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**Action-Oriented Characterization at Argonne National Laboratory\***

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# Action-Oriented Characterization at Argonne National Laboratory\*

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## ABSTRACT

Argonne National Laboratory-East and the U.S. Department of Energy have initiated a voluntary corrective action strategy to characterize and clean up some of the on-site solid waste management units that are subject to the Resource Conservation and Recovery Act Corrective Action process. This strategy is designed for the current atmosphere of reduced funding levels and increased demands for cleanup actions. A focused characterization program is used to identify and roughly delineate the areas of greatest risk, relying as much as possible on existing data about the site; then, removal or interim remedial actions are implemented, where appropriate.

Two interim cleanup operations were completed in 1994. Two additional interim actions are planned for 1995. Future actions may include decontamination operations, soil remediation, and construction of containment barriers.

## INTRODUCTION

Argonne National Laboratory-East (ANL-East) is a multiprogram research and development laboratory funded primarily by the U.S. Department of Energy (DOE). The ANL-East facility was established in its present location, about 27 miles southwest of downtown Chicago, Illinois, on July 1, 1946, with the mission of finding peaceful uses for atomic energy. The ANL-East facility currently carries out broad programs of fundamental and applied research in the physical, biomedical, and environmental sciences and serves as a major center for nuclear and nonnuclear energy research and development.

Because of the varied research activities performed at ANL-East, a large number of diverse waste streams have been generated; some of these waste streams are highly radioactive or chemically hazardous. No waste is currently disposed of on-site; however, in the early years of the laboratory, some wastes were disposed of in various landfills, trenches, dump sites, and other land disposal units. In addition, a number of structures have stored radioactive waste. A series of hazardous waste treatment, storage, and processing units also exists on-site.

In the late 1980s, ANL-East began a voluntary effort to locate, characterize, and clean up these inactive waste sites. A series of preliminary characterization activities has been completed, several Resource Conservation and Recovery Act (RCRA) treatment units have been closed, and the main sanitary landfill has been closed and capped.

ANL-East applied for its RCRA Part B Permit in December 1990; to date, the Illinois Environmental Protection Agency (IEPA) has not issued the permit. Because ANL-East chose to seek a RCRA Permit, the site became subject to the Corrective Action provision of RCRA (Section 3004[u]).

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Pursuant to these requirements, the IEPA conducted a RCRA Facility Assessment (RFA) of the site, which identified 735 solid waste management units (SWMUs) and 5 areas of concern (AOCs). The list of SWMUs includes numerous wastewater holding tanks, sumps, sewer lines, sludge beds, loading docks used to store waste, recycled materials staging areas, satellite accumulation areas, and various land disposal units.

The environmental restoration program at ANL-East is funded by the DOE Environmental Management Program. The level of funding has been decreasing in recent years, which is likely to continue. To address the large number of waste units, ANL-East has initiated a corrective action strategy in which the high-risk units are remediated first, allowing the units with a lower level of risk to remain untouched until funds are available.

## **CORRECTIVE ACTION STRATEGY**

The first step in the corrective action strategy was to evaluate all 735 SWMUs and 5 AOCs to identify those that require further action. ANL-East identified approximately 600 that should qualify for no further action (NFA) status or should be deferred to other regulatory vehicles. Further actions are required for 71 SWMUs and AOCs. ANL-East submitted a proposal to modify the RFA to greatly reduce the number of sites requiring action; the IEPA is reviewing this proposal.

In the typical RCRA Corrective Action process, the first step is to complete a characterization phase (the RCRA Facility Investigation [RFI]), which involves preparing a detailed Work Plan and conducting extensive and costly sampling and analysis. Next, the Corrective Measures Study (CMS) entails developing and evaluating several alternative remedial technologies. The regulatory agency selects the technology to be implemented. The selected remedy is then designed and implemented during the Corrective Measures Implementation stage. This process frequently takes 5 years or more to complete for a given site. By following this sequence for all 71 units, considering anticipated funding levels, no remedial actions would be completed for many years.

Recognizing the inefficiencies inherent in this process, DOE is strongly encouraging the use of interim actions or expedited remedial actions at their facilities. In keeping with this policy, ANL-East has begun implementing an environmental restoration program that maximizes the potential for interim actions by taking advantage of opportunities to proceed with cleanup work before completing the CMS. By accelerating the remediation process wherever possible, the cost of preparing the RFI Work Plan, conducting the characterization, evaluating alternative technologies, and preparing the CMS Report is reduced. The expense is further reduced by avoiding the escalating construction and waste disposal costs. Initiating expedited actions also minimizes the spread of contamination, which further reduces costs.

Over the last few years, ANL-East has developed extensive characterization information on many of the 71 SWMUs and AOCs. The data were used to identify the units with the highest potential risk and greatest economic liability. Most of the highly contaminated sites reside in two geographical areas of ANL-East: the 317/319/ENE Area and the 800 Area. Both ANL-East and DOE gave these two areas the highest priority, and funding was allocated to proceed with remedial actions. The remedial action strategy uses all available site data from various sources, including recent and historical aerial photographs, employee interviews, the routine environmental monitoring program, compliance monitoring of surface water and groundwater, underground storage tank (UST) removal operations, preliminary characterization, radiological surveys, site closure sampling, and facility design information. The data were reviewed to identify known high hazards sites and identify data gaps.

The corrective action process was then initiated, which included interim actions and characterization. The characterization process began in 1993 with the generation of RFI Work Plans for these two areas. Because the RCRA Part B Permit has not yet been issued, ANL-East has significant latitude in how to implement the Work Plans. The RFI fieldwork, begun in late 1994, is being implemented in phases. The phases were selected to generate information about potentially high-risk sites first; information about other aspects of the site will follow in later phases.

The process of evaluating units for interim action then began. Interim actions are evaluated for those units that (1) have significant contamination and (2) the cost of an expedited cleanup is within the available budget. A number of interim actions are funded and implemented according to the relative priority of the demands for the available funds. This work is coordinated with the IEPA to ensure that all applicable requirements are considered in planning the action.

A site is selected for interim action on the basis of the potential human health or environmental risk of the site as well as the magnitude and nature of the contaminated area. Any site that poses a threat of adverse health or ecological impacts is considered. Sites that may not represent a significant health risk but are small and have relatively simple, well understood problems are also considered for interim actions.

In the last few years, the available funding has been approximately equally divided between interim actions and characterization. To make funds available for interim actions, the characterization process was delayed and extended. For example, the majority of the RFI fieldwork for the 317 Area, which contains the sites with greatest risk, was delayed until 1996 to allow funds to be used for two interim actions at sites within the 317 Area. A similar situation exists in the 800 Area, where the RFI investigation uncovered significantly more contamination than originally anticipated at both an inactive landfill and a number of old UST sites. Interim actions are being planned for these areas. Unless additional funds are made available, completion of the RFI in both areas will be delayed.

Implementing this strategy has allowed ANL to move ahead on two fronts simultaneously, both initiating cleanup actions and gathering characterization information. Highlights of the program include the following interim actions that were planned and implemented by using available characterization information as well as limited, focused data collection efforts, some of which were part of the RFI process at these areas.

### **Map Tube Facility Decontamination and Dismantlement**

The Map Tube facility, an inground radioactive waste storage facility, contained a small amount of highly radioactive debris; in addition, the structure itself had significant contamination. The structure deteriorated over time, allowing rainwater to enter the storage tubes, which transported contaminants out of the structure into nearby soil and groundwater. The high levels of radioactivity also represented a radiation exposure hazard to workers in the area. To prevent further deterioration and reduce worker risk, an interim action was completed. The facility was characterized and decontaminated to remove the bulk of the source term. The cast iron tubes, which contained residual radioactivity (particularly in two lead-filled pipe joints in each tube), were removed from the structure. The tube was cut from the concrete matrix with a specially fabricated concrete coring tool. The cores were disassembled to remove the lead and were shipped off-site as low-level radioactive material. The core holes were filled with concrete.

### **Building 810 Paint and Solvent Disposal Area**

This unit, located outside of the former ANL-East paint shop, was contaminated with paint and paint solvents routinely discarded onto the ground surface outside of the shop door. With preliminary characterization data, the extent of contamination around the former disposal area was roughly delineated. Characterization data also determined that the soils presented an unacceptable risk to on-site workers residing in nearby facilities. Leaking USTs removed from the 800 Area showed that the soils there comprise low-permeability, low-organic clays not conducive to the migration of petroleum hydrocarbons. These data, along with subsurface data collected during geotechnical investigations of the local area and the nature of the materials disposed at the paint shop (petroleum hydrocarbons), were enough to conclude that the extent of contamination would be limited and local in extent. ANL-East wrote a work plan to conduct the interim action, which was approved by DOE and the IEPA. Portions of the facility were dismantled, and the contaminated soils were excavated and disposed of as industrial waste. Field screening and expedited laboratory analysis were used to facilitate the soils removal operation and complete the action. Then, the SWMU was presented to the IEPA as a candidate for NFA status. Several

thousand dollars were likely saved because this action was completed with existing data and knowledge of the site, instead of collecting additional characterization data. These savings can now be applied to the characterization and cleanup of other contaminated sites.

### **319 Area Interim Action**

A leachate seep emanating from the inactive 319 Area landfill is contaminated with relatively high concentrations of tritium. Shallow groundwater in the area is also contaminated with tritium and several volatile organic compounds. The leachate migrates to a shallow stream that flows off-site into a nearby forest preserve. Eliminating leachate from the landfill was determined to be too large and complex of an effort for an interim action, but it was determined to be feasible to collect the leachate at the seep and stop further migration of contaminated groundwater. An action was planned and initiated to construct a subsurface groundwater barrier wall and a hydraulic control system to capture and direct the leachate and shallow groundwater to the on-site wastewater treatment plant. This action will continue to provide interim control of releases until the final remedial action is in place.

### **317 Area South Vaults Demolition**

Three inactive inground concrete vaults, which stored radioactive wastes, are located in the 317 Area. The interiors of the vaults are contaminated with radioactive materials. The roofs on the vaults are badly deteriorated, allowing the incursion of rainwater, which transports the contaminants into the footing drain system of the vaults. One vault has been determined to be structurally unsafe because one of its walls failed. To eliminate the ongoing releases of radioactive material and reduce the worker risk, these vaults will be decontaminated to remove loose radioactive contamination and demolished. Because the soil surrounding these units is not fully characterized, only the aboveground portions of the units will be demolished, leaving the belowground portions in place until the soil is fully characterized and remediation efforts, if any, are implemented.

### **800 Area Underground Storage Tanks**

Several former USTs were located in the 800 Area. The USTs served emergency generators and steam boilers in the 800 Area before the tanks were removed in the mid-1970s. ANL included the former USTs in the RFI Work Plan because evidence suggested that some tanks may have released petroleum to the surrounding soil. In March 1995, ANL collected and analyzed several soil samples from the former tank locations. One location was discovered where petroleum hydrocarbons (diesel) had contaminated both perched groundwater and soil. Results of the Geoprobe™ sampling around the area showed that the former UST excavation was backfilled with sand. The native materials in the area comprise a tight, low-permeability, clay till. Once excavated, this clay acts as a natural "bathtub" that holds water for an extended period of time. On the basis of the physical characteristics of the excavation as determined by the field investigation and the nature of the contamination (low viscosity, hydrophobic petroleum products), it can be concluded that the soil contamination is localized to the excavation backfill and closely adjacent soils. With this information, ANL can design a cleanup action based on field screening data to remove the contaminated soil and restore the area for free use.

## **CONCLUSIONS**

By gathering available information and conducting limited, focused characterization actions at high-priority sites, ANL-East has formulated and implemented an environmental restoration program that allows cleanup of high-priority sites to begin while necessary characterization activities also proceed. Several trade-offs were required to accomplish this strategy with present funding limitations. The characterization phase of the Corrective Action process will take considerably longer because available

funds will also be used for cleanup. Also, by proceeding with interim actions before the characterization process is complete, the likelihood increases of selecting an interim action that is not compatible with the final remedy for the entire site. Therefore, careful selection and planning of the interim action is required. Moreover, even though ANL has coordinated these actions with the IEPA, the regulatory review process for voluntary interim actions is not as exhaustive as for final remedial actions covered by a CMS. Thus, the possibility of having to revisit the site of an interim action to document the satisfactory completion of the action increases. In spite of these risks, the use of an environmental restoration program that employs interim actions is expected to greatly accelerate the cleanup of the ANL-East site, resulting in significant cost savings.