

A STRAIGHT FORWARD REMOVAL ACTION?

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ABSTRACT

The Mound Plant in Miamisburg, Ohio, is operated for the U.S. Department of Energy (DOE) by EG&G Mound Applied Technologies. The plant started operations in 1948 and today is an integrated research, development, and production facility that operates in support of the DOE weapons and energy programs (1). Mound Plant manufactures non-nuclear components and tritium containing components for nuclear weapons. In addition, Mound Plant develops small heat sources for the space and defense programs.

Mound Plant was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; i.e., Superfund) National Priorities List (NPL) in 1989. Pursuant to that status, a CERCLA Section 120 Federal Facility Agreement was signed between the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency. The Federal Facility Agreement requires a remedial investigation/feasibility study (RI/FS). Because of the number of potential release sites (over 100) and the overall complexity of the RI/FS, the RI/FS has been divided into nine operable units to facilitate program management. The Miami-Erie Canal comprises Operable Unit 4, and is the only O.U. which is completely outside the Mound plant boundaries.

CANAL HISTORY

During normal operation of the plutonium processing facility at Mound Plant, plutonium-238 waste in an acidic nitrate solution (at a concentration of approximately 5 parts per million [ppm]) was carried from the plutonium processing building to the WD treatment facility via an underground pipeline. On January 23, 1969, this pipeline ruptured, discharging plutonium nitrate solution to the surrounding soil. The rupture area was 4 feet underground and located between Building 41 and the WD Building. Plant workers noted brown fumes emanating from the ground surface as the plutonium-238 solution was being neutralized, adsorbed, and immobilized by the soils surrounding the pipeline. Plant workers then shut down the waste transfer system (2). Excavation and removal of approximately 964 cubic feet of plutonium-238-contaminated soil (up to 800 nanocuries per gram [nCi/g]) around the pipeline ensued (3,1).

During the excavation, three days of intense rainfall occurred from January 28 through 30, 1969. Erosion from the excavated areas carried plutonium-238 contaminated soil particles down the drainage ditch and off the Mound Plant property. The contaminated soil particles and runoff water were diverted into portions of the Miami-Erie Canal. The runoff entering the north canal was diverted into the north and south ponds (Fig. 2), which drain into the Miamisburg storm sewer system and finally into the Great Miami River. The runoff entering the south canal flowed down the canal to an overflow ditch, which drains into the Great Miami River. The rainstorm also washed loose soil from drums containing contaminated soil, resulting in overland flow and plutonium-238 deposition at the so-called runoff hollow, a shallow depression just west of the Mound Plant boundary.

An investigation into the incident in 1974 concluded that the acidic solution of greater than 1 molar (M) nitric acid ($>1M \text{ HNO}_3$) came into contact with the calcareous native soil, causing an effervescent reaction when the calcareous limestone and dolomite in the soil neutralized the acidic solution (2). The capacity of the soil near the rupture site to buffer the acidic plutonium solution was 4 to 11

milliequivalents of acid per gram of soil. After taking into account the pH and the sorption rate, it was determined that essentially none of the plutonium would remain in solution after moving a very short distance through or on fresh soil (2).

The extensive 1974 study was conducted to determine the cause, extent, and health and safety impacts of the 1969 accidental release of plutonium-238 into the abandoned Miami-Erie Canal and adjacent waterways. Approximately 1,750 sediment, biota, water, air, and soil samples were collected and analyzed for plutonium-238. The maximum concentrations occurred 17 m (55 ft) north of the one-way flapper valve in the north canal and midway down the south canal. This high sediment concentration was 4.56 nCi/g at a depth of 2 to 3 ft in the canal. Rogers (2) estimated the total inventory of plutonium-238 in the canal to be 5.2 Ci in 1974, with the majority of the inventory occurring in the south canal, 3.17 Ci.

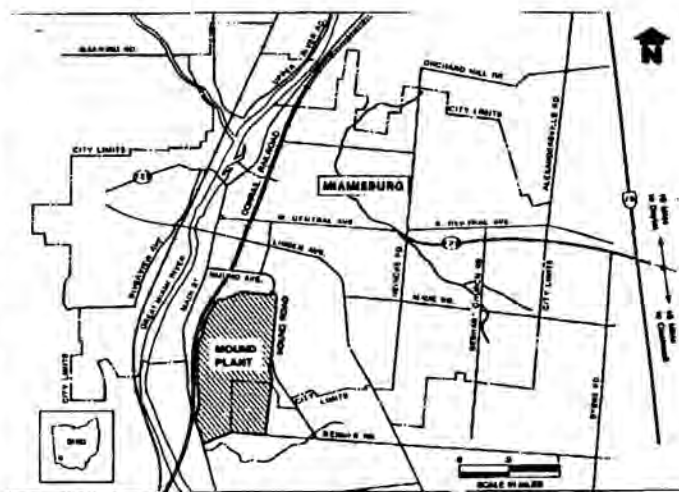


Fig. 1. Location of Mound Plant.

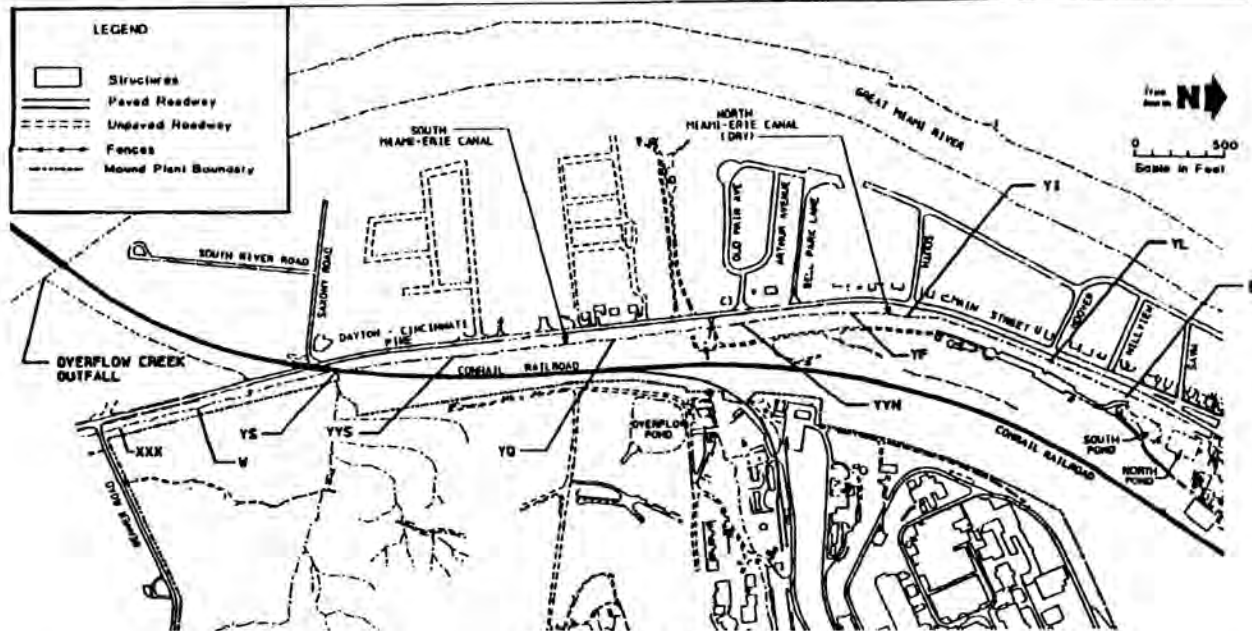


Fig. 2. Miami-Erie Canal.

In 1977, the city of Miamisburg modified the ponds in the Community Park. The north pond was deepened by 10 ft, reshaped, fitted with a plastic liner, and converted to a solar pond. In addition, the south pond was deepened to be used as a fishing pond. The excavated soil was used as fill beneath nearby tennis courts and to build a berm between the tennis courts and the adjacent Conrail Railroad right-of-way. No soil was removed from the park area (4).

Sediment and water samples taken from the south pond in March of 1990 indicated low levels of residual plutonium-contaminated soil. The highest sediment concentration was 2.05 picocuries per gram (pCi/g), while the highest plutonium concentration in water was 1.8×10^{-4} picocuries per milliliter (pCi/mL) (5). This concentration, 1.8×10^{-4} pCi/mL, represents 0.15% of the plutonium-238 concentration for DOE drinking water criteria (6), which is based on a 4-millirem (mrem) annual dose equivalent. While plutonium-238 was the principal radionuclide in the release, it is likely that other radionuclides were present in lesser quantities as isotopic impurities.

As a result of changes in operational practices and controls, the amounts of plutonium released to the environment by Mound Plant were significantly reduced in the 1970's through waste management actions. Water-borne releases of plutonium were recognized to have been due to erosion of superficially contaminated soils from the 1969 radioactive waste line break and probably surface deposition of airborne plutonium (7).

Reduction of water-borne plutonium contamination was accomplished through the construction of the system of surface water retention and discharge basins along the plant drainage ditch. An asphalt-lined pond, completed in 1978, collects surface runoff and allows for controlled resedimentation on the upper reach of the drainage ditch. Low-flow retention basins and an overflow pond were constructed in 1976 and 1977, respectively, on the lower reach of the plant drainage ditch to control surface water discharge from the plant (through the NPDES-permitted Outfall 002) and to provide settling for suspended sediment in the plant runoff

water (Fig. 2). Runoff water and suspended sediment containing low-level plutonium contamination are retained in the ponds to reduce peak runoff volume and velocity. The system was designed to retain 95% of the silt and sand particles, thereby reducing the amount of suspended solids and plutonium released offsite. Retention basin effluent is discharged through a standpipe to the south section of the abandoned Miami-Erie Canal and the Great Miami River. During periods of high flow, water is diverted through a channel to the overflow pond, which is designed to retain all facility effluent for five days in the event of a spill.

CONRAIL PROJECT

EG&G/Mound was notified by the city of Miamisburg on January 8, 1991 that the Conrail company needed to do some repair work on the railroad bridge over the Miami-Erie canal which necessitated excavation of soil. This notification was in accordance with the memorandum of understanding between the City and the DOE. The City requested EG&G presence at a meeting the following day at the site of the proposed work. EG&G Mound initiated a project to perform all of the soil excavation work in order to minimize the spread of contamination and to retain control of the project. The contaminated soil was identified, excavated and packaged for future disposal as LSA (low specific activity) waste. A sampling plan was generated and implemented to assure no mixed waste was present.

During the excavation of contaminated soil many steps were taken to assure worker and community safety and to insure that no additional environmental impacts would occur. Continuous air monitors were set up in three locations around the job site to monitor any possible resuspension of radioactive material. A staging area was established where all boxes were filled in order to control all soil which was excavated. Health Physics monitored the activities by taking readings with a FIDLER (Field Instrument for Detecting Low Energy Radiation), taking soil samples for analysis, directly monitoring workers clothing, feet, and hands, and collecting nose wipes twice daily from all workers. All of the personnel

monitoring indicated no detectable radioactive contamination. In addition all personnel working at this site were required to submit a 24 hour urine sample prior to the project initiation and another after project completion. All sample results were lower than the detection limit of the analysis.

All of the contaminated soil was placed in LSA waste boxes for storage and eventual shipment and burial. A representative group of these containers were sampled to determine if any hazardous chemical contamination existed. The results of these samples indicated no mixed waste was present.

Upon completion of the contaminated soil removal, on Wednesday July 3, 1991 additional uncontaminated soil was removed in order to allow access to the entire structure to be repaired. Conrail was consulted as to what depth and shape the excavation should take in order to facilitate the work. The excavated soil was staged in the area to be used as backfill after repairs were complete. The final excavation work was completed on July 11. Conrail was then informed that the excavation work was complete and that they could begin the trestle repair. On Thursday, November 21 Conrail completed the repairs and soon after Mound restored the work site to as near original condition as possible.

REAL LIFE COMPLICATIONS

Unfortunately, the simple process described above will probably never occur when the project is a CERCLA removal. In the case of the Conrail Removal, local residents, government officials and agencies, and Conrail assured that many complications would affect the progress of the relatively simple project.

Initial Contact

Upon arriving at the scene in January, Mound personnel observed a prefabricated timber bridge in place straddling the canal. Some soil from both banks had been moved to allow placement of the temporary bridge. Mound personnel explained that the canal had been declared an NPL or Superfund site by the US EPA and any disturbance to the site had to be reviewed by EPA before hand. The foreman of the work crew accepted this explanation and said he would tell his management. Several phone calls then took place between Conrail Engineering personnel and EG&G Environmental Restoration (ER) Program staff where the canal situation was discussed. Mound explained that the Conrail workers were not exposed to any significant hazard from the radioactivity in the canal. The Chief Medical Officer for Conrail spoke with EG&G ER program staff and asked what Mound would do in this situation. The staff explained that Mound would not do anything special in a situation like this since there was no significant hazard.

The Medical Officer further explained that Conrail felt a need to do something to allay their workers fears particularly since they had filed a complaint with their union claiming unsafe work conditions because of exposure to radiation. The ER staff explained that the most sensitive method to detect an exposure or uptake of plutonium would be to collect 24 hour urine samples from the workers and analyze them for plutonium. Conrail's Medical Officer asked further if dust or wipe samples from shoes or homes could be taken. It was explained that Mound does these types of analyses routinely and with management approval could arrange to have these done. Both members of the Mound Medical staff spoke with Conrail's

Medical Officer to explain medical aspects of plutonium exposure. Apparently Conrail's Medical Officer had previously worked at a power reactor site and had a good understanding of radiation exposures. After management approval, wipe samples were collected from five workers homes and a Conrail truck. All wipe samples were below the limit for release to the public (20 disintegrations per minute (dpm)) and all but five were below the lower detection limit (LDL) of the proportional counter. These five samples ranged from 0.24 to 1.37 dpm. Three 24 hour urine samples were submitted by each employee and were analyzed by Mound's Bioassay laboratory for plutonium 238. All of these results were below the LDL for this analysis (0.018 pCi). This information was provided and explained to the Conrail employees and to Conrail's Chief Medical Officer. Nine locations in the area where the excavation was to take place were sampled. Core samples were collected in one foot increments down to refusal of the sampling tube which was four or five feet in all cases. The plutonium concentration in the one foot increments ranged from < 25 pCi/g to approximately 350 pCi/g. The Pu contamination did not extend below 2 feet in seven of the nine locations. The contamination extended to three feet in the other two locations. This data is consistent with data collected from this area in 1974. Based on these concentrations and conservative pathways scenarios recently generated either by Weston, the University of Cincinnati, or EG&G/Mound, the maximum dose these workers might have been exposed to was less than 1 mrem. These scenarios do not take into account the conditions existing when the workers were in the canal area, i.e. wet muddy conditions, which eliminates the major pathway to these workers, resuspension and inhalation of the contaminated soil.

The memorandum of understanding between DOE and the City of Miamisburg had been an effective means of preventing uncontrolled disturbance of contaminated areas of the canal. There has always been good communications between the two parties regarding work by the city in the canal area, but it had become apparent that some additional mechanism was necessary. Fencing the canal area or placing signs warning of radiation were both considered and eliminated due to the perception created of a significant health hazard. The selected option was to register the canal area with the Ohio Utility Protection Service (OUPS). This service is the "call before you dig" service which has on record areas where underground utilities or other obstacles to excavation exist. Signs with instructions to call this service before digging were placed in the canal area. The service provides EG&G/Mound, by telephone and facsimile, the information regarding who needs to excavate and where.

Prior to any excavation of contaminated soil the city of Miamisburg was notified and a presentation was made at a City Council working session to describe the planned activities. In addition, a meeting was held with residents of the Hillview subdivision, which is adjacent to the work site, to keep them informed of this work. These residents had previously contacted Mound concerning problems with their drinking water. Their contention was that contamination in their private wells were the result of operations at Mound when, in fact, the wells were being tainted by leachate from their own septic systems. Evidently a Community Block Grant for a project to install city water and sewer lines to this subdivision had been approved in 1982 but the work had never

been started. Mound first learned of this situation at a PEIS (Programmatic Environmental Impact Statement) Reconfiguration meeting in May of 1991 when residents attended the meeting to make public complaints. The residents saw the project at the Conrail site as a way to draw publicity to their problem. Eventually, Mound personnel arranged for two separate water sampling events of the Hillview residents wells. The first was accomplished by Mound personnel and the second included split sampling between Mound and the Ohio Department of Health. As expected, no tritium or plutonium were found in any of the samples.

Soil Removal

On the first day of excavation, Monday, June 24, 1991, the residents assured that the local news media was at the site and they also provided a show for them by picketing with signs and gas masks. Media coverage was mixed from well balanced to misleading. As the media began to discover what the residents problem really was, coverage drastically diminished and became more focused on the water sampling. The residents, however, continued to show interest in the removal activities. A small number of the more vocal members began visiting the site daily, taking photographs and video tape, and speaking with workers whenever they could.

Conrail management indicated that they would have a crew begin work at the site on July 15, after Mound completed the soil removal; however, EG&G was requested to answer Conrail employees questions in a meeting prior to commencement of work. This meeting was scheduled for July 22 and attended by Conrail's Assistant Director of Safety Program Development, Conrail workers and union officials, DOE/DAO (Dayton Area Office), and EG&G medical, health physics, environmental restoration, and public relations. The main topic of the meeting was concern over plutonium contamination in the area. EG&G stated, based on the results from the work Mound has already done, there was no risk of a significant exposure and an extremely low risk of even a detectable result. Mound also offered to analyze 24 hour urine samples before and after the job for all Conrail employees and provide health physics support to monitor the workers and take twice daily nosewipes, even though the levels present in the area did not warrant such precautions. Conrail indicated that they would begin work the following day.

Trestle Repair

Conrail did indeed begin work and had the footer for the new wall poured by August 7. At a CERCLA public meeting which was held the evening of August 7th, many questions about the canal and the Conrail site were raised. Included in these questions was an allegation that radiation levels in the vicinity of the work site were much higher than previously reported. Evidently some trash from the work site had been collected and monitored by an agent of the local residents with the reported results much higher than could be possible without detection by Mound health physics instruments. The data was questionable at best and when analyzed by Mound health physicists it was estimated that about 6 grams of Pu-238 would have to be spread over an area of 2 x 20 meters in order to obtain similar results. It is estimated that 0.3 grams of Pu-238 was actually spread over the 1.5 mile length of the canal as a result of the release in 1969. Many other questions regarding instrument calibration, background readings, and procedures

were raised by EG&G with no satisfactory response from the party providing the information. A letter distributing this misleading information was eventually sent from this citizen's group to Conrail, US EPA, Ohio EPA, and others. This correspondence obviously required EG&G to respond to questions regarding its validity.

Fortunately, work continued to slowly progress without much further interruption until the union which represents the Conrail workers, the Brotherhood of Maintenance Way Employees, requested a meeting to discuss risks at the site. The meeting was held on August 28th and Mound personnel seemed to satisfy the union's concerns and answer their questions. The Conrail crew assigned to this project initially had reservations about working at the site. They became more comfortable as the work continued and as EG&G's health physics technician had a chance to educate them on radioactive materials and its hazards. The workers were approached by residents of Hillview on a regular basis seemingly trying to gather information and incite activities which would bring this project to the attention of other regulating officials. On a number of occasions residents had to be asked to leave the work site so that repairs could continue.

On September 5, EG&G was contacted by a representative of the George Meany Center for Labor Studies. The union representing the Conrail workers had arranged for this organization to investigate the hazards of working in the vicinity of the Miami-Erie Canal. This contact required several additional telephone conversations and written responses to educate another person unfamiliar with radiation. The George Meany Center also contacted the US EPA and Ohio EPA, which caused additional correspondence with Mound. As a result of these contacts, the Ohio Department of Health (ODH) was requested to perform an independent radiological survey of the area to verify the EG&G findings. On October 1 a representative of ODH came to the work site and performed the survey. No detectable levels of radioactive material were found to be present.

On the same day, October 1, an OSHA investigator showed up unannounced at the work site. OSHA had received a complaint from one of the Conrail workers alleging safety or health hazards. All of the alleged hazards described in the OSHA notice involved work in the vicinity of radioactively contaminated soils. The OSHA investigator performed a radiological survey of the area with no detectable levels of radioactive materials being discovered. However, the investigator did find many violations in the areas of scaffolding, Material Safety Data Sheet posting, and worker notifications and wrote citations to Conrail totalling over \$30K in fines. The project received much greater attention from Conrail after the OSHA visit. EG&G was requested to submit additional data and information to OSHA for their review. This was accomplished on October 2 and no further communication has taken place to date. Again, finally on Thursday, November 21 Conrail completed the repairs and soon after Mound restored the work site to as near original condition as possible.

Class Action Suit

On December 5, 1991 a class action law suit was filed in the U.S. District Court for the Southern District of Ohio, Western Division alleging the operating contractors at Mound "have engaged in a continuous course of negligent, careless, reckless, intentional and unlawful conduct resulting in

ongoing and repeated discharges of both radioactive and nonradioactive hazardous substances . . . into the environment surrounding the facility." "As a direct and proximate result of the above negligence, the plaintiffs and members of the class have been damaged. Said damages include, but are not limited to, property damage, loss of use and enjoyment of property, diminution of value to real estate, loss of income, emotional distress, including fear of increased risk of cancer, and contamination of the soil, surface water, ground water, and air." The plaintiffs in the suit mentioned above are asking that the amount of the damages be determined at trial. Many of the plaintiffs listed on the suit are residents of the Hillview area. This litigation is expected to continue for months and impact the workload of Mound ER personnel.

CONCLUSION

The Conrail Removal Action was meant to be a simple removal of contaminated soil near a railroad trestle within the Miami-Erie Canal. The project was estimated to require the removal of 500 cubic feet of plutonium contaminated soil at a cost of \$243K and duration of about 2 months. This "simple" removal, however, soon became a complicated public relations and community education process. From the beginning of soil excavation to project completion took 6 months. Communication links between Conrail, the city of Miamisburg, EG&G Mound, local residents, and several government officials and agencies assured that the project would be well documented and have high level visibility. In the future EG&G Mound is faced with the much larger task of potentially cleaning up the remainder of the Miami-Erie Canal. The current estimate for this large scale removal is \$100M over 10 years and a soil volume of 100,000 cubic yards. Based on the

experience obtained on the Conrail removal, *this job should prove to be very interesting.*

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