



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

Issued March 17, 2022

MIR-22/08

Contact of *Kevin Michael* Tow with Melvin Price Locks and Dam Guide Wall

On March 19, 2021, about 1138 local time, the towing vessel *Kevin Michael* was transiting down river on the Mississippi River with a crew of nine pushing a 15-barge tow when the tow struck the bull nose of the upstream main lock chamber guide wall at the Melvin Price Locks and Dam in Alton, Illinois, resulting in the tow breaking apart and damaging the dam gates.¹ No pollution or injuries were reported. Total damages to the barges and dam gates were estimated to be \$1,172,227.



Figure 1. *Kevin Michael* under way at the Melvin Price Locks and Dam after the casualty. (Source: US Coast Guard)

¹ (a) In this report, all times are central daylight time, and all miles are statute miles. (b) Visit [ntsb.gov](https://www.ntsb.gov) to find additional information in the [public docket](#) for this NTSB investigation (case no. DCA21FM021). Use the [CAROL Query](#) to search investigations.

Casualty type	Contact
Location	Upper Mississippi River, mile 201.1, Alton, Illinois 38°52.30' N, 90°9.46' W
Date	March 19, 2021
Time	1138 central daylight time (coordinated universal time -5 hrs)
Persons on board	9
Injuries	None
Property damage	\$1,172,227 est.
Environmental damage	None
Weather	Visibility 10 mi, few clouds, winds northeast 14 mph, gusts 21 mph, air temperature 45°F
Waterway information	River, nearest river gage at 22.8 ft and rising

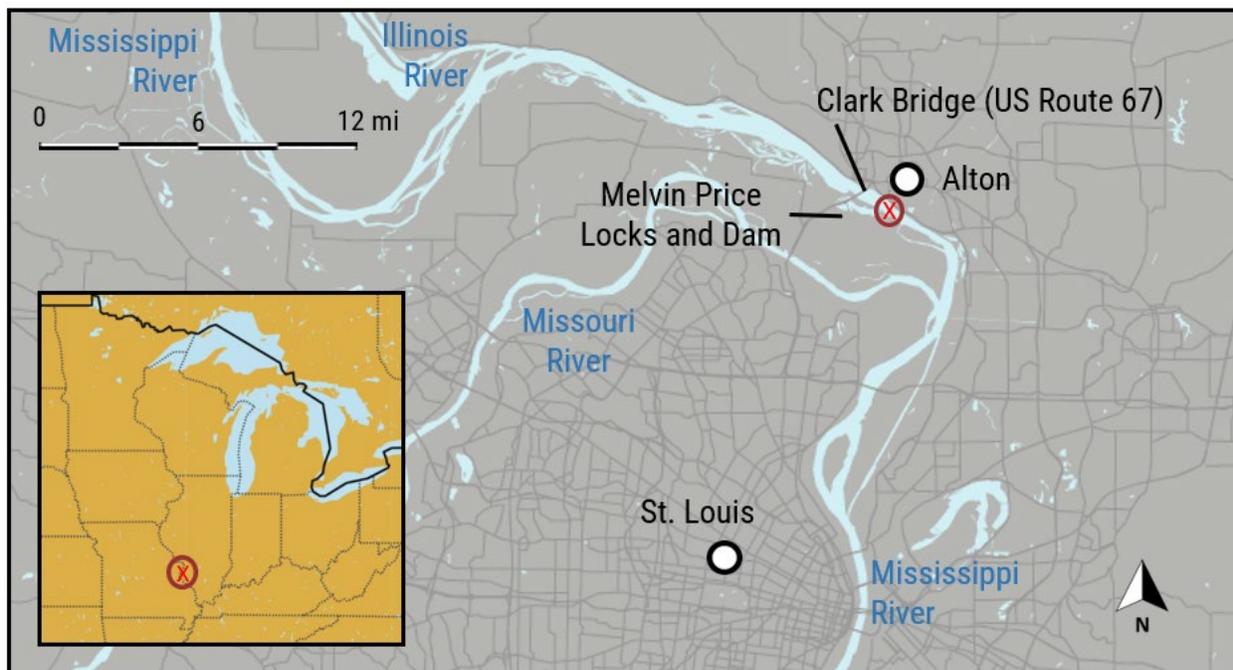


Figure 2. Area where the *Kevin Michael* tow contacted the Melvin Price Locks and Dam guide wall, as indicated by the red X. (Background source: Google Maps)

1. Factual Information

1.1 Background

The 177-foot-long towing vessel *Kevin Michael* was a steel-constructed line-haul boat built in 1957 by Nashville Bridge Company in Nashville, Tennessee, and had been operated by Hamm's Frontier Marine LLC since 2020. Line-haul boats are generally larger towing vessels with higher horsepower used for towing over large distances between major ports. Line-haul tows can be as large as 40 or more barges. The vessel had two propellers, each driven by a 2,800-hp diesel engine. Steering rudders were installed behind and flanking rudders ahead of the propellers.

One of the 37 lock and dam sites within a 9-foot channel navigation project covering 1,200 river miles in Illinois, Iowa, Minnesota, Missouri, and Wisconsin, the Melvin Price Locks and Dam was located at mile 200.8 on the Upper Mississippi River in Alton, Illinois. It was 1.3 miles down river from the Clark Bridge (US Route 67), which crossed the river between West Alton, Missouri, and Alton, Illinois. The main lock chamber was 110 feet wide by 1,200 feet long and featured a 1,600-foot-long upstream guide wall which was separated by 400 feet from the upstream guide wall for the auxiliary lock chamber. The Melvin Price Locks and Dam, which began operation in 1989, was designed with sections of the dam on both sides of the main lock chamber. There were seven dam gates on the Missouri side (right descending bank) of the main lock chamber and two gates on the Illinois side (left descending bank).²

A cross current, also known as an outdraft, was caused when high flow past the dam pulled water laterally from the bank toward the dam gates. Because the lock was situated with two gates on the left descending bank side and seven gates on the right descending bank side, most of the water was pulled toward the seven gates (when open) on the right descending bank side of the lock. To lessen the outdraft upstream of the guide wall, the dam and locks were designed to direct water flow between 6-foot-diameter cylinders, called caissons, made of steel and filled with concrete, which supported the main lock guide wall and allowed water to flow under the wall, creating a transverse flow toward the main lock guide wall in the forebay.

² The inland towing industry refers to the shorelines of Western Rivers as the left and right banks when traveling (facing) down river. The left bank is called the *left descending bank* and the right bank is called the *right descending bank*.

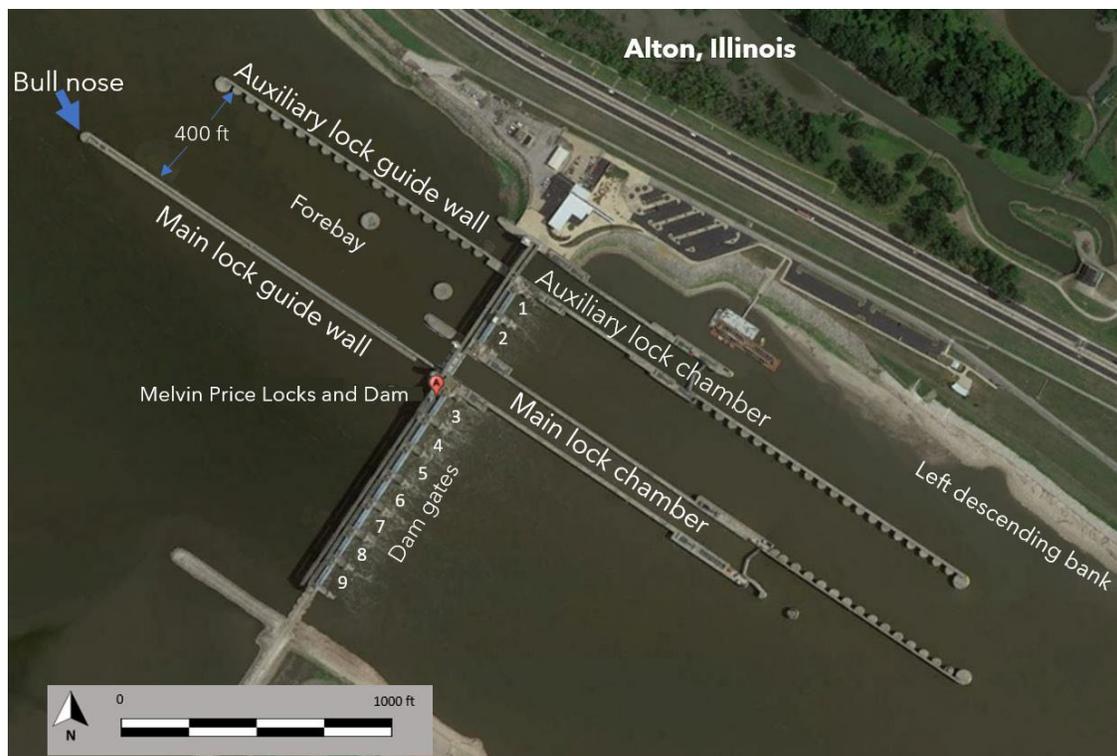


Figure 3. Melvin Price Locks and Dam. (Background source: Google Earth)

1.2 Casualty Events

The *Kevin Michael* departed Hennepin, Illinois, on March 17, 2021, and headed down river on the Illinois and Mississippi Rivers for St. Louis, Missouri. During the casualty transit, the *Kevin Michael* had a crew of nine. The captain was in charge of the vessel and shared helm duties with the pilot.³ The captain and pilot stood 6-hours-on/6-hours-off watch cycles, with the pilot taking the 1100-1700 and 2300-0500 watches, and the captain taking the opposite shifts.

The 15 hopper barges (nine loaded with corn or grain and six empty) were arranged in three strings across (widthwise side by side) and five deep (lengthwise one after the other). All six empty barges were at the front of the tow. The barges were 195 or 200 feet long and 35 feet wide. The entire tow (vessel and barges) was 1,175 feet long and 105 feet wide.

The transit was uneventful, and, on the morning of March 19, the tow neared the Melvin Price Locks and Dam. At the time of the casualty, the river gage at the dam measured 22.8 feet and was rising, and all nine dam gates were raised above the water,

³ *Pilot* is a term used aboard towing vessels on inland waterways for a person, other than the captain, who navigates the vessel.

between 5 and 8 feet. The Waterways Action Plan (WAP) for the Upper Mississippi River defined this river level as the high-water “watch” phase, which began when the gage measured 21 feet (see section 1.3.3 Waterways Action Plan). During this phase of rising water, the WAP encouraged towboat operators to 1) be experienced in high-water operation, and 2) use caution in all passing and meeting situations.

At 1100, 38 minutes before the casualty, the *Kevin Michael* pilot relieved the captain of the watch in the wheelhouse. At 1123, the *Kevin Michael* sailed through the Clark Bridge. The pilot recalled being at a quarter to a third ahead on the engines; that the wind gauge on board the *Kevin Michael* was reading “15 to 20, and sometimes... 30 [mph] or more;” the wind was on his port side; and the current was “swift.” Because of the wind and current, the pilot desired to make a wide approach to the forebay to align the tow for entry into the main lock chamber, staying closer to the left descending bank. He also desired to keep the tow into the wind so he could land the head of the tow about halfway down the lock chamber guide wall at a point 800–1,000 feet from the bull nose (the rounded end of the guide wall).



Figure 4. Annotated electronic chart system track history of the *Kevin Michael* tow over the last 12 minutes leading up to the casualty. (Background source: Google Earth)

Up until 1129, the electronic chart system (ECS) lateral slide indicator for the vessel, which showed the speed of sideways movement perpendicular to the course

over ground, was near zero. At 1130, the tow was about 300 feet to the right of the sailing line, aligned with the auxiliary lock chamber upstream guide wall (the sailing line on inland navigational charts is the preferred or recommended route within the reaches of a navigable channel). The upstream guide walls were separated by 400 feet.

Between 1130 and the time of the contact 8 minutes later, the lateral slide indicator showed the bow and stern moving to starboard (toward the center of the river) with a few short movements to port. The pilot told investigators that when the head of the tow was about 1,000 feet from the bull nose of the main lock chamber guide wall (between 1135 and 1136 based on ECS data), he became concerned with the approach into the lock chamber because the outdraft "really got strong," and the wind was pushing the tow sideways across the river more than he anticipated. The pilot radioed his concern to the two crewmembers at the head of the tow who were providing him with distances to the guide wall.

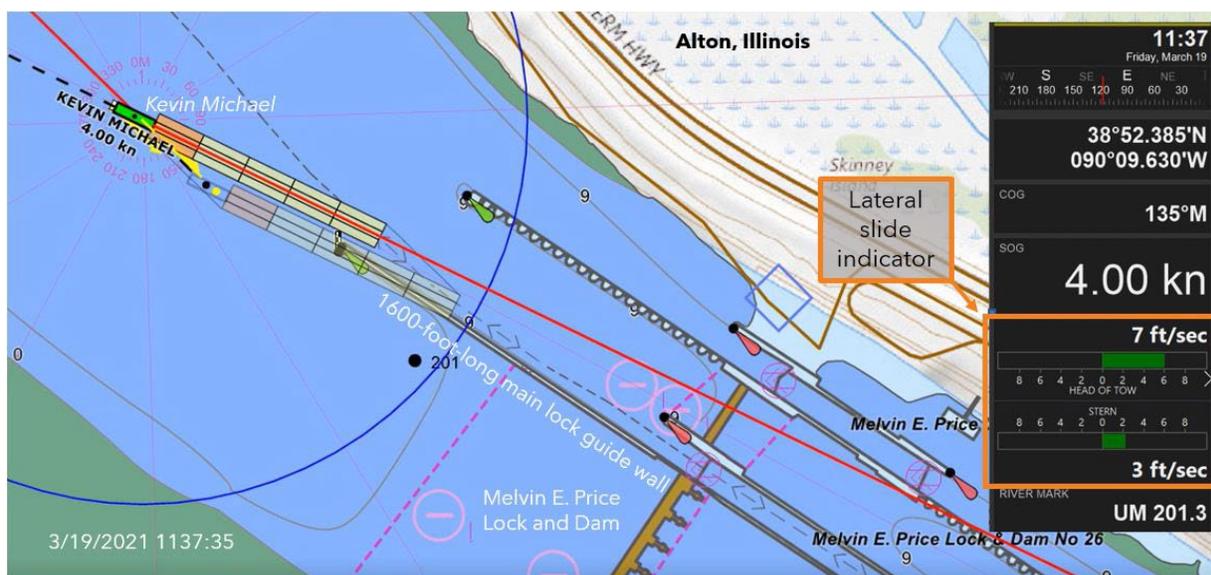


Figure 5. Screenshot of the *Kevin Michael* ECS at 1137 with the bow and stern sliding laterally to the right at 6.1 and 2.1 feet per second (rounded to 7 and 3 feet per second in lateral slide indicator).

At 1138, the empty outboard barge in the second row on the starboard side string contacted the guide wall bull nose, causing the tow to break apart. At the time of the contact, the tow's speed over ground was 4 mph, its heading was 116°, and its course over ground was 132°. In the minute before the contact, the lateral slide indicator showed speeds as high as 6.1 feet per second (4.1 mph) at the bow and 2.1 feet per second (1.4 mph) at the stern.

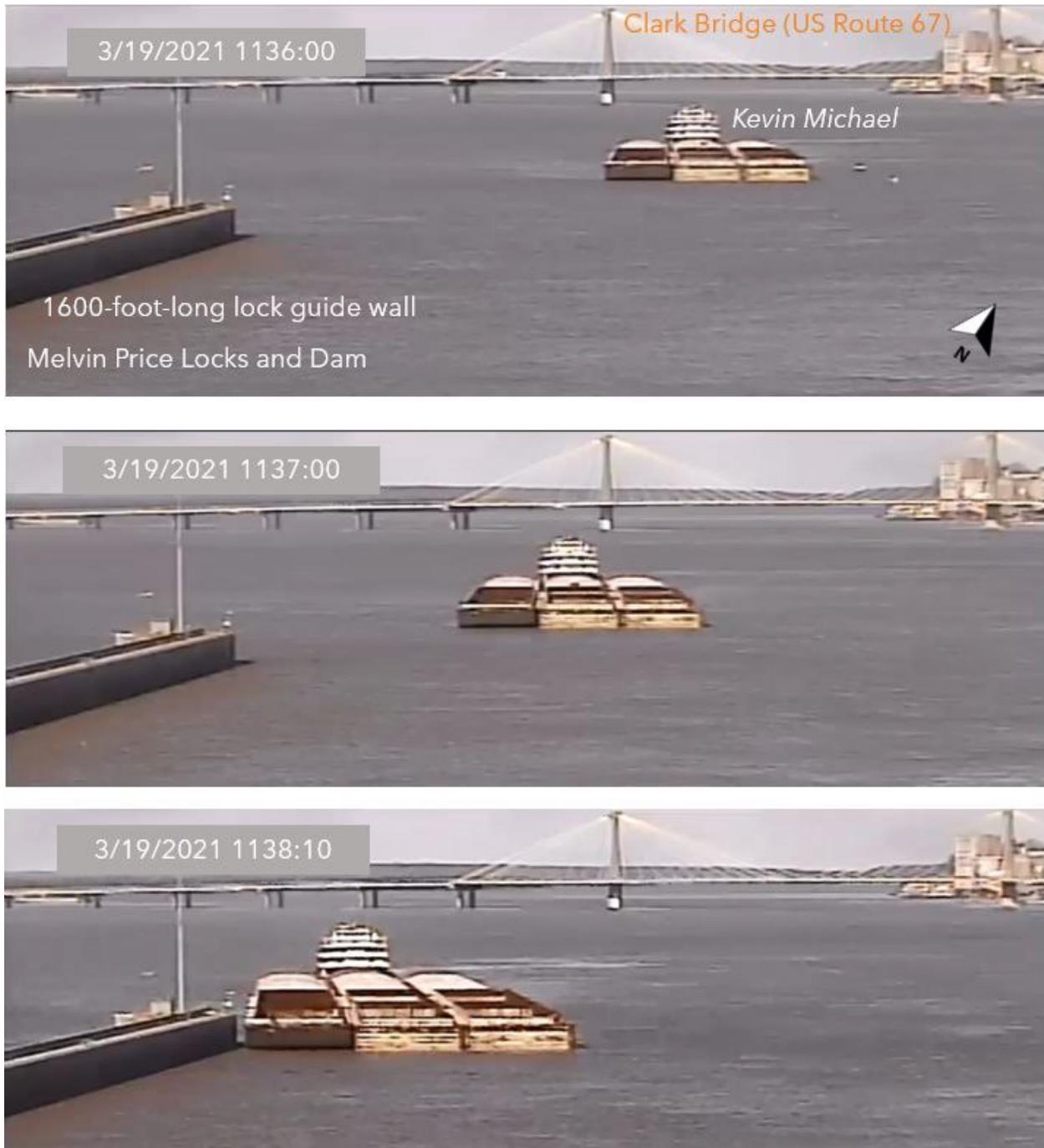


Figure 6. Screenshots of the *Kevin Michael* tow, starting 2 minutes before the contact. (Source: US Army Corps of Engineers)

Eight barges drifted into the forebay area north of gates 1 and 2, with one barge entering the open main lock chamber. Seven barges drifted into gates 3-9. Following the barge breakaway, the lock was closed to traffic. Nearby towing vessels rounded up the barges. The lock reopened the next day, March 20, at 1950. The lock closure delayed seven southbound and three northbound tows.



Figure 7. Barges upstream of the Melvin Price Locks and Dam west of the guide wall following the casualty. (Source: Coast Guard)

1.3 Additional Information

1.3.1 Damage

The *Kevin Michael* was not damaged. Six barges incurred damage to the sides and bottom, coaming, covers, and mooring fittings. The west guide wall was scraped, but an inspection determined it to be structurally sound, and it did not require repairs. Gates 4 and 5 incurred minor damage. The bottom of the raised gate 5 was perforated, and the plate and supporting ribs were deformed.

1.3.2 Water Flow Rates at the Melvin Price Locks and Dam

There was no system in place at the Melvin Price Locks and Dam that measured the velocity of the current. However, waterway users employed the volume of water flow rates to make a relative estimate of the current velocity. River flow rates, measured in cubic feet per second (cfs), varied from just under 50,000 cfs to almost 400,000 cfs. At the time of the casualty, the dam was in “open river” condition, with all nine dam gates raised above the water surface, allowing unrestricted water flow. The water flow rate at the time of the casualty, about 293,000 cfs, was at the high end of historical flows. The water flow peaked at 315,000 cfs 2 days later, on March 21.

To find out how fast the current could flow at the Melvin Price Locks and Dam, the US Army Corps of Engineers collected velocity data on September 20, 2018. On that day, when the discharge rate measured 250,000 cfs, measurements showed velocity patterns of 2.7-3.4 mph up river of the bull nose.

The Corps of Engineers also conducted a case study to understand how vessels approached the Melvin Price Locks and Dam at varying river stages and water flow rates.⁴ The study examined data from 2018 and noted there were 11 downbound strikes involving tows with the Melvin Price Locks and Dam. Of those, six occurred when the water was flowing over the dam at a rate of about 250,000 cfs.⁵ Those 11 events occurred during a year when the Melvin Price Locks and Dam handled more than 6,200 lockages. During that year, the Melvin Price Locks and Dam was within the top five busiest locks in terms of barges handled across the inland waterway system.

1.3.3 Waterways Action Plan

The US Coast Guard, in collaboration with the Corps of Engineers and industry representatives, maintained a WAP, which provided maritime industry and government agencies “with a plan for facilitating the safe and orderly movement of traffic during extreme conditions on the inland rivers” within a Coast Guard sector’s area. The Upper Mississippi River WAP, which contained the Melvin Price Locks and Dam, was reviewed annually and frequently updated to maintain the accuracy of the plan and communications information. It defined three high-water action phases (watch, action, and recovery) for hazardous sections of the rivers, locks and dams, and some bridges. The Western Rivers WAP for 2020 called for closing the Melvin Price Locks and Dam to traffic when the water level reached 34 feet.

1.3.4 Sailing Line Change

Two years before this casualty, in response to similar incidents, the Corps of Engineers implemented a safety improvement to reduce the risk of collisions and barge breakaways at the Melvin Price Locks and Dam by moving the sailing line on the electronic navigation charts for the area. Based on an industry recommendation and an analysis of the paths of tows that struck the Melvin Price Locks and Dam in 2018, the sailing line north of the Clark Bridge moving down river to the locks and dam (labeled UMR 202 - 200.5 on the chart) was moved toward the left descending bank to account for tows being set across the river by the outdraft. Notice of the change was provided in the St. Louis District’s Notice to Navigation Interests (Local Number 18-18) dated October 29, 2018. The notice was published onto the [Notices to Navigation Interest](#)

⁴ Tabbert, C., J. Vest, A. Rhoads, D. Myers, T. Lauth, E. Brauer, J. Wallace, D. Gordon, and M. Kress. 2020. *AIS Data Case Study: River Level and Vessel Approach Variation at Melvin Price Locks and Dam in St. Louis District*. ERDC/CHL CHETN-IX-51. Vicksburg, MS: US Army Engineer Research and Development Center. <https://apps.dtic.mil/sti/pdfs/AD1095043.pdf>

⁵ Though the study documented 12 downriver contact events and indicated seven occurred when the water was flowing over the dam at a rate of about 250,000 cfs, the Corps of Engineers notified NTSB that the figures were actually 11 and 6, respectively.

[website](#) for public view. The notice was also distributed via an email distribution list, which included personnel from the Corps of Engineers, Coast Guard, River Industry Advisory Council, and other waterway users. Hamm's Frontier Marine was not on the mailing list but was added following the casualty.

The *Kevin Michael* had an ECS with the most recent sailing line depicted, and it was available to the pilot during the transit. The towboat's approach was between the original and revised sailing lines. The pilot told investigators he used his knowledge of the river, especially its currents and eddies, to successfully move tows up and down river. He gathered this knowledge from others' experiences, reading, and from personal experience in the wheelhouse that included about 100 downriver entries into the Melvin Price Locks and Dam main lock chamber. To obtain up-to-date information when he began serving on board the *Kevin Michael*, he said he did what he normally did each time he returned to serve as the pilot on a vessel. He opened the boat's email account and read emails that included notices to mariners and other navigation information. He was unaware that the sailing line displayed on the *Kevin Michael's* ECS had been relocated in 2018, nor was he aware that the sailing line was moved as a Corps of Engineers safety improvement to reduce casualties. The vessel's operating company also did not know that the sailing line had been relocated.

2. Analysis

After transiting through the Clark Bridge and approaching the upstream lock of the Melvin Price Locks and Dam, the *Kevin Michael's* pilot knew that, under the dam flow conditions and prevailing winds, a successful landing on the lock's guide wall depended on placing the tow nearer the left descending bank of the river as he approached the forebay, and he tried to move his tow in that direction. Despite lining up in a position he felt would provide for a successful approach to the forebay, the tow slowly slid toward the center of the river and contacted the guide wall. He was unsuccessful because the forces of the dam-induced outdraft and wind acting on the tow overcame the developed forces of the *Kevin Michael's* engines and rudders from his orders, setting the tow to starboard and toward the center of the river before contacting the guide wall's bull nose.

Though the outdraft and wind conditions increased the difficulty for landing the tow on the main guide wall, the pilot anticipated the conditions and expected to enter the lock's forebay successfully. Based on the WAP guidance, the Coast Guard and other waterway stakeholders judged the water level and flow conditions to be within the capability of pilots experienced with high-water operations on the Mississippi River. The pilot used his knowledge, experience, and judgment to assess conditions and then make decisions regarding his vessel. As the pilot of the *Kevin Michael* passed through the Clark Bridge and prepared to enter the lock 1.3 miles ahead, he was aware of the

increased outdraft in the approach to the lock because he was familiar with transiting the Melvin Price Locks and Dam and knew the dam gates were fully open (above the surface). He was also aware of the gusting wind, which he was monitoring by observing the vessel's anemometer.

There were no restrictions for operators transiting the locks on the date of the casualty. The Coast Guard was monitoring the water levels and the dangers caused by the currents associated with high water. The pilot met the WAP recommendation that towing vessel operators transiting during a high-water watch phase should have high-water experience.

Based on a safety improvement effort in response to several casualties where vessels contacted the Melvin Price Locks and Dam guide wall, in 2018 the Corps of Engineers, at the request of other towing vessel operators, moved the sailing line—the preferred or recommended route within the reaches of a navigable channel. The sailing line was moved toward the left descending bank of the river to compensate for the outdraft that set tows sideways to their intended course, toward the center of the river, before the approach to the guide wall. Though the pilot was unaware that the Corps of Engineers had addressed the risk from the outdraft by moving the sailing line, he had made many successful transits through the Melvin Price Locks and Dam since 2018. Although his course, which was based on experience and knowledge, was closer to the bank than the original sailing line, it was not as close to the bank as the revised sailing line, which left the *Kevin Michael's* pilot with less room to compensate for the strong outdraft and high winds as the tow approached the locks.

3. Conclusions

3.1 Probable Cause

The National Transportation Safety Board determines that the probable cause of the contact of the *Kevin Michael* tow with the Melvin Price Locks and Dam guide wall was the *Kevin Michael* pilot not effectively compensating for the strong outdraft and wind above the dam while navigating toward the lock during a period of high-flow conditions.

3.2 Lesson Learned: Use of Charted Sailing Lines

Generally, a sailing line is assigned to a known safe route used by commercial vessels. A sailing line is developed under considerations of channel depth, current patterns, and any other known obstructions to navigation. In some areas, a sailing line is positioned to address a specific navigational hazard, such as the outdraft near the Melvin Price Locks and Dam. A charted sailing line provides for a safe and successful transit

when used as a guide along with the mariner's own experience and assessment of the existing circumstances.

Vessel	<i>Kevin Michael</i>
Type	Towing/Barge (Towing vessel)
Flag	United States
Port of registry	St. Louis, Missouri
Year built	1957
Official number (US)	273675
IMO number	8424159
Classification society	N/A
Length (overall)	167.0 ft (50.9 m)
Beam	42.0 ft (12.8 m)
Draft (casualty)	10.0 ft (3.0 m)
Tonnage	1,165 GRT
Engine power; manufacturer	2 x 2,800 hp (2,088 kW); GM 16-645E5 diesel engines

NTSB investigators worked closely with our counterparts from **Coast Guard Sector Upper Mississippi River** throughout this investigation.

The National Transportation Safety Board (NTSB) is an independent federal agency dedicated to promoting aviation, railroad, highway, marine, and pipeline safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974, to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

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For more detailed background information on this report, visit the NTSB investigations website and search for NTSB accident ID DCA21FM021. Recent publications are available in their entirety on the NTSB website. Other information about available publications also may be obtained from the website or by contacting—

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