Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

MARINE INVESTIGATION REPORT M13C0071

STRIKING AND SUBSEQUENT GROUNDING

GENERAL CARGO SHIP *CLAUDE A. DESGAGNES*
IROQUOIS, ONTARIO
06 NOVEMBER 2013

Canada

Marine Investigation Report M13C0071

Striking and subsequent grounding

General cargo ship *Claude A. Desgagnes*
Iroquois, Ontario
06 November 2013

Summary

On 06 November 2013, at approximately 2305 Eastern Standard Time, the general cargo vessel *Claude A. Desgagnes* struck the upper approach wall of the Iroquois Lock in the St. Lawrence Seaway near Iroquois, Ontario. The vessel then crossed the channel and ran aground. No pollution or injuries were reported; however, the vessel sustained minor damage.

Le présent rapport est également disponible en français.

Factual information

Particulars of the vessel

Name of vessel	*Claude A. Desgagnes*
IMO* number	9488059
Port of registry	Bridgetown, Barbados
Flag	Barbados
Type	General cargo ship
Gross tonnage	9627
Length[1]	138.5 m
Draught at occurrence	Forward: 7.95 m Aft: 8.00 m
Built	2011, Taizhou Sanfu Ship Engineering Co. Ltd., China
Propulsion	1 medium speed 4-stroke diesel engine (5400 kW at 514 rpm) driving a single controllable-pitch propeller
Cargo	Corn (10 700 metric tons)
Crew	16
Registered owner	Transport Desgagnés Inc., Quebec, Canada
Manager	Clipper Projects Shipping Ltd., Nassau, Bahamas

* IMO: International Maritime Organization

Description of the vessel

The *Claude A. Desgagnes* is a steel-hulled general cargo vessel with machinery spaces and accommodations aft (Photo 1). The vessel is fitted with 3 cargo holds serviced by 2 cranes mounted on the vessel's port side; each crane has a lifting capacity of 150 tonnes. The vessel also has a 500 kW bow thruster.

[1] Units of measurement in this report conform to International Maritime Organization Standards or, where there is no such standard, are expressed in the International System of Units.

The bridge main control console is located on the centreline of the vessel, and is fitted with the following navigational equipment: echo sounder, electronic chart display, radar, and GPS. The chart table and Global Marine Distress and Safety System (GMDSS) console are situated aft of the main console.

History of the voyage

On 06 November 2013, at 0400,[2] the *Claude A. Desgagnes* departed Hamilton, Ontario, bound for Londonderry, Northern Ireland. The vessel proceeded eastward across Lake Ontario under the conduct of a marine pilot, and arrived at the pilot station in Cape Vincent, New York, at 1650, where a relief pilot embarked. The relief pilot had been assigned by the Great Lakes Pilotage Authority to navigate the vessel from Cape Vincent, to the Iroquois Lock, a trip of approximately 6 hours covering a distance of 64 nautical miles (nm). Upon boarding, the relief pilot exchanged information with the departing pilot about the vessel's manoeuvring characteristics and had a discussion with the master according to the subjects itemized on the master-pilot checklist.

Photo 1. *Claude A. Desgagnes*

The vessel began the transit on the St. Lawrence River towards the Iroquois Lock with a bridge team that consisted of the pilot, an officer of the watch (OOW), and a helmsman. There were 2 vessels downbound ahead of the *Claude A. Desgagnes:* the *Algolake* and the *Rt. Hon. Paul J. Martin*.

As the *Claude A. Desgagnes* proceeded downbound, the pilot ascertained that a minimum speed of 6 knots[3] was required to maintain steerage and keep a safe distance astern of the *Rt. Hon. Paul. J. Martin.* While passing the Ogdensburg Bridge, the pilot had to begin issuing more frequent helm and engine orders to maintain steerage because of the current and the vessel's manoeuvring characteristics.

At 2218, the pilot advised the OOW that, once they reached the lock, there was a possibility of using the starboard anchor to slow down the vessel and manoeuvre to the upper approach wall; the anchor would be lowered slowly and dragged on the bottom. The pilot's consideration of this option, called dredging, was based on many factors, including the difficulty in maintaining steerage at reduced speed and the proximity of the traffic ahead. The pilot believed that the vessel would lose steerage way due to the effect of the controllable-pitch propeller blanking the rudder.

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2 All times are Eastern Standard Time (Coordinated Universal Time minus 5 hours).

3 All speeds are speed over the ground (SOG).

At 2223, the master came to the bridge. Four minutes later, the pilot reported to Seaway Iroquois[4] and was informed that the *Algolake* was scheduled to enter the Iroquois Lock first, followed by the *Rt. Hon. Paul J. Martin*. The *Claude A. Desgagnes* was to follow behind these 2 vessels. There was no reported upbound traffic.

At 2241, the pilot informed the master of his intention to dredge the starboard anchor to slow down the vessel for the upcoming manoeuvre to the upper approach wall. The master responded by asking for clarification, but the pilot's intended manoeuvre was not discussed further.

The *Algolake* departed the Iroquois Lock downbound. At 2248, the *Rt. Hon. Paul J. Martin* was manoeuvring into the lock, while the *Claude A. Desgagnes* was an estimated 550 m astern[5] and approaching at approximately 5 knots. At 2253, the pilot requested that the master lower the starboard anchor to the water level. The master did so but stated that the water depth could be a risk. The pilot responded that this was a standard manoeuvre.

At 2254, the master suggested reducing speed but the pilot explained that this was not a viable option because of the direction and force of the current.

At 2259, as the vessel approached the lock entrance, the pilot requested the use of the starboard anchor in order to slow down the vessel and to dredge to port towards the upper approach wall. The master did not initiate the action. The pilot then told the master to take command and control of the vessel; however, this transfer was not repeated or confirmed.[6] The pilot and master both continued to issue orders to the helmsman, who, at one point, decided to follow the master's orders. The pilot also issued engine directions to the master, who performed them and repeated them back to the pilot.

At 2305, the pilot again requested the starboard anchor to be lowered, but, again, this was not initiated. As the vessel continued to turn to starboard, the pilot requested the use of the port anchor to slow down the vessel and dredge to starboard in order to prevent the vessel's stern from striking the upper approach wall, but this was not executed by the master. At 2305:59, the vessel's speed was 3 knots and the pilot reported to Seaway Iroquois that the master refused to use the anchors. At 2306:26, the vessel's port quarter struck the upper approach wall.

Immediately following the striking, the master applied astern propulsion and ordered the second officer to lower the stern anchor in an attempt to slow down the vessel. The pilot and master continued to issue helm and engine orders in an attempt to realign the vessel; however, they were unable to regain control of the vessel's heading and speed. The vessel crossed the channel and ran aground at 2312.

Shortly after the grounding, the tanks were sounded, and the vessel proceeded to the upper approach wall under its own power, where the pilot disembarked. At 2330, the master logged

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4 The Seaway Iroquois Traffic Control Station provides traffic services from Crossover Island to Bradford Island.

5 Approximately 3 to 4 ship lengths.

6 During a change of con, bridge team officers normally repeat and confirm which officer has command of the vessel.

that the vessel was secured and, when the relief pilot arrived on board, he reported the same to Seaway Iroquois.

After the occurrence, the St. Lawrence Seaway was closed to downbound traffic for more than 15 hours while the *Claude A. Desgagnes* was inspected for damage.

Damage to the vessel

The inspection identified 2 indentations between frames 0 and 6 on the aft port side of the hull at the upper deck level. The side shell plating was found buckled and holed above the main deck. Ten frames in the internal structure were deformed.

Environmental conditions

On the night of the occurrence, the weather was overcast with periods of heavy rain and reduced visibility. The wind was from the southwest at 15 to 20 knots, and the air temperature was 0°C. The current was flowing in a northeasterly direction at 1.5 knots, which was considered standard for this section of the river.

Vessel certification

The *Claude A. Desgagnes* was certified and equipped in accordance with existing regulations.

On 25 October 2013, the *Claude A. Desgagnes* was inspected by the St. Lawrence Seaway Authority and cleared for transit. During this inspection, it was noted that the vessel was not fitted with landing booms and, as such, was required to adhere to the Seaway's tie-up service at the approach walls in order to transit the St. Lawrence Seaway.

Personnel certification and experience

The crew members of the *Claude A. Desgagnes* were certified for their positions on board. The master had sailed as master since 2005 and had held this position on the *Claude A. Desgagnes* since October 2013. The master had transited the St. Lawrence Seaway approximately 12 times since 2001 and obtained a certificate in Radar Navigation in 2010; this certification incorporated bridge teamwork.

The OOW had sailed as a deck officer since January 2013 and joined the *Claude A. Desgagnes* in October 2013. The helmsman had sailed since 2007 and joined the *Claude A. Desgagnes* in October 2013. In 2012, the helmsman had sailed on another vessel from the same company that navigated the St. Lawrence Seaway.

The pilot held a U.S. Merchant Marine Officer licence with the U.S. Coast Guard that was issued on 25 March 2009. This licence permitted him to act as a first class pilot on vessels of any gross tonnage in the U.S. Great Lakes District 1.[7] He was employed with the St. Lawrence Seaway

[7] U.S. Great Lakes District 1 covers the area between Snell Lock and Cape Vincent, New York.

Pilots Association and had obtained certification in Bridge Resource Management (BRM) in 2011.

Pilotage in the Montréal to Lake Ontario sector

Pilotage is compulsory by regulation for vessels in transit through the St. Lawrence Seaway between Montréal and Lake Ontario.[8] This sector comprises 7 locks and its navigation channel has a minimum width of 61 m and a controlling depth[9] of 8.23 m. Pilotage services in this sector are provided jointly by the Great Lakes Pilotage Authority and the U.S. Coast Guard. Pilots employed by the Great Lakes Pilotage Authority are licensed in Canada, while pilots employed by the U.S. Coast Guard are registered and licensed in the U.S.

The respective obligations of pilots and bridge teams are well established within an international context. The *Standards of Training, Certification and Watchkeeping Code* emphasizes the importance of an ongoing exchange of information between the master and the pilot and states that "despite the duties and obligations of pilots, their presence on board does not relieve the master or officer in charge of the navigational watch from their duties and obligations for the safety of the ship." Additionally, the International Maritime Organization's Resolution A960 states, "Masters and bridge officers have a duty to support the pilot and to ensure that his/her actions are monitored at all times" and, "The master, bridge officers and pilot share a responsibility for good communications and understanding of each other's role for the safe conduct of the vessel in pilotage waters."[10]

In this occurrence, the pilot had a duty to conduct the vessel and was responsible to the master for the vessel's safe navigation. The master was responsible for the overall command of the vessel.

When a vessel is under the conduct of a pilot, the master has the authority to relieve the pilot of the conduct if the master believes that the pilot's actions are endangering the vessel's safety.

Manoeuvring on the approach to the Iroquois Lock

Some of the factors that a navigator may consider when approaching, entering, or leaving a lock are the vessel's estimated time of arrival, other vessel traffic in or near the lock, approach techniques, environmental conditions (e.g., current and weather), anchor use, and emergency manoeuvres.

In this occurrence, the pilot requested to use an anchor manoeuvre referred to as dredging, a common practice used at the Iroquois Lock. This manoeuvre first requires using the anchor at short stay to slow down the vessel and, second, as a pivot point while the current acts on the hull and rudder and moves the vessel laterally. The most efficient movement is obtained when the anchor opposite to the vessel's intended direction is used.

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8 Vessels require either a licensed pilot or holder of a pilotage certificate during the transit.

9 Controlling depth is the minimum depth over the chart datum at which the channel is maintained.

10 International Maritime Organization, Resolution A960, Annex 2, paragraphs 2.2 and 2.3.

The master's preferred manoeuvre was to reduce the vessel's speed by using the main engine to approach the lock. The master was not in the practice of using the anchor for lock approaches and had never used the anchor at Iroquois Lock.

Under-keel clearance

Under-keel clearance is defined as the difference between the available water depth and the vessel's actual draught. In shallow water, under-keel clearance may be influenced by squat (the reduction of under-keel clearance resulting from bodily sinkage and change of trim that occurs when a vessel moves through the water).

In this occurrence, the *Claude A. Desgagnes'* mean draught was 7.9 m and the minimum available water depth in the area at the time of the occurrence was 9.83 m. Therefore, the minimum available under-keel clearance was 1.93 m, or 25% of the vessel's maximum draught. Due to the speed of the vessel, the influence of squat was negligible.

Decision making

Decision making can be defined as a four-step sequence: gathering information, processing that information, making a decision based on possible options, and then acting on that decision. Once a decision has been implemented, the process starts over again as new information is gathered while monitoring the effects of the decision. Decisions can be influenced by a wide range of factors such as individual perception of the situation, experience, training, expectations, time constraints, and contextual elements. Once a decision is made, there is a tendency for an individual to continue with the selected course of action unless there are compelling reasons not to do so. Additionally, people will often seek out elements that reinforce and support, not contradict, the decision that has already been made. Past experience under similar circumstances can make people reluctant to select a different course of action.

In this occurrence, one of the key decisions that needed to be made was how to approach the lock wall. The pilot's proposal to dredge the anchor as a means of slowing down the vessel was based on previous experience of having used this method successfully with vessels having similar characteristics. Other factors that influenced the pilot's perspective included time, wind speed and direction, current, and the limited space available with a vessel ahead going through the lock.

The master decided that reducing the vessel's speed using the main engine, instead of dredging the anchor, was the best course of action in the approach. His decision was based on the prevailing conditions, his background, and his previous experience. This previous experience included work for a company where anchors were not permitted to be deployed in non-emergency situations or where there was less than a minimum of 3 m of under-keel clearance. That company requirement was based on an incident where another company vessel had deployed the anchor in the proximity of a lock but had overridden the anchor, causing damage to the vessel.

Bridge communication

Effective bridge communication is a central concept in BRM,[11] as it enables bridge team members to develop a common understanding (or shared mental model) of how individual tasks will be carried out and how the voyage will progress overall. In order for BRM to be effective, information and intentions must be communicated and updated as the voyage progresses.

An important characteristic of effective bridge team communication is that it remain open and interactive at all times. This requires bridge team members to participate actively in exchanges of information and work towards "closed-loop" communication, whereby information is given, repeated by the receiver, and re-confirmed by the issuer. Closed-loop communication helps reduce the potential for misunderstandings and is routinely used for tasks such as a transfer of conduct. The International Maritime Organization (IMO) provides the following best-practice example of a transfer of conduct between officers that employs repetition and confirmation to ensure that all bridge team members are aware of who is at the con:

> (The Master or an officer handing over the watch should say:)
> You now have the watch.
> (The relieving officer should confirm and say:)
> I now have the watch.
> (The Master when called to the bridge and taking over the conn from the officer of the watch, should say:)
> I now have the conn.
> (The officer of the watch should confirm and say:)
> You now have the conn.[12]

Effective communication is also fundamental to the master-pilot exchange, whereby the master and pilot discuss and agree on plans, procedures, and contingencies prior to departure and then continue to exchange navigational information for the duration of the voyage. The IMO provides recommendations on master-pilot exchanges[13] and notes specifically that information exchanges should be a continuous process that starts when the pilot boards the vessel and continues for the duration of the pilotage. The IMO also notes that any passage plan is a basic indication of preferred intention, and both the pilot and the master should be prepared to depart from it when circumstances so dictate.

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11 Bridge Resource Management refers to the effective management and use of all resources, both human and technical, available to the bridge team to ensure the safe completion of a voyage.

12 International Maritime Organization, Standard Marine Communication Phrases (SMCP), MSC / Circ. 794, 10 June 1997, Section IV-A / 3.13.

13 International Maritime Organization Resolution A.960 (23) Recommendations on training and certification and on operational procedures for maritime pilots other than deep-sea pilots, 05 March 2004.

Previous occurrences

In 1995, the TSB published a safety issues investigation report entitled *A Safety Study of the Operational Relationship between Ship Masters/Watchkeeping Officers and Marine Pilots*.[14] The objective of this study was to identify safety deficiencies associated with teamwork on the bridge, including communication between marine pilots and masters / officers of the watch. The report reviewed 273 occurrences involving vessels under the conduct of a pilot in Canadian pilotage waters. Of these occurrences, 84 involved misunderstanding between pilot and master, inattention, or a lack of communication between the pilot and the OOW. In addition, the report noted that breakdowns in communication or teamwork on the bridge appeared to have been a factor in many of these occurrences. Among other things, misunderstandings between the bridge team, lack of adequate information exchange, and incomplete understandings of the intended manoeuvres were revealed to be symptomatic of problems in bridge practices in compulsory pilotage areas.

In November 2012, the bulk carrier *Tundra*[15] was under the conduct of a pilot when it exited the navigation channel in the St. Lawrence River and ran aground. The TSB investigation found that ineffective communication was a contributing factor: the pilot and other members of the bridge team were not exchanging information and thus the bridge team was unaware of the pilot's planned course change.

In December 2012, the bulk carrier *Cape Apricot*[16] was under the conduct of a pilot when it struck the causeway and conveyor system connecting Westshore Terminals berth 1 to the main terminal at Robert Banks, British Columbia. The TSB investigation revealed that communication between the master and pilot was ineffective during the approach: they did not identify the developing risk while the manoeuvre progressed and thus did not take timely corrective action.

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14 TSB Marine Investigation Report SM9501, http://www.tsb.gc.ca/eng/rapports-reports/marine/etudes-studies/ms9501/ms9501.asp. Last accessed 4 December 2014.

15 TSB Marine Investigation Report M12L0147

16 TSB Marine Investigation Report M12W0207

Analysis

Events leading to the striking and grounding

As the vessel proceeded downriver, the master and pilot spoke, but did not develop a shared understanding of the manoeuvre to be used in the approach to the Iroquois Lock. While the pilot had explained his plan to dredge the anchor to the officer of the watch (OOW) earlier in the voyage, the details of the plan were not relayed to the master when he arrived on the bridge. Although the pilot later informed the master of his intention to carry out the manoeuvre in broad terms, the master did not confirm that he understood or agreed with the manoeuvre. Neither the master nor the pilot discussed the plan further as the vessel approached the lock entrance. When the master ordered that the vessel's speed be reduced, the pilot advised against this due to the direction and force of the current at that time. Although the pilot requested the forward anchors be deployed, each time, the master declined.

When the vessel reached a critical point, close to the lock, the pilot once more requested the use of the anchor to slow down the vessel, but the master did not initiate the pilot's orders. The anchor was not dredged, nor was any other means of slowing down the vessel employed; therefore the vessel continued on its path and struck the upper approach wall. Following the striking, the master and pilot attempted to realign the vessel; however, they were unable to regain control due to the vessel's momentum, the wind, and the current. The vessel crossed the channel and ran aground.

Master and pilot exchanges

Master and pilot exchanges are a continuous process that starts from an initial, more formal, exchange and extends throughout the duration of the piloted voyage, as needed. Exchanges of information include agreements on plans and procedures, including contingency plans for the anticipated passage and discussions of any special conditions. These exchanges are vital for a bridge team to be effective. Insufficient or poor exchanges can result in the bridge team not sharing a common understanding.

The pilot and master of the *Claude A. Desgagnes* were not communicating effectively, did not agree on manoeuvres while approaching the lock, and did not discuss in detail their respective plans of action. A common understanding that ensures unity of action is achieved through open and interactive communication: open communication moves to closed-loop communication, whereby information is given by the issuer, repeated by the receiver, and re-confirmed by the issuer. The pilot and the master both knew that the vessel's speed of approach needed to be reduced; however, they each thought that their method was the best way to slow down the vessel in the approach, based on their individual experiences and knowledge.

The pilot and master were not communicating with each other in sufficient detail to allow them to achieve a mutual understanding and "close the loop"; this negated timely agreement and optimal decision making. Although there was a formal master-pilot exchange at the beginning of the voyage that employed a detailed checklist, the exchange did not address the dredging manoeuvre that was planned by the pilot to slow down the vessel in this occurrence. The pilot requested to have the anchor deployed and, each time, the master declined. The master at one

point suggested that the speed be reduced using the main engine, but the pilot indicated that the direction and force of the current prevented that manoeuvre.

The deficiencies in master and pilot exchanges found in this occurrence are consistent with the findings of TSB's safety issues investigation of 1995, *A Safety Study of the Operational Relationship between Ship Masters/Watchkeeping Officers and Marine Pilots*. That investigation determined that misunderstandings between masters and pilots, often caused by a lack of adequate communication, were a significant factor in many marine occurrences involving piloted vessels.

Therefore, if bridge team members do not exchange information in order to achieve a mutual understanding of a vessel's manoeuvres on an ongoing basis, there is a risk that crucial manoeuvres to ensure safe navigation will not be completed in a timely manner.

Transfer of conduct

To ensure safe navigation, it is essential that only one navigating officer have the conduct of a vessel at any given time. If more than one officer is at the con, there may be conflicting orders and delayed decision making. Transfers of conduct must be clear to ensure that the bridge team is aware of who is in control of the vessel.

Conventionally, the masters / watchkeeping officers and pilots involved in the transfer of the conduct of a vessel repeat and confirm their intentions. This repetition and confirmation clarifies the transfer process and ensures that only one navigating officer is making decisions and issuing orders. In this occurrence, the transfer of conduct was unclear and the helmsman was receiving orders from both the master and the pilot.

If bridge team members do not have clear orders from one officer who has the conduct of the vessel, there is a risk that they will be confused as to who has the conduct of the vessel, compromising decision making and the execution of orders.

Findings

Findings as to cause and contributing factors

1. Effective actions to slow down the vessel were not taken because the master and the pilot did not have a mutual agreement on the best manoeuvre to use in the approach to the Iroquois Lock.

2. The vessel was not slowed down by any means, such as dredging the anchor or using the main engine, and it struck the upper approach wall of the Iroquois Lock.

3. The bridge team was unable to regain control of the vessel following the striking and the vessel crossed the channel and ran aground.

Findings as to risk

1. If bridge team members do not exchange information in order to achieve a mutual understanding of a vessel's manoeuvres on an ongoing basis, there is a risk that crucial manoeuvres to ensure safe navigation will not be completed in a timely manner.

2. If bridge team members do not have clear orders from one officer who has the conduct of the vessel, there is a risk that they will be confused as to who has the conduct of the vessel, compromising decision making and the execution of orders.

Safety action

Safety action taken

Transport Desgagnés Inc.

Following this occurrence, the owner revised and updated the Bridge Manual Instructions included in its Quality, Safety, Security and Environmental Management System. This revision includes the Bridge Resource Management procedures required while the vessel is under the conduct of a pilot and, in particular, the responsibilities of the master and officer of the watch, supervision of the pilot, safe conduct of the vessel, and access to the vessel's bridge and equipment.

This report concludes the Transportation Safety Board's investigation into this occurrence. The Board authorized the release of this report on 05 November 2014. It was first released on 10 December 2014.

Correction

The report has been amended to provide a more detailed explanation of the pilot and bridge team's roles and responsibilities.

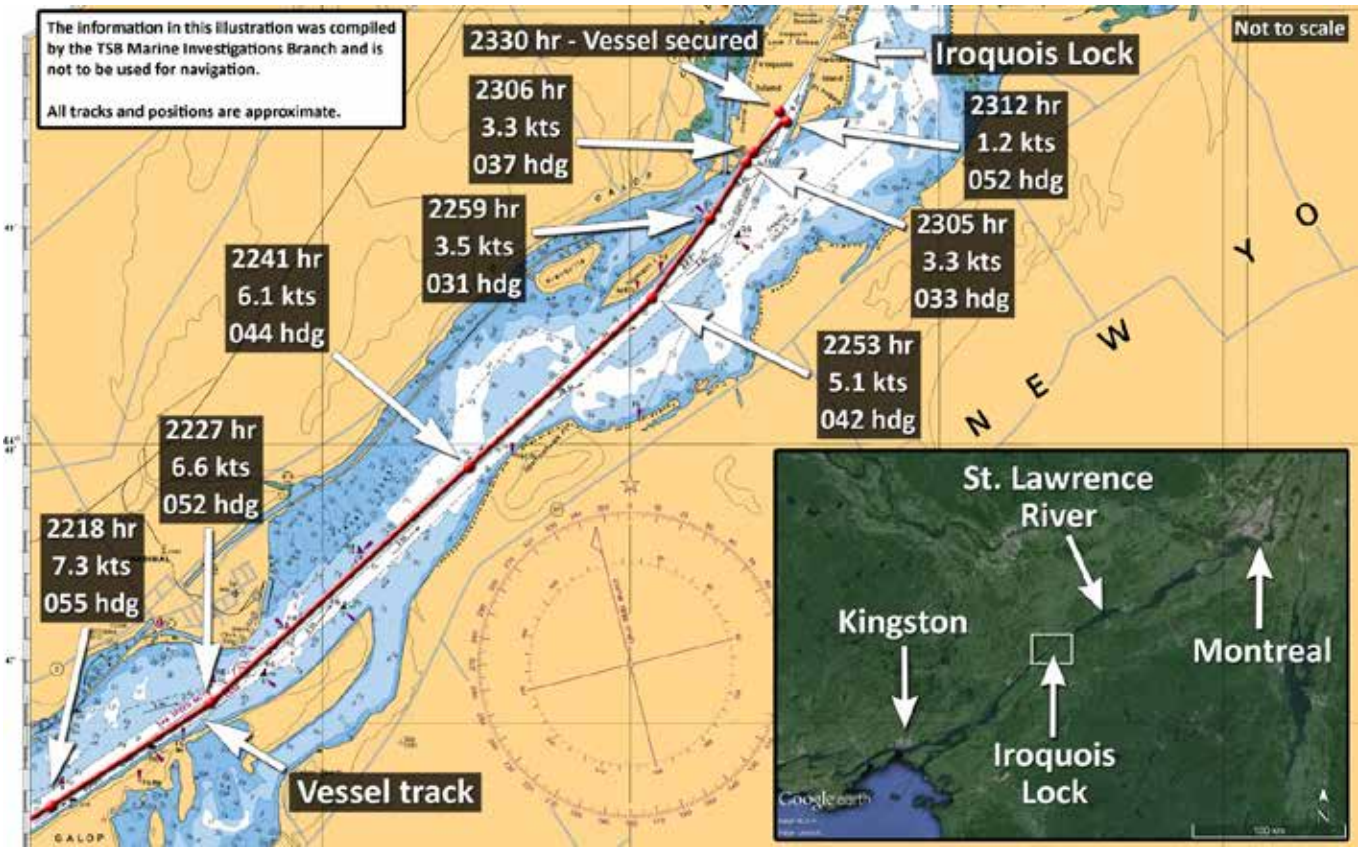
The last paragraph under *Decision making* ("Although the pilot issues orders and advises the master, the master is ultimately responsible for the safety of the vessel and on all decisions made, including which orders to enact") has been deleted, and new text (from the third sentence to the end of the section) has been added under *Pilotage in the Montréal to Lake Ontario sector*.

This correction was approved by the Board on 31 March 2015 and the corrected version of the report was released on 01 May 2015.

Visit the Transportation Safety Board's website (www.bst-tsb.gc.ca) for information about the Transportation Safety Board and its products and services. You will also find the Watchlist, which identifies the transportation safety issues that pose the greatest risk to Canadians. 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.

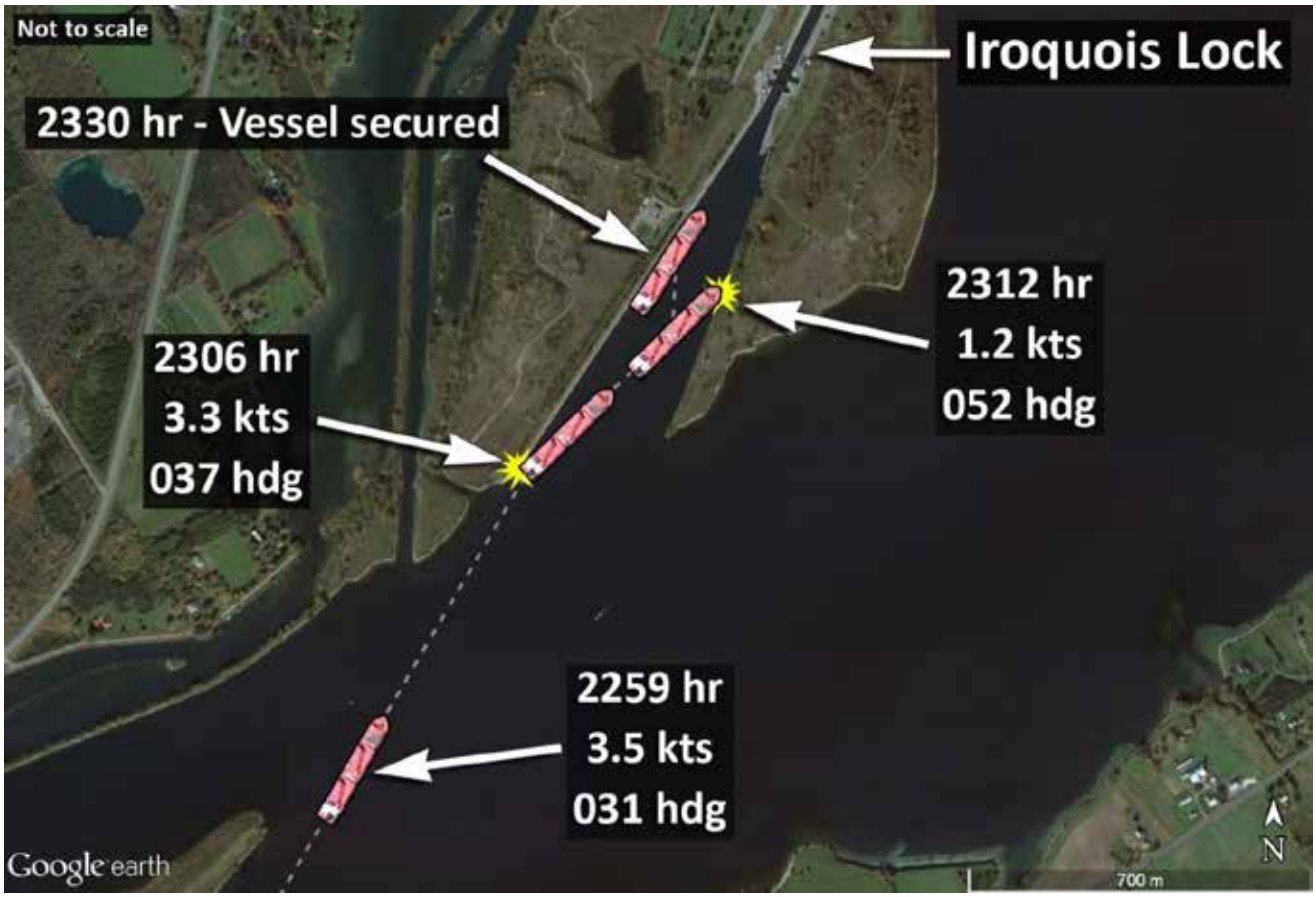
Appendices

Appendix A – Vessel's route to Iroquois Lock



Notes:
Chart based on an electronic navigation chart (ENC) provided by the Canadian Hydrographic Service.
Knots (kts)
Hour (hr)
Heading (hdg)

Appendix B – Occurrence location



(Source: Google Earth, with TSB annotations)

Notes:
2306 - Vessel strikes Iroquois Lock upper approach wall
2312 - Vessel runs aground
2330 - Vessel reported secured at Iroquois Lock upper approach wall