National Transportation Safety Board

Marine Accident Brief

Pipeline Breach and Subsequent Fire aboard Cutter Suction Dredge *Jonathon King Boyd* and Towboat *Bayou Chevron*

Accident type	Fire/Explosion	**No.** DCA18FM021
Vessel names	*Jonathon King Boyd* (dredge), *Bayou Chevron* (towboat)	
Location	Matagorda Bay, Texas, 28°27.54'N 96°23.02'W	
Date	April 17, 2018	
Time	2014 central daylight time (coordinated universal time – 5 hours)	
Injuries	None	
Property damage	Total of about $7.3 million est.	
Environmental damage	3,458 barrels of condensate and 12,680 MSCF of natural gas released, est.[1]	
Weather	Clear, visibility 8 miles, winds south-southeast at 8–10 mph, less than 1-foot waves, air temperature 72°F, water temperature 71°F[2]	
Waterway information	Matagorda Bay is a large estuary on the Texas coast, about 80 miles northeast of Corpus Christi. The Gulf Intracoastal Waterway channel at the intersection with Matagorda Ship Channel has a controlling depth of 10 feet.	

On the evening of April 17, 2018, the cutter suction dredge *Jonathon King Boyd* punctured a submarine natural gas pipeline with a spud during dredging operations in Matagorda Bay, Texas. A gas plume ignited and engulfed the dredge and its accompanying towboat, the *Bayou Chevron*. All 10 crewmembers abandoned the vessels uninjured. Damage to the pipeline was estimated at $1.7 million. The *Jonathon King Boyd* and the *Bayou Chevron* were constructive total losses, valued at $5.5 million and $125,000 respectively.

***Jonathon King Boyd* in Port Lavaca, Texas, before the accident. In this photo, towboat *Bayou Chevron* (marked by a yellow circle) is positioned on the dredge's starboard side. (Photo by RLB Contracting Inc.)**

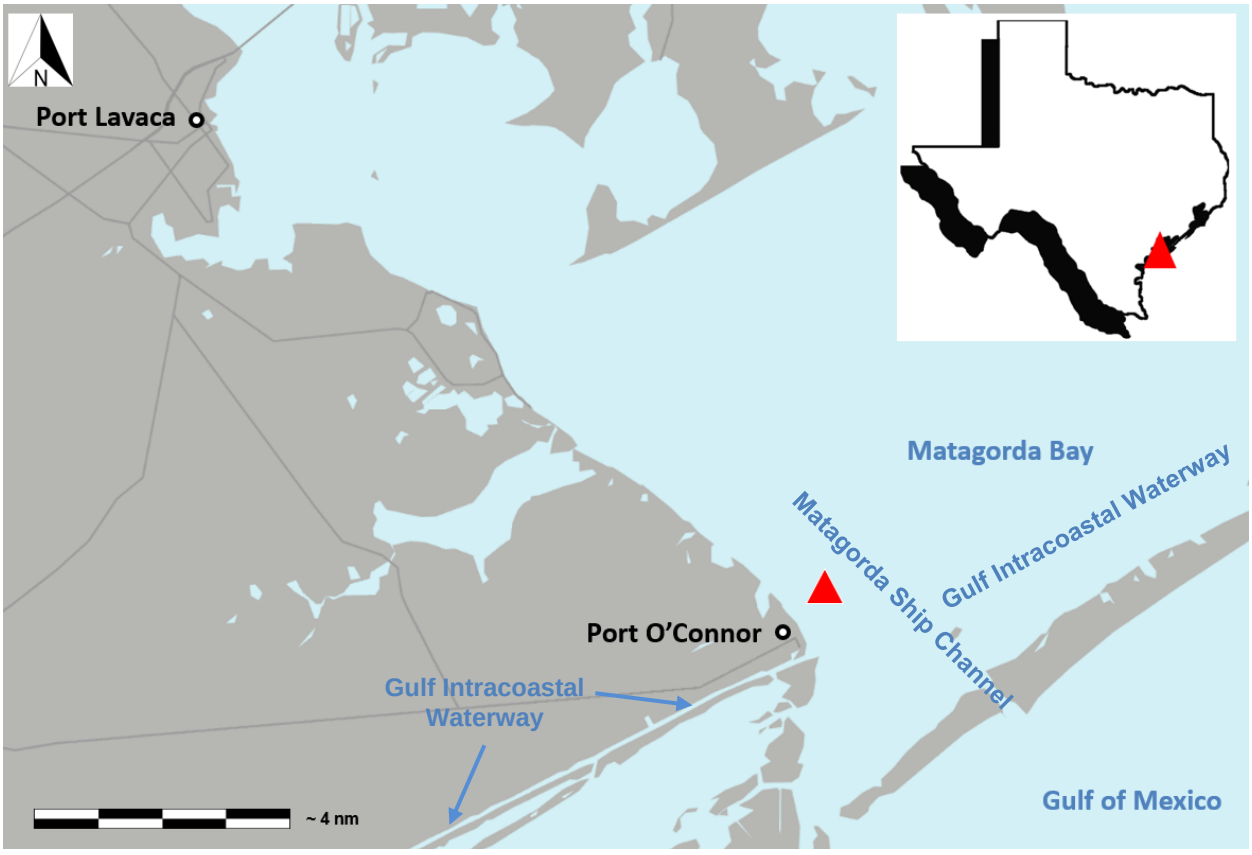
[1] *MSCF* – 1,000 standard cubic feet – is commonly used to express the volume of gas produced, transmitted, or consumed in a given period of time at a temperature of 60°F and an atmospheric pressure of 14.7 pounds per square inch.

[2] All miles in this report are nautical miles (1.15 statute miles).

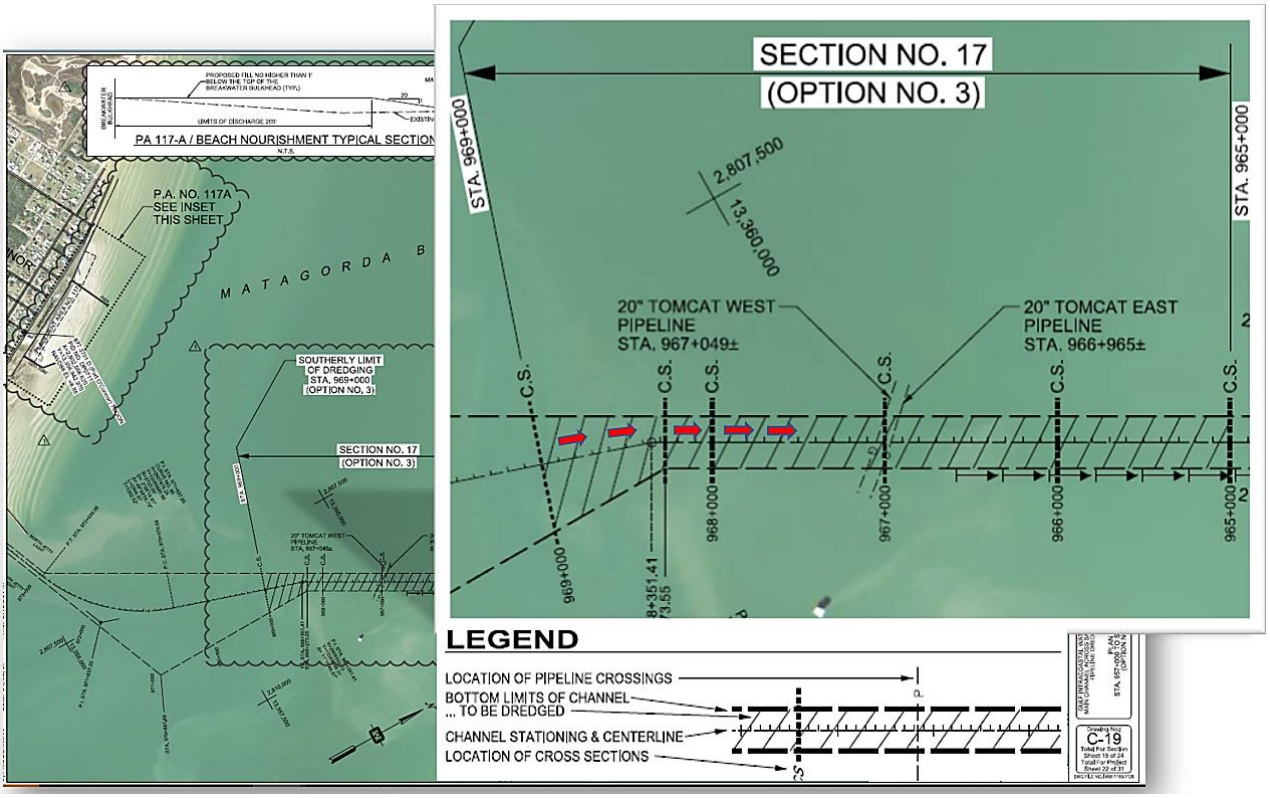
Background

The *Jonathon King Boyd*, a non-propelled, 130-foot-long cutter suction dredge, was owned and operated by RLB Contracting, Inc., located in Port Lavaca, Texas. The dredge was originally built in 1971 by Ellicott Dredges in Baltimore, Maryland, and in 2016 it received a major rebuild by Sterling Shipyard in Port Neches, Texas. The machinery space on the main deck contained a dredge pump driven by a 16-cylinder, 2,800-horsepower General Electric Electro Motive Diesel (EMD) engine; a hydraulically driven cutterhead powered by a 12-cylinder, 764-horsepower Caterpillar 3412 engine; two ship-service generators (Caterpillar 3406), an air compressor, and auxiliary equipment, all of which were running at the time of the accident.

RLB Contracting was under contract with the US Army Corps of Engineers (USACE) to dredge about 247,000 cubic yards of sand in the Gulf Intracoastal Waterway at the Matagorda Ship Channel intersection. At the time of the accident, the section being dredged ("no. 17"), was a portion of the third option ("no. 3") in a multi-option contract between RLB Contracting and USACE. A portion of the dredged material was to be deposited at nearby King Fisher Beach as part of a beach nourishment project in Port O'Connor, Texas. The USACE provided drawings to RLB Contracting that identified utilities, such as pipelines, that crossed the channel to be dredged.



Accident location, identified by a red triangle, in Matagorda Bay, Texas. (Background and inset by Google Maps)



Extracts from USACE Drawing No. C-19 depicting the dredging plan for Option No. 3, Section No. 17 for the Gulf Intracoastal Waterway. The red arrows display *Jonathon King Boyd*'s easterly dredging trajectory, commencing at the southern section (STA. 969+000).

Accident Events

The project started on March 30, eighteen days before the accident, and was anticipated to last about 5 weeks. The dredge was moved to the work site by *Bayou Chevron*, a 25-foot-long push-type towboat, also owned by RLB Contracting. Several other vessels, including work boats and a supply barge, accompanied the dredge and assisted during the setup and dredging operations. About 8,000 feet of pipeline for dredge discharge had been put in place off the *Jonathon King Boyd*'s port quarter to King Fisher Beach. The discharge pipeline corridor was marked with orange ball buoys, orange floats, and lighted flashing buoys.

Jonathon King Boyd commenced round-the-clock dredging operations in a northeast direction toward the Matagorda Ship Channel intersection from station 969+000 (see image above). Two crews, each with a rotation of 14 days on and 7 days off, dredged in 12-hour shifts. During each 12-hour shift, the vessel advanced about 100–150 feet through dense compact sand on the north (red buoy) side of the channel's centerline. The contracted depth of dredging was 14 feet, with an over-depth allowance of 2 feet. The dredge operators (levermen) were instructed to dig to a depth of 16 feet. The operations were progressing as scheduled; neither the dredging crew nor USACE reported any delays or issues.

Dredging operations were performed using a 4-foot-diameter hydraulically operated cutterhead mounted to a 53-foot-long truss-braced ladder. The levermen who controlled the dredge operation from the lever room advanced and swung the dredge and cutterhead from side to side by hauling in and paying out on the port and starboard 3,000-pound anchors off their respective sides

of the bow. As part of the sweeping motion the stern of the dredge was fitted with two steel-pipe spuds starboard and port, each 2 feet in diameter and 50 feet in height. One of them would be dropped into the channel bottom and used as a pivot point for rotating the dredge. With the port spud down, the dredge was swung to the left. At the end of that sweep, the starboard spud would be lowered and the port spud lifted, allowing the vessels to move forward 3–4 feet, also referred to as "the set." A sweep or pass to the right could then be made. One spud would always remain down to maintain a center pivot point. Depending on the channel bottom's composition, density, or volume, more than one pass might be required to achieve the desired channel depth. The spuds would be raised about 6–8 feet above the channel bottom to avoid dragging them when advancing ahead to the next set. The spuds were raised and lowered via a 1-inch wire rope connected to hydraulic winches. Each winch had multi-disc brakes with static and dynamic functions that allowed the winch to have equal speed in both directions and could lower a spud quickly, even allow it to freefall. The leverman allowed the spuds to freefall down to the channel bottom, where he estimated they penetrated 5–6 feet. The leverman did not have a direct line of sight of the spuds' travel but did have a closed-circuit camera and monitor to view the top of the spuds.

RLB Contracting's safety program for its vessels included crew change procedures, monthly abandon-ship and man-overboard drills, and daily safety meetings. On the evening of April 6, a crew change was initiated during the nightshift. During the crew turnover, no major issues or equipment problems were reported. The relief captain arrived on board the following morning and held a daily operational and safety meeting with the crew. He reviewed the previous day's operation, lever log entries for station start and stop positions, safety sign in/out sheets, and timesheets.

On the morning of April 17, ten days into their rotation, the captain and crew started their day as normal. The captain woke up at 0530 and reviewed the previous day's progress and log entries and conducted his daily safety briefing with the crew. The captain instructed the leverman to dig a bit deeper and make bigger sets based on the previous day's hydrographic survey results (commonly referred to as after-dredge surveys or "ADs"). The captain departed the vessel about 1000 to check on the placement and grading of dredge material at King Fisher Beach.

The dayshift leverman told investigators that he advanced about 48 feet during his 12-hour shift (from 0500 to 1700) and also had some downtime due to vessel traffic in the channel. The nightshift leverman stated the change of watch occurred at 1645 and all systems were operating at design temperatures and pressures. Data from the vessel's automatic identification system (AIS) placed the dredge at the beginning of station 967+100. The chief mate departed the dredge at 1700 to meet the captain who was still at King Fisher Beach discussing the schedule of operations with the owner of RLB Contracting.

The nightshift leverman stated he was dredging with the port spud down and walked the vessel ahead on the starboard spud. He made three passes on each of his three sets (3–4-foot advancement) because the bottom material was dense and "hard to dig."

About 1845, while making a round on the dredge, the deckhand noticed bubbles rising from the water off the stern. He notified the leverman, who stopped operations and went to the stern to investigate. The winds were south-southeast at 8–10 mph off the vessel's starboard bow, and the *Bayou Chevron* was tied off on the dredge's port side. The deckhand and the leverman believed they had a break in the dredge's 18-inch flexible discharge pipeline directly off the stern

based on the wind and current and previous experience. The leverman informed the captain, who along with the chief mate was ashore eating dinner. The captain instructed the crew to cease operation and replace the pipeline with a spare located on the nearby supply barge. The captain and chief mate hurried back to the *Jonathon King Boyd* via a workboat. The mate and deckhand returned with the spare pipeline aboard the towing vessel *First State* while the boatman and engineer raised and inspected the discharge line. The mate also examined it for signs of damage and found none, but still noticed bubbles rising to the surface off the stern. He asked if a pipeline was present at the location. None of the crew recalled smelling natural gas at that time. The leverman and engineer went to the galley to look at the nautical charts where they discovered a charted submarine pipeline at their location. They informed the captain, who then ordered the mate and deckhand (aboard the *First State*) to pick up the anchors and move the dredge away from that location for the safety of the crew and vessel. The captain contacted the company, who in turn notified the Coast Guard, National Response Center, and Texas General Land Office. As the crew prepared to move the dredge and as the leverman was raising the port spud, a geyser of gas and water—35–40 feet high by crew accounts—erupted from the stern of the vessel. The crew immediately smelled gas and headed for the muster station, which was located on the dredge's main deck, forward on the starboard side. The mate and the deckhand, who were retrieving the port anchor, also saw the plume of gas and water and immediately returned to the vessel. Shortly thereafter, about 2014, fire erupted near the stern of the dredge port side. All 10 crewmembers were accounted for. They followed their emergency response procedures and abandoned the dredge to the *First State*, which then quickly moved away as fire consumed the dredge and the *Bayou Chevron*. No one was injured.

***Jonathon King Boyd* burns after striking a submarine gas pipeline. (Source: Coast Guard video)**

The *First State* crew notified watchstanders at Coast Guard Sector and Air Station Corpus Christi about the fire. The Coast Guard launched a 29-foot-long response boat, an HC-144 Ocean Sentry aircraft, and an MH-65 Dolphin helicopter to the scene.

The pipeline owner, Genesis Energy, Manually shut down the affected section of the pipeline between an onshore facility and an offshore platform. The onshore valve was closed at 2112 on April 17, and the offshore valve was closed at 0841 the next day. An estimated 3,458 barrels of condensate and 12,680 MSCF of gas were released.

The fire continued into the night. A unified command was established between the Coast Guard, Texas General Land Office, Genesis Energy, and RLB Contracting to extinguish the fire and move the dredge and its accompanying workboats and barges away from the channel. The lines securing the *Bayou Chevron* to the dredge were consumed by the fire, and the vessel drifted away. The Coast Guard established a 4-mile safety zone around the accident. The Intracoastal Waterway was closed to traffic from mile 468 to 474, including the Matagorda Ship Channel from the jetties to 7 miles inside the bay. On April 18 at 1400, shortly after the fire had been extinguished, the safety zone was reduced to 1 mile. The fire-damaged *Bayou Chevron* was later located aground at Sand Point, 8.5 miles northwest of the accident. The Port Lavaca Fire Department and a firefighting barge remained on scene, guarding against the potential for reflash. Late in the evening on April 18, Coast Guard officials reported that salvage personnel had confirmed that the fire on board the dredge was fully extinguished. An oil spill response company placed booms around the dredge as a precaution against potential spills. By mid-afternoon the following day, the dredge had been moved to an RLB Contracting facility at Port Lavaca for fuel removal and damage assessment. Additionally, a damage assessment was completed on the pipeline. The unified command reopened all the waterways near Port O'Connor on Friday, April 20.

Additional Information

Postaccident alcohol and drug testing was performed on the dredge crew as required; all results were negative. Investigators also documented the damage and tried to recover records, lever logs, computer files, and electronic data; however, all items were destroyed by the fire. Investigators interviewed the crew and reviewed the sequence of events and the maintenance performed on board the vessel to determine the relevant circumstances of the accident.

The RLB Contracting production engineer, based at the company's main office, was responsible for notifying and coordinating the planned dredging projects with the Texas Notification System and utility companies in accordance with the USACE contract.[3] After the accident, he produced several tickets that showed RLB Contracting had notified the Texas Notification System about previous sections in the dredging project; however, he was unable to produce a ticket specific to section no. 17, where the accident occurred. Investigators contacted the Texas Notification System, which also provided records of several previous notifications by RLB Contracting but had no record or documentation that the company contacted them prior to dredging section no. 17.

The crew of the *Jonathon King Boyd* utilized HYPACK, a commercially available software used by the hydrographic and dredging industry. HYPACK provides user interface between

[3] Ahead of dredging projects, companies such as RLB Contracting were required to contact the Texas Notification System, who in turn would convey the information to its member utility companies. The utility companies, once notified, would have their personnel or contract locators on site to mark the locations of their underground utilities. According to the *Jonathon King Boyd* captain and crew, utility representatives were normally present when dredging in areas with known utilities, but during this section of the dredging project they were not on site.

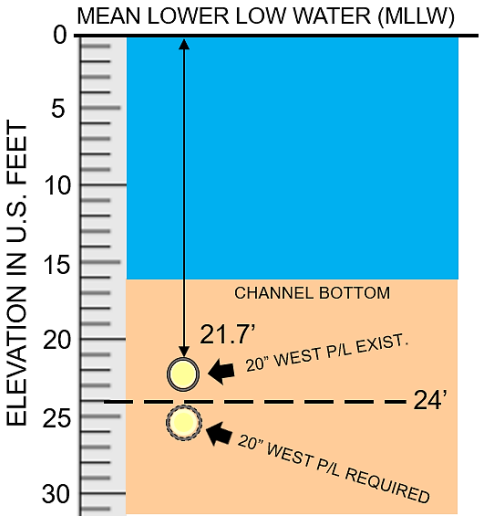
hydrographic surveys, data files, project files, and tracking of dredge operations. In addition, DREDGEPACK—a module in the HYPACK software—enabled the crew to monitor and track digging operations and the position and depth of the cutterhead in real time. The information was displayed to the levermen in cross-sectional views of each station that showed the "as surveyed" and "as dredged" depths, required depth, allowable over-depth, channel centerline, channel width, and channel end- and side-slopes. Pipeline positions could, and as per company policy should, have been entered into the HYPACK software, but according to the crew, the positions were not displayed in the software they had. According to the crew, the production engineer was responsible for entering the location of utilities and that information was typically provided to them at the beginning of the project.

The captain and both levermen told investigators that the channel area in which they were operating did not have signage or pilings identifying the pipeline crossing on either side of the channel. Investigators confirmed that regulations did not require signage marking the pipeline. In addition, they mentioned that although nautical charts (NOAA charts) kept in the lever room and crew galley marked the pipelines in the area, the crew did not use them during dredging (because they did not provide the level of detail needed for dredging operations), nor was there any company policy to do so. The captain and crew did not have a copy of the USACE contract or drawings on board the vessel that identified the locations of the pipelines.

The captain and the levermen told investigators that had they known a pipeline was present they would not have allowed the spuds to freefall from their stowed position. Instead they would have pinned the spud higher and performed a controlled lowering of the spud over the pipeline, if required, to limit the spud's penetration into the channel bottom. The cutterhead would have been secured and the jet pump would have been used when crossing over the pipeline. Also, the dredge would have been repositioned to the other side of the pipeline. According to the company's safety officer, this was the first accident of this magnitude for RLB Contracting Inc. in 18 years of dredging.

The ruptured pipeline, owned by Genesis Energy Offshore Pipeline Transportation, was part of the Matagorda Gathering System (TOMCAT), which consisted of 59 miles of interconnecting onshore pipelines. The pipelines received natural gas from production facilities and transported the gas to downstream pipelines and processing facilities. According to USACE-provided drawings, two submerged 20-inch TOMCAT pipelines, identified as West and East, crossed the channel at the accident location. The East pipeline, referred to as X1-500, was out of service and the portion that crossed the channel had been removed on August 22, 2017. The ruptured pipeline (West; also referred to as X1-400) had an overall length of about 27.8 miles, departed from the Matagorda Island MI-558 Platform, and terminated onshore at the MILSP facility. At the time of the accident, the pipeline was holding gas, not actively transmitting it. The pipeline pressure before the accident was 450 pounds per square inch gage (PSIG) with about 3,751 barrels of condensate in the pipeline. Its construction was API 5L X60-grade, electric-resistance, welded-steel, with a 0.375-inch wall thickness. The pipeline was externally coated with a spiral-wrapped asphalt-tar coating, followed by a 1.5-inch-thick concrete coating.

USACE has regulatory responsibilities pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 *United States Code* §403) under which the Corps authorizes structures and work in or affecting the course, condition, or capacity of navigable waters. The Corps required the top of the West pipeline to be below 24 feet at mean lower low water (MLLW).[4] According to the *U.S. Coast Pilot*, under ordinary weather conditions, the mean tidal range was about 1.5 feet for Matagorda Bay. Hydrographic surveys completed after the accident by USACE and Genesis Energy found that the water depth in the accident area was between 14 and 16 feet deep, corrected for tidal height at MLLW. A postaccident dive survey was conducted by Oceaneering International Inc. on April 26. The survey estimated the elevation at the top of the pipeline, at the ruptured location, to be about 21.7 feet below MLLW.



20-inch TOMCAT West pipeline (P/L) existing and required depth. (Source: *U.S. Coast Pilot*)

Analysis

Regulations and controls were in place to reduce and mitigate the risk and hazard of dredging in a channel with underground piping. However, despite these safeguards, the accident occurred. RLB Contracting did not have adequate oversight measures in place to ensure that two critical steps were taken.

First, RLB Contracting was required to alert the Texas Notification System before commencing the accident section of the dredging project. However, based on the evidence this notification did not take place. When the Notification System received notification about a new project, a ticket would be generated and a copy provided to the notification source. Neither the company nor the Texas Notification System was able to locate a ticket for the dredging location where the accident occurred.

Second, the company typically reviewed USACE provided drawings to identify utilities and other hazards, and incorporated those in their dredging software, HYPACK. The *Jonathon King Boyd* captain and crew relied solely on the HYPACK software while conducting dredging operations. Despite this reliance, before dredging, RLB Contracting did not incorporate files into the HYPACK software from the USACE-provided contract drawings that identified the locations of the submerged pipelines.

RLB Contracting relied on a single shoreside individual (the production engineer) to carry out appropriate notifications and to input the data for the vessel software, which, in this instance, led to a single-point failure.

[4] *Mean lower low water* is the average of the lower low water height of each tidal day observed over the National Tidal Datum Epoch. For stations with shorter series, comparison of simultaneous observations with a control tide station is made in order to derive the equivalent datum of the National Tidal Datum Epoch. https://tidesandcurrents.noaa.gov/datum_options.html

Probable Cause

The National Transportation Safety Board determines that the probable cause of the fire aboard the cutter suction dredge *Jonathon King Boyd* was RLB Contracting's failure to inform the crew about utilities in the area due to ineffective oversight, which led to dropping a spud onto a buried submarine pipeline, causing natural gas to release and ignite.

Vessel Particulars

Vessels	*Jonathon King Boyd*	*Bayou Chevron*
Owner/operator	RLB Contracting Inc	RLB Contracting Inc
Port of registry	Port Lavaca, Texas	Port Lavaca, Texas
Flag	United States	United States
Type	Cutter suction dredge	Push-boat/dredge tender
Year built	1971	2010
Official number (US)	531552	1256006
IMO number	950272	N/A
Classification society	N/A	N/A
Construction	Steel	Steel
Length	130 ft (39.6 m)	25 ft (7.6 m)
Draft	5 ft (1.5 m)	4.5 ft (1.4 m)
Beam/width	33 ft (10 m)	14 ft (4.3 m)
Gross tonnage	261	14
Engine power, manufacturer	2,800 hp (3,000 kW) EMD 16-645 (dredge pump), 764 hp (570 kW) Caterpillar 3412 (cutterhead), marine diesel engines	200 hp (149 kW) twin Detroit Diesels, model 4-71, twin disc 2.96:1 reduction gears
Persons on board	10	0

NTSB investigators worked closely with our counterparts from Coast Guard Marine Safety Detachment Victoria throughout this investigation.

For more details about this accident, visit www.ntsb.gov and search for NTSB accident ID DCA18FM021.

Issued: July 16, 2019