



Australian Government

Australian Transport Safety Bureau



ATSB TRANSPORT SAFETY INVESTIGATION REPORT
Marine Occurrence Investigation No. 237
Final

Independent investigation into the collision between
the Australian recreational vessel

Norma Jean

and the New Zealand registered barge

Seatow 61

off Carnarvon, Western Australia



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18 March 2007

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ISBN and formal report title: see 'Document retrieval information' on page v

CONTENTS

DOCUMENT RETRIEVAL INFORMATION	v
THE AUSTRALIAN TRANSPORT SAFETY BUREAU	vii
TERMINOLOGY USED IN THIS REPORT	ix
EXECUTIVE SUMMARY	xi
1 FACTUAL INFORMATION	1
1.1 <i>Seatow 61</i>	1
1.1.1 Electrical system	2
1.2 <i>Kurutai</i>	3
1.3 <i>Norma Jean</i>	4
1.4 Carnarvon	5
1.5 The accident	7
2 ANALYSIS	13
2.1 Evidence	13
2.2 The collision	13
2.2.1 Collision course	13
2.2.2 Collision speed	15
2.3 <i>Norma Jean</i>	16
2.3.1 Safe speed	16
2.3.2 Effective lookout	17
2.4 <i>Seatow 61</i>	19
2.4.1 Anchoring position	19
2.4.2 Awareness of the anchored barge	21
2.4.3 Barge illumination	23
2.5 A previous similar accident	25
3 FINDINGS	29
3.1 Context	29
3.2 Contributing safety factors	29
4 SAFETY ACTIONS	31
4.1 Safety action taken by Sea-Tow	31
4.2 Safety action taken by the Department for Planning and Infrastructure's Marine Safety Business Unit	31
4.3 Safety action taken by Maritime New Zealand	32

4.4	ATSB recommendations.....	32
4.5	ATSB safety advisory notices	33
APPENDIX A: EVENTS AND CONDITIONS.....		35
APPENDIX B: SHIP INFORMATION.....		37
APPENDIX C: SOURCES AND SUBMISSIONS.....		39
APPENDIX D: MEDIA RELEASE.....		41

DOCUMENT RETRIEVAL INFORMATION

Report No.	Publication Date	No. of pages	ISBN	ISSN
237	May 2008	54	978-1-921490-03-3	1447-087X

Publication Title

Independent investigation into the collision between the Australian recreational vessel *Norma Jean* and the New Zealand registered barge *Seatow 61* off Carnarvon, Western Australia, on 18 March 2007.

Prepared by

Australian Transport Safety Bureau
PO Box 967, Civic Square ACT 2608 Australia
www.atsb.gov.au

Reference No.

May2008/Infrastructure 08074

Acknowledgements

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The photograph used in Figure 16 is courtesy of the Carnarvon regional transport officer.

Abstract

At about 1500 on 12 March 2007, the unmanned barge *Seatow 61* was anchored by the crew of its tug about three miles off Carnarvon, Western Australia, following advice from the Carnarvon harbour master. When anchored, the crew set the barge's anchor lights to operate automatically using a timer.

At about 0610 on 18 March, in near total darkness, the recreational vessel, *Norma Jean*, with four persons on board, left the Carnarvon boat harbour. At about 0625, *Norma Jean* collided with *Seatow 61* and sank almost immediately. All four occupants of the boat died as a result of the collision.

The ATSB investigation found that *Norma Jean*'s skipper may not have seen the barge until seconds before the impact and may have mistaken the barge's anchor lights for the lights of two separate vessels. *Norma Jean*'s speed was inappropriate for the dark conditions and the use of the boat's interior lights probably reduced the skipper's night vision.

The investigation also found that the Carnarvon harbour master, who is based in Perth, about 900 km south of Carnarvon, was not fully aware of recreational vessel activities in Carnarvon when providing advice on where to anchor the barge.

The report issues four recommendations and four safety advisory notices with the aim of preventing further incidents of this type.

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal bureau within the Australian Government Department of Infrastructure, Transport, Regional Development and Local Government. ATSB investigations are independent of regulatory, operator or other external bodies.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to enhance safety. To reduce safety-related risk, ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not the object of an investigation to determine blame or liability. However, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to proactively initiate safety action rather than release formal recommendations. However, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation, a recommendation may be issued either during or at the end of an investigation.

The ATSB has decided that when safety recommendations are issued, they will focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on the method of corrective action. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations. It is a matter for the body to which an ATSB recommendation is directed (for example the relevant regulator in consultation with industry) to assess the costs and benefits of any particular means of addressing a safety issue.

TERMINOLOGY USED IN THIS REPORT

Occurrence: accident or incident.

Safety factor: an event or condition that increases safety risk. In other words, it is something that, if it occurred in the future, would increase the likelihood of an occurrence, and/or the severity of the adverse consequences associated with an occurrence. Safety factors include the occurrence events (e.g. engine failure, signal passed at danger, grounding), individual actions (e.g. errors and violations), local conditions, risk controls and organisational influences.

Contributing safety factor: a safety factor that, if it had not occurred or existed at the relevant time, then either: (a) the occurrence would probably not have occurred; or (b) the adverse consequences associated with the occurrence would probably not have occurred or have been as serious; or (c) another contributing safety factor would probably not have occurred or existed.

Other safety factor: a safety factor identified during an occurrence investigation which did not meet the definition of contributing safety factor but was still considered to be important to communicate in an investigation report.

Other key finding: any finding, other than that associated with safety factors, considered important to include in an investigation report. Such findings may resolve ambiguity or controversy, describe possible scenarios or safety factors when firm safety factor findings were not able to be made, or note events or conditions which 'saved the day' or played an important role in reducing the risk associated with an occurrence.

Safety issue: a safety factor that (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operational environment at a specific point in time.

Safety issues can broadly be classified in terms of their level of risk as follows:

- **Critical safety issue:** associated with an intolerable level of risk.
- **Significant safety issue:** associated with a risk level regarded as acceptable only if it is kept as low as reasonably practicable.
- **Minor safety issue:** associated with a broadly acceptable level of risk.

EXECUTIVE SUMMARY

On 6 March 2007, the tug *Kurutai* departed Dampier, Western Australia, towing the unmanned barge *Seatow 61*, and headed southward to avoid two tropical cyclones. Both *Kurutai* and *Seatow 61* were owned and operated by Sea-Tow, New Zealand.

On 11 March, *Kurutai*'s master requested advice from the Sea-Tow representative in Perth, Western Australia, regarding a safe anchorage for the barge while the tug was refuelled. The Sea-Tow representative, in turn, contacted the Manager for Safety and the Environment in the Western Australia Department for Planning and Infrastructure, Marine Safety Business Unit, in Perth, who fulfilled the role of harbour master for Carnarvon. The harbour master advised Sea-Tow that the barge could be anchored three miles¹ west of Carnarvon while the tug refuelled and that it should exhibit lights and shapes in accordance with the appropriate international regulations.

At about 1508² on 12 March, *Seatow 61* was anchored about 2.6 miles off the entrance to the Carnarvon boat harbour channel, about 3.3 miles west of Carnarvon. The barge's two anchor lights were set, using a timer, to switch on automatically during the hours of darkness. *Kurutai* made several trips between the barge and the Carnarvon boat harbour before leaving the barge unattended from about 1800 on 14 March.

At about 0610 on 18 March, in near total darkness, the recreational vessel *Norma Jean* left the Carnarvon boat ramp with four people on board. The boat transited the channel seawards at about five knots and, when it passed the entrance beacon at about 0620, its speed was increased to close to its maximum. At about 0625, *Norma Jean* collided with *Seatow 61* at a speed of about 30 knots³ and sank quickly with the loss of all four of the boat's occupants.

The available evidence suggests that *Norma Jean*'s skipper did not see the barge early enough to avoid the collision and it is possible that he may have seen the barge's bow and stern anchor lights, interpreted them as belonging to two separate vessels and attempted to pass between them.

The report identifies the following safety issues and issues four recommendations and four safety advisory notices to address them:

- *Norma Jean*'s probable speed was too high in the almost total darkness, increasing the risk and consequences of a collision. At a lower speed, the skipper would have had more time to react after seeing the barge and may have avoided colliding with it. A lower speed would also have lessened the impact of the collision.
- *Norma Jean*'s skipper did not keep an effective lookout just before the collision. Whilst he may have been 'looking out', the likely condition of his eyesight, the boat's speed and the lighting inside the boat's cockpit would have reduced his ability to maintain an effective lookout in the darkness.

1 A nautical mile of 1852 m.

2 All times referred to in this report are local time, Coordinated Universal Time (UTC) + 9 hours.

3 One knot, or one nautical mile per hour equals 1.852 kilometres per hour.

- Sea-Tow did not provide adequate guidance for its tug masters with respect to anchoring a barge and leaving it unattended. Furthermore, the Sea-Tow safety management system did not provide procedures or guidance to disseminate safety information following accidents or incidents involving tugs or barges.
- There was no designated, charted anchorage for the port.
- The Carnarvon harbour master was not fully aware of recreational vessel activities in Carnarvon when he provided advice on where to anchor *Seatow 61*. His advice was based on the good holding ground of the anchorage, its proximity to the boat harbour and the assumption that the barge would remain at anchor for a short duration.
- The Harbour Master's Operational Manual and the Service Level Agreement between the Marine Safety Business Unit and the Regional Services Branch did not provide sufficient guidance for either the harbour master or the regional transport officer to ensure that all navigational risks for Carnarvon were identified and adequately assessed so that appropriate measures could be taken to mitigate them.
- While the lighting on board the barge *Seatow 61* complied with the requirements of the International Regulations for the Prevention of Collisions at Sea, 1972, as amended (COLREGS), it was not sufficient to alert *Norma Jean's* skipper to the barge's presence early enough to prevent the collision. Furthermore, the lighting did not reflect all of the reasonable precautions that could have been taken to prevent a collision with the unmanned barge.
- Despite it being unusual for a barge to anchor off Carnarvon, the Marine Safety Business Unit did not consider it necessary to alert any boat operators to the barge's presence in an area that was regularly transited by them.

1 FACTUAL INFORMATION

1.1 *Seatow 61*

Seatow 61 (Figure 1) is an unmanned ‘dumb barge’⁴ that is registered in New Zealand. It is owned and operated by Sea-Tow, New Zealand, which operates a fleet of five tugs, five barges and two self propelled landing barges.

The barge is classed with Bureau Veritas (BV) as ⚡Hull - Pontoon⁵. The barge was also issued with a certificate of survey by the Western Australia Department for Planning and Infrastructure (WA DPI).

Seatow 61 was built in 2003 by the Taizhou Sanfu Ship Engineering Company in Jiangsu, China. It has an overall length of 85.43 m, a beam of 24.38 m and a depth of 5.52 m. The barge has a deadweight of 6000 tonnes at its maximum draught of 4.48 m. When empty, the barge has draughts of about 1.4 m forward and 0.9 m aft.

Figure 1: *Seatow 61* at anchor off Carnarvon



Seaton 61 is normally towed from the bow by a tug using a chain bridle and towing wire. The day shape for a vessel being towed, a black diamond, was permanently attached to the barge’s foremast.

The barge is fitted with hydraulic mooring winches and anchor windlasses both forward and aft. It is usually anchored using the stern anchor so that the towing bridle does not foul the anchor cable. The stern anchor is mounted on the port quarter, about five metres to port of the barge’s centreline. All of its towing, anchoring and mooring operations are performed by the crew of the attending tug, in this instance *Kurutai*.

4 A freight vessel that does not have its own means of propulsion and is designed to be towed.

5 A class notation assigned to the hull of a pontoon that is designed and constructed in accordance with BV rules.

1.1.1 Electrical system

Seatow 61 is fitted with two generators, located within the watertight deckhouse and forecastle compartments. The hydraulic power packs for the winches are powered by a Mitsubishi 140 kW diesel generator located in the lower level of the forecastle, adjacent to the main switchboard.

A 30 kW Mitsubishi diesel generator is mounted in the upper area of the forecastle deck house and is used to provide power for the fuel transfer pump, the main working floodlights that are used to illuminate the cargo deck and to recharge the barge's batteries.

There are two battery banks, each consisting of four 6 Volt batteries connected in series. Each battery bank has a capacity of 190 Amp-hours. One bank provides the starting power for the 140 kW generator. The second provides power for the navigation lights, for the small floodlights on the barge's sides and for starting the 30 kW generator.

The electrical system is designed for unmanned operation to provide power for navigation lights while the barge is being towed as well as when it is at anchor. The 30 kW generator is normally started and stopped using a timer. At the time of the accident, the timer was set to run from 0530 to 0800 and from 1930 to 2230 each day.

In the event that the battery voltage dropped below 22 Volts, a voltage detector relay initiates a start sequence for the small generator and a timer is set so that the small generator runs to recharge the batteries for a period of two hours (Figure 2).

Figure 2: Generator control devices

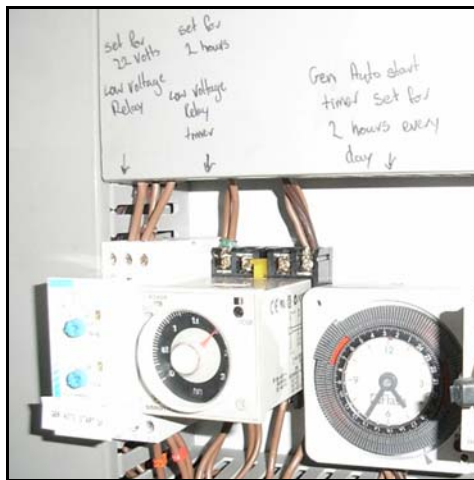


Figure 3: Navigation light timer



The barge is fitted with navigation lights as prescribed by the International Regulations for the Prevention of Collisions at Sea, 1972, as amended (COLREGS). The anchor lights, all around white lights with a minimum visible range of three miles, are located at each end of the barge, about 70 m apart. Each of the navigation lights has two individual light globe assemblies (Figures 4 and 5). Each assembly has, as required, a single 40 W globe mounted within a prismatic lens. If an individual light globe fails, the navigation light control panel automatically switches to the second light globe assembly.

The navigation lights are switched on and off by a timer (Figure 3). On the day of the accident, the anchor lights were set to turn on at 1900 and turn off at 0710.

Figure 4: Forward mast



Figure 5: Forward anchor lights



1.2

Kurutai

Kurutai (Figure 6) is a New Zealand registered tug that is owned and operated by Sea-Tow, New Zealand.

Figure 6: *Kurutai*



At the time of the accident, the tug was not listed with a classification society. It had been issued with a certificate for a non-SOLAS⁶ vessel undertaking an international voyage by Maritime New Zealand and had been issued with a certificate of survey by the WA DPI.

Originally named *Seatow 22*, the tug was built in 1991 by Marine Steel in Auckland, New Zealand, and was renamed *Kurutai* in 2004. It has an overall length of 23.40 m, a beam of 8.40 m, a depth of 4.05 m and a maximum operating draught of 3.60 m.

Kurutai is powered by two Detroit 16V-149-TI, two stroke, single acting diesel engines, each with an output of 1400 kW. Each engine drives a fixed pitch propeller via a clutch and a single reduction, reversible gearbox. Combined, the engines give the tug a bollard pull⁷ of 30 tonnes.

At the time of the accident, *Kurutai* had a crew of one Australian and five New Zealand nationals. The master, mate, two engineers, an able seaman and a seaman/cook all held appropriate qualifications.

The master had been at sea since 1993 and had been a tug master for the previous 11 years. He held a certificate of competency, issued in 2005, as master of vessels up to 500 gross tonnes. He had been employed by Sea-Tow since June 2005. At the time of the accident, he had been the master of *Kurutai* for about three weeks.

The chief engineer had returned to a seagoing career in 2006 after working ashore for several years. He held an engineer class three certificate of competency. It was the third six week period that he had been employed by Sea-Tow but was his first time as *Kurutai*'s chief engineer.

1.3 ***Norma Jean***

Norma Jean (Figure 7) was a privately owned, 5.54 m long, 'Baron Sportsman' type recreational vessel. The glass fibre reinforced plastic (GRP) boat was built in 1975 and registered with the WA DPI in Western Australia.

The boat had an open cockpit area abaft of a small half-cabin. In the cockpit, two forward facing seats were mounted immediately behind the sloped windscreen. A canvas canopy was mounted above the cockpit.

Norma Jean was fitted with a Yamaha 115 HP⁸, two-stroke petrol outboard motor and a smaller 8 HP Johnson auxiliary outboard motor.

The boat was fitted with navigation sidelights mounted on either side of the cabin, about one metre above the waterline. A stern light was mounted on the stern rail. A small 12 V fluorescent light was mounted under the canopy to illuminate the cockpit area.

At the time of the accident, *Norma Jean* was equipped with a magnetic compass, a Uniden 27 MHz radio, a Furuno global positioning system (GPS) receiver and an

6 The International Convention for the Safety of Life at Sea, 1974, as amended.

7 A numerical value indicating the maximum pulling force that a tug can exert on a line.

8 One horsepower (HP) = 0.75 kW.

Eagle echo sounder. The boat was also equipped with an emergency position indicating radio beacon (EPIRB) and distress flares.

Figure 7: Norma Jean after salvage



At the time of the accident, there were four persons on board *Norma Jean*; the boat's 78 year old skipper, his wife and two friends. The skipper was an experienced recreational fisherman who had owned the boat for 14 years. He was familiar with the area, having resided in Carnarvon and fished in Shark Bay for many years. He held a West Australian recreational skipper's ticket (RST), issued in 2006, although it was not mandatory for him to have the ticket until April 2008.

1.4 Carnarvon

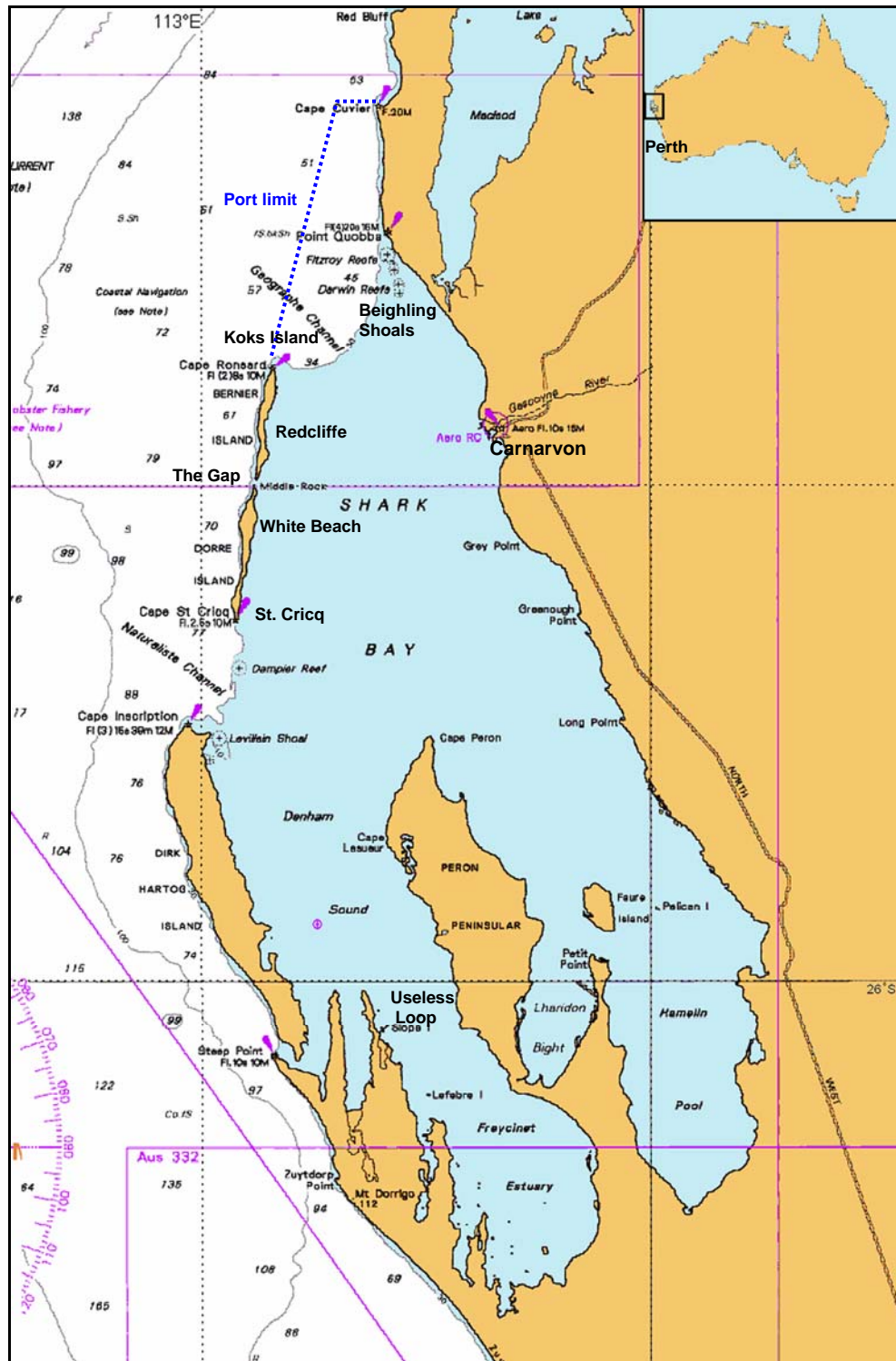
The Port of Carnarvon, Western Australia, (Figure 8) includes all of Shark Bay and extends north to include Cape Cuvier. The port limits are defined in the east by the Australian mainland and in the west by the peninsula of Edel Land and by Bernier, Dorre and Dirk Hartog Islands. The port limits extend from Cape Ronsard in a north north-easterly direction towards Cape Cuvier. The southern part of Shark Bay is divided into two arms by Peron Peninsula. The western arm contains the ship loading wharf at Useless Loop.

A pilot is not required for vessels entering Shark Bay although pilotage is compulsory for vessels loading at Useless Loop. The pilot boarding ground for Useless Loop is one mile north of the Denham Channel number one light beacon.

Ships may enter Shark Bay from the north through Geographe Channel or from the west through Naturaliste Channel.

The town of Carnarvon is about 900 km north of Perth, the capital city of Western Australia. It is located on the eastern side of Shark Bay near the southern entrance to the Gascoyne River. Babbage Island, on the western side of the town lies between the northern and southern entrances to the Gascoyne River. A thriving fishing industry operates from the town of Carnarvon which is also a popular recreational boating area. The one mile jetty on Babbage Island was built in 1904 and it was used for a variety of cargoes before being closed in 1994.

Figure 8: Section of navigational chart Aus 416 showing Shark Bay



The Carnarvon boat harbour basin and entrance channel was dredged to a depth of three metres with some areas within the harbour being slightly deeper. Teggs Channel was dredged to provide a minimum depth of 3.5 m in July 2003. A speed limit of five knots is in place for the channel and the boat harbour.

Information for vessels wishing to anchor off the town of Carnarvon is provided in the Australia Pilot⁹:

The best anchorage is off the N entrance to Gascoyne River on the line of bearing 076° of Babbage Island Light (24° 53' S, 113° 38' E), distant 1 ¼ miles, in a depth of about 6 m (19 ft) sand.

There is anchorage available off the S entrance to the river on the line of bearing 108 of Mangrove Point (24° 55' S, 113° 3' E) with the Babbage Island Light bearing 016° , distant 1 ½ miles in a depth of 5 m (16 ft).

Mariners in vessels of deeper draught must anchor some distance offshore.

The port of Carnarvon does not have its own port authority and is administered under an agreement with the Western Australia Department for Planning and Infrastructure (WA DPI) which retains ownership of seven ports on behalf of the Western Australian Government.

At the time of the accident, the role of harbour master for the Port of Carnarvon was performed by the Manager for Marine Safety and the Environment, who was an employee of the Marine Safety Business Unit (MSBU) of WA DPI and was based in Perth. In November 2005, he was gazetted as the harbour master for the Ports of Barrow Island, Carnarvon, Onslow, Port Walcott, Yampi Sound, Perth and Varanus Island in accordance with the *Western Australia Shipping and Pilotage Act 1967*.

The harbour master was a certificated master mariner and a marine pilot. In May 2005, he was gazetted as a pilot for Useless Loop, within the Carnarvon port limits, where he regularly conducted pilotage.

1.5 The accident

At 0900 on 6 March 2007, *Kurutai* departed Dampier, Western Australia, towing the empty barge *Seatow 61*, and sailed southwards in an attempt to avoid tropical cyclones George and Jacob that were approaching Dampier.

During the voyage, while the tug and barge were to seaward of Shark Bay, a strong southerly wind was encountered which increased the tug's fuel consumption and made it difficult to make useful headway. On 10 March, *Kurutai*'s master contacted the Sea-Tow company representative in Perth to enquire about the availability of fuel in the area.

The Sea-Tow representative determined that fuel was available at Carnarvon and contacted the Carnarvon harbour master for information about anchoring in the port. The harbour master was away from his office in Perth, piloting a ship at Useless Loop. He did not have a chart for Carnarvon or a copy of the Australia Pilot with him at the time so he consulted with a previous harbour master for advice regarding the request. He was advised by the previous harbour master that a suitable anchorage was about three miles west of the Carnarvon Jetty. The Carnarvon harbour master discussed his decision with the General Manager Marine Safety before advising the Seatow representative to anchor the barge three miles west of Carnarvon and to display the anchor lights and shapes required by the international regulations.

⁹ Australia Pilot Volume I, Admiralty Sailing Directions NP 13, First Edition 2005.

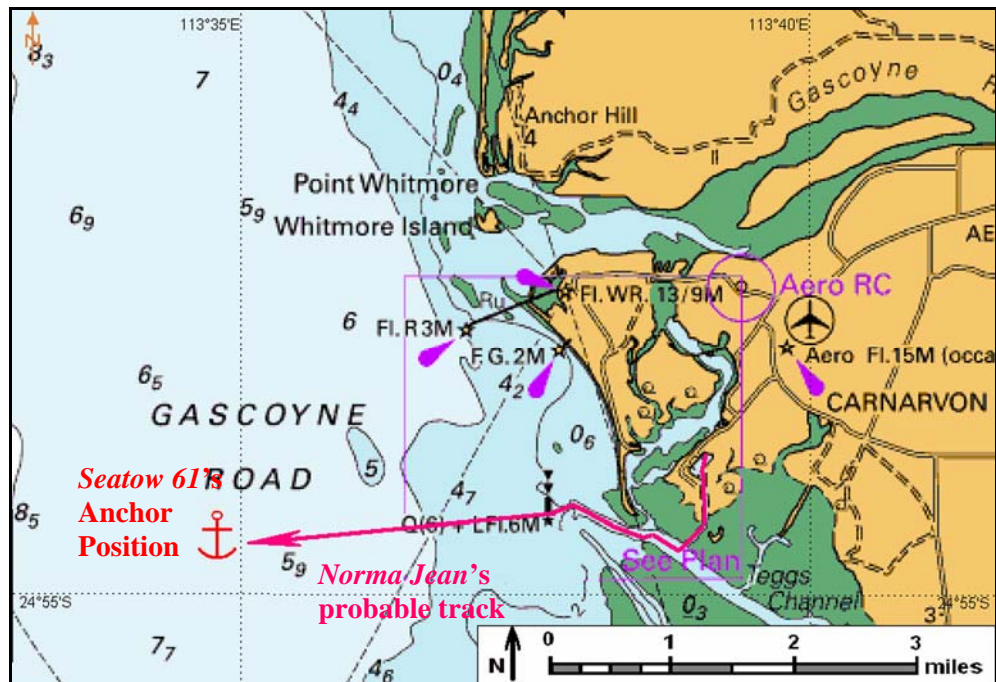
At about 1100 on 11 March, the Sea-Tow representative advised *Kurutai*'s master that fuel was available in Carnarvon and that *Seatow 61* could be anchored in Shark Bay, approximately three miles west of Carnarvon, while the tug was refuelling at a wharf in the Carnarvon boat harbour.

Kurutai's master also contacted a local tug operator within Shark Bay with a view to getting advice on the best channel to use to enter Shark Bay. He was advised that the tug should enter Shark bay via Geographe Channel. He received some general local information and was advised that Gascoyne Road (Figure 9), about three to four miles from Carnarvon, was a suitable anchorage.

At 0904 on 12 March, the Sea-Tow representative advised *Kurutai*'s master of the necessary contact details for the WA DPI regional office and the fuel company in Carnarvon. After a discussion with the Sea-Tow representative, the master was informed that he could also have some minor repair work done on the barge while it was anchored off Carnarvon.

At 0935 on 12 March, *Kurutai* and *Seatow 61* entered Shark Bay though Geographe Channel. At 1335, the crew was transferred from *Kurutai* to *Seatow 61* to prepare the barge for anchoring. At 1445, *Seatow 61*'s stern anchor was let go. At 1508, the barge was brought up to six shackles¹⁰ of anchor cable, in position 24°54.5'S 113°34.8'E (Figure 9). No deck lights were switched on and the anchor lights were set to operate automatically. The crew then returned to *Kurutai* before the tug anchored about one cable¹¹ east of the barge.

Figure 9: Section of navigational chart Aus 747



At about 0700 on 13 March, the regional transport officer (RTO), from the Carnarvon WA DPI office, delivered a local chart showing the approaches to the channel into the Carnarvon boat harbour to *Kurutai* using his own recreational

¹⁰ One shackle equals 90 feet or 27.43 m.

¹¹ One cable equals one tenth of a nautical mile or 185.2 m.

vessel. Due to the limited water depth in the channel, *Kurutai's* transit of the channel would depend on the available height of tide.

At 0800, *Kurutai* left the anchorage for Carnarvon to pick up an engineer who was to prepare a quote for repairs to the radiator on the barge's 140 kW generator. *Kurutai* returned to the barge at about 1500. At about 1540, the tug left the barge to return the engineer to Carnarvon. *Kurutai* then remained alongside in Carnarvon overnight.

On 14 March, *Kurutai's* master signed a berthage arrangement with the RTO for use of the T-Jetty in the boat harbour. The tug would be berthing on a casual basis, starting on 13 March and continuing while it undertook minor repair and maintenance work on both the tug and the barge. *Kurutai's* master did not provide a departure date.

At 1450, *Kurutai* sailed from Carnarvon to *Seatow 61*. The tug remained alongside the barge for about two hours and the anchor cable was walked back to its maximum length of seven shackles before the engineers removed the 140 kW generator's radiator for repairs. The tug then returned to Carnarvon and was all fast alongside the T-Jetty at 1825, where it remained for the next few days.

On 17 March, *Norma Jean's* skipper contacted the local Australian Bureau of Meteorology (BoM) office and requested weather information for 18 March. He stated that he was intending to go across Shark Bay towards 'The Gap' to go fishing but, considering the age and health of himself and his passengers, he wanted to ensure that the weather would be calm. The weather forecast provided by BoM for 18 March was ideal.

On 18 March, moonrise for the almost new moon was at 0616 and sunrise was at 0728 so it was very dark before the start of morning twilight at 0639. There was almost no cloud cover so the stars would have provided some light.

There was little wind, the sea was calm and there was a slight haze above the water. The tide was flooding from the north so *Seatow 61* had swung on its stern anchor and was lying with its port side facing Carnarvon.

At about 0610, *Norma Jean* left the boat ramp in the Carnarvon boat harbour and transited the channel with the skipper, his wife and two friends on board. Witnesses saw *Norma Jean* with all of its navigation lights and its interior light illuminated as it passed the entrance beacon at about 0620. After passing the entrance beacon, *Norma Jean's* speed was increased.

Norma Jean was last seen on the eastern side of the barge at about 0625. Shortly after this, the boat probably collided with the port side of *Seatow 61*. No distress message was sent by the vessel's skipper following the collision and the collision was not witnessed.

At about 1155, a recreational fisherman found some debris, thought to be from a boat, floating in the water about five miles south-southwest of *Seatow 61*. This information was reported to the Carnarvon Volunteer Sea Rescue (CVSR) who, in turn, notified the Western Australia Police (police). The CVSR vessel, *Rescue One*, was despatched to the scene to investigate. At 1255, *Rescue One* recovered the dead body of one of the skipper's friends from the water about one mile south of *Seatow 61*.

The police and CVSR volunteers started checking the number plates of trailers in the car park near the boat ramp to identify which, if any, boats were missing or not accounted for and a full scale waterborne search was started.

At about 1500, the RTO notified *Kurutai*'s master that a boat was missing and some flotsam and a body had been located in the vicinity of the barge. At 1520, *Kurutai* sailed from Carnarvon to attend the barge. The tug's master contacted CVSR and told them he was underway and that he intended to assess the hull of the barge for any marks suggesting that a collision may have occurred before assisting with the search.

At about 1545, a local helicopter, which had been engaged in the search, spotted *Norma Jean*'s submerged wreck close to the barge in about eight metres of water. *Kurutai*'s master was then advised by the police not to approach the barge.

At 1610, *Kurutai* stood by the barge, about one cable away, and the crew was able to see a previously unknown impact mark on the barge's port side (Figure 10).

Figure 10: Impact mark on the hull of *Seatow 61*



At about 1830, the Carnarvon coroner instructed the police to protect the accident site, pending a full investigation. A policeman boarded *Kurutai* at 1838.

Figure 11: *Norma Jean*'s recovered wreckage



The coroner also requested that the barge be better illuminated so, at 1847, *Kurutai*'s crew started the 30 kW generator and switched on the barge's deck floodlights. At about 1905, after the crew had returned to the tug, *Kurutai*'s master anchored the tug about one cable from the barge.

Figure 12: *Norma Jean*'s damaged bow



At about 1200 on 19 March, the bodies of *Norma Jean*'s remaining three occupants were recovered from the sunken boat before it was refloated, using floatation bags, and towed back to Carnarvon. The boat was lifted from the water using a crane and placed on a flat-bed truck (Figures 11 and 12) to enable a thorough examination to be undertaken.

2

ANALYSIS

2.1 Evidence

On 21 March 2007, two investigators from the Australian Transport Safety Bureau (ATSB) travelled to Carnarvon, Western Australia, to interview involved persons, examine *Norma Jean*'s wreck and gather other evidence. The ATSB investigators attended *Kurutai* and *Seatow 61* while the tug and barge were anchored off Carnarvon and the master and directly involved crew members were interviewed. Copies of relevant documents were obtained including log book entries, statutory certificates, maintenance records, procedures and permits.

Information relating to the accident was also obtained from the New Zealand Transport Accident Investigation Commission (TAIC), Sea-Tow, the Marine Safety Business Unit (MSBU) of the Western Australia Department for Planning and Infrastructure (WA DPI), the Bureau of Meteorology (BoM), the Carnarvon Volunteer Sea Rescue (CVSR) and the Western Australia Police (police).

A post-mortem examination of the deceased occupants of the boat was conducted on behalf of the Western Australia coroner and information from these examinations was made available to the ATSB.

A MSBU surveyor assessed the damage to *Norma Jean* at the request of the police and a copy of this report was also provided to the ATSB.

Norma Jean's global positioning system (GPS) receiver and echo sounder unit were taken to Fremantle for examination by the police but no data could be retrieved from the units due to the damage caused by their immersion in sea water.

2.2 The collision

2.2.1 Collision course

When *Norma Jean*'s skipper called the BoM office the night before the accident, he advised them that he intended to cross Shark Bay towards 'The Gap'. The course required to reach 'The Gap' from the Teggs Channel entrance beacon passed directly through the area where *Seatow 61* was anchored (Figures 9 and 16).

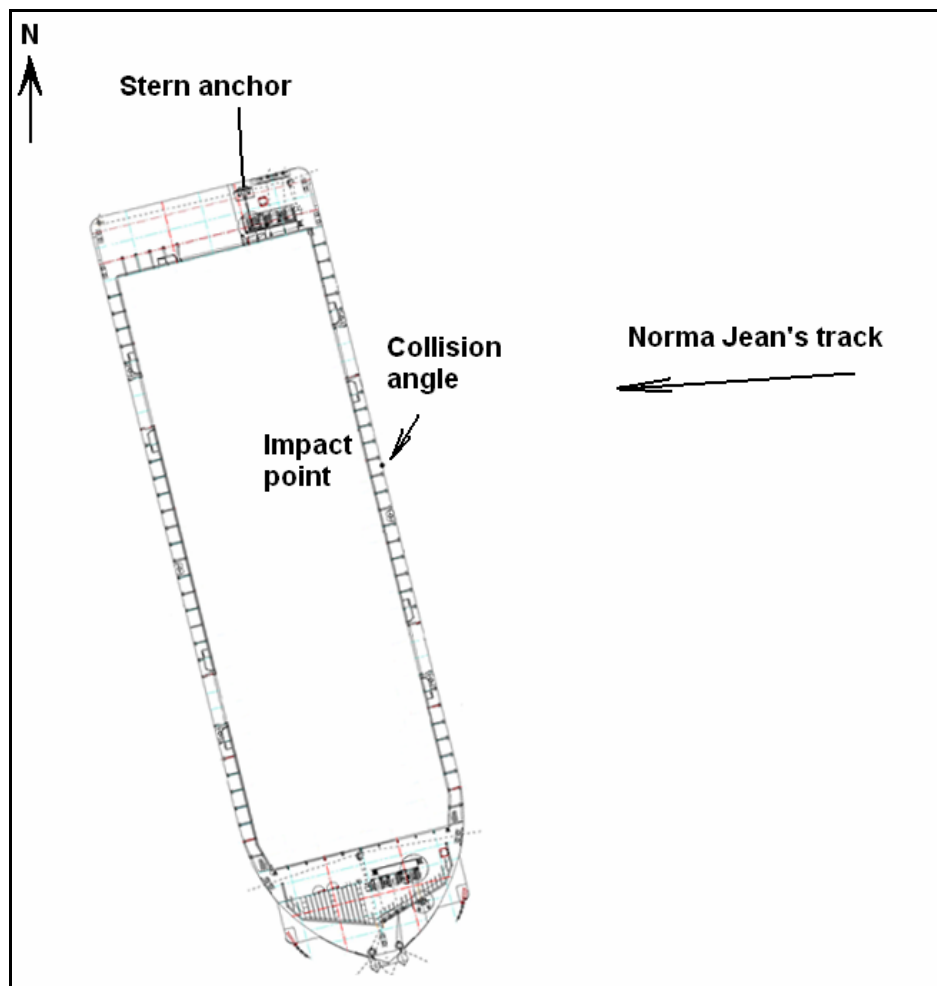
When the tow was disconnected from *Kurutai*, the 20 m forerunner¹² was recovered on board *Seatow 61*. The eye at the end of the forerunner was secured on the deck of the barge. The monkey face¹³, joining the bridle to the forerunner, was not secured to the deck but was allowed to hang in the water over the bow. The bridle arrangement would normally be secured so that it would not drag along the seafloor and foul the anchor cable. The disconnected towing arrangement would not have significantly affected the barge's ability to swing on its anchor.

¹² A length of chain connecting the barge's towing bridle to the tug's towing wire.

¹³ A triangular steel plate allowing three cables or chains to be joined together using shackles.

Considering the length of the barge, the catenary¹⁴ of the anchor chain and the water depth of about 8 m, the barge would have been able to swing through a circle with a diameter of about 200 m. When viewed from the Teggs Channel entrance beacon, the barge could have been lying anywhere on an arc of the horizon of about 2.5 degrees.

Figure 13: Diagrammatic representation of the collision



At 0625 on 18 March 2007, the tide had started to flood and the tidal flow past Carnarvon would have been from almost due north at up to about 1.25 knots. There was almost no wind. The flooding tide would have caused the barge to lie at an angle to its stern anchor cable (Figure 13). Therefore, at about 0600 on 18 March, the barge's stern would have been to the north and its port side would have been facing Carnarvon.

Norma Jean's course towards 'The Gap' would have been about 261° (T). The most severe impact damage was on *Norma Jean's* starboard bow, indicating that it collided at an oblique angle to the barge's centreline. While it is possible that the barge was lying at a different angle, an analysis of the most probable angle of the barge and *Norma Jean's* probable course (Figure 13) indicates that it is likely that *Norma Jean* changed course immediately before the collision occurred. This

¹⁴ The curve of the anchor cable between the seabed and the vessel.

suggests that *Norma Jean*'s skipper may have seen the barge in the moments before the collision and attempted to take avoiding action by altering course to port. If this was the case, the action was too late for *Norma Jean* to avoid the barge.

2.2.2 Collision speed

Information provided by other recreational vessel skippers who left Carnarvon on 18 March allowed the approximate times that *Norma Jean* left the boat ramp and transited the channel to be determined. The boat's approximate speed was estimated with reference to these times.

At about 0610 on 18 March, *Norma Jean* left the boat ramp in the Carnarvon boat harbour and, at the channel speed limit of about five knots, it would have passed the entrance beacon about ten minutes later, at 0620. The boat would then have had to travel at about 30 knots to cover the 2.6 miles between the entrance beacon and the barge in the five minutes to 0625.

The examination of *Norma Jean*'s wreckage revealed that the outboard motor's throttle lever was in the full forward position for maximum speed (Figure 14). While the throttle lever may have been knocked forward during the collision, it is more likely, as suggested by the damage and estimated time of collision, that *Norma Jean* was travelling at or close to its maximum speed when the collision occurred.

Figure 14: Throttle lever



The outboard motor manufacturer publishes engine performance reports for various boats that use its engines. A similar boat to *Norma Jean*, and weighing about 1300 kg, which was powered by a similar 115 HP motor and propeller could have achieved a maximum speed of up to 34 knots.

Norma Jean, a 5.54 m GRP boat powered by a 115 HP motor and with four occupants on board, would probably have been travelling at a speed of up to about

30 knots when the collision occurred. The impact damage on the bow of the boat was consistent with the boat colliding with the barge at high speed.

The available evidence indicates that, at about 0625, *Norma Jean*, while travelling at about 30 knots, collided at an oblique angle with the port side of the barge *Seatow 61*, which lay across its intended course. Given the damage, and the close proximity of the wreck to the barge, it is likely that *Norma Jean* sank quickly following the collision.

2.3 ***Norma Jean***

The International Regulations for the Prevention of Collisions at Sea, 1972, as amended (COLREGS) ‘...apply to all vessels upon the high seas and in all waters connected therewith navigable by seagoing vessels’ and, thus, applied to *Norma Jean*.

The Recreational Skipper’s Ticket (RST) guidebook, produced by the MSBU, includes simple explanations of the COLREGS, to assist recreational skippers. It emphasises the need to maintain an effective lookout and states, in several places, the need to reduce a boat’s speed if visibility is reduced or if the boat is travelling at night. The guidebook also states, ‘Keep lighting within your own vessel to a minimum; it preserves your night vision’¹⁵.

Norma Jean’s skipper held an RST and should have been aware of his obligations under the COLREGS. He had been provided with the RST guidebook and had been examined on its contents when qualifying for an RST and thus had the necessary knowledge to apply the COLREGS.

2.3.1 **Safe speed**

At the time of the accident, the weather conditions were recorded by BoM as calm with a slight sea haze. It was reported by several witnesses that the sea conditions were ideal for small boats and that they were able to travel comfortably at maximum speed.

The skippers of some other boats that departed Carnarvon in the morning of 18 March stated that they increased their boats’ speed to their maximum as soon as they had passed the entrance beacon, despite the near total darkness.

Therefore, it can be reasonably concluded that *Norma Jean* was probably travelling at or near its maximum speed, about 30 knots, when it collided with *Seatow 61*.

Rule 6 of the COLREGS, ‘Safe Speed’, states that:

Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions.

Norma Jean’s speed was inappropriate given the limited range of vision that the skipper would have had in the near total darkness. Had *Norma Jean* been travelling more slowly, the skipper would have had more time to react after seeing the barge

¹⁵ Western Australia Recreational Skipper’s Ticket Workbook, WA DPI, 2006, p 24.

and may have avoided colliding with it. A slower speed would also have lessened the effects of the impact.

2.3.2 Effective lookout

Norma Jean's skipper did not see *Seatow 61* early enough to avoid the collision. The evidence suggests that it is possible that he may have seen the barge and turned in an attempt to avoid the collision at the last moment. It is also possible that he saw the two anchor lights and, misinterpreting them as belonging to two separate vessels, had attempted to pass between them.

Rule 5 of the COLREGS contains the requirements for keeping a lookout:

Every vessel shall at all times maintain a proper lookout by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and the risk of collision.

Norma Jean's skipper was obliged to maintain a proper lookout. The fact that the collision occurred at all suggests that the skippers' lookout was not effective. There are several factors that may have contributed to the quality of his lookout.

Under WA DPI rules, a valid Western Australian driver's licence was acceptable proof of adequate eyesight to be in charge of a recreational powerboat. *Norma Jean's* 78 year old skipper had renewed his driver's licence in September 2006, including the mandatory eyesight test; although this test did not measure his vision under low light conditions.

Research suggests that older adults, even in the absence of any eye disease, have significant difficulty seeing objects under low illumination and at night¹⁶. The dark hull of the barge would also have made it significantly more difficult for *Norma Jean's* skipper to differentiate the barge from its dark background.

Interviews with other skippers that departed the boat harbour on 18 March suggested that *Norma Jean's* lights had been on before the collision. An examination of the recovered boat showed that the switches for the navigation lights and for the cabin light were switched on (Figure 15).

Norma Jean's internal light was on and both it and the screen of the GPS unit, which was mounted to port of the centreline on the skipper's left hand side, would have increased the level of illumination within the boat, decreasing the skipper's sensitivity to dim light sources outside the boat. The light probably would also have reflected off various surfaces within the boat's cockpit, including the windscreen, reducing the skipper's ability to discriminate external objects from their background.

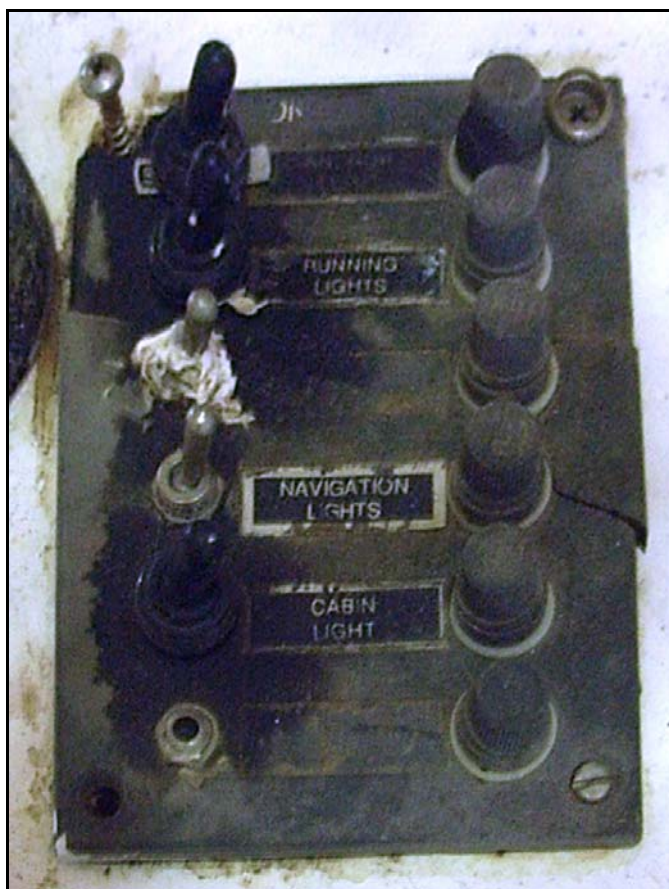
16 Jackson, G., Owsley, C., & McGwin Jr, G. (1999). *Aging and dark adaptation*. Vision Research, 39(5), 3975-3982.

The skipper's eyes would also have probably relaxed in the absence of distant sources of stimulation.

The presence of objects close to the eye's dark focus¹⁷ can result in a phenomenon known as the Mandelbaum effect, in which the eye is involuntarily 'trapped' at its dark focus, making it difficult to see distant objects. Window-posts and dirty windscreens are particularly likely to produce the Mandelbaum effect¹⁸.

The reflections from the GPS, the cabin light and of the boats occupants on the inside of the windscreen would have stimulated the skipper's eyes to relax and focus on the reflections at the expense of his focus on objects outside the boat.

Figure 15: Switch panel



It took *Norma Jean* about 15 minutes to travel from the comparatively well lit harbour area to the barge. This brief time and the use of the boat's interior light would have limited the skipper's visual adaptation to the dark. Dark adaptation occurs when the human visual system is adjusted for efficient response in dim illumination¹⁹. Pupils in the eyes dilate and the light receptors in retinas increase their sensitivity so that the threshold of vision improves with an increase in time spent in the dark.

17 The stable resting accommodation of the eye, usually a distance of about one metre, that the eye relaxes to when it does not have anything on which to focus.

18 BASI (1991), '*Limitations of the See-and-Avoid Principle*', reprinted by ATSB in 2004.

19 A Dictionary of Psychology, 2001, Oxford University Press.

While *Norma Jean*'s skipper may have been 'looking out', his age, the likely condition of his eyes, the boat's speed and the light sources within the boat would have significantly reduced his ability to maintain an effective lookout in the almost completely dark conditions.

2.4 *Seatow 61*

2.4.1 Anchoring position

While a number of ships and fishing vessels have previously anchored off Carnarvon, there is no designated anchorage marked on the navigational charts for either Shark Bay or Carnarvon.

A copy of the Sea-Tow safety management system was kept on board *Kurutai* but it did not contain any procedures or checklists to provide guidance for making a decision about where to anchor *Seatow 61*. When *Kurutai*'s master was told by the Sea-Tow representative in Perth that he could refuel the tug in Carnarvon, he referred to the tug's copy of the Australia Pilot for information about entering the harbour. The Australia Pilot stated that the harbour was suitable for small craft and that local knowledge was required.

Kurutai's master did not rely solely on the charts or the Australia Pilot for guidance on where to anchor the barge. He gathered information from a local tug operator and local knowledge that was sought on his behalf from the harbour master.

When the harbour master was contacted by Sea-Tow for advice, he did not have the relevant charts or publications with him so he firstly chose to contact a previous harbour master for advice, a reasonable step to obtain the necessary information. He was told that a suitable anchorage was three miles west of the Carnarvon Jetty (Figure 16). This advice was based on an anchoring position previously used by ships that had anchored awaiting a pilot for the berth at Useless Loop. The anchoring position was not given as a specific bearing and range to a conspicuous landmark or as a latitude and longitude but was an approximate position. The suggested anchorage position had good holding ground and was conveniently close to the Carnarvon boat harbour. This anchoring position was also different from those suggested in the Australia Pilot (Figure 16).

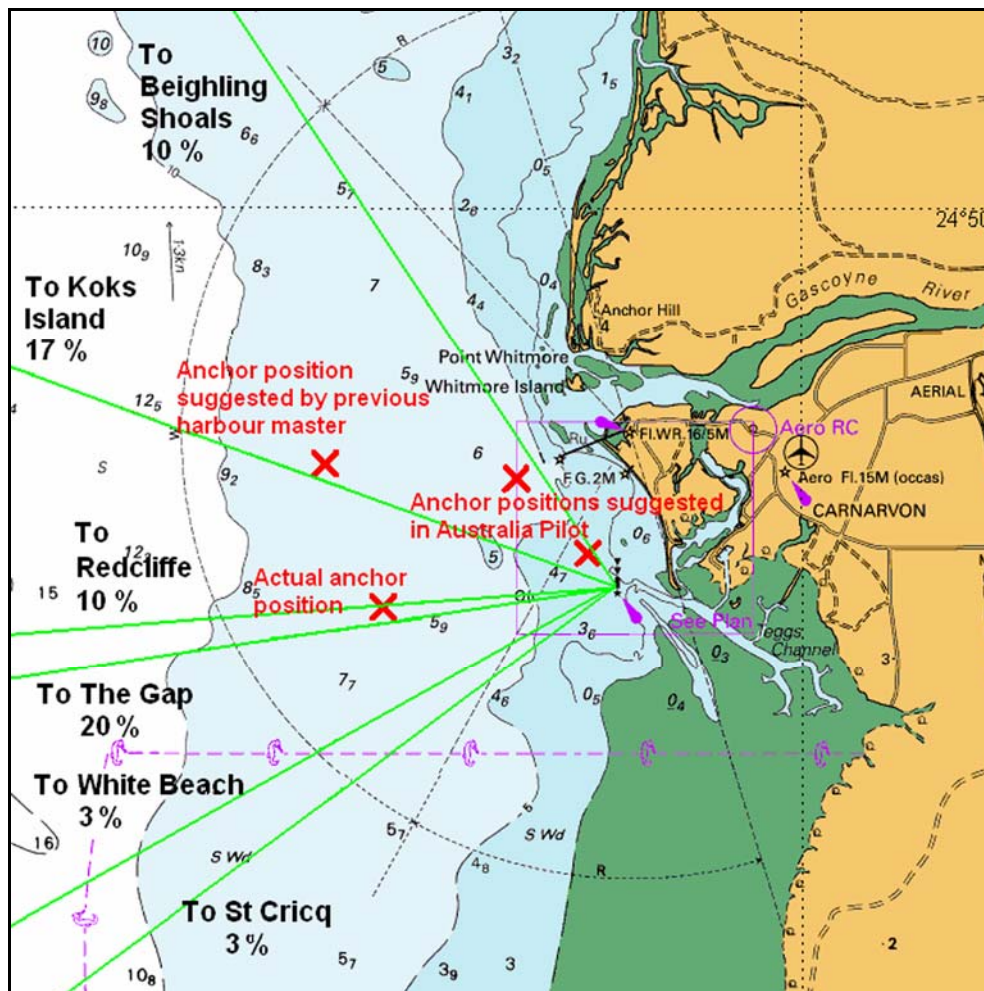
The centralisation of the harbour master's position for some of the smaller West Australian ports has meant that there is no longer a resident harbour master in these ports. Consequently, the harbour master for Carnarvon resided, and mostly worked, in Perth, about 900 km south of Carnarvon.

The harbour master also worked as a marine pilot for ships loading at Useless Loop. While he was aware of the shipping movements within the port and of the fishing fleet that operated from Carnarvon, he was not as familiar with the patterns of the local recreational vessel traffic that operated out of the Carnarvon boat harbour.

There were about 50 recreational vessels operating out of Carnarvon on 18 March because of the good weather. About 30 of these boats had notified CVSR of their departure and their estimated return time. Of these boats, 30 per cent were heading across the bay to either 'The Gap' or 'Redcliffe' (Figure 16). The course to both of these destinations passed through the area in which *Seatow 61* was anchored. Therefore, based on the traffic patterns observed on 18 March, the barge's anchored

position exposed it to the risk of collision with about 30 per cent of the recreational traffic that departed from the Carnarvon boat harbour.

Figure 16: Section of chart Aus 747 showing different anchor positions and popularity for different fishing destinations and approximate headings to reach them



The loss of local knowledge for Carnarvon, in the form of a local resident harbour master, has been offset by the presence of a marine regional transport officer (RTO) who could provide the particular local information that the Perth based harbour master may have required. According to the Harbour Master's Operational Manual:

While discharging their routine duties, harbour masters should consult regularly with port users, other local professionals, Department regional officers and officers from other Agencies in order to gain the benefit of local knowledge and experience.

The MSBU services its customers in regional areas through a partnership arrangement with the regional transport offices. The details of this partnership arrangement are specified in the Service Level Agreement (SLA) between the MSBU and the Regional Services Branch. The Statement of Responsibilities for the Regional Services Branch includes:

Provide timely and accurate advice to the Marine Safety Business Unit.

With regard to the accident, the only service requirement specified in the SLA that has any potential bearing is a requirement for the Regional Transport Office to:

Provide timely information concerning known or potential navigational hazards.

There is no specific requirement for an RTO to assist the harbour master in making decisions about a regional port in which the RTO may have more local knowledge. As such, the SLA does not provide adequate guidance for either the harbour master or the RTO to ensure that they work cooperatively to mitigate navigational risks in the port.

Furthermore, neither the Harbour Master's Operational Manual nor the SLA provide any guidance for identifying hazards within the ports or for assessing the risks associated with these hazards.

After the harbour master made the decision to allow the barge to anchor three miles off Carnarvon, he contacted the WA DPI regional office in Carnarvon and informed the RTO. The harbour master did not actively seek any information from the RTO about Carnarvon marine traffic and the RTO did not offer any. Therefore, the harbour master was not fully aware of the recreational vessel traffic that could be expected to navigate in the proposed anchorage area for the barge.

The Carnarvon harbour master had based his decision on the barge's anchoring position on the assumption that it would only remain unattended for a short period of time while the tug refuelled in Carnarvon. He was not aware that the barge could remain unattended for a period of several days. The decision to undertake repair work was not made until after the barge had anchored off Carnarvon and *Kurutai's* master informed the RTO that the tug would remain alongside in Carnarvon for several days when the berth was booked for the tug. *Kurutai's* master fulfilled his obligations by discussing his intentions with the person he believed to be the "local harbour master", the RTO. The Carnarvon harbour master in Perth was not completely informed of the revised plans and, consequently, he was unable to amend his advice with respect to anchoring and lighting the barge.

When the harbour master decided that the barge should anchor three miles west of Carnarvon, his decision was based on the assumed short duration that the barge would remain at anchor, the good holding of the anchorage and its proximity to the boat harbour. However, he probably did not have sufficient current knowledge of the small boat traffic, and was not provided with it, to adequately assess the risks that this decision could have on the safety of navigation for all of the vessels that operated out of the harbour.

The Harbour Master's Operational Manual and the Service Level Agreement between the Marine Safety Business Unit and the Regional Services Branch did not provide sufficient guidance for either the harbour master or the RTO to ensure that all navigational risks within the port were identified and assessed so that appropriate measures could be taken to mitigate them.

2.4.2 Awareness of the anchored barge

When a designated anchorage has been declared in a port, the navigational charts for the area are amended and a notice to mariners is issued to advise all vessel operators of the information. In this instance, there was no designated anchorage for Carnarvon. Consequently, local recreational vessel skippers were not aware of a

particular area that could be used as an anchorage where they could reasonably expect to encounter an anchored vessel.

Norma Jean's skipper had not been out in his boat for several months. One of his passengers was a volunteer radio operator with CVSR who had been working from his home, not the CVSR base, during the period that the barge was at anchor off the port. In addition, the barge was not readily visible from the town. Consequently, *Norma Jean*'s skipper was probably unaware of the presence of the anchored barge.

Very few large vessels anchor off Carnarvon and most of the vessels that had in the past were ships that had their deck lights illuminated, or smaller fishing vessels that were normally brightly lit. *Norma Jean*'s skipper, like many other recreational skippers using the port, probably expected that, if there was a vessel at anchor outside the boat harbour channel, then it would be well illuminated and conspicuous.

Local notices to mariners are used to warn or advise boat skippers of navigational hazards, such as floating logs or altered channel markers, which may affect their safe operation within a port. The warnings for Carnarvon are issued by the MSBU and are published in the local newspaper, broadcast by the local BoM office with the routine coastal weather forecast and provided by the CVSR if a skipper calls them on the radio.

The presence of the barge was sufficiently unusual that the RTO took a photograph of it while he was taking the local chart out to *Kurutai* on 13 March (Figure 17). Its presence outside the boat channel, while not a navigational hazard, was sufficiently unusual that it may have been worthwhile notifying the recreational vessel skippers to its presence.

The skippers of various other boats leaving the harbour on the morning of 18 March described having difficulty seeing *Seatow 61* and that it was not "lit up". One skipper, who departed from the boat ramp at about 0600, shortly before *Norma Jean*, described coming across the barge unexpectedly. He stated that he realised that other boats could have difficulty spotting the barge but he did not inform the CVSR of this, because the CVSR radio watch did not normally begin until 0700. He did not inform anybody else either.

Recreational skippers generally do not have the same level of training or experience as professional seafarers. While this is being addressed to some extent in Western Australia, by the introduction of the RST, there is still a significant difference between the standards of seamanship that could reasonably be expected of a recreational skipper compared with a professional seafarer. Given the number of recreational vessels using the port and the likely level of training and experience of their skippers, it would probably have been prudent for either the harbour master or the RTO to take steps to alert the local recreational boating community to the presence of the barge to mitigate the risk of any collision.

Despite it being unusual for a barge to anchor off Carnarvon, the MSBU did not consider it necessary to issue a notice to mariners to advise recreational vessel skippers that it was anchored off the port. Furthermore, the recreational vessel skippers who were aware of the barge's presence, and that had experienced difficulty seeing it, did not warn anyone of the hazard.

2.4.3 Barge illumination

Vessels at anchor are required to be illuminated according to Rule 30 of the COLREGS, which states:

- (a) A vessel at anchor shall exhibit where it can best be seen:
 - (i) in the fore part, an all-round white light or one ball;
 - (ii) at or near the stern and at a lower level than the light prescribed in subparagraph (i) an all-round white light.
- (b) A vessel of less than 50 metres in length may exhibit an all-round white light where it can best be seen instead of the lights prescribed in paragraph (a) of this Rule.
- (c) A vessel at anchor may, and a vessel of 100 metres and more in length shall also use the available working or equivalent lights to illuminate her decks.

When *Seatow 61* anchored three miles off Carnarvon, it displayed two anchor lights as prescribed by the COLREGS but was not illuminated in any other way. Because it was not longer than 100 m, additional deck lights could be used but their use was not mandatory. The anchor lights used on board the barge met the minimum requirements prescribed in the COLREGS.

Rule 20 (b) of the COLREGS states:

The Rules concerning lights shall be complied with from sunset to sunrise, and during such times no other lights shall be exhibited, except such lights as cannot be mistaken for the lights specified in these Rules or do not impair their visibility or distinctive character, or interfere with the keeping of a proper look-out.

The purpose of anchor lights is not only for the lookout of another vessel to be able to identify the presence of an anchored vessel but to give some indication of how large it is, once it has been seen. The requirement for deck lights to be used on large vessels is to ensure that the part of the vessel between the fore and aft anchor lights is not misinterpreted as a space between two smaller anchored vessels, each showing a single anchor light. The fishing vessels that regularly anchor off Carnarvon are usually brightly lit using deck lights in addition to displaying their anchor lights, although there is no requirement for them to do so.

Furthermore, Rule 2 of the COLREGS, 'Responsibility' states:

- a) Nothing in these Rules shall exonerate any vessel, or the owner, master or crew thereof, from the consequences of any neglect to comply with these Rules or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.
- b) In construing and complying with these Rules due regard shall be had to all dangers of navigation and collision and to any special circumstances, including the limitations of the vessels involved, which may make a departure from these Rules necessary to avoid immediate danger.

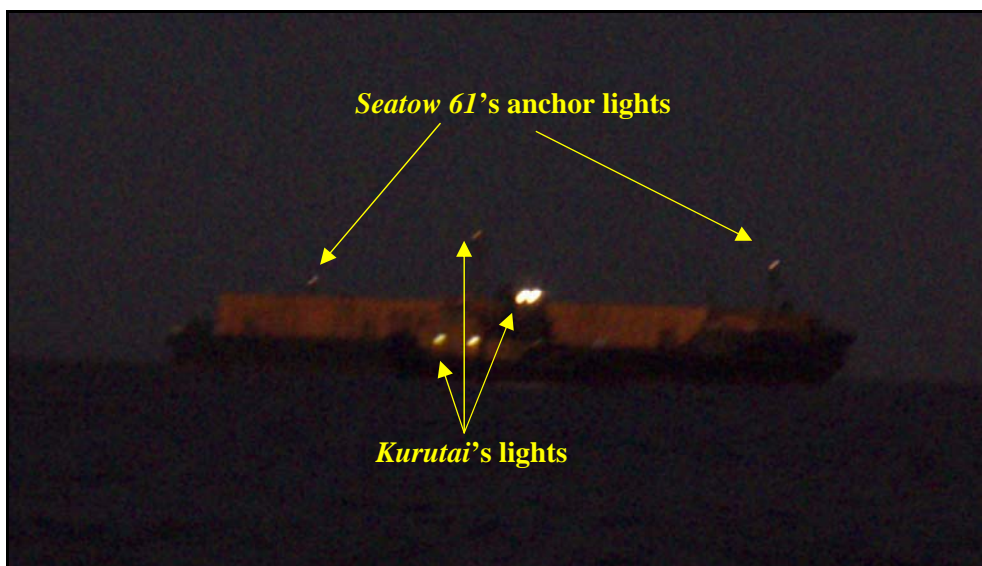
It can be argued that this was a 'special case', considering that the barge would be unattended for an extended period of time in an area that was traversed frequently by a significant volume of small boat traffic, and that additional lighting should have been considered. Compliance with the minimum lighting requirements specified in the COLREGS for *Seatow 61* was not an adequate precaution. The lighting used, only the anchor lights fore and aft, was not sufficient to alert *Norma*

Jean's skipper to the barge's presence early enough to avoid the collision and did not reflect all of the precautions that could have been taken.

The electrical system used for the navigation lights on board *Seatow 61* was designed to be reliable for extended periods, such as long voyages under tow. On 24 March, the ATSB investigators tested *Seatow 61*'s electrical and lighting systems and found them to operate as designed. The batteries were also inspected and found to be in good condition.

At 0711 on 13 March, five days before the accident, the barge's anchor lights were photographed by the RTO while illuminated (Figure 17). No maintenance or repair work was undertaken on the barge's electrical systems between that time and the time that the system was tested on 24 March. The evidence suggests that the barge's anchor lights were probably illuminated at the time of the accident, as required by the COLREGS.

Figure 17: Tug and barge at 0711 on 13 March



The 24 Volt batteries, which were recharged twice daily, provided the power for the navigation lights and for some small floodlights. The small flood lights were not used because their use would require the 30 kW generator to run for longer periods to maintain the battery's voltage. After the accident, the main cargo-working floodlights were switched on at the request of the Carnarvon coroner. While these effectively illuminated the barge, they required the 30 kW generator to be run continuously while they were in use.

Seatow 61's lighting met the minimum requirements prescribed in the COLREGS but was either misinterpreted by *Norma Jean*'s skipper or did not alert him to the presence of the barge early enough to prevent a collision in the early morning darkness on 18 March. Given that the barge was to remain unattended while at anchor, in an area frequently transited by recreational vessel traffic, it would have been prudent for the barge's owner or *Kurutai*'s master to provide the barge with greater illumination, in the form of the deck lights, to alert other vessels to its presence.

2.5 A previous similar accident

At 0200 on 16 October 2002, the barge *Seatow 17* anchored off Tarakohe, New Zealand. The barge was anchored from the stern with four shackles of cable in the water. The tug, *Seatow 22* (now *Kurutai*), was alongside the anchored barge. The barge's anchor lights were switched on and a small spotlight on board the tug was used to illuminate the after end of the barge.

Seatow 22's master instructed the watch-keepers to use the tug's searchlight to warn the fishing vessels, which were expected to depart Tarakohe in the early morning, of the barge's presence.

The barge was positioned just south of the line of the leads, about 0.9 miles from the harbour entrance. The tug was secured on what was, at the time, the seaward side of the barge.

At about 0510, the fishing vessel *Alfred* put to sea from Tarakohe harbour. After clearing the harbour, the skipper increased the boat's speed to its maximum of about 8.5 knots and, about 10 minutes later, set the boat on a compass heading of 298° before switching the steering to auto-pilot. He could see a light on his port bow which he thought was another fishing vessel. About 5 minutes later he went to the back of the wheelhouse to make some tea.

Shortly afterwards, *Alfred* collided with *Seatow 17* and immediately began to sink. One crew member was fatally injured when he became entangled with the boat's rigging and could not be freed before the boat sank. His body was not recovered until after the boat was refloated on 19 October.

The Maritime Safety Authority²⁰ of New Zealand (MSA), the regulator, conducted an investigation into the accident. *Alfred*'s skipper was prosecuted for operating a vessel in a manner causing unnecessary danger or risk to other persons and for breaching maritime rules pertaining to collision avoidance and lookout. The draft MSA report included the following recommendations to Sea-Tow²¹:

It is recommended that Sea Tow Ltd immediately instruct their Masters that when it is deemed necessary to anchor off the port of Tarakohe, they are to anchor to the south of the inner harbour (wharf approach) leads and be mindful of weather which may cause the barge to swing north of this line. This information to be promulgated to the Harbourmaster of Tarakohe who in turn shall disseminate this information to all users of the port.

It is recommended that Sea Tow Ltd investigate immediately the feasibility of illuminating the hull of the barge when at anchor.

Despite the circumstances of the accident and the MSA investigation, Sea-Tow did not take any measures to mitigate the risk of another similar accident. They did not alter the barges' lighting, did not make any changes to the Sea-Tow safety management system (SMS) and information about the accident was not disseminated throughout the Sea-Tow fleet. Consequently, on 13 March 2007, when the master of *Kurutai* anchored the barge *Seatow 61* off the port of

20 The Maritime Safety Authority of New Zealand has since changed its name to Maritime New Zealand.

21 Maritime Safety Authority Accident Investigation report number 02 3021, *Alfred & Seatow 17*.

Carnarvon, he was not aware of the details of this earlier accident and did not have any particular guidance available to him from the company SMS, particularly with respect to anchoring the barge and illuminating it while it was at anchor.

In submission, Sea-Tow stated:

In our view it is not appropriate for you to refer to the earlier incident in New Zealand. Our reasoning for this is set out below:

- a) Following the incident Maritime New Zealand (MNZ) investigated and prepared a draft report;
- b) MNZ then decided to prosecute the skipper of the fishing boat which collided with the barge. The skipper was found guilty after a defended hearing and fined;
- c) As far as can be ascertained by Sea-Tow, MNZ did not circulate the draft report to Sea-Tow for comment as is part of the normal procedure and MNZ did not issue recommendations to Sea-Tow;
- d) Sea-Tow would dispute many of the factual findings in the draft MNZ report and would have taken this up with MNZ as part of the usual consultation process however it was not given the opportunity in this case;
- e) We understand the final report has not been issued by MNZ.

As can be seen from the above Sea-Tow was not given the opportunity to comment on the MNZ draft report and, so far as we understand, the report does not contain recommendations.

For those reasons, reference to the MNZ report should, in our view, be deleted from your report as should the reference to the recommendations made to Sea-Tow as no recommendations were made.

In our view to refer to the New Zealand incident in the way that you have is to unfairly criticise Sea-Tow and is quite improper.

In response to this comment, Maritime New Zealand stated that:

In accordance with MSA policy (which is currently under review), neither a draft nor a final report would have been provided in this case due to the decision of the Director of MSA to prosecute the Skipper of *Alfred*. This is because the information contained therein would have been superseded by the findings of the court.

Following the completion of the legal process, and in the event of a request being made for a copy of the original draft report, copies are made available with a header note explaining that the investigation of the accident has resulted in a prosecution and that the report has not been distributed to affected parties for comment as the information it contains has been superseded by the findings of a court.

For the above reasons, MSA did not provide a draft report to Sea-Tow or formally issue recommendations or issue or publicly release a final report.

A further submission from Maritime New Zealand stated:

Nevertheless, while MSA's report and recommendations were not formally circulated, they were discussed with management of Seatow, and the view of the company at the time was that additional lighting of the barge above the requirements of the COLREGS and New Zealand's domestic Maritime Rules was not possible or practical.

The Nelson District Coroner conducted a coronial inquest into the fatality that occurred as a result of the accident in 2006 during which he referred extensively to the MSA investigation report. In his findings, the coroner stated that:

[21] Given the above information it is to a degree somewhat surprising that no action was taken against the Sea Tow organisation as it is clear that its actions contributed to the accident.

[22] The Maritime Safety report recommended that Sea Tow Limited investigate the feasibility to illuminate the hulls of their barges when at anchor and this court pursuant to section 15 (1) b of the Coroners Act also recommends that this action be implemented and by the actions of the Tasman District Council and this authority is commended for its actions on this matter.

The Nelson Coroner's findings were finalised on 2 November 2006 and copies were sent to Maritime New Zealand, the Tasman District Council and Sea-Tow.

Sea-Tow was advised by a New Zealand Coroner of the recommendations about four months before the collision between *Norma Jean* and *Seatow 61*. However, the company did not provide advice to its tug masters following the coroner's findings and still had not altered the company's policies or procedures with respect to the illumination of the barge's hulls whilst they are at anchor, in keeping with the recommendations.

3

FINDINGS

3.1 Context

At about 0625 on 18 March 2007, the recreational vessel *Norma Jean*, while probably travelling at about 30 knots, collided with the side of the unmanned anchored barge *Seatow 61* off Carnarvon, Western Australia. It is unlikely that *Norma Jean*'s skipper saw the barge early enough to avoid a collision. *Norma Jean* was severely damaged in the collision and sank quickly. None of the four people on board *Norma Jean* survived the accident.

From the evidence available, the following findings are made with respect to the collision between *Norma Jean* and *Seatow 61* and should not be read as apportioning blame or liability to any particular organisation or individual.

3.2 Contributing safety factors

- *Norma Jean*'s probable speed was too high in the almost total darkness, increasing the risk and consequences of a collision. At a lower speed, the skipper would have had more time to react after seeing the barge and may have avoided colliding with it. A lower speed would also have lessened the impact of the collision. [Safety issue]
- *Norma Jean*'s skipper did not keep an effective lookout just before the collision. Whilst he may have been 'looking out', the likely condition of his eyesight, the boat's speed and the lighting inside the boat's cockpit would have reduced his ability to maintain an effective lookout in the darkness. [Safety issue]
- Sea-Tow did not provide adequate guidance for its tug masters with respect to anchoring a barge and leaving it unattended. Furthermore, the Sea-Tow safety management system did not provide procedures or guidance to disseminate safety information following accidents or incidents involving tugs or barges. [Safety issue]
- There was no designated, charted anchorage for the port. [Safety issue]
- The Carnarvon harbour master was not fully aware of recreational vessel activities in Carnarvon when he provided advice on where to anchor *Seatow 61*. His advice was based on the good holding ground of the anchorage, its proximity to the boat harbour and the assumption that the barge would remain at anchor for a short duration. [Safety issue]
- The Harbour Master's Operational Manual and the Service Level Agreement between the Marine Safety Business Unit and the Regional Services Branch did not provide sufficient guidance for either the harbour master or the regional transport officer to ensure that all navigational risks for Carnarvon were identified and adequately assessed so that appropriate measures could be taken to mitigate them. [Safety issue]
- While the lighting on board the barge *Seatow 61* complied with the requirements of the International Regulations for the Prevention of Collisions at Sea, 1972, as amended (COLREGS), it was not sufficient to alert *Norma Jean*'s skipper to the barge's presence early enough to prevent the collision. Furthermore, the lighting

did not reflect all of the reasonable precautions that could have been taken to prevent a collision with the unmanned barge. *[Safety issue]*

- Despite it being unusual for a barge to anchor off Carnarvon, the Marine Safety Business Unit did not consider it necessary to alert any boat operators to the barge's presence in an area that was regularly transited by them. *[Safety issue]*

4.1 Safety action taken by Sea-Tow

The ATSB has been advised that the following safety actions have been taken by Sea-Tow as a result of the collision between *Norma Jean* and *Seatow 61*.

- Sea-Tow is preparing written procedures for anchoring and illuminating barges for inclusion in the safety management system.
- Sea-Tow is investigating the possibility of applying a luminous paint which 'charges' during daylight hours and 'discharges' during the hours of darkness. The intention is that at the next dry-dock this luminous paint will be applied in a line (either continuous or dotted) along the lengths of the sides of the barge.
- Furthermore, when the final ATSB report is released, it is intended to provide a copy of the report to each master of Sea-Tow and to place a copy of the report on board Sea-Tow's tugs.

4.2 Safety action taken by the Department for Planning and Infrastructure's Marine Safety Business Unit

The ATSB has been advised that the following safety actions have been taken by the Marine Safety Business Unit (MSBU) following the collision between *Norma Jean* and *Seatow 61*

- In August 2007 the Dept for Planning and Infrastructures Marine Safety Business Unit (MSBU) commenced a contract with a consultant to re-establish our Quality Management System (QMS). In the past MSBU was quality assured by Det Norske Veritas (DNV) but this was not maintained. To support the QMS, once the consultants work is complete, we are in the process of employing appropriately qualified persons dedicated to the maintenance of our QMS.
- Some of the area being focused on as part of our QMS are:
 - Stakeholder Management Plan which includes a strategic stakeholder communications plan.
 - Risk assessment in progress for all WA Ports looking at cargo types and volumes and the risks they pose.
 - Strategic Relationships and Business Partnerships plans being developed to manage responsibilities and risks.
- The Western Australian Department for Planning and Infrastructure has a new Director General (DG) who commenced in this position October 2007. This new DG is a great advocate of the Australian Business Excellence Framework (A.B.E.F). He has introduced the framework into the whole of DPI with involvement and training being undertaken by all levels of staff in the organisation.
- This introduction of A.B.E.F will assist our unit in the strategic management of our risks by introducing the requirement of triple bottom line outcomes taking into account the social, environmental and economic issues in line with set objectives and requirements.

- The reinstatement of our QMS will provide the necessary tools for ongoing improvements to our policies and procedures to enhance and improve Marine Safety in Western Australia.

4.3 Safety action taken by Maritime New Zealand

The ATSB has been advised that the following safety actions have been taken by Maritime New Zealand as a result of the collision between *Norma Jean* and *Seatow 61*.

- The Maritime Safety Authority's practice, at the time, when there had been an enforcement action arising from an accident investigation, was not to circulate the investigation report unless it was specifically requested by an interested party. Maritime New Zealand is currently reviewing this practice, and also initiated a number of communication strategies so that learning points can be passed to industry even if an enforcement action is underway or pending. This includes publication quarterly of accident summaries and important safety lessons to prevent recurrences.
- Maritime New Zealand is considering a submission to the International Maritime Organisation for an amendment to the International Regulations for the Prevention of Collisions at Sea (COLREGS) which will require a review of lighting of anchored vessels/barges. Research work to support this submission, including a review of other accidents/incidents involving anchored barges internationally, is planned for 2008.
- In the interim, Maritime New Zealand is also drafting guidance material for the operators of New Zealand barges which will include lighting at anchor.

4.4 ATSB recommendations

MR20080003

Sea-Tow did not provide adequate guidance for its tug masters with respect to anchoring a barge and leaving it unattended. Furthermore, the Sea-Tow safety management system did not provide procedures or guidance to disseminate safety information following accidents or incidents involving tugs or barges.

The Australian Transport Safety Bureau acknowledges the safety action taken by Sea-Tow and recommends that the Sea-Tow takes further action to address this safety issue.

MR20080004

The Carnarvon harbour master was not fully aware of recreational vessel activities in Carnarvon when he provided advice on where to anchor *Seatow 61*. His advice was based on the good holding ground of the anchorage, its proximity to the boat harbour and the assumption that the barge would remain at anchor for a short duration.

The Australian Transport Safety Bureau recommends that the Marine Safety Business Unit of the Western Australian Department for Planning and Infrastructure takes action to address this safety issue.

MR20080005

The Harbour Master's Operational Manual and the Service Level Agreement between the Marine Safety Business Unit and the Regional Services Branch did not provide sufficient guidance for either the harbour master or the regional transport officer to ensure that all navigational risks for Carnarvon were identified and assessed so that appropriate measures could be taken to mitigate them.

The Australian Transport Safety Bureau acknowledges the safety action taken by the Marine Safety Business Unit of the Western Australian Department for Planning and Infrastructure and recommends that the Marine Safety Business Unit takes further action to address this safety issue.

MR20080006

Despite it being unusual for a barge to anchor off Carnarvon, the Marine Safety Business Unit did not consider it necessary to alert any boat operators to the barge's presence in an area that was regularly transited by them.

The Australian Transport Safety Bureau recommends that the Marine Safety Business Unit of the Western Australian Department for Planning and Infrastructure takes action to address this safety issue.

4.5 ATSB safety advisory notices

MS20080006

Norma Jean's probable speed was too high in the almost complete darkness, increasing the risk and consequences of a collision. At a lower speed, the skipper would have had more time to react after seeing the barge and may have avoided colliding with it. A lower speed would also have lessened the impact of the collision.

The Australian Transport Safety Bureau advises that the owners and operators of recreational vessels should consider the safety implications of this safety issue and take action where considered appropriate.

MS20080007

Norma Jean's skipper did not keep an effective lookout just before the collision. Whilst he may have been 'looking out', the likely condition of his eyesight, the boat's speed and the lighting inside the boat's cockpit would have reduced his ability to maintain an effective lookout in the darkness.

The Australian Transport Safety Bureau advises that the owners and operators of recreational vessels should consider the safety implications of this safety issue and take action where considered appropriate.

MS20080008

While the lighting on board the barge *Seatow 61* complied with the requirements of the International Regulations for the Prevention of Collisions at Sea, 1972, as amended (COLREGS), it was not sufficient to alert *Norma Jean*'s skipper to the barge's presence early enough to prevent the collision. Furthermore, the lighting did not reflect all of the reasonable precautions that could have been taken to prevent a collision with the unmanned barge.

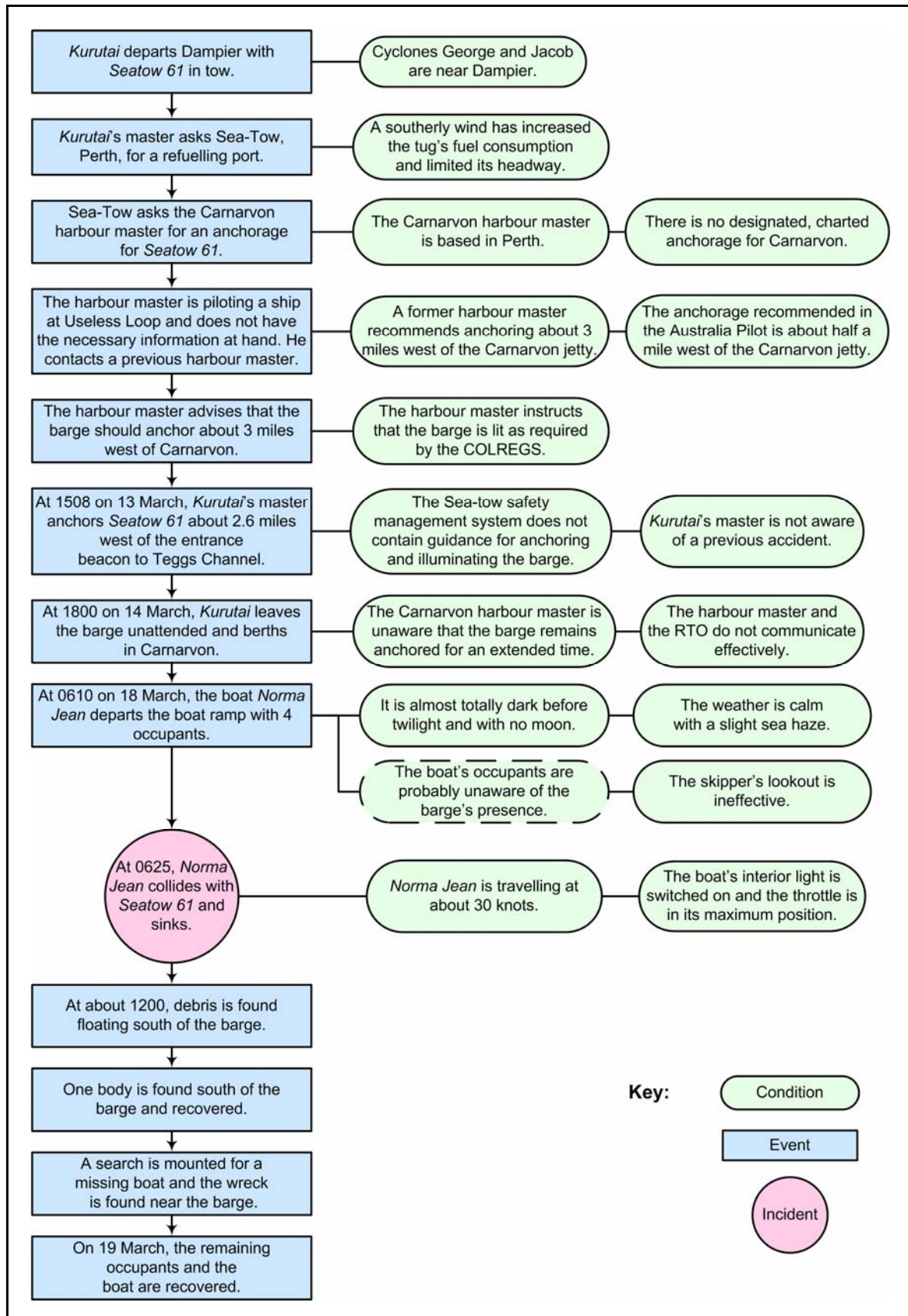
The Australian Transport Safety Bureau advises that the owners and operators of vessels that are, or possibly can be, unmanned should consider the safety implications of this safety issue and take action where considered appropriate.

MS20080009

There was no designated, charted anchorage for the port.

The Australian Transport Safety Bureau advises that harbour masters and port authorities should consider the safety implications of this safety issue and take action where considered appropriate.

APPENDIX A: EVENTS AND CONDITIONS



APPENDIX B: SHIP INFORMATION

Seatow 61

Official Number	876405
Flag	New Zealand
Port of Registry	Auckland
Classification society	Bureau Veritas
Ship Type	Barge
Builder	Taizhou Sanfu Ship Engineering Company, China
Year built	2003
Owners	Sea-Tow
Ship managers	Sea-Tow
Gross tonnage	2772
Net tonnage	832
Deadweight (summer)	6000 tonnes
Summer draught	4.48 m
Length overall	85.43 m
Length between perpendiculars	81.94 m
Moulded breadth	24.38 m
Moulded depth	5.52 m
Crew	Nil

Norma Jean

Registration Number	35539
Flag	Australian
Place of Registration	Western Australia
Vessel Type	'Baron Sportsman' half cabin runabout
Construction	Glass fibre reinforced plastic
Year built	1975
Length overall	5.54 m
Engine	Yamaha 115 outboard petrol engine
Persons on board	Four

APPENDIX C: SOURCES AND SUBMISSIONS

Sources of information

Bureau of Meteorology.

Carnarvon coroner's office.

Carnarvon Volunteer Sea Rescue.

Marine Safety Business Unit (MSBU) of the Western Australian Department for Planning and Infrastructure.

Maritime New Zealand.

New Zealand Ministry of Justice.

Sea-Tow.

Transport Accident Investigation Commission (TAIC), New Zealand.

Western Australia Police.

Western Australia Department for Planning and Infrastructure (WA DPI).

References

Australia Pilot Volume I, Admiralty Sailing Directions NP 13, First Edition 2005.

Australian Seafarer's Handbook, First Edition 2004, as amended.

BASI (1991), '*Limitations of the See-and-Avoid Principle*', reprinted by ATSB in 2004

Dictionary of Psychology, 2001, Oxford University Press.

'Findings of the Coroner I R Smith in the matter of an inquest into the death of Michael Patrick Bowler', written 2 November 2006.

International Regulations for the Prevention of Collisions at Sea, 1972, as amended.

Jackson, G., Owsley, C., & McGwin Jr, G. (1999). *Aging and dark adaptation*. Vision Research, 39(5), 3975-3982.

Maritime Safety Authority Accident Investigation report number 02 3021, *Alfred & Seatow 17*.

Western Australia Recreational Skipper's Ticket Workbook, WA DPI (2006).

Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003*, the Executive Director may provide a draft report, on a confidential basis, to any person whom the Executive Director considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the Executive Director about the draft report.

The final draft of this report was sent to the next of kin of the occupants of *Norma Jean*; the Carnarvon coroner; the Western Australia Police; Sea-Tow in Perth and New Zealand; Transport Accident Investigation Commission; Maritime New Zealand; *Kurutai*'s master; the regional transport officer in Carnarvon; the Manager for Marine Safety and the Environment (the harbour master for Carnarvon); the General Manager Marine Safety, Marine Safety Business Unit of the Western Australian Department for Planning and Infrastructure; the Protection and Indemnity (P & I) solicitor for Sea-Tow; and the Australian Maritime Safety Authority.

Submissions were received from two of the next of kin of the occupants of *Norma Jean*; Transport Accident Investigation Commission; Maritime New Zealand; and *Kurutai*'s master. The regional transport officer in Carnarvon, the harbour master for Carnarvon and the General Manager Marine Safety, Marine Safety Business Unit of the Western Australian Department for Planning and Infrastructure made a joint submission. Sea-Tow in New Zealand made a submission through their P & I solicitor. All submissions received have been included and/or the text of the report was amended where appropriate.

APPENDIX D: MEDIA RELEASE

ATSB investigation into fatal speed boat collision with anchored barge

The ATSB has found that the speed boat *Norma Jean* was travelling too fast in the darkness to avoid a collision that claimed four lives.

The Australian Transport Safety Bureau's final investigation report states that the *Norma Jean*'s probable high speed was inappropriate in the dark conditions and the use of the boat's internal lighting may have restricted the ability of the boat's skipper to see the barge until immediately before the collision.

At about 1500 on 12 March 2007, the unmanned barge *Seatow 61* was anchored about three miles off Carnarvon, Western Australia, and the barge's anchor lights were set to operate automatically. The barge had been anchored in this position following advice from the harbour master.

At about 0610 on March 18, *Norma Jean* left the Carnarvon boat harbour and, at about 0625, it collided with *Seatow 61* and sank quickly with the loss of all four of its occupants.

The ATSB investigation also found that, in 2002, another Sea-Tow barge had been involved in a similar accident in New Zealand and that Sea-Tow did not take proactive measures to prevent a recurrence. Further, the harbour master for the port, who was based in Perth, was not sufficiently aware of recreational vessel activities in Carnarvon to be able to adequately assess the risks posed to recreational vessel skippers by the presence of the anchored barge.

The ATSB reports safety action already taken and has issued four recommendations and four safety advisory notices with the aim of preventing further incidents of this type.

Independent investigation into the collision between the Australian recreational vessel Norma Jean and the New Zealand registered barge Seatow 61 off Carnarvon, Western Australia 18 March 2007.