UNITED STATES COAST GUARD

REPORT OF THE INVESTIGATION

INTO THE

MICHIPICOTEN (IMO: 5102865) STRUCTURAL FAILURE WHILE UNDERWAY ON LAKE SUPERIOR ON JUNE 08, 2024.

MISLE ACTIVITY NUMBER: 7971638

U.S. Department of Homeland Security
United States Coast Guard

Commandant
United States Coast Guard

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16732/IIA #7971638
09 February 2026

STRUCTURAL HULL FAILURE OF THE CANADIAN FLAGGED BULK CARRIER MICHIPICOTEN (IMO #5102865) WHILE TRANSITING WESTERN LAKE SUPERIOR 25 NAUTICAL MILES SOUTHEAST OF GRAND MARAIS, MINNESOTA ON JUNE 8, 2024

ACTION BY THE COMMANDANT

The record and the report of the investigation convened for the subject casualty have been reviewed. The record and the report, including the findings of fact, analysis, conclusions, and recommendations are approved subject to the following comments. This marine casualty investigation is closed.

ACTION ON RECOMMENDATIONS

Recommendation 1: Recommend Great Lakes District (GLD) review its D9-WI-PSC (001) (series) Examination and Investigations Onboard Canadian Cargo Vessels (Lakers) Operating Exclusively on the Great Lakes to ensure the polices reflect the Commander's intent.

This investigation revealed potential concerns regarding the structural integrity of these vessels, which are characterized by high use, with substantial cargo loads, and older vessel construction design. These factors may contribute to an increased likelihood of hull failure, posing significant safety, environmental, and operations risk within the U.S. Coast Guard (USCG) Great Lakes region.

A comprehensive policy review will ensure that USCG GLD is employing robust vessel inspection and examination protocols, to maintain oversight of vessel safety that mitigates risk and safeguard maritime operations.

> **Action**: I concur with this recommendation. The USCG GLD completed the recommended review of D9-WI-PSC (001) (series). As a result, the instruction was updated and a new D9-WI-PSC-(001)(07) was released. Additionally, I note that the GLD has increased the frequency of examinations for Canadian Cargo Vessels with a documented history of serious deficiencies. This risk-based approach aligns with national Port State Control targeting procedures, which use a vessel's compliance history to determine the appropriate level of vessel examination oversight.

Recommendation 2: Recommend that Lower Lakes Towing Ltd. re-evaluate or establish a company policy that codifies the maximum allowable bending moments for continued safe operation of their ships.

During the investigation, it was observed that Lower Lakes Towing Ltd. did not have any prescribed rules or procedures for verifying the maximum loading stresses or bending moments placed on the ship prior to departing from a loading port. The installed CargoMax system has two functions when reviewing loading stress: “at-sea” conditions and “in-harbor” conditions. Nothing in the company policy stated that the crew needs to verify that these conditions are within the limitations stated in the cargo loading manual. Nor did the company have any installed thresholds for maximum stresses or bending moments. The establishment of a policy on maximum loading stresses or bending moments would provide a ship Master with the checkpoints needed to increase the odds of preventing structural failure, maintaining safety standards, enduring long-term durability, and ensuring compliance with regulators while optimizing ship performance, thus increasing safety across their fleet.

On July 14, 2024, after discussions with Marine Safety Unit Duluth, Lower Lakes Towing Ltd. enacted preventative measures to prevent such an incident from occurring again. Company operating guidelines were established lowering the maximum bending moment to eighty percent (80%) of the ABS established maximum allowable bending moments for both “at-sea’ and “in-harbor” conditions.

Action: A copy of this report and its associated recommendations will be provided to Lower Lakes Towing Ltd for their consideration and potential action.

[redacted]

E. B. SAMMS
Captain, U. S. Coast Guard
Chief, Office of Investigations & Casualty Analysis (CG-INV)

U.S. Department of Homeland Security
United States Coast Guard

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16732
Jan 08, 2026

MICHIPICOTEN (IMO: 5102865) STRUCTURAL FAILURE WHILE UNDERWAY ON LAKE SUPERIOR ON JUNE 08, 2024.

ENDORSEMENT BY THE COMMANDER, GREAT LAKES DISTRICT

The record and the report of the investigation convened for the subject casualty have been reviewed. The record and the report, including the findings of fact, analysis, conclusions, and recommendations are approved subject to the following comments. It is recommended that this marine casualty investigation be closed.

ENDORSEMENT/RECOMMENDATIONS

Safety Recommendation 1 - Review Existing Policies for Canadian Cargo Vessels on the Great Lakes. Recommend Great Lakes District review its D9-WI-PSC (001)(series) Examination and Investigations Onboard Canadian Cargo Vessels (Lakers) Operating Exclusively on the Great Lakes to ensure the policies reflect Commanders' intent.

This investigation revealed potential concerns regarding the structural integrity of these vessels, which are characterized by high use, with substantial cargo loads, and older vessel construction design. These factors may contribute to an increased likelihood of hull failure, posing significant safety, environmental, and operational risks within the Coast Guard Great Lakes region.

A comprehensive policy review will ensure that Coast Guard Great Lakes District is employing robust vessel inspection and examination protocols, to maintain oversight of vessel safety that mitigates risks and safeguard maritime operations.

Final Agency Action: I **CONCUR** with this recommendation and have directed my staff to review D9-WI-PSC (001)(series) Examination and Investigations Onboard Canadian Cargo Vessels (Lakers) Operating Exclusively on the Great Lakes.

Due to the age of the vessel, the operating history to include loading, along with the vessel construction, there may be a potential increase of risk of hull failure. To safeguard the maritime domain, it is prudent for the Great Lakes District to leverage and increase oversight where practicable.

Administrative Recommendation 1 - Establish Ship Loading Limitations. Recommend that Lower Lakes Towing Ltd. re-evaluate or establish a company policy that codifies the maximum allowable moments for continued safe operation of the ship.

During the investigation, it was observed that Lower Lakes Towing Ltd. did not have any prescribed rules or procedures for verifying the maximum loading stresses or bending moments placed on the ship prior to departing from a loading port. The installed CargoMax system has two functions when reviewing loading stress: "at-sea" conditions

and “in-harbor” conditions. Nothing in the company policy stated that the crew needs to verify that these conditions are within the limitations stated in the cargo loading manual.

Nor did the company have any installed thresholds for maximum stresses or bending moments. The establishment of maximum loading stresses or bending moments policy would provide a ship Master with the checkpoints needed to increase the odds of preventing structural failure, maintaining safety standards, enduring long-term durability, and ensuring compliance with regulators while optimizing ship performance, thus increasing safety across their fleet.

On July 14, 2024, after discussions with Marine Safety Unit Duluth, Lower Lakes Towing Ltd. enacted preventative measures to prevent such an incident from occurring again. Company operating guidelines were established lowering the maximum bending moment to eighty percent (80%) of the ABS established maximum allowable bending moments for both “at-sea’ and “in-harbor” conditions.

Endorsement: I **concur with the intent** of this recommendation. This recommendation should be addressed to Lower Lakes Towing, and the broader maritime community, via an external Finding of Concern in accordance with CG-INV Policy Letter 2-18, titled SAFETY RECOMMENDATIONS, SAFETY ALERTS, AND FINDINGS OF CONCERN (FORMERLY LESSONS LEARNED). A draft Finding of Concern is already attached to this incident investigation and will be routed to Coast Guard INV with the addition of the above recommended actions for final agency action and disposition.

Administrative Recommendation 2 – Foreign Mariner Enforcement Referral. It is recommended that this case be referred to Transport Canada Marine Safety for potential enforcement action.

Endorsement: I **CONCUR** with this recommendation.

Administrative Recommendation 3. It is recommended that this investigation be closed.

Endorsement: I **CONCUR** with this recommendation.

[redacted]

K. A. BROYLES
Captain, U.S. Coast Guard
Chief, Prevention Division
By Direction

U.S. Department of Homeland Security
United States Coast Guard

Marine Safety Unit Duluth
United States Coast Guard

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16732
November 20, 2025

MICHIPICOTEN (IMO: 5102865) STRUCTURAL FAILURE WHILE UNDERWAY ON LAKE SUPERIOR ON JUNE 08, 2024.

ENDORSEMENT BY THE OFFICER IN CHARGE, MARINE INSPECTION

The record and the report of the investigation convened for the subject casualty have been reviewed. The record and the report, including the findings of fact, analysis, conclusions, and recommendations are approved subject to the following comments. It is recommended that this marine casualty investigation be closed.

[redacted]

J. P. BOTTI
Commander, U.S. Coast Guard
Officer in Charge, Marine Inspections

Enclosure: (1) Executive Summary
(2) Investigating Officer's Report

U.S. Department of Homeland Security

United States Coast Guard

Marine Safety Unit Duluth
United States Coast Guard

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16732
November 20, 2025

MICHIPICOTEN (IMO: 5102865) STRUCTURAL FAILURE WHILE UNDERWAY ON LAKE SUPERIOR ON JUNE 08, 2024

EXECUTIVE SUMMARY

On June 7, 2024, at approximately 2223 Central Standard Time (CST), The Canadian Flagged self-unloading bulk carrier MICHIPICOTEN departed the CN Ore Dock in Two Harbors, MN, enroute to Sault Ste. Marie, Ontario, Canada. The MICHIPICOTEN was loaded with approximately 16,000 tons of iron ore pellets.

On June 8 at 0615 the MICHIPOCOTEN was underway making 9.3 knots approximately 25 nautical miles Southeast of Grand Marais, MN, on western Lake Superior with 22 crewmembers onboard. The sun had risen at 0605 and the weather was calm, with unrestricted visibility and no other ships in the area. At approximately 0618 the bridge watch team heard an abrupt bang on the starboard side of the ship which was followed by a pronounced shaking of the ship. Shortly after the abrupt bang, the ship took on a starboard list of approximately 5 degrees. At approximately 0623, the Master arrived on the bridge and checked the ballast tank gauges. He observed that the ship was taking on water in the #4 starboard ballast tank, activated the ballast pump, and instructed crew members to begin sounding additional tanks. Later it was identified that the #1 inner void space had also been compromised.

At approximately 0650, the general alarm was activated, and the crew was instructed to proceed to their muster stations with immersion suits and lifejackets. Sector Northern Great Lakes was notified by VHF radio at 0646 and at 0652 Coast Guard Station Bayfield launched its small boat CG 45463. At approximately 0715, the Master and ship owners, Lower Lakes Towing, Ltd., made the decision to alter course to Thunder Bay, Ontario, Canada. At approximately 1000, eleven crew members were evacuated to the on-scene Coast Guard Station Bayfield small boat, CG 45643.

The ship was able to continue its voyage to Thunder Bay under tug assistance. During this time the crew utilized the installed ballast pumps, stripping pumps, and portable pumps to de-water the ballast and inner void space. At approximately 1900 the ship was safely moored at the Keefer Terminal in Thunder Bay, Ontario, Canada.

Through its investigation, the Coast Guard determined the initiating event to be the structural failure of the hull, followed by the ship taking on water. Causal factors contributing to this casualty were: 1.) Chronic Overstressing . 2.) Failure to Properly Use Cargo Loading Software Due to Lack of Proficiency. 3.) Failure in Cargo Loading and Oversight. 4.) Failure to Adhere to Company Loading Procedures. 5.) Failure to Establish Company Maximum Bending Moment Policy. 6.) Failure to Trim Cargo as Required by the International Maritime Solid Bulk Cargo Code Requirements.

U.S. Department of Homeland Security
United States Coast Guard

Marine Safety Unit Duluth
United States Coast Guard

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16732
November 20, 2025

MICHIPICOTEN (IMO: 5102865) STRUCTURAL FAILURE WHILE UNDERWAY ON LAKE SUPERIOR ON JUNE 08, 2024.

INVESTIGATING OFFICER'S REPORT

1. Preliminary Statement

1.1. This marine casualty investigation was conducted, and this report was submitted in accordance with Title 46, Code of Federal Regulations (CFR), Subpart 4.07, and under the authority of Title 46, United States Code (USC) Chapter 63.

1.2. No individuals, organizations, or parties were designated as a party-in-interest in accordance with 46 CFR Subsection 4.03-10.

1.3. The Coast Guard was the lead agency for all evidence collection activities involving this investigation. Other organizations who supported the investigation team included individuals representing Transport Canada.

1.4. All times listed in this report are in Central Standard Time using a 24-hour format and are approximate.

2. Vessel Involved in the Incident

Figure 1. Photo of MICHIPICOTEN underway taken on June 8, 2024

Official Name:	MICHIPICOTEN
Identification Number:	IMO 5102865
Flag:	Canada
Vessel Class/Type/Sub-Type	Bulk Carrier/Ore Carrier/Self-Discharging
Build Year:	1952
Gross Tonnage:	15,366 GT
Length:	698’ 0”
Beam/Width:	70’ 0”
Draft/Depth:	37’ 0”
Main/Primary Propulsion: (Configuration/System Type, Ahead Horse Power)	Slow Speed Diesel Reduction at 8046 ahead hp
Owner:	Lower Lakes Towing Ltd Port Dover, Ontario, Canada
Operator:	Lower Lakes Towing Ltd Port Dover, Ontario, Canada

3. Deceased, Missing, and/or Injured Persons

None

4. Findings of Fact

4.1. Pre-Incident

4.1.1. The MICHIPICOTEN is a self-discharging bulk carrying ship flagged in Canada, designed to carry a maximum 22,000 tons of cargo. The ship is certificated to trade commercially on the Great Lakes and St. Lawrence River waterway system in both Canadian and U.S. ports, predominately between Western Lake Superior and Sault Ste Marie, ON, Canada.

4.1.2. In November of 2021 the MICHIPICOTEN grounded in Canadian waters while enroute to Sault Ste. Marie, Ontario, Canada. As a result of the grounding the bottom shell plating of the MICHIPICOTEN suffered damage from frame numbers 60-98 (approximately 115 feet) in the #3 and #4 starboard ballast tanks. A post-mishap physical inspection revealed an inset 3 inches to 4 inches in depth and 3 feet to 4 feet wide. Transverse frames 60-77 were also found buckled in the direction of the inset. Temporary repairs were completed by cropping and renewing the transverse affected floor framing and contouring the renewed steel along the inset in the hull plating. The ship’s Classification Society, American Bureau of Shipping (ABS), attended the ship and provided a survey report attesting to the satisfactory condition of the hull and recommended permanent repairs be completed during the next scheduled dry-dock period in April 2024.

4.1.3. In October 2023 Lower Lakes Towing Ltd requested through the Flag State Authority (Canada) & Classification Society (ABS) for a year of grace approval (known domestically as a dry dock extension) of the ship’s 5-year dry dock inspection

requirements. As part of the year of grace approval application the Classification Society required the ship to conduct hull thickness measurements.

4.1.4. On December 27, 2023, ABS and the Flag State Authority approved the year of grace request, pushing the ship's next required drydock inspection to April 2025.

4.1.5. On March 24, 2024, ABS issued Finding Detail Report 684.0 for the MICHIPICOTEN. It indicated that the hull plating at frame 102 had substantial corrosion. The first plate had 24.5% diminution, and the fourth plate had 23.2% diminution. ABS Classification Society rules recommend steel replacement at 25% diminution. The report stated that the thickness measurement survey was commenced but not completed.

4.1.6. On March 24, 2024, ABS issued Survey After Construction Vessel Report 6218704.R1. It detailed findings from additional surveys required for the year of grace approval. Contents from the report stated that thickness measurements were commenced, and that the completion of these measurements will be completed at the next dry docking in 2025.

4.1.7. In March of 2024, the ship installed a new cargo loading software called CargoMax, which was approved by ABS. Cargo loading software is installed to aide crewmembers in loading cargo safely and within the parameters specified in the cargo loading manual. When properly utilized the software produces two sets of bending moments: "in-harbor" and "at-sea". "In-harbor" bending moments provide data to effectively load a ship to a safety factor of that while in a harbor. "At-sea" bending moments provide data to effectively load a ship to a safety factor of that while underway.

4.1.8. After the installation of the new cargo loading software and prior to the incident voyage (Voyage 021) both the Master and 1st Officer expressed concerns to Lower Lakes Towing Ltd. about the validity of the installed CargoMax loading software, and stated they did not believe the program accurately reflected the loaded condition of the ship.

4.1.9. Lower Lakes Towing Ltd. did not have any internal company policies governing the maximum allowable bending moment ships were permitted to load to for safe cargo operations.

4.1.10. On May 22, 2024, the MICHIPICOTEN completed a voyage (Voyage 017) from Duluth, MN, to Sault Ste. Marie, Ontario, Canada, loaded to 102% of the ship's permissible at-sea bending moment.

4.1.11. On May 27, 2024, the MICHIPICOTEN completed a voyage (Voyage 018) from Superior, WI, to Sault Ste. Marie, Ontario, Canada, loaded to 112% of the ship's permissible at-sea bending moment.

4.1.12. On May 30, 2024, the MICHIPIOCTEN was loading Iron Ore Pellets at Two Harbors, MN, for transit to Sault Ste. Marie, Ontario, Canada (Voyage 019). Prior to getting underway, the Master notified the 1st officer that cargo hold #4 was being overloaded and that cargo needed to be redistributed within the holds. This issue was

corrected prior to commencing Voyage 019, however the voyage was conducted with the ship loaded to 109% of the ship's permissible at-sea bending moment.

4.1.13. On June 3, 2024, the MICHIPICOTEN completed a voyage (Voyage 020) from Duluth, MN, to Sault Ste. Marie, Ontario, Canada, loaded to 112% of the ship's permissible at-sea bending moment.

4.2. The Incident

4.2.1. On June 07, 2024, the MICHIPICOTEN was moored at CN Ore Dock in Two Harbors, MN, to conduct cargo loading in advance of Voyage 021 to Sault Ste. Marie, Ontario, Canada. During the cargo loading process the Master observed that approximately 600 tons of cargo were loaded incorrectly into the cargo holds. These 600 tons were intended to be distributed between cargo holds #1 and #2 but were instead loaded into hold #4. The Master did not require cargo be redistributed within the holds to correct this error as he had during Voyage 019.

4.2.2. The loaded bulk cargo of Iron Ore Pellets was not trimmed prior to the ship getting underway, and upon completion of cargo loading the ship was loaded to 113% of the ship's permissible at-sea bending moment.

4.2.3. The 1st Officer, who is responsible for all cargo loading supervision and planning, shared his assigned loading responsibility on Voyage 021 with the 2nd Officer. This is not a customary or approved procedure by Lower Lakes Towing Ltd.

4.2.4. There is no record that the Master approved the loading plan as required by the company's established loading procedures.

4.2.5. On June 7, 2024, at 2223 the MICHIPICOTEN departed the CN Ore Dock in Two Harbors, MN, enroute to Sault Ste. Marie, Ontario, Canada. The MICHIPICOTEN was loaded with approximately 16,000 tons of Iron Ore Pellets.

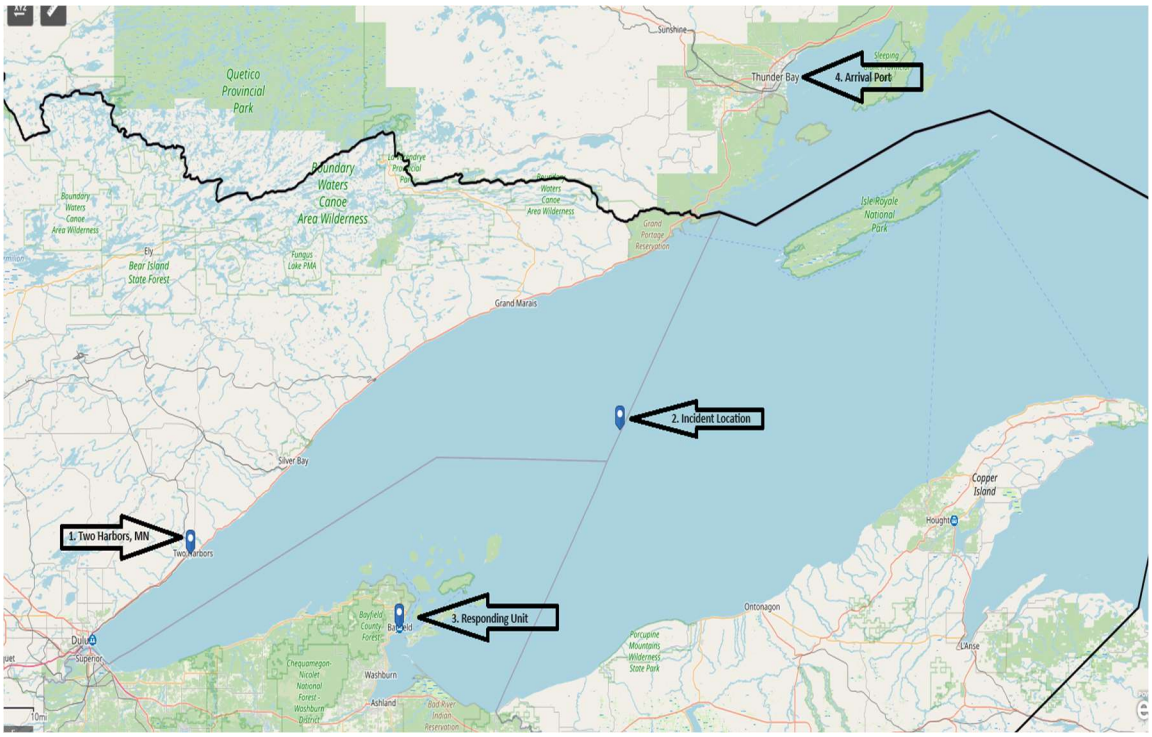

Figure 2. MICHIPICOTEN Incident Map.

4.2.6. On June 8, 2024, at 0615 the MICHIPCOTEN was under way making 9.3 knots approximately 25 nautical miles Southeast of Grand Marais, MN, in position 47 degrees 21.3 minutes North, 089 degrees 55.8 minutes West. The sun had risen at 0605 and the weather was calm, with unrestricted visibility and no other ships in the area. All operational equipment on the bridge was reported to be in working order.

4.2.7. At 0618 the bridge watch team heard an abrubt bang on the starboard side of the ship which was followed by a pronounced shaking of the ship. Shortly after the abrupt bang, the bridge team observed that the ship had developed a noticeable starboard list.

4.2.8. At 0623 the Master arrived on the bridge and checked the ballast tank gauges. He observed the ship was taking on water in the #4 starboard ballast tank. The #4 starboard ballast tank, which should have been dry, was estimated to have 3 feet of water in it. The Master activated the ballast tank pump and instructed crewmember 1 to sound all tanks, which confirmed water ingress in the #4 starboard ballast tank.

4.2.9. At 0646 the Master made radio notification to Sector Northern Great Lakes that the ship was taking on water in the starboard #4 ballast tank.

4.2.10. At 0650 the Master instructed crewmember 2 to sound the general alarm and to have all crewmembers mustered at their stations with immersion suits and life jackets ready. All 22 crew members were accounted for and instructed to ready the life rafts and Jacob's ladder.

4.2.11. At 0651 the Master ordered that all ballast tanks would be sounded at 30-minute intervals. During this time, Crewmember 3 reported that the #4 starboard ballast tank water level had risen to 11.8 feet and notified the Master that the ballast and stripping pumps could not keep up with the ingress of water.

4.2.12. At 0652 U.S. Coast Guard Station Bayfield got underway on small boat CG 45463 to respond to the report of the ship taking on water. Sector Northern Great Lakes issued an Urgent Marine Information Broadcast (UMIB) to notify ships in the area of the ongoing situation.

4.2.13. At 0715 the Master, under direction from company ownership, altered course to Thunder Bay, Ontario, Canada.

4.2.14. At 0850 the crew discovered that the ship's #1 inner void space was compromised and taking on water and reported a water level of approximately 5 feet and rising. The #1 inner void space was sounded again at 0923, which estimated the water level within the void had risen from to 18 feet. After learning of the 0923 sounding estimate, the Master then ordered all crew to make preparations to abandon ship.

4.2.15. At 1025 the Master and company ownership elected to transfer 11 of the 22 crew members to the on-scene CG 45463 small boat asset. The remaining crew of 11 manned the ship for the remainder of the voyage to Thunder Bay.

4.2.16. At 1400 soundings in the #4 starboard ballast tank had stabilized with 15 feet of water in the tank, and the ship was operating at a 5-degree starboard list.

4.2.17. At 1541 the tug GLENADA pulled alongside and provided 2 additional portable pumps with extra length hoses for dewatering.

4.2.18. At 1609 the Master requested permission from Harbor Master and Transport Canada to enter Canadian Waters.

4.2.19. At 1803 the MICHIPICOTEN safely moored up at Keefer Terminal in the Port of Thunder Bay, Ontario, Canada.

4.2.20. Post-casualty drug testing required by 46 CFR 4.06 was conducted on 05 crewmembers deemed to be directly involved in the incident by the Master. All 05 tests came back negative for drug use. Post-casualty alcohol testing was not completed due to the nature of the casualty and the need for personnel to aid in the dewatering and mustering process for a potential abandon ship evolution. There is no indication that alcohol was a contributing factor to this event.

4.2.21. During the post-casualty inspection of the ship while in dry dock, inspectors discovered that the ship suffered a 13-foot crack in the hull plating in the vicinity of frame number 92, which is located within the starboard #4 ballast tank. Additional findings showed that the 13-foot crack extended an additional 55 inches into the inboard longitudinal bulkhead of the #4 ballast tank, and that the #1 inner void was compromised.

4.2.22. A post-casualty analysis was conducted by the Coast Guard Salvage Engineering Response Team (SERT) based on cargo loading data from the past 5 voyages. The results of this analysis showed that the highest bending moments and stress on the ship's hull was on average between 14 and 36 feet from frame 92 within cargo hold #4, the location of the fracture, during each of these voyages.

Figure 3. Crack in MICHIPICOTEN Hull Plating taken during dive survey.

Figure 4. 55-inch crack in the longitudinal bulkhead.

4.3. Additional/Supporting Information:

4.3.1. National Oversight

4.3.1.1. Transport Canada was the Flag State Administration of the MICHIPICOTEN.

4.3.1.2. Unlike the United States, in which the U.S. Coast Guard serves as both a ship's Flag State Administration and Recognized Organization[1], Transport Canada delegates statutory functions related to the inspection and certification of vessels 24 meters and above to, recognized Classification Societies such as ABS. These Classification Societies acted as the Recognized Organization (RO) as defined by the International Maritime Organization.

As part of its delegation program, Transport Canada conducts risk-based monitoring inspections of these delegated vessels and continuous review of the performance of each RO. This is to ensure that delegated statutory functions are being delivered in accordance with the requirements of the Canada Shipping Act, 2001 (CSA, 2001) and the agreement signed between the two organizations.

4.3.1.3. American Bureau of Shipping (ABS) was the approved Classification Society for the MICHIPICOTEN, hired by Lower Lakes Towing Ltd. to act as its Recognized Organization.

4.3.2. *Corporate and Operational Framework.*

4.3.2.1. *Owner and Operator Delineations.* Lower Lakes Towing Ltd. of Port Dover, Ontario, Canada, owned and operated the MICHIPICOTEN. The company owned 04 additional self-unloading bulk carrying ships and 01 conventional bulk carrying ship. All ships operated within the Great Lakes waterway system. Lower Lakes Towing Ltd. was a subsidiary of RAND Logistics, Inc. a U.S. based company incorporated in New Jersey that also oversaw the operation of 16 U.S. Flagged bulk carrying ships owned by American Steamship Navigation and Grand River Navigation.

4.3.3. *Crewmembers and Experience.*

4.3.3.1. *Master.* The Master worked for Lower Lakes Towing Ltd. since 2009 and had served as the Master of the MICHIPICOTEN off and on since 2019. Prior to serving as Master, he served as a 1st Officer for roughly 9 years. He had exclusively worked on the Great Lakes since his graduation from a maritime academy in his home country of Canada.

4.3.3.2. *1st Officer.* The 1st Officer worked on the Great Lakes for 7 years, including 3.5 years as a 1st Officer and 6 years in total with Lower Lakes Towing Ltd. Prior to assuming the role as the 1st Officer onboard the

[1] Recognized Organizations are authorized by a flag state to conduct statutory surveys and issue certifications on its behalf.

MICHIPICOTEN, he had roughly 10 days of training with the designated permanent 1st Officer.

4.3.4. *Post-Casualty Findings.*

4.3.4.1. Bay Engineering was hired as a 3rd party engineering consultant for the ship. During their investigation they found indications that a cement box patch had been installed on frame 92 where the structural failure occurred. Cement box patches are temporary repairs typically installed to stop leaks. There is no evidence or record from either the Classification Society or the company of why a cement box patch would have been installed in this location.

4.3.5. *Company Procedures and Common Practices.*

4.3.5.1. Lower Lakes Towing Ltd. had company procedures that require the Master of each ship to approve all cargo loading plans or proposed changes to already approved loading plans prior to cargo operations. No documentary evidence was found that the Master was reviewing or approving any loading plans, or changes to load plans while in charge of the ship.

4.3.5.2. The Master & 1st Officer did not use the hard copy cargo loading manual when addressing cargo stresses and safe sailing conditions during the loading process. During a post-casualty Flag State inspection on June 8, 2024, the whereabouts of the cargo loading manual were unknown to the crew upon request.

4.3.5.3. The 1st Officer stated he did not record the amount of tonnage being loaded within the cargo holds, but instead prepared the ship for sea based on prior draft readings after he was instructed to do so by the Master.

5. **Analysis**

5.1. *Chronic Overstressing.* Cargo loading records from the incident voyage (Voyage 021) and the four preceding voyages (Voyage 017 through 020) indicate that the MICHIPICOTEN was loaded beyond the permissible at-sea bending moment limitations as outlined in the cargo loading manual on all five voyages. Voyage 017 was loaded to 102%, Voyage 018 to 112%, Voyage 019 to 109%, Voyage 020 to 112%, and Voyage 021 to 113% of the ship's at-sea bending moments. A Coast Guard Salvage Engineering Response Team (SERT) analysis of these voyage loading plans found that the location of the highest bending moments and tensile stress on the hull bottom plating occurred between 14 and 36 feet from frame 92 (the location of the fracture) during each of these voyages. This repetitive overloading of the ship contributed to cumulative stress on the ship's structural members and hull plating, weakening them to the point of failure. Every loading record reviewed as part of this investigation showed that the ship had been overloaded to excess of 100% it's at-sea bending moment. Had the ship adhered to proper loading practices, the stress on the hull would have remained within design specifications, and this casualty may have been avoided.

5.2. *Failure to Properly Use Cargo Loading Software Due to Lack of Proficiency.* The ship was equipped with cargo loading software, approved by the Classification Society ABS, designed to assist the crew in safely loading cargo as specified in the cargo loading manual.

The software generates two sets of bending moments: “in-harbor” and “at-sea.” The “in-harbor” bending moments provide data to safely load the ship while in port, with a lower safety factor, while the “at-sea” bending moments account for dynamic sea conditions and provide data for the safe loading of a ship when underway, with a higher safety factor. Both the Master and the 1st Officer, responsible for using the software, displayed a lack of familiarity with its use, resulting in their inability to fully understand or effectively utilize its features. Despite the software being tested and verified by the Classification Society as functioning correctly, the crew’s inability to accurately interpret the data led them to perceive it as unreliable. As a result, they chose not to consult the cargo loading software during cargo loading. Instead, they relied on preferred draft readings from the Master, based on their experience and prior notes stored in a logbook from previous trips to the loading ports. An analysis of the cargo loading software data from the five voyages (Voyages 017 to 021) leading up to the incident revealed that the “in-harbor” bending moments were consistently below 100% of the maximum allowable threshold. However, when analyzed under “at-sea” conditions, the bending moments exceeded 100% of the maximum allowable limit for safe cargo carriage on all five occasions. Had the crew been adequately trained and proficient in the use of the software it is reasonable to believe they would have utilized it, thus properly loading the ship to the appropriate at-sea bending moment limits. This would have reduced the cumulative stress on the ship’s structural members potentially preventing this casualty.

5.3. *Failure in Cargo Loading and Oversight.* 1st Officers are responsible for cargo loading operations, to include ensuring cargo is loaded in accordance with the ship’s approved cargo loading plan. The 1st Officer on board the MICHIPICOTEN during Voyage 021 delegated some cargo loading responsibilities to the 2nd Officer, this division of duties was not a recognized or approved procedure within the company's implemented Safety Management System (SMS). This delegation, therefore, represents a departure from established safety protocols. During Voyage 019, the 1st Officer unintentionally overloaded cargo hold #4, requiring the Master to order cargo redistribution. On Voyage 021, approximately 600 tons of cargo, designated for cargo holds #1 and #2, were incorrectly placed in cargo hold #4. Although the Master noted this error, no corrective action, such as cargo redistribution, was taken. Cargo hold #4, where these 600 tons of excess cargo were placed, spans frame 92, the location of the eventual fracture. The failure in cargo loading oversight caused an unsafe distribution of cargo and excessive stress on the ship’s structural members near frame 92. This, in turn, cannot be ruled out as a contributing factor to the eventual failure or the hull plating during Voyage 021.

5.4. *Failure to Adhere to Company Loading Procedures.* The company had established loading procedures that directed the Master of the ship to provide approval for each cargo load plan prior to its implementation. However, an examination of the relevant documents revealed a significant lack of oversight; there were no recorded evidence demonstrating that the Master’s approval was obtained for any cargo load plans through signatures or other formal means. Additionally, there were no existing records indicating that the Master was consulted or formally approved any modifications made to the cargo loading plans, raising concerns about compliance with established safety protocols. Had the Master adhered to the existing established company loading procedures, it may be reasonable to believe he would have identified and stopped the chronic overloading of the ship, and specifically the overloading and miss loading (excess 600 tons in cargo hold #4) during Voyage 021. This would have reduced the cumulative stress on the hull bottom plating and this casualty may have been avoided.

5.5. *Failure to Establish Company Maximum Bending Moment Policy*. Evidence from the ship's cargo loading data during prior voyages indicates significant stress was placed on the bottom hull plating due to bending moment values exceeding safe at-sea loading conditions. Lower Lakes Towing Ltd. had no company policy governing the maximum allowable bending moment thresholds to ensure safe operations. If the company had instituted maximum cargo loading stress limits, it is reasonable to believe that the tensile stress on the MICHIPICOTEN's hull bottom plating would have been reduced during Voyage 021, and those leading up to it, and this casualty may have been avoided.

5.6. *Failure to Trim Cargo as Required by the International Maritime Solid Bulk Cargo Code Requirements.* Trimming cargo is required for the safe operation of a ship. It is the process by which the distribution of cargo within the holds is adjusted to create optimal stability and balance. Proper trimming helps prevent cargo from unexpectedly shifting during transit resulting in issues such as listing, or excessive pitching, both of which can affect the ship's performance and safety. Cargo loaded for Voyage 021 was not trimmed in accordance with the International Maritime Solid Bulk Cargoes Code (IMSBC). It cannot be ruled out that shifting cargo within one or multiple cargo holds, as a result of it not being trimmed, may have played a contributing factor into the structural failure of the hull plating.

6. Conclusions

6.1. Determination of Cause:

6.1.1. The initiating event occurred when the MICHIPICOTEN experienced a structural failure of the exterior hull plating. Contributing factors to this event were:

6.1.1.1. Chronic Overstressing.

6.1.1.2. Failure to Properly Use Cargo Loading Software Due to Lack of Proficiency.

6.1.1.3. Failure in Cargo Loading and Oversight.

6.1.1.4. Failure to Adhere to Company Loading Procedures.

6.1.1.5. Failure to Establish Company Maximum Bending Moment Policy.

6.1.1.6. Failure to Trim Cargo as Required by the International Maritime Solid Bulk Cargo Code Requirements.

6.1.2. After the ship experienced the structural hull failure, it began to take on water and experienced its initial flooding in the #4 ballast tank. It was later discovered that the #1 inner void was also compromised. With the hull breached, there was no way to prevent the ingress of water.

6.2. *Unsafe Actions or Conditions that Were Not Causal Factors in this Casualty.* This investigation did not identify any unsafe actions or conditions that were not causal factors.

6.3. *Evidence of Act(s) of Misconduct, Incompetence, Negligence, Unskillfulness or Willful Violation(s) of Law by Any Persons Holding a USCG Credential Subject to Action Under 46 USC Chapter 77:* There was no evidence of any such acts or violations of law by any Coast

Guard-credentialed mariner and the USCG does not have jurisdiction over other mariners in this case.

6.4. *Evidence of Act(s) of Misconduct, Incompetence, Negligence, Unskillfulness, or Willful Violation(s) of Law by Any USCG Personnel, Any Representative or Employee of Any other Government Agency, or Any Other Person:* The Master's failure to review or approve the cargo loading plans as required by company policy, failure to properly utilize the installed cargo loading software, failure to redistribute the misplaced cargo within the holds, and failure to trim the cargo prior to getting underway, may constitute negligence. It is recommended that CG-INV engage with Transport Canada or the appropriate credentialing authority for a referral on foreign merchant mariner enforcement.

6.5. *Evidence of Act(s) Subject to Civil Penalty:* There are no acts or evidence that warrant a civil penalty in this investigation.

6.6. *Evidence of Criminal Act(s):* There was no evidence of criminal activity.

6.7. Need for New or Amended U.S. Law or Regulation: There is no evidence that indicates a necessity for a new or amended U.S. Law or Regulation.

7. Actions Taken Since the Incident

7.1. Upon safe navigation from Thunder Bay, Ontario, Canada, to Fraser Shipyard in Superior, WI, the MICHIPICOTEN repaired the 13-foot hull crack and the 55-inch crack that extended into the longitudinal bulkhead. All repairs were made to the satisfaction of the Classification Society, ABS. On June 14, 2024, Transport Canada revoked the year of grace approval for the dry docking of the ship, to which Lower Lakes Towing Ltd. appealed. On July 25, 2024, Transport Canada supplied the ABS report detailing the results of the inspection conducted on the internal and external hull structures to Marine Safety Unit Duluth for review. Marine Safety Unit Duluth Inspectors reviewed the report on July 27, 2024, and noted several concerning findings.

On July 29, 2024, Marine Safety Unit Duluth authored a letter of concern to Transport Canada, detailing these findings. Specifically, ABS was not able to assess the overall structural integrity of the ship due to 1) a multitude of structures not inspected due to the presence of mud and the need for scaffolding and 2) widespread structural damage that was identified throughout the ship but allowed by ABS to be deferred to next dry dock. On September 9, 2024, the appeal made by Lower Lakes Towing Ltd. was rejected by Transport Canada.

7.2. The scope of ABS's inspection following the marine casualty combined with its approval to allow the ship to continue sailing with a significant inset from 2021 through the year of grace period until 2025, raised serious concerns. Additionally, ABS's conclusion that the ship was deemed safe for continued operations following its most recent casualty, while certain parts remain inaccessible for inspection, further casted doubt on the adequacy of the company's inspection procedures. In light of these issues Marine Safety Unit Duluth initiated a quality case against the ship's Classification Society ABS.

7.3. The U.S. Coast Guard issues Finding of Concerns to raise awareness of conditions and/or actions that have been identified as being factors in marine casualties, and that it

believes can be best addressed by the maritime industry and/or the general public. This investigation revealed that the MICHIPICOTEN had a history loading cargo at various ports by exclusively using historical data. The ship would be prepared for sea based on preferred draft readings from the Master, relying on their experience and prior notes stored in a logbook instead of the approved loading manual.

Marine Safety Unit Duluth drafted a Findings of Concern titled "History Says What? The Not-So-Accurate Tale of Safe Cargo Loading" which has been submitted for release to address unsafe loading practices identified by the efforts of this report with the intention of preventing them from contributing to future casualties.

8. Recommendations

8.1. Safety Recommendation:

8.1.1. Recommend Great Lakes District review its D9-WI-PSC (001) (series) Examination and Investigations Onboard Canadian Cargo Vessels (Lakers) Operating Exclusively on the Great Lakes to ensure the polices reflect the Commander's intent.

This investigation revealed potential concerns regarding the structural integrity of these vessels, which are characterized by high use, with substantial cargo loads, and older vessel construction design. These factors may contribute to an increased likelihood of hull failure, posing significant safety, environmental, and operations risk within the Coast Guard Great Lakes region.

A comprehensive policy review will ensure that Coast Guard Great Lakes District is employing robust vessel inspection and examination protocols, to maintain oversight of vessel safety that mitigates risk and safeguard maritime operations.

8.2. Administrative Recommendation:

8.2.1. Recommend that Lower Lakes Towing Ltd. re-evaluate or establish a company policy that codifies the maximum allowable bending moments for continued safe operation of their ships.

During the investigation, it was observed that Lower Lakes Towing Ltd. did not have any prescribed rules or procedures for verifying the maximum loading stresses or bending moments placed on the ship prior to departing from a loading port. The installed CargoMax system has two functions when reviewing loading stress: "at-sea" conditions and "in-harbor" conditions. Nothing in the company policy stated that the crew needs to verify that these conditions are within the limitations stated in the cargo loading manual. Nor did the company have any installed thresholds for maximum stresses or bending moments. The establishment of maximum loading stresses or bending moments policy would provide a ship Master with the checkpoints needed to increase the odds of preventing structural failure, maintaining safety standards, enduring long-term durability, and ensuring compliance with regulators while optimizing ship performance, thus increasing safety across their fleet.

On July 14, 2024, after discussions with Marine Safety Unit Duluth, Lower Lakes Towing Ltd. enacted preventative measures to prevent such an incident from occurring

again. Company operating guidelines were established lowering the maximum bending moment to eighty percent (80%) of the ABS established maximum allowable bending moments for both “at-sea’ and “in-harbor” conditions.

8.2.2. Referral: It is recommended that this case be referred to Transport Canada Marine Safety for potential enforcement action.

8.2.3. It is recommended that this investigation be closed.

LT, U.S. Coast Guard
Investigating Officer