



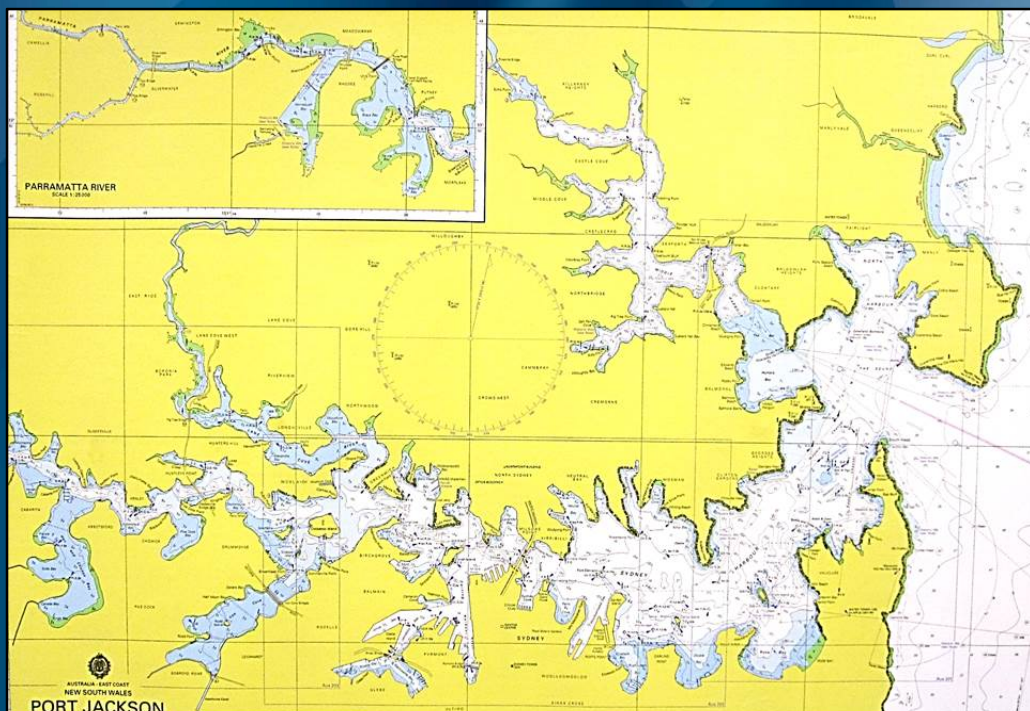
Office of Transport Safety Investigations

FERRY SAFETY INVESTIGATION REPORT

SYSTEMIC INVESTIGATION INTO FERRY CLOSE QUARTER INCIDENTS

SYDNEY HARBOUR

2010 - 2016



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Established on 1 January 2004 by the *Transport Administration Act 1988 (NSW)*, and confirmed by amending legislation as an independent statutory office on 1 July 2005, OTSI is responsible for determining the contributing factors of accidents and to make recommendations for the implementation of remedial safety action to prevent recurrence. Importantly, however, OTSI does not confine itself to the consideration of just those matters that contributed to a particular accident; it also seeks to identify any transport safety matters which, if left unaddressed, might contribute to other accidents.

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Once OTSI has completed an investigation, its report is provided to the NSW Minister for Transport and Infrastructure for tabling in Parliament. The Minister is required to table the report in both Houses of the NSW Parliament within seven days of receiving it. Following tabling, the report is published on OTSI's website at www.otsi.nsw.gov.au.

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GLOSSARY

Automatic Identification System (AIS)	AIS is an automatic tracking system used on ships and by the Vessel Traffic Service (VTS) for identifying and locating vessels by electronically exchanging data with other nearby ships and AIS base stations. AIS information is relayed to other vessels and shore based stations by transponder sending a GPS signal. AIS supplements marine radar as an aid to navigation.
Close Quarter	The <i>Marine Safety (Domestic Commercial Vessel) National Law Act 2012</i> defines close quarter as a situation in which vessels pass each other, or a vessel passes another vessel, a person or an object, in such proximity that a reasonable person would conclude that in all the circumstances there was a risk of an imminent collision.
COLREGS	Convention on the International Regulations for Preventing Collisions at Sea. COLREGS are published by the International Maritime Organisation (IMO) and set out the navigation rules for vessels at sea in order to prevent collisions between vessels.
Domestic Commercial Vessel	A vessel which is not used solely for pleasure or recreation and the use of which is made, allowed or authorised in the course of any business or in connection with any commercial activity.
Ferry	The <i>Passenger Transport Act 1990</i> (PTA) defines a ferry as “...a vessel which seats more than eight adult persons, and includes a vessel of any class prescribed by the regulations for the purposes of this definition.”
Grounding	The impact of a vessel on a seabed or waterway side. It may be intentional, as in beaching to land crew or cargo, and careening, for maintenance or repair, or unintentional, as in a marine accident.
Recreational vessels	A vessel (a boat or ship) operated primarily for pleasure or leisure. This would include aluminium runabouts, motor launches, small sailing boats and yachts.
Survey	Vessels in commercial use in Australia that require a Certificate of Survey and Operation must have regular survey inspections to ensure that they are compliant with National Standards.
Vessel Traffic Service (VTS)	Vessel Traffic Service means a vessel traffic service as a navigational service implemented under a law of the Commonwealth or of a State or Territory and in accordance with guidelines for vessel traffic services adopted by the International Maritime Organisation on 27 November 1997 to improve the safety and efficiency of vessel traffic and to protect the environment, as in force from time to time.

ACRONYMS AND ABBREVIATIONS

AIS	Automatic Identification System
AMSA	Australian Maritime Safety Authority
CBD	Central Business District
CCTV	Closed Circuit Television
COLREGS	<i>International Regulations for Preventing Collisions at Sea, 1972</i>
DIP	Directly Involved Party
FLIR	Forward Looking Infrared
IMO	International Maritime Organisation
MS Act	<i>Marine Safety Act 1998</i>
NSCV	National Standard for Commercial Vessels
OTSI	Office of Transport Safety Investigations
OPT	Overseas Passenger Terminal
PANSW	Port Authority of New South Wales
PTA	<i>Passenger Transport Act 1990*</i>
RADAR	Radio Direction and Ranging
RMS	Roads and Maritime Services
TAA	<i>Transport Administration Act 1988</i>
TfNSW	Transport for NSW
VHF	Very High Frequency (radio)
VTs	Vessel Traffic Service
WAP	Wharf Access Policy

* Denotes act in force at time of investigation

EXECUTIVE SUMMARY

While monitoring ferry operations, OTSI observed a significant increase in the number of reported close quarter incidents giving rise to concerns of systemic safety issues associated with ferry operations in Sydney Harbour.

OTSI's objective was to determine the extent of these incidents, identify any commonality, identify the contributory factors, and provide recommendations to prevent or minimise a recurrence.

The investigation determined that there had been an increase in close quarter incidents between 2010 and 2016. The contributory factors to these incidents included; a greater number of vessels in high usage areas in Sydney Harbour, ineffective communication between vessels, scheduling and timetabling of ferry services, and ferry design.

OTSI has made recommendations to Transport for NSW, Roads and Maritime Services, Australian Maritime Safety Authority, Port Authority of NSW and Ferry Operators.

The full details of the Findings and Recommendations of this investigation are contained in Parts 4 and 5 of this report.

PART 1 INTRODUCTION

Initiation of report

- 1.1 The Office of Transport Safety Investigations (OTSI) while monitoring ferry operations, observed a marked rise in the number of reported close quarter incidents involving ferries in Sydney Harbour. This rise gave concerns there may be systemic safety issues associated with ferry operations on the harbour. As a result, OTSI initiated an investigation in accordance with the provisions and requirements of s46BA of the *Passenger Transport Act 1990* (PTA).
- 1.2 The investigation focused on ferry close quarter incidents that occurred in Sydney Harbour within the period between 2010 and 2016. OTSI also included ferry incidents in that period that resulted in a collision following a close quarter incident. The data was analysed to capture the contributory factors related to close quarter incidents.

Terms of Reference

- 1.3 The terms of reference established by the Chief Investigator required the investigator to:
 - determine the extent of close quarter ferry incidents in Sydney Harbour between 1 January 2010 and 31 December 2016
 - ascertain whether there was commonality between the incidents
 - identify the contributory factors related to close quarter incidents
 - make recommendations to prevent, or minimise the potential for recurrence of these types of incidents
 - make recommendations that will enhance ferry safety.

Investigation methodology

- 1.4 OTSI has analysed available data related to close quarter incidents in Sydney Harbour. The data comprised of incident and CSIRS¹ reports provided to OTSI between 2010 and 2016.
- 1.5 OTSI sourced the following data to address the Terms of Reference.
 - Close quarter incidents reported to OTSI.
 - Ferry master survey results.
 - On-board and water side observations of ferry operations in Sydney Harbour.
 - Interview findings from selected masters during field observations by OTSI of ferry operations.
 - Examination of Closed Circuit Television (CCTV), Automatic Identification System (AIS), and Forward Looking Infrared (FLIR) imagery capturing reported close quarter incidents.
- 1.6 The investigation adopted the *Marine Safety (Domestic Commercial Vessel) National Law Act 2012* definition of a close quarter.
- 1.7 It is not uncommon for a ferry master involved in a close quarter incident to disagree on the severity of the situation. OTSI has accepted that if one master perceives an unsafe distance between two or more vessels and/or a risk of imminent collision, then a close quarter incident had occurred.
- 1.8 OTSI also recognises that a collision is one of the possible consequences of a close quarter incident. This outcome supports OTSI's interest in close quarter incidents involving passenger transport vessels.
- 1.9 The analysis has categorised the vessel type by their operating type as ferry, commercial and recreational. OTSI recognises the restrictions on some types, such as recreational vessels, to navigate in Sydney Cove.

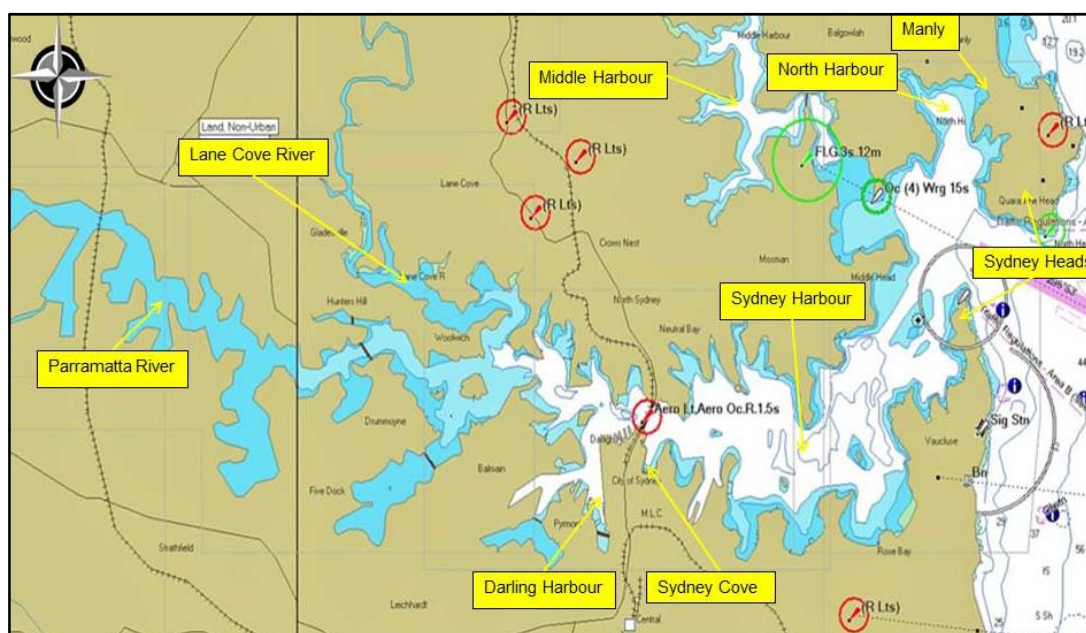
¹ CSIRS – confidential safety information reporting system managed by OTSI

PART 2 FACTUAL INFORMATION

Location of reported incidents

Sydney Harbour

2.1 This report adopted the commonly used term Sydney Harbour for all areas of Port Jackson. According to the Geographical Names Board of New South Wales, Port Jackson is "...a harbour which comprises all the waters within an imaginary line joining North Head and South Head..." Port Jackson extends westward from the single entrance, known as Sydney Heads (North and South Heads) and encompasses all tidal waters including North Harbour, Middle Harbour, Sydney Harbour, Darling Harbour, Parramatta River and Lane Cove River (see Figure 1).



Source: SIX Maps

Figure 1: Map of Port Jackson - Sydney Harbour

- 2.2 Sydney Harbour is approximately 19 km long with a 55 km² surface area.
- 2.3 NSW Government studies indicate Sydney Harbour was home to approximately 20,000 recreational vessels in 2016². Recreational vessels range from large ocean going motor cruisers to small trailered runabouts and sailing dinghies.

² Marine Management Centre, Transport for New South Wales (2013) *Sydney Harbour Boat Storage Strategy*, Sydney: NSW government. This study predicts further growth trends of 2.9% each year to 2026.

- 2.4 A TfNSW Boating Safety Plan³ estimates a maximum potential of 13,000 vessels may be in Sydney Harbour at any one time. Ferries interact with recreational vessels, water taxis, commercial vessels, international cruise liners and naval vessels, making Sydney Harbour a complex waterway.

Sydney Cove

- 2.5 Sydney Cove is located on the southern shore of Sydney Harbour and is one of Sydney's main transport hubs. Within its confines are the Overseas Passenger Terminal (OPT), Campbells Cove, Commissioners Steps, Harbour Masters Steps, East Pontoon and the five main commuter wharves of Circular Quay.
- 2.6 Sydney Cove has the highest concentration of harbour traffic. Approximately 80 ferry movements occur between the week day peak time of 0800 and 0900.

Manly

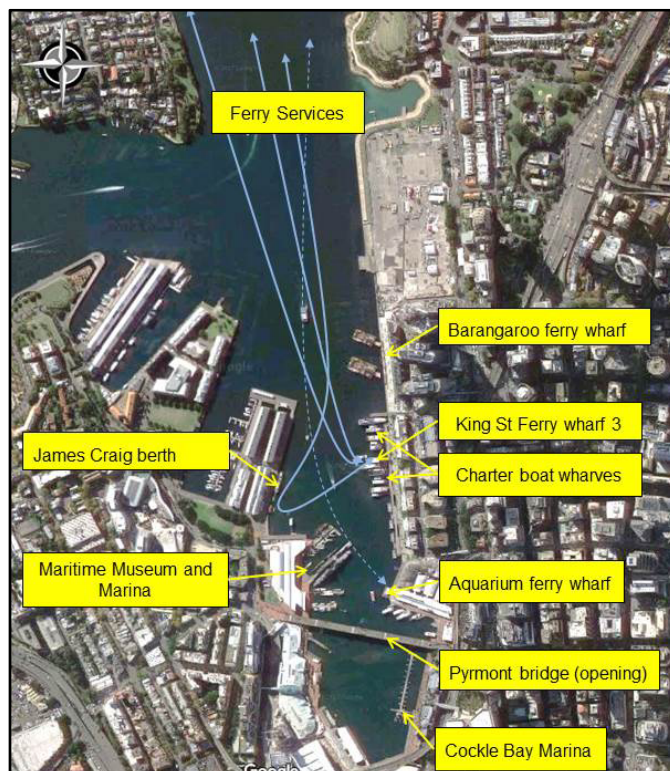
- 2.7 Manly Wharf located on the harbour's north shore is a major transport hub for Sydney's northern beaches. The location caters to commuters and a large number of tourists.
- 2.8 The main wharf at Manly is a large purpose built two-sided pier. A second wharf, Manly East Jetty, is located to the east of the main wharf and has had the southern face strengthened to allow passenger ferries to operate from the wharf.

Darling Harbour

- 2.9 Darling Harbour is on the western side of the city's Central Business District (CBD).
- 2.10 Currently there are a number of wharves at the southern end that provide berths for numerous commercial and recreational vessels. King Street Wharf, Aquarium Wharf and Pyrmont Wharf provide access for commuters utilising ferries.

³ Marine Management Centre (2014) Boating Safety Plan - Sydney Harbour and its tributaries, Sydney, NSW: Transport for New South Wales.

- 2.11 A new passenger ferry hub at Barangaroo north of King Street was commissioned in 2017 (see *Figure 2*).



Source: Google

Figure 2: Darling Harbour

- 2.12 The attractions in and around Cockle Bay provide a regular source of clientele for ferry operators. The need to service the large number of passengers has placed a high demand on limited wharf space.
- 2.13 Navigation in and around Darling Harbour is further complicated by the narrow waters located at the entrance of Cockle Bay.

Ferry operations in Sydney Harbour

- 2.14 A number of ferry operators service Sydney Harbour. The ferries in these fleets vary in size and number, from single ferry operations to the largest fleet of 29⁴.
- 2.15 The three largest operators have a combined fleet of 54 ferries with the largest vessel being over 68 metres in length and capable of carrying over 1000 passengers. The combined fleet carried approximately 19 million passengers in 2016.

⁴ This number excludes Heritage class ferries which are being commissioned in 2017.

- 2.16 A range of ferry operators navigate in Sydney Cove. Other vessels that enter the cove include water taxis, charter services and commercial adventure vessels (see *Figure 3*).

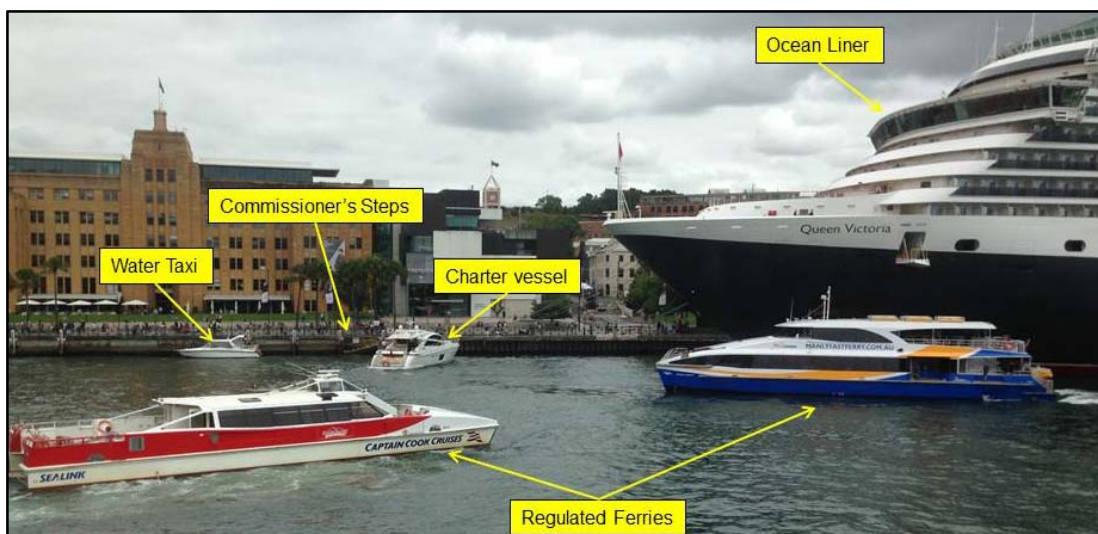


Figure 3: Vessel in the vicinity of Wharf 6 Circular Quay

Management of operations in Sydney Harbour

- 2.17 There are a number of organisations responsible for managing aspects of ferry passenger transport in Sydney Harbour. The principal organisations are:

Transport for NSW (TfNSW)

- 2.18 TfNSW is the lead agency of the NSW transport cluster. Their role is to lead the development of a safe, efficient, integrated transport system. TfNSW engages private ferry companies to supply regulated ferry services through service contracts.

Roads and Maritime Services (RMS)

- 2.19 RMS is part of the NSW transport cluster and is responsible for managing the operations and programs of NSW roads and waterways.
- 2.20 Following an agreement between the Commonwealth and NSW Governments, RMS became a delivery agent for the Australian Maritime Safety Authority (AMSA) in NSW under the national marine legislation. Under this agreement, AMSA delegates certain legislative powers to state and territory marine safety agencies. RMS holds this delegation in NSW.

Australian Maritime Safety Authority (AMSA)

2.21 AMSA is a commonwealth statutory authority whose principal responsibilities include:

- promoting maritime safety and protection of the marine environment
- preventing ship-sourced pollution in the marine environment
- providing infrastructure to support the safety of navigation in Australian waters
- providing a national search and rescue service to the maritime and aviation sectors
- certification of commercial crew competencies.

2.22 AMSA is responsible for ensuring ferries meet minimum safety standards for design and operation. AMSA regulates this process through the survey inspection regime. The survey encompasses vessel design, stability, floatation, navigation and safety equipment.

Port Authority of New South Wales (PANSW)

2.23 PANSW under the leadership of the Harbour Master provides port services in Sydney Harbour. The Harbour Master is appointed by the NSW Government to manage and develop port facilities and services catering for the commercial shipping needs of the State.

2.24 PANSW manages commercial marine navigation in Sydney Harbour & Botany Bay through its Vessel Traffic Service (VTS).

2.25 Located at Port Botany, the PANSW control room manages vessel operations for both Sydney Harbour and Port Botany.

Regulatory environment

2.26 Vessels operating in Sydney Harbour are subject to a number of Acts, regulations and rules, including but not limited to:

- *Marine Safety (Domestic Commercial Vessel) National Law Act 2012* (Cwlth) (from here on referred to as National Law)
- *Passenger Transport Act 1990* (NSW)⁵ (PTA)

⁵ Passenger Transport Act 1990 was in force at the time of this investigation

- *Ports and Maritime Administration Act 1995* (NSW)
- *Marine Safety Act 1998* (NSW), and embedded COLREGS
- Harbour Masters Directions.

2.27 The *Marine Safety Act 1998* (NSW) regulates the navigation of vessels in Sydney Harbour. This Act utilises the *Marine Safety Regulation (NSW) 2016* (the Regulation). These regulations incorporate the COLREGS to facilitate the safe navigation of vessel in Sydney Harbour. These regulations are enforced by the NSW Police and RMS.

2.28 Schedule 6 of the regulation specifically deals with the requirements relating to vessel operating in Sydney Cove. They include, but not limited to:

- authorisation to enter Sydney Cove
- the “north / south” rule⁶
- ferries are to wait at the waiting line before approaching occupied wharves (see *Figure 4*)
- a speed restriction of eight knots for all vessels within Circular Quay south of an imaginary line between Dawes Point and Bennelong Point.

⁶ Described in Schedule 6 of the Regulation: ‘...a vessel must be operated on a northerly or southerly course within Sydney Cove’ and a northerly course when departing to a place west, ‘until altering course to port to pass north of the diamond shape marking the centre of the Harbour Bridge’.

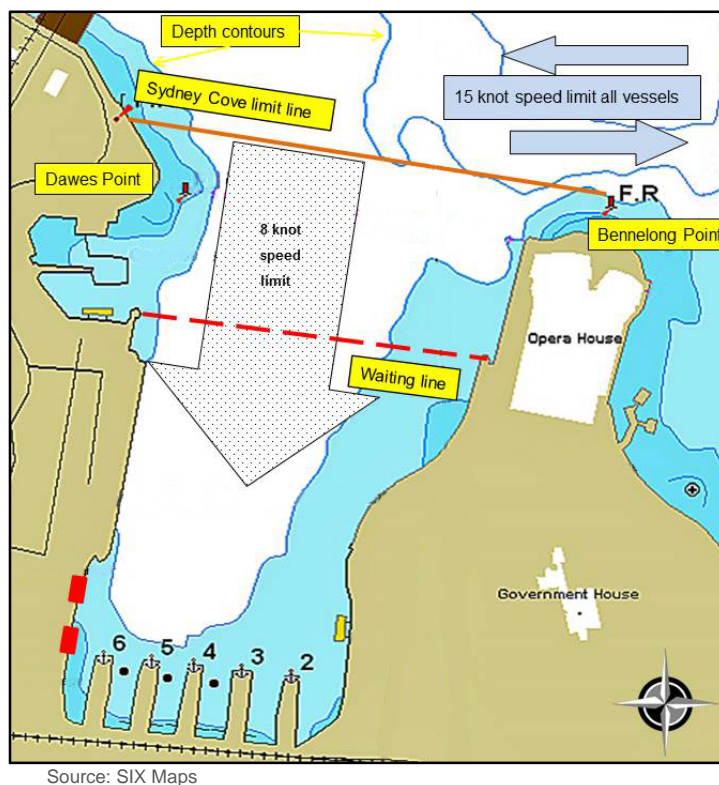


Figure 4: Sydney Cove

- 2.29 The National Law specifies the safety requirements for all commercial vessels and their crew in Australian waters. It sets the National Standard for Commercial Vessels (NSCV) for construction, operation and seafarer qualifications. It also establishes AMSA as the single national safety regulator for commercial vessels.
- 2.30 The Harbour Master may issue directions to advise vessel operators of changes to the operating environment and local knowledge requirements for masters operating a vessel of more than 30 metres in length without a pilot.
- 2.31 The PTA specifies different categories of ferry services. Currently, there are four categories of ferry services applicable to Sydney Harbour:
- Regulated ferry services
 - Deregulated ferry services
 - Tourist services
 - Charter services.
- 2.32 Regulated ferry services are any public passenger services operating to regular routes and timetables. The PTA requires these services to be

operated under a service contract with TfNSW. Within these contracts TfNSW may direct timetables, routes and impose contract performance standards.

- 2.33 Deregulated ferry services are timetabled services that TfNSW has exempted from the requirements to hold a service contract.

- 2.34 Tourist services are defined in the PTA as a public passenger service that is a pre-booked service designed to transport tourists to destinations on a publicly available itinerary, or a service designed to transport tourists where the journeys of each passenger have a common origin or destination (or both). These operators are not required to hold a service contract. Despite this definition, in practice, tourist services are mostly not pre-booked. Rather, passengers usually purchase a ticket at the wharf or on board the ferry.

- 2.35 Charter services are non-timetabled services where the hirer of the ferry is entitled to determine the route for the journey and time of travel. The services are pre-booked for an agreed fee.

- 2.36 The regulation of access to commuter and charter wharves is specified under the *Ports and Maritime Administration Regulation 2012* (NSW). The Wharf Access Policy (WAP) was developed by TfNSW and its associated wharf booking system is administered by RMS.

PART 3 ANALYSIS

Data analysis

- 3.1 The investigation focused on collecting data from reported incidents involving ferries that came into close quarters with other vessels or objects. This included collision incidents that resulted from close quarters. Excluded from the data were grounding and berthing incidents that were a result of a loss of control or misjudgement. Additionally, OTSI has also excluded from the analysis close quarter incidents between ferries and recreational vessels.
- 3.2 OTSI recognises that the skippers of recreational vessels operate under different conditions to professional masters. The controls related to close quarter incidents involving recreational vessels may differ from controls for incidents involving ferries and commercial vessels.
- 3.3 RMS advises recreational skippers to keep a proper lookout, give way to passenger ferries, to stay clear of, and not cross the path of, large vessels on Sydney Harbour.
- 3.4 An analysis of the data from 2010 to 2016 revealed that 108 close quarter incidents were received by OTSI. There was an increase in incidents from five in 2010 to 30 in 2016 (see *Figure 5*). It is unclear whether this was a result of an actual increase in incidents or an increase in incident reporting or both.

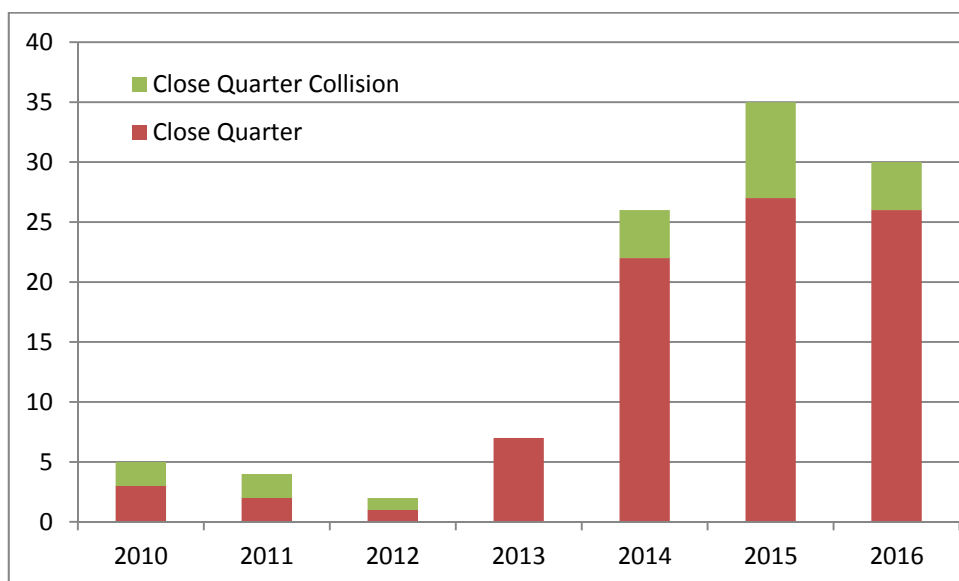


Figure 5: Close Quarter Incidents 2010 - 2016

- 3.5 An examination of the close quarter incidents showed that most involved a ferry coming into close quarters with another ferry. The least frequent occurrence was between a ferry and an object (see *Figure 6*).

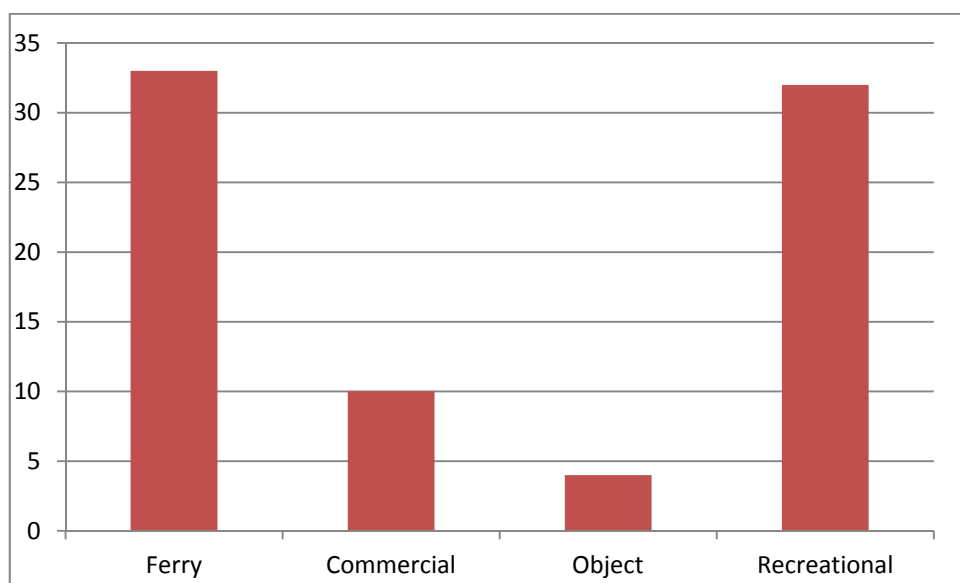


Figure 6: Type of Close Quarter

Complexity of ferry operations in Sydney Cove

Wharf Access

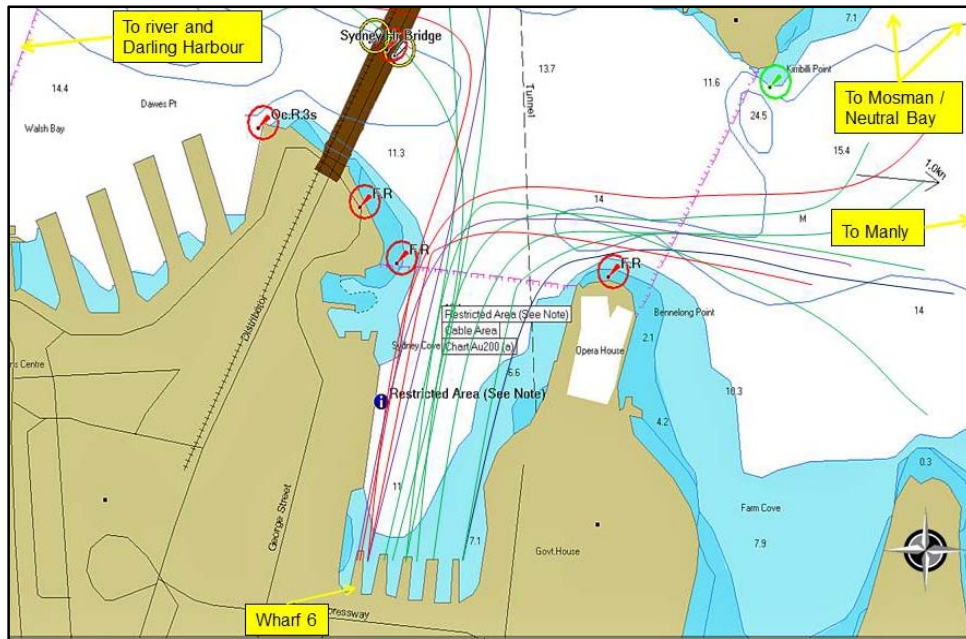
- 3.6 An important factor which contributes to complexity in Sydney Cove is wharf access. In order to maximise use of limited wharf space in Sydney Cove a WAP has been developed. For this policy to take effect there is an associated wharf booking system.
- 3.7 The wharf booking system is designed to provide commercial vessel operators a right of access to wharves in Sydney Harbour. This booking system allows other operators to utilise wharves when the wharf is not required for regulated services. However, this has increased the complexity of navigation as it allows additional services to operate in parallel with scheduled timetables services. This is particularly evident in the south western corner of Circular Quay near the heavily utilised Wharf 6, the Commissioners Steps and the Harbour Masters Steps.
- 3.8 This issue arises as wharf bookings are entered by an operator and there appears to be minimal assessment on the impact upon other ferry services operating in the vicinity.

- 3.9 In addition, other vessels such as water taxis are not required to use the wharf booking system. Water taxis operate on an as needs basis and are often found in the vicinity of the eastern and western shores of Sydney Cove (see *Figure 7*).



Figure 7: Water Taxi waiting zones

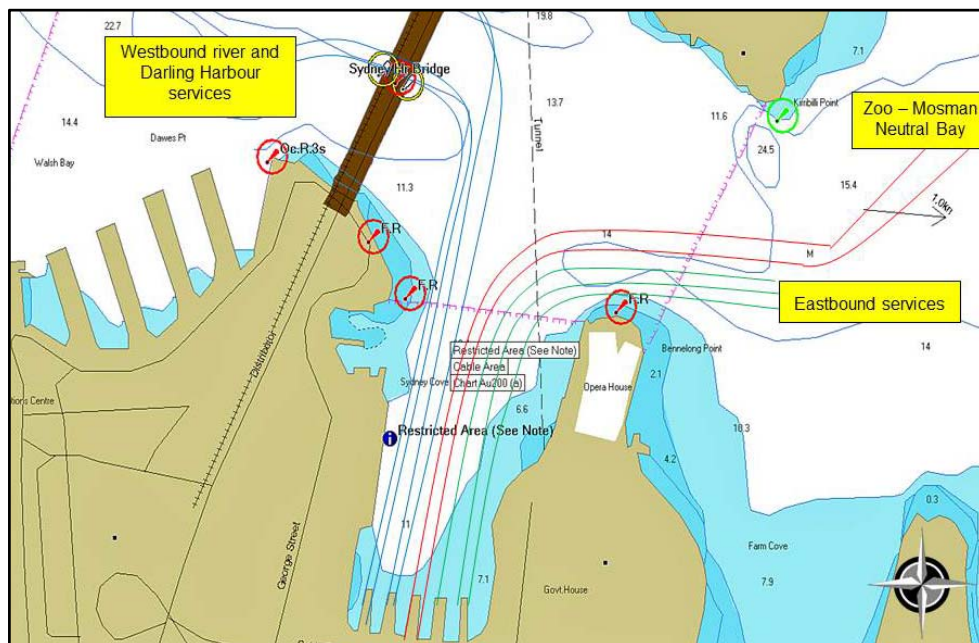
- 3.10 Within the WAP there is an arrangement where one operator is provided with exclusive access to Circular Quay Wharves 2 West, 3, 4 and 5. A high speed ferry operates from Wharf 6 West to Manly. Ferries departing Wharf 6 turn to the east and cross paths with ferries utilising the eastern wharves. These conflicting courses typically intersect near Bennelong Point (see *Figure 8*).



Source: SIX Maps

Figure 8: Crossing ferry routes

- 3.11 A solution would be to allocate wharf access on the basis of geographic destination whereby ferries destined for eastern suburbs used the more easterly wharves, those destined for north and north-easterly suburbs used the central wharves, and those heading for destinations west of the Harbour Bridge used the more westerly wharves (see *Figure 9*).



Source: SIX Maps

Figure 9: Non crossing ferry routes

- 3.12 The alignment of wharf usage with geographic destination needs careful consideration to ensure that an increase of vessel movements in Sydney

Cove does not result from extra services utilising vacant wharves that may arise from any distribution of services.

- 3.13 Charter vessels up to 60 metres in length operate from Wharf 6 East. Because of their size, when manoeuvring they block access to Wharves 4 and 5. When cruise ships are berthed at the OPT, services operating from Wharf 3 can be negatively impacted upon.

Cruise Ships

- 3.14 The increasing presence of cruise ships in Sydney Cove affects the operation of ferries. Since 2014, there has been an approximate 20% per annum increase in cruise ships visiting Sydney Harbour. When cruise ships arrive and depart, all traffic within Sydney Cove virtually comes to a standstill. This is not only due to the physical space occupied by the ship, but also due to turbulence created by tug boats and the ship's thrusters. This turbulence does not dissipate quickly and can affect other vessels as they pass. (see *Figure 10*).

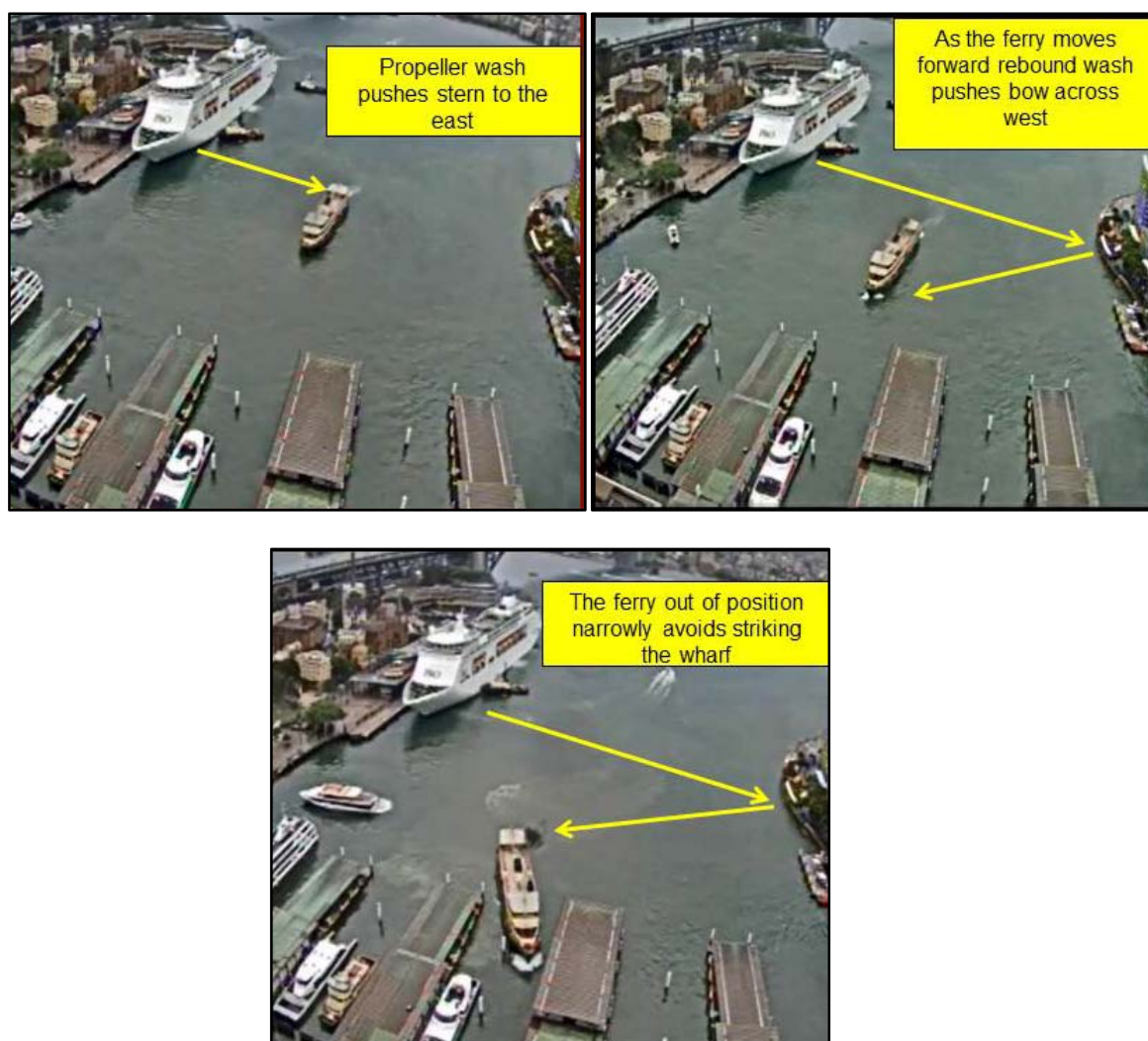


Figure 10: CCTV series of frames showing turbulent wash in Sydney Cove

- 3.15 When cruise ships are berthed at the OPT there is a reduction in the width of the navigable waters within the cove. This is further exacerbated when ancillary vessels, such as bunker barges, are alongside a cruise ship. This means that vessels utilising Wharves 5 and 6 are forced to navigate on a more easterly track and may bring them in proximity with vessels utilising the eastern wharves.
- 3.16 Berthed cruise ships can create turbulence when thrusters are activated to hold the vessel more securely alongside the OPT wharf in strong westerly winds.

- 3.17 The presence of cruise ships in Sydney Cove poses a challenge for masters to comply with regulatory requirements. Schedule 6 of the regulation, places restrictions on vessel arrivals and departures. Vessels entering the cove must not proceed south of the waiting line unless their intended berth is vacant and there are no vessels hindering their approach. Also, a vessel must not depart from a berth if the departure hinders a vessel that is south of the waiting line. A cruise ship can restrict the line of sight of a ferry navigating between the waiting line and the south western area of the cove. This means that, unless technology such as AIS is mandated, masters cannot confirm if the berth is vacant or whether their movements would hinder an approaching vessel (see *Figure 11*).

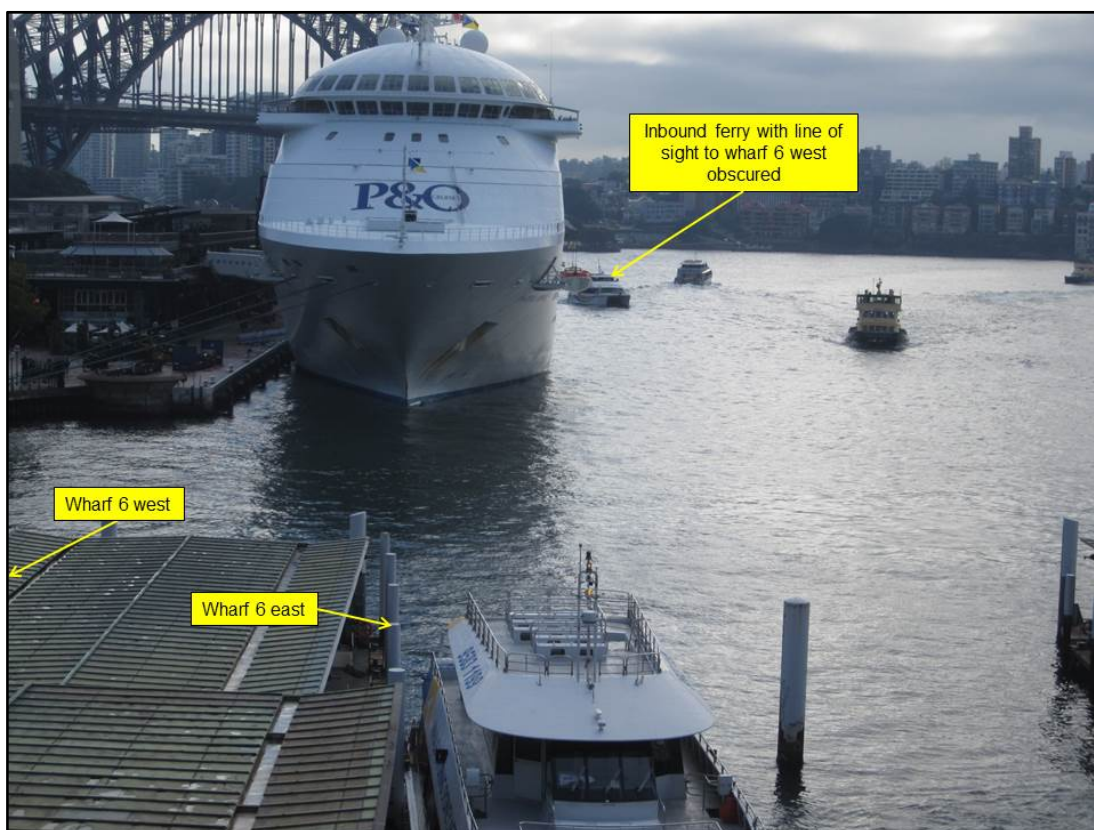


Figure 11: Ocean Liner obstructing line of sight

- 3.18 OTSI's observations confirmed ferries often creep south beyond the waiting line to a point near the bow of the cruise ship to gain line of sight of the berth (see *Figure 12*). On occasions, vessels departing from the south western wharves have their projected path hindered by an approaching inbound vessel (see *Figure 13*).



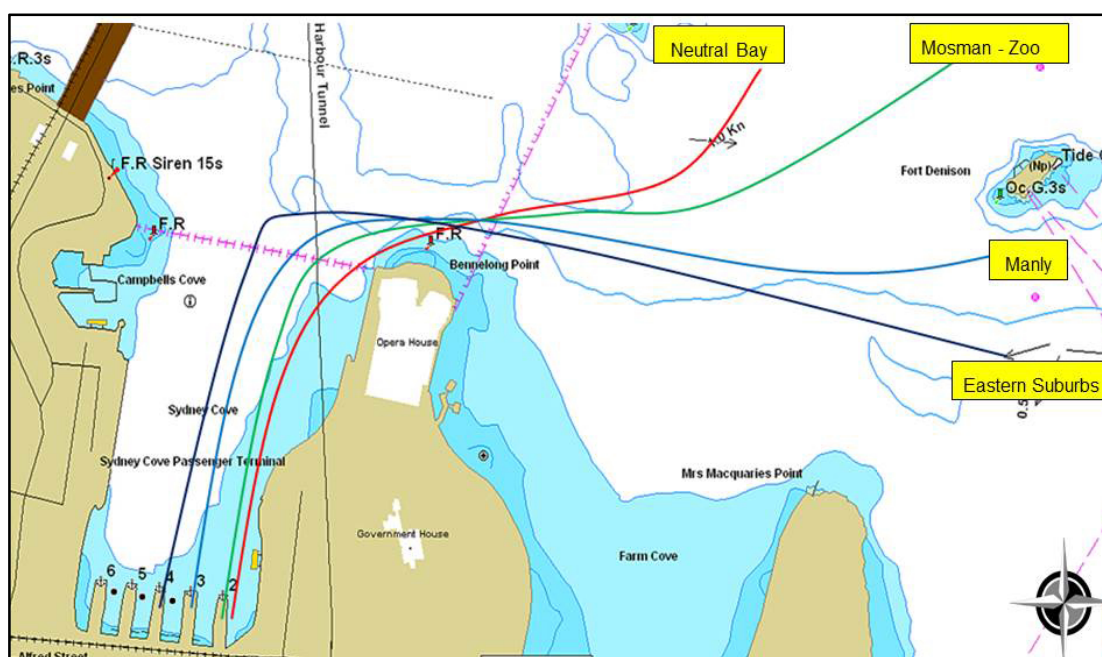
Figure 12: View from ferry wing control Wharf 6 West



Figure 13: Vessels crossing paths south western corner of Sydney Cove

Routes and timetabling

- 3.19 Prior to 2014, services departing Circular Quay for Manly, Mosman and Taronga Zoo commonly crossed paths due to same time departures. These routes would typically cross at Bennelong Point (see *Figure 14*).
- 3.20 The crossing movement still exists with the current timetable for some services departing their wharves at the same time. An example of this is the weekday 1530 service departing for Manly from Wharf 3 and Mosman service from Circular Quay Wharf 2. When these vessels reach the vicinity of Bennelong Point they have to cross paths so that the Mosman service can continue to the north.



Source: SIX Map

Figure 14: A representation of same time departure conflicting routes (pre 2014)

- 3.21 Congestion created by same time departures is intensified when ferries are required to reverse away from their wharf before swinging through 180 degrees and heading north. This increases congestion at the mouth of the wharves. The use of double ended ferries, which do not swing when departing, reduces this congestion.
- 3.22 Following the OTSI draft report regarding Close Quarter Incidents in Sydney Harbour, HCF has rationalised wharf usage with a view to minimise the impact of tight timetables and ferry same time departures (see *Figure 15*).

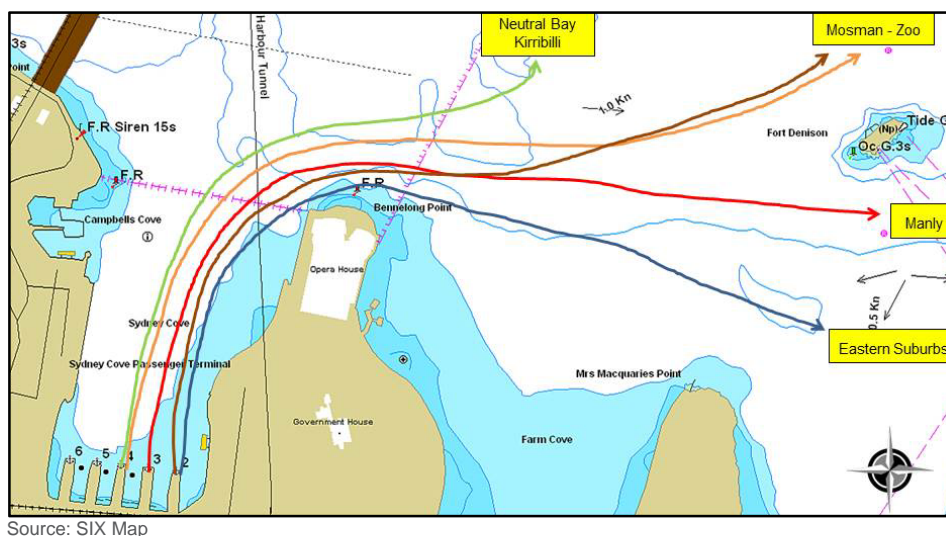


Figure 15: Post OTSI draft report wharf usage

- 3.23 Currently, 12 high speed ferry services arrive and depart each hour during the peak periods from Wharf 6 West. During this same period, an additional 8 ferry services arrive and depart from Wharf 6 East. Added to this, other ferry services, both scheduled and non-scheduled, operate from Commissioners Steps and Harbour Masters Steps adjacent to Wharf 6 West. The high traffic through Wharf 6 in Sydney Cove is a challenge to ferry timetabling.
- 3.24 In recent years, operators have introduced 'double stack' berthing on Wharf 6, whereby two ferries berth stern to stern. This is further increasing congestion in this location. Double stacking requires the second ferry stopping on approach, then swinging through 180 degrees and berth stern first into the wharf. These manoeuvres are often unexpected by other masters and have resulted in close quarter incidents (see *Figure 16*).

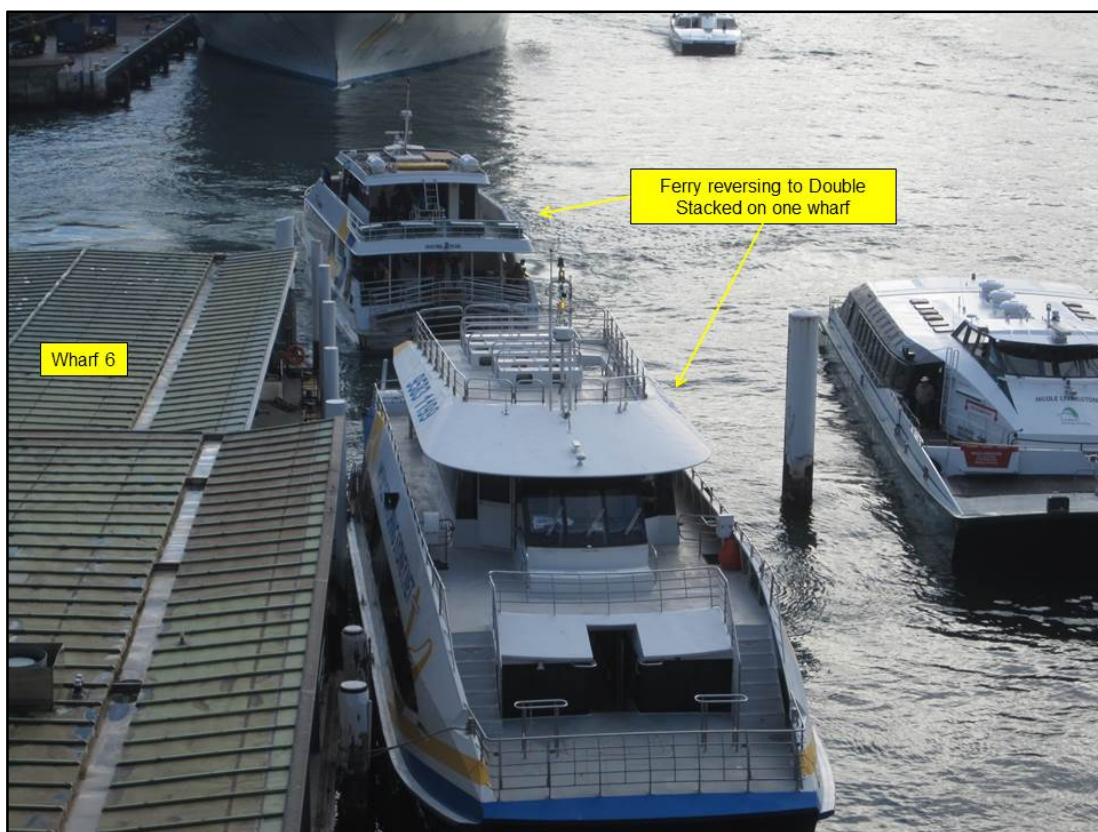


Figure 16: Double stacked ferry berthing

Operational Control

- 3.25 A master navigating within Sydney Cove is required to follow Schedule 6 of the regulation. A master relies on visual cues to navigate in this complex environment with limited communication with other vessels.
- 3.26 Currently one operator provides navigational support to their masters through a communications control centre. Communication with this control centre is carried out on a discrete radio channel. There is no single controlling body to assist overall ferry operations within Sydney Cove.
- 3.27 Remaining operators provide either limited or no support to masters when navigating within Sydney Cove. This lack of communal coordination has often led to misunderstandings and close quarter incidents. This situation becomes more complex when non-timetabled tourist or charter vessels also navigate within Sydney Cove.

Communications

- 3.28 While Schedule 6 of the regulation requires vessels in Sydney Cove to monitor VHF channel 13⁷ it does not require them to use that channel exclusively for vessel to vessel communications. Furthermore, many masters limit their use of channel 13 for formal communication. The masters rely on either their company's internal radio networks and / or mobile phones for informal communication. The lack of a prescribed common communication channel leaves masters often unaware of the intentions of other operators. This can create confusion and pose a challenge to safe navigation in the confines of Sydney Cove.
- 3.29 An examination of incident reports by OTSI revealed that a lack of communication between masters was a contributory factor in a number of close quarter incidents. On some occasions when communication was attempted on channel 13, the radio call was unanswered by the other master.
- 3.30 It may be beneficial that a dedicated working channel and a common radio protocol be implemented for all communications in Sydney Cove.
- 3.31 This radio protocol will be further bolstered by the creation of a common communications control centre to coordinate movements within Sydney Cove.

Sydney Cove Local Knowledge

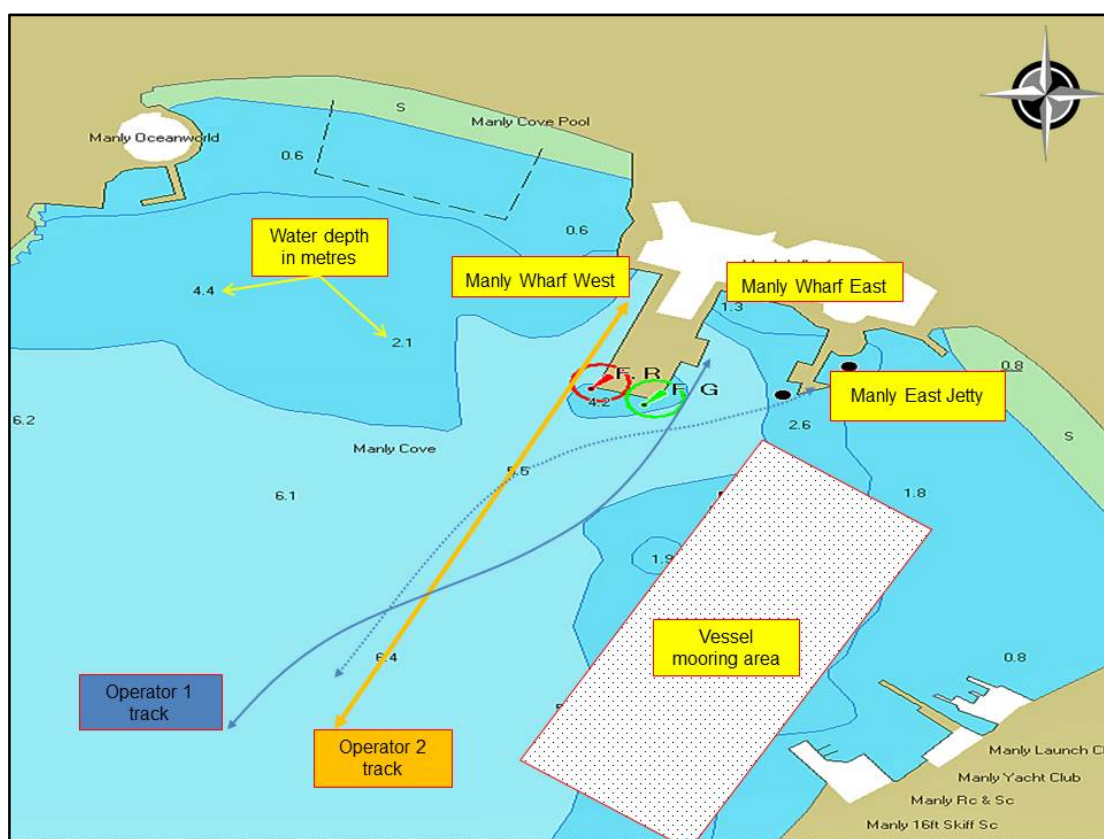
- 3.32 A certificate of local knowledge is required by all masters to navigate in Sydney Harbour for vessels 30 metres or more in length with the exception of those under pilot. There is no such requirement for masters of vessels under 30 metres in length. This creates an anomaly where two different standards of qualification exist based on vessel length.
- 3.33 Irrespective of vessel length, it will be beneficial to navigation if all masters had a common understanding of the local operating requirements in Sydney Cove.

⁷ 156.65 megahertz

Complexity of ferry operations in other areas of Sydney Harbour

Manly

- 3.34 Manly Wharf and the Manly East Jetty are in close proximity to one another. The angled approach to Manly East Jetty requires vessels to navigate across the pathway into Manly Wharf (see *Figure 17*). The number of vessels movements at the Manly wharves in peak periods is comparable to the south west corner of Sydney Cove. In addition, there is limited navigable water due to the proximity to shallow water and a vessel mooring area.



Source: SIX Map

Figure 17: Manly Wharf locality

- 3.35 Previously, there were two high speed ferry operators servicing Manly from Sydney Cove. When this was reduced to one operator the number of close quarter incidents declined. The introduction of a wharf booking system has increased the number of vessels and operators utilising Manly Wharf. This has the potential to increase complexity of operation in the waters around the Manly wharves if not managed.

- 3.36 Currently there are no local directions for navigation in the Manly Wharf area. It would be beneficial to develop common use procedures for navigating around the Manly wharves.

Darling Harbour / Barangaroo

- 3.37 The wharves at Darling Harbour are located in a narrow body of water. In this area, regulated ferry services interact with a number of other vessels which include recreational, deregulated ferry services, tourist and charter vessels.
- 3.38 During summer, the high season for charters and special events, ferry services have to navigate near a fleet of large charter vessels waiting to berth and depart from the east-west oriented wharves located at the end of King Street (see *Figure 2*). Ferries have limited navigable waters adjacent to the King Street wharves due to the large Maritime Museum marina on the western side of the bay.
- 3.39 Vessels encountered difficulty when departing King Street Wharf 3 stern first. Departing stern first is the preferred method of operation as berthing stern first can be problematic. Vessels moored beside King Street Wharf obscure visibility of ferry masters and also make it difficult for passing traffic to see the departing ferry (see *Figure 18*).

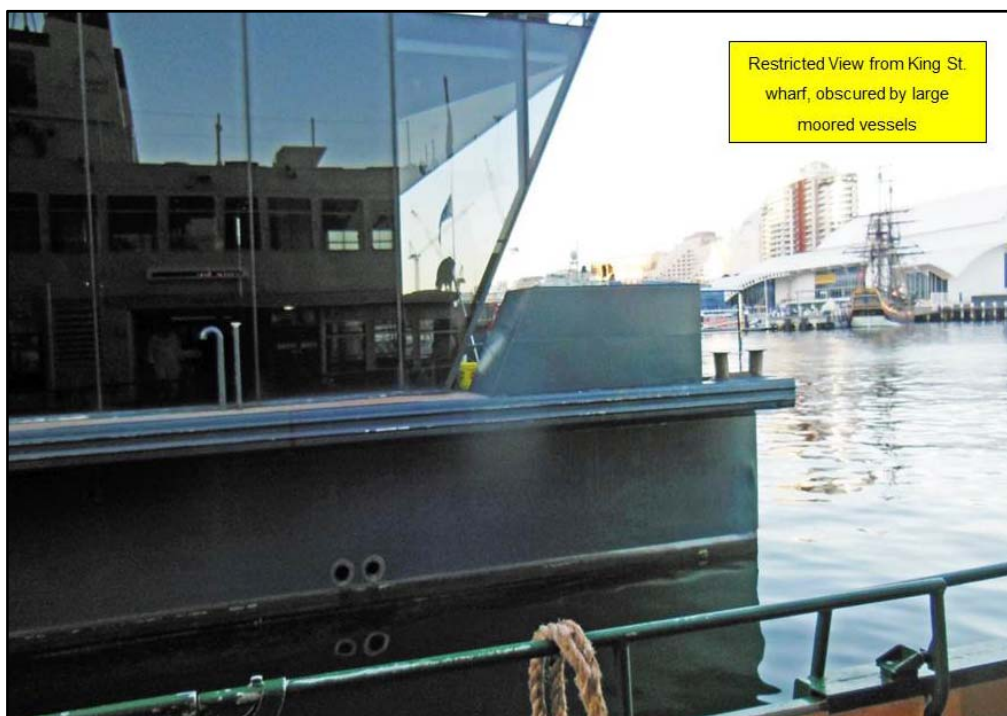


Figure 18: Restricted line of sight at King Street Wharf

- 3.40 The new four berth Barangaroo Wharf has been commissioned. The ferry passenger services at King Street Wharf will relocate to Barangaroo. The new wharves will introduce additional services in the area.
- 3.41 The Darling Harbour waterway is busy. Monitoring of traffic increase over and above the existing services will be needed to prevent the complexities arising, similar to those at Sydney Cove.

Other issues

Ferry design

- 3.42 Passenger transport operations in Sydney Harbour benefit from purpose designed and built ferries. Certain design requirements are necessary for the service area of operation. For example, a service to Manly requires larger more seaworthy ferries to handle large swells and seas around the Heads. In contrast, shallow draft and low wash ferries are required to service the Lane Cove and Parramatta rivers.
- 3.43 Other design elements, while not compulsory, offer benefits to operations in busy waterways. For example, designs which encompass all round vision from the wheelhouse may improve a master's situational awareness. This assists a master in maintaining a proper lookout, vital in effective decision making when manoeuvring in and around other vessels.
- 3.44 Poor visibility astern poses challenges for the master when operating from various types of wharves, especially dead-end wharves as found at Circular Quay, where ferries are required to back out into the path of other vessels.
- 3.45 Ferries designed without direct visibility astern may require the master to rely on lookouts or CCTV cameras and screens to assist the master see into blind spots. Limitations of CCTV include poor depth of field, narrow field of view and loss of definition in low light situations. The light from CCTV screens in the wheelhouse may negatively impact upon a master's night vision increasing the risk of the master missing an object during low light conditions.
- 3.46 Masters may utilise crew lookouts to assist in monitoring blind spots. The lookouts proficiency may impact upon the effectiveness of the task.

- 3.47 Prior to 1984, the majority of ferries using Sydney Cove were double-ended, having control bridges at both ends of the ferry. This facilitated direct entry into and out of dead-end wharves, no other manoeuvring being necessary and generally good visibility for the master.
- 3.48 The introduction of catamaran type ferries to services operating in Sydney Harbour has introduced an added complexity at dead-end wharves. The catamaran while offering greater manoeuvrability must reverse and rotate through 180 degrees when departing Circular Quay. This manoeuvre may bring vessels into close quarters when being carried out simultaneously by two or more vessels. Good visibility from the wheelhouse is imperative in this case to mitigate a close quarter situation developing.
- 3.49 A number of vessels currently operating from Circular Quay offer limited or no visibility astern. This investigation found that vessels of this type were often involved in close quarter incidents while carrying out a turnaround manoeuvre.
- 3.50 When designing new vessels for Sydney Harbour consideration must be given to managing the risk of obstructed visibility, ideally providing the master with all round visibility.
- 3.51 Vessels where passengers are not separated from the helm position add to the risk of distraction for the master, potentially blocking the master's field of view and introducing an additional security risk.
- 3.52 The NSCV Part C Design and construction⁸, states that:
- On a passenger vessel of measured length at least 24m, the primary operating station:*
- (a) *must be separated from passenger spaces; and*
- (b) *must not be used for purposes other than navigation, communications, and provision of watch keeper amenities or other functions essential to the safe operation of the craft, its engines, passengers, and cargo.*
- 3.53 Increasingly, fast passenger carrying vessels less than 24 metres in length are being introduced to Sydney Harbour. These vessels are not required to meet the above standard, even though they are performing the same passenger service. In order to address the possible distraction and security

⁸ Published 18 November 2013 following approval by the Standing Council on Transport and Infrastructure, 15 November 2013

risks it may be beneficial that all regulated ferry services are required to meet the above mentioned standard.

On-board Technology

- 3.54 Masters utilise on-board navigation aids such as AIS⁹, RADAR and FLIR to assist safe navigation. These systems are specified in the NSCV.
- 3.55 Ferries operating in Sydney Harbour are not required to be fitted with AIS. AIS, however, provides masters with increased awareness of vessels which would otherwise be hidden from the naked eye. AIS also provides extra information about a neighbouring vessel's course, speed and name. This information is invaluable to any centralised control centre.
- 3.56 At night, FLIR can identify the presence of unlit vessels and obstructions not readily visible to the naked eye. RADAR is especially valuable in conditions of reduced visibility when it is necessary to make a safe passage to a refuge by locating and identifying other vessels.
- 3.57 These on-board navigational aids can assist the master in preventing a close quarter situation developing by providing additional information which facilitates informed decision making.
- 3.58 High speed ferry operation reduces the time available for an effective decision making process. On ferries operating with only the master in the wheelhouse it is challenging to maintain a visual lookout as well as effectively monitor all the navigational aids. A human factors assessment should be carried out prior to the introduction of on-board navigational aids to ensure a lone master is not overwhelmed by information / task overload.

Incident Reporting

- 3.59 There is evidence that many incidents are not reported to AMSA as required by legislation. This is based on numerous interviews with masters and direct observation by OTSI investigators. Masters when interviewed informed the investigators they were reluctant to report close quarter situations, especially those resulting from conflicting routes and same time departures. They believed no action would be taken if reported or that the action would be

⁹ AIS is available as AIS-A and AIS-B. AIS-A provides more frequent data transfer than AIS-B.

punitive rather than consultative. A secondary concern of masters is that the current reporting process is overly time consuming.

- 3.60 Most incident reports are made by the larger operators. It is unclear why smaller operators didn't always report. It is important for all incidents to be reported and that the reporting process is simplified.

PART 4 FINDINGS

From the evidence available, the following findings are made with respect to close quarter incidents in Sydney Harbour.

Contributory Factors

- 4.1 The investigation found that there was an increase of close quarter incidents in Sydney Harbour between 2010 and 2016.
- 4.2 The wharf booking system in Sydney Harbour has not resolved congestion issues around high usage wharf areas such as south-west corner of Circular Quay, Manly and Darling Harbour.
- 4.3 There is minimal effective oversight of the operation of the wharf booking system. In particular, how the booking of an individual berth impacts upon surrounding ferry operations.
- 4.4 The allocation of wharf usage for example, where west bound ferries are allocated berths on the eastern wharves leads to ferries crossing paths near congested areas.
- 4.5 There have been an increased number of cruise ships berthing in Sydney Harbour between 2010 and 2016.
- 4.6 When cruise ships are arriving, berthed and departing Sydney Cove, the resulting propulsion wash impacts on ferry handling.
- 4.7 When cruise ships are berthed at the OPT in Sydney Cove it reduces the line of sight for ferries accessing the south western wharves of Sydney Cove.
- 4.8 The scheduling of regulated ferry services for same time departures is adding to congestion.
- 4.9 The timetabling of high frequency ferry services from Wharf 6 is creating congestion issues.
- 4.10 The double stack berthing of ferry services in Sydney Cove has led to congestion and close quarter incidents.

- 4.11 There is no independent common control centre to coordinate ferry operations within Sydney Cove.
- 4.12 The designated VHF radio channel 13 is currently not being fully utilised by all masters operating vessels in Sydney Cove.
- 4.13 The current requirement for a certificate of local knowledge does not apply to masters who operate vessels under 30 metres in length.
- 4.14 The new Barangaroo ferry hub will provide additional services in Darling Harbour. This may introduce further challenges in the area.
- 4.15 Ferry design that provides all round visibility from the wheelhouse may improve situational awareness for the master.
- 4.16 Ferry designs where passengers are not separated from the wheelhouse create potential issues with distraction and security threat.
- 4.17 The fitting of AIS to all ferries in Sydney Harbour would provide improved information for masters and controllers. This extra information would likely improve situational awareness and reduce the likelihood of close quarter incidents.
- 4.18 A master's workload will increase during high speed or high traffic situations and may expose the master to task overload.
- 4.19 There is evidence from master interviews that incidents are not being reported in accordance with the legislation.
- 4.20 Poor communications between masters contributed to close quarter incidents within Sydney Cove.
- 4.21 Although close quarter incidents between ferries and recreational vessels were not covered in this report, OTSI wishes to highlight the number of these type of incidents reported by ferry masters. RMS currently advises recreational skippers to stay clear of passenger ferries on Sydney Harbour.

PART 5 RECOMMENDATIONS

Transport for NSW

- 5.1 Support the introduction of robust management of the wharf booking system to reduce the congestion around high usage wharf areas and water taxi operations.
- 5.2 Designate wharf usage according to geographic destination where practicable in order to minimise ferries crossing paths in congested areas.
- 5.3 Ensure ferry timetables avoid same time departures.
- 5.4 Amend ferry timetables to reduce congestion around Wharf 6.
- 5.5 Support establishing an independent common control centre that has dedicated responsibility for the management of traffic in Sydney Cove.
- 5.6 Introduce a traffic management plan for other high usage areas such as Manly and Barangaroo / Darling Harbour.
- 5.7 Include master's field of view from wheelhouse in procurement standards when acquiring new vessels for Sydney Harbour operations.
- 5.8 Explore the benefits of installing AIS on all passenger transport ferries operating in Sydney Harbour.
- 5.9 Support the introduction for all masters to have local knowledge for operating in Sydney Cove, irrespective of vessel length.

Roads and Maritime Services

- 5.10 Increase monitoring of the wharf booking system to ensure that congestion issues are minimised.
- 5.11 Assess and control the risk associated with the practice of double stack berthing in Sydney Cove.
- 5.12 Introduce robust management of the wharf booking system to reduce the congestion around high usage wharf areas and water taxi operations.

- 5.13 Support the introduction for all masters to have local knowledge for operating in Sydney Cove, irrespective of vessel length.
- 5.14 Future safety programs to further educate recreational skippers on the risks associated with their vessel being in close proximity to ferries.

Australian Maritime Safety Authority

- 5.15 Consider including the separation of helm position from passenger areas in future designs. This will minimise the risk of distraction, adverse security situations and loss of field of view.
- 5.16 Simplify the marine incident reporting process to facilitate timely notifications.

Port Authority of NSW

- 5.17 Ensure that effective communication by ship operators occurs when thrusters are in use by ships in Sydney Cove.
- 5.18 Establish an independent common control centre with dedicated responsibility for the management of traffic in Sydney Cove.
- 5.19 Allocate a working VHF radio channel and require masters to not only monitor but transmit through this channel when in Sydney Cove.
- 5.20 Irrespective of vessel length, all masters to have local knowledge for operating in Sydney Cove.

Ferry Operators

- 5.21 Allocate qualified crew members as additional lookouts in the wheelhouse when navigating at high speed or in high traffic areas.
- 5.22 Assess and control the risk associated with the practice of double stack berthing in Sydney Cove.
- 5.23 A human factors assessment should be carried out prior to the introduction of navigational aids to ensure a lone master is not overwhelmed by information / task overload.
- 5.24 Select the departure wharf according to geographic destination where practicable, in order to minimise ferries crossing paths in congested areas.

- 5.25 Include master's field of view from wheelhouse in procurement standards when acquiring new vessels for Sydney Harbour operations.

PART 6 APPENDICES

Appendix 1: Sources, Submissions and Acknowledgements

Sources of Information

Marine Management Centre, Transport for New South Wales (2013) *Sydney Harbour Boat Storage Strategy*, Sydney: NSW Government.

Marine Management Centre, Transport for New South Wales (2014) *Boating Safety Plan - Sydney Harbour and its tributaries*, Sydney: NSW Government.

Marine Safety Act 1998 (NSW).

Marine Safety Regulation 2016 (NSW).

Marine Safety (Domestic Commercial Vessel) National Law Act 2012 (Cwlth).

National Standard for Commercial Vessels (NSCV) Part C Design and construction 2013.

Passenger Transport Act 1990 (NSW).

Passenger Transport Act 2014 (NSW).

Port Authority of New South Wales (2016) *Harbour Master's Directions for Sydney Harbour & Botany Bay*, Sydney: NSW Government.

Transport Administration Act 1988 (NSW).

Transport for New South Wales (2010) *Moving Together Corporate Plan 2010 – 2014*, Sydney: NSW Government.

Transport for New South Wales (2016) *Sydney Cove – Vessel Traffic Analysis*, Sydney: NSW Government.

Transport for New South Wales (2015) *Wharf Access Policy*, Sydney: NSW Government.