



September 23, 2024

MIR-24-30

Contact of *Cindy B* Tow with Dock

On November 12, 2023, about 0552 local time, the towing vessel *Cindy B* was pushing the loaded deck barge *St. John* upbound on the Columbia River at mile 53 near Clatskanie, Oregon, when the tow gradually moved to starboard out of the navigation channel and struck the Port Westward Beaver Dock (see figure 1 and figure 2).¹ None of the three crewmembers aboard the *Cindy B* were injured. During the cleanup, about 2 gallons of renewable diesel fuel leaked onto the dock from a damaged pipe on the dock, with about 1 gallon going into the river; a portion of the spilled fuel was recovered. Damage to the *St. John* and the Beaver Dock was estimated to be about \$6 million.



Figure 1. *Cindy B* and *St. John* underway after the contact with the Beaver Dock. (Source: Columbia Pacific Bio-Refinery)

¹ (a) In this report, all times are Pacific standard time, and all miles are statute miles. (b) Visit [nts.gov](https://www.nts.gov) to find additional information in the [public docket](#) for this NTSB investigation (case no. DCA24FM010). Use the [CAROL Query](#) to search investigations.

Casualty Summary

Casualty type	Contact
Location	Columbia River, mile 53, near Clatskanie, Oregon 46°10.83' N, 123°11.09' W
Date	November 12, 2023
Time	0552 Pacific standard time (coordinated universal time -8 hrs)
Persons on board	3
Injuries	None
Property damage	\$6,047,224 est.
Environmental damage	Estimated 1 gal renewable diesel fuel discharged into Columbia River, creating a sheen in area within a containment boom; some spilled fuel recovered with absorbent pads
Weather	Visibility 9 mi, overcast, winds northwest 3 kts, air temperature 46°F, water temperature 54°F, morning civil twilight 0559, sunrise 0708
Waterway information	River, total width 2,000 ft, channel width 600 ft, channel depth 45 ft, depth at casualty location (outside channel) 15 ft

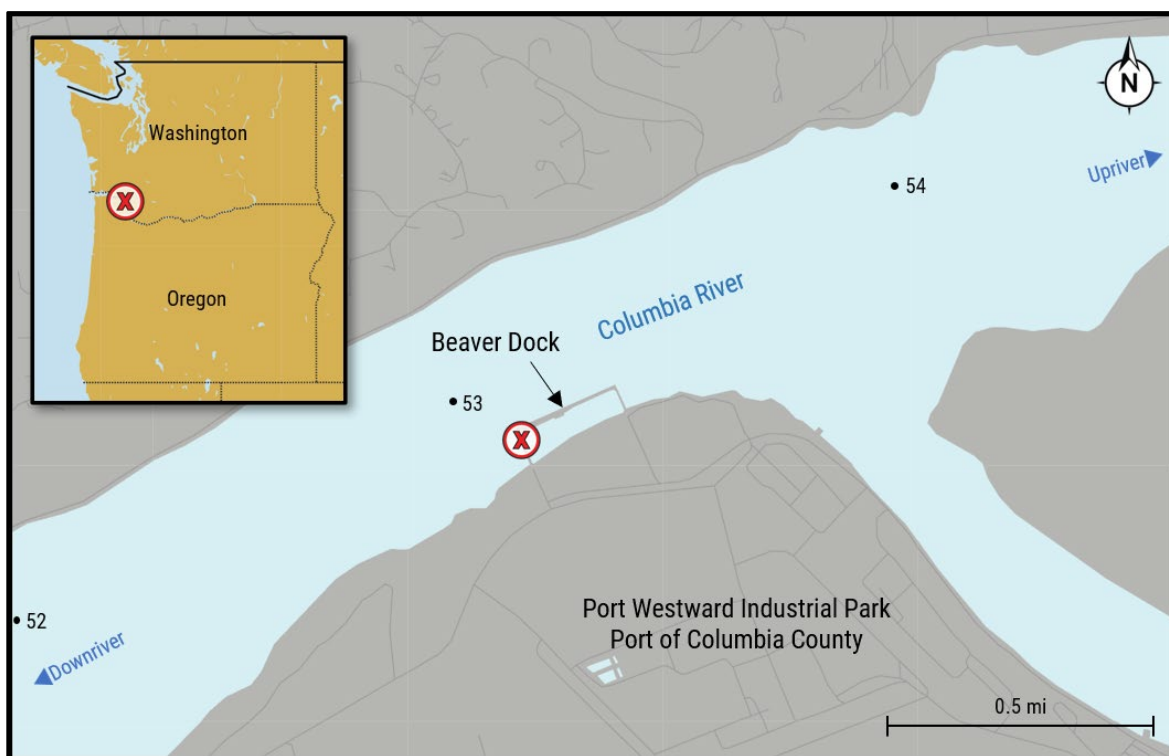


Figure 2. Area where the *Cindy B* tow contacted the Beaver Dock, as indicated by a circled X. (Background source: Google Maps)

1 Factual Information

1.1 Background

The 101-foot-long *Cindy B* was a towing vessel constructed of welded steel in 1974. It was owned and operated by WCP Inc. The towing vessel had two 1,500-hp main propulsion diesel engines, each driving a nozzled (ducted) propeller. Three rudders behind each nozzle (six total) and two flanking rudders ahead of each nozzle (four total) provided steering. The *Cindy B* had a two-level deckhouse that contained berthing, galley, and engineering spaces. The vessel's wheelhouse sat atop a tower structure about two deck heights above the top of the deckhouse.

The *St. John* was a 250-foot-long deck barge constructed of welded steel in 1976. It was owned by the Shaver Transportation Company and operated by Teevin Marine, LLC.

The Port Westward Beaver Dock, located on the southern bank of the Columbia River, was constructed by the US Army in 1942 and used as an ammunition shipping hub during World War II and the Korean War (see figure 3). In the mid-1960s, the Port of Columbia County acquired the property and developed it for commercial use.² At the time of the contact, the dock was primarily used for onloading renewable diesel fuel to bulk liquid cargo vessels (tank ships and barges).³ The main wharf, which ran parallel to the shoreline, was 1,600 feet long. Piles supporting the remnants of an abandoned rail track extended westward from the wharf and curved shoreward. Causeways connected the main wharf to shore at each end. The causeway at the western (downriver) end was constructed of wood piles and wood decking. Piping systems for the renewable diesel cargo and other liquids ran atop the causeway and main wharf.

² "Beaver Army Terminal Dock," Oregon Historical Society, updated September 7, 2022, https://www.oregonencyclopedia.org/articles/beaver_army_terminal_dock/

³ *Renewable diesel* is a fuel made from fats and oils, such as soybean oil or canola oil, and is processed to be chemically the same as petroleum diesel. Source: <https://afdc.energy.gov/fuels/renewable-diesel>

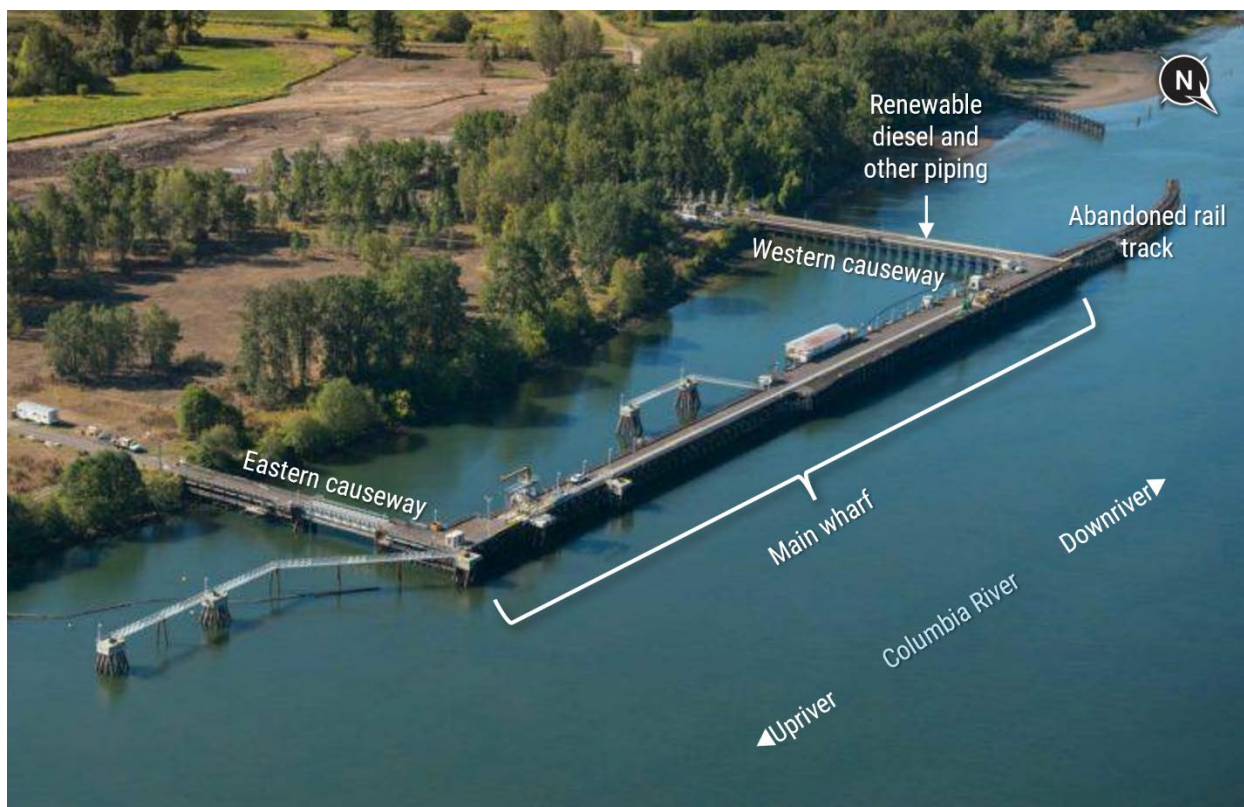


Figure 3. The Beaver Dock at an undetermined date before the contact by the *Cindy B* tow. (Background source: Port of Columbia County)

1.2 Event Sequence

In November 2023, the *Cindy B* was contracted to tow the *St. John*, hauling aggregate (mixed dirt and rocks) from Westport, Oregon, at mile 43 on the Columbia River, to Troutdale, Oregon, about 77 miles upriver. The job required making several trips between the onload and offload locations, with operations beginning on November 10.

According to the *Cindy B*'s certificate of inspection, the vessel was required to have a minimum crew of a master and one deckhand when operated for a period not exceeding 12 hours.⁴ On the casualty transit, the *Cindy B* had a crew of three, comprising a captain (master) and two deckhands. When the vessel was operating, the two deckhands rotated watch every 6 hours, with the first deckhand (deckhand 1) standing the 0000 to 0600 and 1200 to 1800 watches, and the second deckhand (deckhand 2) taking the opposite watches. The captain stood wheel watches while

⁴ When operating over 12 hours, a mate and a second deckhand were required, in addition to the master and first deckhand.

the vessel was underway; his watches did not follow a standard rotational period but instead varied depending on the vessel's underway schedule.

On November 10, the *Cindy B* tow arrived in Westport, unloaded cargo, and began its first trip up the river. The tow arrived in Troutdale the next day, offloaded the cargo, and then returned to Westport, arriving just before midnight on November 11.

In the early morning on November 12, the day of the contact, cargo was loaded onto the barge in preparation for the tow's second trip up the river. Loading concluded at 0340, and the crew readied the tow to get underway. Deckhand 1, who had been on watch since midnight, handled the mooring lines on the *St. John*, while the captain took the helm of the *Cindy B*.

At 0406, the tow departed Westport and proceeded upbound on the Columbia River. As it made its way up the river, the *Cindy B* tow generally followed the main deepwater navigation channel, transiting at 6 knots.

A little after 0530, the captain asked deckhand 1 to take the helm while the captain used the lavatory. Deckhand 1 took the controls, and the captain went below to the deckhouse. The deckhand stated that, when he took the helm from the captain, "I was pretty pumped up still from untying the barge, so I was up ... not tired. I ... felt good." After using the lavatory, the captain stopped in the galley, located on the main deck (first level) of the deckhouse, to make a pot of coffee; deckhand 1 remained at the helm in the wheelhouse.

Automatic identification system (AIS) data showed that, at 0544, the *Cindy B* tow began to move to starboard (see figure 4). The *Cindy B* and *St. John* subsequently exited the main channel at 0548. The tow's speed remained constant. The *Cindy B* and *St. John* passed between two sections of the Beaver Dock's abandoned railway structure and then struck the dock's western causeway at 0552.

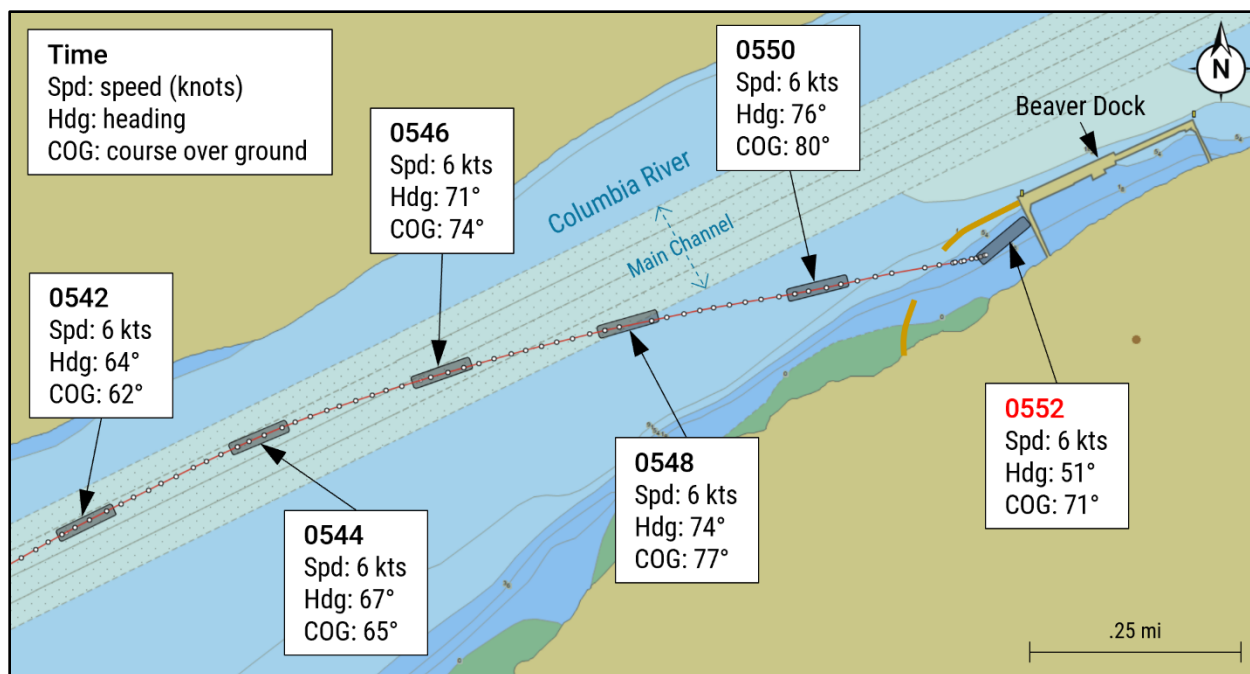


Figure 4. AIS trackline of the *Cindy B* tow as it transited east. (Background source: National Oceanic and Atmospheric Administration Electronic Navigation Chart US5OR12M as viewed on Made Smart AIS)

Deckhand 1 later described what had happened: while steering the vessel, “I started leaning forward and then I—that’s about all I remember ... I sort of just fell asleep.” He woke when the barge struck the dock.

While in the galley, the captain felt the tow strike the dock. He returned to the wheelhouse, where he found the deckhand confused and groggy. He took over the helm from the deckhand and maneuvered the vessel out of the causeway wreckage and alongside the main wharf.

1.3 Additional Information

1.3.1 Damage

About 100 feet of the western causeway connecting the Beaver Dock’s main wharf to the shore were destroyed (see figure 5). Piping, electrical lines, and navigation lights on the causeway and main wharf were also damaged. A pipe on the causeway used for transporting renewable diesel fuel to the main wharf was severely bent but did not rupture. An estimated 525 barrels of diesel were in the pipe at the time of the casualty. Most of the diesel was recovered from the pipe during cleanup and recovery operations; however, about 2 gallons spilled onto the dock, and 1 gallon of the spilled fuel eventually entered the river. The fuel was contained within

booms that had been deployed after the casualty, and a portion of the spilled fuel was recovered using absorbent pads. The estimated cost of cleanup, recovery, and repairs to the Beaver Dock was \$5,429,274.

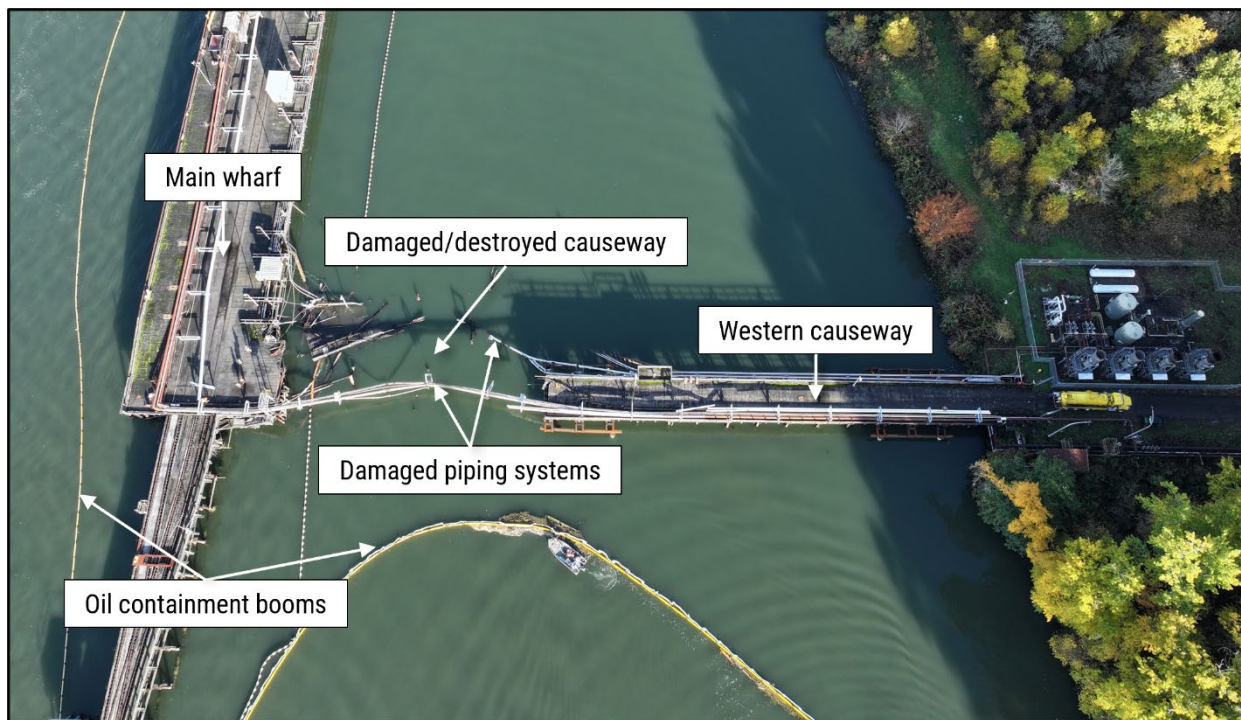


Figure 5. Beaver Dock after contact by the *Cindy B* tow. (Background source: US Coast Guard)

On the bow of the *St. John*, hull plating was inset to a maximum of 3 inches over a 2-foot-by-3-foot area, and one of two vertical bars that allowed the barge to be pushed by its raked bow was slightly distorted (see figure 6). Additionally, plating on the wavewall at the forward end of the barge deck and on the starboard coaming that surrounded the deck was distorted. On the deck at the bow, a manual winch was pushed aft and its handwheel was damaged. A conveyor belt system on the barge, used for unloading cargo, was also damaged. The cost of repairs to the *St. John* and equipment totaled \$647,224.

The *Cindy B* was not damaged.

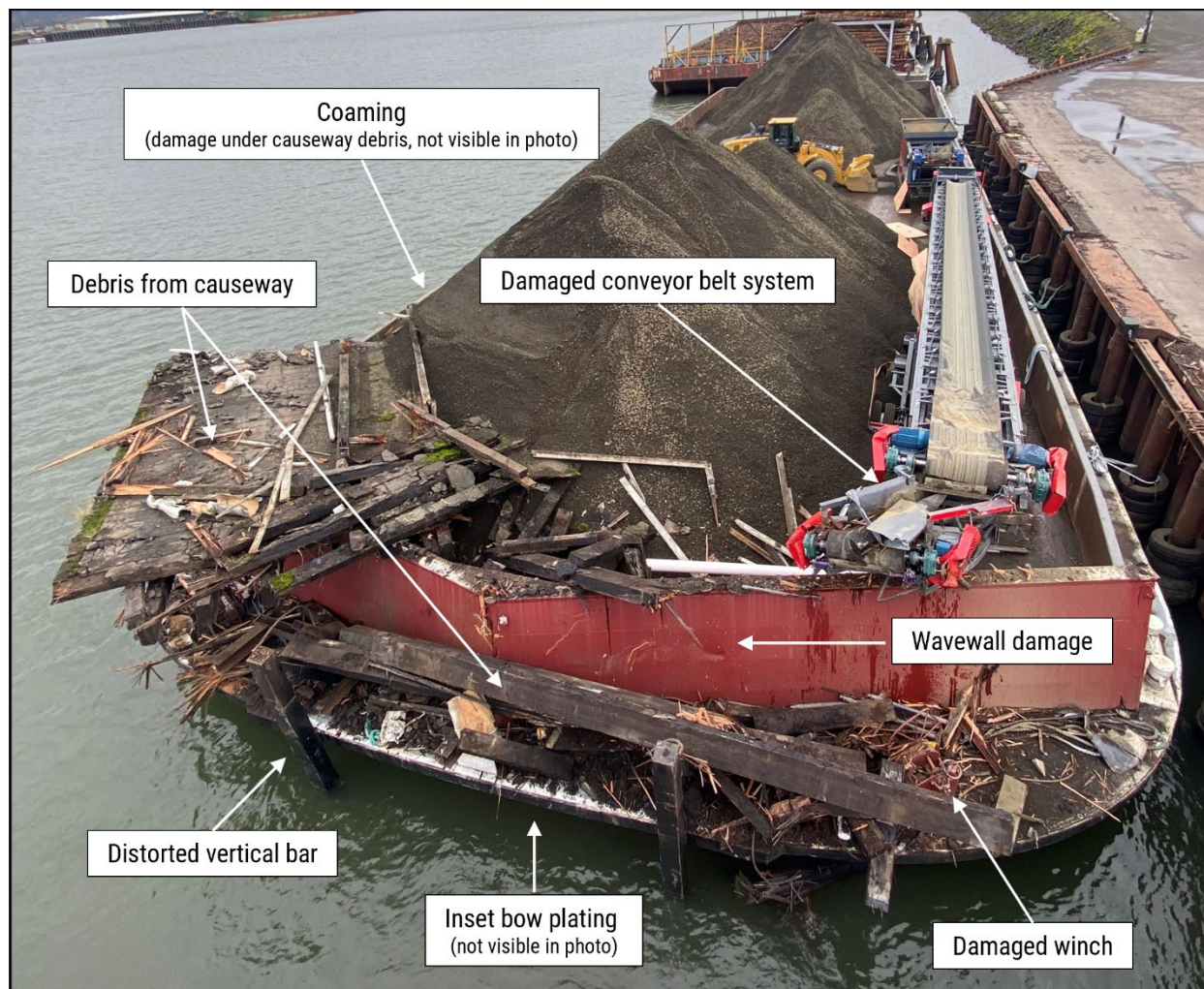


Figure 6. *St. John* after contact with the Beaver Dock. (Background source: Coast Guard)

1.3.2 *Cindy B* Crew Qualifications and Experience

The captain of the *Cindy B* held valid US Coast Guard-issued credentials as master of vessels less than 500 gross tons on near coastal voyages and master of towing vessels less than 300 gross register tons on near coastal voyages. The captain had 27 years' experience in the towing industry, including 24 years as a credentialed captain. He had worked for the *Cindy B*'s owning/operating company for over 3 years as a port captain and operations manager, and he served as a towing vessel captain when needed. The captain was tested for alcohol and other drugs after the casualty, and the results were negative for all tested-for substances.

Deckhand 1 held a valid Coast Guard-issued credential as an ordinary seaman and wiper. He had about 1 year of experience on towing vessels and barges, all with the same owning/operating company. He stated that he had been training as a

helmsman, under the observation and mentorship of the towing vessel captains, for about 6 months. He would occasionally take the helm unmonitored while vessel captains used the lavatory. Deckhand 1 was tested for alcohol and other drugs after the casualty, and the results were negative for all tested-for substances.

1.3.3 Deckhand 1 Work/Rest

On November 8, four days before the casualty, the crew of the *Cindy B* had the day off. That day and night, deckhand 1 maintained a normal awake/sleep cycle: awake during the day and sleeping at night. The next day, the vessel did not get underway, and the crew worked during the day. On the night of November 9/10, deckhand 1 slept about 7 hours, and then had a 2-hour nap later in the morning on November 10, when the contracted towing operations began.

Deckhand 1 began work on November 10 about 1000, first conducting maintenance before assisting in getting the *Cindy B* tow underway for its first trip up the river to Westport. After getting underway, the two deckhands shifted to their 6-hours-on/6-hours-off watch schedule, with deckhand 1 taking the first 1200-1800 watch. They remained in this watch rotation throughout operations over the next 3 days, while underway and during loading and unloading operations in between.

Although deckhand 1's watch rotation ended at 1800 on November 10, work/rest records indicate that he continued on watch until about 2000 (the tow got underway at 1925 that evening after completion of the cargo onload at Westport). According to the work/rest records, deckhand 1 slept for about 4 hours, then came back on watch at midnight on November 11 as the tow continued upbound on the river. After his night (0000-0600) watch, he slept for about 5 hours. He slept for another 5 hours after his day (1200-1800) watch before returning to watch at midnight on November 12 (see table 1).

Table 1. Deckhand 1 sleep (S), awake on watch/working (AW), and awake not on watch/not working (AN) periods in the 4 days before and the day of the casualty.

		8-Nov	9-Nov	10-Nov	11-Nov	12-Nov
Night	0000-0100		S	S	AW	AW
	0100-0200		S	S	AW	AW
	0200-0300		S	S	AW	AW
	0300-0400		S	S	AW	AW
	0400-0500		S	AN	AW	AW
	0500-0600		S	AN	AW	Casualty
	0600-0700		AW	AN	AN	
Day	0700-0800	Day off	AW	AN	S	
	0800-0900		AW	S	S	
	0900-1000		AW	S	S	
	1000-1100		AW	AW	S	
	1100-1200		AW	AW	S	
	1200-1300		AW	AW	AN	
	1300-1400		AW	AW	AW	
	1400-1500		AW	AW	AW	
	1500-1600		AW	AW	AW	
	1600-1700		AW	AW	AW	
Night	1700-1800	AN	AN	AW	AW	
	1800-1900	AN	AN	AW	AN	
	1900-2000	AN	AN	AN	S	
	2000-2100	AN	AN	S	S	
	2100-2200	S	S	S	S	
	2200-2300	S	S	S	S	
	2300-2400	S	S	S	S	

During his most recent merchant mariner medical exam, deckhand 1 indicated that he did not have any sleep problems such as obstructive sleep apnea, narcolepsy, or shift work disorder.

1.3.4 Pilothouse Alerter System

The *Cindy B* was required by Title 46 *Code of Federal Regulations* Subchapter M (Towing Vessels) to be fitted with a pilothouse alerter system (sometimes referred to as a watch alarm) to detect when an operator became incapacitated while underway. The pilothouse alerter on the *Cindy B* consisted of two motion sensors, buzzer and horn alarms, indicator and strobe lights, and control circuitry (see figure 7). According to the crew, the system was on whenever the steering system was online.



Figure 7. Left to right: *Cindy B* pilothouse alerter system motion detector (one of two on board) and strobe light with audible alarm. (Source: WCP Inc.)

According to the company, the pilothouse alerter system was configured to alert as follows:

- After 3 minutes of no motion, a buzzer sounded and a red indicator light on the wheelhouse forward window post illuminated.
- After 6 minutes, a louder horn sounded, and a strobe light located at the aft starboard section of the wheelhouse began to flash.
- After 10 minutes, the vessel's general alarm, which could be heard throughout the vessel, sounded.

According to the captain, during the casualty transit, the *Cindy B* pilothouse alerter system did not activate. Following the casualty, the system was tested and found to be operational. However, during testing, the captain determined that a VHF radio microphone that had been rigged to hang by its cord from the overhead could swing back and forth, tripping the motion sensors and thereby resetting the alarm timers.

After the contact, the pilothouse alerter system on the *Cindy B* was replaced with an updated system.

2 Analysis

While the *Cindy B* tow was transiting up the Columbia River pushing the loaded deck barge *St. John*, the tow moved gradually to starboard out of the main deepwater navigation channel and, at 0552, struck the Port Westward Beaver Dock. Deckhand 1, who was at the helm of the vessel at the time of the contact, stated that he had fallen asleep, waking only after the tow hit the dock.

The vessel's AIS track showed it began moving off course at 0544, indicating the deckhand was asleep by this time. The deckhand fell asleep during the end of his scheduled night watch, which started at 0000 and ended at 0600. Studies of shift workers have shown that workers on the night shift, similar to mariners on night watches, have a loss of alertness and increased attentional lapses when compared to dayshift workers.⁵ Shift workers are also more likely to be involved in occupational accidents, with some studies showing the risk to be almost three times that of regular day workers.⁶ Shift workers can also experience increased levels of fatigue caused by fragmented sleep cycles that negatively impact sleep quality, especially when these sleep cycles occur during times when an individual was typically awake in the preceding days.

Between November 8 and the morning of November 10, deckhand 1 had followed a normal awake/sleep cycle (awake during the day, sleeping at night) and obtained between 7 and 9 hours of uninterrupted sleep. Then, from November 10 until the casualty on November 12, deckhand 1 stood watch from 0000-0600 and 1200-1800, and he reported more-fragmented sleep patterns of just 4-5 hours each off-watch period. In addition to the general increased risk of accidents during a night watch, research of shift workers has shown that there is a greater chance of incidents during the first two nights of a night shift period.⁷

⁵ Nayantara Santhi, Todd S. Horowitz, Jeanne F. Duffy, and Charles A. Czeisler, "Acute Sleep Deprivation and Circadian Misalignment Associated with Transition onto the First Night of Work Impairs Visual Selective Attention," *PLoS ONE*, 2007, e1233.

⁶ Michael I. Reinganum and Janelle Thomas, "Shift Work Hazards," *StatPearls*, 2023, 3.

⁷ Matthew M. Laske, Philip E. Hinson, Yalcin Acikgoz, Timothy D. Ludwig, Anne M. Foreman, and Shawn M. Bergman, "Do employees' work schedules put them at-risk? The role of shift scheduling and holidays in predicting near miss and incident likelihood," *Journal of Safety Research*, 2022, 8.

When a person changes awake/sleep cycles in order to stand night watches or work night shifts, the person's circadian rhythm, or biological clock, is not synchronized to their new awake/sleep cycle, a condition known as circadian misalignment. The effect is similar to jet lag and may result in excessive sleepiness during watch, at least until the body has adjusted to the change. One study found that on the first night of a night shift period, test subjects experienced cognitive impairment greater than that of a person consuming alcohol and having a blood-alcohol content (BAC) of 0.10%. On the second and third nights of the night shift period, test subjects experienced impairment greater than that of a person with a BAC of .05%.⁸ (At the time of this report, the legal limit to operate a motor vehicle in most states is .08% BAC; in Utah, the legal limit is .05% BAC).

The risk of an accident occurring during a night watch was compounded by the fact that the contact occurred at 0552, during a period considered to be a circadian low (roughly 0200-0600), when the body is normally more fatigued and prone to diminished alertness and degraded performance. The deckhand stated that he did not feel tired before he fell asleep; however, research has shown that self-assessment of fatigue is problematic due to the noted impacts to judgment and decision-making. These impacts result in a diminished ability of the fatigued individual to detect when their performance is declining.⁹ The deckhand fell asleep due to fatigue that he did not perceive, which occurred during a night watch, at a low point in his circadian rhythm, and following a change in his awake/sleep cycle.

To mitigate the risk of an operator becoming incapacitated, including falling asleep, regulations require a pilothouse alerter system on towing vessels like the *Cindy B*. The towing vessel's system was designed to activate successively louder audio and more salient visual alerts when movement was not detected in the wheelhouse for periods of 3, 6, and 10 minutes. The elapsed time from when the *Cindy B* tow began to turn to starboard to the time that it hit the Beaver Dock was 8 minutes. Assuming that the deckhand fell asleep before the *Cindy B* tow began to turn, the alerter's lights and alarms should have activated 3 and 6 minutes after the deckhand had fallen asleep—before the tow struck the dock. However, the system did not alert during the casualty.

⁸ Nicole Lamond, Jill Dorrian, Heleh Burgess, Alex Holmes, Gregory Roach, Kirsty McCulloch, Adam Fletcher, and Drew Dawson, "Adaptation of performance during a week of simulated night work," *Ergonomics*, 2004, 162-163.

⁹ National Safety Council, "Fatigue in Safety-Critical Industries: Impact, Risks, & Recommendations," 2018, <https://www.nsc.org/getmedia/4b5503b3-5e0b-474d-af19-c419cedb4c17/fatigue-in-safety-critical-industries.pdf>, 8.

Although postcasualty testing verified that the system operated as designed, the vessel captain determined that a VHF microphone hanging by its cord from the wheelhouse overhead could swing and trip the system's motion detectors and reset the system timers, thus defeating the system and interrupting the activation of any indicators and alarms. Therefore, the pilothouse alerter system was rendered ineffective because a swinging VHF radio microphone in the motion sensors' field of view defeated the system.

3 Conclusions

3.1 Probable Cause

The National Transportation Safety Board determines that the probable cause of the contact of the *Cindy B* tow with the Port Westward Beaver Dock was the deckhand falling asleep at the helm due to fatigue that he did not perceive, which occurred during a night watch, at a low point in his circadian rhythm, and following a change in his awake/sleep cycle. Contributing to the casualty was the pilothouse alerter system not alarming to wake the incapacitated deckhand at the helm because a swinging VHF radio microphone in the motion sensors' field of view defeated the system.

3.2 Lessons Learned

Transitioning from Daytime to Nighttime Work

Disturbances in awake/sleep cycles caused by transitioning from daytime to nighttime watches or shifts result in increased accidents and occupational mistakes. Although the impacts of these awake/sleep cycle disturbances cannot be fully mitigated, they can be reduced by tools such as pilothouse alerter systems and by allowing longer downtime between watches/shifts.

Using Pilothouse Alerter Systems

A pilothouse alerter, when used as intended, is an effective tool that can help ensure that a crewmember remains awake and vigilant while on duty. Established procedures for the operation and use of the system, to include measures to ensure the system cannot be unintentionally reset, help ensure that it operates as designed.

Vessel Particulars

Vessel	<i>Cindy B</i>	<i>St. John</i>
Type	Towing/barge (Towing vessel)	Towing/barge (Barge)
Owner/Operator	WCP Inc. (Commercial)	Shaver Transportation Company/Teevin Marine LLC (Commercial)
Flag	United States	United States
Port of registry	Portland, Oregon	Portland, Oregon
Year built	1974	1976
Official number	561814 (US)	575053 (US)
IMO number	N/A	N/A
Classification society	N/A	N/A
Length (overall)	101.0 ft (30.8 m)	250.0 ft (76.2 m)
Breadth (max.)	30.0 ft (9.1 m)	76.0 ft (23.2 m)
Draft (casualty)	8.5 ft (2.6 m)	12.8 ft (3.9 m)
Tonnage	286 GRT	1,837 GRT
Engine power; manufacturer	2 x 1,500 hp (1,119 kW); EMD 12-645E6 diesel engines	N/A

NTSB investigators worked closely with our counterparts from **Coast Guard Sector Columbia River** 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 DCA24FM010. 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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