AVIATION HIGHWAY MARINE RAILROAD PIPELINE

April 8, 2024 MIR-24-07

Flooding and Partial Sinking of Towing Vessel *Joanne Marie*

On June 25, 2023, about 0600 local time, the inspected towing vessel *Joanne Marie* was found partially submerged while moored at a shipyard on the Harvey Canal near New Orleans, Louisiana.[1] There were no crewmembers or shipyard workers on board the vessel. An estimated 10 gallons of diesel fuel were released into the water. Damage to the vessel was $176,751.

Figure 1. *Joanne Marie* underway precasualty. (Source: Marquette Transportation)

[1] (a) In this report, all times are central daylight time. (b) Visit ntsb.gov to find additional information in the public docket for this NTSB investigation (case no. DCA23FM037). Use the CAROL Query to search investigations.

Casualty type	Flooding/Hull Failure
Location	Harvey Canal, New Orleans, Louisiana 29°53'59.75" N, 90°4'50.47" W
Date	June 25, 2023
Time	0600 central daylight time (coordinated universal time –5 hrs)
Persons on board	None
Injuries	None
Property damage	$176,751
Environmental damage	Est. 10 gallons diesel fuel released
Weather	Overcast, winds south 4 kts, air temperature 81°F
Waterway information	Industrial canal, width 300 ft, depth 15 ft

Figure 2. Area where the *Joanne Marie* flooding and partial sinking occurred, as indicated by a red *X*. (Background source: Google Maps)

1 Factual Information

1.1 Background

The 65-foot-long *Joanne Marie* was an inspected towing vessel constructed of steel and built by A. Ortis Boat Building in Krotz Springs, Louisiana, in 1979 (see figure 1). Two 625-hp diesel engines, each driving a propeller, provided propulsion power. Marquette Transportation acquired the *Joanne Marie* in 2007 and operated it within the company's Gulf-Inland division, primarily working with barge fleets on the Lower Mississippi River. Marquette contracted out the vessel to customers who wanted to use the vessel for specific jobs. When the vessel was not being used by a customer, it was "deactivated" and returned to the Bollinger Quick Repair Shipyard on the Harvey Canal near New Orleans, Louisiana, where it would remain, unattended, to await another assignment.[2]

The *Joanne Marie* had a valid US Coast Guard certificate of inspection endorsed for Rivers routes and operated under a towing safety management system (TSMS) certificate issued by Sabine Surveyors.

1.2 Event Sequence

On June 23, 2023, about 1050, the *Joanne Marie* arrived at the Bollinger Quick Repair Shipyard, after completing fleeting operations for a customer on the Lower Mississippi River (see figure 2). The company that had contracted the *Joanne Marie* no longer needed the vessel, and the operating company directed the crew to move the vessel to the shipyard and deactivate it. A captain and two deckhands operated the vessel, working 12-hour shifts. Upon arrival at the shipyard, the *Joanne Marie* crew moored the vessel with its starboard side to a fleet of seven other company towboats (see figure 3). No vessel was moored to the port side of the *Joanne Marie*.

[2] The company used the term "deactivated" to describe a vessel that had been removed from a job and was unattended while awaiting further job orders. When a vessel was deactivated, the crew returned to the shipyard to secure the vessel before departing.

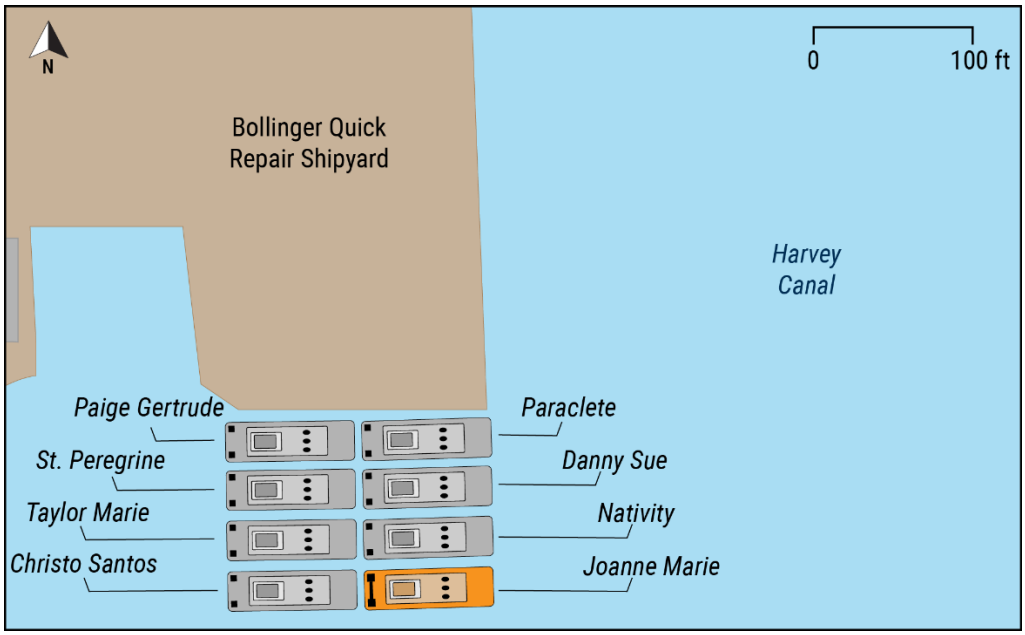

Figure 3. Mooring arrangement at the shipyard on June 23. The *Joanne Marie* is highlighted in orange. (Scale approximate.)

Before the crew departed the vessel, the port captain assisted with, and oversaw the crew as they completed, the required vessel deactivation tasks, which, according to the company's TSMS, included—

- cleaning of crew quarters and bathrooms,
- replacing bunk linens,
- securing tools and radios,
- transferring vessel keys,
- shutting down unnecessary electronics,
- ensuring decks and walkways are clear,
- storing rigging,
- ensuring guard chains are hooked up,
- recording fuel levels in the vessel's daily log, and
- transmitting the log to the office before departing.

The port captain oversaw the deactivation "according to memory" (he was not required to use a checklist or reference the TSMS deactivation policy). He directed a deckhand to "tidy up" the engine room and take out the trash while he and the captain remained on the bridge to complete and submit the daily boat log. After submitting the daily boat log, the port captain and crew completed the remaining deactivation tasks. In addition to the items listed in the deactivation policy, the port captain tightened the four fasteners on each of the *Joanne Marie*'s two propulsion

shaft seals, which had packing glands, to "no drip," noting that this was "best practice."

After the crew completed the deactivation tasks, the port captain shut down the vessel's main diesel engines and generators, leaving the *Joanne Marie* with no power (the vessel was not connected to shore power; this was typical practice when deactivated at the Bollinger Quick Repair Shipyard). There were no battery-operated alarms on board. According to the port captain, once the engines and generators are shut down, "it's pretty dead ship."

About 1400, the crew departed the vessel with the port captain. At 1515, the port captain returned to the vessel to conduct a final round and secure all doors and deck hatches before he departed for the day.

On June 24, between 1230 and 1300, the port captain returned to conduct a round of the *Joanne Marie* at the shipyard. The port captain stated that there were no company requirements for these rounds but they typically involved visually checking the overall condition of the exterior of the vessel and ensuring the vessel "isn't taking on water." The port captain stated these rounds did not typically include checks of interior spaces or measurements, such as vessel drafts. The port captain observed no issues with the condition of the vessel's exterior during the round, and the *Joanne Marie* remained moored at the yard throughout the day.

On June 25, about 0530, the on-duty port captain (a different port captain than had secured the vessel) received a phone call from company personnel notifying him that a vessel was listing at the shipyard (see figure 4). The on-duty port captain then notified the off-duty port captain (who had secured the vessel and was responsible for managing it), who headed to the shipyard, arriving about 0600. The off-duty port captain found the *Joanne Marie* partially submerged at the stern and listing to port, with the port quarter resting on the bottom of the canal at a depth of 15 feet. The mooring lines remained secured on the *Joanne Marie*'s starboard side to the towboat *Nativity*. About 0630, the port captain notified other company personnel.

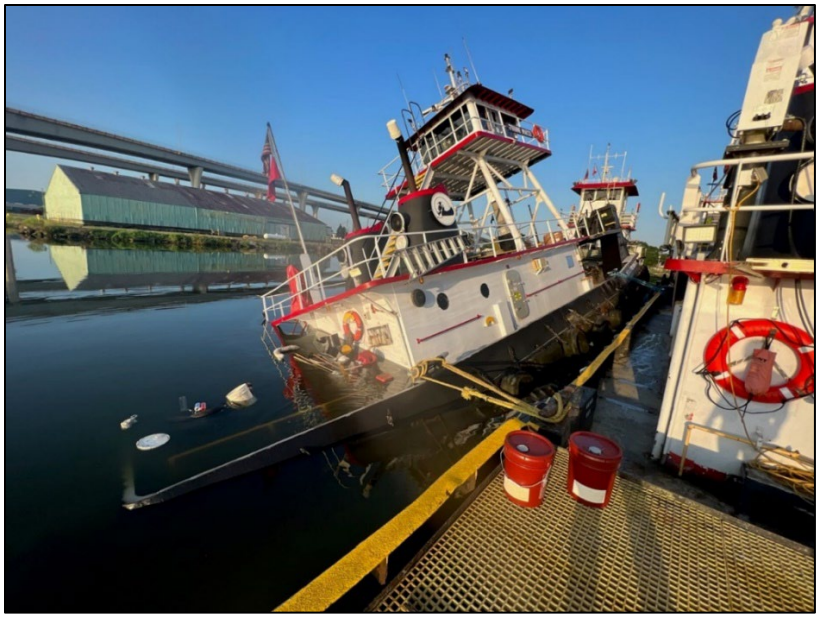

Figure 4. *Joanne Marie* listing at the shipyard on the morning of June 25. (Source: US Coast Guard)

At 0640, the operating company notified the US Coast Guard and contracted a marine surveyor to assess the vessel, perform salvage operations, and conduct spill response. The surveyor arrived later that morning, took an initial assessment of the vessel, and determined that the vessel was "stable, not actively sinking at that time." The survey crew dispatched booms and plugged vents to prevent additional pollution and began planning to refloat the vessel. The company reported that an estimated 10 gallons of diesel fuel were released into the water.

Initial salvage and dewatering attempts caused the vessel to sink further, so the surveyor and company personnel decided to halt operations and use a heavy lift crane to lift the *Joanne Marie* out of the water. About 1600, the *Joanne Marie* was successfully lifted off the bottom of the canal. Once refloated, no water ingress was observed in any of the vessel spaces, and the *Joanne Marie* remained afloat without the assistance of pumps. Salvage operations were completed the following day, on June 26.

1.3 Additional Information

1.3.1 Damage

As a result of the partial sinking, the engine room of the *Joanne Marie* was completely flooded. Crew spaces on the main deck were also partially flooded. In the engine room, both main diesel engines and generators were damaged and required

repair. Additionally, various electrical components in the engine room sustained damage. The final cost to repair the *Joanne Marie* was $176,751.

1.3.2 Cofferdam Discharge System

Within the engine room, a cofferdam collected water leakage from the vessel's two propeller shaft seals. The cofferdam's top was not designed to be watertight and was covered with a deck plate in the engine room. The crew tightened or loosened the shaft seals based on the operating status of the vessel: the seals were loosened when the vessel was underway, and outside water would slowly enter the cofferdam through the seals. The crew typically tightened the seals when the vessel was deactivated.

Two dedicated bilge pumps inside the cofferdam discharged any water that entered through the shaft seals. These pumps were electrically powered either through the onboard generators or shore power (the *Joanne Marie* was not typically connected to shore power when it was deactivated). Both pumps were float-activated and automatically engaged once water inside the cofferdam reached a set level. When activated, each pump routed the water through a short hose connected to a check valve that was connected to 1.5-inch Schedule 40 steel piping that discharged overboard via a through-hull pipe (see figure 5 and figure 6).

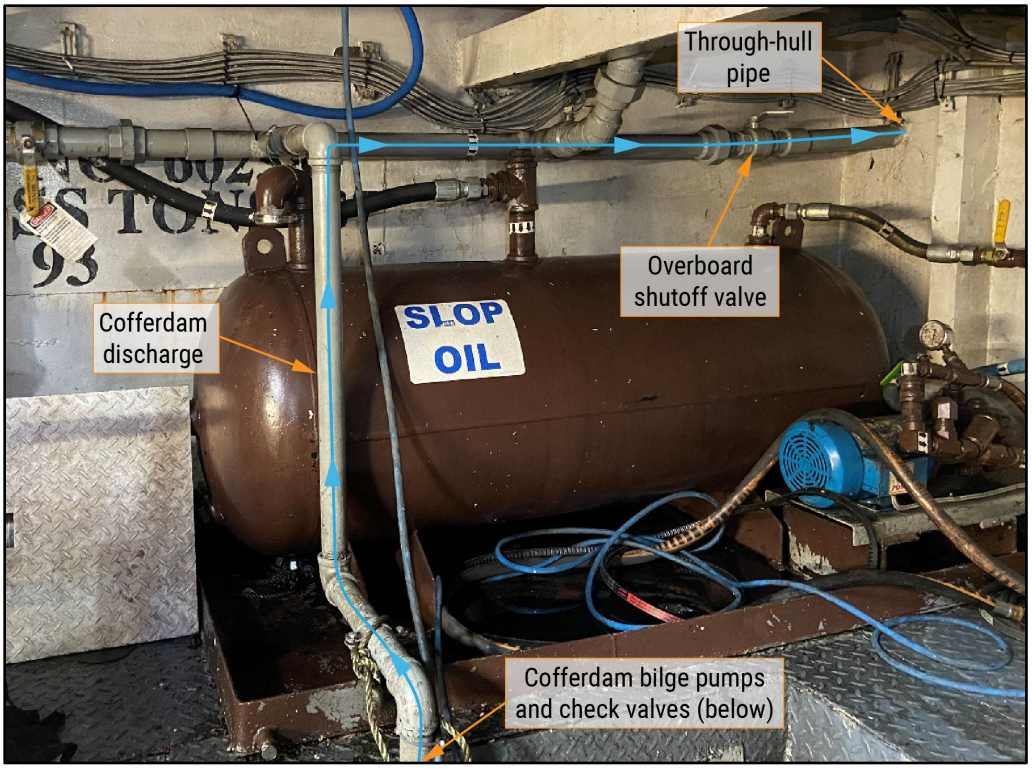

Figure 5. *Joanne Marie* cofferdam discharge system (facing aft). (Background source: Coast Guard)

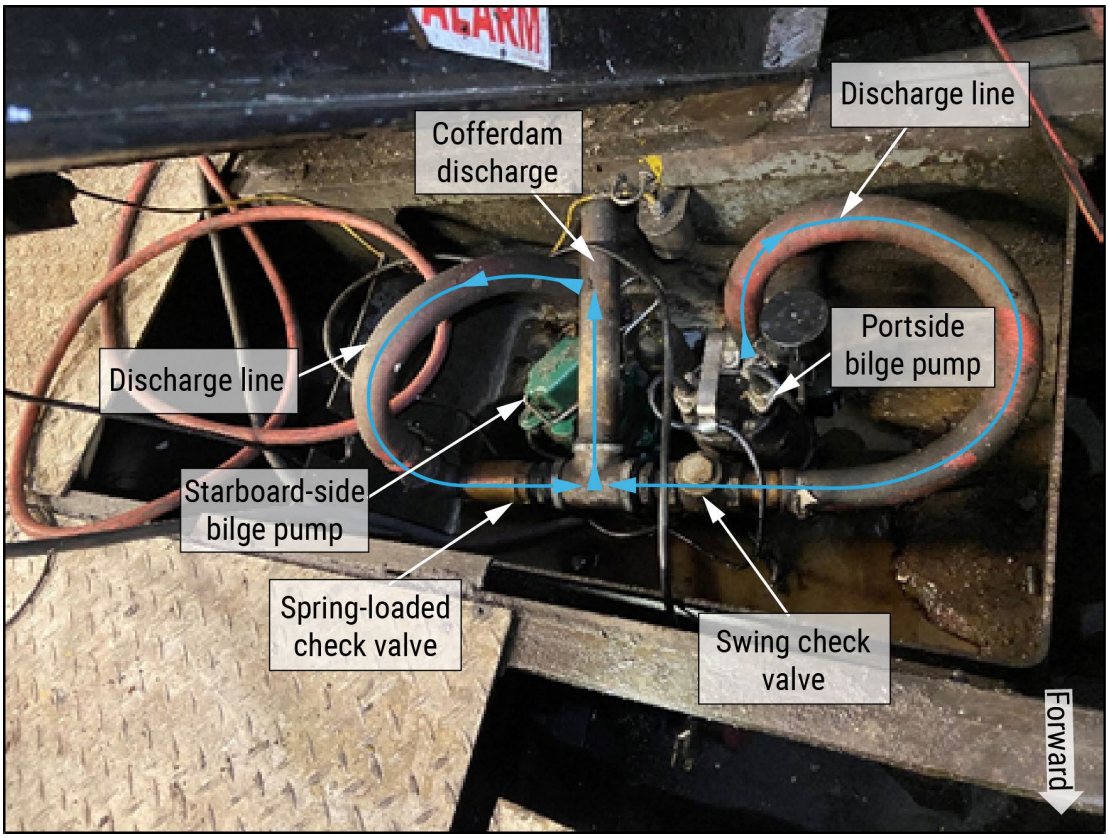

Figure 6. *Joanne Marie* cofferdam (looking down) with deck plate removed postcasualty, showing bilge pumps, pump discharge lines, and associated check valves. (Background source: Coast Guard)

As required by Title 46 *Code of Federal Regulations* (*CFR*) Subchapter M, each cofferdam bilge pump was protected by a check valve, which prevented water from backflowing into the cofferdam either from outside water entering through the through-hull pipe, or from water that remained in the system when the pumps turned off.[3] The starboard-side pump was protected by a spring-loaded check valve, and the portside pump was protected by a swing check valve.

The through-hull pipe for the cofferdam overboard discharge was located on the port quarter of the vessel above the 9-foot draft marking on the hull (see figure 7). As required by Subchapter M, the discharge system was equipped with an overboard

[3] 46 *CFR* 143.275 requires "All installed bilge piping must have a check/foot valve in each bilge suction that prevents unintended backflooding through bilge piping."

shutoff valve immediately before the through-hull pipe.[4] The port captain stated the valve was typically kept in the open position when the *Joanne Marie* was moored; the valve was open when the vessel was deactivated before the sinking.

Figure 7. *Joanne Marie* through-hull pipe for the cofferdam pumps' overboard discharge on the port quarter with 9-foot draft mark shown postcasualty. (Background source: Coast Guard)

1.3.3 Postcasualty Examination

After the vessel was refloated, no water ingress was observed in the engine room or any other spaces. Therefore, the marine surveyor used a hose to pump water through the *Joanne Marie*'s engine room through-hull fittings to determine if there

[4] 46 *CFR* 143.250(d) requires "Any piping system that penetrates the hull below the waterline must be fitted with an accessible valve, located as close to the hull penetration as is practicable, for preventing the accidental admission of water into the vessel either through such pipes or in the event of a fracture of such pipe. The valve must be clearly marked by labeling or color coding that enables the crew to identify its function."

was possible ingress from one of them. The surveyor observed water entering through the inlet strainer on the starboard-side cofferdam bilge pump.

Following the casualty, the Coast Guard and company personnel removed the bilge pump discharge check valves and the starboard bilge pump protected by the spring-loaded check valve. They found that the spring-loaded check valve was stuck in a partially open position due to a lodged twist-on electrical wire connector, commonly called a wire nut (see figure 8). The wire nut was about 0.5 inches wide and 0.88 inches in height. The Coast Guard retained the bilge pump and check valves for further examination.

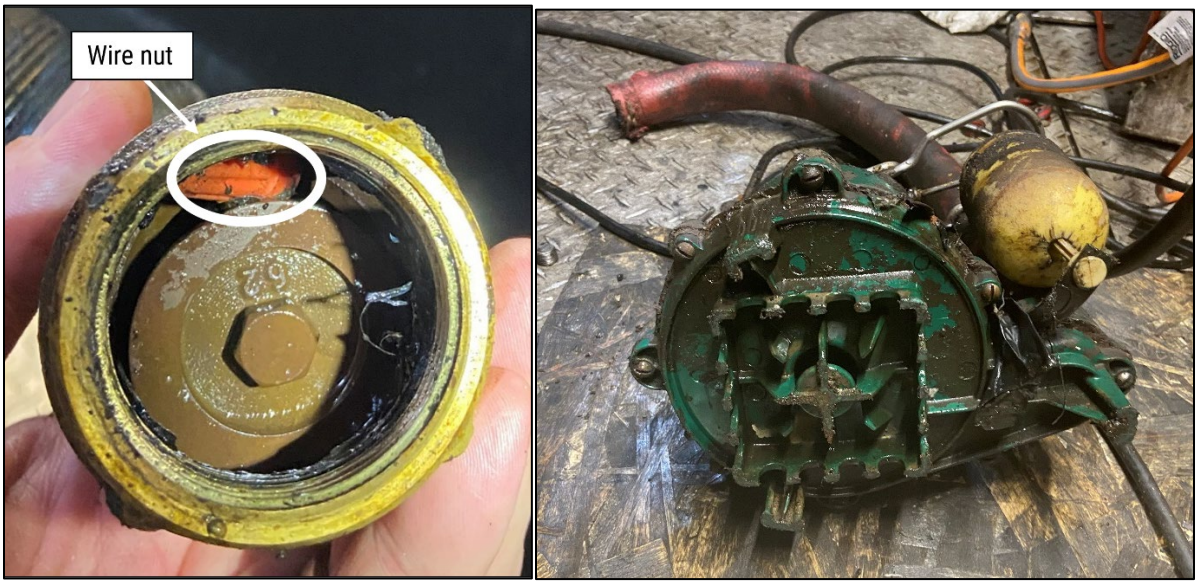

Figure 8. Spring-loaded check valve shown with lodged wire nut (*left*) and associated cofferdam bilge pump with inlet shown with strainer removed (*right*). (Source: Coast Guard)

On July 14, Coast Guard investigators and representatives from the vessel's operating company examined the removed check valves and starboard bilge pump. The bilge pump functioned normally when connected to a power source, and there were no issues identified with the internal components. After the wire nut was removed from the spring-loaded check valve, the check valve functioned normally. The swing check valve from the other bilge pump was not obstructed and functioned normally.

With the wire nut removed, the Coast Guard and company representatives evaluated the fittings on the bilge pump, including the strainer and pump mechanism, to determine if the wire nut could have passed through the bilge pump and into the spring-loaded check valve. The Coast Guard and company representatives found that the wire nut was sufficiently small to pass through the pump inlet strainer, pump impeller, and the discharge line into the check valve. The

technical data sheet for the pump stated that the pump was capable of handling 0.5-inch (12-millimeter) spherical solids.

Following vessel salvage and repairs, a company representative noted that the *Joanne Marie* had a draft of "about 8 feet" with 12,500 gallons of fuel on board (62% of max); he stated that 8 feet of draft is "typical," but "does change based on fuel and water on board." According to the daily boat log that was submitted by the *Joanne Marie* captain and port captain on June 23 when the crew departed, there were 15,100 gallons of fuel (75% of max) and 7,630 gallons of potable water (102% of max) on board. When the vessel was refloated, based on water markings on the vessel's hull, the Coast Guard estimated that the typical operating draft of the vessel was 9 feet 2 inches.

1.3.4 Postcasualty Actions

Following the casualty, the operating company of the *Joanne Marie* investigated the sinking and determined that the partially open spring-loaded check valve, open overboard shutoff valve, and open fuel tank crossover valve (which allowed "fuel to gravitate from one side to the other") all contributed to the water ingress and subsequent sinking. As a result of the casualty, the company modified their checklist for vessels entering deactivation to include closing the overboard shutoff valve when a vessel was not connected to shore power. The company also replaced the spring-loaded check valve on the cofferdam discharge line before the through-hull pipe with a swing check valve—they believed a swing check valve would be less likely to become "jammed."

2 Analysis

About a day and a half after being moored and deactivated at a shipyard on the Harvey Canal, the unattended *Joanne Marie* was found listing and partially submerged with its port quarter resting on the bottom of the canal.

After the vessel was refloated, no water ingress into any vessel spaces was found, indicating the hull condition did not contribute to the flooding. Postcasualty testing found that, when water was pumped into the through-hull pipe for the propulsion shaft seals' cofferdam overboard discharge, it entered the cofferdam (open to the engine room).

The vessel's typical operating draft was estimated to be about 9 feet 2 inches. The port captain did not note the *Joanne Marie*'s draft during his rounds of the vessel on June 23 or June 24, and there were no records of the vessel's draft at the time it was deactivated on June 23. Therefore, investigators were unable to definitively determine the vessel's draft and, subsequently, the exact height of the through-hull pipe for the cofferdam overboard discharge above the waterline when the vessel was deactivated. A company representative stated that the draft of the *Joanne Marie* was 8 feet when the fuel tanks were 62% full. However, on the day the vessel was deactivated, the daily boat log showed that the fuel tanks were 75% full—which equated to over 18,000 additional pounds of fuel. Given the weight from the additional fuel, the vessel's draft on the day it was deactivated was likely greater than 8 feet and closer to the estimated normal operating draft of 9 feet 2 inches. This draft placed the through-hull pipe—which was located about 9 feet above the keel—near or potentially below the waterline. Therefore, because the opening of the through-hull pipe was so close to the waterline, water would have been able to enter the discharge line from a variety of sources, including the wake from passing vessels or a small list.

The shaft seal cofferdam discharge system had two bilge pumps whose discharges combined into a single overboard line. The discharge lines had valves installed to prevent water ingress. First, there was an overboard shutoff valve installed just before the through-hull pipe (combined overboard discharge) to prevent the accidental admission of water from moving through the discharge system into the engine room. However, company personnel stated that the overboard shutoff valve was left open when the *Joanne Marie* was secured on June 23 and this was typical for deactivated vessels.

Each pump also had a check valve on its individual discharge line before the lines combined. After the casualty, investigators found that a wire nut had lodged in a spring-loaded check valve on the starboard-side bilge pump discharge line,

obstructing the valve and forcing it to remain partially open (the swing-type check valve on the portside bilge pump worked properly). Investigators could not determine how the wire nut had entered the cofferdam. The wire nut may have been inadvertently dropped or fallen into the cofferdam when the deck plate covering the cofferdam was removed for regular maintenance. The Coast Guard and company representatives found that the wire nut was small enough to pass through the cofferdam bilge pump inlet strainer, so when the cofferdam bilge pump activated, the wire nut was pulled through the strainer and subsequently the pump impeller and discharge line before reaching the spring-loaded check valve. The spring-loaded design of the check valve held the wire nut in place, leaving the valve in a partially open position and susceptible to backflow.

The overboard shutoff valve and spring-loaded check valve in the discharge line from the starboard cofferdam bilge pump both served to prevent accidental admission of water from water movement against the hull, water present in the lines with the pumps turned off, and water ingress if the through-hull pipe was submerged. However, with the overboard shutoff valve left open and the spring-loaded check valve stuck partially open, water entered through the through-hull pipe, causing the cofferdam—which was not watertight—to overflow and water to flood the engine room.

The port captain completed the deactivation tasks with the crew in accordance with the TSMS. However, the tasks were limited to housekeeping items and did not address the configuration of onboard systems to prevent a casualty (the port captain did tighten the shaft seals; however, this task was not captured in the company's TSMS for vessel deactivation). The deactivation procedures in the operating company's TSMS did not direct the crew to close the overboard shutoff valve. Had the TSMS deactivation procedures accounted for the configuration of vessel systems, such as closing the overboard shutoff valve, the procedures would have accounted for the possibility of the spring-loaded check valve becoming stuck and resulting in flooding. Following the casualty, the operating company replaced the spring-loaded check valve with a swing check valve (like the check valve on the other cofferdam bilge pump); the company also modified their checklist for vessels entering deactivation to include closing the overboard shutoff valve for vessels without shore power.

As water continued to ingress through the overboard discharge, the added weight from the water in the engine room would have increased the vessel's draft near the stern, further submerging the through-hull pipe for the cofferdam overboard discharge. Based on the specifications of the 1.5-inch Schedule 40 pipe used for the cofferdam discharge system as well as the postcasualty examination of the spring-loaded check valve, which showed the wire nut blocked about 50% of the pipe/flow

of water into the cofferdam, investigators calculated a rough initial rate of flooding of 1,508 gallons per hour once the center of the overboard discharge was submerged at a depth of 1 foot.[5] As the vessel's stern sank lower and the overboard discharge moved further underwater, the rate of flooding would have increased until the port quarter rested on the bottom of the canal.

The flooding went undetected until about 0530 on June 25, about 17 hours after a port captain had completed a daily round of the *Joanne Marie*'s exterior on June 24. Per company policy, monitoring of deactivated vessels did not include checks of vessel interior spaces, such as the engine room. As such, the port captain's June 24 round was not sufficient to detect water ingress. The vessel was equipped with bilge alarms as well as bilge pumps. However, the vessel was not connected to shore power at the time of the casualty (nor was it required to be), and therefore the alarms were not active. Without functioning bilge alarms or crewmembers conducting more thorough and frequent rounds, company personnel remained unaware of the flooding until the vessel had already partially sunk.

[5] Investigators used the center of the through-hull pipe as the basis for the flow rate calculation.

3 Conclusions

3.1 Probable Cause

The National Transportation Safety Board determines that the probable cause of the flooding and partial sinking of the *Joanne Marie* was the ingress of water into the engine room through a through-hull pipe located near the waterline due to an obstructed spring-loaded check valve on a cofferdam bilge pump discharge. Contributing to the sinking were inadequate procedures for securing unattended vessels.

3.2 Lessons Learned

Ensuring Oversight of Inactive Vessels

It is good marine practice for owners and operators of towing vessels to assess risks and develop tasks in their towing safety management system (TSMS) for vessels that are unattended or in layup status. TSMS task lists for such vessels should address factors in the configuration of the vessel that could lead to a casualty. To reduce the potential for flooding, operators should consider closing through-hull fitting valves (such as skin valves or seacocks) and tightening packing glands for propulsion shaft seals, or other machinery, as needed. Additionally, conducting periodic rounds of vessel spaces and installing high-water bilge alarms and fire detection systems that remotely alert responsible personnel facilitates the early detection and mitigation of potential safety risks, such as flooding or fire.

Vessel	*Joanne Marie*
Type	Towing/Barge (Towing vessel)
Owner/Operator	Marquette Transportation, Gulf Inland Division (Commercial)
Flag	United States
Port of registry	New Orleans, Louisiana
Year built	1979
Official number (US)	602586
IMO number	8635758
Classification society	Sabine Surveyors (Third-party organization)
Length (overall)	65.0 ft (19.8 m)
Breadth (max.)	24.0 ft (7.3 m)
Draft (casualty)	9.2 ft (2.8 m)
Tonnage	137 GRT
Engine power; manufacturer	2 x 625 hp (466 kW); Caterpillar 3412 diesel engines

NTSB investigators worked closely with our counterparts from **Coast Guard Sector New Orleans** throughout this investigation.

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For more detailed background information on this report, visit the NTSB Case Analysis and Reporting Online (CAROL) website and search for NTSB accident ID DCA23FM037. 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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