



Office of Transport Safety Investigations

# FERRY SAFETY INVESTIGATION REPORT

FIRE ONBOARD CAPTAIN COOK CRUISES' FERRY *JILLIAN*

SYDNEY HARBOUR

28 APRIL 2010



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*Published by:* The Office of Transport Safety Investigations  
*Postal address:* PO Box A2616, Sydney South, NSW 1235  
*Office location:* Level 17, 201 Elizabeth Street, Sydney NSW 2000  
*Telephone:* 02 9322 9200  
Accident and incident notification: 1800 677 766  
*Facsimile:* 02 9322 9299  
*E-mail:* [info@otsi.nsw.gov.au](mailto:info@otsi.nsw.gov.au)  
*Internet:* [www.otsi.nsw.gov.au](http://www.otsi.nsw.gov.au)

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Established on 1 January 2004 by the Transport Administration Act 1988, and confirmed by amending legislation as an independent statutory office on 1 July 2005, OTSI is responsible for determining the causes and 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 caused or 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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## ACRONYMS AND ABBREVIATIONS

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<b>CCC</b>	..... Captain Cook Cruises
<b>CSIRS</b>	..... (OTSI's) Confidential Safety Information Reporting Scheme
<b>DIP</b>	..... Directly Involved Party
<b>GPH</b>	..... General Purpose Hand
<b>MED III</b>	..... Certificate of Competency as a Marine Engine Driver Grade 3
<b>NSWMA</b>	..... NSW Maritime Authority
<b>NUC</b>	..... Not Under Command (lights)
<b>OTSI</b>	..... Office of Transport Safety Investigations
<b>SF</b>	..... Sydney Ferries
<b>SMS</b>	..... Safety Management System
<b>SPC</b>	..... Sydney Ports Corporation
<b>USL</b>	..... Uniform Shipping Laws

## GLOSSARY OF TERMS

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<b>Air Damper</b>	A rigid metal flap which when used cuts off the supply of air to the engine room.
<b>Airex® Foam</b>	Airex structural foams combine high stiffness and strength-to-weight ratios which makes them ideally suited as a core material for light-weight sandwich structures subjected to both static and dynamic loads in service.
<b>Bulkhead</b>	A vertical partition between two compartments (equivalent to a wall).
<b>Carley Float</b>	A rigid floatation life saving device used for people in the water to cling to after a sinking of a vessel.
<b>Ferry</b>	A vessel designed and surveyed to carry passengers for payment or reward.
<b>'Harbour Control'</b>	Sydney Ports Corporation Sydney Harbour Radio Control Station.
<b>Herex® Foam</b>	Herex foam is lightweight with high ratios of stiffness and strength-to-weight and an elevated temperature resistance and so is suitable for statically and dynamically loaded lightweight sandwich constructions which are exposed to raised temperatures during manufacturing or in service.
<b>Hydrostatic Release</b>	A device which when immersed to a prescribed depth severs the tie down straps on the carley float.
<b>NUC Lights</b>	Two red all round lights in a vertical line.
<b>Port Side</b>	The left hand side of a vessel when facing towards the front.
<b>Starboard Side</b>	The right hand side of a vessel when facing the front.
<b>Survey Class</b>	The figure in a Survey Class designation identifies the type of vessel e.g., "1" identifies the vessel as passenger carrying. The letter defines the permitted area of operation: A = unlimited offshore operation; B = offshore operation to 200 nautical miles seaward of the coast; C = restricted offshore operations up to 30 nautical miles seaward of the coast; D = sheltered operations (partially smooth water operations); and E = sheltered waters (smooth water operations).
<b>Tiller Flat</b>	A compartment in which the rudder shafts are located.
<b>Thermal Detectors</b>	Thermal Detectors detect a sudden rise in temperature and activate audio alarms in the wheel house.



## EXECUTIVE SUMMARY

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At approximately 7:15pm on Wednesday 28 April 2010, Captain Cook Cruises' Rocket Class ferry *Jillian* was en route from Homebush Bay to Circular Quay with 31 passengers and two crew members onboard. The ferry disembarked 20 passengers at Darling Harbour then proceeded to Circular Quay. In the vicinity of Millers Point, the crew detected a burning smell emanating from the rear deck area on the port side. The ferry continued on to Circular Quay where the remaining passengers were disembarked. The Master switched off the port engine and opened all rear port side deck hatches and then decided to take the ferry to the Company base at Neutral Bay on the starboard engine.

On the way to Neutral Bay smoke was detected coming from the rear port side and the existence of a fire became evident. On arrival at the Neutral Bay Marina, the Master called for assistance from Sydney Ports Corporation Harbour Control. The crew of the *Jillian* and a sister ferry, Water Police and the NSW Fire Brigade extinguished the fire, while the Sydney Ports Corporation fire tug stood by in case of escalation.

Three employees from Captain Cook Cruises and one Water Police constable were conveyed to hospital suffering from smoke inhalation but were released the same night after a period of observation. The *Jillian* suffered extensive fire damage to its aft port section.

The investigation found that the fire was caused by the radiated heat emanating from a crack in the port exhaust pipe located under the rear deck and behind the port engine room rear bulkhead. The heat reached such intensity that it ignited the epoxy resin in the composite fabric used in the hull of the ferry. Additionally, the engine room exhaust fan was unserviceable, and the *Jillian's* thermal detectors were incorrectly wired so did not activate the fire alarm.

The nature and extent of other safety issues identified in the course of the investigation raised concerns that there may be systemic safety deficiencies

throughout Captain Cook Cruises' fleet. Accordingly, an OTSI systemic investigation to examine thoroughly the safety of operations across the entire Captain Cook Cruises' fleet has been initiated.

Captain Cook Cruises has responded positively and progressively to all the findings and observations that have emerged during the course of this investigation. The *Jillian* has been repaired; the exhaust systems on all three Rocket Class ferries have been changed to wet systems; the safety defects and deficiencies have been satisfactorily addressed; and its Safety Management Systems are in the process of being completely revised.

In view of the remedial safety action that has been undertaken and is in progress, no further recommendations in relation to the Rocket Class ferries are deemed necessary.

## PART 1 CIRCUMSTANCES OF THE INCIDENT

### Incident Synopsis

- 1.1 At approximately 7:15pm<sup>1</sup> on Wednesday 28 April 2010, Captain Cook Cruises' (CCC) ferry *Jillian* was en route from Homebush Bay to Circular Quay with 31 passengers and two crew members onboard (see *Figure 1*). The ferry disembarked 20 passengers at Darling Harbour then proceeded en route to Circular Quay. In the vicinity of Millers Point, the crew detected a burning smell emanating from the rear deck area on the port side of the ferry. The ferry continued on to No 6 Wharf at Circular Quay where the remaining passengers were disembarked and the Master switched off the port engine and opened all rear port side deck hatches. The Master then decided to take the ferry to the Company base at Neutral Bay on the starboard engine.



Figure 1: *Jillian's* track

- 1.2 On the way to Neutral Bay smoke was detected coming from the rear port side. On arrival at CCC's Neutral Bay Marina, the Master called for

<sup>1</sup> All times referred to in this report are Eastern Standard Time (EST) GMT + 10 hours.

assistance from 'Harbour Control' on VHF Channel 13.<sup>2</sup> Water Police, another CCC vessel and the Sydney Ports Corporation (SPC) fire tug attended in response to the call for assistance. The NSW Fire Brigade also attended.

- 1.3 As a result of their actions to extinguish the fire, three employees from CCC and one Water Police constable were conveyed to hospital suffering from smoke inhalation but were released the same night after a period of observation. The *Jillian* suffered extensive fire damage to the port side engine room rear bulkhead, main deck and port side of the hull, from the engine room to the stern of the ferry.

## **The Ferry *Jillian***

- 1.4 The *Jillian* was designed by Graeme Parker Naval Architects and built and launched by Norman Wright & Sons at Bulimba, Queensland, in 1996. It is one of three Rocket Class ferries operated by CCC since Matilda Cruises was acquired by Quay Cruises in 2005.<sup>3</sup>
- 1.5 The Rocket Class ferries conduct regular passenger services from Circular Quay to Homebush, Watsons Bay, Taronga Zoo and Fort Denison. They are also used on regular school runs morning and afternoon from Sydney up the Lane Cove River to Riverview College stopping at all public wharves on the way. The ferries are also available for charter.
- 1.6 The *Jillian* is a 23.87 metre catamaran with a beam of 7.20 metres and a draft of 1.50 metres. It is powered by twin C12 339kw Caterpillar diesel engines. At the time of the fire, it was in current survey with the NSW Maritime Authority (NSWMA) in Classes 1D and 1E operation (Survey/Identifying Number 21044).
- 1.7 Survey Class 1D permits sheltered operations (i.e., in partially smooth waters) with up to 122 people onboard, including crew, in an area of operations within Sydney Harbour where the significant wave height does not exceed 1.5 metres. Survey Class 1E permits smooth water operations with up to 152

<sup>2</sup> Channel 13 VHF is controlled by Sydney Ports Corporation (SPC) Sydney Harbour Radio Control Station.

<sup>3</sup> The assets of Matilda Cruises Pty Ltd were acquired by Quay Cruises Pty Ltd which is a wholly owned subsidiary of Captain Cook Cruises Australasia Ltd. The vessels continue to run with the Matilda brand.

people onboard, including crew, on Sydney Harbour, South of a line between Georges Head and Langs Point when the significant wave height does not exceed 0.5 metres.

## Ferry Construction

- 1.8 The hull, decks and superstructure are constructed of composite layers of fibreglass, Kevlar and foam bonded together with epoxy fibreglass resin. The hulls below the water line are comprised of an outer skin and an inner skin between which there is a 15mm Airex<sup>®</sup> R.63.80 foam core. The outer skin consists of a laminate with one layer each of EC305 satin weave fibreglass, EB 850 stitched E-Glass and KEDB 440 woven E-Glass/Kevlar and then another layer of EB 850 stitched E-Glass bonded to the core. The inner skin consists of one layer each of EB 850 stitched E-Glass, KEDB 440 woven E-Glass/Kevlar and EB 566 stitched E-Glass which is bonded to the core. Other parts of the ferry are constructed with a laminate consisting of a foam core sheathed in stitched E-Glass bonded with an epoxy resin. The core material varies with 15mm Airex<sup>®</sup> R.90.200 used in the keel; 12mm Herex<sup>®</sup> C.70.75 used in the decks, hull bulkheads and superstructure; and 15mm Herex<sup>®</sup> C.70.75 used throughout the remainder.

## Crewing

- 1.9 The *Jillian* carried a crew of two, a Master 5<sup>4</sup> who was also an Engineer MED III<sup>5</sup> and a General Purpose Hand (GPH). The survey allowed for the Master, if qualified as an MED III, to also be the engineer. On 26 August 2009, the Master was first issued his Master's Certificate of Competency which permitted him to operate vessels up to 24 metres in length. His MED III Certificate of Competency was first issued on 25 August 2009. He commenced employment with Captain Cook Cruises in 1999 and had worked as a deckhand before gaining his master's ticket. He completed his sea survival training, which includes fire fighting, in 2001.

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<sup>4</sup> Master 5 Certificate of Competency issued by the NSWMA pursuant to the Uniform Shipping Law (USL).

<sup>5</sup> Marine Engine Driver Grade 3 Certificate of Competency issued by the NSWMA pursuant to the USL.

- 1.10 The GPH held a current Certificate of Competency. She had also completed her sea survival training, including fire fighting, as part of the qualification requirements.
- 1.11 The crew onboard *Jillian* on the day of the incident commenced work at 11:30am. They reported that they had worked continuously throughout the day, not taking standard rostered breaks, and had eaten meals “*on the run*”.

## The Fire

- 1.12 At about 6:30pm on 28 April 2010, the *Jillian* departed Homebush Bay for Circular Quay with 31 passengers onboard. It stopped at Darling Harbour and disembarked 20 passengers before continuing its journey. As it approached the Harbour Bridge off Millers Point, the crew noticed a burning smell emanating from the port side after deck area. However, the Master continued on to Circular Quay arriving at 7:15pm and disembarked the remaining passengers at No 6 Wharf East side.
- 1.13 At Circular Quay, the Master shut down the port engine and, with the GPH’s assistance, opened the three engine room hatches. They noticed a strong burning smell but no smoke or fire was evident. The air dampers to the engine room were not closed, nor was the fixed fire fighting system activated or the fuel shut-off closed. The engine room thermal detector did not activate an audio alert.
- 1.14 At 7:30pm, with the hatches still open, the Master decided to return the ferry to the Neutral Bay Marina. He restarted the port engine, manoeuvred the ferry away from the wharf, turned the ferry around and commenced heading to Neutral Bay. He then switched off the port engine thus running only on the starboard engine.
- 1.15 On the way to Neutral Bay the crew detected smoke coming from the rear port side. At 7:51pm, as the ferry approached Neutral Bay, the smoke intensified in the area of the port engine room aft bulkhead (see *Figure 2*) and the Master called Harbour Control on VHF Channel 13 to seek assistance. In response, SPC Harbour Control handled the coordination of services in an expeditious and professional manner.

1.16 By 7:53pm Harbour Control had called the SPC fire tug *Ted Noffs* and Water Police vessel 33. The NSW Fire Brigade was then alerted at 7:56pm by SPC Harbour Control. The CCC Rocket Class ferry *Alice* arrived at 7:59pm and its

crew assisted in the fire fighting from an unattended CCC charter boat moored next to the *Jillian*. This boat provided an effective, elevated position from which to attack the flames which were visible in the aft port engine room and rudder area deck hatches. The *Ted Noffs* and Water Police 33 arrived at the Marina at 8:07pm by which time the Neutral Bay Fire Brigade Hazmat Unit had also arrived. The Water Police assisted in extinguishing the fire while the *Ted Noffs* stood by in case the fire escalated and threatened neighbouring boats and fuel lines on the wharf. The fire was declared extinguished by the NSW Fire Brigade at 8:59 pm.

## Injuries

- 1.17 Two crew members from the *Jillian*, one crew member from the ferry *Alice* and one Water Police constable were conveyed to hospital by ambulance suffering from smoke inhalation. All were released later that night after a period of observation. There were no injuries to any passengers.

## Fire Damage

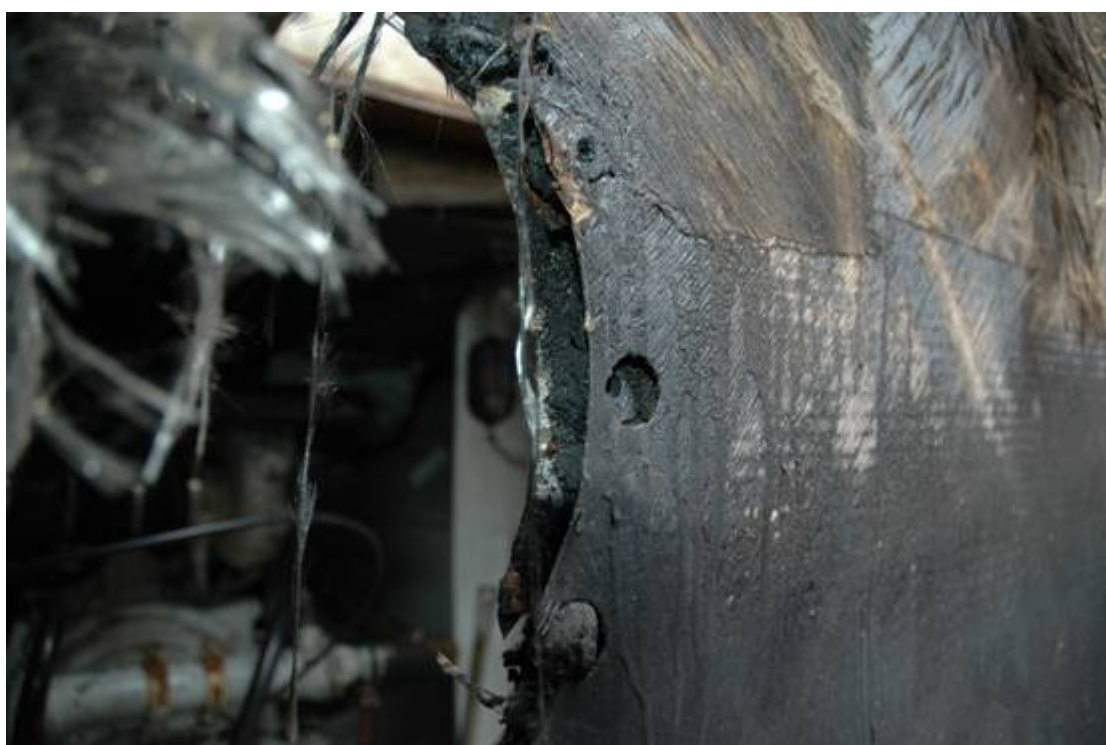
- 1.18 OTSI Investigators inspected the *Jillian* at the Neutral Bay Marina on 29 April 2010 along with Investigators and a Surveyor from the New South Wales Maritime Authority (NSWMA) and the CCC Operations Manager and Shipwright.
- 1.19 The *Jillian* suffered fire damage to the rear port side from the engine room aft bulkhead to the steering compartment including the main after deck area. The outer port side hull, bulkhead and deck were extensively damaged and all the composite material delaminated (see *Photographs 1 & 2*).
- 1.20 The most extensive fire damage was to the compartment located behind the engine room where the exhaust muffler was mounted from the deck head (see *Photograph 3*). Major fire damage and delamination was sustained by the whole rear port side deck and outboard port side hull of the vessel, from the engine room rear bulkhead to the rear hatch of the steering compartment.
- 1.21 There was also some damage to the section immediately behind the muffler compartment and the deck area above it where the bulkhead was



delaminated. There was little structural damage to the compartment housing the rudder although some delamination had occurred.



**Photograph 1: Rear port engine room bulkhead damage**



**Photograph 2: Bulkhead delamination**

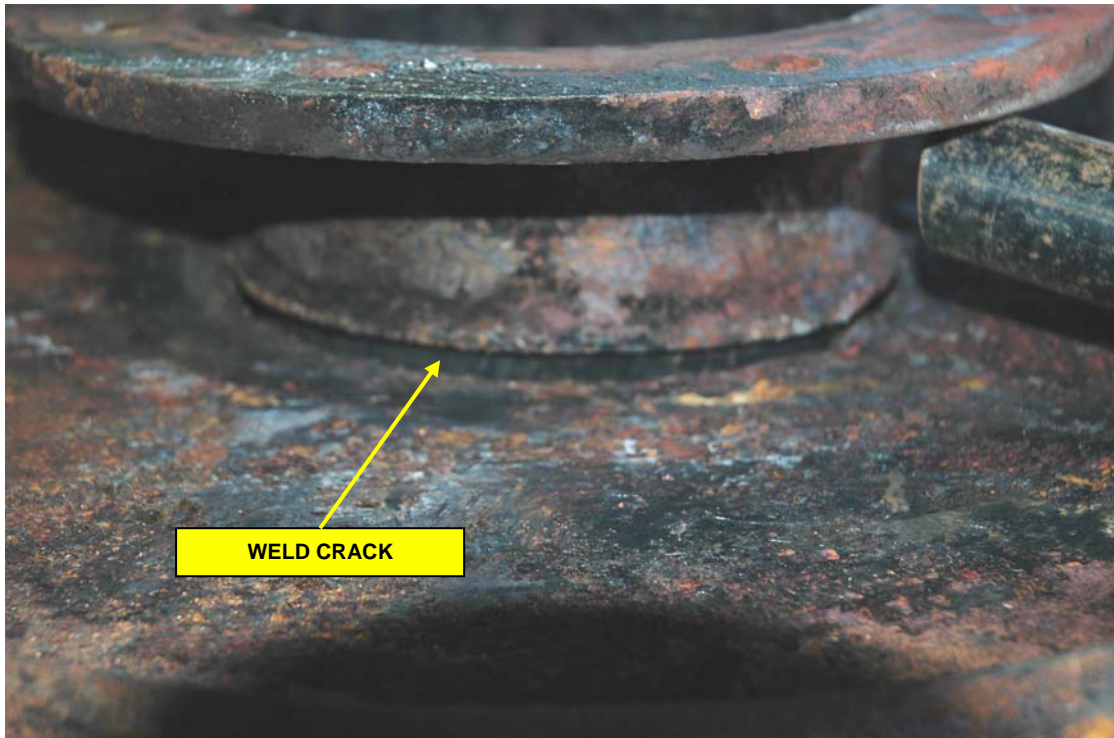


**Photograph 3: Port muffler compartment**

- 1.22 The lagging enclosing the exhaust system was burnt around the area at the front of the muffler and along the top. There was also damage to the lagging at the end near the outlet pipe.

### **Cause of the Fire**

- 1.23 The seat of the fire was identified as being at the front end of the muffler in the area just after the point where the exhaust pipe passed through the engine room rear bulkhead, in the void where the muffler is housed. From there it spread to the deck, the engine room rear bulkhead and then throughout the muffler compartment.
- 1.24 Having removed the lagging from the rear of the port engine and muffler, an examination of the short 500mm section of pipe between the flange and the front of the muffler revealed a crack at the join where the pipe is attached to the muffler, extending over 75% of the circumference of the pipe where it is welded to the muffler (see *Photograph 4*). This crack allowed the heat from the exhaust to impinge on the deck head and engine room rear bulkhead which eventually caught fire.



Photograph 4: Crack in port muffler

## Exhaust System

- 1.25 The exhaust system on the *Jillian* is known as a dry exhaust whereby exhaust gases flow directly from the engine exhaust manifold in steel piping through a hole cut in the bulkhead located at the rear of the engine room. After passing through the bulkhead, the piping joins a muffler by way of a flange welded to the pipe. This flange is bolted to another flange welded onto the end of the muffler. The muffler is supported by four steel hangings bolted to the underneath of the main aft deck. The muffler is located in another compartment behind the engine room aft bulkhead.
- 1.26 After passing through the muffler, hot exhaust gases are discharged through a pipe also joined by flanges to the muffler. The gases then pass through the inboard side of the port hull and discharge between the two hulls.
- 1.27 The entire exhaust system effectively acts as a single rigid component. The muffler is bolted to the engine manifold and supported from the deck by four rigid fastenings. The exit piping is bolted to the hull. As there are no flexible sections or connections between the engine exhaust manifold and the hull outlet, there is no relief from engine vibration and the structural flexing of the

vessel as it travels through the water. This lack of flexibility causes stress points within the system, especially where the flange is welded to the muffler.

- 1.28 Lagging of the muffler and piping prevents most of the radiant heat from the hot exhaust system affecting the fabric of the hull, however, the lagging also keeps the heat within the exhaust system.
- 1.29 Where the exhaust piping goes through the engine room aft bulkhead there is a large gap between the pipe and the bulkhead which would not maintain a watertight space should flooding occur aft of this bulkhead.

### **Previous Fire Onboard the *Jillian***

- 1.30 The fire on 28 April 2010 was not the first occasion that a fire had been experienced onboard the *Jillian*, but an earlier fire on 23 January 2010 had not been reported by CCC to either OTSI or the NSWMA at the time. OTSI only became aware of the incident through a Confidential Safety Information Report Scheme (CSIRS) notification. On receipt of this notification, OTSI contacted NSWMA who then requested CCC to submit a report. Despite a number of requests, information sought from CCC by OTSI was not provided until a copy of the report was received from CCC's former Operations Manager through NSWMA on 2 February 2010. This report lacked detail and did not fully explain the circumstances of the fire.
- 1.31 Because the report did not contain sufficient information to satisfy OTSI's lines of inquiry, investigators met with the Operations Manager on 10 February 2010 to discuss the circumstances of the fire and explain the statutory incident reporting requirements as prescribed in the *Passenger Transport Act 1990* and its Regulations. The Operations Manager stated that the fire was caused by the failure of a bracket supporting the muffler which caused the muffler to drop and the hot exhaust to come into contact with the engine room aft bulkhead. He advised that this muffler bracket had been replaced.
- 1.32 OTSI Investigators subsequently interviewed the Master in control of the *Jillian* when this incident occurred. The Master, a very experienced Master and Engineer, stated that, when the fire was detected, he immediately stopped the ferry, went to the nearest wharf, shut down the port engine,



closed all ventilation to the area, and discharged a fire extinguisher into the area at the end of the port engine room. The Master and GPH conducted boundary cooling of the area with fire hoses for one and a half hours before deciding a risk no longer existed. The Master had informed Harbour Control of the fire when he first detected it and also contacted his Operations Manager who instructed him to bring the *Jillian* to the Neutral Bay Marina. The Master commenced compiling a report but was instructed not to as the Operations Manager would attend to it. The Operations Manager has since left CCC's employment.

- 1.33 CCC's only record of this 23 January 2010 fire onboard the *Jillian* was in an entry in the vessel's log book, but it had no record of any repairs undertaken as a result of the fire, although it subsequently produced an invoice for some work which may have been associated with the repair of fire damaged lagging. After the second fire, during examinations of the vessel on 29 April and 3 May 2010, OTSI ascertained that none of the four bottle screw supports to the muffler had been replaced since the exhaust system was installed originally ( see *Photograph 5* ). Additionally, there was no evidence of an



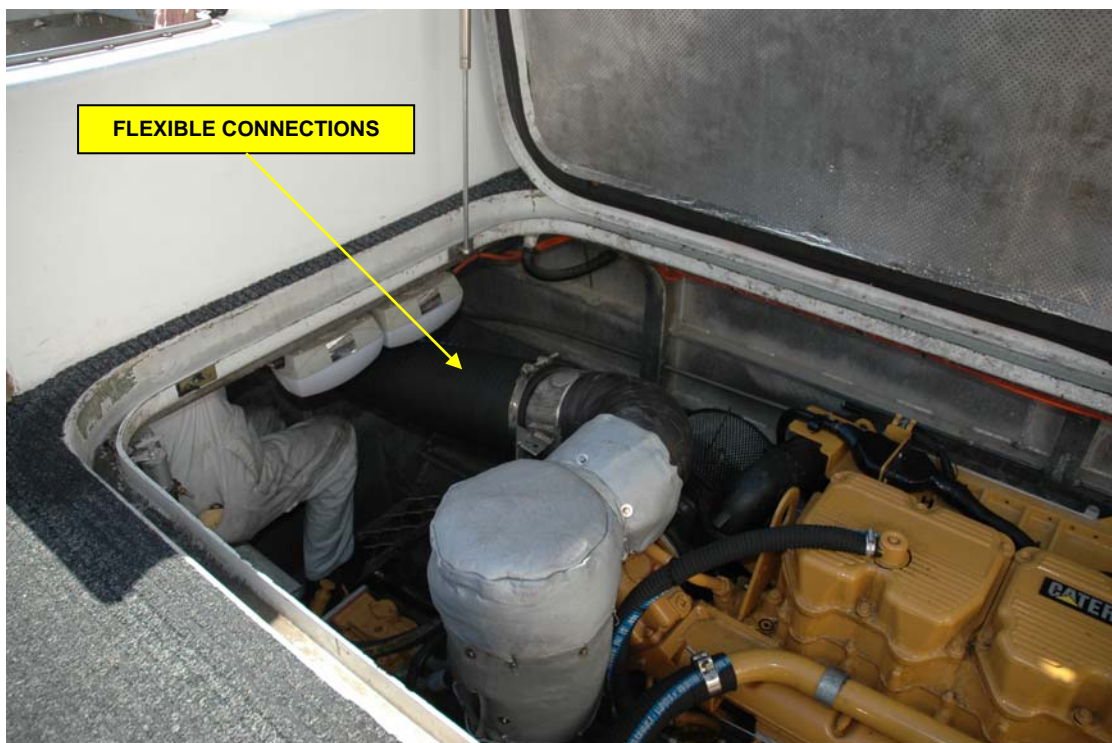
**Photograph 5: Port muffler hanging supports**

order being placed for a replacement support bracket, nor were there any maintenance or repair records or invoices located indicating a support bracket was replaced.

- 1.34 In short, there was no evidence of any remedial safety action having been taken to repair the hanging support brackets in the muffler compartment after the 23 January 2010 fire.

### Exhaust Systems of Similar Vessels

- 1.35 The Rocket Class ferries, *Jillian*, *Alice*, and *Megan* were the first of their type to be built by Norman Wright and Sons. This Company also built two HarbourCats for Sydney Ferries (SF) and 18 ferries for Brisbane River Ferries which are similar in shape and design to the *Jillian*. Unlike the *Jillian*, they were fitted with wet exhaust systems.



**Photograph 6: Wet muffler system – SF's Pam Burridge**

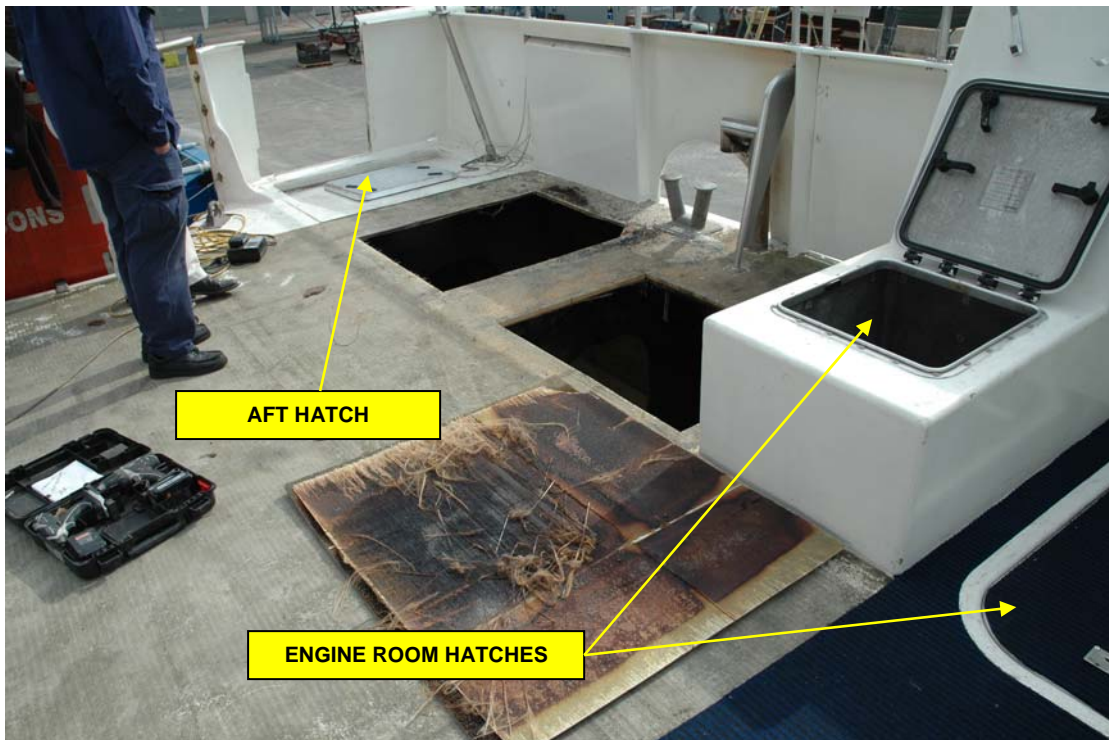
- 1.36 With a wet exhaust system, the engine exhaust gas is mixed with water pumped into the system. This system operates at a cool temperature such that the exhaust can be touched at any time without inflicting a burn. The system is flexible and so is not adversely affected by engine vibration and the normal flexing of the vessel (see *Photograph 6*). On the HarbourCats, the wet

exhaust system is constructed of Kevlar components and heat resistant rubber. On the Brisbane River Ferries stainless steel piping is also used.

- 1.37 On both the SF HarbourCats and Brisbane River Ferries, the exhaust systems have a watertight seal at the engine room bulkhead which also serves to support the exhaust. This seal is a requirement of the vessels' survey certificates.

## Further Inspections

- 1.38 Following the 28 April 2010 fire, inspections by CCC's maintenance department detected fractures in the exhaust system of the *Alice* in the same position as in the *Jillian*. The *Alice* was immediately removed from service and the exhausts removed, re-welded and re-lagged before resuming operation. Similar cracks on the weld at the leading edge of the muffler were also detected on the *Megan*. These were also re-welded and re-lagged.
- 1.39 The *Jillian* was again inspected on 20 May 2010 while on the hardstand at Sydney City Marina where sections of the deck had been cut out to enable repairers to better inspect and assess the damage and to plan repairs.



**Photograph 7: Rear deck of *Jillian* after deck sections removed**



The inspection revealed that a large section of plywood had been fibreglassed on to the deck above the muffler void to strengthen the deck (see *Photograph 7*). Inquiries revealed that the deck required additional stiffening in this area to support the weight of the muffler as the deck was flexing excessively. This extra stiffening was not required on the *Megan* and *Alice* as this problem had been identified on the *Jillian* not long after it was launched and had been rectified by the builder during the construction of the *Alice* and the *Megan*.

- 1.40 With the section of *Jillian*'s aft deck removed, the full extent of the fire damage was revealed. Delamination of the deck, port side outer hull, engine room bulkhead and aft muffler bulkhead was evident with the foam core melted between the layers of fibreglass sheathing. Repair of this damage required cutting out all affected areas and re-laminating with epoxy resin, fibreglass and foam composite materials.



**Photograph 8: *Jillian*'s rusted anchor**

- 1.41 There were cracks in the fibreglass on the main structural deck beams and evidence of other repairs to the beams. The anchor was badly rusted to the extent that it would not have functioned properly (see *Photograph 8*).



- 1.42 An inspection of the starboard rudder showed cracking on the lower portion of the rudder blade with the crack extending right through the rudder blade. There was evidence of a previous repair made to the port rudder in the same area. The rudders were not a matched pair and differed in their design.

## Contributory Factors

- 1.43 Examination of the port engine room showed that the engine room exhaust fan was inoperable. This had been reported 20 days before the fire but had not been repaired. The wiring to the port and starboard exhaust fans was in poor condition and the port fan was only connected by one wire. The fan not extracting heat from the port engine room and bulkhead area would have contributed to a build up of heat in the area.
- 1.44 The thermal detectors did not activate an alarm until the battery banks were changed over on arrival at the Neutral Bay Marina. The Master had been driving all day on the port battery bank but, when fighting the fire, had asked the GPH to switch power to the starboard battery bank. Immediately this was done, the fire alarm sounded. The thermal detection units were found to be incorrectly wired so they would only activate on one battery bank. There are two of these detectors in each engine room and all must function independently regardless of which battery bank is in use.
- 1.45 The Master chose to return to Neutral Bay rather than stay at Circular Quay, conduct an examination of the cause of the smell and smoke and make a thorough assessment of available courses of action. He also opened three engine room hatches on the port side and drove the ferry with them open. These actions would have served to promote the intensity and spread of the fire. A preferable alternative course of action would have been to:
- remain at Circular Quay;
  - notify Harbour Control of the situation;
  - close the engine room air dampers;
  - close off the fuel supply to the area of the fire by using the emergency fuel shut offs; and
  - commence boundary cooling with the *Jillian's* own fire hose.

- 1.46 Taking the ferry to the Neutral Bay Marina introduced an increased risk to other vessels and infrastructure. Circular Quay is readily and more quickly accessible to Water Police, SPC fire emergency vessels and land-based Fire Brigade units, and there is a plentiful supply of fire hydrants and extinguishers. By comparison, access to Neutral Bay is more restricted and the presence of other vessels, some with large gas cylinders onboard, moored in very close proximity to the *Jillian*, together with fuel lines on the marina, increased the complexity and risk of the firefighting operation, and even more so if the fire had spread beyond the ferry (see *Photograph 9*).



**Photograph 9: View of fuel pump and Neutral Bay Marina**

## **Other Safety Issues**

- 1.47 During the course of the investigation, a number of other safety issues were identified which are summarised below.
- 1.48 **Confined spaces.** Since the only entrance to the compartments on the Rocket Class ferries below the after deck between the engine room rear bulkhead and the transom is from the tiller flat hatch, the compartments should be classified as confined spaces in accordance with the *Occupational*

*Health and Safety Regulation 2001, Division 9, s66 Definitions.* None of the Rocket Class ferries had these confined spaces marked and there was no register for signing in persons entering them, no provision for testing air quality and no instructions for precautions to be exercised.

- 1.49 **Stowage of life jackets.** The stowage of lifejackets did not comply with the requirements of NSWMA as they were not readily accessible for emergency usage. Signage for the location of the life jackets was misleading in that they were not located where the signage indicated; they were in an unsigned storage bin in a dead-end passage and sealed in plastic bags (see *Photographs 10 & 11* and *Figure 3*). The unsafe storage of the life jackets had not been identified during survey.
- 1.50 **Hatches not signed, locked or sealed.** None of the hatches were marked with a warning to passengers prohibiting access; these included the eight hatches located on the back passenger deck, six leading into the engine rooms and two to the tiller flat. The hatches were closed but not lockable and could be accessed readily by any passenger, including children, who would be at risk of serious injury if they entered a machinery space or tank void. The engine room hatches, which are flush on the aft deck, did not have the water tight seals necessary to prevent water ingress and to block air from entering in the case of fire (see *Photograph 12*).
- 1.51 **Log Book.** Entries in the onboard log book reflected a generally unsatisfactory standard of record keeping. For example, there were no records of:
  - departure routes or locations;
  - weather forecasts, warnings or tidal information; or
  - crew training in emergency procedures.
- 1.52 **Incident Reporting Book.** The Incident Reporting Book contained entries recording reportable incidents which had not been reported to either OTSI or NSWMA as required by legislation and by CCC's own Safety Management System (SMS) requirements. These entries included a passenger injury requiring an ambulance (no date recorded) and the fire on 23 January 2010.



**Photograph 10: Life jacket signed storage below wheel house**



**Photograph 11: Life jackets wrapped in plastic in unsigned storage**



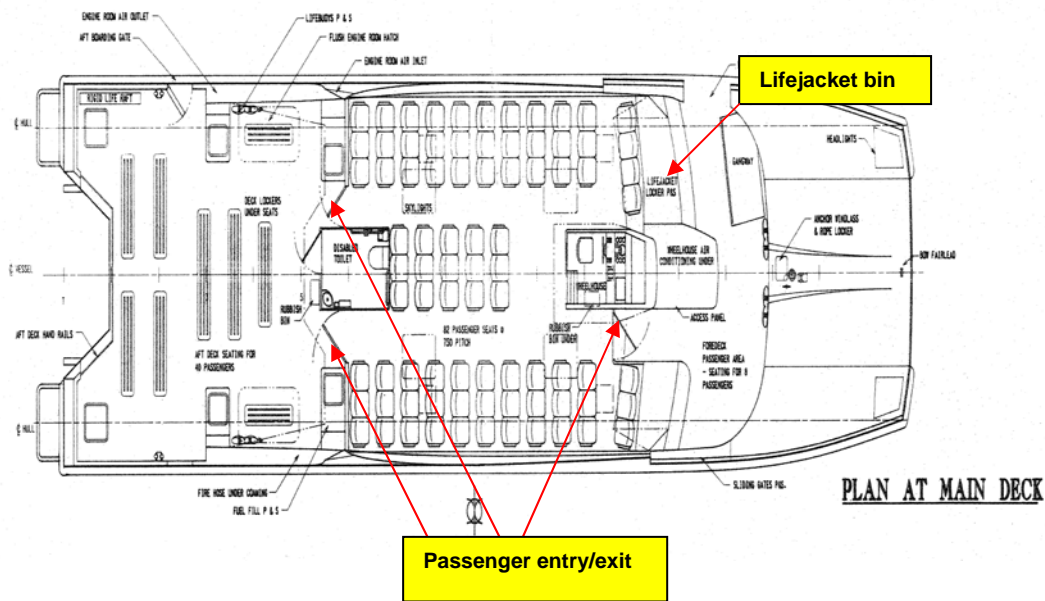
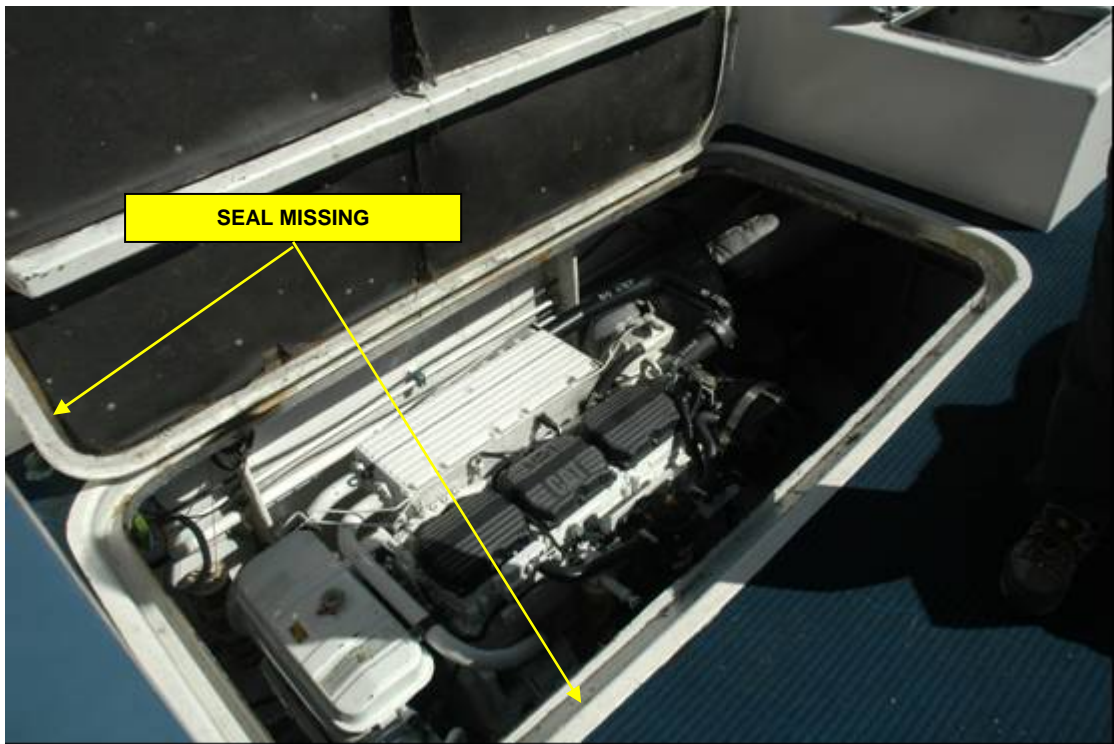


Figure 3: Passenger access to life jackets



Photograph 12: Engine room hatch without seals

- 1.53 **Defect Book.** There were 47 defects reported on the *Jillian* for the period 1 December 2009 to May 2010. Included in these defects were nine reports of leaks on the port exhaust system, seven reports of the engine room fan not working and two reports requesting the ferry be withdrawn from service as it “*was an accident waiting to happen*” and “*the vessel needs to come off the run ASAP*”.
- 1.54 Lack of attention to, or concern for, maintenance requirements was evident from the Defect Book. The ferry was allowed to operate for several days before a report of bilge pumps not working was actioned. No record of work or repairs undertaken in response to requests by Masters to have the ferry placed out of service due to excessive vibration and rudder misalignment was made in the Defect Book.
- 1.55 Some Masters stated that there were occasions when they were instructed to continue operating a ferry when the nature of a defect warranted its being taken out of service. They believed that if they did not comply with these instructions, they would be penalised by having the times of their shifts changed and/or by being assigned a reduced number of shifts.
- 1.56 **Emergency crew drills.** The Emergency Drill Report forms for the *Jillian* showed that only four drills were conducted in the period April 2009 to April 2010. The number, type, content and standard of drills conducted were significantly less than the requirements stipulated in the Uniform Shipping Laws Code, Section 15, *Emergency Procedures*, which is a compliance requirement of the *Commercial Vessels Act 1979*. Drill practices were not rostered or scheduled and some types of drills were seldom, if ever, practiced. Some Masters advised that they would sometimes receive a message on their personal mobile phone to go to drills, and would be given five to ten minutes in which to perform the drills.
- 1.57 **Maintenance work.** CCC did not have in place a planned, regular maintenance program for servicing and inspections. Reported defects were programmed for attention by entry on a white board. At the completion of any work undertaken the whiteboard entry was erased. No endorsements were

made against entries in Defect Books and no information was communicated back to Masters.

1.58 **Safety Management System.** Captain Cook Cruises had two separate SMS in place; CCC SMS 2010 reviewed May 2010 and, for the Rocket Class ferries, a SMS issued by Matilda Cruises on 1 February 2005. The two were different and the Matilda Cruises documentation lacked important detail about most operational standards and procedures. New instructions from management were given verbally. Circulars on new procedures or instructions were not issued, the effect of which was that operational changes did not reach all employees, especially casual employees who made up a significant proportion of the workforce.

1.59 **Other defects.** During inspections of the *Jillian*, the following deficiencies were identified as requiring attention:

- the hydrostatic release on the carley floats was out of date;
- the reflective tape on some carley floats needed to be replaced;
- all life rings needed the reflective tape replaced;
- some life rings needed to be replaced due to breaking of the outer protective covering;
- the emergency light attached to the life ring was inoperable;
- the anchor was frozen and needed to be replaced;
- the emergency exit light was inoperable;
- 'Not Under Command' (NUC) lights were not fitted with bulbs;
- some gauges on the dashboard were not working; and
- the horn was not clearly marked.

## Remedial Action

1.60 In response to issues raised during the course of the investigation, CCC has undertaken the following remedial action on the *Jillian*:

- repaired the structural damage to the ferry by cutting out and replacing the damaged section of deck and bulkheads, replacing wiring and installing a new wet exhaust system;

- fitted new shafts, rudders and hydraulic steering;
- replaced the anchor;
- replaced the water tight seals to the engine room hatches;
- fitted locking mechanisms to hatches;
- replaced the reflective tape on all life rings and carley floats;
- installed a new hydrostatic release to the carley floats;
- repaired lighting in the tiller flat, exit signs and replaced bulbs in the NUC lights; and
- rectified, and where necessary, replaced the defective life rings, unserviceable gauges and the marking of the horn.

1.61 The following action has been undertaken on all vessels in association with an overhaul of the Rocket Class fleet and in response to other general safety issues that arose during the investigation:

- new wet exhaust systems have been fitted to both the *Megan* and the *Alice*;
- lagging has been checked and replaced where necessary;
- seats with under-seat life jacket storage have been installed;
- bilge and fire valve operations have been re-assessed and adjusted as necessary;
- vessel log, defect reporting and fire drill systems have been reviewed and improved; and
- locking, signing and sealing of all hatches.

1.62 In addition, CCC is completely revising its Safety Management Systems, including the development of a version control system for them, which will be subject to NSWMA scrutiny for compliance.



## PART 2 FINDINGS

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### Causation

- 2.1 The fire onboard the *Jillian* on 28 April 2010 was caused by the radiated heat emanating from a crack in the port exhaust pipe located under the rear deck and behind the port engine room rear bulkhead. The heat reached such intensity that it ignited the epoxy resin in the composite fabric used in the hull of the ferry.

### Contributing Factors

- 2.2 On the day of the fire, the engine room exhaust fan was unserviceable and had been for some 20 days. This allowed excessive heat to build up around the exhaust system and engine room rear bulkhead area.
- 2.3 Although no flames were observed, the decision to drive the ferry from Circular Quay to Neutral Bay with engine room hatches open after a burning smell had been detected, provided the conditions for the overheated epoxy resin to catch alight.
- 2.4 The *Jillian*'s thermal detectors were incorrectly wired and so did not activate the fire alarm until batteries were changed over after fire fighting had commenced.

### Other Safety Issues

- 2.5 The nature and extent of the "Other Safety Issues" identified in the course of the investigation gave cause for concern that there may be systemic safety deficiencies throughout Captain Cook Cruises' fleet. A thorough examination of the safe operation of the entire Captain Cook Cruises' fleet was therefore considered to be warranted and an OTSI systemic investigation has been initiated by the Chief Investigator.

### Remedial Action

- 2.6 The structural damage to the *Jillian* has been repaired and all three Rocket Class ferries have had their dry exhaust systems replaced with wet systems.

- 2.7 Since all essential remedial safety action has been completed, or in the case of the SMS is in progress, no further recommendations in relation to the *Jillian* or the other Rocket Class ferries are deemed necessary.

## PART 3 APPENDIX

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### Appendix 1: Sources, Submissions and Acknowledgements

#### Sources of Information

- Captain Cook Cruises
- NSW Maritime Authority
- NSW Water Police Marine Area Command
- Graeme Parker Naval Architects

#### References

- Chart AUS 200
- Occupational Health and Safety Regulation 2001
- *Passenger Transport Act 1990 (NSW)*
- Uniform Shipping Laws 2009

#### Submissions

The Chief Investigator forwarded a copy of the Draft Report to the Directly Involved Parties (DIPs) to provide them with the opportunity to contribute to the compilation of the Final Report by verifying the factual information, scrutinising the analysis, findings and recommendations, and to submit recommendations for amendments to the Draft Report that they believed would enhance the accuracy, logic, integrity and resilience of the Investigation Report. The following DIPs were invited to make submissions on the Draft Report:

- Captain Cook Cruises
- NSW Maritime Authority

The NSW Water Police Marine Area Command and the Independent Transport Safety Regulator (ITSR) were also offered the opportunity to comment on the Draft Report.

Written responses were received from Captain Cook Cruises, the NSWMA and ITSIR. NSW Water Police advised they concurred with the Draft Report.

The Chief Investigator considered all representations made by DIPs and responded to the author of each of the submissions advising which of their recommended amendments would be incorporated in the Final Report, and those that would not. Where any recommended amendment was excluded, the reasons for doing so were explained.

## **Acknowledgements**

The locality map reproduced as *Figure 1* is used with the permission of Google Earth.

*Figures 2 and 3* are reproduced with the permission of Graeme Parker Naval Architects.