DOCUMENT RESUME

ED 152 494 SE 023 761

TITLE Oil Spills and Spills of Hazardous Substances.
INSTITUTION Environmental Protection Agency, Washington, D.C. Office of Water Programs.
PUB DATE Mar 77
NOTE 44p.; Contains occasional small print and broken type; Photographs may not reproduce well
AVAILABLE FROM Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (no price quoted)

EDRS PRICE MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS Accident Prevention; Chemical Industry; *Environmental Education; Government Publications; *Pesticides; *Petroleum Industry; *Pollution; Public Health; Science Education; Secondary School Students; *Water Pollution Control
IDENTIFIERS *Environmental Protection Agency; *Oil Pollution

ABSTRACT

The stated purpose of this publication is to describe some of the more significant spill incidents and the mechanisms, both managerial and technological, to deal with them. This publication is targeted for school, general public, and other such audiences. Sections include effects of spills, prevention of spills, responding to spills, spill surveillance, spill incidents, spills of hazardous substances, international cooperation, and Environmental Protection Agency (EPA) Regional Offices. Along with many black and white photographs of oil spills and clean-up efforts, this publication contains discussion of several recent spills. Among the spills described are the Torrey Canyon, the Santa Barbara off-shore well blow-out, San Juan River spill, Tappan Zee barge spill, the Argo Merchant disaster and many others. Also described are clean-up measures employed and plans for dealing with future spills. Hazardous substance accidents described are tank car, terminal, barge, and ship spills of PCB's, toxaphene, chlorine, strip mine ponds, and chlorinated hydrocarbons. (MR)

OIL SPILLS

AND SPILLS OF HAZARDOUS SUBSTANCES

Oil and Special Materials Control Division
Office of Water Program Operations
U.S. Environmental Protection Agency
Washington, D.C. 20460

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

FOREWORD

This document represents the third edition of "Oil Spills and Spills of Hazardous Substances" originally prepared in March 1973 by the Oil and Special Materials Control Division. We have found this type of publication to be extremely effective in describing some of the more significant spill incidents and the mechanisms, both managerial and technological, to deal with them. Already, over 25,000 copies of this booklet have been requested by and sent to schools, the general public and others.

The primary objective of EPA's oil and hazardous substance spill program is to protect water quality through the prevention of spills and minimize the impact of spills on the environment. Section 311 of the Federal Water Pollution Control Act, as amended in 1972, specifies a threefold approach to the control of spills which consists of response, prevention and enforcement. Essential to the implementation of Section 311 is the promulgation of key regulations, development of the National Contingency Plan, establishment of spill response programs, and development of an aggressive spill prevention program.

One should recall that prior to the passage of the Federal Water Pollution Control Act of 1970, there was a minimal effort at the State and Federal levels to prevent or clean-up spills. Since then, and bolstered by the FWPCA amendments of 1972, spill prevention and spill response have taken on an added impetus. It is heartening for us in EPA to witness the progress being made in both areas.

Kenneth E. Biglane

Director
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March 1977

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Front cover: Tanker Olympic Games, see p. 21.
Back cover: Tanker Argo Merchant, see p. 21.

Photos by EPA (NERC)

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OIL SPILLS

AND SPILLS OF HAZARDOUS SUBSTANCES

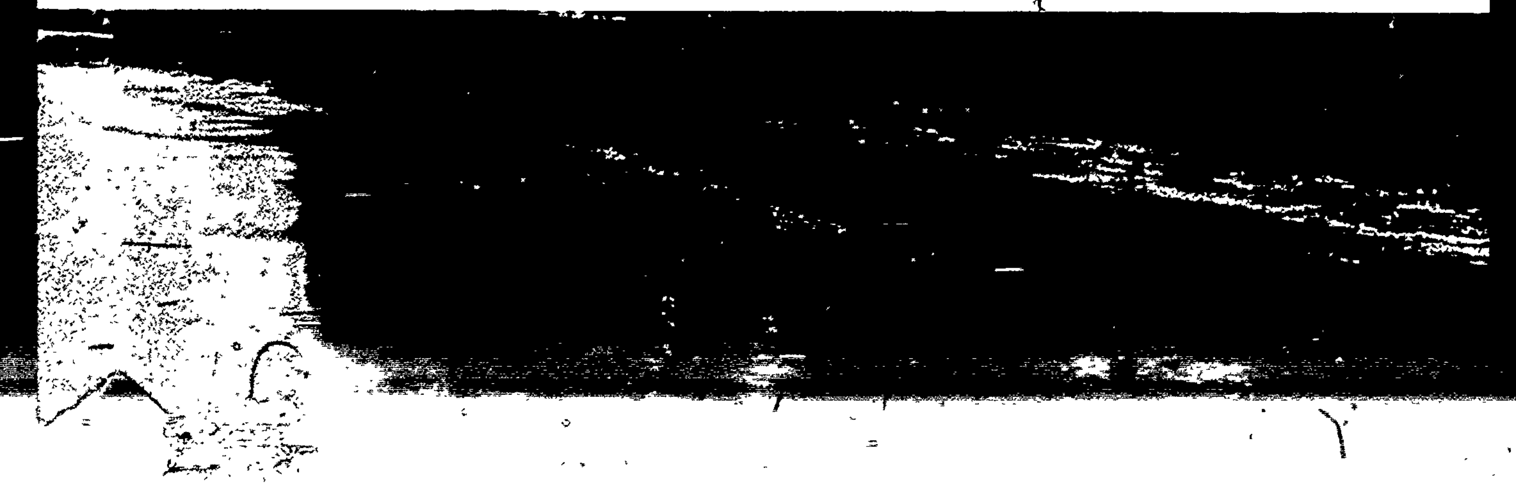
For several years the U.S. Environmental Protection Agency and the U.S. Coast Guard have played major roles in attempts to reduce the frequency and volume of spills of oil and hazardous substances, and to minimize environmental damage caused by those spills that do occur.

Spills add to any existing pollution stresses in lakes, streams, estuaries, or the ocean itself. These stresses accumulate from urban runoff, agricultural operations, industrial activities, and many other sources.

Among the 13,000 spills which have been reported annually in the United States, the effects of some are easy to see, as in the photo below.

Over 95% of the oil spills are fairly small-- less than 1,000 gallons. About 6,500 are less than 20 gallons. Spilled into rivers, streams, coastal waters, estuaries, and lakes, oil is carried away in a matter of minutes by the force of currents, tides, and winds. Hazardous substances, which are generally soluble in water, disperse just as quickly and are often more difficult than oil to clean up.

Spills not only damage the environment, they may threaten health and safety. They are expensive to clean up, and cause wasted energy and food resources. Because of the obvious limitations to responding after the fact, EPA's Oil and Special Materials Control Division em-



phasizes prevention of spills. EPA has issued regulations covering oil operations not related to transportation--for example, oil fields and tank farms--while the U.S. Coast Guard has issued regulations for oil facilities related to transportation.

The Federal program to combat spills has three goals:

-To prevent spills.

-To detect spills that do occur.

-To contain, remove, and clean up spills.

Primed with legal authority to fine spillers and to make them liable for clean-up costs, the Federal program is committed to meeting those goals and protecting the Nation's waterways from materials that are unwanted, harmful, and wasted there.

EFFECTS OF SPILLS

Because of the large quantities often involved in spills, their effects are not always comparable to those caused by chronic pollution from sources such as industrial and municipal discharges. Some of the effects of an oil spill are obvious -- covered beaches, rivers dotted with oil slicks, trees and bushes coated with oil, dead birds and fish. A spill of a hazardous substance such as acids, bases and pesticides can threaten health and safety. It can kill birds and fish; in some cases, a hazardous substances spill can literally sterilize a body of water.

But the effects of spills are not confined to the immediate or obvious. They may also involve subtle changes that over a long period could change the composition of aquatic communities or damage the ability of a species to survive.

Marine birds die as a direct result of oil spills. They die when oil destroys the natural insulating qualities of their feathers. In addition, ingested oil can kill birds by interfering with their normal body processes.

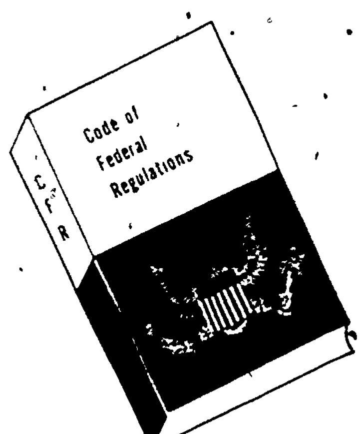
Fish and shellfish are killed, stressed, or made unfit for human consumption by an oily taste. Damaged fishing grounds have meant financial losses for fishermen and processors. Hazardous substances can also accumulate in organisms, damaging the organism itself or making it unfit for consumption by man and other animals.

Spills can affect aquatic systems in many other ways. Oil and hazardous substances can interfere with vital processes such as photosynthesis, and introduce subtle changes in the behavior patterns of aquatic organisms. For example, fish may lose their ability to secure food, avoid injury, escape from enemies, choose a habitat, recognize territory, migrate, communicate, and reproduce. Spills interfere with the movement of fish such as salmon, striped bass, shad and others. They must leave the ocean coastal areas and go into bays, estuaries, wetlands, rivers, or streams in order to spawn.

PREVENTION OF SPILLS

The causes of spills are many -- equipment failure, human error, collisions, natural disasters. The philosophy of the Federal spill prevention program is that, whatever the cause, most spills can be prevented by the use of proper equipment and procedures. Responsibility for the program is divided between EPA and the U.S. Coast Guard. EPA is responsible for all facilities, both onshore and offshore (within 3 miles), that are not related to transportation. Included are facilities that drill, produce, gather, store, process, refine, transfer, distribute, or consume oil and hazardous substances. The Coast Guard is responsible for transportation-related facilities, including vessels, railroads, tank trucks, and pipelines.

On December 11, 1973, EPA published oil pollution prevention regulations in the Code of Federal Regulations (40 CFR Part 112). They require that a Spill Prevention, Control and Countermeasure (SPCC) Plan be prepared and implemented by any facility that could reasonably



PART 112
OIL POLLUTION PREVENTION
NON-TRANSPORTATION RELATED ONSHORE AND OFFSHORE FACILITIES

be expected to spill oil into the waters of the United States if it meets any of these criteria:

- Has total buried storage greater than 42,000 gallons.
- Has total nonburied storage of greater than 1,320 gallons.
- Has any single container greater than 660 gallons.

SPCC PLANS

The SPCC plan is prepared by the owner or operator and must be certified by a registered Professional Engineer. The EPA regulations contain guidance as to what should be included in a plan, the form in which the information should be presented, and good prevention engineering practices that have been successfully used by industry in the past.

This guideline approach is designed to provide flexibility so that even older facilities can prevent spills at a reasonable cost. The plan is not submitted to EPA unless the facility violates the conditions specified below. The plan must, however, be available at the facility for EPA review to assure that it has been prepared and is implemented. EPA Regional offices conduct frequent inspections of facilities to confirm that the required design changes are constructed and prevention equipment is installed as stated in the plan.

If a facility experiences a single spill of over 1,000 gallons or two spills which discharge a harmful quantity of oil (as defined by EPA regulation 40 CFR Part 110) within 12 consecutive months, the owner or operator must submit his plan, along with additional data, to the EPA Regional Administrator for review of the facility's prevention devices and procedures.

On reviewing the SPCC plan, the Regional Administrator may determine that it is not adequate to prevent spills. In that case, he may require the owner or operator to amend it. Unless extensions were granted, plans for existing facilities had to be prepared by July 11, 1974, and implemented by January 11, 1975.

EPA's oil spill prevention program covers these major facilities:

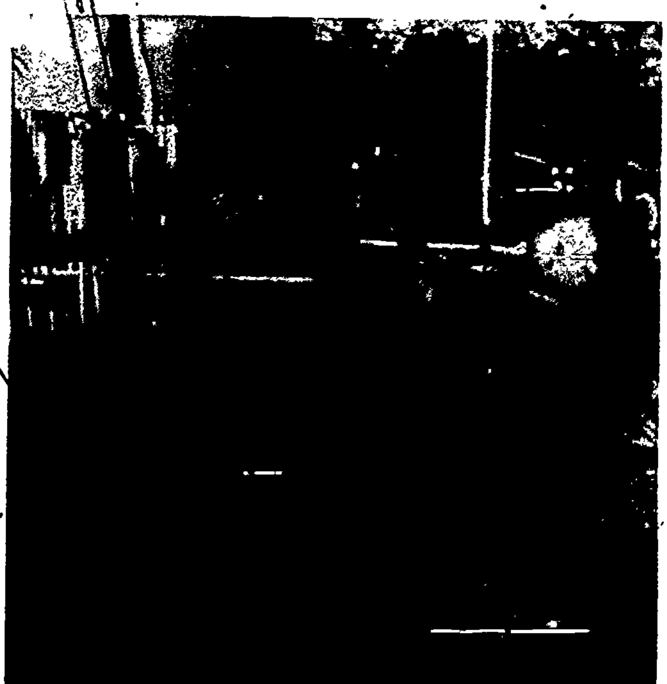
- About 30,000 oil storage terminals, tank farms, and bulk plants.
- About 285 oil refineries.
- Several thousand production facilities, both onshore and offshore. The number changes almost daily as old oil fields are reopened, stripped, and closed or abandoned.
- Large numbers of bulk oil consumers such as apartment houses, office buildings, schools, hospitals, farms, and Federal facilities.

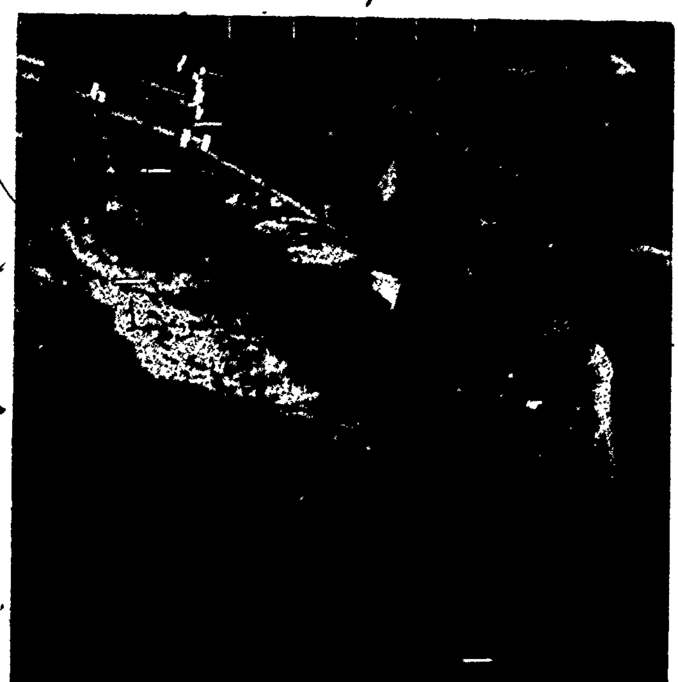
The number of oil spills from nontransportation related facilities during calendar year 1975--the first year that the prevention regulation was fully operational--were significantly lower than the previous year.

COAST GUARD REGULATIONS

On December 21, 1972, the Coast Guard published prevention regulations for vessels and

Below: Oil-water separator equipment is being installed to avoid harmful discharges of oily water during oil terminal operations.





oil transfer facilities (33 CFR Parts 154, 155, 156). The regulations became effective on July 1, 1974. Regulations applicable to other modes of transportation -- pipelines, railroads, and tank trucks -- are expected to be published.

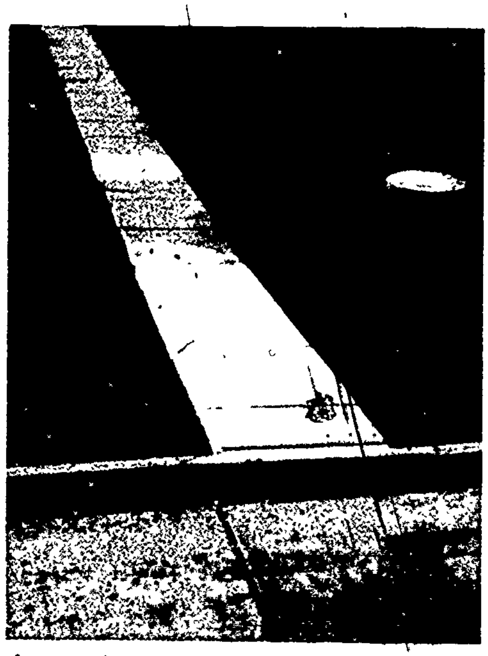
The regulations governing vessels emphasize the need to assign responsibility for oil transfer operations to a specific individual experienced in such operations. They cover:

- Onshore and offshore facilities transferring oil in bulk to and from any vessel having a capacity of 250 or more barrels. Each facility must prepare an operations manual spelling out how it will meet the operating rules and equipment requirements of the regulations, as well as the duties and responsibilities of those conducting oil transfer operations. The Coast Guard can inspect the facility, assess civil penalties for violations of the regulations, and suspend operations when conditions are found that threaten the environment.
- Operations of vessels in the navigable waters and contiguous zone of the United States. To receive a certificate of inspection from the Coast Guard -- in fact, an authority to operate -- U.S. vessels must adhere to the design and equipment requirements of the oil pollution prevention regulations. Again, operations can be suspended if they threaten the environment.
- Transfer of oil to or from vessels having a capacity of 250 or more barrels on the navigable waters and contiguous zone of the United States.

The Coast Guard regulations, together with vessel traffic systems and construction requirements under the Ports and Waterways Safety Act of 1972, should significantly reduce discharges from vessels and oil transfer operations.

COMPLIANCE ACTIONS

EPA has been conducting compliance inspections for preparation of SPCC plans since July 11, 1974, and for preparation and implementation of plans since January 11, 1975. As of June 1, 1976 EPA had completed 12,313 compliance inspections, which resulted in 1,487 notices of violations of the Oil Pollution Prevention Regulation being issued.



Simple repairs at an oil facility may protect environment from spills during truck loading.

On February 1, 1975, EPA began receiving plans for review from facilities that had spill problems. To ensure reasonable uniformity in its review and amendment procedures, EPA developed a course in oil spill prevention engineering. Among the first to take the course were engineers from EPA Regional Offices who review SPCC plans, evaluate the facility's system design from a spill prevention point of view, and develop required amendments.

HAZARDOUS SUBSTANCES

EPA's program to prevent spills of hazardous substances will probably follow the same principles used in setting up the oil spill prevention program.

Spills of hazardous substances are fewer in number compared with oil spills, but far more toxic and dangerous than oil spills. In many instances they pose immediate and long-term threats to human safety and health.

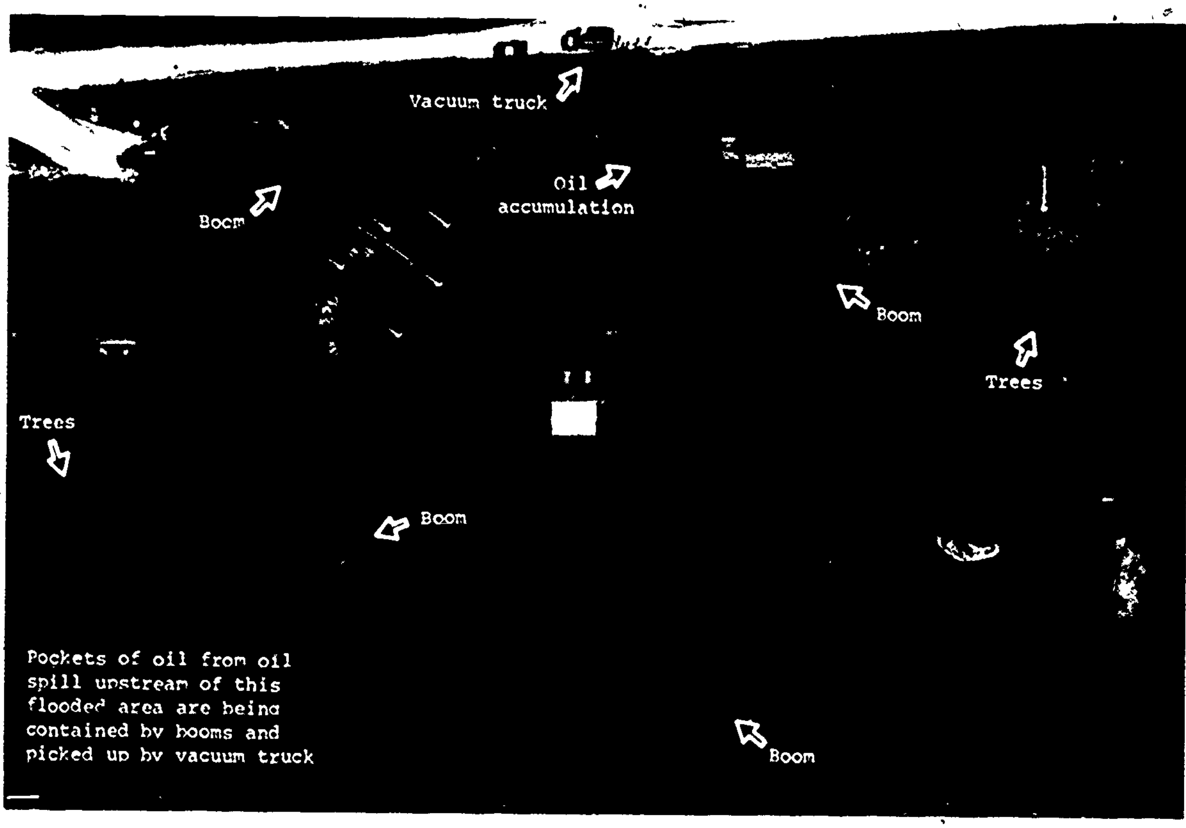
In response to Section 311 of the Federal Water Pollution Control Act Amendments of 1972, EPA promulgated notice of proposed rule making relative to spills of hazardous substances in the Federal Register on December

30, 1975. Therein, over 300 substances were designated as hazardous, along with corollary regulations dealing with removability, harmful quantities, and penalty rates.

Because of certain problems relating to degree of penalty assessment and enforcement procedures, final rule making has been postponed. It is expected that the final rules and regulations will go into effect in 1977, at which time EPA and the U.S. Coast Guard can implement an enforcement, control and prevention program similar to that in effect for oil spills. In the interim, they will respond to spills of hazardous substances in the interest of public welfare.

Most spillers have taken quick remedial actions on a voluntary basis. There is no legal requirement at the present time for reporting spills of hazardous substances. There may be about 2,000 of them a year.

RESPONDING TO SPILLS



Pockets of oil from oil spill upstream of this flooded area are being contained by booms and picked up by vacuum truck

Success in cleaning up an oil spill depends upon preparedness and rapid action by the spiller and by Federal, State, and local agencies. When a spill occurs, the spiller must report it promptly to the nearest Coast Guard Station or EPA office. If the spiller fails to give immediate notice, he can be fined up to $10,000 and imprisoned up to one year, or both. The spiller must also take proper action to contain and clean up the spill. If he doesn't, EPA or the Coast Guard may remove the spill using a special Federal revolving fund. In such cases, the spiller is liable for the cost incurred.

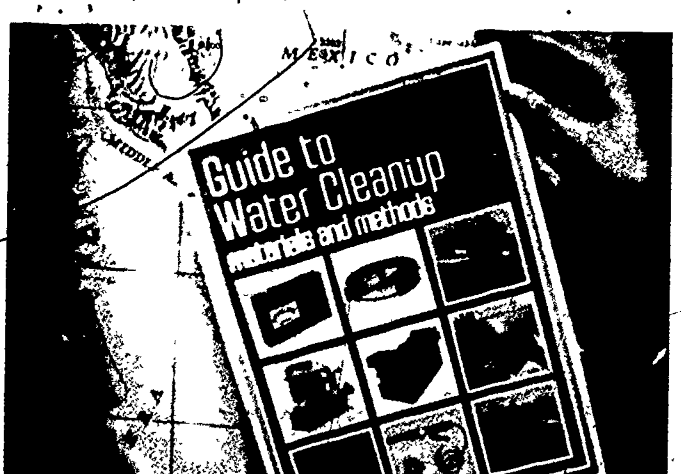
Cleaning up after an oil spill that is floating or partially submerged starts with containing it. Safety of work crews is an important consideration. The containment needed depends on the type of waterway, the size of the spill, weather conditions, and the procedure to be used to remove it. In shallow water, a dam of baled straw can absorb oil and trap or filter floating materials. In a small, fast-moving stream, wire fencing such as chicken wire can be packed with straw and laid across the stream at an angle. A series of barriers can be placed to catch any oil that is already moving downstream.

In slow-moving water, small booms with a weighted apron or shield, or earthen dikes may be used. Such booms are commercially available. In general, containment procedures are adequate for coastal or slow-moving waters, but in large bodies of water or fast-moving streams, the spills disperse so quickly that effective containment is very difficult.

Several different procedures may be used to remove a spill once it has been contained. Liquid deposits that have settled can be dredged, sucked up, or pumped off. Solid or sludge deposits can be shoveled or dredged. Contained oil or other liquids can be removed by tank or vacuum trucks equipped with pumps, which are usually available locally. Large amounts of oily water can be removed by mechanical skimmers; the kind and type to be used depend upon water conditions and the amount of debris, availability of equipment, and other factors.

Cleaning oily sand from beach areas can be a long and tedious process. Heavy grading equipment is effective, but many beach areas have limited access. Manual labor then becomes the only method for picking up oil-soaked debris and sand. Finding a site for permanent disposal of the oil and debris -- without creating new pollution -- is often a serious problem.

The complex nature of oil removal operations has caused the oil industry to establish oil clean-up cooperatives. They provide specialized equipment and personnel trained in oil cleanup techniques.



RESPONSE TO SPILLS OF HAZARDOUS SUBSTANCES

Since most hazardous substances are soluble in water, actually removing them from the water is extremely difficult with current technology. Traditional methods of treatment--adsorption with activated carbon, neutralization with acids and alkalies, or precipitation, for example--have proved their effectiveness in industrial processes and laboratory application. However, they have not been demonstrated satisfactorily in actual spills of hazardous substances.

Even though there is little technology available to actually remove hazardous substances spilled into the water, there are actions which can be taken to minimize the damage. For example, an entire lake or pond of water contaminated by a hazardous material spill can be dammed, bypassed, and filtered or treated to make the water safe again. The bottom sediments are then treated to make them safe.

Water flowing into lake is bypassed while the Endrin-poisoned water is being treated.

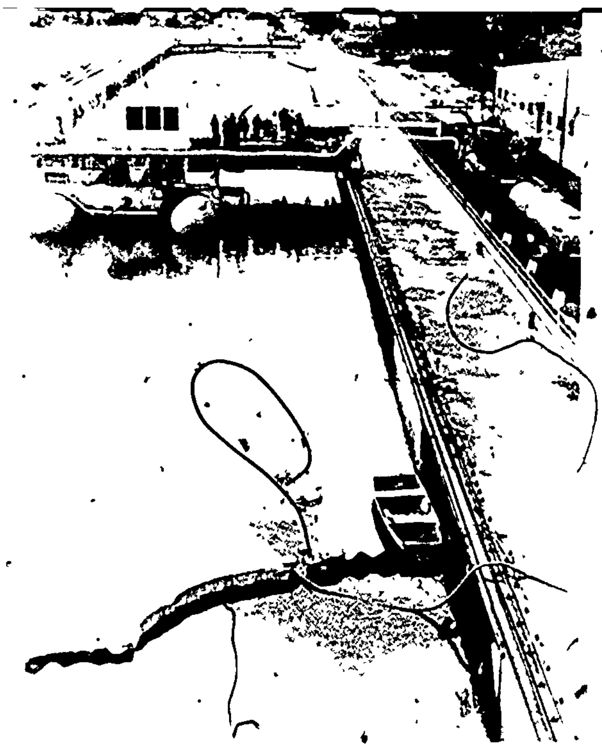
TECHNICAL ASSISTANCE DATA SYSTEM

A valuable tool now available to spill response personnel is the Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS). This computerized information retrieval file is accessible by telephone hookup to a computer terminal.

OHM-TADS stores detailed information on some 900 chemical compounds. The information--numerical data as well as interpretative comments--has been assembled into the computer from technical literature. It emphasizes the effects the materials can have when spilled, but much more information is provided, including trade names, synonyms, chemical formulas, major producers, common modes of transportation, flammability, explosiveness, potential for air pollution, methods of analysis, and chemical, physical, biological, and toxicological properties. In less than 15 minutes, OHM-TADS can relay procedures for safe handling and clean-up of spilled materials.

Another capability of OHM-TADS is identification of unknown materials. After key characteristics of the unknown are furnished to the system, OHM-TADS screens for candidate substances with similar physical and chemical properties. For example, if the computer is given the color, odor, or density of an unknown material, it will generate a list of candidates. Continued elimination of substances on this list will lead ultimately to identification of the material.

OHM-TADS was first used in June 1971 in a fire in an agricultural chemicals warehouse in Farmville, North Carolina. Since that time it has been used on a wide variety of spills; it is now being expanded to provide a network of data terminals for emergency service to spill response personnel all over the Nation and in Canada and Sweden.



Oil is being added to the water in the OHMSETT tank in preparation for a test. A party of observers is on the moveable bridge.

OHMSETT FACILITY

EPA supports a number of research and development activities to provide spill response teams with more effective techniques and equipment for the future. In Leonardo, New Jersey, a new spill research facility called OHMSETT (Oil and Hazardous Materials Simulated Environmental Test Tank) is used to develop standard test procedures and evaluate devices to contain and pick up spills.

The tank is 670 feet long, 65 feet wide, and 11 feet deep. One end has a wave generator capable of making 2-foot-high waves with a length of up to 16 feet. Wave height and length are selected for each test. Waves can be absorbed by a simulated beach at one end of the tank, or reflected so as to generate a choppy condition. Currents are simulated by towing test equipment down the tank from a moveable bridge.

The bridge and wave generator are controlled from a three-story control building. An underwater observation area and instrumentation equipment are also provided. More information about this facility may be obtained from the Director, EPA Industrial Waste Treatment Research Laboratory, Edison, N.J. 08817.

Device designed for picking up oil from the surface of the water, being tested for the U.S. Coast Guard at EPA's new OHMSETT facility.

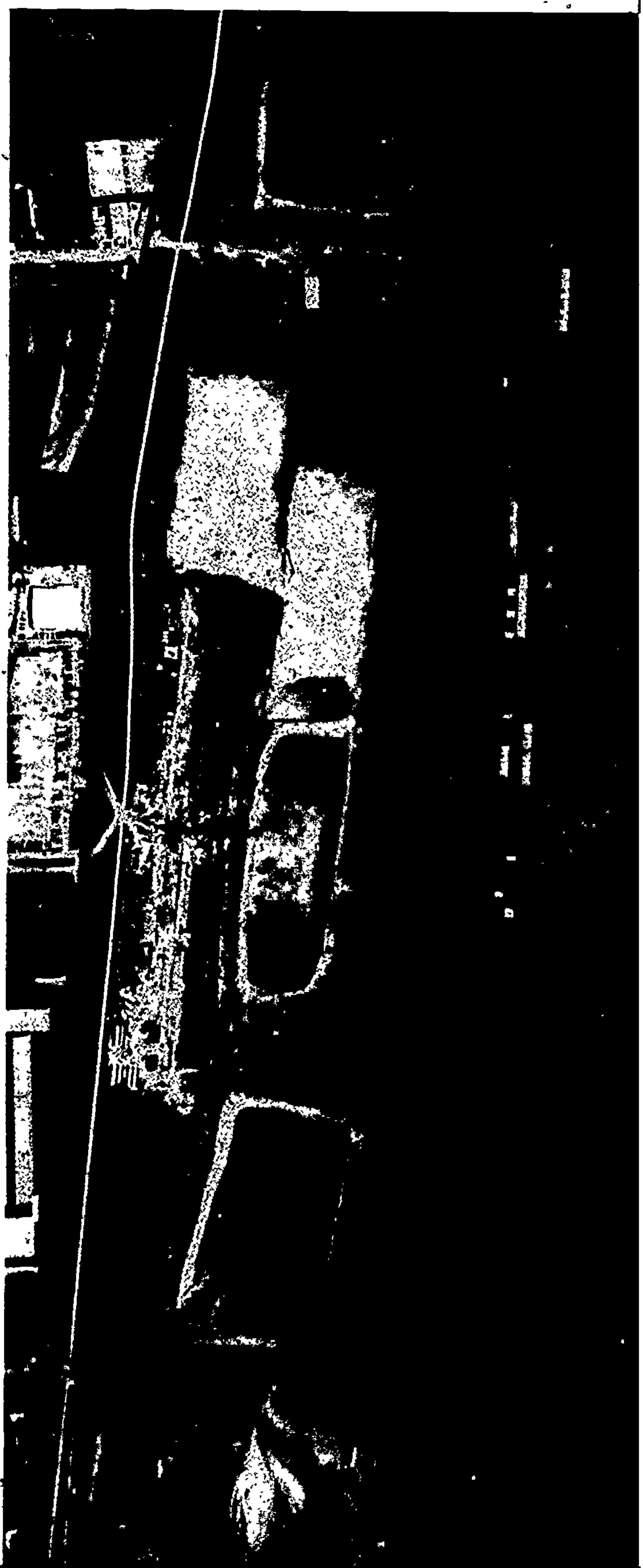
SPILL SURVEILLANCE

Even with adequate laws and regulations, spills will probably continue to occur and must be quickly detected and controlled. Spill surveillance, detection, reporting, and tracking are useful in legal proceedings and enforcement actions. The information gathered also helps in containment and removal operations. Spill surveillance is essential to discover and clean up spills, especially the larger ones that result from tanker accidents, offshore oil well blowouts, storage lagoon failures, catastrophic storms, and pipeline failures. Many details, useful in cleanup, are learned about such spills, which spread out over wide areas of water and shore.

Remote sensing is an effective surveillance tool, because it can be used in many locations with low manpower costs. Working together, the Coast Guard and EPA conduct spill surveillance from aircraft in coastal and inland waters. The purpose is to detect unreported spills, as well as to check operations and maintenance of harbor areas and industrial oil handling facilities adjacent to inland waterways in support of EPA and USCG oil pollution prevention regulations.

A number of modern remote sensing systems are used in the aircraft, including standard aerial cameras, electromechanical scanners operating in the ultraviolet and thermal infrared range, and various radar systems for all-weather and long-range detection. All systems can detect petroleum products on the water under varying atmospheric conditions.

Apart from these surveillance activities, aerial photographic mapping of large spills provides support during clean-up operations by mapping the extent and location of heavy concentrations of oil. For example, in 1976 EPA contractor aircraft conducted a number of aerial photographic missions for major spills, occuring on the Chesapeake Bay, St. Lawrence River, and Hackensack River in New Jersey. Also, the Delaware River and the Nantucket Shoals area, after the grounding and breakup of the tanker Argo Merchant, were photographed. EPA's Environmental Monitoring and Support Laboratory at Las Vegas processed and analyzed the photographic data round the clock, quickly dispatching the data to Federal authorities in charge of cleanup and control. With the photographs, EPA and Coast Guard officials and the oil company officials in charge of clean-up operations were able to direct their attention to the areas where oil had accumulated. They even located access routes for cleanup equipment to be moved to the heavily polluted areas.



EPA and the Coast Guard have also embarked upon a joint effort to install oil sensors on fixed platforms in harbors near marine transfer terminals and in inland waterways adjacent to refineries and industrial complexes. Research and development supported by the two agencies has resulted in several remote sensing instruments that can detect oil on water, in day or night and in varied weather conditions. These instruments can record spills and notify spill response crews. Thus, they are truly oil spill sentinels. Several of these sensors are now being installed in the industrial Rouge River in Detroit, Michigan. Other instruments under development will afford greater range detection and a scanning capability.

With improved detection capabilities for many pollutants, remote sensing will also be utilized for monitoring of industrial facilities producing and using hazardous substances.

CONTINGENCY PLANNING

The National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 1510), published by the Council on Environmental Quality, is put into operation when the spiller is not taking proper action to clean up. The plan is intended to coordinate Federal clean-up efforts. Responsibility for on-the-scene coordination on spills into inland waters rests with EPA. The Coast Guard deals with those in coastal waters and the Great Lakes.

NATIONAL AND REGIONAL RESPONSE TEAMS

When a spill presents an unusual situation or transects regional boundaries, the National Response Team (NRT) assumes certain responsibilities. Representatives to the NRT are provided by several Federal agencies, including the Energy Research and Development Administration and the Federal Disaster Assistance Administration of the Department of Housing and Urban Development. The NRT also serves as the committee responsible for revising the National Contingency Plan and for generally overseeing its operations.

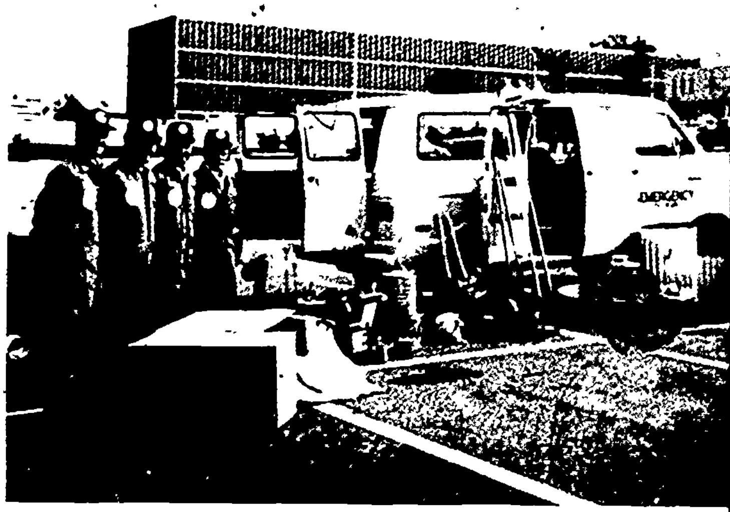
The NRT's emergency activities are coordinated in the National Response Center (NRC) located at Coast Guard Headquarters in Washington, D.C., where a continuously manned communications center, as well as other specialized facilities and personnel, are on hand.

In addition, a spill-emergency Situation Room is maintained by EPA's Oil and Special Materials Control Division in Washington; the room is equipped with audiovisual and communication facilities, as well as the OHM-TADS computerized information system.

Regional Response Teams (RRT) exist in each of the 10 EPA Regional Offices. When necessary, the teams can call upon skilled emergency personnel trained by EPA and the Coast Guard. Coast Guard Strike Teams on the East, West, and Gulf Coasts are made up of specialists in ship salvage, diving, and spill removal techniques. Each EPA Regional Office has at least four emergency response specialists. They are trained in biology, chemistry, engineering, meteorology and oceanography and experienced in cleaning up and removing spills or mitigating their environmental effects.

Spill response cooperatives and fully equipped response teams have been set up by some coastal States, port authorities, local agencies, and industrial facilities.

Most spills are handled at the regional level, either with regional resources or by contract. The Oil and Special Materials Control Division in EPA's Headquarters provides back-up support when EPA Regions need additional scientific personnel and equipment. If a spill involves more than one Region or requires outside assistance, EPA Headquarters assists in coordinating the efforts, or arranges to bring in additional personnel and equipment from other EPA facilities.



A spill-response team, with some relatively light and portable spill-containment and clean-up equipment.

SPILL INCIDENTS

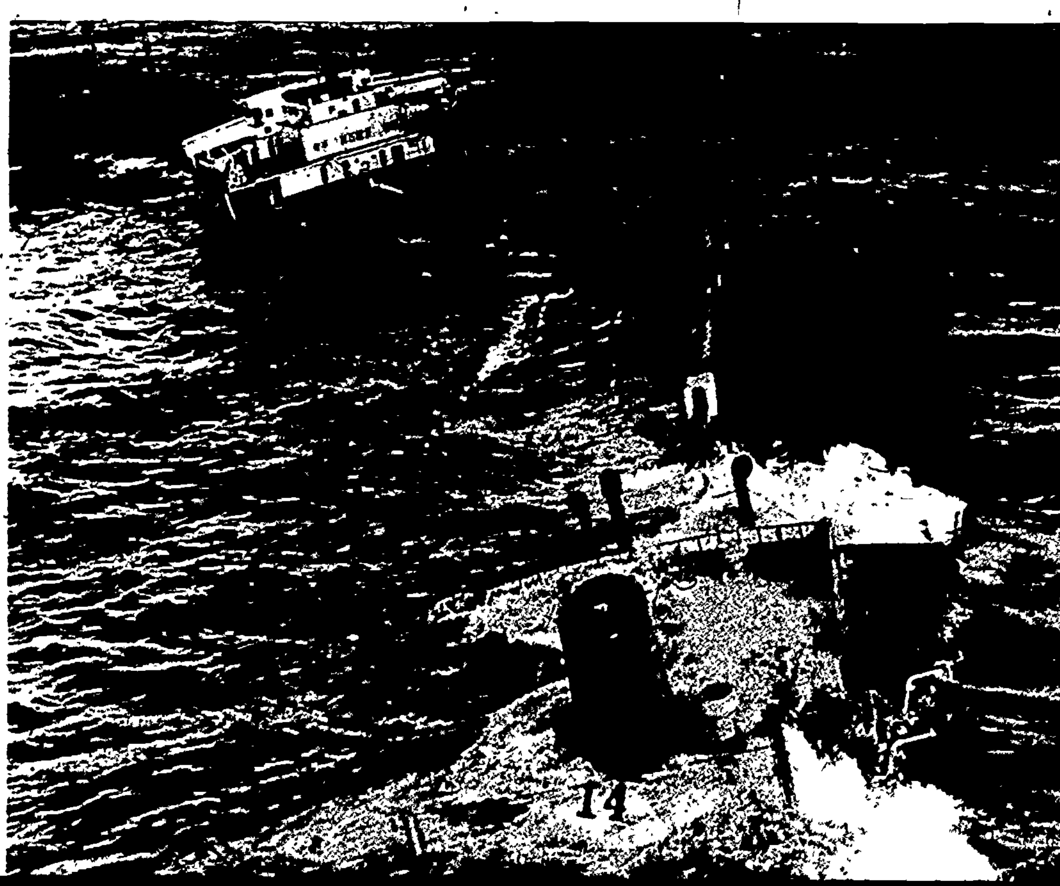
A number of spectacular spills of the 1960s and early 1970s resulted in considerable harm to the environment. But they did more than that--they provided the stimulus for enactment of oil spill legislation in the United States, Canada, and Great Britain and also provided valuable experience in clean-up operations.

The incident that alerted the world to the disastrous consequences of spills was the grounding of the Torrey Canyon on the shoals off the English coast in 1967. The tanker spilled approximately 30 million gallons of oil upon the shores of Great Britain and France. Property damage was extensive. Tens of thousands of seafowl were killed, and several hundred miles of beaches and shorelines were covered with oil.

For two months a concerted attack was waged to clean up the spill. It was the first major international effort to clean up a very large oil spill, and many mistakes were made. For example, the use of chemical detergents to disperse the oil in the water proved to be more toxic to aquatic life than the oil itself. A variety of materials were used to lessen the effects of the oil slick, including napalm, sawdust, straw, hydrophobic chalk, and detergents. The attempts were largely unsuccessful, although some valuable lessons were learned from experimenting with unproven methods of control.

The Torrey Canyon compelled the United States to take its first step in planning for and dealing with oil spills. On May 26, 1967, the President of the United States directed the Secretary of the Interior and the Secretary of Transportation to examine how the resources of the Nation could best be mobilized against the pollution of water by spills of oil and other hazardous substances. Referring to the Torrey Canyon incident, the President considered it "imperative that we take prompt action to prevent similar catastrophes in the future

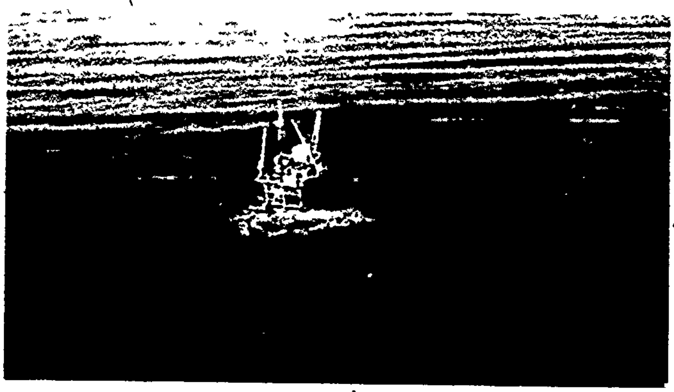
Above: Cleanup after the Torrey Canyon oil spill.
Below: The Torrey Canyon breaking up.



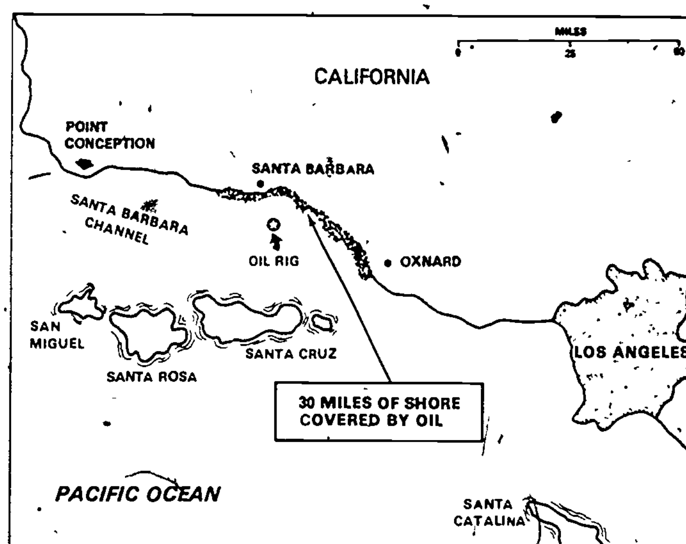
and to insure that the Nation is fully equipped to minimize the threat from such accidents to health, safety, and our natural resources." An extensive report was subsequently prepared, with specific recommendations for new legislation to prevent and control oil spills in U.S. waters.

In January 1969, an oil production platform blowout off the Santa Barbara coast released 700,000 gallons of oil. Spurred by public reaction, Congress enacted the Water Quality Improvement Act of 1970 (PL 91-224). This Act established the policy that there should be no discharges of oil into or upon the navigable waters of the United States, adjoining shorelines, or into or upon the waters of the contiguous zone (12 miles from the shoreline). In addition, the Water Quality Improvement Act prescribed a three-pronged program--including contingency planning and cleanup, prevention, and enforcement--to prevent and control oil spills.

Some of the cleanup activity along the coast resulting from the Santa Barbara oil spill.

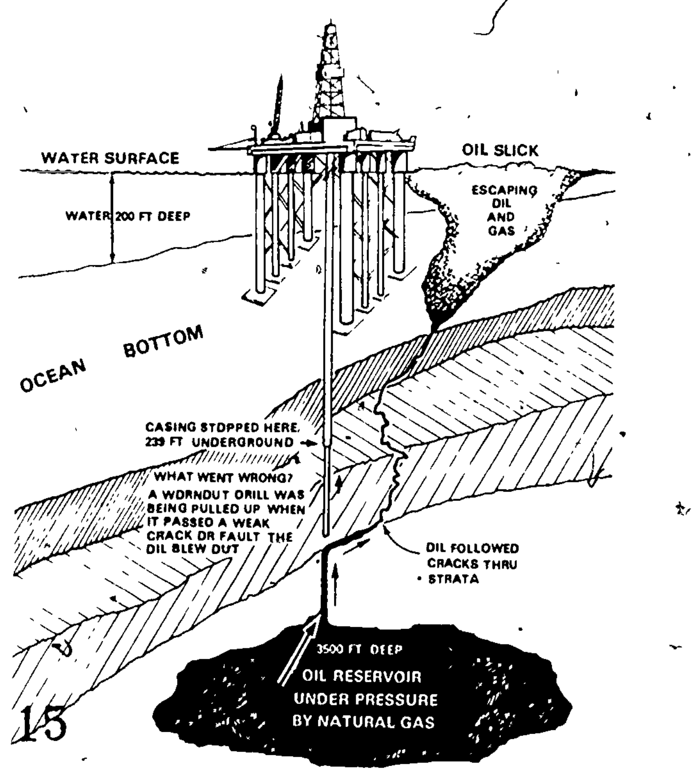


The offshore platform blowout at Santa Barbara.



In the period from February 1970 to January 1971, four major oil spills occurred in the United States and one in Canada, each in excess of 1 million gallons; estimated cleanup costs totaled more than $15 million. The massive spills presaged the difficult battle ahead to control and prevent oil spills. There was a demonstrated need for government assistance, oil recovery and disposal contractors, and industry personnel to coordinate efforts to meet the emergencies of oil spills. EPA and the Coast Guard, with their Canadian counterparts, discovered that even monumental and costly clean-up efforts could retrieve relatively small amounts of spilled oil.

February 1970	Arrow	Tanker grounding	Chedabucto Bay Canada	3,000,000 gal.
April 1970	Chevron platform	Blowout	Gulf of Mexico	1,500.000 gal.
November 1970	Waste crankcase oil/sludge	Lagoon break	Schuylkill River, Pennsylvania	3,000.000 gal.
December 1970	Shell platform	Blowout	Gulf of Mexico	4,000.000 gal.
January 1971	Oregon Standard	Tanker collision	San Francisco Bay	1,200,000 gal.



OIL SPILLS

Oil spills occur in many types of facilities, in many locations, and for many reasons. In addition, oil sometimes enters the aquatic environment from routine operations--for example, cleaning out tankers and discharging process water from offshore oil platforms.

River barges, rail tank cars, pipelines, and highway tank trucks carry millions of gallons of crude oil, diesel and heating oil, gasoline, and other products. Collisions and other accidents can result in oil spills. Human error and equipment failure in loading and transfer operations also cause spills.

To protect human lives from fire and explosions, fire fighters frequently hose down volatile and flammable materials. This can result in pollutants being washed into sewers, rivers, and harbors. EPA frequently provides on-scene technical assistance to fire department personnel: But in some cases there is little that can be done to prevent pollution of waterways.

PIPELINE SPILLS

Pipeline breaks and leaks cause about 500 spills a year, discharging over 1 million gallons of oil. Small leaks in underground lines may go undetected for years. Some breaks can be observed indirectly, as when snow covers the ground or when leaks from offshore lines produce an oil film on the surface of the water.

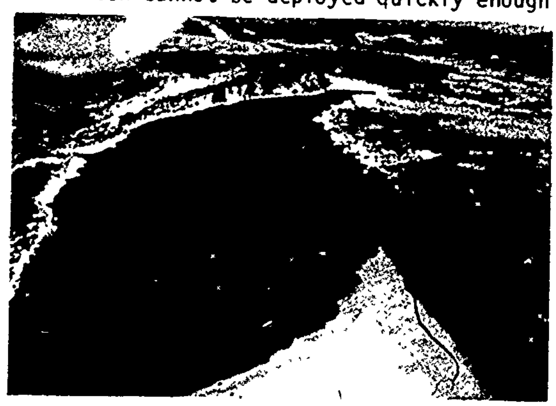
Other causes of pipeline spills include accidental rupture of a buried pipeline by heavy equipment or underwater damage to an offshore pipeline by a dragging anchor. Gathering lines and flowlines in oil fields as well as piping in plants and terminals are frequent spill sources.

Pipeline break as seen from the air.

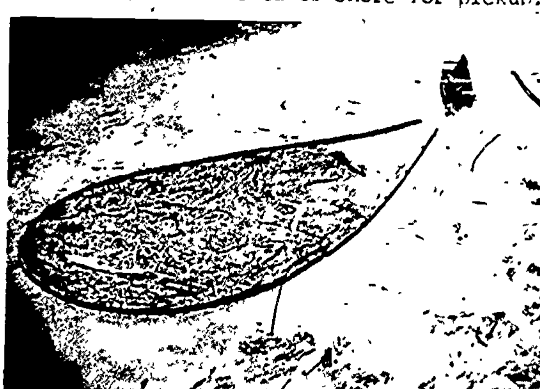
Some older lines are not protected against corrosion and are a common cause of spills. Current Department of Transportation regulations, which call for cathodic protection of major interstate pipelines, do not apply to intrastate pipelines. However, EPA's oil pollution prevention regulations do apply to flow and gathering lines in oil fields.

SAN JUAN RIVER SPILL

With present capabilities, men and equipment often cannot be deployed quickly enough to



Above: Crude oil and debris on the San Juan River. Below: A portion has been enclosed in a boom, being towed to shore for pickup.



meet every conceivable spill emergency in all types of terrain. In October 1972, a broken 16-inch pipeline spilled over 285,000 gallons of crude oil into the San Juan River, which flows through isolated and rugged land in New Mexico and southern Utah. The spill threatened the waters of an Indian reservation and a National recreation area. Several days passed as heavy rains, near-record floods and snowstorms delayed the actions necessary to contain and remove the oil and debris in the river.

In October 1975 an excavation crane ruptured an 8-inch pipeline near Moosie, Pennsylvania, spilling about 100,000 gallons of gasoline. The product quickly spread for several miles into the swift-flowing Lackawanna River. Thousands of dead fish were found, including some which had jumped out to avoid the gas. Conservation officers estimated a complete fish kill for six miles of river. No containment or cleanup of the light material was possible because of rapid mixing into the water column.

A 5-inch pipeline in Pennsylvania was accidentally pierced in 1976 when an iron stake was driven into the ground. Over 100,000 gallons of fuel oil from a plant were spilled into a nearby stream and spread 40 miles downstream to a reservoir and dam.

Iron stake was driven into pipeline.

Pipeline was pierced accidentally.

UNDERGROUND OIL LEAKAGE

Long-term seepage of oil into underground water at Heath, Ohio, covered a wide area and emerged in streams.

In March 1975 EPA was asked by the State of Ohio to assist in a project to cleanup an underground oil seepage problem at Heath, Ohio. The source of the oil, estimated to be from 500,000 to 1,000,000 gallons, was unknown.

There was no simple solution to the problem, since a large amount of oil was spreading above the water table, at a depth of about 30 feet, under a large area of ground. This was first noticed in 1961 and developed over the years into a considerable nuisance and hazard to safety and health.

All possible sources for the oil, including nearby past and present oil, industrial, and other facilities had to be checked. Action had to be taken to find and stop the leak and to clean up the surface and subsurface water aquifer.

Booms and skimmers were used on the oil which surfaced on a creek in the area. Chemical analyses were made of the oil to assist in tracing the source. Wells and pumps were installed in the ground to intercept and pick up the flow of seepage.

Skimming pond on bank of creek.

OIL BARGE SPILLS

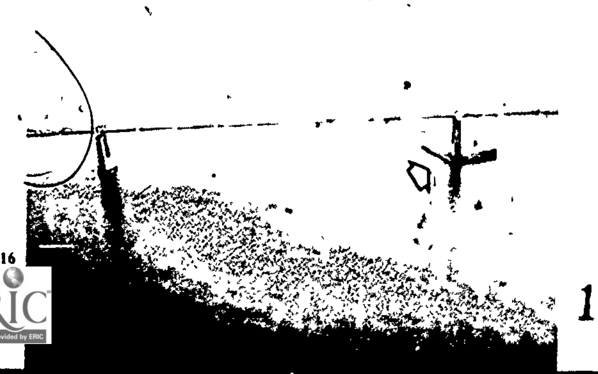
In January 1973 an oil barge struck a bridge pier on the Mississippi near Helena, Arkansas, spilling 800,000 gallons of diesel fuel. This was one of four oil barges which broke loose during a wintry accident resulting from flood conditions and fast current. The other barges stranded nearby, with two leaking.

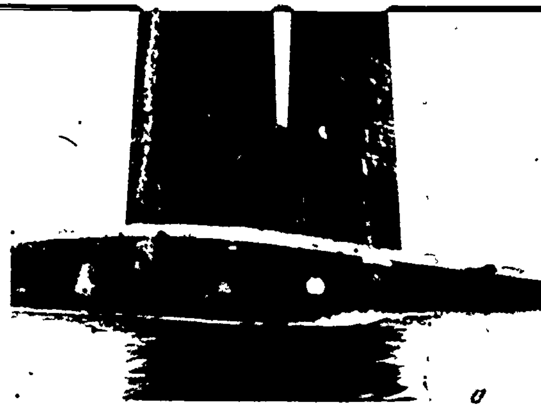
Response was coordinated by Region IV of EPA, as the OSC, assisted by the Coast Guard, the Army Corps of Engineers, the Arkansas Highway Department, Civil Defense officials, and others involved with public health and drinking water safety, and with fish and wildlife protection. The leaking barges were offloaded after booms were placed near them.

In March 1975 one of the four barges of the tug Johnny Dan wrapped around the same bridge and lost 770,000 gallons of crude oil. The spill was carried downstream 40 miles.

In these spills, although some of the oil reached 120 miles downriver, most of the cleanup was confined to a number of pockets close

Oil barge wrapped around bridge pier.





Close-up of oil barge wrapped around pier.

to the accident site. In spite of the conditions, several thousand gallons were recovered.

In December 1973 a towed barge spilled 336,000 gallons of crude oil after an accident on the Atchafalaya River west of Baton Rouge. Much of the oil was contained within a one-mile stretch of the river. There were an estimated 50,000 ducks in the marshes along the river, but the oil was prevented from reaching them by protective booms placed by response personnel.

In June 1974 a barge struck the Huey Long Bridge on the Mississippi near New Orleans, spilling an estimated 157,000 gallons of crude oil. Ribbons of the oil reached 30 miles downriver and oil was collected at the outside of each bend on the river.

TAPPAN ZEE BRIDGE SPILL

Late in December 1975 a 240-ft. barge pushed by the tug Peter Callahan in dense fog, hit a pier of the Tappan Zee Bridge over the Hudson River. More than 90,000 gallons of No. 2 home-heating oil were spilled.

Because of the cold water, scientists from the Woods Hole Oceanographic Institute estimated that 25 percent of the spill went to the bottom. They indicated that the effects of the spill would persist in the river and its sediments for years.

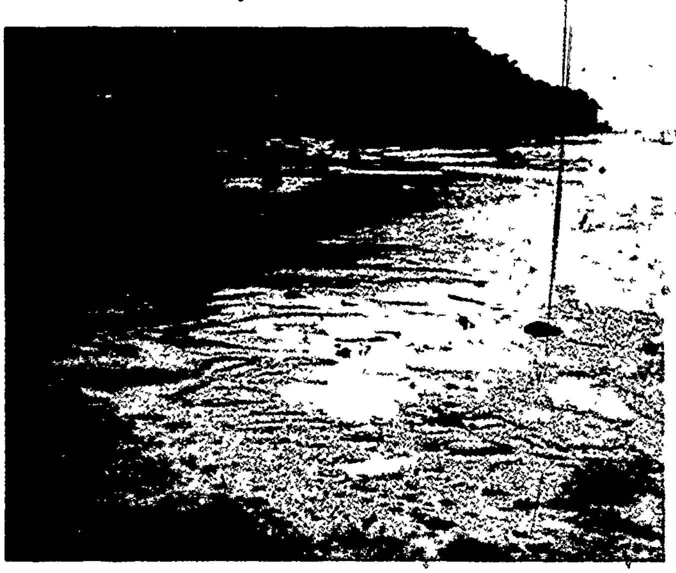
BARGE STC-101 SPILL INTO CHESAPEAKE BAY

On February 2, 1976 the Barge STC-101 spilled about 250,000 gallons of heavy No. 6 fuel oil into Chesapeake Bay after she ran aground in gale-force winds and ice-cold water. Much of the oil sank and was not visible on the water.

Barge STC-101 in Chesapeake Bay.

In a week a new mystery spill was suspected, some distance away. It later became evident that this was oil which had spread underwater for several miles from the STC-101. It had simply reappeared on the surface when the black underwater oil was heated by the sun, during a freak warm spell.

Investigation underwater and by aerial surveillance revealed the full extent of the spill. Major environmental damage was probably done to the bottom of the bay as well as the water column. The shores of islands and both sides of the bay could be more readily inspected than the bay bottom and water column.



Oil on shore of Chesapeake Bay after spill by Barge STC-101.

Oil-coated birds were found every 20 or 30 feet along the shore of Fisherman's Island National Wildlife Refuge in the bay. About 500 whistling swans and many more migratory ducks wintered there.

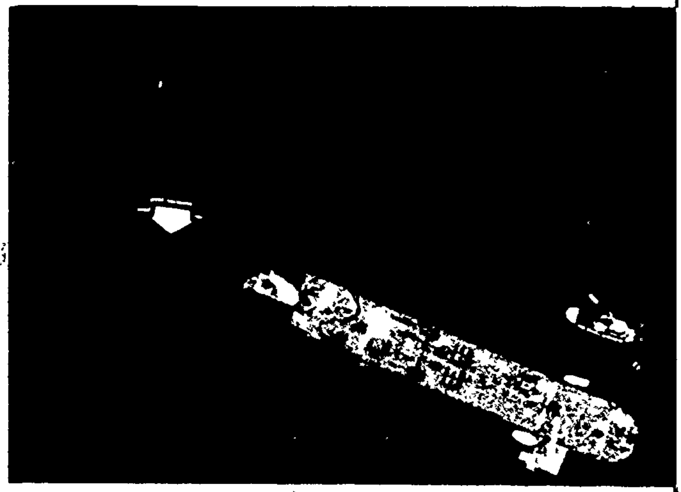
Spill response was aided by aerial surveillance and photographic interpretation, to locate pockets of oil and the best access routes for cleanup and removal equipment.

A remarkable coincidence in this spill is that just before it occurred Nancy G. Kelly of the Chesapeake Bay Foundation completed a study of a hypothetical case. It involved a spill of 250,000 gallons of heavy industrial oil which occurred, in her model, only four miles from this one. Her study suggested that oil spills might be causing more harm to the environment than is realized at present.

Many birds were killed by the oil.

ST. LAWRENCE SEAWAY

On June 23, 1976 the barge Nepco 140, with almost 7 million gallons of heavy fuel oil, went aground at 1:35 a.m. in the American Narrows near the Thousand Islands Bridge. Three tanks ruptured and spilled about 500,000 gallons of oil.



Barge Nepco 140 spilling oil on St. Lawrence River. Arrow shows boom around vessel which was not effective in holding back the spill.

The spill moved 80 miles downstream and covered 30 miles of it on the first day. Hundreds of miles of beaches, shorelines, inlets, coves, marshes or wetlands, and waterfronts were covered with the tarlike substance, requiring over $6.9 million for cleanup.

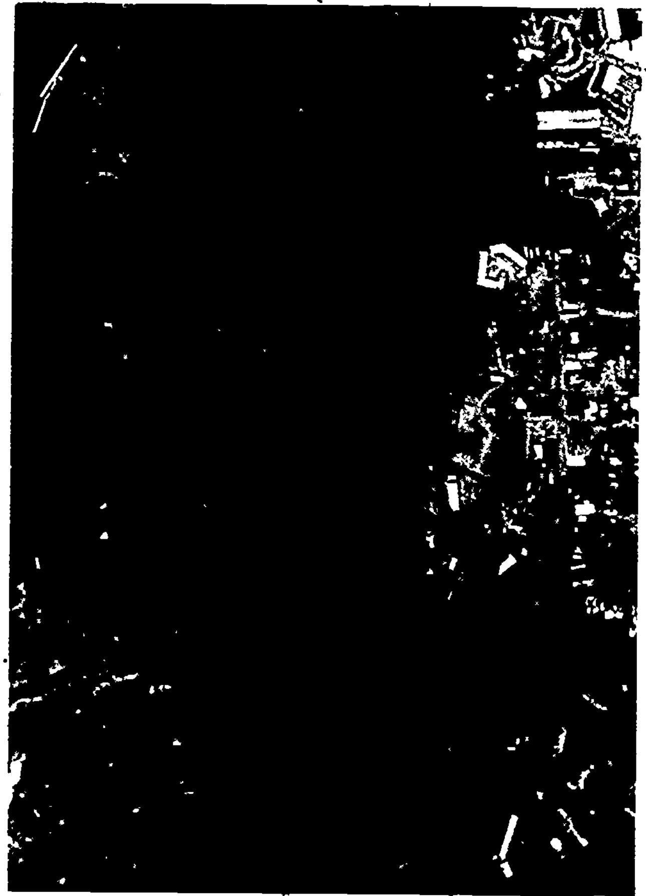
Aerial photography obtained by EPA aircraft was used to assist the Joint U.S.-Canadian Spill Response Team in mapping out the spill and planning the logistics and other phases of the response efforts.

Over 700 people, 50 vessels, several booms, seven skimmers and 14 vacuum trucks were involved in cleanup. Oil containment booms were placed in an effort to keep oil from entering critical areas. In spite of this the No. 6 oil penetrated more than five feet into 16 miles of wetlands.

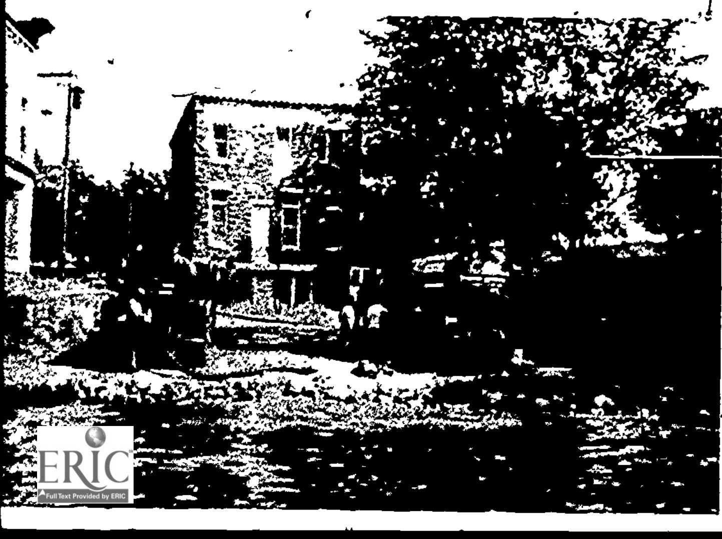
Oil moved downriver 80 miles. Arrows show booms between islands, placed there in an attempt to capture some oil.

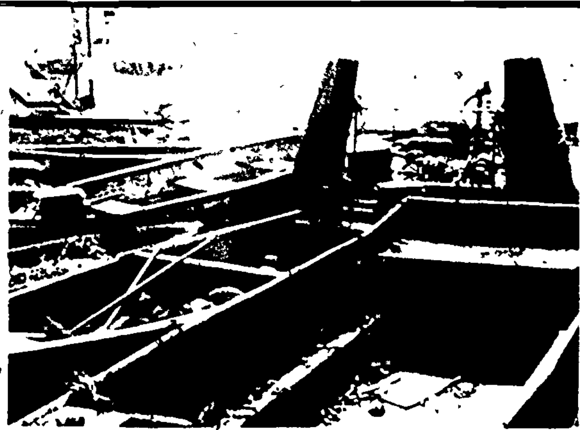
In addition, it caused extensive damage to beaches, private property, ducks, geese, and other wildlife, and to the aquatic life in the river, along its bottom, and in the sediments.

In 1974 an oil spill from the tanker Imperial Sarnia caused damages which cost about $2 million to clean up. In October 1961 a tanker spill on the St. Lawrence was reported to have caused the extinction of the last colony of Greater Snow Geese.



Above: EPA aerial photos, showing oil moving into shore areas. Photos were helpful in cleanup and locating access routes to oil.
Below: Vacuum trucks at town along the St. Lawrence after Nepco 140 spill.



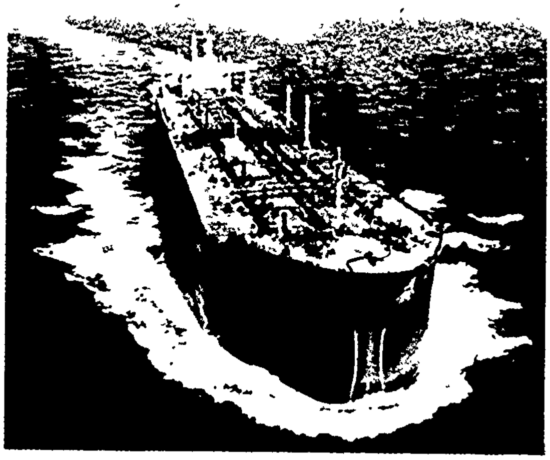


Workboats after a day of cleanup at one of thousands of oiled areas on St. Lawrence.

OCEAN VESSELS

Tanker spills have occurred in the past and can be expected to continue to occur. The world's tanker capacity doubled from 1960 to 1970 and is still increasing. New supertankers and their facilities will be required to receive oil from Alaska and other world sources. The rapid growth of the numbers of tankers will inevitably increase tanker-related spills and also discharges. At the same time, tankers are getting larger; 125-million-gallon supertankers are now in operation and tankers with a capacity of 250 million gallons are under construction. Thus, spills possibly will be proportionately larger.

A supertanker at sea.



In late January 1977 Brock Adams, the Secretary of Transportation, directed that all domestic and foreign vessels operating in United States waters be equipped with a variety of modern navigation and safety devices.

In February 1977 the tanker Golden Jason arrived in Newport News, Virginia and was detained by the U.S. Coast Guard for safety reasons. It was carrying 9.2 million gallons of heavy fuel oil from Venezuela to New York when it developed engine trouble off North Carolina. The Coast Guard reported a number of major defects and expected the ship would be offloaded at Newport News by the owners and then scrapped.

Continued efforts are being made toward adoption of better designs, techniques, and equipment to reduce the pollution by tankers and other vessels. Cleaning practices for tankers and bilge cleaning methods on vessels are receiving increased attention.

EPA supports the use of the load-on-top method for cleaning tanks on existing tankers at sea, the incorporation of segregated ballast designs in new tankers, and better tank cleaning facilities at terminals. Most large fleets now use the load-on-top technique. A properly equipped tanker carrying 30 million gallons of crude oil avoids washing 150,000 gallons of oil into the sea after each delivery.

ZOE COLOCOTRONI SPILL

In March 1973 the tanker Zoe Colocotroni, with its cargo of 7.5 million gallons of crude oil, ran aground near the southwest coast of Puerto Rico. Her captain quickly discharged over 2 million gallons of crude oil into the sea to lighten and free the vessel, instead of waiting to offload it into a barge. With only minor damage, she proceeded to port, after causing the most serious oil spill in Puerto Rico since the Ocean Eagle incident in 1968.

The oil, driven by the wind, headed toward Bahia Sucia and Cabo Rojo. Floating oil covered a wide area, moving about with the wind and water currents.

An estimated 1 million gallons of oil hit the shore and beach areas; 400,000 gallons reached the island's mangrove swamps, where there was major damage to plant and animal life. On the beaches the oil penetrated as deep as 12 inches.

Below: Crude oil floats into mangrove area after Zoe Colocotroni spill.

The Coast Guard assumed on-scene coordination in spill clean-up operations. EPA spill response personnel from Region II and Headquarters provided technical assistance for oil recovery operations.

Oil in mangrove area.

Perpendicular trenches and sumps were dug into the sand to trap the heavy oil slicks piled up by wind and surf along some areas of the shoreline. Vacuum trucks pumped out oil largely free of water and debris. Any water taken in was drained off. The trucks drove to a refinery near Ponce, a round-trip drive of 5 hours.

Because of the long turnaround time and a shortage of trucks, larger pits were dug near the trenches and sumps for temporary storage.

Floating debris and seaweed could be cleared after filling each pit, increasing the efficiency of pumping the oil to the trucks.

Above: Perpendicular trenches in beach collect some oil coming ashore.
Below: Tank trucks load up.

Additional temporary ponds were made as needed to contain the oil collected from the sump/trenches.

Removing oil from the mangroves was more difficult. The area was swampy and virtually inaccessible by trucks and other equipment. In addition, the wind shifted frequently and moved the oil in and out of the mangrove areas. Local and Federal agencies began a massive clean-up effort, using booms to confine the oil in a fairly small area and foam to absorb it. The oil-soaked foam was then collected and removed.

The damage by the oil was considerable, but the percentage of oil recovered was larger than in previous clean-up operations of oil tanker spills at sea. An estimated 700,000 gallons were collected in the first 6 days of recovery operations.

OIL TANKER CORINTHOS

In January 1975, the tanker Corinthos, while offloading crude oil at Marcus Hook below Philadelphia, was struck by the tanker Edgar M. Queeny. The Corinthos exploded and burned, leaving three dead and 27 missing. The Corinthos carried approximately 13 million gallons of light crude. The Queeny, with its cargo of phenol, gasoline, paraffin, and vinyl acetate monomer, suffered relatively light damage.

Flames from the fire reached 500 feet into the air and could be seen for over 15 miles in the heavily industrialized and populated area. Favorable winds kept the flames from reaching the tank storage area near the unloading terminal. The oil slick immediately began to spread down river, and the Coast Guard provided an on-scene coordinator for spill containment and clean-up. The chairman of the National Response Team flew over the spill area and noted that approximately 50 miles of the Delaware River were covered with oil.

EPA's Regions II and III provided technical support in the response operations and EPA's NERC Las Vegas provided aerial surveillance. EPA placed booms to protect three wildlife areas from oil, warned downstream water users to close their intakes, directed six clean-up contractors,

Wreckage of the tanker Corinthos after fire.

made additional aerial photography and surveillance of the spill areas, and suggested and assisted in establishing bird-cleaning operations. The cost of cleanup was over $1 million.

In April 1974 the oil tanker Elias exploded and burned while offloading Venezuelan crude oil in Philadelphia. The blast was felt for 35 miles.

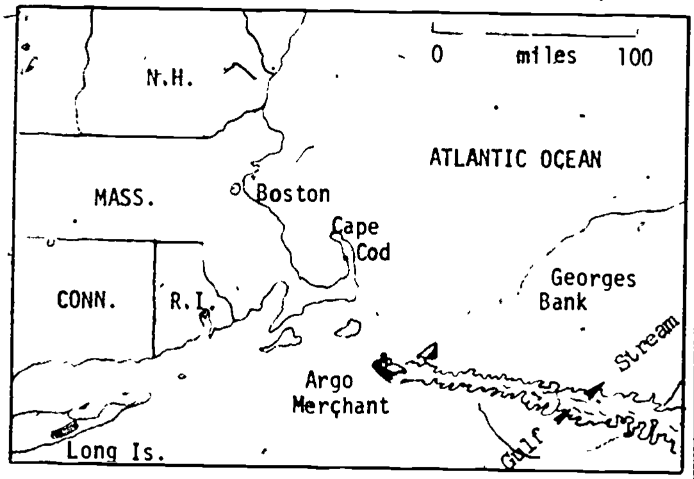
ARGO MERCHANT TANKER SPILL

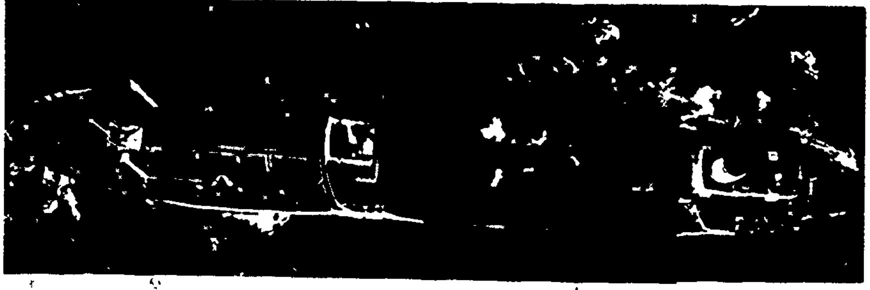
In December 1976 the Argo Merchant ran aground on the Nantucket Shoals about 35 miles southeast of Nantucket Island. Efforts to free the vessel were unsuccessful and she broke up, spilling 7.6 million gallons of heavy oil. Some of the slick moved into the fishery area of the Georges Bank.

Containment booms and skimmers were impractical because of the high winds and waves. Burning of the thick oil on a cold and choppy sea was tried but combustion could not be sustained.

The Argo Merchant spill threatened the humpback whales, gray seals, and a large fishing industry. Twelve groups of fishermen, from the local fishing industry which employs about 30,000 people, sued for $60 million in damages.

Also in December 1976 the tanker Olympic Games ran aground, spilling 134,000 gallons of oil into the Delaware River near Marcus Hook, Pennsylvania. Within a few weeks of the spill about 80,000 gallons of the oil had been recovered. Some of the oil remained trapped under the ice along two shorelines and could not be reached until warmer weather.





Above: Spill situation chart.
Left: Tanker Argo Merchant aground and leaking.
Inset: Tanker breaks up.
Below: Aerial view of oil slick.

The tanker Sansinena, after unloading a cargo of crude oil, exploded and burned at San Pedro, California, December 17, 1976. During the cleanup operations oil was recovered from the vessel and surrounding water. See pages 40, 41.

World-wide, in the first nine months of 1976 13 tankers had spilled more than 50 million gallons of oil--a new record. Soon after these and the year-end events, the tanker Grand Zenith sank several miles south of Nova Scotia with over 6 million gallons of oil. Late in January 1977 the tanker Exxon San Francisco and Barge Exxon 119 exploded and burned in the Houston Ship Channel. A loading arm failure had sprayed heating oil and a nearby tow boat started its engines, which may have caused the fire. Several people were killed or injured in the incident.

The tanker Irene's Challenge, with over 9 million gallons of gasoline, broke up and sank near the Midway Islands in the North Pacific Ocean, January 21, 1977. To end the month the Barge B-65 ran aground at Buzzards Bay, Massachusetts and spilled 100,000 gallons of heating oil.

METULA SPILL

The Metula, a supertanker carrying 64 million gallons of crude oil, ran aground off the Coast of Chile in August 1974, spilling 16 million gallons of its cargo. The incident occurred at night during a high wind.

Oil spread for 1,000 square miles, into an estuary and along 75 miles of Chilean coast. A team from the Coast Guard flew in with special equipment to offload some of the crude oil from the Metula into a smaller tanker. Winds of 50 miles per hour and intense cold hampered the process. Refloating and removal of the supertanker was delayed until late September because of high winds. No attempt was made to clean up the spill.

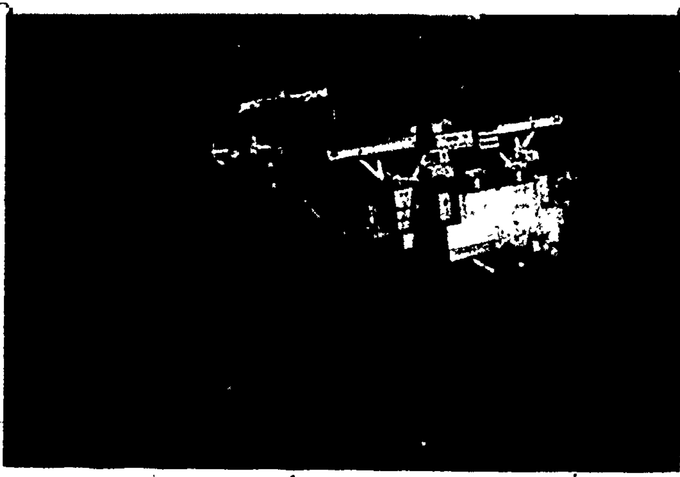
Five months later a joint study team from the United States, including a marine biologist from EPA, conducted a field investigation of the affected shorelines and islands to document some of the environmental effects. At that time at least half of the stranded oil was still on the shore and in estuarine areas. The fate of the oil in the water and on the bottom was not established. Because of the low rate of biodegradation in this cold climate, the stranded oil could be a source of oil pollution for a longer period than for a spill in a warmer climate. Massive environmental damage was recorded by the team.

Crude oil from the Metula appeared inland and ashore after being driven there by very high winds which are normal for Tierra del Fuego area.

SHOWA MARU SPILL

In January 1975 the supertanker Showa Maru, with over 67 million gallons of crude oil, ran aground on rocks and coral reefs in the Strait of Malacca. Coastal and beach areas of Singapore, the Malay Peninsula, and adjacent islands were threatened after three of her 12 tanks released about 1 million gallons of light oil. A 10-mile

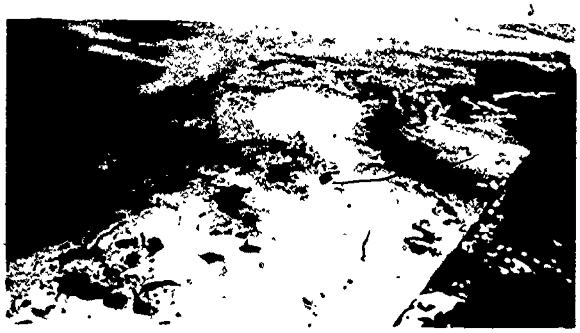
Tanker Metula aground in the Strait of Magellan.



Showa Maru lists to port after running aground.

slick moved onto several islands in the western section of the port of Singapore, as well as resort and dock areas. Large-scale measures to combat the slick had to be organized and put into service almost immediately.

An EPA observer on the scene noted that massive amounts of chemical dispersants were used on the oil slicks in an attempt to keep them away from beaches and shore areas. In the United States dispersants are rarely used.



Detergents, after being applied to an oil slick, can create new pollution and other problems--they are not favored over physical removal of the oil in the United States.

SPILLS AT BANTRY BAY

Early in January 1975 a supertanker spill occurred in Bantry Bay at the southwest corner of Ireland. It was the second spill there in a short time. In October 1974, crude oil was spilled at a terminal on Whiddy Island in Bantry Bay when a valve on the 92,000-ton tanker Universe Leader failed to close.

During the 1974 spill over 750,000 gallons of oil escaped, clogging Irish fishing ports and fouling coast and beach areas. Seagoing tugs sprayed detergent on the slick along the coast to sink it. Removal of the oil was hampered by lack of manpower and suitable equipment.

The Bantry Bay is rich in marine life. On the south shore of the bay, all life was reported virtually destroyed a month later. Fishermen claimed that the entire southern end of the bay, where oil was accumulated by northerly winds, had become unfishable. Marine biologists are watching the area closely, using surface inspection techniques, as well as underwater television and scuba divers.

JAKOB MAERSK SPILL

In late January 1975 the supertanker Jakob Maersk, with over 26 million gallons of Persian Gulf crude oil, struck a sandbar and suffered four explosions while attempting to enter the artificial deepwater port of the city of Porto, Portugal. Spilled and leaking crude oil soon covered 20 miles of coastline and additional damage was feared. Although the ship burned for two days after the incident, it continued to leak after that time.

OTHER TANKER SPILLS OF THE WORLD

In May 1975 the tanker Epic Colocotronis, carrying about 16.5 million gallons of Venezuelan crude oil, split and burned near the Dominican Republic. In May 1972 the tanker Tien Chee, carrying about 2 million gallons of crude oil, burned and spilled oil after she was rammed by the cargo vessel Royston Grange southwest of Montevideo, Uruguay. Oil spread in a fan shape to the southeast covering an area of about 300 square miles.

In August 1974 a broken submerged pipeline caused the tanker Esso Garden State to spill a large quantity of oil into the South Atlantic Ocean at Rio Grande do Sul, Brazil. She was moored five kilometers off Tramandai Beach, discharging about 15 million gallons of crude oil through the pipeline to a shore terminal when the spill occurred. The terminal serves the refinery at Canoa, near Porto Alegre.

In March 1975 the tanker Tarik Ibn Ziyad, carrying about 28,000,000 gallons of light crude oil, ran aground and spilled about three million gallons of oil into the Guanabara Bay at Rio de Janeiro, Brazil. Some of the oil was carried out of the bay by tides and wind. A portion of the South Atlantic shore area was affected.

On May 12, 1976, the tanker Urquiola exploded and broke open after it struck a reef near the mouth of La Coruna Bay in Spain, spilling about 4.5 million gallons of light crude oil. The fire was extinguished May 15, and the remaining oil was pumped into another tanker. Oceanographers advised that there was a possibility that prevailing ocean currents could carry some of the oil to the Caribbean area in the months following the spill. In January 1977 the tanker Exotic exploded and burned in southern Morocco.

In September 1974 the tanker Transhuron ran aground on the north shore of Kiltan Island in India and spilled about 900,000 gallons of heavy fuel oil. In April 1975 the tankers Tosa Maru and Cactus Queen collided south of St. John's Island in the Strait of Singapore. The Tosa Maru burned and sank. In July 1976 five ship collisions and a major oil spill were reported in the crowded Strait of Malacca near Singapore. In October 1975 a 123,484-ton tanker was struck by lightning and broke into three parts after catching fire in Singapore Harbor.

In November 1974 about 12.5 million gallons of naphtha and liquefied petroleum were spilled into Tokyo Bay when a tanker and freighter collided and exploded. On 18 December 1974 about 11 million gallons of crude oil were spilled into the Inland Sea from a large storage tank at Mizushima, 300 miles southwest of Tokyo.

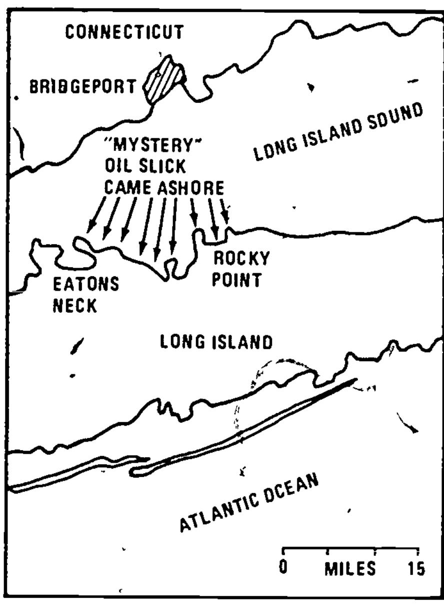
Damages to fisheries were extensive in this first large oil spill into the Inland Sea. Winds and current pushed a slick 80 miles long and 15 miles wide. Payments by the oil company for damages soon reached $6.1 million, with $3.3 million more promised.

In September 1976 the 96,000-ton tanker Ryoyo Maru broke in half during a typhoon off southern Japan, east of Kyushu.

In January 1975 the tanker Oswego Patriot leaked about 1.3 million gallons of crude oil into the Pacific Ocean. During a three-week voyage from Singapore to Los Angeles the oil came through a hole which was found in the No.3 port wing tank when the ship reached port.

MYSTERY OIL SPILLS

In January 1972 a mystery oil spill washed heavy No. 6 fuel oil ashore for 25 miles along the North Shore of Long Island. Cold weather caused some of the oil on shore to congeal on rocks and debris. It formed a solid band about [illegible] inches wide on beaches and flat shoreline. Visible oil on the shore extended from Eatons Neck, past Sunken Meadow State Park and eastward to Rocky Point. EPA and Coast Guard investigators suspected the cause was tank cleaning by a passing oil tanker. It was typical of hundreds of mystery oil spills which had been occurring along the world's coastlines for years.



"MYSTERY" OIL SPILL. In January 1972 heavy oil—probably tank washings—came ashore for 25 miles between Eatons Neck and Rocky Point.

In January 1975 a mystery spill of 25,000 gallons of oil in the Norfolk harbor spread from the vicinity of the Craney Island fuel depot in Portsmouth to the Norfolk Naval Base, to Norfolk International Terminal and into several estuaries.

U.S. Coast Guard Locates Source of Mystery Spill

In July 1975 a mystery oil spill came ashore and caused damage along Key West for 60 miles from Marathon to Dry Tortugas. To locate the source, the U.S. Coast Guard checked 247 ships docking at ports from Maine to Texas. Samples of oil were taken from 50 of them and chemically checked against the spilled oil.

Late in October 1975 a match was made and the captain of the oil tanker Garbis was arrested and jailed--facing a $10,000 fine and a year in prison for failure to report the spill.

OFFSHORE PLATFORM BLOWOUTS

There was a rash of offshore oil well blowouts in the early 1970s in the Gulf of Mexico, causing considerable oil pollution there. Stricter controls on proper blowout prevention equipment from the wells have almost eliminated these incidents.

Offshore oil platform blowout in Gulf of Mexico.

TANKER RAMS OIL RIG

In August 1975 the oil tanker Globtik Sun caused an oil spill after it ran into an offshore drilling rig at night and caught fire. The platform had no working wells and was being built in 175 feet of water in the Gulf of Mexico, 120 miles southeast of Galveston, Texas. The tanker was carrying almost 15 million gallons of light crude oil and was abandoned by the crew at the time of the accident because of the fire. The drifting and leaking ship was later salvaged and offloaded of remaining oil after the fire went out.

WELL BLOWOUT

In October 1975 a new gas well near a wildlife refuge in Louisiana blew out, spraying a mixture of gas, oil, and salt water over a wide area for about three weeks. The heavy spray covered an area of several miles of marsh, canals, Vermillion River and Bay. Booms were only partially successful in keeping the paraffin-based oil from spreading beyond the areas of impact. Considerable damage to fish and wildlife was noted as a result of the incident.

In cleanup, the Regional Response Team agreed that burning would be the best for 300 acres of marsh area with a thick coating of the oil and paraffin. The remaining areas were cleaned by physical removal and disposal.

STORAGE TERMINAL SPILLS

In April 1972 a tank car exploded while loaded at the storage terminal of an oil refinery in Doraville, Georgia. A fire started among the tanks of oil products and spread to homes in the neighboring area. One person was killed and several injured. Civil Defense evacuated 400 from the area, and Region IV of EPA

Storage terminal fire in Georgia caused oil spill which spread to nearby homes.

constructed two underflow dams to protect an adjacent creek flowing into the Atlanta water supply.

In July 1974, a storage tank in Glenmont, New York, was overfilled and approximately 800,000 gallons of fuel oil flowed from the top. About 100,000 gallons leaked out through part of the earthen dike area around the tank. The oil reached a creek flowing into the Hudson River. When the leak was discovered, the tank owners had placed oil booms across the mouth of the creek, but 10,000 gallons still reached the Hudson. Once there, it moved about 4 miles down river. Directional booms were extended at an angle from the shore in an effort to entrap some of the oil in the river.

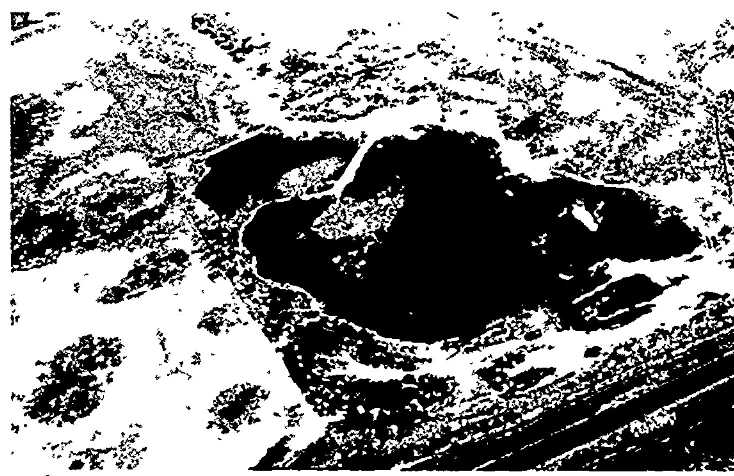
A contractor used about 50 persons and heavy equipment, such as tank and vacuum trucks, to clean up the contained oil.

In May 1976 a considerable amount of oil polluted the Hackensack River as a result of the rupture of a 3 million gallon storage tank at an oil terminal at Jersey City, N.J.

A containment dike near the ruptured tank failed. The dike should have kept most of the spilled oil confined at the oil terminal. The facility had been fined in the past due to failure to have a spill prevention, control, and countermeasure plan.

WASTE OIL LAGOON

A spill does not have to involve a simple discharge--as the case of an abandoned lagoon in Utah illustrates. In late 1973, at the request of State officials, EPA's Region VIII investigated and found that waste oil sludge in the 5-acre lagoon was seeping into canals of the nearby Ogden Bay Wildlife Refuge. Some of



Aerial view of waste oil lagoon.

the lagoon's containment walls were in danger of collapsing and polluting the entire refuge and even the nearby Great Salt Lake. The lagoon's contents were in three layers. The bottom layer was an acidic and tarlike sludge containing a high content of sulfurous acid and lead. A middle layer of water and top layer of oil were also high in these substances.

At this point, EPA, supported by the State of Utah and the Bureau of Sport Fisheries and Wildlife, declared that the situation was an "imminent and substantial threat" under section 311(c) of the FWPCA. EPA took formal legal action against the operator of the lagoon, and while awaiting the court's decision, strengthened the weak banks around the pond with sand bags.

In March 1974, the court decided that EPA should take action under section 311(c). EPA moved quickly to set up contracts for the removal and disposal of the contents of the lagoon.

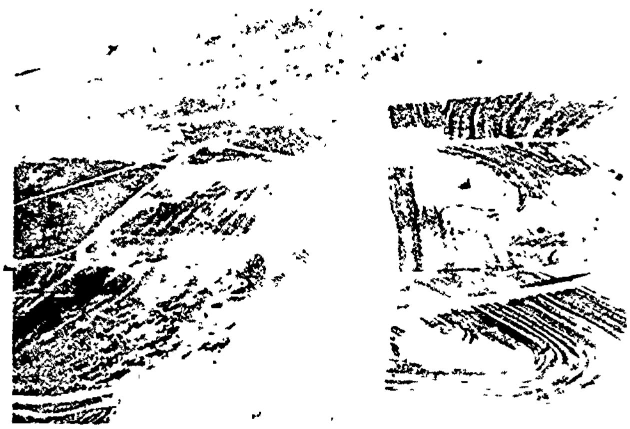
Numerous flocks of ducks landed and died.

Both the oil and water had to be disposed of safely. The disposal problem was solved when the nearby U.S. Air Force base permitted EPA to establish a disposal farm on an isolated tract of land near the lagoon. The material could be biodegraded by farming it into the land under controlled procedures.

After removing a large number of junked cars and other debris to gain access to all parts of the lagoon, the two top liquid layers were pumped into small tank trucks and spread over prepared and fertilized ground on the Air Force land. The liquids were worked into the soil with farm machinery. The pumping, hauling, and farming operation proceeded for several weeks until all the ponds of the lagoon complex were dry.

The liquid was removed by summer, exposing the bottom sludge, which softened somewhat in the Utah sun. Disturbing it with a dragline and bulldozer created hazardous levels of sulfur dioxide, methane, ethane and propane on hot days, requiring crews to wear self-contained breathing apparatus.

In this dry and dusty setting, with the sharp and pungent odor being carried by the wind for more than a mile, the sludge was thoroughly mixed with local clay until it was firm enough to hold



Aerial view of disposal farm.

a heavy layer of clay and topsoil. This task ended the clean-up operations at the lagoon. Monitoring of the farm will be necessary to check on the microbiological degradation of the liquids. Late in 1974 plants were growing on many of the farmed areas.

SPILLS OF HAZARDOUS SUBSTANCES

Though far fewer in number than oil spills, hazardous substances spills are extremely significant in terms of their immediate and long-term threat to human life and the environment. Because final regulations governing hazardous substances are not yet in effect, EPA cannot implement the provisions of section 311 of the 1972 Act. In the interim, EPA actively responds to spills of hazardous substances.

HERBICIDE FACILITY FIRE

In July 1974 lightning struck a powerline, igniting a million-dollar fire in a paint and herbicide manufacturing and storage facility in Alliance, Ohio.

BEFORE

Waste oil lagoon before cleanup.

AFTER

Waste oil lagoon after cleanup, showing the site near the time of final grading. The liquids were pumped out and farmed into the soil at a suitable nearby plot.

Soot, ashes, hydrogen chloride, and other toxic gases were carried by a slight breeze over residential areas into the Alliance Water Facility, the Berlin Reservoir, and the Mahoning River. Runoff from fire-fighting operations flowed toward the reservoir and river.

Herbicide facility fire at Alliance, Ohio.

The on-scene coordinator from EPA's Region V called for local and county police to evacuate citizens downwind; later a shift in the winds at the site of the fire necessitated evacuation of 500 hospital patients.

To reduce runoff, chemical foam was flown in and used as much as possible to fight the fire. Bags of lime were dumped into gutters and storm sewers in an attempt to neutralize the acid liquid. Several filter fence dams of peat moss and fine limestone were erected across a small creek near the site. They neutralized some of the pollutants before they reached the river and the reservoir.

About a day later, the fire was extinguished and the air pollution hazard eliminated. The Mayor of Alliance, after consultation with EPA representatives, allowed citizens to return to their homes.

This did not end the EPA involvement. Follow-up action included:

- Monitoring the clean-up and disposal of contaminated debris and soil to an approved landfill.
- Maintaining a hotline for inquiries from citizens and the press.
- Conducting an extensive water-sampling program in the Mahoning River and Berlin Reservoir.

The reservoir was sampled for several days until lab results showed that the water was safe. At the end of the clean-up, EPA's on-scene coordinator was given the Keys to the City in recognition of his efforts.

PESTICIDE PLANT FIRE

In March 1976 a 12-hour fire at a chemical plant in Ennis, Texas sent fireballs from exploding drums over 200 feet high. About 500 nearby residents were evacuated when toxic fumes spread over the southern portion of the

Fire at chemical plant in Texas.

city. Response by firemen had been trained for several years for such an emergency and were prepared with proper clothing, equipment and procedures.

Because the contaminated runoff water from firefighting operations contained insecticides, fungicides, and herbicides, it was captured and contained in a ditch. After the fire it was pumped into tanks and the debris was thoroughly covered with lime, pending disposal.

Testing and decontamination of fire debris and areas affected by fallout were well coordinated and executed through local, state, and Federal levels. The contaminated water was deep-well injected after several alternate methods were considered.

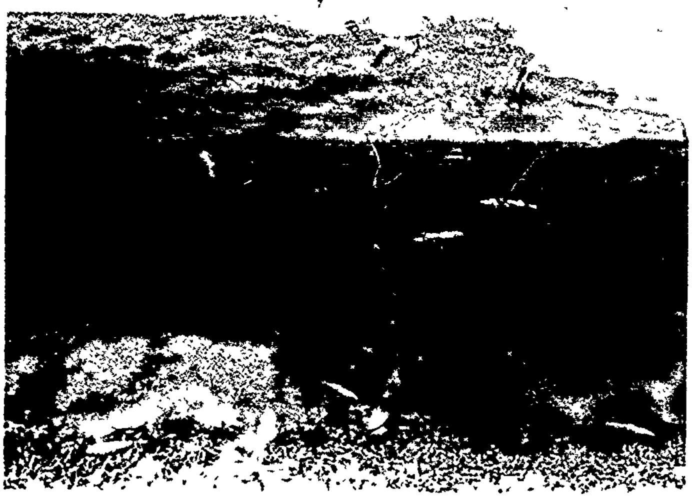
Pesticide-contaminated runoff water from fire.

TOXAPHENE SPILL

In March 1975 about 50 pounds of toxaphene pesticide were spilled into a pond near the Plains, Virginia. In response to a reported

fish kill in the pond, State and Federal environmental experts discovered the cause and outlined a program of treatment or cleanup.

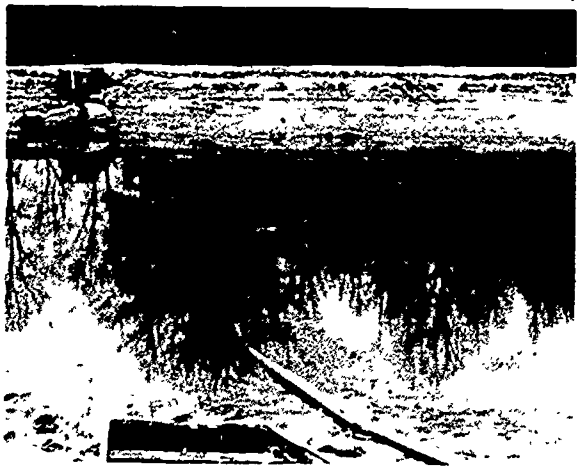
The pond water which could drain into Broad Run and the Manassas River, was fully contained, pumped out, and treated by a trailer unit recently developed by EPA for such emergencies. The visible chlorinated hydrocarbon



Fish killed in pond water by toxaphene spill.

residues were then picked up and some pond sediments excavated and decontaminated.

In similar cases all over the United States involving collected water contaminated by spilled chemicals, the Mobile Hazardous Materials Spill Trailers have been useful.



Above: Pumping out the pond.
Below: Temporary holding tank.

Mobile Hazardous Materials Spill Trailer at toxaphene spill.

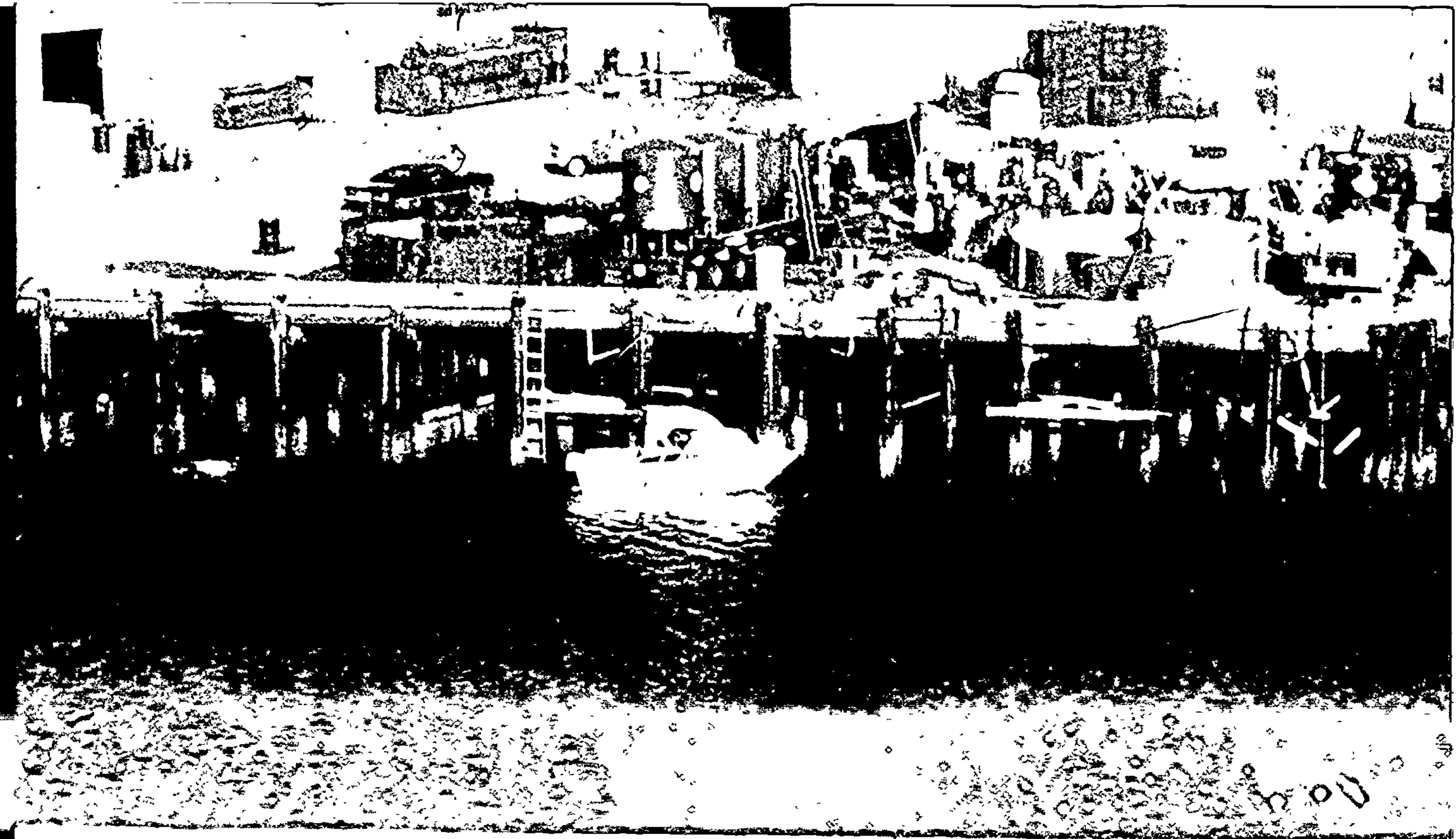
PCBs SPILL

A simple accident in September 1974 caused a major hazardous substance spill in the Duwamish Waterway in the State of Washington. An electrical transformer being loaded onto a barge fell from its loading sling, spilling 260 gallons of polychlorinated biphenyls (PCBs) onto the dock and into the waterway. By direct contact, this liquid can cause sickness, serious skin disease, stunted growth, and other effects. When spilled, it does not harmlessly disappear, but persists in the environment. It can even penetrate to underground water supplies when spilled on land. PCBs can concentrate in tissues, and thus are harmful to aquatic life, livestock, and birds.

The spiller handled the incident as a minor spill until a follow-up investigation by the Washington State Department of Ecology revealed that PCBs were involved. The State requested EPA's assistance in clean-up, and Region X assumed the responsibility of on-scene coordination. An initial plan called for using a 20-inch suction dredge and a slurry pipeline to a small island with lined containment ponds about 100 yards from the spill site. Because of construction problems and concern over possible soil instability, this plan was discarded in favor of a more secure method of containing the PCBs.

Using 4-inch hand-held suction dredges, divers picked up pools of PCBs, which are heavier than water, from the bottom of the waterway. This, with dredged material, was pumped into a series of settling tanks. The sludge was separated from this slurry and stored in 55-gallon

Building temporary holding tank on dock.



drums. The water was processed through a truck-mounted unit brought in from an EPA research facility in New Jersey. The prototype unit used a series of charcoal filters to adsorb PCBs. The treated water was returned to the waterway.

In the effort to locate and remove the PCBs, divers searched the bottom of the waterway. They discovered pools of the persistent PCBs lying on the bottom. Clean-up operations continued for several weeks, with the main effort concentrated on removing the PCBs from the immediate spill area.

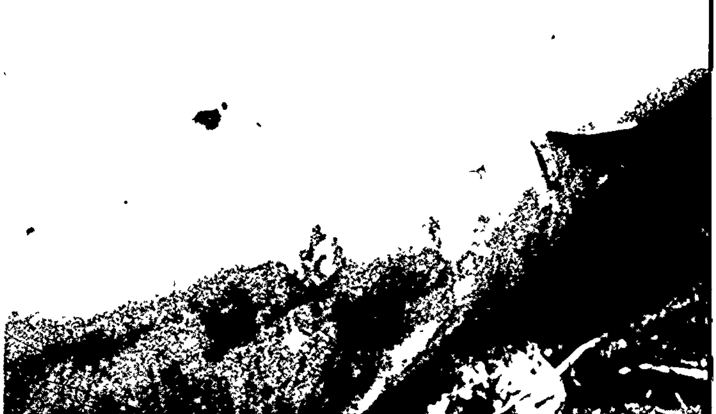
About 190 gallons of PCBs were recovered using this method. The remaining pollutant was so widely dispersed that removal would have required dredging the entire channel.

DERAILMENT INVOLVING CHEMICALS

A hazardous substance spill occurred near Rush, Kentucky, in October 1973 when 15 railroad cars were derailed. There were several explosions and a fire involving three tank cars containing acrylonitriles, metallic sodium, and other hazardous substances.

Another car containing tetraethyl lead did not rupture. OHM-TADS provided additional information on the characteristics of the spilled substances and cargoes nearby that were still intact.

Fires and explosions had already occurred, the fire was still burning from one huge tank car, and another even larger explosion was a good possibility. The EPA on-scene coordinator from Region IV requested Civil Defense to evacuate area residents.



Hazardous material leaking from rail tankcar.

Reading TADS printout in aircraft.

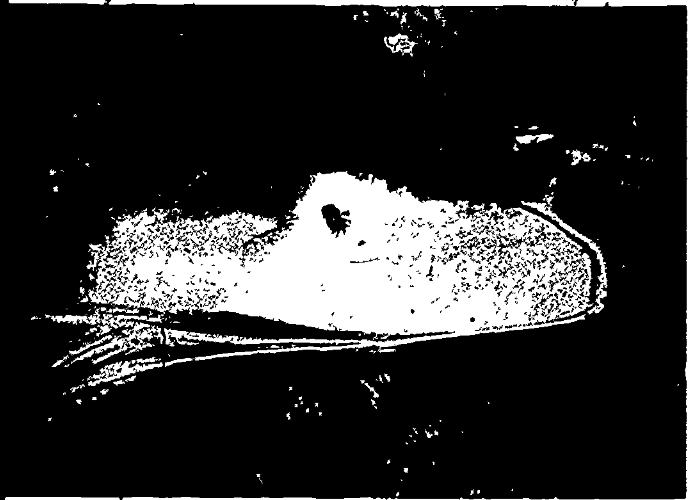
Headquarters EPA personnel flew in to provide technical assistance to the coordinator and make a situation report by means of videotape.

Because of an extensive fish kill 15 miles downstream from the spill site, numerous water quality sampling stations were set up for local wells, Williams Creek, and the Ohio River.

In addition, EPA set up air monitoring stations, and residents were allowed to return to their homes only after analysis indicated that the air was safe.

STORAGE POND SPILLS

Spills caused by failure of storage ponds containing hazardous substances are a constant threat. In 1972, a strip mining pond in West Virginia gave way, releasing a wave of polluted water. Such ponds are commonly constructed in strip mining areas (using tailings) to concentrate liquid wastes from mining operations. There they settle and clarify; the liquid then passes into lower ponds for additional settling.

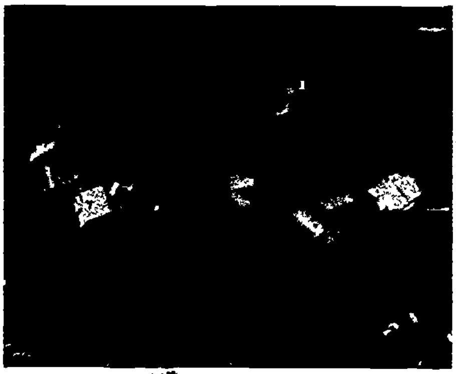


Lagoon perched high in strip mining area.

In February 1972, heavy rainfall and melting snow overflowed one of the ponds at Buffalo Creek and eroded a small dam on the upper level. The dam failed, cascading water into the lower and larger ponds. The resulting wave crashed down a narrow valley, destroying small towns and killing over 100 people.

Research on systems to provide early warning of the failure of earth dams holding hazardous substances has been sponsored by EPA.

Above: Earth dam failure brought spill disaster.
Below: Some of the homes caught in the event.



On the Peace River in Florida in 1971 a storage pond released 2 billion gallons of sludge from phosphate mining operations. Composed of silica sand, clay and phosphate, the sludge is a gummy, sticky, almost rubber-like substance.

The sludge polluted the Peace River and the Charlotte Harbor area for 60 miles. The sheer volume and nature of the spill suffocated most forms of marine life in the river, destroyed the adult fish population, drastically

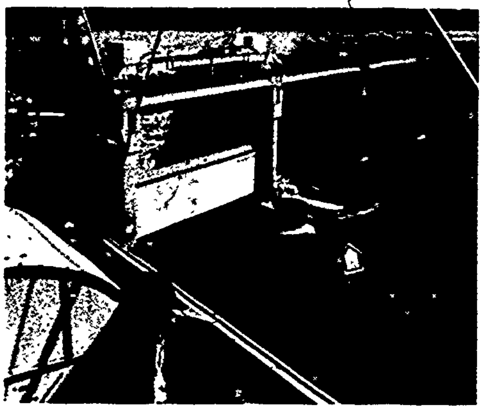
Peace River after pollution.

curtailed growth, and seriously altered the total environmental structure of the area.

Even in 1974, sludge remaining on the bottom of the river was being flushed out by heavy rains, polluting the water repeatedly.

CHLORINE BARGE INCIDENT

In March 1972 a barge loaded with liquid chlorine broke its towline in the Ohio River near Louisville, Kentucky. Drifting backward in a 15-mile-per-hour current, the barge punctured its hull as it struck a pillar of the McAlpine Dam, part of a hydroelectric complex. Then the barge was pierced by submerged concrete obstructions inside the spillway. The four 70-foot long tanks held a total of 640 tons of

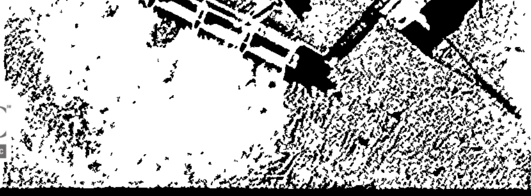


Chlorine barge hung on dam.

liquid chlorine, capable of releasing a poison gas cloud into Louisville, just downwind. On EPA's recommendation, the National Response Team was activated and the Office of Emergency Preparedness joined in the effort to avoid a national disaster.

To prevent the heavy barge from breaking loose and tumbling over the dam, a large salvage catamaran was brought in and tied to the barge by cables. Plans were then made to offload the chlorine to another barge by slowly reducing the pressure inside the tanks. Any gas released would be neutralized by bubbling it through a caustic solution. As an extra precaution, a high-pressure spray of water was set up and directed downward from the superstructure of the dam toward the tanks. The spray was

Aerial view of barge at hydroelectric complex. Less than one-half of chlorine barge can be seen.



Striking the pillar saved the barge from going over the dam. Note two men on barge.

to force any leaking chlorine back into the water. Instruments were also set up to detect chlorine in the air or water, and part of the city was evacuated. The tanks were emptied of chlorine without incident, however, and no chlorine escaped.

HURRICANE AGNES SPILLS OF OIL AND HAZARDOUS SUBSTANCES

Nature often causes spill problems. In June of 1972, Hurricane Agnes lashed up from the Gulf of Mexico, causing severe floods in several river basins over the eastern half of the United States. In her wake she left scores dead, thousands homeless, and property damage in the billions.

Water pollution from spills of oil and hazardous substances was general and widespread. EPA, together with other Federal,

State, local, and private agencies, worked hard to restore clean water supplies. Large quantities of floating oil were on the loose, as well as thousands of drums of oil, chemicals, and other materials—some of unknown composition. Specialists from EPA and industry helped in the oil clean-up and in identification and removal of drums from the disaster areas.

Hurricane Agnes also inundated some oil storage lagoons along the Schuylkill River in Pennsylvania. These same lagoons had overflowed in 1970, following 10 days of heavy rain, and about 3 million gallons of oily sludge were spilled into the river.

The Hurricane Agnes spill released 6 to 7 million gallons of the material, which had a high acid and lead content. Carried by the flood water, the oily sludge penetrated high ground and damaged farms, homes, and businesses as it swept down the Schuylkill.

Clean-up and removal of oil and debris were an almost endless task. Disposal of the waste material collected was especially difficult; after numerous delays, the material went via dump trucks and railroad hopper cars to a sanitary landfill approved by State and local authorities.

Hurricane caused spill of several million gallons of gasoline at storage terminal.

INTERNATIONAL COOPERATION

Many nations recognize that cooperative programs must be broadened and strengthened if countries are to deal effectively with the problems of global pollution. EPA has demonstrated a willingness to share its knowledge and experience by participating in international activities dealing with the pollution aspects of ship design and operations, ocean dumping, designation and control of hazardous substances, and other related programs.

As a part of this effort, EPA provides representatives to the Intergovernmental Maritime Consultative Organization (IMCO) and to the Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP). These United Nations organizations provide an international forum for airing of marine pollution problems and establishing international conventions to regulate the activities of member nations.

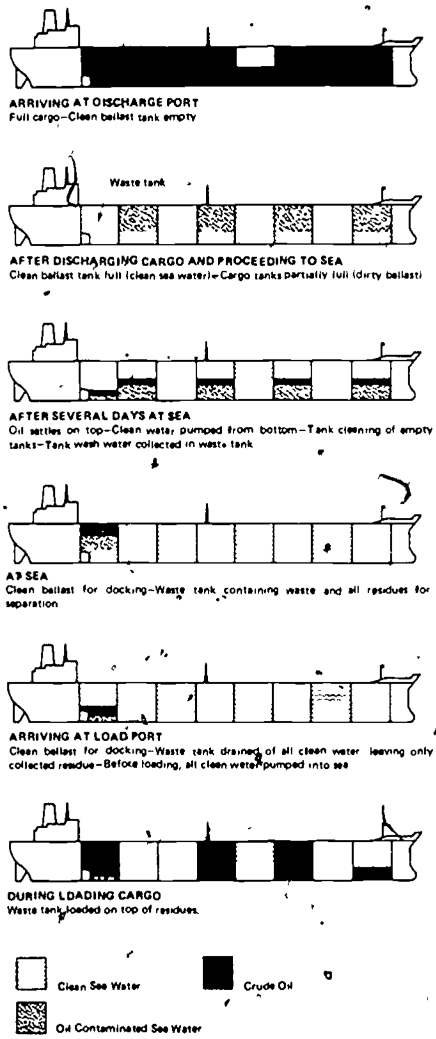
Since IMCO began in 1948, two International Conferences for the Prevention of Pollution of the Sea by Oil were held, resulting in the 1954 and 1973 Conventions. Amendments to the 1954 Convention were proposed in 1962, 1969, and 1971.

The 1973 Conference adopted regulations for the prevention of pollution by oil, noxious liquid substances in bulk, harmful substances carried in package form, sewage, and garbage. In addition, the Conference adopted a protocol relating to intervention on the high seas in cases of casualties involving marine pollution by substances other than oil. EPA was instrumental at the 1973 Conference in broadening the definition of oil to include all types of petroleum oils, such as light refined products and other nonpersistent oils.

One of the principal causes of ocean pollution has been the operational discharge of oily ballast water. The traditional practice for most tankers has been to carry ballast water in cargo tanks to weigh the ship down in the water and provide stability during the return voyage. This water mixed with oil clinging to the sides of the cargo tanks and was flushed into the ocean on the return voyage to the loading port.

All tankers subject to the 1973 Convention would be required to be capable of operating either retention-on-board (ROB) systems with the discharge of oily wastes to reception facilities, or load-on-top (LOT) systems.

The Load-on-top system is used to avoid the problem of washing residues from emptied oil tanks into the sea. Some tanks must be filled with water after unloading or the ship will ride too high in the sea.



The 1973 IMCO regulation requiring ROB or LOT systems was originally designed to reduce operational discharges. However, because of increased transportation of oil, these measures have not proved adequate to reduce ocean pollution. Accordingly, the Convention will require all new tankers of 70,000 tons deadweight and above, contracted or delivered after specified dates, to be fitted with segregated ballast tanks large enough to provide adequate operating draft without the need to carry ballast water in the cargo tanks.

The 1973 Convention will enter into force for those nations signing the Convention, 12 months after ratification by a required number of countries. Upon ratification, the 1973 Convention will supersede the 1954 Convention. The United States has not yet ratified the Convention.

EPA was instrumental in establishing the Marine Environmental Protection Committee within IMCO. The committee acquires and disseminates scientific, technical, and practical information; promotes international cooperation; and adopts or amends regulations under international conventions for prevention and control of marine pollution from ships. EPA provides representatives and technical information to the MEPC.

Additionally, EPA has been instrumental in development of bilateral agreements for prevention and control of pollution, with other North American countries. During development of the agreement between Canada and the United States on Great Lakes Water Quality, EPA, with other Federal agencies, provided the technical criteria and standards for protection of these lakes.

Together with Canadian counterparts, EPA and the Coast Guard prepared a Marine Pollution Contingency Plan (MPCP) for joint response to spills affecting the boundary waters of the Great Lakes. This plan, effective in 1972, was later expanded to include the boundary waters of both coasts.

The plan has been successfully implemented a number of times. It has served further as a guidance document for other nations sharing coastal and river boundaries subject to spill incidents.

Harbor scene after chemical loading accident killed 576 persons at Texas City, Texas in 1947.

EPA promotes international cooperation because a uniform set of rules and regulations will better enable the international community to enforce the prevention and control of marine pollution from ships. With IMCO's expanding role to prevent operational and accidental discharges of oil and hazardous substances into the oceans, EPA's efforts will continue to increase at the international level.

LIST OF SPILL INCIDENTS

The following list of spills is representative of thousands which occur each year. The quantity does not always equate to the amount spilled into waterways. In the case of vessel strandings and collisions, a portion may have been recovered by pumping operations or burned.

1977

North Atlantic Tanker Grand Zenith Missing since 4 Jan 1977	8,000,000 + gal. NR 6 oil
Delaware River, Pa. Tanker Universe Leader 5 Jan 1977	No leakage - refloated (potential spill of 21,000,000 gals. crude)
Tampa Bay, Fla. Moran Barge 9 Jan 1977	80,000 gal. NR 2 diesel
Grand Traverse Bay, Great Lakes Vessel Amoco Indiana 11 Jan 1977	No leakage - refloated (potential spill of 2,310,000 gals. NR 2 diesel)
Chesapeake Bay -Tangier Is. Interstate 17	No leakage - refloated (potential spill of 608,000 gals. NR 6)

Several barges grounded during harsh winter weather Jan.-Feb. 1977. USCG could not respond to large number of vessels needing assistance.

Gravesend Bay, N.Y. Tanker Harmonic 13 Jan 1977	Negligible (50 gal) (potential spill of 27,000,000 gal. of light crude oil)
Potomac River, Md. Barge STC 007 17 Jan 1977	No leakage - refloated (potential spill of 840,000 gals. NR 6)
Choctaw County, Ala. Lebauf Barge 17 Jan 1977	6,300 gals. (potential major spill crude oil)
Canado, Texas Pipeline spill 18 Jan 1977	63,000 gal. crude oil
Midway Island area, Pacific Tanker Irenes Challenge sank. 17 Jan 1977	9,600,000 gallons light crude

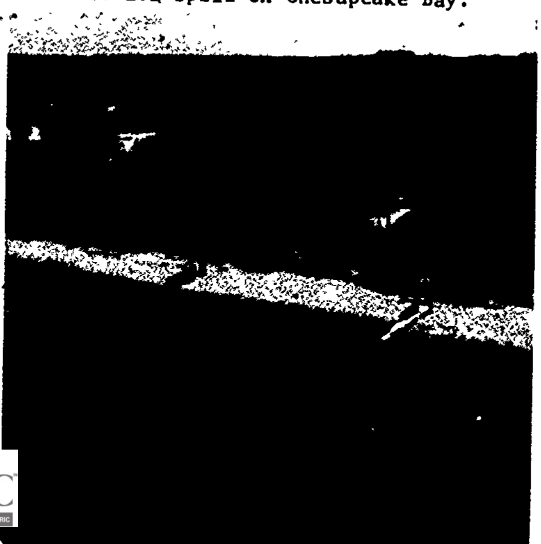
Chesapeake Bay, Hoopers Strait Barge 24 Jan 1977	No leakage - refloated (potential spill 276,000 gal. NR 2 and 138,000 gal. kerosene)
Baltimore, Md. Tanker Overseas Alice 25 Jan 1977	No leakage - refloated (potential spill 5,880,000 gal. gasoline)
Good Hope, La. Barge NMS 2600 collided 21 Jan 1977	63,000 gal. asphalt
Baytown, Texas Tanker Exxon San Francisco and Barge Exxon 119 Explosion and fire 27 Jan 1977	Unknown gasoline
Arcade, N.Y. Pipeline spill 25 Jan 1977	10,000 gal. NR 2 diesel
Buzzards Bay, Mass. Barge B-65 28 Jan 1977	100,000 gal. heating oil

(List incomplete for 1977)

1976

Brooklyn, N.Y. - Gowanus Canal Storage tank 6 Jan 1976	2,000,000 gal. NR 6 oil
Green Pond, Ala. - lake Pipeline spill 27 Jan 1976	126,000 gal. NR 2 diesel
Chesapeake Bay, Va. Barge STC-101 2 Feb 1976	261,500 gal. NR 6 bunker
Stonewall County, Texas Brazos River Pipeline spill 9 Feb 1976	125,000 oil oil
Chalmette, La. (Miss. R.) Barge SJT-4 24 Feb 1976	84,000 gal. (potential 877,800 gal.)

Oil coming ashore after Barge STC-101 spill on Chesapeake Bay.



Cleanup crew after Barge STC-101 spill.

Gibson, La. Barge Sully 1 March 1976	79,800 gal. crude oil
Bradford, Pa. - Kendall Creek Pipeline spill 2 March 1976	84,000 gal. NR 2 diesel
Isle de Cabras, Puerto Rico Tug Gelderland 8 March 1976	19,500 gal. NR 2 diesel (potential - 79,250 gal.
Valentine, Neb. Train derailment 9 March 1976	12,000 gal. crude oil
Billings, Montana Silver Tip Creek Pipeline spill 9 March 1976	27,300 gal. crude oil

Silver Tip Creek after pipeline spill in Montana.

Cook Inlet, Alaska Separator failure 12 March 1976	10,000 gal. crude oil
Buffalo, N.Y. Buffalo R. threatened Storage tank 13 March 1976	840,000 gal. (potential 1,680,000 gal.

Lake Charles, La. Pipeline spill 29 March 1976	42,000 gal. NR 6 fuel oil and naptha
Martinsville, Ill. Pipeline - manifold failure 1 April 1976	1,764,000 gal. crude oil
Glenwood, Pa. Nonongahela and Ohio Rivers Storage tank failure 9 April 1976	200,000 gal. NR 2 diesel

Placing skimmer in pocket of oil from storage tank failure at Glenwood, Pa.

Houston Ship Channel, Texas Tank Barge MS 3105 - sank 4 May 1976	220,000 gal. Bunker oil
Shelburne, Vermont Lake Champlain threatened Storage tank 19 May 1976	80,000 gal. gasoline
Cleveland, Ohio Cayuhoga River Tug Kinsdale & Barge Gaelic E-17	5,000 gal. NR 6 (potential - 550,000 gal.
Hackensack, N.J. Hackensack River Storage tank 26 May 1976	2,000,000 gal. NR 6 oil (150,000 gals. reached river)
St. Lawrence Seaway Nepco Barge 140 23 June 1976	500,000 gal. NR 6 heavy residual
Rockton, W. Va. - Elk River Train derailment 23 June 1976	44,000 gal. Lube oil
Houston Ship Channel, Texas Texas Sun & Barge Exxon 257 collided 28 June 1976	16,800 gal. NR 6 fuel oil

Key Biscayne, Fla. Mystery Spill 29 June 1976	Slick 30 miles by 100 yards wide
Jacksonville, Fla. McGirts Creek Abandoned oil pit 29 June 1976	200,000 gal. waste oil
Cook Inlet, Alaska Sea Lift Pacific 5 October 1976	1,260,000 gal. Jet fuel (potential - 7,350,000 gal.
Aguirre, Puerto Rico Tank Barge Caribsun 15 October 1976	No leakage (potential - 2,940,000 gal. bunker oil)
Perth Amboy, N.J. Tanker Richard C. Sauer 29 October 1976	75,000 gal. Light Arabian crude (potential - 9,240,000 gal.
Belt, Montana Railroad spill 26 Nov. 1976	60,000 gal. NR 6 oil
Cartaret, N.J. Pipeline spill 30 Nov 1976	200,000 gal. NR 2 oil
Potomac River (near Quantico, Va.) Barge Elk River 30 Nov 1976	200,000 gal. NR 2 oil
Nantucket, Mass. Argo Merchant 15 Dec 1976	7,500,000 + gal. NR 6 oil
Bluff Point, Va. Potomac River Barge-411 21 Dec 1976	No leakage (potential - 1,680,000 gal. NR 6 oil)
Marcus Hook, Pa. Delaware River Olympic Games 27 Dec 1976	134,000 gal. Arabian crude
San Juan Harbor, P.R. Daphne 29 Dec 1976	No leakage (potential - 47,160 tons oil condensate, 500 tons bunker

A new gas well blew out in Louisiana, spraying paraffin-based oil over a wide area near wildlife refuge. (See p.25)

1975

Norfolk, Va. Naval base-unk. cause	30,000 gal. oil
Singapore Tanker Showa Maru grounded	1,000,000 gal. crude
Galveston, Texas Pipeline fracture	90,000 gal. oil
Albany, N.Y. Source unknown	10,000 gal. NR 2
Bay St. Louis, Miss. Derailment	4,000 gal. isobutyronitrile
Limetree Bay, St. Croix T/V Michael C. Lemos disch.	136,000 gal. crude
Marcus Hook, Pa. M/T Corinthos struck by M/T Edgar Queeny	13,000,000 gal. crude

New Orleans, La. Freighter collided with tow of barges	250,000 + gal. oil
Porto, Portugal Supertanker Jakob Maersk grounding and fire	
Prudhoe Bay, Alaska Storage tank failure	72,000 gal. diesel
San Juan Harbor, P.R. Barge Z-102, accident	150,000 gal. mixed oils
Conway, Pa. Ruptured pipeline	100,000 + gal. NR 2
Alameda, Calif. Merchant Vessel Mosshill	13,000 gal. bunker oil
Latania Lake, La. Well	42,000 gal.
Intracoastal City, La. gas well (oily) blowout	882,000 gal. oil-paraffin

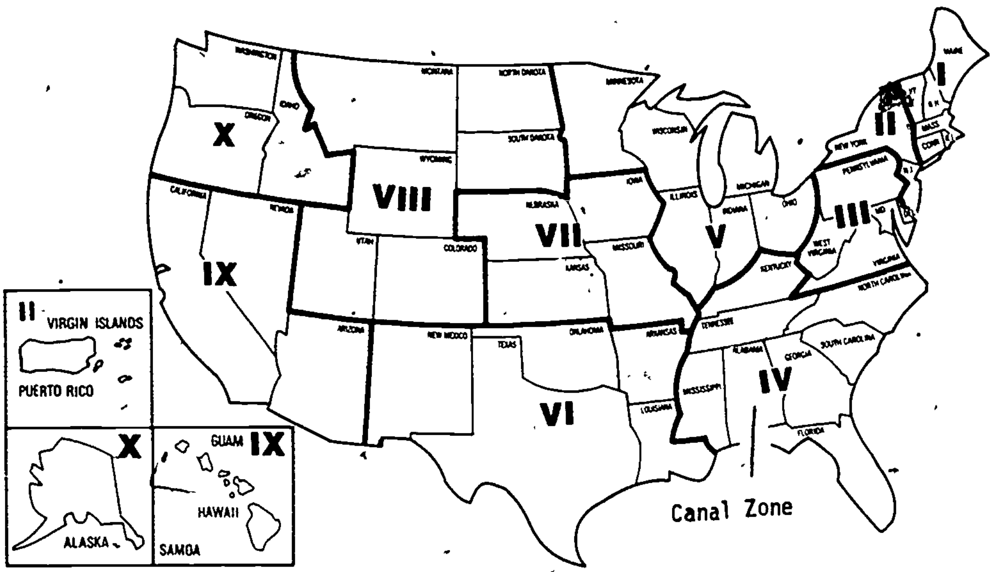
Oil tanker Corinthos burning in Delaware River. The white area between ship and dock is chemical foam, used in firefighting. (See p.20.) EPA Las Vegas photo.

Lake Superior Ore boat Edmund Fitzgerald sank	70,000 gal. bunker oil
Dayton, Ohio Tank collapsed	2,000 gal. hydrochloric acid
Trenton, N.J. Pipeline break	200,000 gal. kerosene
Moosic, Pa. Pipeline damaged by equip.	100,000 gal. gasoline
Galveston, Texas Tugboat sank	12,600 gal. diesel
Skagway, Alaska Tank rupture	25,000 gal. gasoline
Bronx, N.Y. Bouchard Barge 115 grounding	20,000 + gal. NR 4
Lake City, Tenn. Tank truck accident	5,000 gal. mixed chemicals
Portsmouth, Ohio Chemical facility, fire	unknown mixed chemicals
Gulf of Mexico (90 mi. S. Cameron, La.) Tanker Globtik Sun struck oil rig, holed, and burned.	unknown crude oil (14,700,000 gal. originally)
Baltimore, Md. Possible barge overfill	126,000 gal. NR 6
Roanoke, Va. Terminal accident	3,500 gal. toluene
Strongstown, Pa. Termite treatment--to drainage	unknown mixed chemicals
Key West, Fla. Mystery spill (later tied to tanker Garbis)	approx 100,000 gal. bunker C oil
Cape May, N.J. Tanker Olympic Dale missed turn, ran aground. Refloated	small quantity spilled out of 5 million gal. potential.
Chicago, Ill. Storage tank explosion	17,000 gal. hot asphalt
Garfield Heights, Ohio Tank car overflow	50 tons sulfuric acid
Detroit, Mich. Sewer system failure	20,000 gal. heavy waste oil mixed with sewage
Milton Freewater, Oregon Pesticide warehouse fire	unknown mixed chemicals
Mississippi River near New Orleans, La. Barge "Butane" collided with tug	193,000 gal. crude oil

Tanker Globtik Sun after fire, as seen from U.S.Coast Guard aircraft over Gulf of Mexico.

EPA
REGIONAL OFFICES

I-BOSTON IV-ATLANTA VIII-DENVER
II-NEW YORK V-CHICAGO IX-SAN FRANCISCO
III-PHILADELPHIA VI-DALLAS X-SEATTLE
VII-KANSAS CITY



1975 Spill List (continued)

Atlantic Ocean (400 mi. off N.J. coast) Tanker Spartan Lady broke up in heavy seas	6,000,000 + gal. crude oil
Vandalia, Ill. Storage tank	14,000 gal. transformer oil (not PCBs)
Rio de Janeiro, Brazil Tanker Taryk Ibn Ziyad ran aground	3,000,000 gal. light crude oil
The Plains, Va. Dumped in pond	unknown toxaphene
Salt Lake City, Utah Pipeline leak	50,000 gal. gasoline
Vicksburg, Miss. Johnny Dan, barges	850,000 + gal. crude oil and other oil

REPORTING SPILLS

The National Response Center (NRC) is the National terminal point for receiving notification of spills via the toll-free telephone number 800-424-8802 and via other telephone and teletype circuits. NRC provides physical and communications facilities for relaying this notification.

If you cause a spill, or if you happen to see one, you should report it immediately. You may use the toll-free number 800-424-8802. All vessels and aircraft, military, civil, or private, may cooperate in observing and reporting spills.

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OILED BIRDS

Estimates of damage caused by oil spills are often erroneously based on the numbers of birds found on the shore. Millions of birds may perish and sink on the open water every year after contact with floating oil spills. Oiled aquatic birds are unable to fly, lose their insulation from the cold, cannot float, are sick, and often blinded. As scavengers or food seekers, however, waterfowl in the area of a spill may be attracted to dead or dying fish and shellfish in oily water, or on shores and beaches.

RESCUE OF BIRDS

Rescue of oiled birds found on the shore is generally done at low tide, using nets to avoid injury to the active ones. They are carefully placed in boxes and promptly taken to a cleaning station within the hour. The cleaning station is usually supervised by a person with experience in bird rehabilitation, who instructs the others in cleaning, drying, treatment, and keeping proper records. The birds are force fed for nourishment and to clear oil from the digestive tract. Those lightly oiled are washed or immersed in a detergent solution and the inside of the beak is cleaned. A second washing and rinsing is done on heavily oiled birds. They all dry in a warm, roomy area for 12 to 24 hours. If space is available they stay 2 or 3 days and go to a nearby long-term facility. A bird that relies on natural oil for waterproofing its feathers should stay until its own wax is restored. It may have to molt first, which could take 6 months or a year.

SCARING BIRDS AWAY FROM SPILLS

Birds are sometimes saved from oil spills by alarms which employ noisemakers, flashing lights, pennants, or other devices. It does not work with all birds. Some ducks dive rather than fly away. This increases their chances of becoming oiled.

INTERESTED ORGANIZATIONS

The U.S. Department of the Interior, Fish and Wildlife Service provides information on the rescue of oiled birds. In addition, Regional Contingency Plans for oil spill cleanup identify organizations or institutions that can and are willing to participate in waterfowl dispersal, collection, cleaning and recovery activities. These plans are available from EPA Regional offices listed on page 38 of this booklet and from district offices of the U.S. Coast Guard.

The Congress hereby declares that it is the policy of the United States that there should be no discharges of oil or hazardous substances into or upon the navigable waters of the United States, adjoining shorelines, or into or upon the waters of the contiguous zone.

--Section 311, Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500)

FOR FURTHER INFORMATION

A more detailed presentation of the laws, regulations and other subjects pertaining to spills may be found in these references:

Council on Environmental Quality, 40 CFR, 1510, "National Oil and Hazardous Substances Pollution Contingency Plan," Federal Register, vol. 38, no. 155, August 13, 1973.

Executive Order 11735, "Assignment of Functions Under Section 311 of the Federal Water Pollution Control Act, As Amended," Federal Register, vol. 38, no. 151, August 7, 1973.

Federal Water Pollution Control Act of 1972, As Amended, Public Law 92-500, 86 Stat. 816, October 18, 1972.

U.S. Environmental Protection Agency, 40 CFR, 114, "Civil Penalties for Violation of Oil Pollution Prevention Regulations," Federal Register, vol. 36, no. 228, November 25, 1974.

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U.S. Environmental Protection Agency, 40 CFR, 110, "Discharge of Oil," Federal Register, vol. 36, no. 228, November 25, 1971.

U.S. Environmental Protection Agency, 40 CFR, 113, "Liability Limits for Small Onshore Storage Facilities," Federal Register, vol. 38, no. 177, September 13, 1973.

U.S. Environmental Protection Agency, "Tamano Oil Spill Casco Bay: Environmental Effects and Cleanup Operations," (EPA 430/9-75-018) December 1975, Office of Water Program Operations, EPA, Washington, D.C. 20460.

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Below: Tanker Sansinena after explosion and fire which began December 17, 1976 at an oil terminal in San Pedro, California. U.S. Coast Guard photograph.

U.S. Environmental Protection Agency, 40 CFR, 129, "Water Programs: Proposed Toxic Pollutant Effluent Standards," Federal Register, vol. 38, no. 247, December 27, 1973.

U.S. Department of Commerce, "Shipboard Guide to Pollution-Free Operations," December 1975, Maritime Administration, Washington, D.C. 20230.

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Arthur D. Little Learning Systems, "Guide to Water Cleanup Materials and Methods," New Boston House, 1974.

Commoner, Barry, "The Closing Circle. Nature, Man and Technology," Alfred A. Knopf, New York, 1971.

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Proceedings of the 1972 National Conference on Control of Hazardous Material Spills, sponsored by U.S. Environmental Protection Agency and University of Houston. Published by Graphics Management Corporation, 1101 16th St., N.W., Washington, D.C. 20036.

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McHale, John, The Ecological Context, New York, George Braaziller, 1970.

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Ross, William M., Oil Pollution as an International Problem: A Study of Puget Sound and the Strait of Georgia, Seattle, University of Washington Press, 1973.

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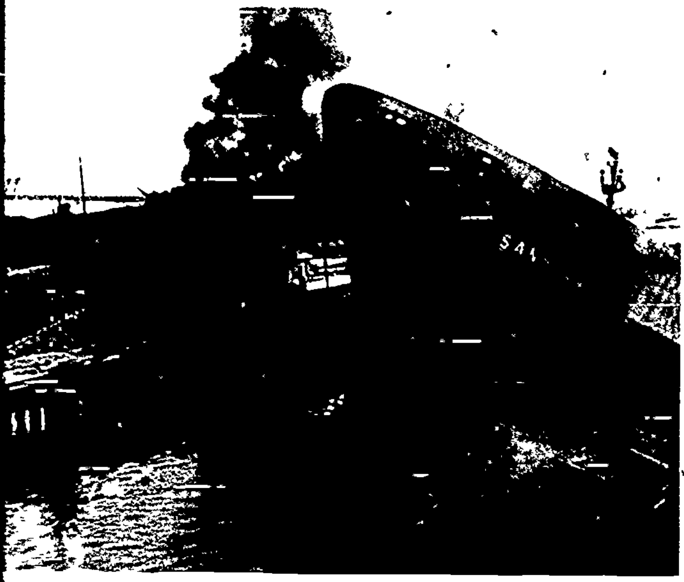
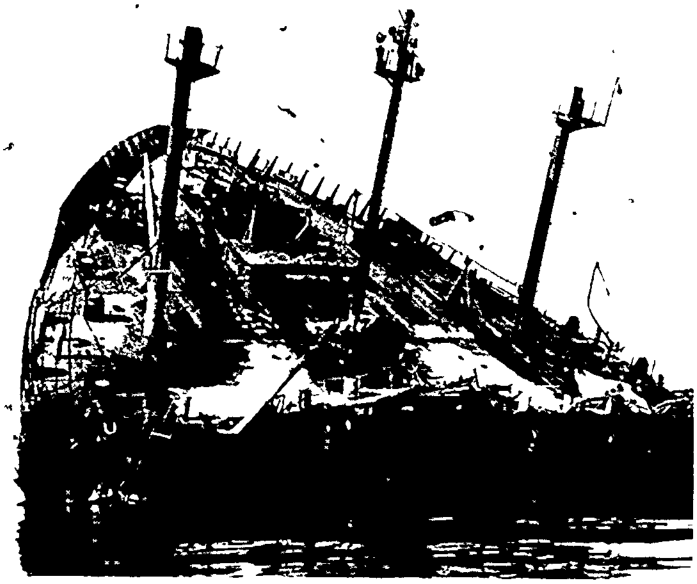


A 2,500-ton piece of the Sansinena smolders on the dock, blown there by the force of explosion.



A closeup view of the bow of the tanker Sansinena.

The tanker Sansinena at San Pedro, California. The unloading of her 34 crude oil cargo tanks was completed about 2 hours before the explosion. A flash fire on deck carried into the vapor inside the No. 10 tank, causing the first explosion.

U.S. Coast Guard Photos