Transportation Safety Board of Canada
Bureau de la sécurité des transports du Canada

# MARINE TRANSPORTATION SAFETY INVESTIGATION REPORT M22C0231

**STRIKING OF BERTH**

Passenger ferry *Sam McBride*
Toronto, Ontario
20 August 2022

Canada

## ABOUT THIS INVESTIGATION REPORT

This report is the result of an investigation into a class 2 occurrence. For more information, see the Policy on Occurrence Classification at www.tsb.gc.ca

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

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**Citation**

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## Executive summary

On 20 August 2022, at around 1700 Eastern Daylight Time, the passenger ferry *Sam McBride*, with 6 crew members and approximately 910 passengers on board, struck the dock while berthing at the Jack Layton Ferry Terminal in Toronto, Ontario. Twenty passengers were reported injured. Emergency services responded to the occurrence and 6 of the injured passengers were taken to hospital. The vessel and dock sustained damage. No pollution was reported.

The *Sam McBride* is a double-ended ferry, meaning that it has propellers at both the forward and aft ends. The TSB's analysis of security footage from the occurrence voyage determined that the vessel was travelling at 5 knots when it passed the first mooring dolphin on its way to the dock, while the speed of approach on other transits that day had been approximately 3 knots. The footage also showed that only the aft propeller was turning as the *Sam McBride* approached the dock. The aft propeller alone was not enough to stop the *Sam McBride* from striking the dock, given the vessel's speed and distance from the dock.

Post-occurrence sea trials indicated that both the forward and aft engines and their control systems were in good working order. As well, the engine control modules for the forward and aft engines did not show any fault codes or events for the day of the occurrence. The investigation was unable to determine why the forward engine and propeller did not engage to slow the vessel on the occurrence voyage.

On the day of the occurrence, the *Sam McBride* had made 8 runs, 6 of which were at full capacity, and was behind its published schedule. When many people were waiting for the ferry and it was behind schedule, as in this case, crews on City of Toronto ferries expedited crossings to address passenger backlog by transiting faster and/or reducing the time it took to dock by approaching at higher speeds and slowing down at a faster rate. The City of Toronto did not have written procedures that defined a safe speed of approach during docking, which meant that decisions around docking speed were at the discretion of

masters and might be influenced by operational pressure. The City of Toronto has since put in place documented procedures for docking.

The TSB investigation into this occurrence found safety deficiencies related to passenger safety management that were also present during the TSB's investigation of the passenger vessel *Island Queen III* in 2017.[1] As a result, the Board issued 3 recommendations related to passenger safety management.

**Crew training**

The need for crew members to respond quickly and effectively to an emergency on a passenger vessel is the same for all vessels and voyages. When faced with an emergency, crew members need to have knowledge and skills related to crowd management and human behaviour in emergencies.

While the *Marine Personnel Regulations* require that crew members of passenger vessels greater than 500 gross tonnage (GT) on unlimited, near coastal Class 1, or near coastal Class 2 voyages have a Specialized Passenger Safety Management certificate or endorsement, there is no such requirement for crew members of vessels on sheltered waters voyages or those on vessels of 500 GT or less. The Specialized Passenger Safety Management certificate provides training on crowd management, crisis management and human behaviour in emergencies, passenger safety, and safety for personnel providing direct services to passengers. It also provides familiarization training.

While passenger vessels that are on sheltered waters voyages are closer to shore and shore-based emergency responders than vessels on other types of voyages, there are a number of types of emergencies that need an immediate response that cannot await the arrival of shore-based responders.

Currently in Canada, there are only 46 passenger vessels greater than 500 GT, while there are 5025 passenger vessels of 500 GT or less.[2] The maximum complement of a passenger vessel depends on more factors than just its gross tonnage, which means that passenger vessels of 500 GT or less may be carrying more passengers than those greater than 500 GT. Requiring training for only vessels greater than 500 GT leaves out the majority of passenger vessels.

The *Sam McBride* is less than 500 GT and was on a sheltered waters voyage. None of the crew members had received such training, nor were they required to. Following an occurrence on board the passenger vessel *Island Queen III* in 2017, the TSB issued a safety concern about the lack of a requirement for training in passenger safety management for crew members on all vessels carrying more than 12 passengers on sheltered water voyages. However, Transport Canada (TC) has yet to implement passenger management training

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1 TSB Marine Transportation Safety Investigation M17C0179.

2 The numbers for passenger vessels were obtained from a query of the Transport Canada Vessel Registry on 17 May 2024 using the vessel type "Passengers." Vessels may have safe manning documents to operate on different classes of voyage, so it is difficult to assign an accurate number of vessels to each class of voyage.

requirements to fully address this concern. If all passenger vessel crew members are not trained in passenger safety management, there is a risk that they will not be prepared to manage passengers in emergency situations.

For this reason, the Board recommends that

> the Department of Transport implement a requirement for crew members of all passenger vessels, including those on sheltered waters voyages, to complete appropriate training in passenger safety management.
>
> **TSB Recommendation M24-01**

### Passenger vessel evacuation procedures

The *Life Saving Equipment Regulations* require all passenger vessels to have an evacuation procedure that dictates how all passengers and crew members will be evacuated from the vessel within 30 minutes of the abandon ship signal being given. Although this regulatory requirement is in place, TC has no formal procedure to assess if this requirement is being met. Operators who develop evacuation procedures have no approval process to confirm their procedure meets the requirement or to obtain approval from the regulator. Presently, each TC inspector or recognized organization surveyor is left to individually determine how this requirement is assessed; the requirement is most frequently assessed by the inspector or surveyor witnessing a drill on board the vessel.

For vessels, emergency drills are an opportunity to validate the evacuation procedures; the *Fire and Boat Drills Regulations* require that the master of a vessel ensure that drills are carried out as if they were a real emergency, in so far as is feasible. For a passenger vessel, realistic drills require a large number of people acting as passengers, as indicated in TC's Ship Safety Bulletin 04/2022. However, due to the logistical challenges of finding and managing a large number of volunteers, "in so far as is feasible" often means that drills are conducted without passenger involvement, which means the drill cannot evaluate the crew's ability to evacuate passengers from the vessel.

As is the case for many other vessels, drills on the *Sam McBride* were typically carried out without passengers on board, which meant that they did not provide an opportunity to realistically validate the feasibility of the vessel's evacuation procedure. The investigation determined that the evacuation procedures for *Sam McBride* were not sufficient to support the evacuation of a large number of passengers, as they required crew members to be in multiple places simultaneously, assist an unreasonably large number of passengers, potentially complete multiple tasks at once, and move quickly within the vessel even if it was crowded. If passenger evacuation procedures are not validated through a realistic exercise with a representative number of participants, a vessel's crew will be insufficiently prepared for an emergency and passengers will be at an elevated risk of injury or death.

The issues found in the *Sam McBride*'s evacuation procedure are the latest example pointing to a need for TC to validate passenger vessels' evacuation procedures. In 2020, following the occurrence on board the passenger vessel *Island Queen III*, the Board issued a safety

concern regarding the risk to passengers if evacuation procedures are not validated. More than 4 years later, the safety deficiency still exists and the risk to passengers remains high. Therefore, the Board recommends that

> the Department of Transport implement a formal validation and approval process for passenger vessel evacuation procedures.
>
> **TSB Recommendation M24-02**

**Passenger counting**

In any emergency, it is essential to have an accurate count of passengers. Without an accurate count, a crew and emergency responders will be unable to determine if all passengers have been accounted for. To this end, the *Fire and Boat Drills Regulations* require that, before a passenger vessel sails, the master be provided with the number of persons on board and with details of persons who have declared a need for special care or assistance during an emergency. On voyages of 12 hours or more, there is also a requirement to keep a separate count of the number of children and infants; however, there is no such requirement for voyages of less than 12 hours.

When passengers were boarding the *Sam McBride* or other Toronto Island Park ferries, the number of passengers was estimated (counted in groups of 5 to 10) by a member of the crew and tracked using a hand-held tally counter. However, this method did not give the exact number of passengers boarding and meant that, in the event of an emergency, it would not be possible to account for all passengers. As well, the Toronto Island Park ferries did not keep a separate count of children and infants on board, nor were they required to. However, this meant that there was no way to determine whether there was an adequate number of lifejackets available in the appropriate sizes for the passengers on board.

Although TSB Recommendation M08-01 addressing passenger counting procedures on board ferries was closed as Fully Satisfactory in July 2010, 4 subsequent investigations[3] have shown that the provisions in the *Fire and Boat Drills Regulations* requiring an accurate count of passengers are not being consistently met. If there is no accurate method to count the passengers boarding a vessel, there is a risk that not all passengers will be accounted for in an emergency. Furthermore, if there is no method to identify passengers that require special care or additional assistance during an emergency and there are no provisions in place to provide this additional assistance, the safety of these passengers may be compromised.

Therefore, the Board recommends that

> the Department of Transport implement a process to validate that passenger vessels are keeping an accurate count of all passengers, including a separate count of the number of children and infants, on all voyages.
>
> **TSB Recommendation M24-03**

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[3] TSB marine transportation safety investigations M22A0312, M17C0179, M15A0009, and M13L0067.

# MARINE TRANSPORTATION SAFETY INVESTIGATION REPORT M22C0231

**STRIKING OF BERTH**

Passenger ferry *Sam McBride*
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## 1.0 FACTUAL INFORMATION

### 1.1 Particulars of the vessel

**Table 1. Particulars of the vessel**

| | |
|---|---|
| Name | *Sam McBride* |
| Official number | 171709 |
| Port of registry | Toronto |
| Flag | Canada |
| Type | Passenger (double-ended) |
| Gross tonnage | 387 |
| Length overall | 38.7 m |
| Registered length | 36.9 m |
| Depth | 3.36 m |
| Built | 1939 |
| Propulsion | 2 geared diesel engines, providing 958 hp |
| Maximum complement | 921 (maximum 915 passengers, minimum 6 crew members) |
| Owner and authorized representative | City of Toronto |
| Recognized organization | Lloyd's Register |

### 1.2 Description of the vessel

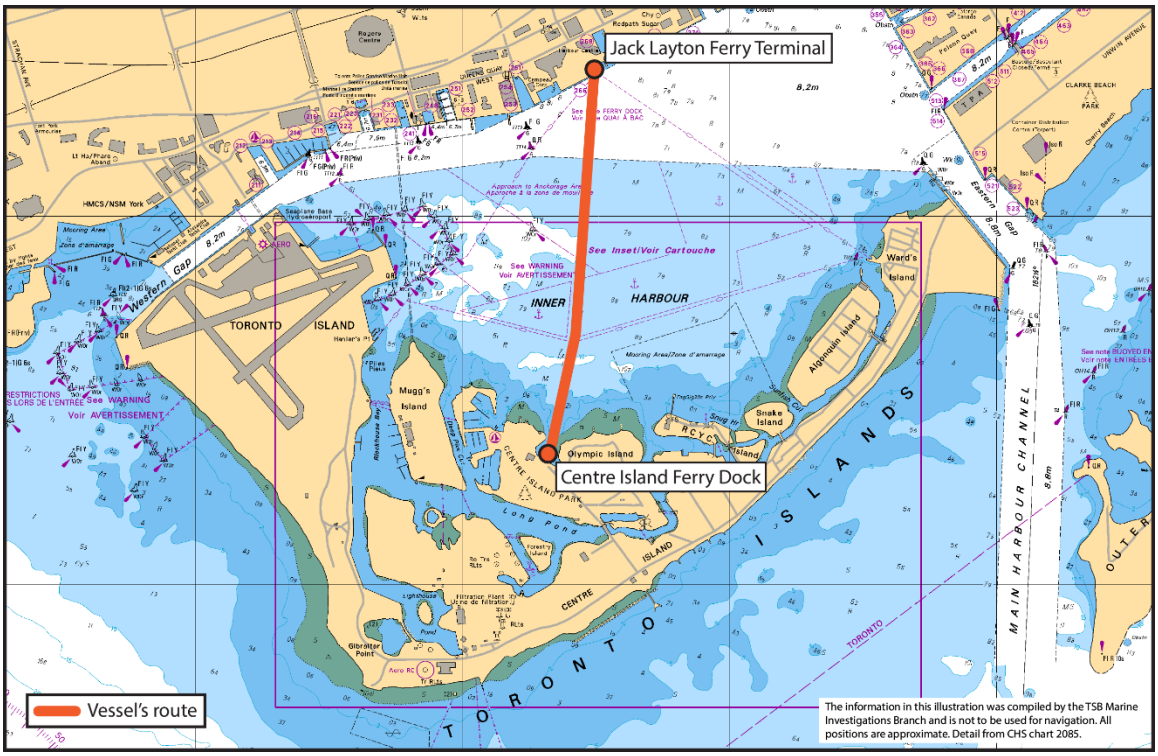
The *Sam McBride* (Figure 1) is a double-ended passenger ferry that operates between Toronto, Ontario, and Toronto Island Park (Figure 2). It has boarding ramps at each end that lead onto the main deck; the ramp areas are separated from the main deck passenger area by gates. The vessel typically operates with the same end facing toward Toronto; this

end is referred to as the forward end in this report. The end of the vessel facing Toronto Island Park is referred to as the aft end.[4]

**Figure 1. The *Sam McBride* berthed at the Jack Layton Ferry Terminal in Toronto, Ontario (Source: TSB)**

[4] Throughout this report, "bow" and "stern" are used relative to the direction of travel; bow refers to the end of the ferry moving ahead, and stern refers to the opposite end where the propeller is in motion. "Forward" and "aft" are used to refer to the vessel itself.

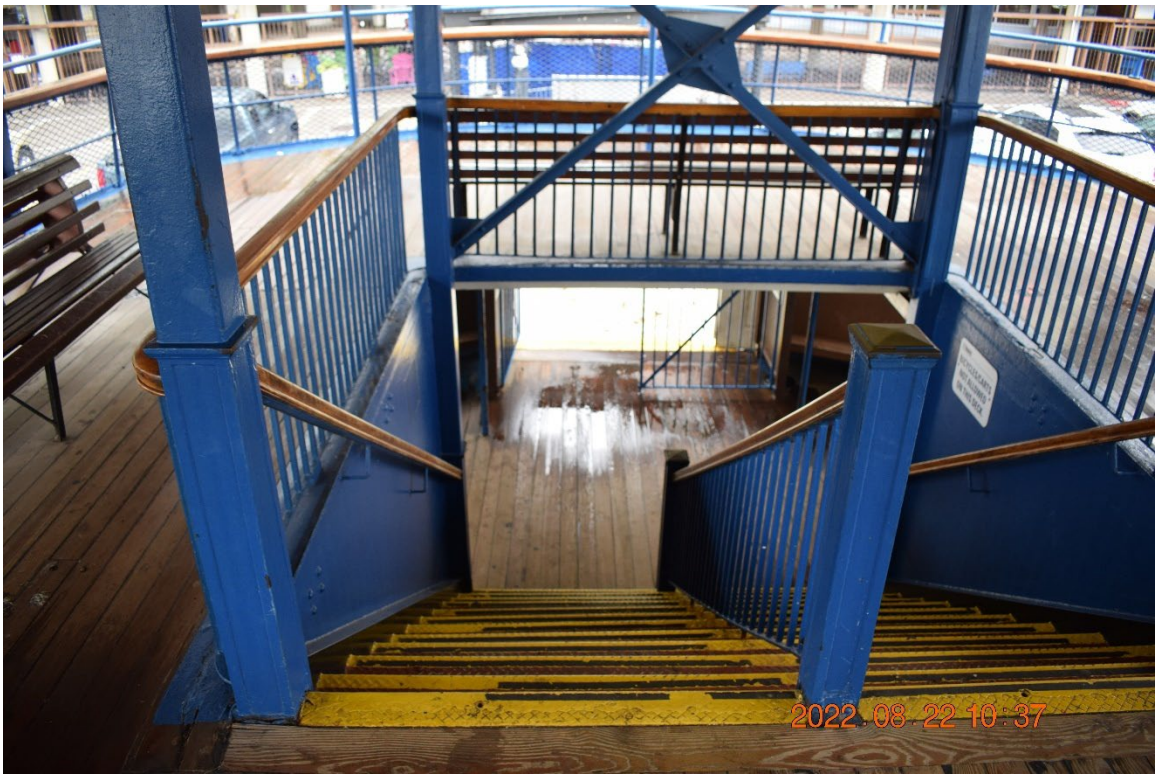
**Figure 2. Area of occurrence (Source: Canadian Hydrographic Services chart 2085, with TSB annotations)**




The vessel has 3 decks: the main deck, promenade deck, and bridge deck. Most of the main deck houses a passenger space that is enclosed with windows. There are sliding doors separating the passenger space from the boarding ramp areas; at the time of the occurrence, there was no means to secure the sliding door in the open position. The promenade deck is mainly open to the air and enclosed by a railing.

Stairways at each end of the vessel provide access to the promenade deck from the main deck (Figure 3). There is also an enclosed area along the centreline of the vessel containing the engine stack, public washrooms, and stairs for the crew to access the bridge deck.

**Figure 3. Stairs descending from the promenade deck to the main deck (Source: TSB)**




The bridge deck is accessible only by crew and has a wheelhouse at each end. Each wheelhouse is equipped with a GPS (global positioning system) receiver, a radar, an automatic identification system display unit, an echo sounder, 2 very high frequency (VHF) radiotelephones, a public address system, a video surveillance system that monitors the passenger areas and boarding ramps, engine controls for the propellers, and the steering control.

The hull below the main deck is divided into 8 compartments, including 2 engine rooms (Appendix A). The compartments are separated by vertical watertight bulkheads.

The vessel is equipped with 7 inflatable life rafts located on the bridge deck: six 150-person life rafts and one 75-person life raft. It also has a rescue boat located on the bridge deck. In a post-occurrence examination of the vessel, the TSB found that lighting required to illuminate the life raft launching station had not been installed.. As per the Record of Safety Equipment, the vessel carries 987 adult lifejackets and 183 child lifejackets.[5]

### 1.2.1 Propulsion system

In 2011, the *Sam McBride*'s engines were replaced by 2 Caterpillar C18 diesel engines, each rated at 479 brake horsepower. One engine is in the forward engine room and the other is in the aft engine room. Each engine is coupled to its own propeller shaft through a Twin Disk MGX-5114DC transmission. The propeller shaft connects to a fixed-pitch propeller at

5 Adult lifejackets are for people over 40 kg, and child lifejackets are for people between 15 kg and 40 kg.

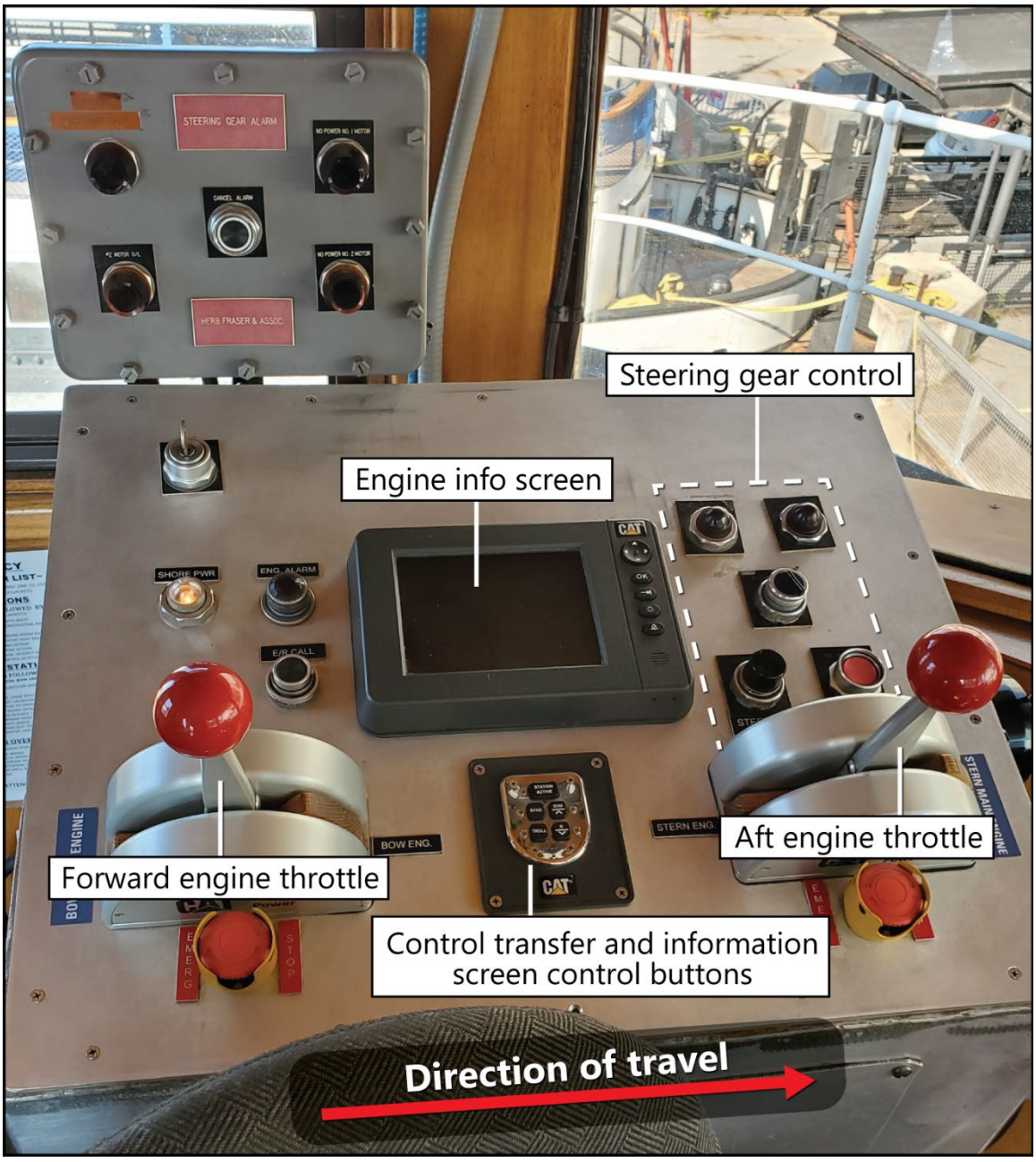
each end of the vessel, and the transmission allows the propellers to operate in both forward and reverse. Either or both engines can be used to propel the vessel.

Controls for the engines are located in 3 places on the vessel: the forward and aft wheelhouses and the aft engine room. Each control console (Figure 4) contains

- control transfer buttons (to transfer control to each particular console);
- an engine information screen showing engine speed (in revolutions per minute), temperature, and pressure; and
- throttles for the forward and aft engines.

The controls are located to the left of the steering position.

**Figure 4. Engine control console in the forward wheelhouse, on the port side of the steering position (Source: TSB)**




The ferry typically transits using the stern propeller, but both propellers are generally used when docking the vessel.

## 1.3 Ferry operations

The City of Toronto owns and operates 5 ferries. Four of the ferries regularly service routes between the Jack Layton Ferry Terminal in downtown Toronto (Figure 5) and 3 destinations within Toronto Island Park, namely Centre Island, Hanlan's Point, and Ward's Island. The 5th ferry, the *Trillium*, is a paddlewheel steamer that operates as weather conditions and staffing allow. The ferries are operated by the Marine Operations team of the

Waterfront District group within the Parks branch of the City's Parks, Forestry and Recreation department.

**Figure 5. Toronto ferries docked at the Jack Layton Ferry Terminal (Source: TSB)**

The department's role is to "contribute to the city's social and environmental resilience by ensuring that [Toronto's] parks, playing fields, recreation centres, ice rinks and pools, along with tree-lined streets, trails, forests, meadows, marshes, and ravines, are beautiful, safe and accessible, that they expand and adapt to meet the needs of a growing city, and are filled with vibrant, active, and engaged communities."[6] Accordingly, the Marine Operations team's role is to ensure access to Toronto Island for visitors to Toronto Island Park as well as residents of the Toronto Islands.

The Toronto Island Park ferry service is the only non-emergency marine operation of the City of Toronto, and thus, except for capital acquisition projects, is a self-contained marine organization within the broader municipal management infrastructure. Toronto Police and Toronto Fire Services conduct emergency marine operations, and they are each based in the same area as the Jack Layton Ferry Terminal.

The Jack Layton Ferry Terminal operates with a team of shore-side staff, including a marine supervisor, a marine coordinator, a chief engineer, and security and administration staff. At the time of the occurrence, the marine coordinator held a Master, Limited for a Vessel 60 GT or more certificate and the chief engineer held a First-class Engineer, Motor Ship certificate.

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6 City of Toronto, Parks, Forestry, and Recreation, at https://www.toronto.ca/city-government/accountability-operations-customer-service/city-administration/staff-directory-divisions-and-customer-service/parks-forestry-recreation/ (last accessed -09 July 2024).

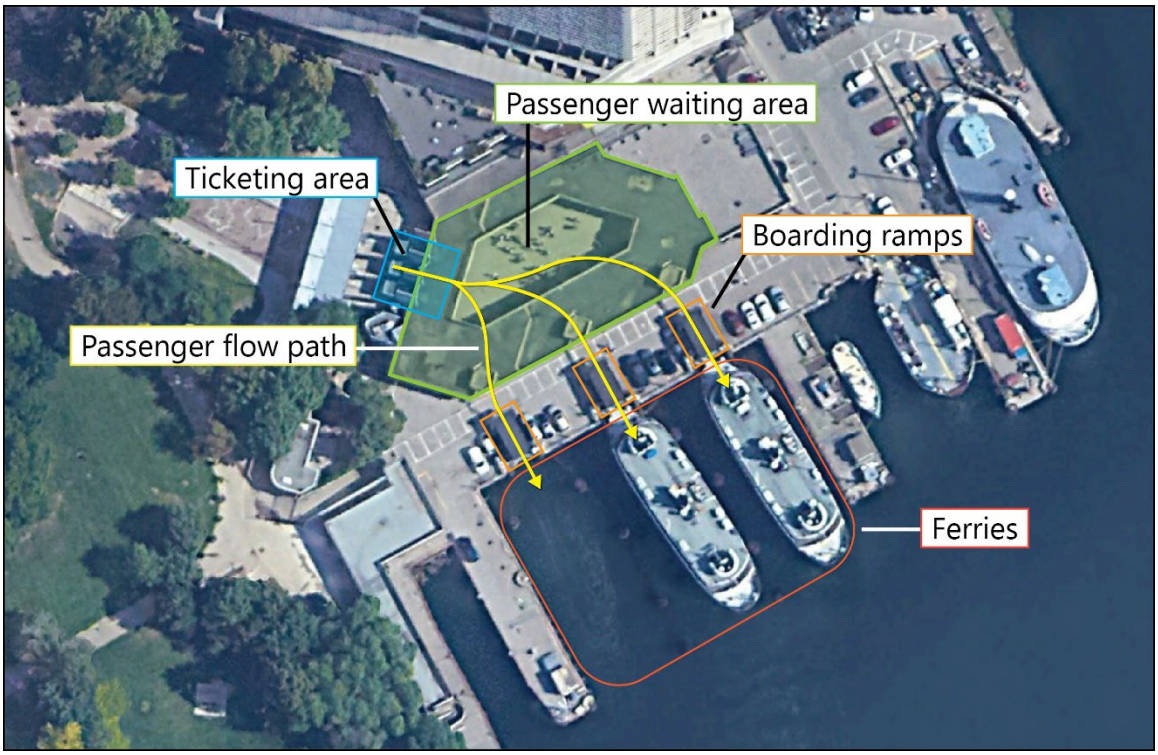
The Marine Operations team is responsible for the establishment of operating and safety procedures, and their approach is to grant the masters wide-ranging authority for the navigation and operation of the ferries. Limited guidance is given through written procedures.

The ferries operate year-round in sheltered waters within the Toronto Inner Harbour and voyages are approximately 1 nautical mile, with a transit time of about 10 minutes. The busiest season is in the summer, particularly on weekends. The ferries also transport children to Toronto Island Park for camp programs that run during July and August. The children are aged from 6 to 12 and travel to and from the park as a group, supervised by camp counsellors. The TSB observed 2 passages on 23 August 2022, 3 days after the occurrence; on these crossings the ferries were operating at capacity and approximately half of the passengers were children.

Passengers purchase tickets either online or at the ferry terminal. Once past the ticket booth, they enter a holding area, where there are gates for each of the destinations within the park (Figure 6). On busy days, the passenger holding area can fill with passengers; this area is visible to a ferry's crew while it is docking, making the crew aware of the backlog of passengers to be carried. While passenger demand for the Toronto Island Park ferries has been increasing with the growth in residential buildings in downtown Toronto, the capacity of the ferries and terminal has remained the same; this has resulted in complaints from the public about the time it can take to access the ferry.[7]

[7] The City of Toronto has announced a replacement strategy for its ferries; the proposed design would carry up to 1,300 passengers per trip. Source: City of Toronto, Ferry Fleet Replacement, at https://www.toronto.ca/city-government/planning-development/construction-new-facilities/park-facility-projects/ferry-fleet-replacement/ (last accessed 02 July 2024).

**Figure 6. Arrangement of the Jack Layton Ferry Terminal (Source: Google Earth with TSB annotations)**




When a ferry arrives at the terminal, passengers disembark and depart the dock area before the terminal gate is opened to allow new passengers in the holding area to board via the boarding ramps (Figure 7). While passengers are boarding, the mate estimates the number of passengers boarding by counting in groups of 5 to 10 and uses a handheld tally counter to keep track of the estimate.

**Figure 7. Passengers at the Jack Layton Ferry Terminal boarding a ferry for Centre Island (Source: TSB)**

Once the maximum passenger count is estimated to be reached, the mate signals to a security guard to close the terminal gate. The deckhands raise the boarding ramp and cast off the lines for the vessel to depart.

During the brief transit, the deckhands move through the passenger decks to the other side of the vessel to prepare for its arrival. During the approach, the master initially begins slowing the vessel by reducing throttle, moving to reverse throttle, and moving to neutral. These operations are done with the stern propeller. Once the vessel passes the first mooring dolphin,[8] at a speed of approximately 3 knots, both propellers are used to slow the vessel. Once the vessel has reached the dock, the deckhands tie the vessel off and then lower the boarding ramp to allow the passengers to disembark and new passengers to board.

TSB investigators made several crossings on board one of the ferries between Toronto and Centre Island. On each crossing, passengers began to gather in the boarding ramp area as the ferry neared the terminal. On crossings with a large number of passengers, there was insufficient space for everyone to gather in this area, and passengers on the promenade deck gathered on or near the top of the stairs.

8 Mooring dolphins are groups of pilings installed in the harbour and are used to help guide the vessel into the berth.

## 1.4 Ferry scheduling and service delivery

The published summer schedule for the Centre Island ferries has a departure from either the Jack Layton Ferry Terminal or the Centre Islands dock every 15 minutes. In practice, on busy days, crew are instructed to forego the schedule and depart the dock as soon as the ferry is full in order to accommodate as many passengers as possible. To try to keep up with passenger volume, the ferries could transit faster and/or reduce the time it took to dock by approaching at higher speeds and slowing down at a faster rate. The crew can estimate the backlog of passengers to be carried as the passengers wait in a fenced area of the terminal visible from the ferries as they dock.

On the day of the occurrence, each crossing took approximately 20 minutes, including the loading and unloading of passengers; as such, the *Sam McBride* was running behind the published schedule and there was a significant number of passengers waiting.

## 1.5 History of the voyage

On 20 August 2022, at around 1645,[9] passengers boarded the *Sam McBride* to travel from Centre Island to Toronto. The vessel, 1 of 2 servicing the route, was making its 8th run of the day and was at full capacity. The rest of the runs that day had also been at full capacity, with the exception of the first 2 runs in the morning. When the estimated number of passengers reached 910, the mate signalled to a security guard to close the terminal gate, then joined the master in the stern wheelhouse. After passengers boarded, the deckhands raised the boarding ramp at the stern of the vessel and cast off the lines. The master then engaged the aft engine to depart the island around 1650, and the vessel began the trip toward Toronto, at a cruising speed of approximately 8.5 knots.

At 1702, the master reduced the throttle to begin approaching the dock. Over the next 2 minutes, the master reduced the throttle to neutral, reversed the throttle, and moved the throttle back to neutral. The crew noted that the forward engine was not responding normally. At this time, the vessel reached the first mooring dolphin, approximately 40 m from the dock, at a speed of approximately 5 knots. As the vessel approached the dock, passengers had begun moving toward the exit; some passengers were standing on or at the top of the forward stairs to the main deck.

Approximately 15 seconds after the vessel passed the mooring dolphin, it struck the dock. The force of the vessel striking the dock caused many passengers to lose their footing and fall to the deck or down the stairs. Some passengers sustained injuries from the fall.

After the striking, the vessel rebounded from the dock. Deckhands and the mate began attending to injured passengers. The impact had damaged the shore-side mooring ramp that connects with the vessel's ramp to load and unload passengers. To allow passengers to disembark, the vessel manoeuvred to the adjacent dock using forward and aft propellers.

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9 All times are Eastern Daylight Time (Coordinated Universal Time minus 4 hours).

Once the vessel was at the dock, the crew secured the vessel and began disembarking passengers. Shortly after the vessel was secured, first responders arrived on the scene, and 6 passengers were taken to hospital.

Following the occurrence, the TSB reviewed security camera footage of the voyage from both the vessel and shore. The video showed propeller wash around the aft end of the vessel, indicating that the aft propeller was operating. Propeller wash was not evident around the forward end of the vessel until after the vessel had struck the dock.

## 1.6 Injuries

Approximately 20 passengers were injured when the vessel struck the dock. Most of those injured were standing on the stairs or at the top of the stairs. They were injured by falling on the stairs or by colliding with other passengers above or below them. Some were standing on deck and were injured by falling to the deck.

## 1.7 Damage to the vessel and dock

The *Sam McBride* sustained minor deformations to the forward end.

The ramp at the terminal dock and the concrete that surrounds the ramp were also damaged. The dock was closed until the required repairs were completed in April 2023.

## 1.8 Environmental conditions

At the time of the occurrence, the sky was clear, visibility was good, and the wind and water were calm.

## 1.9 Personnel certification and experience

The master of the vessel held a Master, Limited for a Vessel of 60 Gross Tonnage or more certificate of competency. The master had been working on the Toronto Island Park ferries since 1991 and had been master since 2008.

The mate held a Chief Mate, limited for a vessel of 150 Gross Tonnage or more certificate of competency and had been working on the Toronto Island Park ferries for approximately 6 months.

The engineer held a First-Class Engineer, Motor Ship certificate of competency and had worked as an engineer on the Toronto Island Park ferries since 2014.

All of the remaining crew members on the *Sam McBride* held the required certificates for their positions on board. The vessel's safe manning document (SMD) required the vessel to carry 1 master, 1 chief mate, 1 engineer, and 3 ratings, which was the crew complement on board at the time of the occurrence.[10]

[10] In this occurrence, the 3 ratings worked on board as deckhands.

There was no indication that fatigue or other physiological factors played a role in this occurrence.

## 1.10 Vessel certification

At the time of the occurrence, the *Sam McBride* was certified and equipped in accordance with existing regulations. The vessel held a valid Transport Canada (TC) inspection certificate for a non-Convention passenger vessel greater than 15 gross tonnage or carrying more than 12 passengers and was limited to operating in sheltered waters. The certificate, which was valid for 1 year, permitted a maximum complement of 921 persons. The vessel was enrolled in TC's Delegated Statutory Inspection Program with Lloyd's Register as the recognized organization and was last inspected on 21 June 2022.

## 1.11 Post-occurrence engine trials

Following the occurrence, the City of Toronto conducted sea trials of the *Sam McBride* under the supervision of a representative for the engine manufacturer to verify whether the forward engine would respond in various scenarios, aiming to recreate the situation leading up to the occurrence. TSB investigators observed the sea trials and noted that, during all trials, both the forward and aft engines responded as expected.

The representative for the engine manufacturer also downloaded the engine control modules for the forward and aft engines to retrieve any fault codes or events, but none were recorded for the day of the occurrence. It was noted that on 18 June, there were fault codes logged for the throttles at the port and starboard control stations.

## 1.12 Safety management systems

A safety management system (SMS) is an internationally recognized framework that allows companies to identify hazards, manage risks, and make operations safer—ideally before an accident occurs. An SMS uses a documented, systematic approach and provides individuals at all levels of a company with the tools they need to make sound decisions in routine and emergency operations. The policies, procedures, practices, training, and culture of a company are the outputs of an SMS.

Risk management within an SMS is an ongoing cycle that helps companies and vessel operators identify, assess, mitigate, and follow up on existing and potential risks to vessels, personnel, and the environment. To be effective, an SMS must be specific to each vessel and related to its operations on board.[11,12]

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11 C. Kuo, *Safety Management and Its Maritime Application* (The Nautical Institute, 2007), p. 93.

12 International Safety Management Code (ISM Code), Part A, Section (7) Shipboard Operations states that "[t]he company should establish procedures, plans and instructions, including checklists as appropriate, for key shipboard operations concerning the safety of the personnel, ship and protection of the environment. The various tasks should be defined and assigned to qualified personnel."

At the time of the occurrence, the *Sam McBride* did not require an SMS under existing regulations but will require one under the new *Marine Safety Management System Regulations,* published in July 2024. The City of Toronto's ferry-related procedures document listed required training as well as the duties of masters, mates, deckhands, and engineers. The document also included a wide range of procedures, including the following:

- Start-up and shutdown
- Maintenance of the vessel and equipment
- Loading and unloading of passengers
- Emergency drills
- Maritime security duties
- Vessel familiarization, including equipment, personal protective equipment, and emergency drills
- Occupational health and safety

Under Toronto Ferries program policy, the operation of the vessels was considered to be the responsibility of individual masters. Guidance related to speed, dock approach, and departure was not documented in the procedures, and operational decisions were left to the discretion of each master. As such, the Toronto Ferries program had not carried out a risk assessment on specific aspects of vessel operation such as approach procedures and safe docking speed.

## 1.13 Authorized representative responsibilities

The *Canada Shipping Act, 2001* (CSA 2001) and its regulations set out certain responsibilities for owners and operators of commercial vessels. Under the CSA 2001, the vessel must have a person, known as the authorized representative (AR), who is responsible for all vessel-related matters that are not assigned to another person.[13] Among other things, the AR is required to

- ensure that each member of the complement, before being assigned any duty, is familiar with the shipboard equipment and their duties, including duties vital to safety;[14]
- ensure that the vessel and its machinery and equipment meet the requirements of the regulations;
- ensure that the crew and passengers receive safety training; and

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13 Unless the vessel is under a bare-boat charter or there is an arrangement with a qualified person, the AR is the owner of the vessel. (Source: Government of Canada, *Canada Shipping Act, 2001* [S.C. 2001, c. 26] [as amended 30 July 2019], subsection 14(2))

14 Transport Canada, SOR/2007-115, *Marine Personnel Regulations* (as amended 23 June 2021), Part 2, section 206.

- develop procedures both for the safe operation of the vessel and for dealing with emergencies.[15]

For passenger ships, procedures for dealing with emergencies must include a procedure for safe evacuation of the complement within 30 minutes of the abandon-ship signal.[16] In 2022, TC issued a Ship Safety Bulletin (04-2022)[17] providing additional guidance on this requirement and how to evaluate it.

The Toronto Ferries program had developed documents describing the safety procedures to be followed in case of an emergency on board its vessels. Procedures for emergencies such as persons in the water (man overboard), collisions, and fires, were prepared and available to the crew. The procedures were in the form of checklists, each approximately 1 page in length. The fire on board procedure included a step for the officer in charge to instruct the deckhands to assist passengers with donning lifejackets, but it did not include steps for how to evacuate the vessel. The evacuation procedure was kept separately from the emergency procedures, and it was formatted differently. The fire on board procedure and the evacuation procedure are provided in Appendix B for comparison purposes.

## 1.14 Passenger safety management

In case of an emergency on board a passenger vessel, crew and passengers need to be appropriately equipped and informed. Crew members need training as well as documented emergency procedures that are practised regularly through drills to ensure that they can respond effectively to emergencies. Passengers, who are unlikely to be familiar with the vessel and its equipment, need instructions on where to muster in the event of an emergency, where to access lifesaving equipment, and how to use that lifesaving equipment. In an emergency, untrained passengers may act in seemingly irrational ways, misunderstand instructions, or not follow them correctly, adding to the crew's workload. The vessel's AR is responsible for ensuring that both the crew and the passengers receive safety training.[18]

Following the sinking of the passenger ferry *Queen of the North*,[19] the TSB issued 3 recommendations, 2 of which (recommendations M08-01 and M08-02) were closed as

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15 Government of Canada, *Canada Shipping Act, 2001* (S.C. 2001, c. 26) (as amended 30 July 2019), subsection 106(1).

16 Transport Canada, C.R.C., c. 1436, *Life Saving Equipment Regulations* (as amended 06 October 2020), section 111.

17 Transport Canada, Ship Safety Bulletin 04/2020: Requirements for passenger evacuation and safety (08 February, 2022), at https://tc.canada.ca/en/marine-transportation/marine-safety/ship-safety-bulletins/requirements-passenger-evacuation-safety-ssb-no-04-2022 (last accessed on 11 July 2024).

18 Government of Canada, *Canada Shipping Act, 2001* (S.C. 2001, c. 26) (as amended 13 December 2018), paragraph 106(1)(c).

19 TSB Marine Transportation Safety Investigation M06W0052.

Fully Satisfactory following the publication of amendments to the *Fire and Boat Drills Regulations*. In the 1st closed recommendation, the Board recommended that

> the Department of Transport, in conjunction with the Canadian Ferry Operators Association and the Canadian Coast Guard, develop, through a risk-based approach, a framework that ferry operators can use to develop effective passenger accounting for each vessel and route.
>
> **TSB Recommendation M08-01**

In the 2nd closed recommendation, the Board recommended that

> the Department of Transport establish criteria, including the requirement for realistic exercises, against which operators of passenger vessels can evaluate the preparedness of their crews to effectively manage passengers during an emergency.
>
> **TSB Recommendation M08-02**

The requirements implemented by TC in response to Recommendation M08-02 mandated that crew on passenger vessels have a Specialized Passenger Safety Management certificate or endorsement when the vessel is on unlimited, near coastal Class 1, or near coastal Class 2 voyages.

Following an occurrence on board the passenger vessel *Island Queen III*,[20] the TSB issued a safety concern about the lack of a requirement for training in passenger safety management for crew members on vessels carrying more than 12 passengers on sheltered waters voyages. There are still no requirements for the crew of these vessels to receive training in passenger safety management; at the time of this occurrence none of the crew members of the *Sam McBride* had received such training, nor were they required to.

The *Island Queen III* report also included a safety concern about the lack of formal validation and approval for passenger evacuation procedures.

### 1.14.1 Passenger count

The *Fire and Boat Drills Regulations* require that, before a passenger vessel sails, the master is to be provided with the number of persons on board and with details of persons who have declared a need for special care or assistance during an emergency. An accurate count of all persons on board (passengers and crew members) will assist the master and crew in ensuring everyone on board is accounted for when responding to an incident and will also assist outside agencies in their response, if required.

On voyages of less than 12 hours, there is no requirement under the *Fire and Boat Drills Regulations* to keep a separate count of the number of children or infants. At the time of the occurrence, the Toronto Island Park ferries did not keep a separate count of passengers who might require assistance in an emergency, and ferry crews estimated the number of passengers in groups of 5 to 10 until the capacity of the ferry was reached or all waiting

[20] TSB Marine Transportation Safety Investigation M17C0179.

passengers had boarded; the estimated number of passengers was recorded in the logbook but an exact count of the number of persons on board was not kept.

### 1.14.2 Information provided to passengers

According to the *Life Saving Equipment Regulations*, "every passenger ship shall make an announcement for the information of passengers before the ship leaves any place where passengers embark."[21] Section 110.1 of the Regulations states that

> (4) The announcement shall
>
> (a) specify the location of lifejackets;
>
> (b) in each area of the ship, inform the passengers in that area of the location of lifejackets that are closest to them;
>
> (c) specify the location of survival craft and muster stations; and
>
> (d) in each area of the ship, inform the passengers in that area of the location of survival craft that are closest to them.
>
> (5) The announcement shall be
>
> (a) in either official language or in both, according to the needs of the passengers; and
>
> (b) in the most recent format approved by the Board[22] as meeting the requirements of this section.[23]

Additionally, the *Fire and Boat Drills Regulations* require that passengers receive vessel-specific safety information and emergency procedures in the form of a safety briefing, either immediately before or after a passenger vessel departs on a voyage.[24] Subsection 13(3) of the regulations states that

> The master of a vessel referred to in subsection (2) shall ensure that the safety briefing:
>
> (a) informs the passengers of the essential actions they must take during an emergency;
>
> (b) specifies the location of lifejackets, survival craft and muster stations;
>
> (c) informs the passengers in each area of the vessel of the location of the lifejackets and survival craft that are closest to them;
>
> (d) instructs the passengers in the donning and use of their lifejackets;

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21 Transport Canada, C.R.C., c. 1436, *Life Saving Equipment Regulations* (as amended 22 December 2022), subsection 110.1(1).

22 This is a reference to the Board of Steamship Inspection established by the *Canada Shipping Act*, which has since been replaced by the Marine Technical Review Board.

23 Transport Canada, C.R.C., c. 1436, *Life Saving Equipment Regulations* (as amended 22 December 2022), paragraph 110.1(1)(4).

24 Transport Canada, SOR/2010-83, *Fire and Boat Drills Regulations* (as amended 23 June 2021), subsection 13(2).

> (e) is given in either or both official languages, according to the needs of the passengers;
>
> (f) is given on the vessel's public address system if the vessel has one; and
>
> (g) is given in a way that is likely to be understood by the passengers.[25]

The *Sam McBride* had a pre-recorded audio safety briefing in English that was played upon departure. During the investigation, it was noted that many of the vessel's speakers were not working appropriately; during busy crossings where passenger noise was high, the safety briefing was inaudible. The safety briefing included a warning to the passengers to not stand on the stairs while the vessel was moving.

The *Fire and Boat Drills Regulations* also require the master of a vessel to ensure that the additional illustrations and instructions stated under subsection 5(1) are posted in both official languages in all passenger spaces and at all muster stations. The subsection states that the following information must be posted:

> (a) the alarm signals that will sound to indicate an emergency
>
> (b) actions to be taken in the event of an emergency
>
> (c) the location of the vessel's designated muster stations
>
> (d) the correct method of donning a lifejacket[26]

At the time of the occurrence, the *Sam McBride* had a lifesaving equipment plan posted on the main deck, which indicated where muster stations and lifejackets were located. The lifesaving equipment plan on board was dated 23 September 2013 and indicated a maximum complement of 736. The inspection certificate on board the vessel, which had expired on 21 June 2022, indicated a maximum complement of 921.

The *Sam McBride* carried 4 different types of lifejackets (2 adult types and 2 child types), stored hanging from the ceilings above the main and promenade decks (Figure 8). Some of the lifejackets did not have information on both sides identifying if they were sized for a child or an adult.

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25 Ibid., subsection 13(3).

26 Transport Canada, SOR/2010-83, *Fire and Boat Drills Regulations* (as amended 23 June 2021), subsection 5(1).

**Figure 8. Lifejacket stowage above the main deck (Source: TSB)**


Some of the lifejackets were stored in a way that obscured the information about sizing, which could impede the ability of passengers to select an appropriate lifejacket. Although there was 1 sign posted per deck (Figure 9), containing information in English and French on how to don adult lifejackets, the information was not specific to either of the 2 types on board.

**Figure 9. Lifejacket donning instructions on promenade deck (Source: Imperial Industries Ltd. Source of photo: TSB)**


### 1.14.3 Passenger vessel evacuation procedures

The *Life Saving Equipment Regulations* require passenger ships to have a procedure in place for the safe evacuation of the entire crew and passenger complement within 30 minutes of the master giving the abandon-ship signal. This requirement is explained in Ship Safety

Bulletin 04/2022.[27] The bulletin includes guidance on the information to be included in the procedure and requirements for the vessel's crew to be trained on the evacuation procedures.

The bulletin also states that a realistic exercise of the procedure, involving a large number of participants to simulate passengers, should be done after the elaboration or updating of the procedure. This allows the AR to confirm the time required to evacuate the vessel, but also to validate the realism and practicality of the evacuation procedure.

The emergency evacuation procedure (Appendix B) for the *Sam McBride* directs the master to dock or beach the vessel, with the evacuation to be conducted through "any available ramps furthest from the accident / or fire." The master is also to call the Toronto marine fire unit, the Toronto fire boat, emergency services (911) by cellular phone, and issue a Mayday call on VHF radio.

The procedure also states that the engineer is to assist the master—both of whom have other duties in emergency response—to launch the life rafts if the deckhands are occupied with passengers. The subsequent paragraph makes the mate responsible for launching the life rafts along with 2 deckhands, while the 3rd deckhand and the engineer are to take care of passengers.

Once the life rafts are inflated, crew members are directed to pull the raft along the rail to the disembarking area. Proceeding from the boat deck to the disembarking area requires crew members to use an enclosed staircase located on the centreline of the vessel.

The investigation found no evidence that an exercise including a large number of people representing the vessel's maximum passenger complement was ever performed. In 2018, the City of Toronto had conducted an emergency drill involving approximately 50 people who acted in the role of passengers; this was the largest number of people that had been involved in an emergency drill.

### 1.14.4 Drills

When faced with an uncertain situation, particularly when there is an element of time pressure and the potential consequences are serious, individuals will often focus on responding to, rather than evaluating, the situation. For this reason, it is important for crew members to have had sufficient training and to have practised different emergency situations and tasks. With practice, tasks can be performed automatically, with minimal demand on cognitive resources, which may be required to deal with unexpected

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[27] Transport Canada, Ship Safety Bulletin 04/2020: Requirements for passenger evacuation and safety (08 February 2022), at https://tc.canada.ca/en/marine-transportation/marine-safety/ship-safety-bulletins/requirements-passenger-evacuation-safety-ssb-no-04-2022 (last accessed on 03 July 2024).

distractions and events.[28] Training and practice are particularly important because, in the event of an emergency, there is no time to learn how to use lifesaving equipment, and the stressful nature of an emergency makes it more difficult to remember the procedures or techniques to respond quickly.

The *Fire and Boat Drills Regulations* mandate that passenger vessels conduct drills to ensure that crew are prepared to respond in an emergency. Masters are required to "ensure that drills, in so far as is feasible, are carried out as if there were an actual emergency."[29]

Toronto ferry crews routinely carried out drills to practise the emergency procedures. The investigation determined that the last drill with people acting in the role of passengers was conducted in 2018.

## 1.15 Minimum vessel crewing

In 2007, the *Marine Personnel Regulations* came into force, requiring vessels to have an SMD issued by TC.[30] An SMD lists the minimum number of crew members that are mandatory for the vessel to operate, as determined by TC under the *Marine Personnel Regulations*, as well as the minimum degree of certification that these crew members are required to hold. Vessels may carry additional crew to perform other duties, or to supplement the minimum number of crew members.

A key consideration in determining the minimum number of crew members is the ability to respond to emergencies. Section 207(4) of the regulations addresses the minimum complement for these situations, specifically

> (4) The minimum complement of a vessel, in order to deal with an emergency situation, shall consist of […]
>
> (d) the persons needed to simultaneously carry out the following tasks:
>
> (i) operate and use the fire extinguishing equipment and systems required by or approved under the *Vessel Fire Safety Regulations* to fight a fire at any one location on the vessel,
>
> (ii) prepare for launching the survival craft carried in accordance with the *Vessel Construction and Equipment Regulations* or the *Life Saving Equipment Regulations*, as the case may be,
>
> (iii) operate the vessel's pumping and emergency power system,
>
> (iv) direct and control the passengers who are on board, and

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28 As workload and stress increase, cognitive capacity decreases and affects decision making. Source: C.D. Wickens and J.G. Hollands, *Engineering psychology and human performance* 3rd Edition (Prentice Hall, 1999), Chapter 12: Stress and human error, pp. 483–484.

29 Transport Canada, SOR/2010-83, *Fire and Boat Drills Regulations* (as amended 23 June 2021), Section 17.

30 Transport Canada, SOR/2007-115, *Marine Personnel Regulations* (as amended 23 June 2021), subsection 202(3).

> (v) provide communication between the person in immediate charge of the vessel and the persons directing and controlling the passengers.[31]

Further, under Section 209 of the regulations, a rescue boat such as that carried by the *Sam McBride* must be operated by a team of 2 persons holding certificates as master or mate, or certificate of proficiency in survival crafts. Life rafts with a capacity of over 25 persons, meanwhile, must each have 1 certificated person assigned, as per section 210.

To obtain or renew an SMD, ARs make an application for the vessel, which includes a proposed crew complement. The SMD may also name conditions restricting its applicability.

Once an application is received, 2 TC marine safety inspectors independently evaluate the proposed crew complement. Inspectors assess the number of crew members needed to carry out the required duties for each emergency scenario. Once the number of crew needed for each scenario is established, the minimum crew complement is determined by the scenario that requires the most crew.[32]

In April 2008, the City of Toronto made an application to TC for an SMD for the *Sam McBride* proposing a crew of 6: 1 master, 1 mate, 1 engineer, and 3 deckhands. In response to the City of Toronto's SMD application, the local TC office completed an evaluation for the *Sam McBride* in October 2008 that considered 4 scenarios. For each scenario, determining the number of crew was based on the number of decks, the lifesaving equipment, and the minimum crew required to perform the functions listed in section 207 of the *Marine Personnel Regulations*. Those scenarios covered:[33]

- Normal operation
- Fire on board
- Abandoning ship
- Post-abandonment

TC determined the scenario requiring the most crew to be an on-board fire and, therefore, required the vessel to have a minimum crew complement of 12 (Table 2). A response to a fire on board was found to require a deck watch, an engineering watch, a fire team, and crew members for life raft launching and passenger control.

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31 Transport Canada, SOR/2007-115, *Marine Personnel Regulations* (as amended 23 June 2021), subsection 207(4).

32 In November 2023, Transport Canada announced that a new procedure for issuance of safe manning documents will begin in January 2024. According to the new procedure, all new SMDs will be approved by a national committee of TC inspectors instead of in regional offices.

33 In 2022, a 5th scenario (person overboard) was added.

**Table 2. First safe manning evaluation for types of emergencies on board the *Sam McBride***

| Scenario | Crew complement required |
|---|---|
| Normal operation | 6 |
| Fire on board | 12 |
| Abandoning ship | 7 |
| Post-abandonment | 8 |

Accordingly, the SMD was issued for a minimum crew complement of 12.

Following this assessment, in December 2008, the City of Toronto asked TC to be allowed to have a lower crew complement for its vessel operations, through a letter that stated:

> In regards to staffing/crewing issues stemming from "Safe Manning Regulations", the City of Toronto has every intention of being as compliant with your decisions as possible. Financially, we do have grave concerns over the additional costs to increase our compliment [*sic*] of staff.[34]

The letter also presented mitigating measures for the vessel when carrying a lower crew complement, including

- having other vessels available to assist a vessel in distress;
- using side and/or portable ramps to transfer crew and passengers;
- providing training on these procedures for all staff;
- having shore-side personnel with previous marine emergency duties and deckhand training, as well as security personnel, deploy to assist;
- introducing a surveillance system to permit the master to view strategic areas of the vessel; and
- requesting assistance from the City Marine Police Unit in case of emergency.

Following receipt of this letter, TC inspectors discussed the City of Toronto's proposals to mitigate the risks of its proposed crew complement. Following these internal discussions, TC carried out a new evaluation and determined that a minimum crew complement of 13 would be required (Table 3).

**Table 3. Second safe manning evaluation for types of emergencies on board the *Sam McBride***

| Scenario | Crew complement required |
|---|---|
| Normal operation | 6 |
| Fire on board | 13 |
| Abandoning ship | 9 |
| Post-abandonment | 9 |

[34] City of Toronto, letter from the Supervisor, Marine Operations, to Transport Canada, Marine Safety, 12 December 2008.

TC inspectors subsequently discussed the mitigation procedures proposed by the City of Toronto and agreed to take the proposed mitigating procedures into account. A replacement SMD for the *Sam McBride* was issued by TC in February 2009, which required 6 crew members on board (master, mate, engineer, and 3 ratings). There were no conditions recorded on the certificate to explain this variance or required mitigation actions to ensure response to all possible emergencies. The SMD was subsequently renewed every 5 years without revisions or modifications.

## 1.16 Lifesaving equipment

The lifesaving equipment required on board a vessel per the *Life Saving Equipment Regulations* is based on the class of the ship, which is defined in the regulations. The *Sam McBride* is a Class V ship and requires, among other items, a lifejacket for each member of the complement and enough child lifejackets for at least 10% of the complement or 1 for each child on board, whichever is greater.[35] The *Sam McBride* had 987 adult lifejackets and 183 child lifejackets, according to the vessel's Record of Safety Equipment.

At the time of the occurrence, the *Life Saving Equipment Regulations* did not require Canadian vessels to carry infant lifejackets. In 2020, TC published Ship Safety Bulletin (SSB) 14/2020 to remind the marine industry of the requirement to carry at least 1 lifejacket for each person on board, and to "remind parents of infants of the carriage requirements for infant lifejackets." It also stated:

> Until the VCER [*Vessel Construction and Equipment Regulations*] are published and the requirements of the *Small Vessel Regulations* are amended, parents are encouraged to bring their own infant lifejackets when on board any vessel.[36]

Although this message is directed at parents using Canadian ferries, the SSB system is designed to communicate with "owners, authorized representatives and operators of commercial vessels, including other interested marine industry stakeholders."[37] SSBs are published on TC's website, and email notification of new SSBs is provided to individuals and organizations who have subscribed.

On 20 December 2023, the VCER were published in the *Canada Gazette*, Part II; among other provisions, these regulations modified carriage requirements for life saving appliances. Following a safety concern published in the TSB Marine Transportation Safety Investigation

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35 Transport Canada, C.R.C., c. 1436, *Life Saving Equipment Regulations* (as amended 22 December 2022), paragraph 16(1)f).

36 Transport Canada, Ship Safety Bulletin 14/2020: Carrying lifejackets on board passenger vessels (29 July 2020), at https://tc.canada.ca/en/marine-transportation/marine-safety/ship-safety-bulletins/carrying-lifejackets-board-passenger-vessels-ssb-no-14-2020-modified-july-29-2020 (last accessed on 11 July 2024).

37 Transport Canada, "Ship Safety Bulletins," at https://tc.canada.ca/en/marine-transportation/marine-safety/ship-safety-bulletins (last accessed on 12 July 2024).

Report on the *Island Queen III* investigation,[38] TC included a requirement in the VCER that Canadian passenger vessels will be required to carry a number of infant lifejackets[39] equal to the number of infants on board as of the first anniversary of the publication of the VCER.[40]

## 1.17 Marine Technical Review Board

The Marine Technical Review Board (MTRB), established under the *Canada Shipping Act, 2001,* comprises TC employees with expertise in marine matters. The MTRB is empowered to make decisions on "applications for an exemption from, or the replacement of, any requirement under the regulations […] in respect of a Canadian vessel […]."[41] The MTRB considers requests when vessels seek to replace safety requirements. When the MTRB permits replacement of safety requirements, it imposes conditions that provide an equivalent level of safety, rather than granting an outright exemption.

There is 1 active MTRB decision for the *Sam McBride*—decision P13998, which grants the vessel an exemption from full compliance with the standard on intact stability, specifically the provisions on emergency passenger heeling.[42] The exemption was granted with 4 conditions:

a. Maximum passenger complement of 915 to be reduced to 609 in extreme weather;

b. Signs to be posted restricting the number of passengers allowed on the promenade deck to 506 total in normal weather or 308 total when in extreme weather;

c. When operating with a passenger complement greater than 609 limited to 308 on the promenade deck this vessel is restricted to wave heights not exceeding the intact freeboard and a maximum wind speed of 20 knots;

d. When carrying passengers, vessel to operate in the Toronto inner harbour only.[43]

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38 TSB Marine Transportation Safety Investigation Report M17C0179.

39 Infant lifejackets are for children of less than 15 kg.

40 Canadian modifications to the requirements of SOLAS Chapter III are included in TP 15415, *Canadian Modifications for the* Vessel Construction and Equipment Regulations at https://tc.canada.ca/en/marine-transportation/marine-safety/marine-safety-publications/tp-15415-canadian-modifications-vessel-construction-equipment-regulations (last accessed on 03 July 2024).

41 Government of Canada, *Canada Shipping Act, 2001* (S.C. 2001, c. 26) (as amended 22 June 2023).

42 "Heeling" is a temporary tilting of a vessel away from the vertical; in extreme cases, it can lead to capsizing. Emergency passenger heeling refers to heeling due to the movements of passengers in an emergency.

43 Transport Canada Marine Technical Review Board, "Details for decision number P13998," at https://wwwapps.tc.gc.ca/Saf-Sec-Sur/4/mtrbq-sridb/eng/decisions/details/13998 (last accessed on 12 July 2024).

This decision was granted for the life of the vessel (i.e., no expiry date). The conditions of the MTRB decision were recorded in the recognized organization's survey reports, and the MTRB decision was referred to on the vessel's inspection certificate.

TSB investigators noted that the signs required by the MTRB decision were not visible on board the *Sam McBride*.

## 1.18 Previous occurrences

Since 1997, the TSB has investigated 15 other passenger vessel occurrences that had similar issues related to SMS, lifesaving equipment, safe manning, and safe speed (Appendix C).

## 1.19 TSB Watchlist

The TSB Watchlist identifies the key safety issues that need to be addressed to make Canada's transportation system even safer.

**Regulatory surveillance is a Watchlist 2022 issue.** As this occurrence demonstrates, TC's surveillance and monitoring does not always ensure that a vessel complies with regulatory requirements. In this investigation, the TSB found that the conditions included in the active MTRB decision for the vessel were not implemented. In addition, the results of TC's safe manning evaluation were not applied to the SMD that was issued to the vessel. This resulted in an insufficient number of crew members available to manage an emergency response, particularly when the complement is at the maximum number of passengers the ferry carries.

**ACTION REQUIRED**

The issue of **regulatory surveillance in marine transportation** will remain on the Watchlist until TC provides more oversight of the commercial vessel inspection process by demonstrating that its surveillance and monitoring are effective in ensuring that authorized representatives and recognized organizations are ensuring vessel compliance with regulatory requirements; and until TC demonstrates an increase in proactive surveillance.

**Safety management is a Watchlist 2022 issue.** Operations that do not have an SMS in place are at higher risk of operational issues and accidents. In this occurrence, the City of Toronto's ferries did not have an SMS, and the guidance provided to the crew was limited in scope.

**ACTION REQUIRED**

The issue of **safety management in marine transportation** will remain on the Watchlist until TC implements regulations requiring all commercial operators to have formal safety management processes; and operators that do have an SMS demonstrate to TC that it is working—that hazards are being identified and effective risk-mitigation measures are being implemented.

## 2.0 ANALYSIS

The analysis will focus on the factors leading to the accident, as well as the determination of minimum crewing levels, the application of Marine Technical Review Board (MTRB) conditions to achieve an equivalent level of safety, and factors related to passenger safety.

Following the occurrence, sea trials were carried out under the supervision of a representative from the engine manufacturer. The trials were unable to recreate the situation leading up to the occurrence. Accordingly, the investigation was unable to identify a mechanical cause for the striking.

### 2.1 Dock approach

The *Sam McBride* is a double-ended ferry, meaning it has propellers at both the forward and aft ends. This allows it to transit its route without turning around at each dock. Although the vessel has 2 propellers that can be simultaneously used to propel the vessel, the vessel normally used only the stern propeller when transiting. The forward propeller could be used to slow the advance of the vessel when nearing the dock.

During berthing, the master had to monitor and adjust the vessel's speed so that the vessel contacted the dock gently. Considerations in determining these adjustments included the vessel's manoeuvring characteristics, the prevailing weather conditions, and the crossing schedule.

The City of Toronto did not have any written procedures or guidelines for docking of the ferries. Masters were left to navigate the vessels as they deemed appropriate in any given scenario. The investigation found no evidence that a risk assessment of the docking manoeuvre had ever been performed.

During busy times, such as summer weekends, the Toronto Island ferries frequently carried the maximum number of passengers. Embarking and disembarking a full complement took considerable time that was not fully accounted for in the ferry schedule. While ferries were tied up at the dock, crews could see waiting passengers crowded in the holding area. When there were many people waiting for a ferry, its crew likely experienced a sense of pressure from watching them wait and accelerated their operations to reduce the time passengers spent waiting. Masters likely experienced pressure to complete the voyages as quickly as possible to ensure that passenger queues did not back up at either dock.

To try to keep up with passenger volume, the ferries could transit faster and/or reduce the time it took to dock by approaching at higher speeds and slowing down at a faster rate. No controls or procedures were in place to ensure that the ferries maintained a safe speed regardless of operational pressure. Approaching the dock at higher speeds gave masters less time to complete the actions required to slow and dock the ferries or react to unforeseen situations. On the day of the occurrence, the *Sam McBride* had made 8 runs, 6 of which were at full capacity, and it was behind the published schedule.

Finding as to causes and contributing factors

During busy times, such as the day of the occurrence, crews on City of Toronto ferries expedited crossings to address passenger backlog. Without written procedures that defined a safe speed of approach during docking, decisions around docking speed may have been influenced by operational pressure.

TSB analysis of security camera footage from the occurrence voyage determined that the *Sam McBride* was travelling at 5 knots when it passed the first mooring dolphin; the speed of approach on the other transits conducted that day was approximately 3 knots. The footage also showed that only the aft propeller was in use as the vessel approached the dock.

Findings as to causes and contributing factors

On the occurrence voyage, the *Sam McBride* approached the dock at 5 knots, which was 2 knots faster than its typical approach speed, reducing the time available for the vessel to decelerate.

Only the aft propeller was in use to slow the vessel, and it was not enough to stop the *Sam McBride* from striking the dock.

TSB investigators observed sea trials of the vessel after the occurrence; both engines and their control systems were found to be in good working order. As well, the engine control modules for the bow and stern engines did not show any fault codes or events for the day of the occurrence. The investigation was unable to determine why the forward engine and propeller did not engage to slow the vessel on the occurrence voyage.

As the ferry approached the end of the occurrence voyage, passengers had begun to move toward its forward end in anticipation of disembarking. Passengers crowded on the main deck near the sliding door that opens out to the forward boarding ramp. Those coming from the promenade deck descended the stairs to the exit, but with the number of passengers already gathered, some passengers were unable to get to the bottom of the stairs, leaving many passengers standing on or at the top of the stairs.

Without effective measures to prevent passengers from standing in these high-risk areas, many passengers were at risk of falling when the vessel struck the dock. As the vessel came to a sudden stop, its momentum carried people forward and caused many to lose their balance. Those standing on one of the decks were at less risk because they could recover their balance by stepping forward, and, if they fell, it was only onto the deck or the person in front of them. Only a few passengers standing on the decks were injured. However, those standing on or at the top of the stairs did not have level ground in front of them to allow them to catch themselves. This resulted in people falling down the stairs and onto others standing in front of them, leading to multiple injuries.

Finding as to cause and contributing factors

The *Sam McBride's* momentum when it struck the dock caused multiple passengers to lose their footing and fall, resulting in numerous injuries.

## 2.2 Minimum vessel crewing

Under the *Marine Personnel Regulations,* vessels are required to have a Safe Manning Document (SMD) issued by Transport Canada (TC). Operators make an application for each vessel, which includes their proposed crew complement. Each application is evaluated independently by 2 TC inspectors using an established procedure to determine the number of crew required in various scenarios; the scenario with the highest number of crew is used to set the minimum crew complement required by regulation.

In the case of the *Sam McBride,* the scenario requiring the most crew was an emergency response to a fire on board. Although the City of Toronto's initial application for the vessel was for 6 crew, TC's evaluation determined that 12 crew were required to respond to an on-board fire. After the evaluation was completed in December 2008, the City of Toronto sent a letter to the regional TC office requesting that the evaluation be revised to allow for a crew of 6. In its letter, the City of Toronto presented proposed mitigating measures to offset the lower crew complement, such as using shore-based personnel to assist in an emergency. A second evaluation was performed, which determined that 13 crew were required. Despite this evaluation, the SMD allowing for a minimum crew complement of 6—the number assessed for normal operations—was issued in February 2009 without any related conditions required to mitigate risks associated with responding to a fire on board or abandoning the vessel. The number of passengers permitted on board the vessel was not changed. The SMD was subsequently renewed every 5 years, without revisions or modifications. The investigation found no evidence that an evaluation supporting a crew complement of 6 was ever completed.

The SMD lists only the minimum crew complement required by regulation. The City of Toronto perceived that the SMD was TC's assessment of the safe level of staffing for the *Sam McBride*. Accordingly, the City of Toronto maintained a crew complement of 6. Procedures identified by the City of Toronto in its December 2008 letter to TC, including bringing additional crew members to a stricken vessel, were not found during the investigation.

At the time of the occurrence, the *Sam McBride* had 6 crew members on board the vessel, in compliance with its SMD. With 3 crew members assigned to responding to an emergency, this left 3 crew members for passenger management. If there were a fire on board or a need to abandon the vessel, there would be insufficient personnel to respond to the emergency and manage the mustering and evacuation of passengers, especially on voyages where a ferry carries hundreds of children. By TC's own evaluation, at least 9 crew members—a crew to passenger ratio of 1 to 101.7—were required to facilitate the abandonment of the vessel, and 12 crew members—a ratio of 1 to 76.25—were required to respond to a fire on board. Despite this evaluation, the crew complement remained at 6—a ratio of 152.5 passengers per crew member—in spite of SMD renewals every 5 years.

Finding as to risk

If the crew complement specified on a vessel's SMD is insufficient to respond to an emergency, there is an increased risk to the safety of the vessel's crew and passengers.

## 2.3 Marine Technical Review Board

One of the regulatory requirements for the *Sam McBride* was compliance with Marine Technical Review Board (MTRB) decision P13998, which allowed the ferry to deviate from the stability criteria related to emergency passenger heeling. In its decision on 26 February 2016, the MTRB required 4 conditions as a means to provide an equivalent level of safety to the exempted stability criteria.

However, TC's regulatory oversight did not confirm that the MTRB's conditions had been implemented. The investigation was unable to find evidence that the City of Toronto had any procedures in place to comply with the MTRB's decision. For example, "extreme weather" had not been defined and no measures were taken to limit the number of passengers on the promenade deck.

Finding as to risk

If the conditions of an MTRB decision are not implemented by an operator and if the regulator does not enforce their implementation, vessels will not operate at an equivalent level of safety.

## 2.4 Passenger management

To ensure that passengers are prepared for an emergency, it is important that they be managed appropriately during all phases of the voyage. This requires the vessel to have a sufficient number of trained crew members on board with the dedicated responsibility for passenger management.

### 2.4.1 Passenger management training for crew members

The need for crew members to respond quickly and effectively to an emergency on a passenger vessel is the same for all vessels and voyages. When faced with an emergency, crew members need to have knowledge and skills related to crowd management and human behaviour in emergencies.

While crew members of passenger vessels greater than 500 gross tonnage (GT) on unlimited, near coastal Class 1, or near coastal Class 2 voyages are required to have a Specialized Passenger Safety Management certificate or endorsement, there is no such requirement for crew of vessels of 500 GT or less, or those on sheltered waters voyages. The Specialized Passenger Safety Management certificate provides training on crowd management, crisis management and human behaviour in emergencies, passenger safety, and safety for personnel providing direct services to passengers. It also provides familiarization training.

While passenger vessels that are on sheltered waters voyages are closer to shore and shore-based emergency responders than vessels on other types of voyages, there are a number of types of emergencies that need an immediate response that cannot await the arrival of shore-based responders.

Because the *Sam McBride* operated in sheltered waters, there were no requirements for the crew to have training in passenger management, and the crew had not received this training. The TSB has previously issued a safety concern about the lack of training in passenger safety management for crew on sheltered waters voyages.[44]

Finding as to risk

If all passenger vessel crew members are not trained in passenger safety management, there is a risk that they will not be prepared to manage passengers in emergency situations.

When the *Sam McBride* was docking, all crew members were assigned duties related to the docking operation. There were not enough crew members to manage the passengers and to ensure that passengers did not stand on the stairs when the vessel was approaching the dock. In addition, the typical drills performed by Toronto Island Park ferries did not include passengers, which meant that they did not realistically represent an actual emergency. For example, during these drills crew could perform all of their tasks without having to deal with any of the additional workload that would be present in a real emergency due to the presence of passengers. Examples of additional workload might include directing passengers, maintaining calm and order, helping passengers who may need extra assistance, and responding to passenger requests for information. The conditions in an emergency with passengers on board would also be different, for example, passengers can create high volumes of noise and block access points so that it becomes difficult for the crew to move through the vessel.

### 2.4.2 Passenger counting

In any emergency, an accurate count of passengers is vital. To ensure that all passengers are accounted for, a crew should conduct a passenger count as passengers board the vessel and in the event of evacuation. If needed, emergency responders will also conduct a count of rescued or recovered passengers. Without an accurate count of the passengers, crew and emergency responders will be unable to determine if all passengers have been accounted for.

Although TSB Recommendation M08-01 addressing passenger counting procedures on board ferries was closed as Fully Satisfactory in July 2010, subsequent investigations have shown[45] that the provisions in the *Fire and Boat Drills Regulations* requiring an accurate count of passengers are not being consistently met. In this occurrence, as with several

44 TSB marine transportation safety investigation M17C0179.

45 TSB marine transportation safety investigations M22A0312, M17C0179, and M13L0067.

previous occurrences investigated by the TSB, there was no procedure in place to ensure an accurate passenger count on board the vessel before departure.

At the time of the occurrence, when passengers were boarding the *Sam McBride* or other Toronto Island Park ferries, the number of passengers was estimated (counted in groups of 5 to 10) by a member of the crew and tracked using a hand-held tally counter. This method did not give the exact number of passengers boarding, which was critical information if there was an emergency on board and crew needed to account for passengers.

Finding as to risk

If there is no accurate method to count the passengers boarding a vessel, there is a risk that not all passengers will be accounted for in an emergency.

In addition, at the time of the occurrence, there was no system in place that allowed passengers who may require special care or additional assistance to identify themselves to the crew, nor were there procedures in place to address them if they do.

Finding as to risk

If there is no method to identify passengers that require special care or additional assistance during an emergency and there are no provisions in place to provide this additional assistance, the safety of these passengers may be compromised.

### 2.4.3 Passenger familiarization

Passengers are unlikely to be familiar with the vessel on which they are travelling and the lifesaving equipment on board. For this reason, a vessel-specific passenger safety briefing is required at the beginning of each voyage. The briefing informs passengers of the location of safety equipment and of what to do in an emergency.

The *Sam McBride* had a public address system that played a safety message at the beginning of each crossing. The message included a warning to the passengers to not stand on the stairs while the vessel was moving. However, this message was played only at departure, and on busy crossings it was virtually impossible to hear the message above vessel and passenger noise, particularly in areas where the investigation identified that the speakers were not working.

The announcement was the only measure in place to prevent passengers from standing on the stairs as the vessel approached the dock. There were no barriers, signs, or crew designated to prevent passengers from standing on the stairs.

In the case of an emergency, vessels must have signs posted showing passengers how to properly don a lifejacket. Signage must appear throughout the passenger areas, and there must be instructions for each type of lifejacket that the vessel carries. The *Sam McBride* carried 4 different types of lifejackets (2 adult types and 2 child types). However, there was only 1 sign posted per deck, which contained information on how to don 1 of the 2 types of adult lifejackets. There was no information available for the other 3 types of lifejackets on the vessel.

It must also be clear which lifejackets are for children and which are for adults. On the *Sam McBride*, the lifejackets were suspended from the ceilings above the main and promenade decks. Some of the lifejackets did not have information on both sides identifying if they were for a child or an adult. Furthermore, some lifejackets were placed so that this information was not visible, impeding the ability of passengers to select an appropriate lifejacket.

Finding as to risk

If passenger familiarization methods, such as briefings or signage, do not transmit safety information effectively, the safety of passengers may be put at risk.

### 2.4.4 Passenger evacuation procedures

In order to safely complete the complex task of evacuating a large number of passengers from a vessel in an emergency, there must be substantial forethought and planning. The passenger evacuation procedure is meant to record this planning and act as a reference guide for the crew when responding to an emergency.

Procedures must reflect the specific characteristics of the vessel and consider the feasibility of the steps to ensure that the crew are able to enact the procedure as described. While drills allow the crew to learn and practise the evacuation procedure, on board the *Sam McBride* they were typically conducted without passengers, which meant they did not provide the realism necessary to evaluate the efficacy of evacuation procedures.

Carrying out drills as realistically as possible is important as it can identify gaps in procedures or infrastructure. For example, on the *Sam McBride*, the procedure for deployment of the life rafts creates logistical challenges for the crew. The life rafts are deployed from the bridge deck, while the muster stations where passengers board them are on the main deck. In order for the crew to deploy the life rafts and then move them from the sides of the vessel to the muster stations at each end of the main deck, the procedure directs the crew to pull the life rafts along the railing to the disembarking areas. However, the procedure does not take into account the fact that crew cannot pull the life rafts along the railing by their painter while also having to pass through an enclosed staircase on the centreline of the vessel to move between decks. In addition to this logistical challenge, there is no easy way for passengers to board the life rafts. Although not described in the procedures, the 2 options would be to lower the loading ramp, or for passengers to climb over the bulwarks and drop themselves down into a raft. Both of these options pose a risk to the physical safety of the passengers and may not be feasible for those with limited mobility.

Large numbers of passengers create significant noise and occupy substantial amounts of space. They may react unpredictably in an emergency or misunderstand instructions. Their presence may impede crew communications, block or slow crew member movements aboard the vessel, or create additional tasks for the crew to address in the course of an evacuation. In any evacuation procedure, such impediments should be identified and taken into account. Performing a trial of the evacuation procedure with a large number of participants (passengers) on board will allow an AR to identify such potential issues.

The investigation found that the procedures on board the *Sam McBride* did not reflect a realistic assessment of an emergency response in the presence of passengers, as they required crew members to be in multiple places simultaneously, assist an unrealistically large numbers of passengers, potentially complete multiple tasks at once, and move quickly within the vessel.

Specifically, the emergency evacuation procedure for the *Sam McBride* directed the engineer to assist the master in launching life rafts on the bridge deck, while also indicating that the engineer was to assist with crowd control on the 2 passenger decks. The procedure did not consider that the engineer may have important duties in response to the emergency, such as firefighting or ensuring that pumps are operating to dewater the vessel.

Finding as to risk

If passenger evacuation procedures are not validated through a realistic exercise with a representative number of participants, a vessel's crew will be insufficiently prepared for an emergency and passengers will be at an elevated risk of injury or death.

## 2.5 Requirements for lifejackets

The lifesaving equipment required to be carried on board vessels is defined in the *Life Saving Equipment Regulations*. The requirements are specific to each class of ship. The *Sam McBride* is a Class V ship and requires, among other items, 1 lifejacket for each member of the complement and enough child lifejackets for at least 10% of the complement or 1 for each child on board, whichever is greater.

The *Sam McBride* had 987 adult lifejackets and 183 child lifejackets. Based on a maximum passenger complement of 915, the number of child lifejackets exceeded the 10% requirement. However, there was no separate count of the number of children or infants as they were boarding the *Sam McBride*. During the investigation, the TSB observed voyages where groups of children were being transported to the summer camp in Toronto Island Park and the number of children on the ferry exceeded 183. The investigation determined that, on these crossings, the vessel did not meet the requirement to have 1 child lifejacket for each child on board.

The *Sam McBride* and other City of Toronto ferries also carry infants. At the time of the occurrence, the *Life Saving Equipment Regulations* did not require Canadian vessels to carry infant lifejackets. Since the occurrence, TC has published the *Vessel Construction and Equipment Regulations* which will require passenger vessels to carry enough infant lifejackets for all infants on board as of 20 December 2024. However, if the number of infants is not verified during boarding, the vessel crew will not be able to confirm if they have enough lifejackets on board.

Finding as to risk

If a crew does not ensure that the number of lifejackets of the correct sizes is sufficient for the number of children and infants boarding the vessel, there is a risk that children and infants will not have lifejackets in an emergency.

## 2.6 Communication with the public

In 2020, TC published Ship Safety Bulletin (SSB) 14/2020 to remind the marine industry of the requirement to carry at least 1 lifejacket for each person on board, and to "remind parents of infants of the carriage requirements for infant lifejackets." The SSB stated that Canadian vessels were not required to carry infant lifejackets until the proposed Vessel Construction and Equipment Regulations came into force.

Although part of SSB 14/2020 is directed at parents, the SSB system is not designed to communicate with the travelling public. The system is aimed at "owners, authorized representatives, and operators of commercial vessels, including other interested marine industry stakeholders." SSBs are published on TC's website. However, to be notified when new SSBs are released, a person must register for notifications on TC's webpage for the bulletins. There is no reason to expect that the travelling public outside the marine community are aware of this system.

Finding as to risk

If TC uses only its SSB system to communicate vessel safety information to passengers, there is a risk that they will be unaware of information that may be vital to their safety in an emergency.

# 3.0 FINDINGS

## 3.1 Findings as to causes and contributing factors

These are conditions, acts or safety deficiencies that were found to have caused or contributed to this occurrence.

1. During busy times, such as the day of the occurrence, crews on City of Toronto ferries expedited crossings to address passenger backlog. Without written procedures that defined a safe speed of approach during docking, decisions around docking speed may have been influenced by operational pressure.

2. On the occurrence voyage, the *Sam McBride* approached the dock at 5 knots, which was 2 knots faster than its typical approach speed, reducing the time available for the vessel to decelerate.

3. Only the aft propeller was in use to slow the vessel, and it was not enough to stop the *Sam McBride* from striking the dock.

4. The *Sam McBride's* momentum when it struck the dock caused multiple passengers to lose their footing and fall, resulting in numerous injuries.

## 3.2 Findings as to risk

These are conditions, unsafe acts or safety deficiencies that were found not to be a factor in this occurrence but could have adverse consequences in future occurrences.

1. If the crew complement specified on a vessel's safe manning document is insufficient to respond to an emergency, there is an increased risk to the safety of the vessel's crew and passengers.

2. If the conditions of a Marine Technical Review Board decision are not implemented by an operator and if the regulator does not enforce their implementation, vessels will not operate at an equivalent level of safety.

3. If all passenger vessel crew members are not trained in passenger safety management, there is a risk that they will not be prepared to manage passengers in emergency situations.

4. If there is no accurate method to count the passengers boarding a vessel, there is a risk that not all passengers will be accounted for in an emergency.

5. If there is no method to identify passengers that require special care or additional assistance during an emergency and there are no provisions in place to provide this additional assistance, the safety of these passengers may be compromised.

6. If passenger familiarization methods, such as briefings or signage, do not transmit safety information effectively, the safety of passengers may be put at risk.

7. If passenger evacuation procedures are not validated through a realistic exercise with a representative number of participants, a vessel's crew will be insufficiently prepared for an emergency and passengers will be at an elevated risk of injury or death.

8. If a crew does not ensure that the number of lifejackets of the correct sizes is sufficient for the number of children and infants boarding the vessel, there is a risk that children and infants will not have lifejackets in an emergency.

9. If Transport Canada uses only its Ship Safety Bulletin system to communicate vessel safety information to passengers, there is a risk that they will be unaware of information that may be vital to their safety in an emergency.

# 4.0 SAFETY ACTION

## 4.1 Safety action taken

### 4.1.1 Transportation Safety Board of Canada

The TSB identified several safety issues on board ferries operated by the City of Toronto. These issues were communicated to Transport Canada (TC) via email on 07 September 2022.

During the course of the investigation, the TSB identified further safety issues related to emergency management, passenger safety management, and lifesaving equipment on City of Toronto ferries. These safety issues were described in Marine Safety Advisory Letter 02/22 "Safety issues on passenger vessels owned by the City of Toronto," sent to the City of Toronto on 01 November 2022.

### 4.1.2 Transport Canada

On 23 October 2023, TC requested that the City of Toronto resubmit applications for the minimum safe manning documents for each of its ferries. TC reviewed the applications and, with respect to the *Sam McBride*, issued new safe manning documents on 07 December 2023. The new safe manning documents required the following:

- At 100% passenger capacity, a minimum crew complement of 13.
- At 75% passenger capacity, a minimum crew complement of 11.
- At 50% passenger capacity, a minimum crew complement of 10.

TC also advised the City of Toronto that any requests for consideration of alternative safe manning levels must be submitted to the TC Marine Technical Review Board (MTRB) for consideration. The City of Toronto has since submitted applications to the MTRB on 14 March 2024.

With respect to the processing of safe manning applications more generally, TC has delivered refresher training to all delegated inspectors on crewing calculations for safe manning requirements and has updated internal procedures to process new and renewal applications.

### 4.1.3 City of Toronto

The City of Toronto updated procedures for all of its ferries to include instructions related to playing pre-departure safety briefings. Masters were reminded about the importance of the briefings and to ensure they are broadcasted on each trip per the *Life Saving Equipment Regulations*, and they will continue to receive a reminder every 6 months.

The recorded safety briefing was updated to advise passengers to review the instructions posted on how to don lifejackets. Additionally, the safety briefing will be repeated prior to

arrival to remind passengers to not stand on the stairs while the vessel is moving. The malfunctioning speakers were repaired to the City's satisfaction.

Additional signage was posted around the vessel to indicate:

- the 2 types of lifejackets used on the vessel;
- the maximum capacity of the promenade deck; and
- a warning to not stand on the stairs while the vessel is moving.

The City of Toronto also assigned 1 of the deckhands to monitor the number of passengers on the promenade deck.

In September 2022, crew members began tracking the number of passengers who may require assistance in an emergency and recording this information for each trip in the logbook.

On 06 October 2022, the City held an annual training exercise that included man-overboard, lifeboat, fire, and evacuation drills. It was carried out in collaboration with PortsToronto, Toronto Police Service Marine Unit, City of Toronto Corporate Security, and Toronto Emergency Medical Services.

On 19 December 2022, a mechanism was installed to ensure that the heavy sliding doors leading to the embarkation decks are secured in place while the vessel is in operation.

The number of child-sized lifejackets was increased to 30% of the total vessel capacity. The City posted SSB 14/2020 at points of sale and on its website to advise parents to bring infant lifejackets. The City purchased 10 infant lifejackets for each of its ferries and has posted instructions for donning these lifejackets. Storage of lifejackets has been adjusted to allow passengers to identify each type.

Finally, the City installed light fixtures to illuminate each life raft launching station.

## 4.2 Safety action required

On 20 August 2022, at around 1700 Eastern Daylight Time, the passenger ferry *Sam McBride*, with 6 crew members and approximately 910 passengers on board, struck the dock while berthing at the Jack Layton Ferry Terminal in Toronto, Ontario. Twenty passengers were reported injured. No pollution was reported. The vessel and dock sustained minor damage. Emergency services responded to the occurrence and 6 of the injured passengers were taken to hospital.

In the case of an emergency on board a passenger vessel, it is essential that crew members have training in passenger management and effective procedures to guide their overall response. Emergency situations usually develop rapidly, and passengers, who are likely to be unfamiliar with the vessel and its equipment, are relying on the fast and coordinated actions of crew to keep them safe. The TSB investigation into this occurrence identified safety deficiencies related to passenger safety management that led the Board to issue 3 recommendations.

### 4.2.1 Crew training

The need for crew members to respond quickly and effectively to an emergency on a passenger vessel is the same for all vessels and voyages. When faced with an emergency, crew members need to have knowledge and skills related to crowd management and human behaviour in emergencies.

While the *Marine Personnel Regulations* require that crew members of passenger vessels greater than 500 gross tonnage (GT) on unlimited, near coastal Class 1, or near coastal Class 2 voyages have a Specialized Passenger Safety Management certificate or endorsement, there is no such requirement for crew members of vessels on sheltered waters voyages or those on vessels of 500 GT or less. The Specialized Passenger Safety Management certificate provides training on crowd management, crisis management and human behaviour in emergencies, passenger safety, and safety for personnel providing direct services to passengers. It also provides familiarization training.

While passenger vessels that are on sheltered waters voyages are closer to shore and shore-based emergency responders than vessels on other types of voyages, there are a number of types of emergencies that need an immediate response that cannot await the arrival of shore-based responders.

Currently in Canada, there are only 46 passenger vessels greater than 500 GT, while there are 5025 passenger vessels of 500 GT or less.[46] The maximum complement of a passenger vessel depends on more factors than just its gross tonnage, which means that passenger vessels of 500 GT or less may be carrying more passengers than those greater than 500 GT. Requiring training for only vessels greater than 500 GT leaves out the majority of passenger vessels.

The *Sam McBride* is less than 500 GT and was on a sheltered waters voyage. None of the crew members had received such training, nor were they required to. Following an occurrence on board the passenger vessel *Island Queen III* in 2017, the TSB issued a safety concern about the lack of a requirement for training in passenger safety management for crew members on all vessels carrying more than 12 passengers on sheltered water voyages. However, TC has yet to implement passenger management training requirements to fully address this concern. If all passenger vessel crew members are not trained in passenger safety management, there is a risk that they will not be prepared to manage passengers in emergency situations.

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[46] The numbers for passenger vessels were obtained from a query of the Transport Canada Vessel Registry on 17 May 2024 using the vessel type "Passengers." Vessels may have safe manning documents to operate on different classes of voyage, so it is difficult to assign an accurate number of vessels to each class of voyage.

For this reason, the Board recommends that

> the Department of Transport implement a requirement for crew members of all passenger vessels, including those on sheltered waters voyages, to complete appropriate training in passenger safety management.
>
> **TSB Recommendation M24-01**

### 4.2.2 Passenger vessel evacuation procedures

The *Life Saving Equipment Regulations* require all passenger vessels to have an evacuation procedure that dictates how all passengers and crew members will be evacuated from the vessel within 30 minutes of the abandon ship signal being given. Although this regulatory requirement is in place, TC has no formal procedure to assess if this requirement is being met. Operators who develop evacuation procedures have no approval process to confirm their procedure meets the requirement or to obtain approval from the regulator. Presently, each TC inspector or recognized organization surveyor is left to individually determine how this requirement is assessed; the requirement is most frequently assessed by the inspector or surveyor witnessing a drill on board the vessel.

For vessels, emergency drills are an opportunity to validate the evacuation procedures; the *Fire and Boat Drills Regulations* require that the master of a vessel ensure that drills are carried out as if they were a real emergency, as far as is feasible. For a passenger vessel, realistic drills require a large number of people acting as passengers, as indicated in TC's Ship Safety Bulletin 04/2022. However, due to the logistical challenges of finding and managing a large number of volunteers, "as far as is feasible" often means that drills are conducted without passenger involvement, which means the drill cannot evaluate the crew's ability to evacuate passengers from the vessel.

As is the case for many other vessels, drills on the *Sam McBride* were typically carried out without passengers on board, which meant that they did not provide an opportunity to realistically validate the feasibility of the vessel's evacuation procedure. The investigation determined that the evacuation procedures for *Sam McBride* were not sufficient to support the evacuation of a large number of passengers, as they required crew members to be in multiple places simultaneously, assist an unreasonably large number of passengers, potentially complete multiple tasks at once, and move quickly within the vessel even if it was crowded. If passenger evacuation procedures are not validated through a realistic exercise with a representative number of participants, a vessel's crew will be insufficiently prepared for an emergency and passengers will be at an elevated risk of injury or death.

The issues found in the *Sam McBride*'s evacuation procedure are the latest example pointing to a need for TC to validate passenger vessels' evacuation procedures. In 2020, following the occurrence on board the passenger vessel *Island Queen III*, the Board issued a safety concern regarding the risk to passengers if evacuation procedures are not validated. More

than 4 years later, the safety deficiency still exists and the risk to passengers remains high. Therefore, the Board recommends that

> the Department of Transport implement a formal validation and approval process for passenger vessel evacuation procedures.
>
> **TSB Recommendation M24-02**

### 4.2.3 Passenger counting

In any emergency, it is essential to have an accurate count of passengers. Without an accurate count, a crew and emergency responders will be unable to determine if all passengers have been accounted for. To this end, the *Fire and Boat Drills Regulations* require that, before a passenger vessel sails, the master be provided with the number of persons on board and with details of persons who have declared a need for special care or assistance during an emergency. On voyages of 12 hours or more, there is also a requirement to keep a separate count of the number of children and infants; however, there is no such requirement for voyages of less than 12 hours.

When passengers were boarding the *Sam McBride* or other Toronto Island Park ferries, the number of passengers was estimated (counted in groups of 5 to 10) by a member of the crew and tracked using a hand-held tally counter. However, this method did not give the exact number of passengers boarding and meant that, in the event of an emergency, it would not be possible to account for all passengers. As well, the Toronto Island Park ferries did not keep a separate count of children and infants on board, nor were they required to. However, this meant that there was no way to determine whether there was an adequate number of lifejackets available in the appropriate sizes for the passengers on board.

Although TSB Recommendation M08-01 addressing passenger counting procedures on board ferries was closed as Fully Satisfactory in July 2010, 4 subsequent investigations[47] have shown that the provisions in the *Fire and Boat Drills Regulations* requiring an accurate count of passengers are not being consistently met. If there is no accurate method to count the passengers boarding a vessel, there is a risk that not all passengers will be accounted for in an emergency. Furthermore, if there is no method to identify passengers that require special care or additional assistance during an emergency and there are no provisions in place to provide this additional assistance, the safety of these passengers may be compromised.

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47 TSB marine transportation safety investigations M22A0312, M17C0179, M15A0009, and M13L0067.

Therefore, the Board recommends that

> The Department of Transport implement a process to validate that passenger vessels are keeping an accurate count of all passengers, including a separate count of the number of children and infants, on all voyages.
>
> **TSB Recommendation M24-03**

This report concludes the Transportation Safety Board of Canada's investigation into this occurrence. The Board authorized the release of this report on 24 July 2024. It was officially released on 19 August 2024.

Visit the Transportation Safety Board of Canada's website (www.tsb.gc.ca) for information about the TSB and its products and services. You will also find the Watchlist, which identifies the key safety issues that need to be addressed to make Canada's transportation system even safer. In each case, the TSB has found that actions taken to date are inadequate, and that industry and regulators need to take additional concrete measures to eliminate the risks.

# APPENDICES

## Appendix A – General arrangement of the *Sam McBride*

**Figure A1. Profile view of the *Sam McBride* (Source: Allswater Naval Architects & Engineers, *City of Toronto, Sam McBride and Thomas Rennie, Intact and Damage Stability Booklet*, Revision 3 [03 February 2014])**

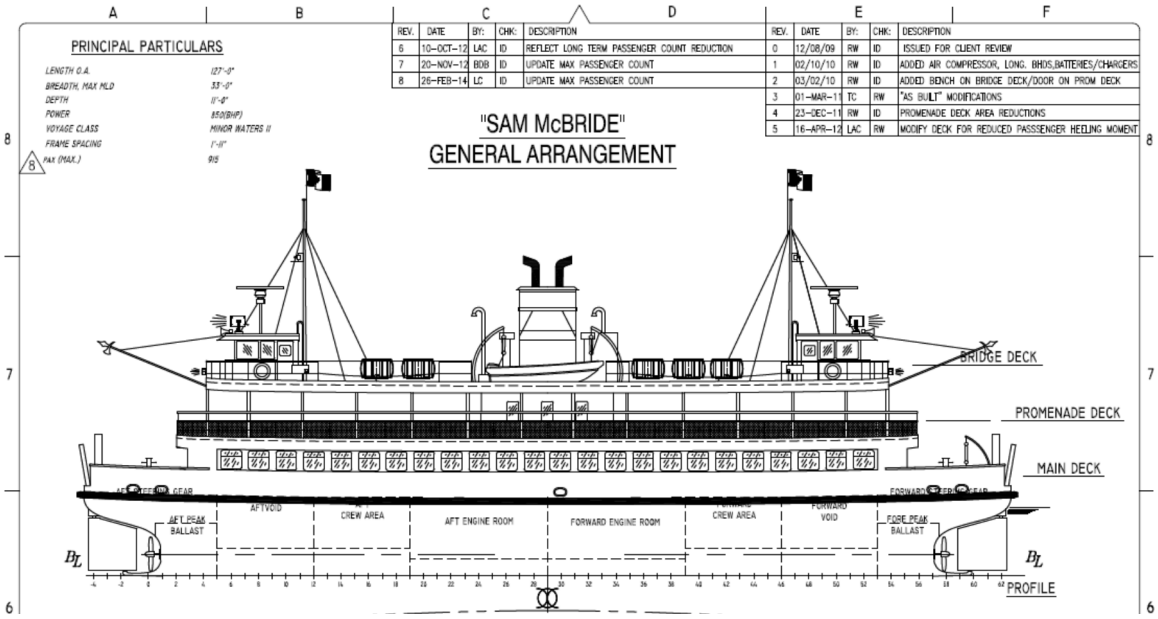



**Figure A2. Diagram of the bridge deck and promenade deck of the *Sam McBride* (Source: Allswater Naval Architects & Engineers, *City of Toronto, Sam McBride and Thomas Rennie, Intact and Damage Stability Booklet*, Revision 3 [03 February 2014])**

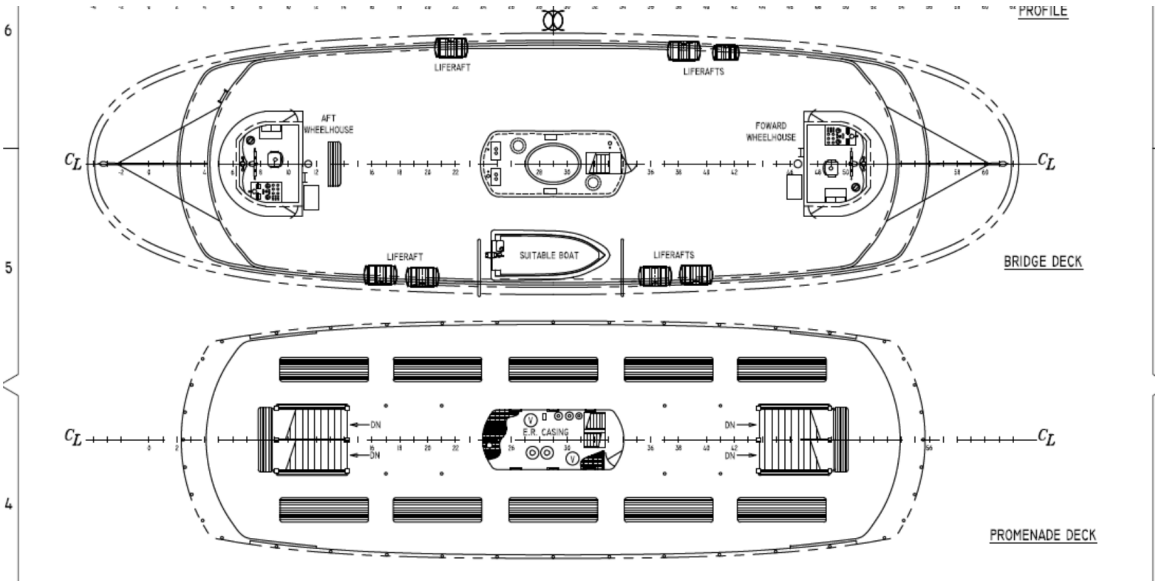
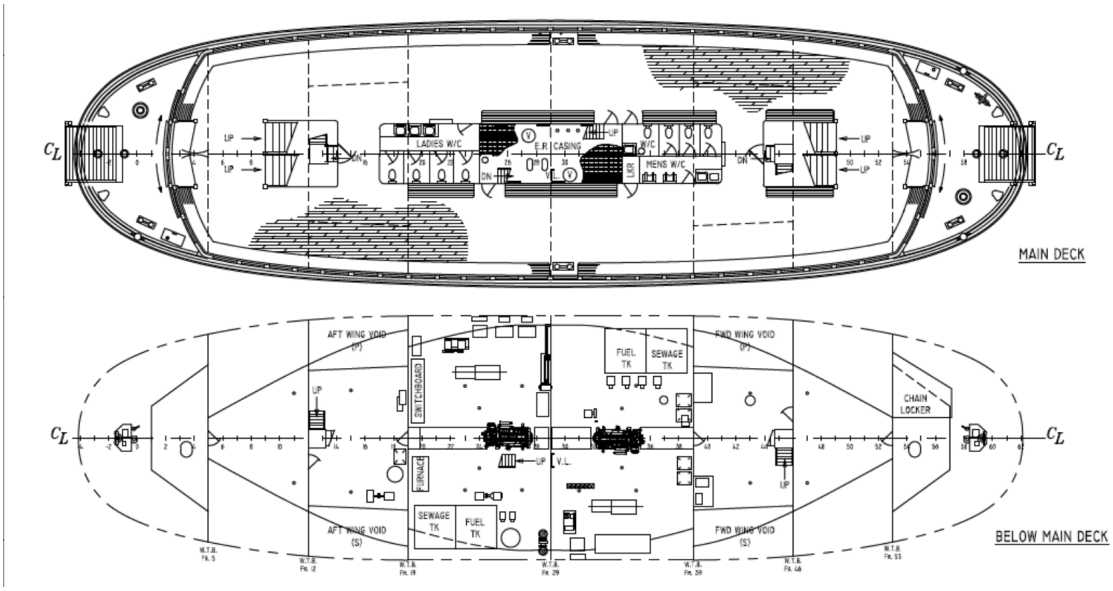


**Figure A3. Diagrams of the main deck and below main deck of the *Sam McBride* (Source: Allswater Naval Architects & Engineers, *City of Toronto, Sam McBride and Thomas Rennie, Intact and Damage Stability Booklet*, Revision 3 [03 February 2014])**



## Appendix B – Toronto Ferries fire and evacuation procedures

**Figure B1. Fire on board procedure (Source of procedure: City of Toronto. Source of image: TSB)**

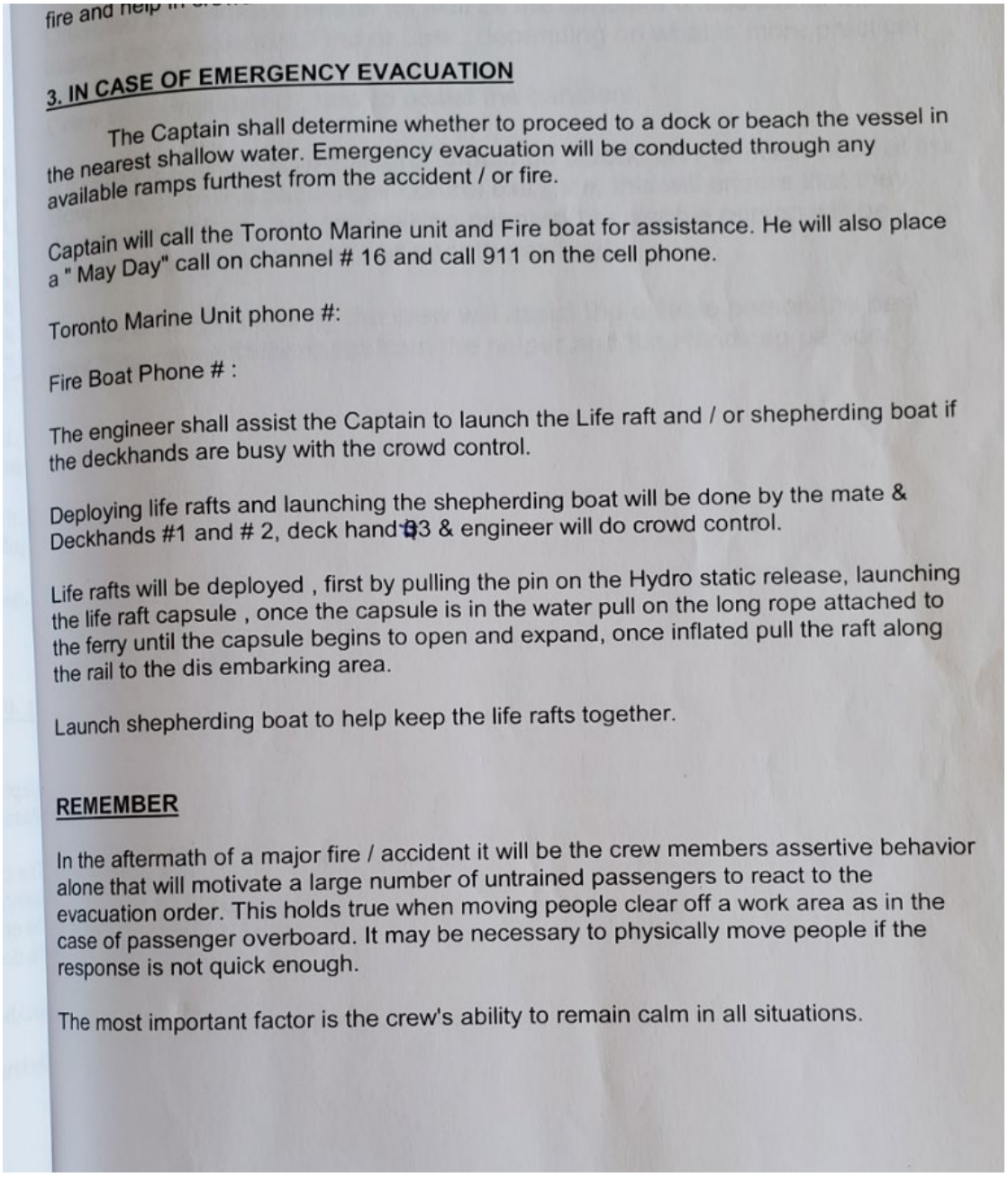
**JACK LAYTON FERRY TERMINAL**

**FIRE ON BOARD PROCEDURE**

| | |
|---|---|
| **Upon observing or receiving a report of smoke or flames:** | |
| 1. | Immediately investigate the report<br>- Take a fire extinguisher to the location |
| 2. | Notify the officer in charge by the quickest means possible.<br>- Provide location of reported smoke/ fire. |
| 3. | Attempt to put out the fire with the extinguisher brought to the scene if source can be located. |
| 4. | If the fire is larger than can be contained by an extinguisher alone; wait for the officer in charge and follow instructions for fire fighting. |
| **Upon receipt of the emergency, officer in charge should take the following actions:** | |
| 1. | Notify Master of the emergency. |
| 2. | Make an announcement via the P.A. system regarding the nature of the emergency. |
| 3. | Notify Engine Room of the emergency. |
| 4. | Prepare to fight the fire.<br>- Instruct crew to close all appropriate vents and doors.<br>- Instruct crew to prepare fire hose<br>- Instruct crew to bring extra fire extinguishers<br>- Instruct crew to prepare fire buckets. |
| 5. | Update Master continuously regarding the state of the emergency.<br>- Example – fire is under control, fire is uncontrollable or, hoses have been readied and are in use. |
| 6. | Instruct a deckhand to assist passengers with donning of lifejackets. |
| **Upon receipt of the emergency, Master should take the following actions:** | |
| 1. | Notify other vessels in the area of your emergency via VHF radio |
| 2. | Sound on the ship's whistle continuous blasts |
| 3. | Call 911 from the ship's phone and inform them your location. |
| 3. | Contact the Security office to be ready to recieve fire personnel at the dock to assist in the fire fighting efforts. |
| 4. | Contact Toronto Marine Fire Unit – 416-931-2336 |
| 5. | Return to the dock as soon as possible. |

UPDATED 2020/05/21 CAPTAINSOFFICE

**Figure B2. Emergency evacuation procedure (Source of procedure: City of Toronto. Source of image: TSB)**



fire and help in

**3. IN CASE OF EMERGENCY EVACUATION**

The Captain shall determine whether to proceed to a dock or beach the vessel in the nearest shallow water. Emergency evacuation will be conducted through any available ramps furthest from the accident / or fire.

Captain will call the Toronto Marine unit and Fire boat for assistance. He will also place a " May Day" call on channel # 16 and call 911 on the cell phone.

Toronto Marine Unit phone #:

Fire Boat Phone # :

The engineer shall assist the Captain to launch the Life raft and / or shepherding boat if the deckhands are busy with the crowd control.

Deploying life rafts and launching the shepherding boat will be done by the mate & Deckhands #1 and # 2, deck hand #3 & engineer will do crowd control.

Life rafts will be deployed , first by pulling the pin on the Hydro static release, launching the life raft capsule , once the capsule is in the water pull on the long rope attached to the ferry until the capsule begins to open and expand, once inflated pull the raft along the rail to the dis embarking area.

Launch shepherding boat to help keep the life rafts together.

**REMEMBER**

In the aftermath of a major fire / accident it will be the crew members assertive behavior alone that will motivate a large number of untrained passengers to react to the evacuation order. This holds true when moving people clear off a work area as in the case of passenger overboard. It may be necessary to physically move people if the response is not quick enough.

The most important factor is the crew's ability to remain calm in all situations.

## Appendix C – Previous occurrences

**M22A0312 (*Confederation*)** – The passenger vessel *Confederation*, with 217 passengers on board, sustained a rudder failure and grounded. The number of passengers was not recorded prior to sailing and the master did not receive the official count of passengers until more than an hour after the occurrence began.

**M20P0110 (*Spirit of Vancouver Island*)** – The passenger vessel *Spirit of Vancouver Island*, with 208 passengers on board, struck the ferry dock. The report included a safety message regarding safe speed when making an approach to a dock.

**M17C0179 (*Island Queen III*)** – The passenger vessel *Island Queen III*, with 279 passengers on board, made bottom contact, flooding the steering compartment. The investigation made findings related to familiarization with and quantities of lifesaving equipment and the counting of passengers, safety management systems (SMS), and emergency procedures. The investigation report included 3 safety concerns: the lack of requirement for infant lifejackets, the lack of assessment of passenger evacuation procedures, and the gap in training in passenger safety management for crew on sheltered waters voyages.[48]

**M15A0009 (*Grace Sparkes*)** – The passenger vessel *Grace Sparkes*, with 8 crew and 4 passengers on board, struck a rock. The investigation made findings related to the need for comprehensive documented emergency procedures, realistic drills, the determination of minimum safe manning to include passenger mustering and accounting, and Transport Canada oversight of passenger-safety related emergency procedures.

**M14C0156 (*La Relève II*)** – The passenger vessel *La Relève II*, with 33 passengers on board, had a fire in the engine compartment. The investigation made findings related to SMS and Transport Canada oversight, including the applicability of the Safe Manning Document to vessel operations.[49]

**M13L0067 (*Louis Jolliet*)** – The passenger vessel *Louis Jolliet,* with 57 passengers and 21 crew on board, ran aground. The investigation made findings related to emergency management training for crew, comprehensive documented procedures, and realistic drills for passenger safety management. The report also documented a discrepancy between the number of passengers on board and the number recorded in the vessel's logbook.[50]

**M13M0287 (*Princess of Acadia*)** – The passenger vessel *Princess of Acadia*, with 63 passengers and 24 crew on board, ran aground. Two passengers were initially unaccounted for, and were found by the crew 15 minutes after the initiation of the emergency. The report made findings related to the importance of written safety procedures.

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48 TSB Marine Investigation Report M17C0179.

49 TSB Marine Investigation Report M14C0156.

50 TSB Marine Investigation Report M13L0067.

**M12C0058 (*Jimaan*)** – The passenger vessel *Jimaan*, with 18 passengers and 16 crew members onboard, ran aground. The investigation made findings regarding safety-related emergency procedures and passenger management. The Board expressed a concern that if Transport Canada marine safety inspectors do not assess muster lists and evacuation plans for compliance and adequacy and Transport Canada does not provide interpretive guidelines, compliance with passenger safety regulations may be inadequate, thereby negating the potential safety benefits of such regulations.

**M06W0052 (*Queen of the North*)** – The passenger vessel *Queen of the North,* with 59 passengers on board, struck land and sank, resulting in 2 fatalities. The investigation made findings related to counting of passengers, assessment of emergency procedures, and SMS.

The Board issued 3 recommendations in this report, including a requirement to develop effective passenger accounting (M08-01), realistic exercises so that operators of passenger vessels can evaluate the preparedness of their crews (M08-02), and an extension of the requirement to carry voyage data recorders (M08-03).[51]

**M04L0105 (*Famille Dufour II*)** – The high-speed passenger vessel *Famille Dufour II*, with 159 passengers on board, struck the wharf at 8.7 knots, resulting in injuries to 9 passengers and 1 crew member. The investigation made findings related to the accessibility of lifejackets, training in passenger and crowd management, a lack of emergency drills, and the unavailability of appropriate safety information.

**M00C0033 (*True North II*)** – The small passenger vessel *True North II*, with 19 passengers on board, foundered and sank, resulting in 2 fatalities. The investigation made findings related to the adequacy of crewing, the absence of a pre-departure safety briefing, and inadequate quality assurance procedures in relation to the annual ship inspection program.

**M98F0023 (*Seaflight I)*** - The small passenger vessel *Seaflight I*, travelling at 33 knots with 8 passengers on board, struck 4 anchored pleasure crafts following a failure of its rudder system. The investigation made findings regarding the absence of a safety management system and the design of the vessel's steering system.

**M98C0046 (*Sunrise V*)** – On 23 August 1998, the passenger hydrofoil ferry *Sunrise V*, with no passengers on board, made contact with a submerged object off Four Mile Point, Ontario. The investigation made findings regarding the absence of a safety management system, passage planning, and detailed operating procedures.

**M98C0040 (*Sunrise V*)** – On 18 August 1998, the passenger hydrofoil ferry *Sunrise V*, with 4 passengers on board, sustained damage in heavy weather on Lake Ontario, resulting in injuries to 1 passenger. The investigation made findings as to excessive operating speed.

**M97C0054 (*Thomas Rennie*)** – The Toronto Island Park ferry *Thomas Rennie*, with 5 passengers on board, struck a dolphin and the Toronto dock, resulting in injuries to a

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51 TSB Marine Investigation Report M06W0052.

passenger and a crew member. The investigation made findings related to the organization's planned maintenance system, passenger communications, and bridge ressource management procedures.