



National Transportation Safety Board

Marine Accident Brief

Contact of *Mary Lucy Lane* Tow with Markland Locks and Workboat *Gibson*

Accident type	Contact	No. DCA19PM011
Vessel names	Towing vessel <i>Mary Lucy Lane</i> and workboat <i>Gibson</i>	
Location	Ohio River, mile 531.5, Markland Locks & Dam, Warsaw, Kentucky (about 30 miles southwest of Cincinnati, Ohio) 38°46.44' N, 084°57.34' W	
Date	December 18, 2018	
Time	1555 eastern standard time (coordinated universal time – 5 hours)	
Injuries	0	
Property damage	\$2.1 million est.	
Environmental damage	None	
Weather	Visibility 10 miles, sunny skies, south winds at 8 mph, air temperature 52°F, water temperature 45°F	
Waterway information	The navigable Ohio River is 981 miles long, starting at mile 0 in Pittsburgh, Pennsylvania, and ending at mile 981 in Cairo, Illinois, where it flows into the Upper Mississippi River. ¹ The Markland Locks & Dam has an upper pool and a lower pool used to maintain the navigable channel.	

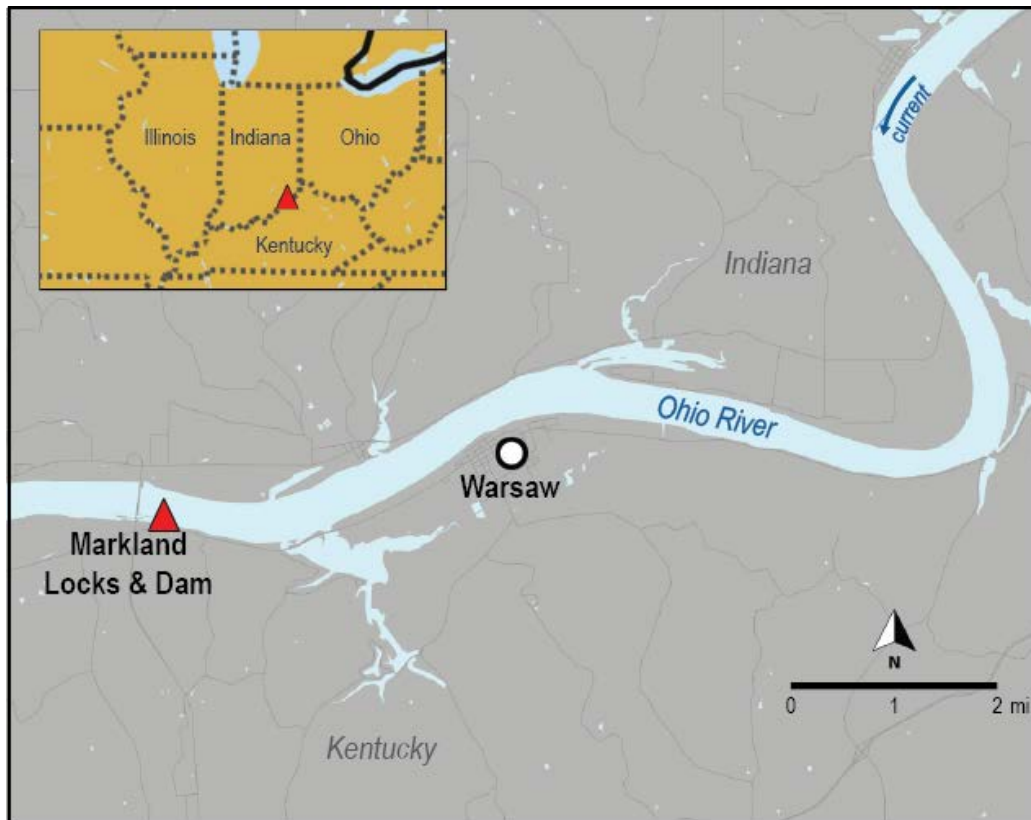
About 1555 on December 18, 2018, the towing vessel *Mary Lucy Lane*, with eight crewmembers on board and pushing a tow of 12 barges, was locking southbound at the Markland Locks & Dam (L&D) at mile 531.5 on the Ohio River, when the tow struck the lock's wall, then its guard wall. Several barges broke loose and continued forward, one of which collided with the moored US Army Corps of Engineers workboat *Gibson*. No injuries or pollution resulted from the accident. Damage to the *Mary Lucy Lane*, the barges, and the dam was estimated at \$321,943, and the Corps of Engineers estimated the cost to replace the *Gibson* at \$1.8 million.



Left: Towing vessel *Mary Lucy Lane*. (Source: © Photo by Jeff L. Yates) Right: Corps of Engineers workboat *Gibson*. (Source: US Coast Guard)

¹ All distances in this report are statute miles and all speeds are miles per hour.

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Area where the *Mary Lucy Lane* contacted the Markland L&D and the Corps of Engineers workboat *Gibson*. The site of the accident is marked by a red triangle. (Background Source: Google Earth)

Background

The Corps of Engineers operates the Markland L&D. The dam's 12 gates are 42 feet high by 100 feet wide. Two 110-foot-wide navigation locks are on the river's left descending bank.² The (riverside) main lock chamber is 1,200 feet long, and the (landside) auxiliary lock chamber is 600 feet long. A guard wall was fitted between the main lock chamber and the river.³

Accident Events

The 140-foot-long, twin-propeller towing vessel *Mary Lucy Lane* began its planned 940-mile southbound voyage on December 11 with 8 crewmembers on board. The vessel was scheduled to pick up and drop off barges along the Ohio River between East Liverpool, Ohio, and Cairo, Illinois. The tow departed Cincinnati, Ohio, on December 18 at 0336 after picking up barges.⁴ The *Mary Lucy Lane* was pushing a tow of 12 barges in three strings (rows) of four barges

² The inland towing industry refers to the shorelines of western rivers as the left and right banks when traveling (facing) downstream. The left bank is called the *left descending bank*, and the right bank is called the *right descending bank*.

³ A *guard wall* is a structural mechanism (usually in both the upper and lower lock approaches) that towboats use to align with and enter a lock chamber. The guard wall also protects the tow from flow drawn toward the dam in the upper lock approach or from flow discharged from the dam across the lower lock approach. US Army Corps of Engineers, "General Guard Wall Design Considerations for Tow Entry and Exit," June 2002, <https://apps.dtic.mil/dtic/tr/fulltext/u2/a607395.pdf>.

⁴ In this report, all times associated with the *Mary Lucy Lane* have been converted from central standard time (which the vessel kept on board) to eastern standard time.

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(an empty lead barge followed by three loaded barges); combined, the vessel and tow's length was 930 feet, its width was 105 feet, and its deepest draft component (*Mary Lucy Lane*) was 10 feet.

CBC 92	CBC 1341	AGS 266B	CC 1319	
WCAO 116	CTC 9716	AGS 227B	MTC 302	<i>Mary Lucy Lane</i>
ART 36109	MTC 645	AGS 812B	AGS 153	

Simplified towing arrangement, with the *Mary Lucy Lane* pushing 12 barges in 3 strings.

At 0935 on December 18, the *Mary Lucy Lane* arrived in the vicinity of the Markland L&D, about 3.5 miles downriver from Warsaw, Kentucky. The tow waited in queue to transit the lock. Also at the dam was the *Gibson*, a 40-foot-long Corps of Engineers workboat equipped with a 1.5-ton crane and used for debris removal and maintenance of the Markland L&D and other nearby locks and dams. At the time of the accident, the *Gibson* was unmanned and moored next to its work barge in a sheltered area behind the upriver guide wall at the Markland L&D.

At 1526, after the lock operator radioed the *Mary Lucy Lane* and gave permission to commence approach to the main lock chamber, the *Mary Lucy Lane* got under way from the federal mooring cells (mile 530.4), about 0.9 mile upriver from the Markland L&D. One deckhand was stationed on the port lead barge, and another deckhand was stationed on the starboard lead barge to aid in the transit. Dam security camera video footage showed the *Mary Lucy Lane* tow approaching the lock, parallel to the left descending bank. The pilot on board the *Mary Lucy Lane* had transited with tows through the Markland L&D many times previously and stated that the area leading up to the lock was "very narrow" because of a protruding point just upstream before the entrance.⁵ He stated that "the river was up" and the current swift, and he slowed the engines to keep his approach speed at about 3.5 miles per hour. As the tow got closer, its speed increased, so the pilot slowed it by putting the port engine in neutral. At 1534, the aft end of the tow was drawn toward the guard wall due to what the pilot described as "cross current" (outdraft).⁶ Video footage showed that at 1550, the *Mary Lucy Lane* was no longer lined up on the inside of the guard wall.

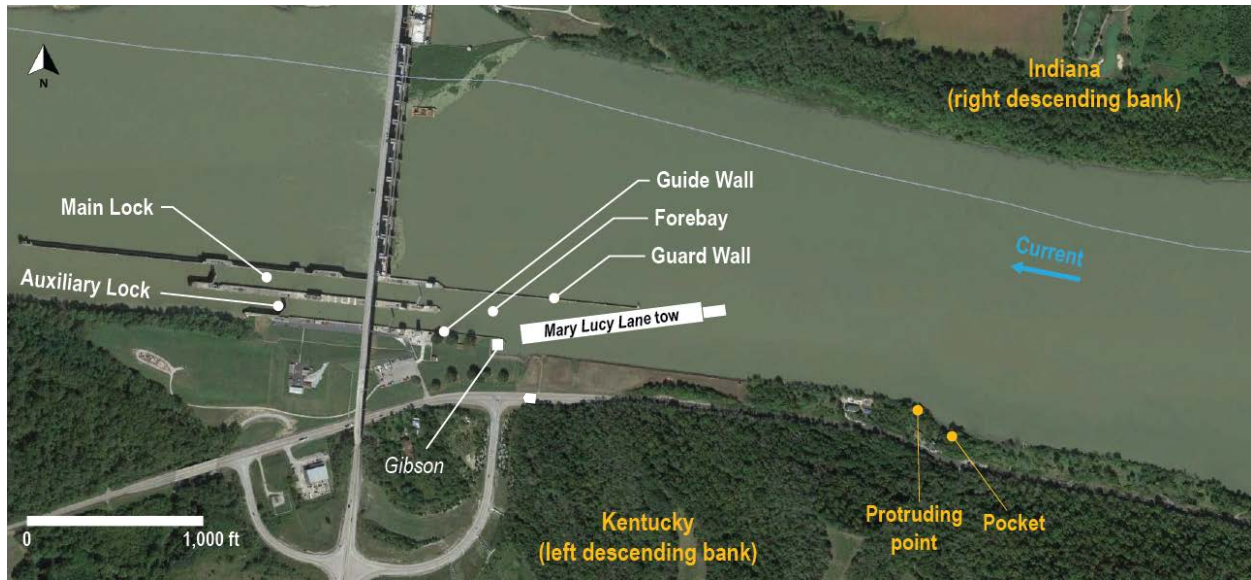
The pilot said that the deckhand on the starboard lead barge radioed when the tow was 200 feet from the end of the guard wall. The tow was drawn quickly toward the dam, and the pilot put both engines ahead to move the tow to the forebay. The pilot said that increasing speed did not correct the approach, so he began alternating the port and starboard engines with ahead and astern commands, and he positioned the head of the tow into the forebay. The tow continued to be pulled toward the dam, and when striking the guard wall seemed imminent, the pilot sounded the vessel's general alarm. At 1541:31, the tow struck the guard wall's protective bullnose between the second and third barges of the starboard string, which parted the tugboat's starboard facing and wing

⁵ *Pilot* is a term used aboard towing vessels on inland waterways for a person, other than the captain, who navigates the vessel.

⁶ *Outdraft* is a river cross current that pulls toward a downstream dam in front of upstream lock gates and guard walls.

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wires.⁷ The pilot applied full-ahead on both engines to move the rest of the tow into the forebay and away from potentially being swept into the dam gates. As the end of the tow was about to clear the guard wall, the pilot reversed propulsion to full astern. Despite this, at 1542:25, the center string's lead barge, *WCAO 116*, struck the protective bullnose on the shoreside guide wall, and a large chunk of concrete broke off in the collision. The guide wall stopped all forward motion of the center string and the *Mary Lucy Lane*; however, the towing wires on the portside string parted, and the four portside barges continued forward into the sheltered area behind the guide wall where the *Gibson* was moored. At 1542:36, the lead port barge *ART 36109* struck the *Gibson*'s stern.



Approximate positions of the *Mary Lucy Lane* tow and the workboat *Gibson* about 1555, when the tow contacted the guard wall. (Background source: Google Earth)

No injuries or pollution resulted from the accident, and the locks were closed to navigational traffic. The center string of the tow came to rest diagonally, wedged in the forebay. The *WCAO 116* was impaled at the bow on the guide wall's protective bull nose. The next day, the *WCAO 116* was successfully pulled off the guide wall. Since the four towing wire winches were inoperative, the crew temporarily remade the tow with conventional rigging wires and ratchets. Later that night, the tow cleared the main lock chamber and proceeded to a barge fleeting area 4.5 miles downriver. Four days later, after its winches were replaced, the *Mary Lucy Lane* tow continued its voyage.

Additional Information

Damage. A damage survey of the *Mary Lucy Lane* and its tow was conducted on December 20, 2018. Four of the vessel's winches were damaged, and the starboard string of barges that struck the guard wall's protective bullnose—the *CBC92*, *CBC1341*, and the *CS1319*—had minor scraping damage.⁸ The *ART 36109*, which struck the *Gibson*, had estimated damages of \$6,500. The *WCAO 116*, which was impaled on the guide wall bullnose, sustained a 5-foot-wide-by-10-foot-high hole in the bow rake.

⁷ Short "facing wires" are connected to a barge string's (tow's) center barges from the towboat's bow to keep the barges securely against vessel. Long "wing wires" are connected between the next outboard barges and the sides of the towboat (at opposite angles) to limit side-to-side movement and transfer torque when steering the tow.

⁸ Neptune Marine Surveys, *Damage Report M/V Mary Lucy Lane & Tow*, Milford, Ohio, December 20, 2018.

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The guide wall's bullnose armor steel plate edge broke off, and the underlying 17-foot-long-by-24-feet-thick concrete was damaged up to a depth of 6 inches. A 2-foot-thick-by-5-foot-long section of the concrete cap of the wall extending shoreward broke off and fell into the harbor pool. The *Gibson's* pilothouse and deckhouse were crushed, and portions of the aft deck were buckled by the impact with the *ART 36109*; the Corps of Engineers estimated the cost to replace the *Gibson* at \$1.8 million. The total estimated damages for the *Mary Lucy Lane*, the barges, and the dam were \$321,943.

River Conditions. Markland L&D's 12 gates could each be opened to 40 feet, and the maximum opening for the dam was 480 feet. The dam opening amount was measured in total feet and was determined by adding together the amount each individual gate was open (for example, if 12 gates were each open 5 feet, the dam opening amount would be 60 feet). The gate heights were adjusted to maintain an upper pool gage between 12 and 13.2 feet.

The Coast Guard, in collaboration with the Corps of Engineers and industry representatives, maintains a Waterways Action Plan (WAP), which provides 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 WAP defines three action phases (watch, action, and recovery) for hazardous sections of the rivers, locks and dams, and some bridges. The WAP is considered a "living document" that is to be frequently updated and is reviewed annually to verify the accuracy of the plan and communications information.

The Corps of Engineers groups Markland L&D's flow "phases" according to feet of dam (the amount that the dam gates are open) and water trend (the direction the river level is moving [rising or falling]) to determine operating restrictions. The WAP advises mariners that "the potential for vessel allisions with Markland L&D tends to increase as water rises and currents increase. Vessels experience outdraft while entering Southbound Lock Chamber." The WAP also featured two cautionary notes, warning downbound mariners of the "pocket and protruding point that has a potential to saddlebag the tow on the left descending bank at [mile] 531," and that when the dam reaches 400 feet of gate opening, "outdraft is severe."⁹

WAP phases by feet of dam open and water trend at Markland L&D	
Phase	Conditions
N/A (<50 feet dam and rising)	Normal operations/flow conditions; locking operations normal.
Watch Phase (50 feet+ dam and rising & projected to continue rising rapidly)	High-water/increased flow conditions; issue Scheduled Marine Information Broadcast (SMIB).
Action Phase (120 feet+ dam and rising)	Extreme high-water/extreme high-flow conditions; Coast Guard, Corps of Engineers, and Central Ohio River Marine Industry Group (CORMIG) conference call to evaluate. A Regulated Navigation Area (RNA) is initiated when the Cincinnati gage reads 45 feet or greater.

⁹ (a) *Saddlebag* occurs when the tow grounds and wraps itself around the point (like a saddle). (b) At 400 feet of dam, the 12 dam gates would be about 33.3 feet high to keep the upper pool between 12–13.2 feet.

WAP phases by feet of dam open and water trend at Markland L&D	
Action Phase (120 feet dam and falling)	High water/increased flow conditions; continue conference call; monitor conditions and adjust restrictions as appropriate. Consider SMIB.
Recovery Phase (50 feet dam opening and falling)	Normal operations/normal flow conditions; continue monitoring river conditions and consider canceling SMIB.

The Sector Ohio River Valley (Louisville) communications center began broadcasting high-water Scheduled Marine Information Broadcasts (SMIB) on September 10, 2018, warning mariners to “exercise extreme caution due to hazardous conditions associated with strong currents, increased drift, and severe outdrafts when making approaches to bridges, and lock and dams.” The SMIB included a list of areas that were affected by the high water and strong current, including Markland L&D and other bridges and locks and dams. The SMIB recommended that mariners “contact their company’s operations support to discuss risk mitigation strategies during the trip planning phase of their voyage. These strategies should consider the area’s waterway action plan and collaboration with the local industry representative when navigating these areas.” The Coast Guard broadcasted the SMIB about 0400, 1100, 1600, and 2200 daily over VHF channel 16 through April 2019. On the day of the accident, the pilot was on watch 0030-0630 and 1230-1830.

In October 2018, the National Weather Service (NWS) forecasted rapidly rising water and potential flooding in portions of the inland river system. In conjunction with this forecast, on October 31, the Coast Guard issued a Marine Safety Information Bulletin (MSIB) to Sector Ohio Valley’s industry members and government agencies via email, warning mariners of impending high water levels and increased currents in the Ohio Valley area; the MSIB was in effect at the time of the accident and through the end of the year.¹⁰ On December 18, the day of the accident, the river was at action phase, with 177 feet of gate open at the dam, and the river was rising.

At 2101 on December 19, the day after the accident and immediately after the Markland L&D was reopened for locking operations, with 187 feet of dam opening and the water trend rising, the first southbound towing vessel *Jack James* and its tow began its approach from the upriver federal mooring cells had a nearly identical accident with the guard and guide walls.¹¹ The river continued to rise, and on December 20, the Coast Guard established a safety zone, imposing operating restrictions around the Markland L&D between miles 530.6 and 533.0, “due to the increase in river level, extreme currents and excessive drift.” With 32 vessels in queue, the captain of the port (COTP) opened the waterway at 0517 on December 21, with three conditions: first, southbound towing operations were restricted to during daylight hours only; second, an assist (helper) boat was on-scene (paid for by industry) to assist tows in and out of the lock; and third, vessels were prohibited from mooring to the upper approach federal mooring cells. At 1815 on December 21, the northbound towing vessel *Brees* and its tow struck the bullnose on the Markland L&D’s auxiliary lock chamber. After the river level fell, the safety zone and the first two COTP conditions were canceled on January 7, 2019. The third COTP condition was not cancelled until the first week of March 2019, when the dam opening fell below 120 feet.

Personnel Information. The 63-year-old pilot had been working for the company and assigned to the *Mary Lucy Lane* for more than 3 years. He had worked in the maritime industry

¹⁰ US Coast Guard, *MSIB 08-2018 Rapidly Rising Water Conditions*, October 31, 2018.

¹¹ NTSB, *Summary of Phone Interview/Conversation with Operations Manager Locks & Dams Project Office, Corps of Engineers Louisville District*, October 24, 2019.

for more than 39 years and been a credentialed mariner for 35 years. He was credentialed as master of towing vessels upon the Great Lakes, inland waters, and Western Rivers. He estimated he had made this approach to the Markland L&D about 30 times previously, with many taking place during high-water conditions. Both the pilot and the master told investigators that the vessel's mechanical equipment and electrical systems were functioning properly at the time of the accident. Samples for postaccident toxicological tests were taken from the tow's crewmembers on duty, and all results were negative for the tested drugs and alcohol.

US Army Corps of Engineers. Title 33 *Code of Federal Regulations* authorizes the Corps of Engineers to review and approve all changes to hydrodynamic structures in order to maintain a navigable channel. In addition, the Corps of Engineers is charged with conducting operations to maintain the physical nature of a navigable channel on particular waterways. Generally, the Corps of Engineers has the responsibility to maintain a 9-foot, congressionally authorized project depth in the navigable channel on the Ohio River.

At the Markland L&D, tow operators communicate directly with the Corps of Engineers lock operators via radio when in the vicinity of the locks. The information that a lock operator passes to a tow operator includes the lower pool level and the amount of feet of dam open; the lock operator also requests that the tow operator keep the tow flat on the wall, position crewmembers on the head of the tow, use a four-part line to secure the tow, and put radar in standby mode. The locks do not have dedicated video cameras to record tows during locking operations and vessel locking operations are not normally recorded on video. The Markland lock master said that the accident was recorded on a security camera because he happened to be at the camera controls in the lock operator's office and thought the *Mary Lucy Lane*'s approach looked too far away from the shoreline. Radio communications between Corps of Engineers lock operators and vessel operators are not recorded. The log of all vessels transiting the locks is stored in the Corps of Engineers *Lock Performance Monitoring System* database. Of the 20 locks and dams in Coast Guard Sector Ohio Valley's area of responsibility, the Markland L&D had the second highest number of accidents (13) in the last 10 years.

Postaccident Action. After 3 tows struck the Markland L&D in 3 days during extreme high-water/flow conditions, the Corps of Engineers reinstated the restriction (beginning February 8) of 160 feet of dam for southbound tows on daylight transits.

Based on the *Mary Lucy Lane* accident investigation and the "no mooring" practice adopted at other dams as a proven risk mitigation action, the Coast Guard and the Corps of Engineers updated the WAP for the Markland L&D with a cautionary note, warning southbound tows to "consider no mooring to the upper approach mooring cells" at mile 530.4 when the total dam opening exceeds 120 feet of dam. The Coast Guard and Corps of Engineers recognized that the 0.9-mile distance from the mooring cells to the dam does not give a moored tow sufficient distance to gain speed and make an approach for southbound locking operations during extreme high-water/high-flow conditions. Tows moored to the cells would also obstruct the approach of a southbound tow conducting locking operations, by forcing the tow towards the middle of the river until clear of moored tows; the approaching tow then must turn to get close to and parallel the left descending bank.



The *Gibson* and barge *ART 36109* three days after the accident. (Source: Coast Guard)

Analysis

Per the Sector Ohio Valley WAP, when the water at the Markland L&D is rising, and with 50 feet of dam opening, the Coast Guard issued an SMIB (watch phase) about three months before the accident, which was broadcast four times per day. At 120 feet of dam opening, because of “extreme high water/extreme high flow conditions,” the Coast Guard convened an organizational phone conference (action phase). The Coast Guard was proactive when they issued an MSIB, about seven weeks before the accident, warning mariners of rapidly rising water conditions. At the time of the accident the dam opening was 177 feet, and the river was rising, placing the waterway at action phase. Information regarding the dam’s flow conditions and indication of outdraft (the dam’s lower pool level and the feet of dam opening) are currently passed to a tow operator by the lock operator as the tow approaches the lock.

The *Mary Lucy Lane* pilot told investigators he had made the same approach to the Markland L&D in high-water conditions in the past without any issues. However, he was out of position from the beginning on the day of the accident. In fact, the approach of the tow was far enough from the shore that the Markland lock master felt the need to activate the security camera in order to record what was happening. Although the pilot was able to get the head of the tow into the forebay, the outdraft caused by the high current pulled the tow toward the dam. The pilot was able to keep the vessel from being overwhelmed by the current and pushed downstream to the dam but was unable to prevent it from striking the guard wall or the guide wall. In this case, better communication between the lock operator and the approaching tow may have ensured that the tow operator was aware of the challenging local conditions.

In addition, following the *Mary Lucy Lane* accident, there was another downbound accident 2 days later, indicating that pilots had difficulty transiting the lock safely in the river conditions and with the dam openings at the time. When this area experienced high-water conditions, there were two known hazards, including stronger outdraft as water rose and the current became stronger, and the potential to strike and/or wrap around the “pocket and protruding point at mile 531” on the left descending bank, thereby increasing the potential for vessel contact with Markland L&D. According to the WAP, the pocket and protruding point at mile 531 had been known to cause adverse effects on tows locking southbound, most likely from the current’s

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direction being diverted by changes in the riverbank's contour as a tow's lead barges were about to enter the forebay. The Markland L&D WAP modification to "consider no mooring to the upper approach mooring cells" with 120 feet of dam opening is a proven risk mitigation practice to prevent southbound tows from being pushed toward the center of the river by powerful outdrafts during extreme high-water/flow conditions. The modification removes obstructions, allowing a clear approach, and gives southbound tows more time and distance to line-up when conducting locking operations.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the contact of the *Mary Lucy Lane* tow with the Markland Locks and workboat *Gibson* was a strong outdraft above the dam caused by the extreme high flow conditions, which overwhelmed the pilot's ability to control the *Mary Lucy Lane* tow before locking.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

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Adopted: April 16, 2020

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Vessel Particulars

Vessels	<i>Gibson</i>	<i>Mary Lucy Lane</i>	<i>WCAO 116</i>	<i>ART 36109</i>
Owner / operator	US Army Corps of Engineers	Canal Barge Co., Inc.	West Lake Chemical	American River Transport Co.
Port of registry	Warsaw, Kentucky	New Orleans, Louisiana	Calvert City, Kentucky	St. Louis, Missouri
Flag	United States	United States	United States	United States
Type	Workboat	Towboat	Tank barge	Freight barge
Year built	1988	1979	2010	2008
Official number (US)	LD739	602462	1226629	1207542
IMO number	Not applicable	Not applicable	Not applicable	Not applicable
Construction	Steel	Steel	Steel	Steel
Classification Society	Not applicable	Not applicable	Not applicable	Not applicable
Length	40 ft (12.2 m)	140 ft (42.7 m)	195 ft (59.4 m)	195 ft (59.4 m)
Draft	3 ft (0.9 m)	10 ft (3.1 m)	9 ft (2.7 m)	9 ft (2.7 m)
Beam/width	16 ft (4.9 m)	38 ft (11.6 m)	35 ft (10.7 m)	35 ft (10.7 m)
Tonnage	42 GRT	491 GRT	687 GRT	745 GRT
Engine power; manufacturer	2 X 115 hp (86 kW), Cummins 6B, twin screw	2 x 3,800 hp (2,834 kW), GM 16- 645E6A, twin screw	Not applicable	Not applicable
Persons on board	0	8	0	0

NTSB investigators worked closely with our counterparts from Coast Guard Sector Ohio Valley and Marine Safety Unit Paducah, Kentucky throughout this investigation.

For more details about this accident, visit www.nts.gov and search for NTSB accident ID DCA19PM011.

The NTSB has authority to investigate and establish the probable cause of any major marine casualty or any marine casualty involving both public and nonpublic vessels under Title 49 *United States Code*, Section 1131(b)(1). This report is based on factual information either gathered by NTSB investigators or provided by the Coast Guard from its investigation of the accident.

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The NTSB does not assign fault or blame for a marine casualty; rather, as specified by NTSB regulation, “[NTSB] investigations are fact-finding proceedings with no formal issues and no adverse parties . . . and are not conducted for the purpose of determining the rights or liabilities of any person.” Title 49 *Code of Federal Regulations*, Section 831.4.

Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by conducting investigations and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report. Title 49 *United States Code*, Section 1154(b).
