



National Transportation Safety Board

Washington, D.C. 20594
Safety Recommendation

Date: October 1, 1990

In reply refer to: P-90-29 through -31

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On October 3, 1989, the United States fishing vessel NORTHUMBERLAND struck and ruptured a 16-inch-diameter natural gas transmission pipeline about 1/2 nautical mile offshore in the Gulf of Mexico, and about 5 1/3 nautical miles west of the jetties at the entrance to Sabine Pass, Texas. Natural gas under a pressure of 835 psig was released. An undetermined source on board the vessel ignited the gas, and within seconds, the entire vessel was engulfed in flames. The fire on the vessel burned itself out on October 4. Leaking gas from the pipeline also continued to burn until October 4. Of the 14 crewmembers, 11 died as a result of the accident.¹

When the accident occurred, the NORTHUMBERLAND was in shallow waters and close to shore, which was normal and usual for its trade. The major constraint of the vessel's operation in the area was its depth. The water depth and the estimated draft of the vessel at the time of the accident were both about 10 feet. Consequently, the bottom of the vessel was close to the sea bottom or slightly penetrating the bottom when it struck the pipeline.

The pipeline was not fully buried when it was struck by the NORTHUMBERLAND. Diving surveys conducted after the accident established that the unburied segments of the pipeline were not confined to a limited length, but extended for as much as 400 feet in the immediate accident area. The quantity and type of marine growth found on the pipeline indicated that the pipeline had been unburied for a prolonged period. Damage to the concrete coating also indicated that the pipeline had been previously struck by other vessels or equipment towed by vessels.

¹ Additional information is given in the accident report. (National Transportation Safety Board, 1990. Fire on board the F/V NORTHUMBERLAND and rupture of a natural gas transmission pipeline in the Gulf of Mexico near Sabine Pass, Texas, October 3, 1989. Pipeline Accident Report NTSB/PAR-90/02. Washington, DC.)

The U.S. Army Corps of Engineers (the Corps) issues permits to operators placing man-made objects in navigable waters to prevent the obstruction of such waterways. Therefore, in issuing its permit to the owner and operator of the pipeline, the Corps required the pipeline to be buried and maintained to the burial depths shown on approved plans (about 9 feet below the seabed in the case of this pipeline). The NORTHUMBERLAND struck and ruptured the pipeline because the pipeline was not buried and maintained at the burial depth required by the Corps' permit.

An offshore pipeline can be and often is subject to the jurisdiction of several Federal and State regulatory agencies. To illustrate, the pipeline involved in this accident was subject to the jurisdiction of the Research and Special Programs Administration's (RSPA) Office of Pipeline Safety (OPS) within the U.S. Department of Transportation (DOT), the Minerals Management Service (MMS) within the U.S. Department of the Interior (DOI), the Corps, and the General Land Office of Texas. The investigation of the NORTHUMBERLAND accident revealed many deficiencies in the Federal regulations for submerged pipelines and the oversight and enforcement programs.

The regulations or standards of the OPS, the MMS, and the Corps differ in their applicability and scope. Pipelines are exempted from regulation by one agency but not another because of seemingly arbitrary factors such as minimum stress level, diameter, or location of a pipeline. For example, the OPS does not regulate hazardous liquid pipelines that operate at a stress level of 20 percent or less, while the MMS and the Corps do not have a similar exclusion. The MMS requires the burial of pipelines greater than 8 5/8 inches in diameter, whereas OPS requires the burial of hazardous liquid and natural gas transmission pipelines without consideration of diameter.

Further, DOT regulations, enforced by OPS, also have grandfathering provisions that exempt existing pipelines from many standards. As a result of the inconsistent standards, exemptions, and grandfathering provisions among the different regulatory agencies, submerged pipelines may not be required to be buried, protected, or even regulated. To ensure that all pipelines with comparable hazards will be consistently protected, the RSPA (through OPS), the MMS, and the Corps collectively need to evaluate the applicability of their respective regulations and to amend their regulations as necessary to provide uniform regulation of submerged pipelines.

However, the Safety Board is also concerned about the possible number of submerged pipelines that have never been regulated, were never required to be buried and protected, and have never been regularly inspected. Although the number of reported incidents of submerged pipelines damaged by surface vessels is small according to OPS (21 incidents since 1985), the large number of claims filed under Louisiana's Fisherman's Gear Compensation Fund (about 364 a year) suggests that the danger from underwater obstructions, including pipelines, is greater than OPS records suggest. Because all submerged pipelines are not subject to OPS or other reporting requirements, and because the number, location, and owners of all submerged pipelines in the Gulf of Mexico are not known, the actual danger cannot be ascertained from OPS

incident reports alone. Consequently, the magnitude of the problem and the potential danger of submerged pipelines to surface vessels are unknown.

Therefore, in Safety Recommendations P-90-4 to the DOT and P-90-1 to the DOI, issued February 22, 1990, the Safety Board recommended that the Departments identify, with appropriate Gulf States, the number, location, and owner of all offshore pipelines in the Gulf of Mexico. In a response dated May 30, 1990, the DOT cited a recently completed study conducted as part of MMS' ongoing environmental studies program. The study includes the information specified in the recommendation for those pipelines previously documented by MMS. The DOT also cited the records maintained under the Corps' permit program. The DOT further stated it is considering proposals to require pipeline operators to maintain current maps and other information about their pipelines that can be used to identify and locate pipeline facilities. The DOI responded that it was cooperating with the DOT through a DOT-sponsored task force that was organized as a result of the NORTHUMBERLAND accident. (The task force is discussed later in this letter.)

The responses of the DOT and the DOI, however, did not completely meet the intent of the recommendations. The study and records cited in the DOT's response identify known pipelines that were issued right-of-way permits. The Safety Board's primary concern, however, is for those pipelines that were--for whatever reason--never issued right-of-way permits or otherwise regulated. Until their number, location, and ownership are established, the potential danger to surface vessels remains unknown. The Safety Board urges both the DOT and DOI to renew their efforts to collect these data, and to utilize their resources of the States in the gulf region. However, because of the positive efforts of the DOT and DOI, Safety Recommendations P-90-4 to the DOT and -1 to the DOI are classified as "Open--Acceptable Response."

The OPS, the MMS, and the Corps have acknowledged the need to bury submerged pipelines to protect them from vessel operations. Yet, the MMS and the Corps were unable to cite the basis of their respective standards, whereas an OPS representative indicated that OPS standards were based on industry practices.

The Safety Board believes that the appropriate burial depth to protect a submerged pipeline from damage depends on several factors, including the design of the pipeline, the product transported, the operating pressures of the pipeline, characteristics of the sea bottom, subsidence and sedimentation rates, the depth of water, and the type and extent of vessel activity in the area. Without proper consideration of these factors, burial depths become arbitrary and may not necessarily be effective in protecting the pipelines from damage. Because the OPS, the MMS, and the Corps cannot justify the basis for their standards, the Safety Board is concerned that each agency has adopted its standards without proper consideration of these factors.

Also, the burial standards of the OPS, MMS, and the Corps establish the "natural bottom" or the "sea bottom" as the reference datum for burial depths. However, in areas of soft mud and silt, such as those found in much of the Gulf of Mexico, there may be several feet of mud and silt suspended in

the water. Because the suspension of mud and silt does not provide effective support or cover for a pipeline, the reference datum must be located where the bottom sediment has sufficient consistency and compaction to support and cover a pipeline. The Safety Board believes that prescribed burial depths would provide a more consistent level of protection if the reference datum was based on a specified compaction of the bottom sediments.

Although current DOT regulations in 49 CFR 192.317 require that offshore gas pipelines must be protected from ship anchors and fishing operations, the OPS has not adequately defined the level of protection required. Interpretations that an operator must provide "reasonable" protection against "foreseeable damage" are vague and do not provide sufficient guidance to pipeline operators. The OPS should be able to identify those conditions that place unacceptable risks on the pipeline, and then determine the minimum level of protection required. For example, if the rupture of a gas pipeline under high pressure is an unacceptable risk, events that can cause a rupture should be identified and adequate protection of the pipeline from those events should be required. Additional protection can also be required for those sections of the pipeline perceived to be in the greatest danger, such as those sections in areas with heavy vessel activity. Hazardous liquid pipelines should also be afforded the same protection as natural gas pipelines because of the potential for loss of life, property damage, and pollution damage.

Both the OPS and the MMS have designated the requirements to bury and protect submerged pipelines as construction or installation standards that do not apply throughout the service life of the pipeline. The need to protect a pipeline from damage, however, does not diminish after the pipeline has been constructed. Consequently, the level of protection required throughout the service life of a pipeline should not be less than that required at the time of construction.

Because of these deficiencies, DOT and DOI regulations and the standards of the Corps do not provide a sufficient level of safety. Consequently, the RSPA (through the OPS), the MMS, and the Corps should, collectively and under the leadership of the RSPA, develop and implement new standards for the burial and continued protection of submerged pipelines based on the potential risks to and from the pipeline.

Requirements to bury and protect submerged pipelines from surface vessels will have little effect without proper inspection and surveillance programs. Over time, environmental effects and the activities of surface vessels in the near-shore or along embankment areas can lead to the loss of overburden over a submerged pipeline that is offshore or under a river. The pipeline therefore becomes more vulnerable to external damage and poses a greater danger to vessels that operate in the area.

Because the OPS, the MMS, and the Corps do not explicitly require operators to conduct regular inspections of submerged pipelines, operators have not given adequate attention to potential dangers from unburied pipelines. Further, OPS officials have stated that operators cannot be expected to take corrective action if the operators are not aware of

hazardous conditions, and that the operators do not usually become aware of such conditions until an accident is reported. The OPS, therefore, adopted a reactive posture that permitted operators to take action after an accident occurred rather than a proactive posture that would have required operators to continuously search for and identify hazardous conditions. This reactive posture by the OPS has very likely led operators of submerged pipelines to also adopt reactive policies regarding continuing surveillance, to the detriment of public safety.

A DOT-sponsored study published in 1977 identified many of the problems noted in the NORTHUMBERLAND accident about deficiencies and inconsistencies in the regulations and also identified needed areas of research.² However, the OPS took no action. As a result of the SEA CHIEF accident,³ the OPS's Southwest regional office recommended that the OPS regulations be amended to require operators to inspect all offshore pipelines on a regular cycle and to rebury those pipelines without sufficient cover. Personnel in the OPS headquarters did not act on the recommendation, stating that the problem was a navigational one, yet did not discuss the problem with the Coast Guard.

The Safety Board believes that the OPS had enough information to recognize there were problems with submerged pipelines and that they posed danger to surface vessels. If the OPS had acted on the study and the recommendation from their Southwest regional office, effective regulations requiring operators to maintain their submerged pipelines in a safely buried condition might have been in force, and the pipeline involved in the accident might have been protected from the NORTHUMBERLAND.

The Safety Board recognizes that insufficient resources have adversely affected Federal and State enforcement programs. The staffing of the OPS Southwest regional office is not sufficient to meet its enforcement and oversight responsibilities given the number of offshore pipeline operators, the miles of offshore pipelines, and the office's additional responsibilities for land-based pipelines and the evaluation of the DOT-certified State inspection programs. The inability of the regional office to comply with its internal policies of inspection intervals also suggests that staffing levels are insufficient. Because of the shortage of qualified inspectors, the Southwest regional office does not adequately fulfill its enforcement and oversight responsibilities.

² Funge, William; Chang, Kai S.; Juran, David I. 1977. Offshore pipeline facility safety practices. DOT/MTB/OPSO-77/13 and DOT/MTB/OPSO-77/14. Washington, DC; U.S. Department of Transportation, Materials Transportation Bureau, Office of Pipeline Safety Operations. 2 vol. Available from: National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

³ In July 1987, the menhaden fishing vessel SEA CHIEF struck and ruptured a submerged pipeline transporting natural gas liquids in Louisiana waters; two crewmembers were killed. At the time of the accident, the pipeline was unburied.

The Safety Board has recognized in previous accident investigations the shortage of OPS personnel and its effect on programs intended to carry out the OPS responsibilities.⁴ As a result of those investigations, the Safety Board issued Safety Recommendations P-87-28 to the DOT, and P-88-13 and P-90-13 to RSPA:

P-87-28

Increase, through use of State inspection personnel and by increasing the number of Office of Pipeline Safety (OPS) inspectors, the OPS pipeline inspectors, the OPS pipeline inspection capabilities sufficient to perform thorough, periodic safety reviews of all pipeline operations directly subject to OPS monitoring and to perform timely, effective, followup compliance reviews of those operations in which compliance deficiencies are identified.

P-88-13

Monitor the staffing levels of the certified State pipeline inspection agencies, and require staffing level increases sufficient to respond to responsibilities beyond programmed inspection activities.

P-90-13

Assess the adequacy of and modify, as necessary, its program for monitoring and detecting inadequacies in State pipeline safety programs accepted by RSPA for determining compliance with Federal pipeline safety standards.

⁴ (a) National Transportation Safety Board. 1987. William Pipe Line Company, Liquid pipeline rupture and fire, Mounds View, Minnesota, July 8, 1986. Pipeline Accident Report NTSB/PAR-87/02. Washington, D.C. 58 p. (b) National Transportation Safety Board. 1988. Piedmont Natural Gas Company, natural gas explosion and fire, Winston-Salem, North Carolina, January 18, 1988. Pipeline Accident Report NTSB/PAR-88/01. Washington, D.C. 43 p. (c) National Transportation Safety Board. 1990. Kansas Power and Light Company, natural gas pipeline accidents, September 16, 1988 to March 29, 1989. Pipeline Accident Report NTSB/PAR-90/01. Washington, D.C. 53 p.

The RSPA Administrator has also recognized the OPS staffing problem and in August 1990 commented that the "...resource deficiency, when matched against the issues we face is of particular concern."⁵ The Administrator pointed out that the OPS has overall responsibility for more than 2,000 pipeline operators of 1.6 million miles of gas pipelines and more than 200 operators of 155,000 miles of hazardous liquid pipelines. He further commented that to improve operations, the pipeline safety program:

- (1) is being placed on a risk-assessment basis to target inspections and to rank regulatory projects so that optimum utilization will be made of the program's limited resources;
- (2) is being upgraded to meet the challenges of an aging pipeline infrastructure;
- (3) is being examined to determine if additional rulemaking actions are needed to enhance public safety;
- (4) is being improved by enhancing cooperation among Federal agencies to more effectively meet the OPS responsibilities for pipeline safety;
- (5) is seeking to expand its staff from 51 to 60 personnel to increase its capabilities to determine compliance, carry out enforcement, and develop regulations (3 of the new personnel are to be added to the OPS Southwest regional office to meet the agency's goal of more frequent inspections of offshore pipelines, especially those of operators with a history of violations, poor accident record, or poor rating under the OPS computer-based risk assessment tool); and
- (6) is seeking to improve the current partnership between Federal and State agencies by increasing the amount of funds provided to the States.

The Safety Board commends these proposed actions, which, if implemented could greatly enhance pipeline safety. However, the Safety Board recognizes that Federal and State agencies with responsibilities for pipeline safety have limited resources, and the likelihood of these agencies obtaining additional resources may be small unless RSPA's proposed actions are endorsed by the Secretary of the Department of Transportation as a priority need within the Department. The Safety Board believes that the Secretary should provide staffing and other resources adequate for the OPS to effectively fulfill its regulatory, inspection, enforcement, and State program oversight responsibilities.

⁵ Dungan, Travis P. 1990. Current thinking and future activities at DOT and OPS. Pipe Line Industry. 73(2): 21-24.

The Safety Board also believes that the inadequacy of the OPS resources is the primary reason for the problems previously identified in RSPA's oversight of State pipeline safety programs, in its lack of frequent and thorough inspections of pipeline operators for which the OPS has sole responsibility, and in its previous reluctance to implement resource-consuming enforcement actions. Although accomplishment of the objectives of Safety Recommendations P-87-28, P-88-13, and P-90-13 is needed, the Safety Board does not believe it is reasonable to expect the OPS to accomplish those objectives without adequate resources to fulfill its responsibilities. Consequently, the Safety Board has reclassified Safety Recommendations P-87-28, P-88-13, and P-90-13 as "Closed--Superseded" by Safety Recommendation P-90-28 issued to the DOT as a result of this investigation.

Although the resources for meeting its pipeline safety responsibilities are limited, the OPS could improve the effectiveness of its existing resources by identifying mutual areas of cooperation and coordination with other Federal agencies and within the States. The OPS could also improve its effectiveness by gaining a better understanding of the operations of the fishing industry; such an understanding might have prompted the OPS to reassess the appropriateness of its regulations for offshore pipelines. Further, an understanding of the fishing industry also might have prompted the OPS to have coordinated an exchange of information with the Coast Guard, thereby making the OPS more aware of the hazards to navigation posed by offshore pipelines.

Because of concerns about deficiencies in the regulations and practices to protect and inspect submerged pipelines, the Safety Board, on February 22, 1990, issued Safety Recommendation P-90-5 to the DOT and P-90-2 to the DOI recommending that the Departments determine effective methods of inspection, maintenance, and protection for offshore pipelines in shallow waters of the Gulf of Mexico. The DOT responded that a Federal task force, under the sponsorship of OPS, had been established in February 1990 to develop solutions to the hazards that may exist between offshore pipelines and fishing vessels in the Gulf of Mexico. Other participating agencies included the MMS, the Coast Guard, the Corps, the National Oceanic and Atmospheric Administration, and the States of Texas and Louisiana. The OPS has indicated that by October 1, 1990, the task force will have completed a report on the long-term regulatory and administrative projects to be initiated by each agency. The DOI stated that it is cooperating with the DOT through the Federal task force.

The Safety Board is pleased that the DOT has established the Federal task force to develop near-term and long-term solutions that will adequately protect offshore pipelines in the Gulf of Mexico and that will also be compatible with operations of the fishing and pipeline industries. In issuing the recommendations, however, the Safety Board also cited the need to involve industry associations as well. The Safety Board believes that the insights and expertise of the pipeline and fishing industries will provide a more comprehensive evaluation because both industries have already established a consensus on some actions they believe are needed to prevent a recurrence of this type of accident.

Since these two recommendations were issued, however, the Safety Board has become concerned that the safety problems with submerged pipelines are not confined to the offshore areas of the Gulf of Mexico. A submerged pipeline under a river, shipping channel, or other body of water is also susceptible to being unburied and damaged or ruptured by a vessel. For example, on January 2, 1990, a submerged 12-inch pipeline transporting heating oil was ruptured in the Arthur Kill channel between Staten Island, New York, and Linden, New Jersey.

Although the Federal task force is addressing safety issues involving commercial fishing vessels and offshore pipelines in the Gulf of Mexico, the Safety Board now believes that the scope of the initial recommendations needs to be expanded to evaluate the level of safety that exists for all submerged pipelines located under navigable waterways. The evaluation should address the issues and problems concerning the practices of the both the fishing and pipeline industries, the jurisdiction over submerged pipelines, the deficiencies in regulatory standards for submerged pipelines, the inadequacy of enforcement and oversight, and the need for improved communication and coordination. Because the RSPA, through the OPS, is the primary Federal agency for pipeline safety, the Safety Board believes that the RSPA, with the assistance of the MMS, the Coast Guard, and the Corps, should build on the work of the current Federal task force and develop and implement effective methods and requirements to bury, protect, inspect the burial depth of, and maintain all submerged pipelines in areas subject to damage by surface vessels and their operations. The Safety Board has therefore classified Safety Recommendations P-90-5 to the DOT and -2 to the DOI as "Closed--Superseded" by Recommendations P-90-29 to the RSPA and -34 to the MMS.

While the standards are being developed for the protection of submerged pipelines, measures are also needed to increase communication and coordination between and among government and industry groups. The Safety Board therefore believes that the RSPA, with the assistance of the MMS, the Coast Guard, and the Corps, should also implement permanent measures to increase the coordination and communication between and among Federal and State regulatory agencies, and the pipeline, fishing, and marine industries.

The pipeline that was struck by the NORTHUMBERLAND transported natural gas from four offshore platforms operated by four different owners. Natural Gas Pipeline Company of America (NGPL), owner of the pipeline, had to rely on the proper operation of the automatic shutdown systems on the four platforms to isolate the pipeline from offshore; therefore, it was imperative for the NGPL district superintendent to be able to contact each producer for confirmation that each platform had shut-in. The district emergency plan, however, did not include a telephone number for the owner of one of the platforms, and company personnel did not attempt to find an emergency telephone number or use other means to contact the owner of the platform. Because NGPL could not make contact and because of communications problems with another platform, the superintendent dispatched two employees by helicopter to confirm that all four platforms had shut-in.

The failure of the district superintendent to have an emergency telephone number can be attributed to an absence of emergency planning and

coordination between the pipeline operators and the offshore producers. Because the operations of an offshore pipeline and platform are directly integrated, an emergency condition on one will necessarily affect the operation of the other. The failure to have a telephone contact and the communications problems may have been mitigated if the NGPL and the producers had previously planned and coordinated for emergency situations. Effective coordination requires that the pipeline operator and the producer have current emergency contacts and agreement on their respective procedures in the event of an offshore emergency.

The Safety Board is also concerned about the effectiveness of the emergency planning and coordination between pipeline operators and offshore producers on an industry-wide basis. Because such emergency planning is not required under the DOT or the DOI regulations, the Safety Board believes that the RSPA, through the OPS, and the MMS should evaluate the need for greater emergency planning between offshore pipeline operators and producers, and then should implement, if necessary, appropriate safety regulations.

Therefore, as a result of this accident, the National Transportation Safety Board recommends that the Research and Special Programs Administration:

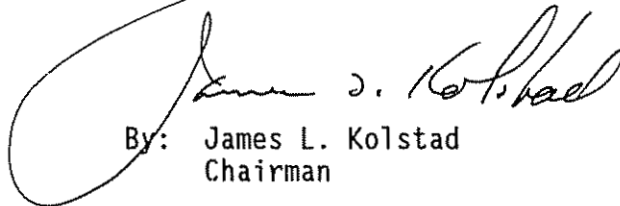
Develop and implement, with the assistance of the Minerals Management Service, the U.S. Coast Guard, and the U.S. Army Corps of Engineers, effective methods and requirements to bury, protect, inspect the burial depth of, and maintain all submerged pipelines in areas subject to damage by surface vessels and their operations. (Class II, Priority Action) (P-90-29)

Implement permanent measures, with the assistance of the Minerals Management Service, the U.S. Coast Guard, and the U.S. Army Corps of Engineers, to increase the coordination and communication between and among Federal and State regulatory agencies, and the pipeline, fishing, and marine industries. (Class II, Priority Action) (P-90-30)

Evaluate, with the assistance of the Minerals Management Service, the need for emergency planning and coordination between offshore pipeline operators and producers, and then implement, if necessary, appropriate safety regulations. (Class III, Longer Term Action) (P-90-31)

Also a result of this investigation, the Safety Board issued recommendations to Zapata Haynie Corporation, Natural Gas Pipeline Company of America, U.S. Department of Transportation, Research and Special Programs Administration, U.S. Coast Guard, Minerals Management Service, U.S. Army Corps of Engineers, National Oceanic and Atmospheric Administration, Interstate Natural Gas Association of America, American Gas Association, American Public Gas Association, American Petroleum Institute, National Fish Meal and Oil Association, Louisiana Shrimp Association, and National Council of Fishing Vessel Safety and Insurance.

KOLSTAD, Chairman, COUGHLIN, Vice Chairman, LAUBER, BURNETT, and HART, Members, concurred in these recommendations.

A handwritten signature in cursive script, reading "James L. Kolstad". The signature is written in dark ink and is positioned above the typed name and title.

By: James L. Kolstad
Chairman