Office of the Chief Investigator
Transport Safety

Marine Safety Investigation
Report No 2015/01

Collision

Recreational vessel *Who Cares* and № 6 Beacon

West Channel, Port Phillip Bay

13 December 2015

THE CHIEF INVESTIGATOR

The Chief Investigator, Transport Safety is a statutory position under Part 7 of the *Transport Integration Act 2010*. The objective of the position is to seek to improve transport safety by providing for the independent no-blame investigation of transport safety matters consistent with the vision statement and the transport system objectives.

The primary focus of an investigation is to determine what factors caused the incident, rather than apportion blame for the incident, and to identify issues that may require review, monitoring or further consideration.

The Chief Investigator is required to report the results of an investigation to the Minister for Public Transport or the Minister for Ports. However, before submitting the results of an investigation to the Minister, the Chief Investigator must consult in accordance with section 85A of the *Transport (Compliance and Miscellaneous) Act 1983*.

The Chief Investigator is not subject to the direction or control of the Minister in performing or exercising his or her functions or powers, but the Minister may direct the Chief Investigator to investigate a transport safety matter.

SAFETY SUMMARY

What happened

At about 0400 on the morning of 13 December 2015, the 8.9 m recreational vessel *Who Cares* departed Queenscliff Harbour with five persons on board, bound for Mornington. After departing the harbour, the skipper steered a course to enter the West Channel on its western edge. At about 0420, when travelling at a speed of about 40 km/h, the vessel collided with № 6 beacon on the western edge of West Channel. Two occupants of the vessel suffered serious injuries and the others suffered minor bruising. There was significant damage to the vessel and to the beacon.

What was found

It was found that the light on № 6 beacon was not functioning at the time it was struck by *Who Cares* and the beacon was not observed by the boat's skipper. The light on the nearby № 7 beacon was also not functioning. The performance of the two beacons' lighting systems was probably affected by coverage of their solar cells with bird droppings.

The outage of the lights on № 6 and № 7 beacons had not been detected by Parks Victoria, the local port manager. It was found that the monitoring and inspection systems that were in place did not assure a reliable and measurable level of beacon light availability.

It was also found that the skipper of *Who Cares* lost awareness of his position relative to the channel beacons. After stopping between № 4 and № 6 beacons, the skipper resumed the voyage without reference to his navigation equipment, relying instead on visual observation of the next set of lit channel beacons, № 8 and № 9. As a result he travelled to the west of his normal track and collided with № 6 beacon.

What has been done as a result

Following the incident, Parks Victoria commenced a review of the management of aids to navigation within its port waters. This included the verification of the functionality of lit aids to navigation, and a review of the requirements for their ongoing performance, monitoring and maintenance.

Parks Victoria and Transport Safety Victoria have advised that they will work together to determine the current classification to apply to the Parks Victoria aids to navigation network and develop of an appropriate reporting system.

Safety message

Aids to navigation that are normally lit become hazards to waterway users when the lights are not functioning. Monitoring, inspection and maintenance systems should be established that consider the risks associated with potential outage.

Boat operators should physically identify the aids to navigation they will encounter during the voyage; and should report any issue with those aids to the relevant port or waterway manager.

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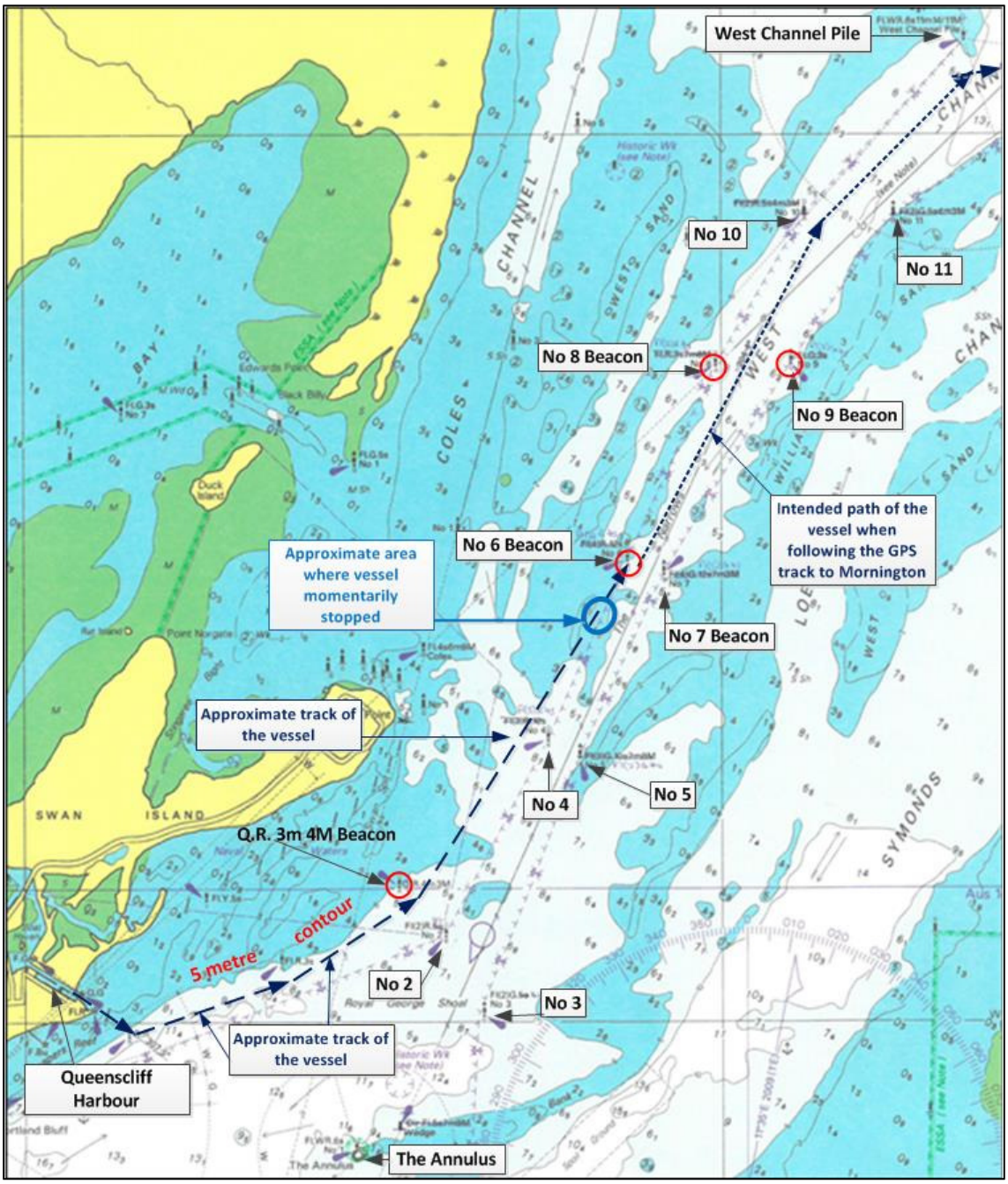
1. THE OCCURRENCE

At about 0400[1] on 13 December 2015, the recreational vessel *Who Cares* with five persons aboard departed Queenscliff Harbour to fish near Mornington. The skipper intended to travel via the West Channel and then on reaching its northern end, turn east towards Mornington. The estimated track of the vessel until the collision with № 6 beacon and the course intended beyond № 6 are shown in Figure 1.

Figure 1: The West Channel and the estimated track of Who Cares. № 13 beacon (not in picture) was about 900 m to the south east of West Channel Pile



Source: Australian Hydrographic Office annotated by Chief Investigator, Transport Safety

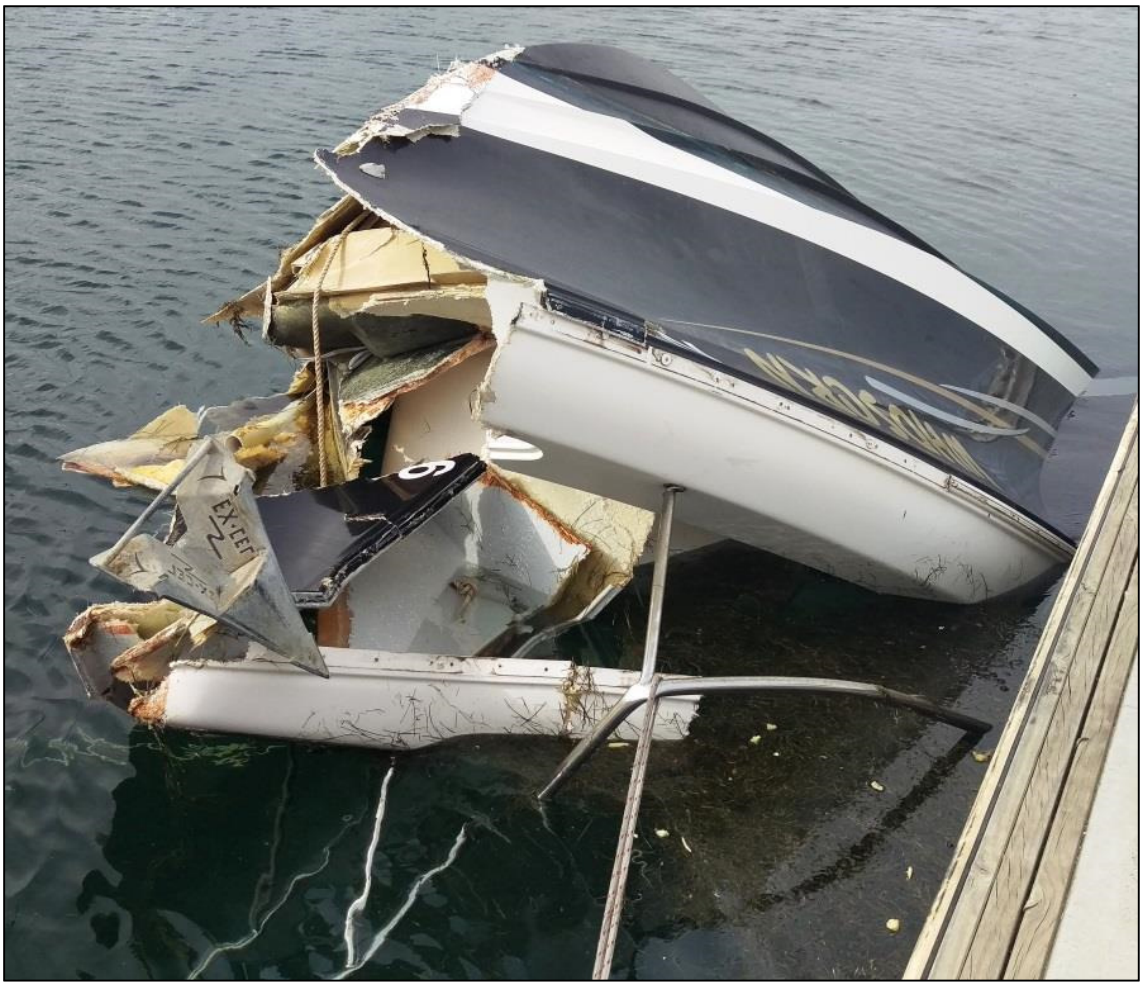
[1] All times are in Australian Eastern Daylight Time.

On clearing the harbour, the skipper altered course to port to navigate approximately parallel to the five metre depth contour, marked by red lighted beacons. After passing the Q.R. 3m 4M beacon[2], the skipper adjusted course to enter the West Channel on its western edge between № 4 and № 6 beacons. For this initial part of the voyage, the skipper was following the vessel's GPS[3] track from a previous voyage, identified on the vessel's navigation equipment (see 2.1.3).

When between № 4 and № 6 beacons, the skipper stopped the vessel to collect a bucket of seawater. On resumption, the skipper observed a red light and a green light ahead and adjusted his course to head between them. Soon after, estimated by the skipper to be less than a minute, the vessel collided with № 6 beacon. The boat was travelling at a speed of about 40 km/h and the collision occurred at about 0420. The skipper reported that he did not see the beacon nor its light.

As a result of the collision, two passengers sitting aft were thrown forward and suffered serious injuries. Two passengers in the forward cabin and the skipper suffered bruising. The bow of the vessel suffered severe impact damage and the vessel subsequently capsized after being evacuated (Figure 2).

Figure 2: The overturned and damaged *Who Cares* alongside at Queenscliff



Source: Owner of *Who Cares*

[2] Indicates the characteristic of the light – a quick flashing red light, located three metres above the water and having a nominal visibility range of four nautical miles under normal atmospheric conditions.

[3] Global Positioning System.

Initially after the collision, the vessel remained upright. The skipper was able to transmit a distress message to Coast Guard Melbourne using the vessel's VHF radio. A passing boat had noticed the disabled vessel and came alongside, transferring the five occupants to their vessel. Soon after, *Who Cares* capsized.

About 30 minutes after the collision, the Volunteer Coast Guard from Queenscliff arrived. The injured were taken aboard the Coast Guard vessel and the overturned *Who Cares* towed to Queenscliff harbour. On arrival, the injured occupants of *Who Cares* were transported by ambulance to hospital.

The weather at the time of the collision was fine with a light south easterly breeze and rippled seas. The sky was cloudy and there was no moon. In these dark conditions, lights would have been clearly visible but unlit structures would have been difficult to distinguish. The current in the area was not significant.

The collision also damaged the base of № 6 beacon. The damaged structure was removed and a temporary buoy installed in its place. The lantern assembly of the beacon was not damaged in the collision and was recovered for on shore inspection.

2. CONTEXT

2.1 The vessel

2.1.1 Type and configuration

Who Cares was an 8.9 m model *2800 Walkaround* half-cabin cruiser of fibreglass construction and planning hull configuration. It was built by Seatime Marine in 2007 and purchased by the current owner in June 2011.

Propulsion was by twin Mercury Optimax 200 hp outboard engines, giving a maximum speed of about 52 km/h.

2.1.2 Conning position

The conning position was located on the starboard side, just forward of the mid-ship, and covered by a rigid fibreglass awning. Forward of this position was a rigid wind break constructed of clear plexiglass. A removable clear plastic screen was fitted between this windbreak and the awning (Figure 3). The plastic screen was fitted with a flap that could be unzipped to provide unobstructed visibility.

Figure 3: Forward view from the conning position

Source: Chief Investigator, Transport Safety

2.1.3 Navigation equipment

The vessel was fitted with a magnetic compass and a NAVMAN 8120 GPS. The NAVMAN used a C-Map electronic chart program (May 2011 edition). This edition of C-Map displayed the West Channel beacons.

The GPS was reported to be functional at the time of the collision. However, it suffered water damage when the vessel overturned and a replay of the vessel's track on this or previous voyages could not be recovered.

2.2 The skipper

The skipper had about 38 years boating experience and at the time of the incident held a Marine Licence that he first obtained in February 2009. The licence allowed him to operate a recreational vessel within Victorian waters.

The skipper estimated that, since purchasing the boat in 2011, he had navigated this route (Queenscliff to Mornington via West Channel) 6-10 times each year. As in this case, he usually departed before dawn so as to be at Mornington by daybreak. He stated that it was usual for him to follow the GPS track from previous voyages, navigating along the set of red lights marking the 5-metre depth contour then adjusting course to enter the channel and follow the channel to the West Channel Pile.

2.3 Safe navigation

The rules governing safe navigation are embodied within the International Regulations for Preventing Collisions at Sea (COLREGS). These rules are enforced within Victoria and apply to both commercial mariners and recreational boaters.

The *Victorian Recreational Boating Safety Handbook* provides extensive guidance to recreational boaters on safe operations. Included in the handbook was advice on:

- safe navigation including being aware of potential hazards
- keeping a proper lookout by sight, hearing and any appropriate means available
- travelling at a safe speed.

2.4 West Channel

2.4.1 Overview

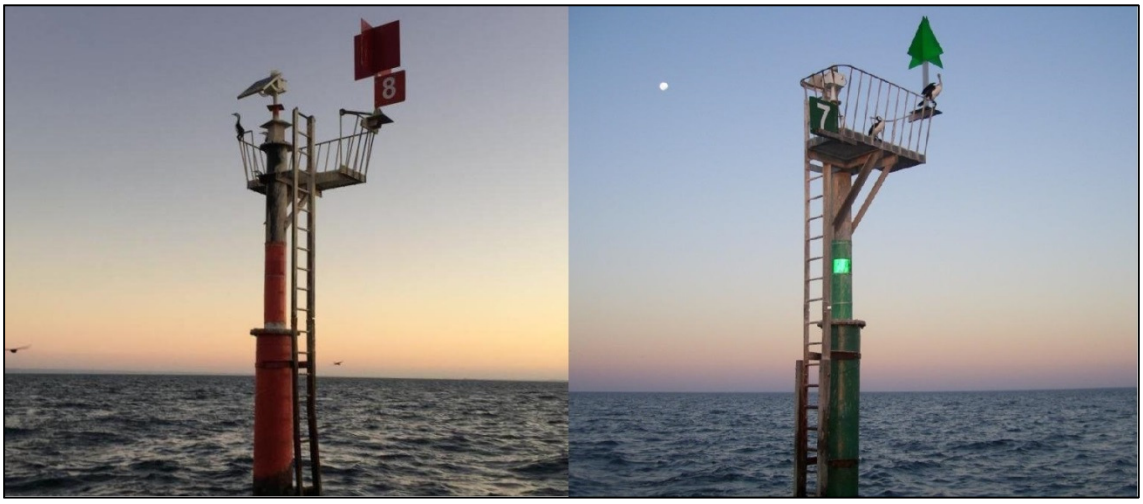
West Channel is located in the southern part of Port Phillip. It extends from The Annulus at the southern end to West Channel Pile at the northern end (Figure 1).

The total length of the channel is about 5.7 nautical miles. At its deepest the channel is about seven metres but there are many shoal patches where the depth is about four metres. Due to frequent shifting shoals within the channel, local knowledge is recommended when transiting. The channel is used by small commercial vessels and recreational vessels.

2.4.2 Channel markers

The West Channel is defined by a series of port and starboard lateral markers[4] (Figure 4). When travelling inwards (from the sea), the port side markers are red spars numbered 2, 4, 6, 8 and 10, all similarly constructed with a red can-shaped topmark and a red light flashing twice every four seconds; and the starboard side markers are green spars numbered 3, 5, 7, 9, 11 and 13, all similarly constructed with a green cone-shaped topmark and a green light flashing twice every 4 seconds. The spars are of steel construction secured to the sea bed.

Figure 4: West Channel beacons №s 8 (port-hand) and 7 (starboard-hand) markers. № 6 beacon was similar in design and construction to № 8 beacon shown below left



Source: Chief Investigator, Transport Safety

An ambient-light sensor automatically controlled the operation of the lights at times of darkness.

All beacons marking West Channel were fitted with a GPS module that provided timing information for the lights. None were fitted with facilities to allow remote monitoring of light performance.

2.4.3 Beacon light assembly

Fitted lights were LED type marine lanterns. Each lantern was powered by a 12V rechargeable sealed lead-acid battery connected to a 20W solar panel. The unit was manufactured by Sealite Pty Ltd and installed on the West Channel beacons.

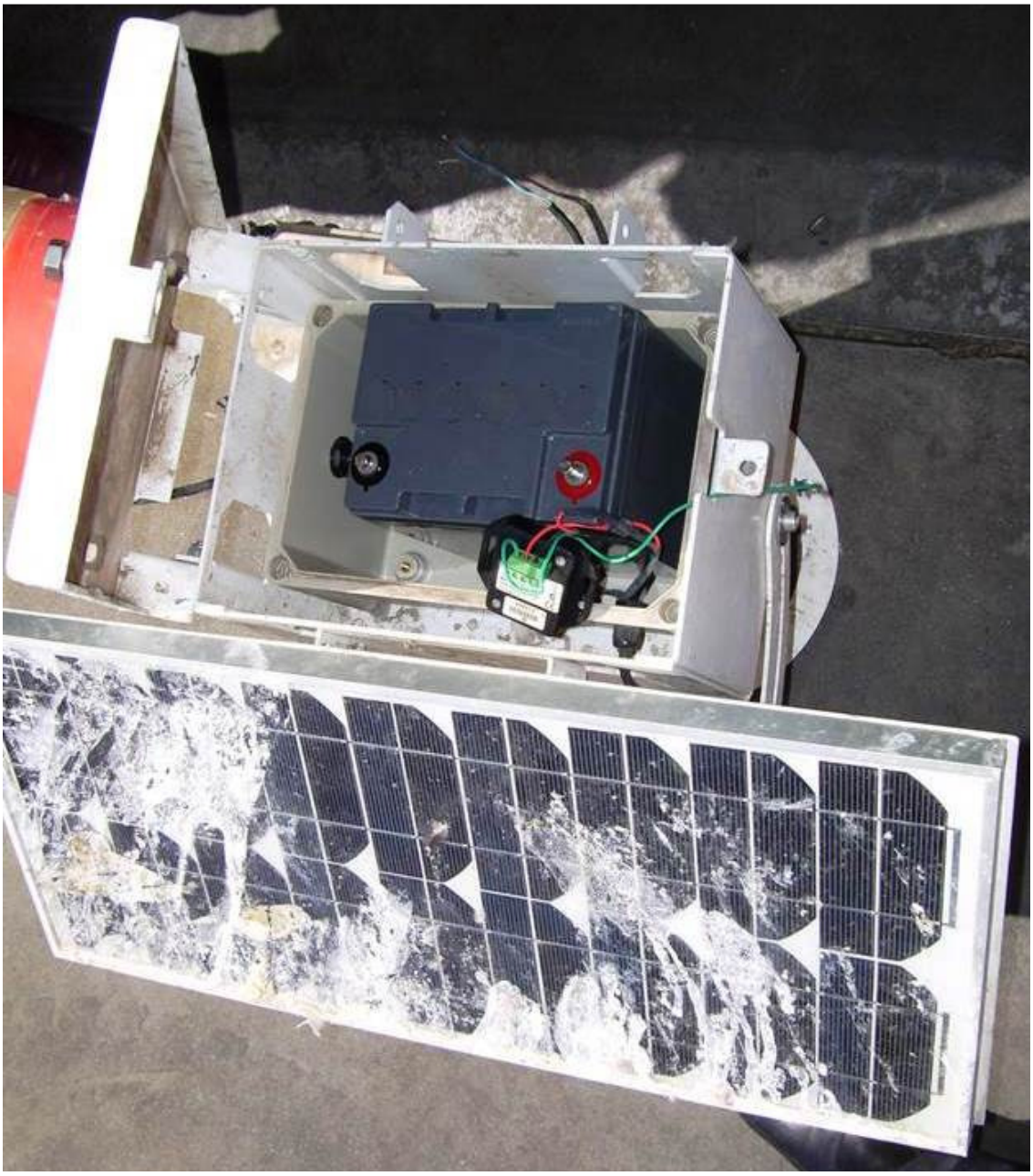
The maximum charging current was 600mA. This reduced progressively as the battery voltage increased to about 14V. The manufacturer advised that a battery voltage of 13.2V was required at dusk to enable the beacon to operate through the night. The expected battery life was between four and five years.

[4] This refers to the IALA (International Association of Marine Aids to Navigation and Lighthouse Authorities) system of buoyage.

2.4.4 № 6 Beacon light assembly

The lighting system of № 6 beacon, including the solar cell and battery, was recovered and transported to the manufacturer (Sealite) for inspection (Figure 5). With the solar cell exposed to sunlight, the battery charged sufficiently for the lantern to operate normally.

Figure 5: Solar cell, charging unit and battery of № 6 beacon at Sealite workshop



Source: Chief Investigator, Transport Safety

There was considerable coverage of the solar cell with bird droppings and markings that indicated that coverage of the cell was probably more extensive prior to the unit's recovery.

The unit was not fitted with a low voltage cut-off that would prevent complete discharge of the battery. Battery manufacturers typically specify a minimum battery voltage of about 10V to avoid a reduction in battery life.

2.5 The local port manager

2.5.1 Role and responsibility

Parks Victoria is a statutory authority created by the *Parks Victoria Act 1998*. Their responsibilities under the *Parks Victoria Act 1998* are to manage the State's parks, reserves, waterways and other public land including a representative system of terrestrial and marine national parks and marine sanctuaries. It is also the Local Port Manager for Port Phillip Bay, Western Port and Port Campbell and the Waterway Manager for the Yarra and Maribyrnong rivers.

Under a service agreement with the Department of Economic Development, Jobs, Transport and Resources (DEDJTR), Parks Victoria are required to manage 710 aids to navigation and 44 piers and jetties in Port Phillip Bay, Western Port and Port Campbell; and carry out approximately 150,000 cubic metres of maintenance dredging, all with an annual operating budget of about $7 million.

2.5.2 Management of West Channel

West Channel was located in the designated port of Port Phillip. The local port manager for this port was Parks Victoria[5].

The management of the West Channel was transferred from the Port of Melbourne Corporation to Parks Victoria in 2006. As part of the transfer arrangements, channel markers, including structures, topmarks and lights, were upgraded to comply with IALA (International Association of Marine Aids to Navigation and Lighthouse Authorities) standards. At the time of the transfer, it was agreed to remove the lights on beacons № 10, 11 and 13. A later review by Parks Victoria in 2012, reinstated the lights with similar characteristics as the existing lights of the West Channel beacons.

2.5.3 Maintenance of West Channel beacons

At the time of the incident Parks Victoria was applying the December 2002 Aids to Navigation Classification issued by the then Marine Board of Victoria. Under that classification, Parks Victoria had designated a performance criteria of 97 per cent for beacons in the West Channel. This equated to rectifying any fault reported to them within 24 hours, weather permitting. If it were not possible to rectify the outage within 24 hours, a Victorian Notice to Mariners would be published

Parks Victoria had also compiled a list of aids to navigation under their management and was drafting *Asset Condition Monitoring Guidelines*. However, categorisation of navigational aids as vital, important or necessary (see 2.5.4) had not been undertaken.

The most recent structural audit of the beacons was conducted by Parks Victoria in August 2012 and a location audit conducted in August 2015. Other inspections and maintenance was conducted on a needs basis when defects were observed during patrols or reported by third parties. Identified defects were recorded and rectified either by the Parks Victoria maintenance team or external contractors.

Inspection of the functionality of beacon lights was not to a planned schedule. There were also no records maintained of the installation dates of battery units, nor of lantern apparatus being checked to ensure design performance of the charging cycle.

[5] Parks Victoria is a government agency of the State of Victoria, responsible for managing national parks, reserves and other land under the control of the State. As part of its portfolio, Parks Victoria also manages selected waterways and local ports.

2.5.4 Standard for aids to navigation

Under the *Marine Safety Act 2010* (the Act), the Director, Transport Safety[6] (the Safety Director) had a function to develop a standard for the provision and maintenance of aids to navigation. Consistent with this function, the *Standard for Aids to Navigation on Victorian State Waters 2012* was issued by the Director Maritime Safety[7] on 29 June 2012. In accordance with the Act, the local port manager was required to comply with this standard. In the case of non-compliance, there was provision for the Safety Director to provide or maintain the aids to navigation in accordance with the standard.

The standard specified the design, construction and maintenance requirements for aids to navigation and associated equipment and required local port managers to conduct a risk assessment of their local port to determine the number and type of aids to navigation to be installed.

Local port managers were further required to categorise the aids to navigation according to their navigational significance, as vital, important or necessary. The standard specified that aids to navigation of vital significance were required to have an availability of 99.8 per cent, important significance 99 per cent, and necessary significance 97 per cent.

With regard to reporting on aids to navigation, the standard required local port managers to:

- maintain a list of all aids to navigation for which they had responsibility, in a format developed by the Safety Director
- complete the IALA-Aids to navigation questionnaire on a yearly basis
- report to the Safety Director on a 6-monthly basis the availability and reliability of aids to navigation in a format agreed with the Safety Director.

2.5.5 Roll-out of GSM equipped beacons[8]

Parks Victoria has been rolling out GSM LED lights across their network in a staged manner. Since June 2007, 75 aids to navigation have been fitted with GSM capability under stages 1 and 2. The West Channel has been earmarked for upgrade in stage 4, at a date yet to be determined.

[6] The functions of the Director, Transport Safety are supported by Transport Safety Victoria (TSV).
[7] Under delegation from the Director, Transport Safety.
[8] GSM – Global System for Mobile communications - when fitted provides a data link from the beacon to enable remote monitoring of key aspects of the operational condition of a beacon.

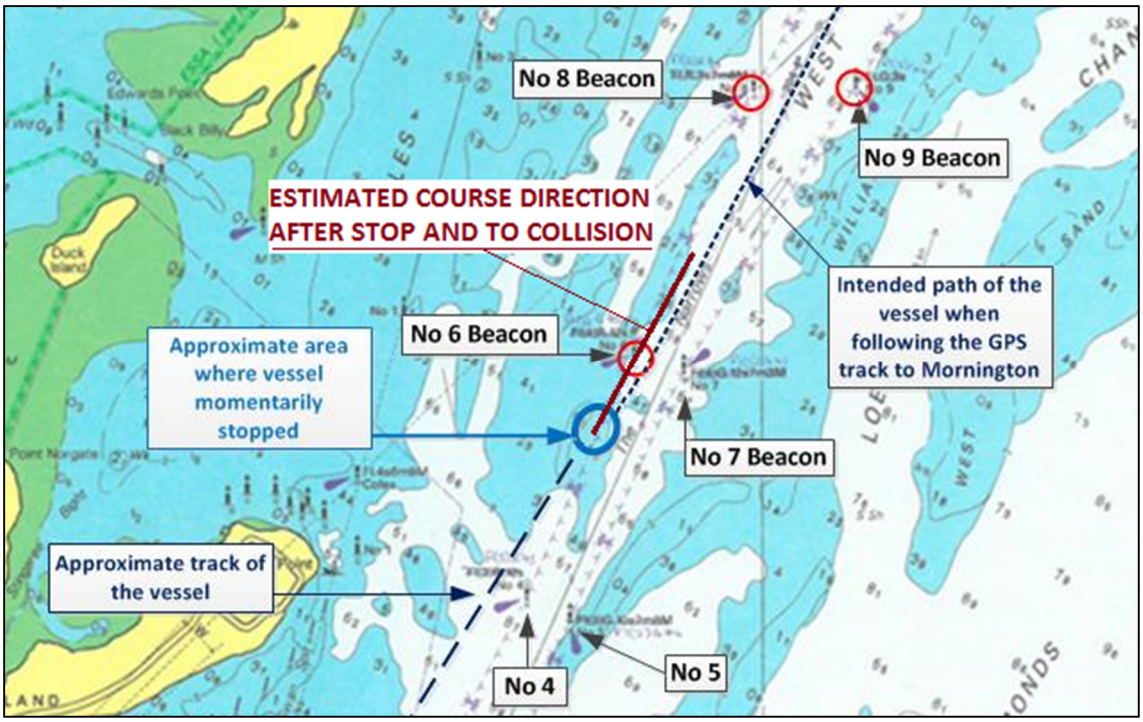
3. SAFETY ANALYSIS

3.1 The incident

After departing Queenscliff, the skipper used the vessel's navigation equipment to follow his normal track towards the West Channel. This course took him to the western edge of the channel between № 4 and № 6 beacons. In normal circumstances he would have continued along a track passing to the east of № 6 beacon. However, in this instance, he stopped to collect seawater before reaching № 6 beacon.

At this point the skipper altered his method of navigation, from equipment-aided navigation to visual. On resuming his voyage, he made a course to pass between the next pair of observed lights on № 8 and № 9 beacons. This course took him on a path to the west of that he would normally take, and he collided with № 6 beacon (Figure 6).

Figure 6: The estimated course of *Who Cares*, leading to the collision with № 6 beacon



Source: Australian Hydrographic Office annotated by Chief Investigator, Transport Safety

3.2 № 6 beacon light outage

The light on № 6 beacon was not functioning at the time *Who Cares* was transiting West Channel. The skipper reported that № 6 beacon light was out and this outage was corroborated by two other vessels.

There was no moon on this night. As a result, the unlit beacon structure would have been difficult to observe. The skipper reported that he did not see the beacon before colliding with it.

3.3 № 7 beacon light outage

The light on № 7 beacon was also not functioning at the time *Who Cares* was transiting West Channel. This outage was reported by two other vessels.

The outage of № 7 beacon light, located on the opposite side of the channel to № 6 beacon, removed a visual cue that could have alerted the skipper to the absence of № 6 beacon light.

3.4 Beacon lighting system performance

The performance of a self-contained battery powered lighting system relies on an effective solar powered battery-charging system. Coverage of the solar cell will reduce its capacity to charge the battery. This can lead to a reduced capacity for a lamp to be lit through the night, and also longer term battery deterioration. Coverage of the solar cell by bird droppings is a common problem for aids to navigation.

Bird droppings had covered a substantial area of the solar cell of № 6 beacon. As no other critical fault was found, it is probable that coverage of the solar cell was the primary cause of degraded lighting system performance and the outage.

The reason for the outage of the № 7 beacon light was less conclusive, although its performance was also probably affected by bird droppings. Following the incident the lighting system could be restarted after cleaning of the solar cell, indicating that cell coverage was probably a factor. Subsequently, after a further outage, signs of corrosion were also identified and the light replaced.

3.5 Detection of outage of beacon lights

The durations of the outages of the lights on № 6 and № 7 beacons are not known.

The beacon lights were not fitted with monitoring devices that would have alerted the local port to their outage. There was also no other system of inspection in place that would have reliably assured a target level of light availability.

Potential enhancements to assuring availability include more frequent inspection and planned maintenance and/or real time monitoring. There are technological solutions that would assist with monitoring.

3.6 Vessel navigation

For the first part of the voyage the skipper of *Who Cares* followed the track of his GPS navigation equipment. However, after stopping to collect water, the voyage was resumed without reference to his normal GPS track and his navigation equipment that showed the locations of the beacons.

Instead, the skipper observed the lights on the port and starboard beacons № 8 and № 9. The skipper made a course to pass between these beacons probably in the belief that they were the next pair of channel beacons marking the channel edges. However, this course was to the west of his normal path, and the vessel collided with № 6 beacon.

3.7 Managing availability of aids to navigation

The 2012 standard[9] for aids to navigation specified obligations on local port managers for the management of their aids to navigation. These requirements included:

- The categorisation of aids to navigation according to their navigational significance.
- The required availability of each navigation aid based on this categorisation.
- Reporting to the State regulator on the reliability and availability of aids to navigation.

Parks Victoria was working to the 2002 standards and did not have systems in place to meet these new requirements.

3.8 Oversight of the management of aids to navigation

The 2012 standard for aids to navigation required local port managers to report to the Director, Transport Safety on a 6-monthly basis the availability and reliability of aids to navigation under their responsibility. The standard also specified that reports were to be in a format agreed by with Director.

The Director, Transport Safety had not agreed a reporting structure with Parks Victoria, and had not proactively addressed the apparent absence of systems to categorise and report on the availability of aids to navigation in the Port of Port Phillip.

[9] Standard for Aids to Navigation on Victorian Sate Waters, Director Maritime Safety, Transport Safety Victoria, 29 June 2012.

4. FINDINGS

The following findings are made with respect to the collision of the recreational vessel *Who Cares* and № 6 beacon in the West Channel, Port Phillip. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

A safety issue is an event or condition that increases safety risk and: (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 operating environment at a specific point in time.

4.1 Contributing factors

- The light on № 6 beacon was not functioning at the time *Who Cares* was transiting West Channel. The beacon was not observed by the vessel's skipper and the vessel collided with the beacon.

- The light on № 7 beacon was also not functioning at the time *Who Cares* was transiting West Channel. This removed a visual cue that could have alerted the skipper to the outage of № 6 beacon light.

- The performance of the lighting systems on № 6 and № 7 beacons was probably affected by coverage of the solar cells by bird droppings. **[Safety Issue]**

- The outage of the lights on № 6 and № 7 beacons was not detected by the local port manager. The monitoring and inspection systems that were in place did not assure a reliable level of beacon light availability. **[Safety Issue]**

- The skipper of *Who Cares* lost awareness of his position relative to the channel beacons. After stopping to collect water, the skipper resumed the voyage without reference to his navigation equipment.

4.2 Other factors that increased risk

- The local port manager did not have a system to manage and report on the availability of aids to navigation in accordance with the specified standard. **[Safety issue]**

- The regulatory agency had not proactively addressed the lack of reporting by the local port manager on the availability of aids to navigation in accordance with the specified standard. **[Safety issue]**

5. SAFETY ISSUES AND ACTIONS

The safety issues identified during this investigation are listed in the Findings and Safety issues and actions sections of this report. The Chief Investigator, Transport Safety expects that all safety issues identified by the investigation should be addressed by the relevant organisation(s). In addressing those issues, the Chief Investigator prefers to encourage relevant organisation(s) to proactively initiate safety action.

Directly involved parties are provided with a draft report and invited to provide submissions. As part of that process, each organisation is asked to communicate what safety actions, if any, they have carried out or are planning to carry out in relation to each safety issue relevant to their organisation.

5.1 Coverage of solar cells

Number:	2015-01-001
Issue owner:	Parks Victoria

Safety issue description

The performance of the lighting systems on № 6 and № 7 beacons was probably affected by coverage of the solar cells by bird droppings.

Proactive action taken by Parks Victoria

Following the incident Parks Victoria installed bird spikes to all solar panels on West Channel to discourage birds from landing on the panels. The solar panels were also cleaned during the installation of the bird spikes.

Chief Investigator, Transport Safety comment in response

This action significantly reduces the issue of bird dropping obscuring the solar cells but does not replace the requirement for inspection and monitoring of the beacon light performance.

5.2 Detection of light outage

Number:	2015-01-002
Issue owner:	Parks Victoria

Safety issue description

The outage of the lights on № 6 and № 7 beacons was not detected by the local port manager. The monitoring and inspection systems that were in place did not assure a reliable level of beacon light availability.

Proactive action taken by Parks Victoria

Parks Victoria have advised that they will continue to improve internal procedures to clearly identify frequency of inspections and will continue to improve the collection of data to proactively manage the aids to navigation network. Parks Victoria is also currently developing data collection applications (enabled via mobiles and iPads) to capture more efficiently asset data.

Following the incident, Parks Victoria commenced a review of aids to navigation under its management, including:

- Inspections to verify the functionality of lit aids to navigation in accordance with hydrographic charts.
- A detailed inspection of navigation assets including cleaning and minor maintenance.
- An update and validation of the aids to navigation database.
- Specification of the performance requirements for aids to navigation.
- The definition of requirements for ongoing monitoring and maintenance.

Chief Investigator, Transport Safety comment in response

Effective implementation of these control measures will reduce the risk of unlit beacons not being detected.

5.3 Reporting on availability

Number:	2015-01-003
Issue owner:	Parks Victoria

Safety issue description

The local port manager did not have a system to manage and report on the availability of aids to navigation in accordance with the specified standard.

Proactive action taken by Parks Victoria

Parks Victoria will work with Transport Safety Victoria to determine the current classification to apply to the Parks Victoria aids to navigation network.

Chief Investigator, Transport Safety comment in response

Effective implementation of these control measures will improve Parks Victoria's system to manage and report on the availability of aids to navigation.

5.4 Oversight of the management of aids to navigation

Number:	2015-01-004
Issue owner:	Transport Safety Victoria

Safety issue description

The regulatory agency had not proactively addressed the lack of reporting by the local port manager on the availability of aids to navigation in accordance with the specified standard.

Proactive action taken by Transport Safety Victoria

TSV will work with Parks Victoria to assist in their development of an appropriate reporting system, and will continue to encourage them to seek appropriate funding through the Boating Safety & Facilities Program and Local Ports Program.

Chief Investigator, Transport Safety comment in response

Effective implementation of these control measures will improve the reporting systems and management of aids to navigation.