United States Environmental Protection Agency

Enforcement and Compliance Assurance (2201A)

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EPA

# Superfund At Work

## Hazardous Waste Cleanup Efforts Nationwide

### Bruin Lagoon Site Profile

**Site Description:** Abandoned chemical storage facility and petroleum refinery

**Site Size:** Almost six acres

**Primary Contaminants:** Sulfuric acid, hydrogen sulfide, sulfur dioxide, and heavy metals

**Potential Range of Health Effects:** Corrosive effects on lungs, skin, and internal organs; central nervous system disorders

**Ecological Concerns:** Three rivers polluted in 1968 spill

**Nearby Population:** 35 people in adjacent properties; 700 locally

**Year Listed on NPL:** 1983

**EPA Region:** 3

**State:** Pennsylvania

**Congressional District:** 4

*Success in Brief*

## Lagoon Wastes Meet Quiet Demise

When Congress first passed environmental legislation in 1980, EPA began by asking the states what hazardous waste sites needed cleanup first. At that time, the primary means to get federal dollars and immediate attention, was a score on the Hazard Ranking System (HRS). Originally developed in 1982, the HRS evaluated the risk to the environment over five "pathways" or routes of exposure. The resulting score was based on contaminant migration through ground water, surface water, and air. The other two pathways, direct contact and fire or explosion potential, determined whether substantial endangerment required emergency removal actions. Scores could range from 0 to 100, but a score of 28.5 was the cutoff point for the first National Priorities List (NPL) comprised of 400 sites. In 1990, EPA revised the HRS to add a new pathway, soil exposure.

Another mechanism to place sites on the NPL allows States or Territories to designate one top-priority site regardless of score. Of the 57 States or Territories, 40 have nominated their worst site. A third mechanism allows for listing a site if a health advisory recommends dissociation for nearby residents, the site poses a significant threat, and site conditions dictate long-term remediation instead of emergency removal.

Photo by Black and Veatch Waste Science and Technology Corp.

**Included on the first NPL,** Bruin Lagoon shared a fence line with several houses and Bear Creek.

Bruin Lagoon in Butler County, Pennsylvania was added to the NPL with a score in the 90s. The cleanup embodied a common sense approach to immobilize the wastes, community involvement, and permanent closure with little fanfare.

## The Site Today

A multi-layer cap entombs the lagoon and its stabilized sludge behind a chainlink fence. An occasional weed or wild flower takes hold in the grassy surface. Not much else will ever grow here and no one will build anything here again.

# A Site Snapshot

The Bruin Lagoon site covers almost six fenced acres in Bruin Borough, Butler County, Pennsylvania. The site was an abandoned chemical storage facility and former petroleum refinery located roughly 45 miles northeast of Pittsburgh. The site is partially situated in the 100-year floodplain of the South Branch of Bear Creek, seven miles upstream of the Allegheny River.

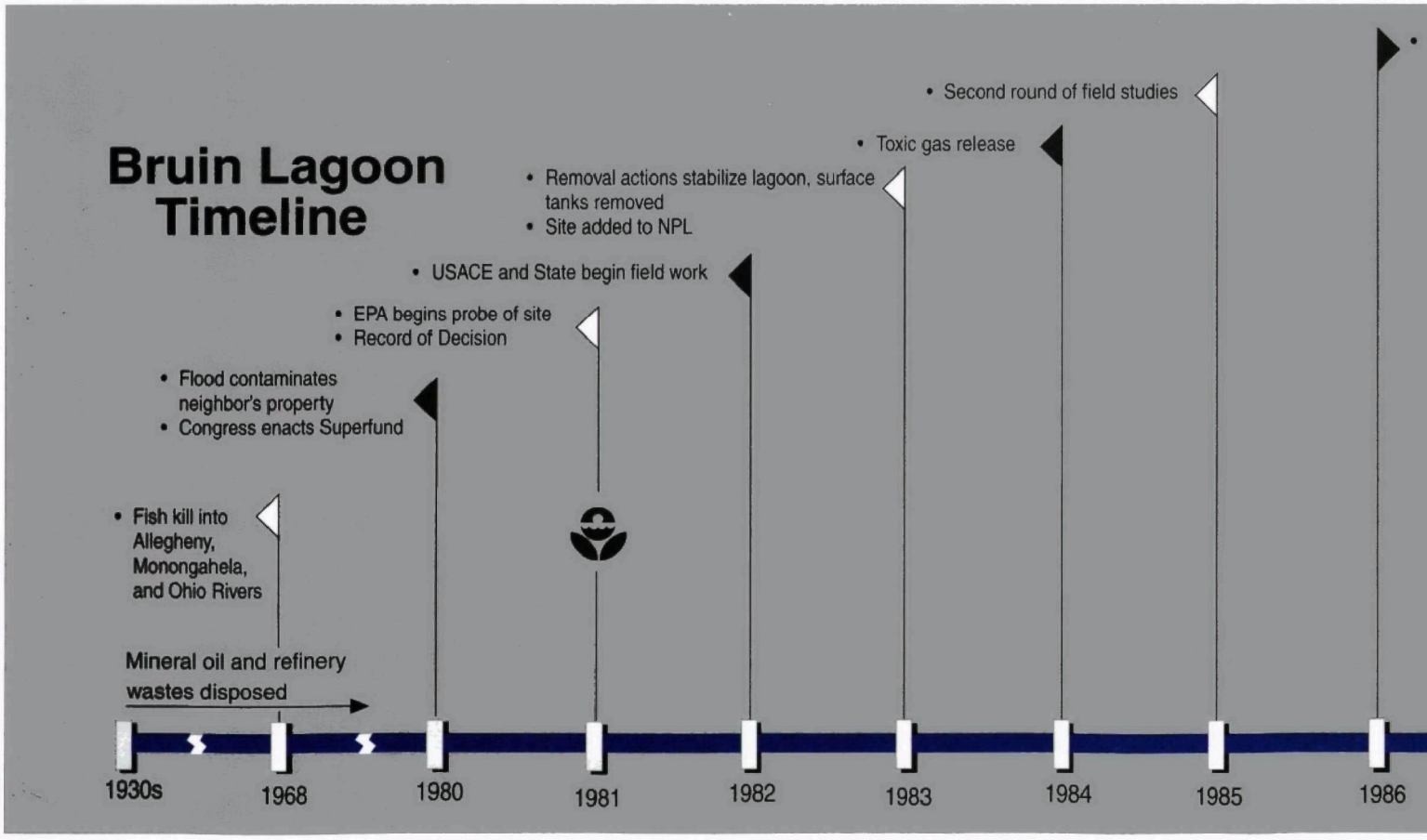
Operations at the site began in the 1930s when the Bruin Oil Company, located on adjacent property to the south, used a chemical storage lagoon to dispose of mineral oil production wastes and motor oil reclamation wastes. Disposal operations continued for a period of 40 years. Materials mixed in the lagoon formed lethal organic gases that eventually erupted through vents in the surface.

An abandoned coal mine located a half mile northeast of the site was a primary contributor to poor ground water quality in the area. Ground water contaminants included sulfuric acid, hydrogen sulfide, sulfuric dioxide, and acidic sludges. Several homes for 35 people had been built adjacent to the site, and another 700 people reside in the community. A breached dike caused a major fish kill downriver, and flooding thoroughly contaminated one neighbor's property. No reported health effects were documented from the population at large.

# Eco-disasters and

### Fish Kill Affects Thousands Downstream

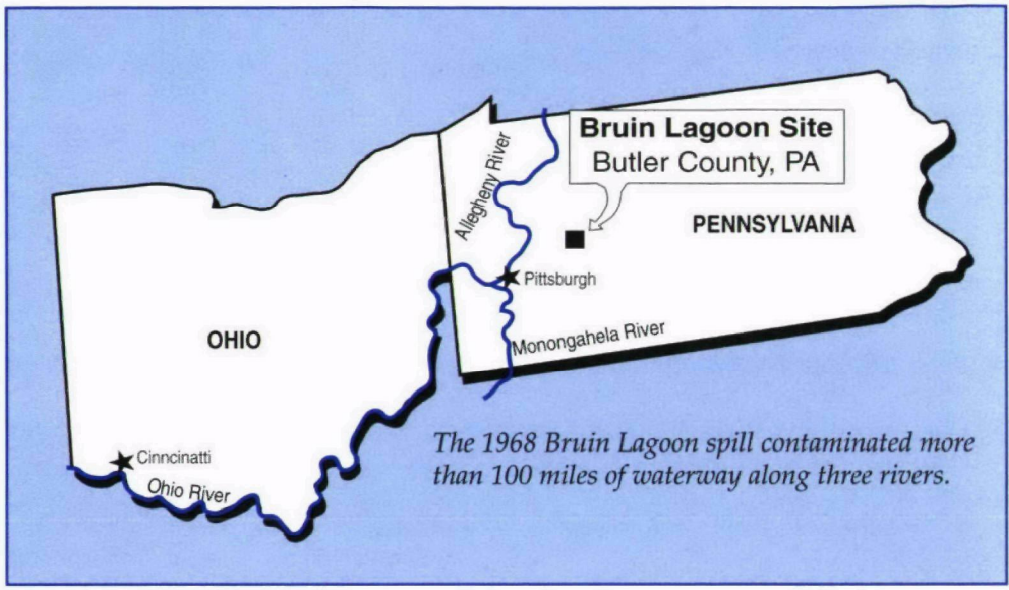
In 1968, Bruin Lagoon received national attention when 3,000 gallons of acidic sludge spilled into the South Branch of Bear Creek through a breach in the dike. The contaminants entered the Allegheny River and eventually the Ohio River, traveling as far as Cincinnati. An estimated 4,000,000 fish died in river ecosystems spanning more than 100 miles. Many more uncounted birds, water mammals, and amphibians were killed or poisoned along the way. State officials cited the Bruin Oil Company for damages and hurried repairs to the earthen dike were made. But



# Public Outrage Force Closure of Hazardous Disposal La

downstream communities, including Pittsburgh, had to temporarily close off water supply systems. The spill made major headlines and shortly thereafter, the company closed its doors and declared bankruptcy.

In 1980, a flood caused the lagoon to overflow, contaminating the property north of the lagoon. State authorities nominated the site as a priority under the newly enacted "Superfund law", the Comprehensive Environmental Response, Compensation, and Liability Act of 1980. Derived from exise taxes on chemical feedstocks and crude oil, the Superfund cleans up abandoned or uncontrolled hazardous waste sites and can be used for accidents, spills, and other emergency releases of pollutants into the environment.




*The 1968 Bruin Lagoon spill contaminated more than 100 miles of waterway along three rivers.*

In July 1981, EPA began a probe of the various contaminants at the site. An estimated 35,000 cubic yards of contaminated sludge filled the open

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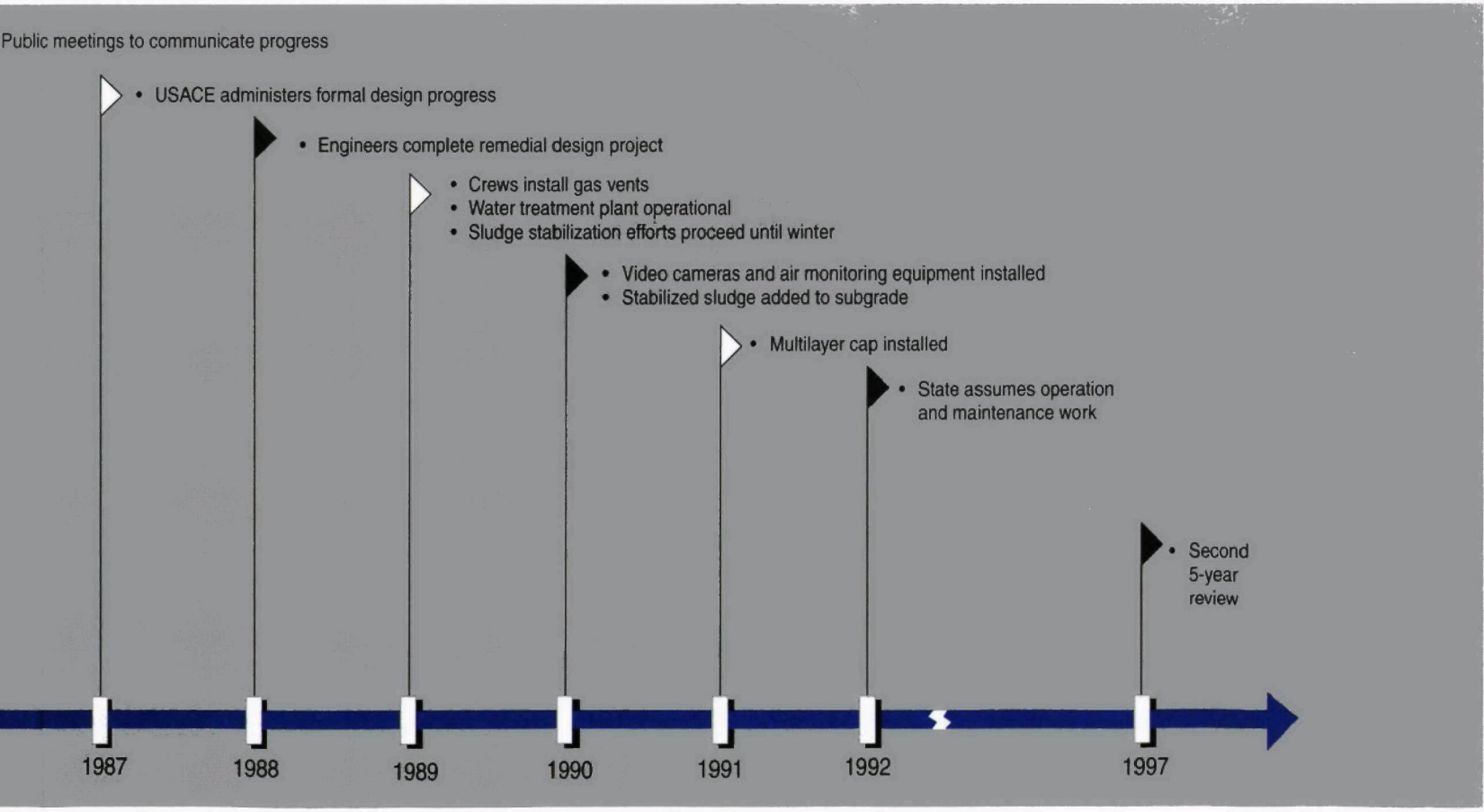

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lagoon. The following June, the report of findings culminated in a Record of Decision to cover the lagoon with an impermeable, multilayer cap. In September 1982, EPA signed a contract with the State, using the U.S. Army Corps of Engineers for support. Work began in August, 1983 to remove liquid floating on top, to stabilize the lagoon walls and dikes, and to remove scrap storage tanks and equipment. A channel was constructed to prevent ground water from entering the site.

That same year, Bruin Lagoon was officially added to the National Priorities List (NPL), a roster of hazardous waste sites eligible for federal cleanup. Given the types of contaminants and the proximity of the site to Bear Creek and several homes, EPA added Bruin Lagoon to the NPL. Since that time, more than 1200 other sites have been listed.

**EPA Controls Toxic Gas Leak**

Construction activities continued until May, 1984 when workers penetrated a previously unidentified crust layer, releasing a poisonous gas that contained high concentrations of carbon dioxide, hydrogen sulfide, and sulfuric acid mist. EPA called in an emergency team of specialists to cover the hot spot with stabilized sludge and to install gas monitoring wells. A second investigation commenced during the winter to reevaluate the site; field activities continued all summer through October, 1985.

While monitoring the gas, sludges, and ground water around the lagoon, EPA completed analyses to select the best cleanup method. A public meeting and comment period in August 1986 evidenced a high degree of community involvement as well as Congressional and state concern. Following a formal decision to expand upon the remedy previously chosen, the Army Corps of Engineers prepared blueprints and awarded contracts for the remedial work.

Before the start of construction, EPA held a meeting at the Bruin Fire Hall with the Butler County Emergency Management Agency and local officials. Community members had requested a warning siren to detect a gas release or construction accident. Following installation of the siren, EPA established a 24-hour hotline with the fire department. A team of residents, township officials, and the fire department began regular meetings with EPA to discuss cleanup progress as well as concerns such as property values.

EPA then asked the USACE to administer the formal design for the site in March, 1987 and a professional consulting team completed their report in July, 1988. Proposals for competitive contracts to conduct the actual construction took about nine months.

In June 1989, crews installed 20 pre-construction gas vent wells to prevent a large pressurized gas release. Sedimentation ponds and diversion ditches served to control precipitation, excess surface water, and silt. In order to neutralize the remaining sludge, crews excavated and hauled the lagoon wastes to mixing pits. An on-site water treatment plant treated all water that came in contact with raw wastes from the open excavations. Decontamination water also was treated and the effluent discharged into a tributary of the South Branch of Bear Creek. Crews then scraped the bedrock of the lagoon, applied six inches of limestone aggregate, and backfilled with the stablized sludge until the onset of winter.

**Communications and Monitoring Ensure Safety**

Before resuming construction in May 1990, a second Emergency Response Meeting convened to better communicate with county and borough officials. A new notification plan would keep the community current with progress through fact sheets, a radio talk show, and a site tour. In addition, a remotely controlled black and white video camera was installed on a pole to record a

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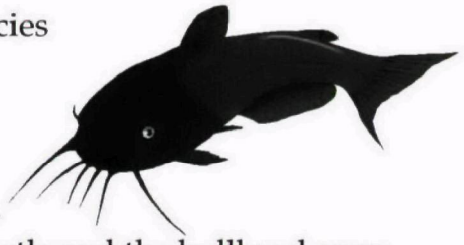
"birds eye view" of the construction activities. A hand-held video camera also recorded milestones and provided close-up color documentation of various sludge types, mixing operations, and material placement such as the bedrock neutralization.

To ensure continuous air quality for both the surrounding neighborhood and on-site workers, continuous perimeter monitoring sampled for sulfur dioxide, hydrogen chloride, and dust. Work areas also were tested every half hour for organics and explosiveness. Despite the threat of off-gassing, crews finished the sludge stabilization without incident on November 1, 1990. This additional material was added to the subgrade layers as well as more rip-rap for embankment protection. The surface was capped in the spring of 1991, including seeding for grass. On July 1992, the state of Pennsylvania assumed all responsibility for operations and maintenance, including annual inspections to ensure effective erosion control measures, routine mowing, maintenance of the perimeter fence, and periodic sampling of ground water monitoring wells.

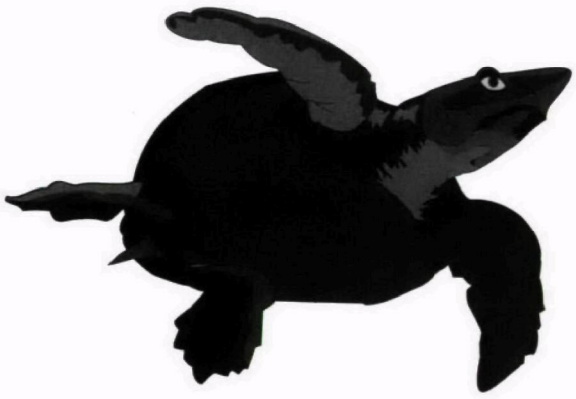
# The Bullhead and the Softshell



An uncounted number of species suffered or died when highly acidic, petroleum-based contaminants from Bruin Lagoon spread through an already-compromised Ohio River ecosystem in 1968. The softshell turtle and the bullhead were among the hardest hit. Both species are bottom feeders, preferring aquatic insects, crayfish, mollusks, and other fish in the food chain.

Current scientific research suggests a connection between a wide range of animal disorders and industrial chemicals. Among the disorders which may be related to chemical exposure are decreased fertility, decreased hatching success, gross birth deformities, and behavioral abnormalities. Autopsied bullhead, for example, have exhibited enlarged livers, various tumors, lesions on the mouth, and ulcers of the stomach, esophagus, and intestines. Changes in body mass and shell erosion have been found in the softshell turtle.

Not until passage of the Clean Water Act in 1977 were effluent standards set for individual toxic pollutants and industries required to obtain discharge permits. Through water quality based permitting, chemical-specific standards as well as whole effluent testing have helped to reduce loads of toxic chemicals into the Ohio River ecosystem. Through these and related regulatory and environmental management initiatives, the ecosystem has improved dramatically and both species remain in the Ohio River. However, there remains the need to improve techniques to identify chemicals that may cause reproductive, developmental, and synergistic effects and to test the effects of



# Success at Bruin Lagoon

We've had a long history in this country of burying our toxic and chemical wastes, only to have those graveyards erupt years later. The hours and dollars spent to clean up or remove the contaminants always far outweigh the costs of disposal on an order of magnitude in the millions. Before these sites come to closure, wildlife suffers, sensitive species fail to reproduce, and some surrender to extinction.

Because the U.S. has thousands of abandoned and uncontrolled hazardous waste sites, many worse than Bruin Lagoon, states, federal agencies, and responsible parties have formed a network of professionals who tackle the complex issues posed at each location. Each site has a specific set of destroyed variables in the ecosystem, synergistic effects in the food chain, and unique challenges for remedial technology. From reports on failures and successes alike, this information is now exchanged at public meetings, university seminars, national conventions, and on the Internet. Every community needs this information to intelligently design solutions for upcoming sites in the queue. But as a society, the lessons of pollution prevention will take us further than the bandaids we apply today.

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