#77

161657

REMEDIAL DESIGN ACTIVITIES
FULTZ LANDFILL SITE
BYESVILLE, OHIO
FINAL WORK PLAN

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Region 5 Remedial and Enforcement Response Branch
Chicago, IL 60604

Work Assignment No.	:	46-5NC6
Date Prepared	:	April 2, 1993
Contract No.	:	68-W8-0084
Prepared by	:	PRC Environmental Management, Inc.
Telephone No.	:	(312) 856-8700
EPA Remedial Project Manager	:	Tom Bloom
Telephone No.	:	(312) 886-1967

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

This work plan defines the activities that PRC Environmental Management, Inc. (PRC), will complete under ARCS (Contract No. 68-W8-0084) Work Assignment No. 46-5NC6. The U.S. Environmental Protection Agency (EPA) is implementing a record of decision (ROD) for the remediation of the Fultz Landfill Site located near Byesville, Ohio. This work is being performed under authority of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), as amended by SARA. EPA has developed a predesign/remedial design scope of work (SOW) to guide the implementation of the remedy and to serve as the basis for the current work plan. EPA's SOW establishes general objectives for the remedial design (RD), with specific predesign activities that include additional data collection and site security work. This work plan builds on the SOW to include the detailed data collection, technical reporting, and management aspects of the RD effort. This work plan is based on that SOW and kick-off meetings with EPA, the Ohio Environmental Protection Agency (OEPA), and the U.S. Army Corps of Engineers (COE). Comments received from the EPA, OEPA, and COE during December 1992 and January/February/March 1993 have been addressed in this Final Work Plan.

1.1 PROJECT OBJECTIVE

The major objective of this RD work assignment is to develop detailed construction plans and specifications for conducting EPA's selected remedial action at the Fultz Landfill site. EPA's selected remedy for the site is described in the ROD, which was signed by the regional administrator for Region 5 on September 30, 1991 (EPA, 1991a). The final design documents submitted by PRC will be suitable for inclusion in a bid package to solicit bids from contractors capable of constructing the remedial design. PRC will develop the final design in accordance with the requirements of the ROD; the scope of work for this assignment; any relevant EPA guidance documents, such as Superfund Remedial Design and Remedial Action Guidance (EPA, 1986); and the COE Architect Engineer Instruction Manual and other relevant COE guidance documents and specifications.

1.2 PROJECT DESCRIPTION

As stated in the ROD, this site will be remediated by capping the landfill and collecting and treating ground water and leachate. The remedy contains eight major remedial action components: (1) a fence surrounding the site, (2) subsurface structural supports for mine voids below the landfill, (3) surface water and sediment controls, (4) a multilayer cap, (5) a leachate collection system, (6) a ground-water extraction system, (7) a water treatment system, and (8) wetlands replacement as necessary.

PRC and ICF will conduct the RD in three phases. The first phase will include planning all predesign activities required to develop information for the RD and help establish ground-water treatment criteria. The second phase involves collection and analysis of the data required for design, establishing background levels for contaminants of concern, and installation of the fence. In the third phase of this project, PRC will prepare a preliminary design report to define the RD, develop plans and specifications to implement the RD, prepare capital and operation and maintenance (O&M) cost estimates, and develop an O&M plan and construction quality assurance (CQA) plan to be used during and after construction of the RD.

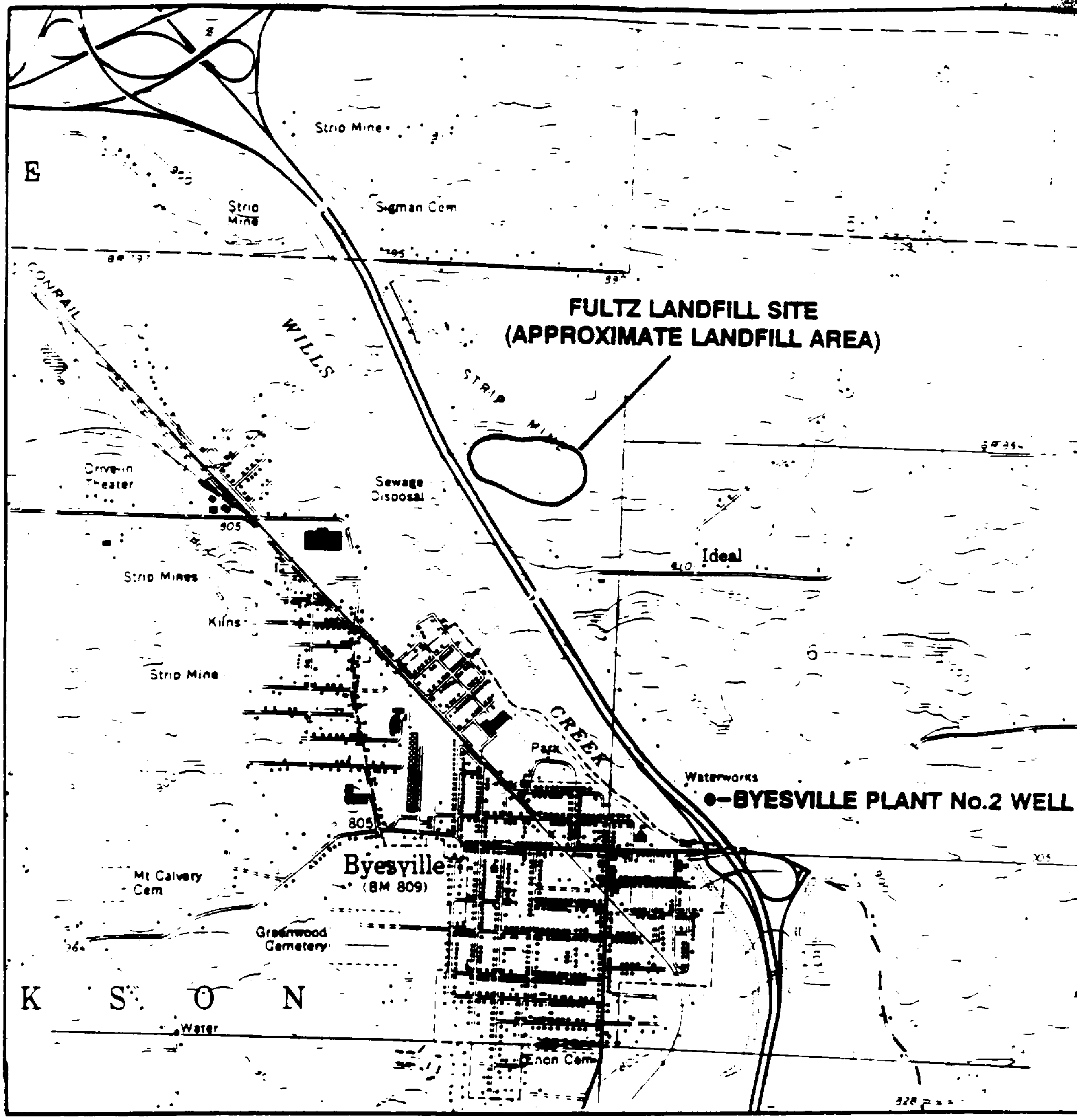
2.0 SITE BACKGROUND

The Fultz Landfill Site is a privately-owned sanitary landfill at which hazardous industrial wastes were allegedly co-disposed with municipal waste. The landfill has been closed since 1985. The site's remedial investigation and the feasibility study were both finalized in June 1991. The final remedial investigation report (EPA, 1991b) contains a detailed description of the site history, the physical characteristics of the site, and investigation findings. The Public Comment Feasibility Study Report (EPA, 1991c) developed ten remedial alternatives and evaluated six of the alternatives in detail. EPA's ROD (EPA, 1991a), issued in September 1991, presented the selected remedial action for the site: a multi-layer RCRA cap with ground-water extraction and treatment (Alternative 4).

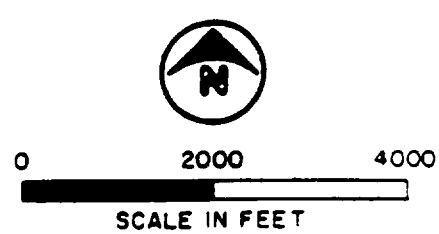
The following subsections discuss the site's location, surface water, and hydrogeology.

2.1 SITE LOCATION AND DESCRIPTION

The Fultz Landfill Site is located in an agricultural and coal mining region of east-central Ohio, approximately 75 miles east of Columbus. The site is situated in Jackson Township in the northwest corner of Military Lot 5, Township 1 North, Range 3 West in Guernsey County, Ohio. The site is about 0.5 mile northeast of the corporate limits of Byesville, Ohio, and about 1 mile southeast of the interchange of Interstates 77 and 70, as illustrated on Figure 1. The county's largest city, Cambridge, lies approximately 3 miles northwest of the site.



REFERENCE:
U.S.G.S. 7.5' TOPOGRAPHIC MAP, BYESVILLE QUADRANGLE, OHIO, DATED: 1961, PHOTOREVISED: 1972 AND 1975, SCALE: 1" = 2000'



QUADRANGLE LOCATION

FIGURE 1
LOCATION MAP
FULTZ LANDFILL, BYESVILLE, OH
REMEDIAL DESIGN WORK PLAN

As illustrated on Figure 2, the landfill occupies approximately 30 acres of a 58-acre land tract within Parcel 1 of Military Lot 5. Land use in the vicinity of the site is primarily wooded and pasture land to the south, north and east. To the west, land has been developed for residential and light industrial use.

The landfill is situated on a ridge that overlies abandoned coal mines in the Upper Freeport Coal seam. The north half of the landfill lies in an unreclaimed strip mine in this coal seam, while the south half of the landfill lies 25 to 80 feet above an abandoned, partially flooded deep mine in the same coal seam.

2.2 SURFACE WATER

The site is located within the Wills Creek drainage basin, a subdivision of the Muskingum River basin. The total area drained by Wills Creek is approximately 850 square miles. Wills Creek flows northward past the site and through the city of Cambridge, which uses the creek as a municipal water supply.

The drainage course on the north side of the landfill is designated Stream A. Prior to the existence of the landfill, Stream A was interrupted by surface mining activities, and several ponds were left in unreclaimed mine spoil. These ponds are numbered 1 through 6 on Figure 2.

2.3 HYDROGEOLOGY

The hydrogeology of the site area is complex because of underground and surface coal mining. The ground-water regime generally consists of two hydrogeologic systems. The first, designated the "shallow aquifer" system, consists of ground water at water table conditions within the unconsolidated alluvial deposits and surface mine spoil in the Stream A valley. The second system is the partially-confined "coal mine aquifer" that formed as a result of flooding in the interconnected abandoned underground coal mines of the Upper Freeport Coal seam. The coal mine aquifer is used by the city of Byesville as a source of municipal water, with the withdrawal point located approximately 1 mile south of the site, as shown on Figure 1.

LEGEND

- — — — LANDFILL AREA (APPROXIMATE)
- ——— PROPERTY BOUNDARY (APPROXIMATE)
- —···— STREAMS AND PONDS

N

0 400 800
SCALE IN FEET

FIGURE 2
SITE MAP
FULTZ LANDFILL BYESVILLE, OH

3.0 REMEDIAL DESIGN TASKS

PRC has organized the Fultz Landfill RD into seven major tasks. The seven tasks are (1) project management, (2) field management, (3) addenda to quality assurance project plan (QAPP) and health and safety plan (HSAP), (4) site mobilization, (5) predesign activities, (6) design activities, and (7) design support.

The tasks and activities were developed based on the SOW and discussions with EPA, OEPA, and COE. The predesign activities were discussed in detail at the kick-off meeting. The objectives of the predesign investigation are as follows:

- Design and install a fence to restrict access to the site
- Identify residential wells and well owners in areas most likely to be affected by the Fultz Landfill Site
- Further characterize the background and downgradient ground-water quality
- Determine the condition of the underground mine voids and obtain data for development of a mine stabilization plan
- Determine the feasibility of ground-water extraction in the shallow aquifer
- Further characterize the landfill's limits
- Investigate leachate treatment options
- Collect data for the design of a leachate collection system
- Determine the need for a ground-water diversion drain at the south side of the site

This section describes the specific activities that will be conducted under each task.

3.1 PROJECT MANAGEMENT

As part of the project management activities, PRC will staff, schedule, and track the costs for the RD. PRC will manage and staff the Fultz Landfill Site RD work assignment through its Chicago, Illinois, office and ICF's Pittsburgh office. Ron Riesing will serve as PRC's site manager (SM). He will be responsible for managing all aspects of the project, from preparing this work plan to submitting the final RD. He will work closely with EPA's RPM, Tom Bloom.

PRC has selected a project team for this assignment based on (1) previous site-specific experience and (2) qualifications and experience with technical issues to be addressed in the RD. Appendix A identifies members of the team.

ICF prepared the remedial investigation/feasibility study (RI/FS) for the Fultz Landfill Site. Because of ICF's detailed knowledge of the site, PRC has selected ICF to do all the predesign field activities. PRC will prepare the final plans and specifications to construct the remedial action (RA).

Proper scoping and budgeting is an important element in controlling costs for RD projects. Section 4.0 of this work plan provides a summary of projected labor and expense costs, broken down by individual RD tasks. PRC's cost monitoring system for this project will provide the SM with monthly reports of the current and total costs for each task. The SM will use this system to track budgeted versus actual expenditures to obtain a clear indication of any deviations in project costs. On-site personnel will advise the SM of actual expenditures so that the SM can check subcontractor invoices for reasonableness and compliance with the terms of the subcontract.

Section 5.0 of this work plan presents a schedule for RD activities at the Fultz Landfill site. The PRC SM will monitor progress against this schedule. The SM will be responsible for maintaining and, if necessary, updating the project schedule. The SM will also be responsible for acquiring additional project staff or resources to meet the project schedule.

PRC will submit detailed monthly progress reports to EPA and OEPA. These reports will update the project budget and document changes to the RD, describe significant problems and the steps taken to resolve those problems, identify changes in key project personnel, and project activities for the next month.

3.2 FIELD MANAGEMENT

Under this task, ICF will provide the overall management and administration of the predesign field investigation. Field management activities will be handled through ICF's

Pittsburgh, Pennsylvania, office and coordinated with PRC's office in Chicago, Illinois. Contact will be maintained with the EPA RPM by the SM during all phases of the project.

Field management activities will include controlling field activity budgets and schedules; selecting, coordinating, and scheduling field staff; and managing subcontractors.

3.3 ADDENDA TO QAPP AND HASP

ICF will prepare a plan addendum to modify the existing, approved QAPP and HASP for the Fultz Landfill Site remedial investigation (RI). It is anticipated that the QAPP addendum will primarily focus on the following:

- Project Description: The site description will be updated and the results of the Phase II RI will be added to provide the latest information on the nature and extent of site problems.
- Field Investigation Sampling Plan: Detailed plans for monitoring well installation, monitoring well sampling and residential well sampling will be prepared. (The technical work to develop the well installation and ground-water sampling plans is discussed in Section 3.6).
- Standard Operating Procedures: Procedures will be revised for the collection of ground-water samples to optimize the preservation of volatile organic compounds. Residential well sampling procedures will be revised.
- Analytical Procedures: The analytical methods for ground-water analysis will be revised to achieve detection limits below maximum concentration limits (MCL).
- Water Supply Inventory: An inventory form will be developed for use in the water supply field survey work.

The QAPP addendum will have the same basic organization as the original QAPP. Revisions will be addressed section-by-section, with "NO CHANGE" indicated where applicable. The HASP will be reviewed for potentially outdated materials and the final content of the addendum will be guided accordingly. Draft QAPP and HASP addendum will be submitted to the EPA as draft deliverables. Based on EPA's comments, a final addendum will be submitted.

3.4 SITE MOBILIZATION

Site mobilization activities include the setting up of a field office at the site, completing site surveys, installing a fence around the site, and identifying overhead and underground utilities affecting the remedial action (RA).

3.4.1 Field Support

The field support task will involve setting up a field office at the site and maintaining the office for use during the implementation of all field activities. The office will consist of a trailer with electrical and telephone hookups and will be located within the fenced RI waste storage area. The task will include setup and maintenance of a portable toilet and trash dumpster, as well as decontamination of equipment, and implementation of the HASP.

3.4.2 Site Surveys and Fence Installation

This task will consist of several elements, including a topographic and property boundary survey, fence design, fencing subcontractor procurement, and construction management. Fence installation activities will be among the first field activities initiated to expedite site security. The fence installation task will proceed prior to finalization of the QAPP addendum, as any relevant quality control issues, such as surveying, are addressed in the existing QAPP. Plans for implementation of fence installation are detailed below.

3.4.2.1 Topographic and Property Boundary Survey

Property boundary surveys, aerial topographic mapping, and a utility search will be performed under a single subcontract. This work will be performed early in the project to provide site data for fence design. Property boundaries will be researched at the appropriate municipal office in Cambridge, Ohio. A comprehensive review will be performed of all site plans and as built drawings of the facility which are available from OEPA or Ohio Department of Health. The deed(s) for the Fultz property and adjacent properties will be researched to develop the full property description needed for a complete field survey of the property boundary and adjacent properties that may be affected by the construction. This activity will include identification of property owners to the east and south of the site where monitoring wells are likely to be planned (see Section 3.5.2). The utility search, which may be performed by ICF, will include the collection of all available information regarding buried and overhead utilities located in the project area.

A comprehensive inventory of historical aerial photos was already performed by EMSL, Las Vegas. A total of 5 historical photographs are on file for the period 1951 through 1985. New topographic data are needed to facilitate design activities. The new mapping will provide a 1-foot contour interval and will be CADD compatible. The mapping coverage will include the entire Fultz property, the residential properties adjacent to the south, the ponded areas to the north, and the existing waste water treatment plant. Concurrent with obtaining the aerial photography for topographic mapping, infrared photos will be obtained. The infrared photos could be used for wetlands assessment, and may be useful in the identification of leachate seeps and areas where methane is generated.

Specification packages will be prepared for the topographic and property survey. Available COE guidance will be used in developing the specifications. The packages will be circulated to between three and five aerial topographic and surveying contractors requesting a Statement of Qualifications and a cost estimate for the work proposed. A meeting will be conducted at the site for the benefit of the invited offerors to review the required work and visit control monuments and other critical areas of the site. Following the meeting, an addendum will be prepared and circulated to officially address questions and comments raised by the surveyors and to revise the specifications, if needed.

3.4.2.2 Utility Search

A utility search will be performed to identify underground utilities located in the vicinity of the proposed construction. COE guidance will be used in completing the utility search. Location of utilities will be shown on a CADD compatible map.

3.4.2.3 Fence Design

Fencing at the site will consist of a 6-foot-high chain-link fence bordering the landfill and pond areas. The fence location will be established based on a field reconnaissance of potential routes and will be finalized in discussions with EPA and COE. At a minimum, 12-foot-wide gates will be placed at three locations: (1) behind the Ruth Fultz residence on Vocational Road, (2) behind the Alston Fultz residence, and (3) at the main site access location on Vocational Road.

Warning signs will be posted at intervals along the fence and at the gates. These signs will warn of hazardous chemicals present at the site and provide the telephone number of a contact for additional site information.

Specifications and plans for the site fence and warning signs will be prepared and submitted as a draft deliverable to EPA, OEPA, and COE for their review. ICF will communicate with the COE to acquire any standardized CADD drawings, details and specifications that may be needed for the fence construction plans to be developed for this project. The fence design and specifications will be finalized based on input from all agencies. Among the details to be addressed in the fence specifications will be the gate design, the distance the fence will be offset from the property line, how the fence will cross or skirt Ponds 4 and 5, clearing and grubbing areas, and design considerations relative to wildlife movement.

3.4.2.4 Fence Contractor Procurement

PRC will use Federal Acquisition Regulations (FAR) to procure the fence contractor. Availability of the bid specification package will be advertised in the local newspapers. A pre-bid meeting will be conducted at the site to walk the proposed fence perimeter and review the required work. After the pre-bid meeting, a bid package addendum will be prepared and circulated to officially address questions and comments raised by the contractors and to revise the specifications, if necessary.

3.4.2.5 Fence Construction Management

The fence construction will be monitored on a part-time basis by ICF staff, who will inspect the work for adherence to specifications, confirm pay items, and address field questions

3.5 PREDESIGN ACTIVITIES

Predesign activities include the water supply inventory, installation of ground-water monitoring wells, investigation of mine voids, defining the landfill perimeter, depth of waste, and depth of bedrock, ground-water testing and treatability studies, and miscellaneous sampling tasks Predesign activities will be summarized in a preliminary design report.

3.5.1 Water Supply Inventory

A water supply inventory will be performed to identify and sample all residential wells located in areas downgradient of the landfill where ground water is most likely to be affected by discharges from the landfill. In general, these downgradient areas are those underlain by the flooded Ideal Coal Mine (the coal mine aquifer), approximately 1 mile east of the landfill property and within 1.5 miles to the south. This includes the area between the landfill and the Byesville municipal well. The water supply inventory will also include an upgradient area northeast of the landfill, where residential wells, if found, may prove useful to determining background ground-water quality (determination of background water quality is an objective in this task). The tentative survey area for the water supply inventory is indicated on Figure 3. A technical memorandum will be submitted summarizing the results.

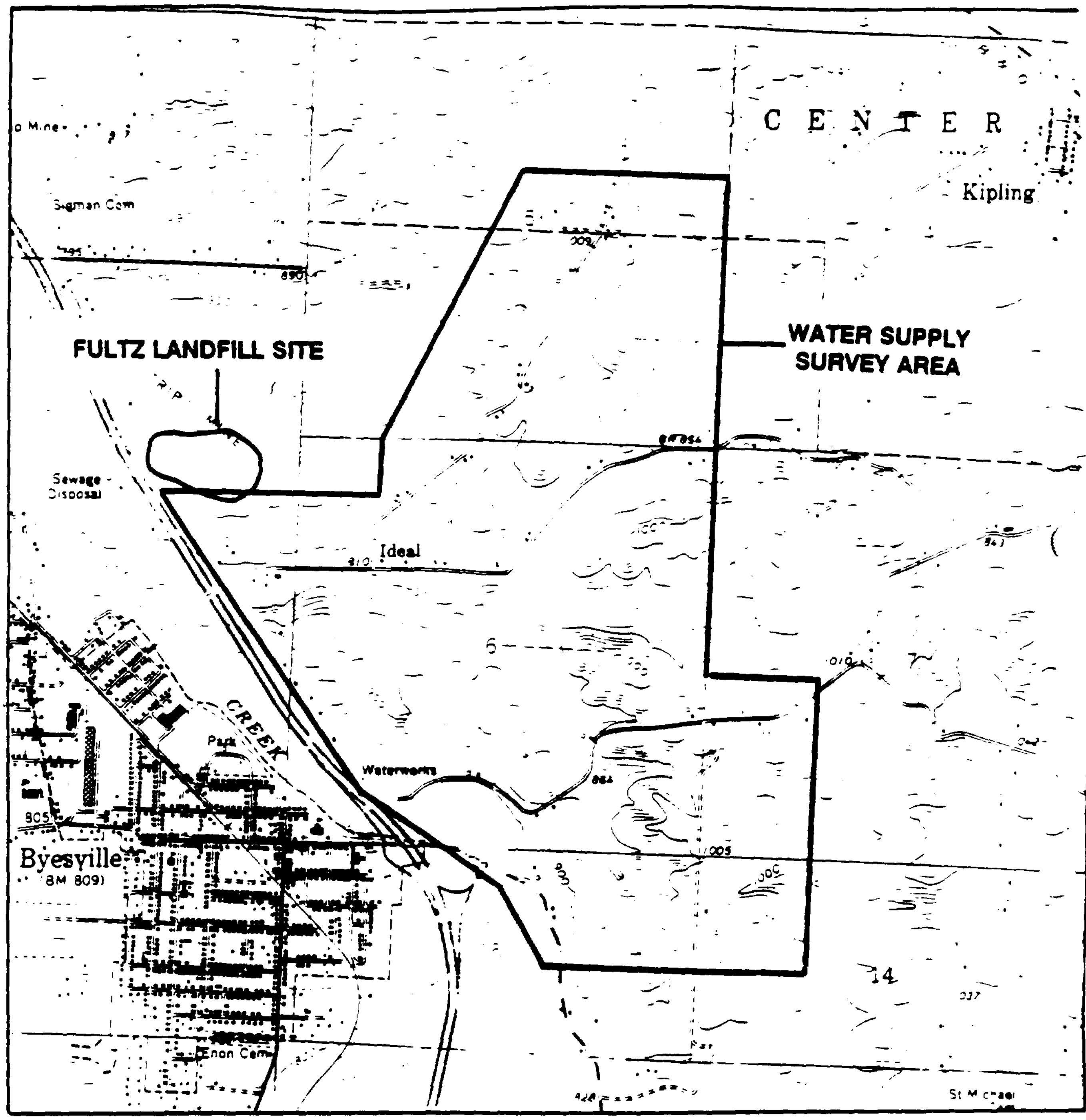
This activity will include three subactivities: (1) a records search, (2) a water supply verification, and (3) residential well sampling.

3.5.1.1 Records Search

The water supply inventory will begin with a records search to help identify properties where wells have been installed. The State of Ohio began to require registration of private wells as early as the late 1940s (ODNR, 1992). The state's records will be searched at the Ohio Department of Natural Resources (ODNR), Division of Water, Groundwater Resources Section in Columbus, Ohio. Based on this search, a list of private wells within the search area will be compiled. This list will include the property owners' name and address, and available well construction information, such as depth of well and depth of the casing or screen. PRC will verify the current ownership of the wells, if necessary, using the Guernsey County Tax records.

The Guernsey County Health Department will also be contacted to determine what information is available relating to the use of private wells within the survey area. Any additional well owners found through contacts at the health department will be added to the list of well owners.

Municipal water service coverage will be determined for the survey area. This information will be used to delineate areas with no municipal water service. The City of Byesville will be contacted for water supply service area information, and the service area will be



REFERENCE:
U.S.G.S. 7.5' TOPOGRAPHIC MAP, BYESVILLE QUADRANGLE, OHIO, DATED: 1961, PHOTOREVISED: 1972 AND 1975, SCALE: 1" = 2000'

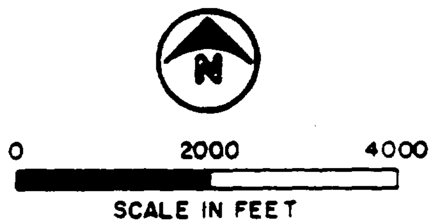


FIGURE 3
WATER SUPPLY SURVEY AREA
FULTZ LANDFILL BYESVILLE, OH
REMEDIAL DESIGN WORK PLAN

transferred to a 2X enlargement of the U.S. Geological Survey (USGS) Byesville 7.5' quadrangle map (1 inch = 1000 feet). This map will serve as a base map for the water supply verification activity.

3.5.1.2 Water Supply Verification

Well records obtained from state and local agency sources cannot be assumed to be complete documentation of well use within the survey area. The wells located from agency records will be verified in the field; furthermore, the water supplies of residences within the entire survey area will also be verified. Areas located outside of the municipal water supply coverage (no-service areas) will be considered high priority areas for water supply verification.

Water supply verification will consist of direct door-to-door canvassing of all residences within the survey area. Preparation for this task will include the development of a "Letter of Introduction" and a "Permission to Enter" form. The purpose of the letter of introduction will be to educate the property owners or residents as to the purpose of the well inventory. ICF will assist EPA draft the letter of introduction and the letter will be copied onto EPA letterhead. The purpose of the permission to enter form will be to formally authorize EPA (or its contractor) to enter the premises and to sample well water. If EPA cannot supply this form, ICF will draft one for EPA's review and approval.

An interview form will be developed for use by the interviewer and submitted to EPA for approval. At a minimum, the form will include questions to verify the following:

- Source of potable water at the residence
- The nature of any well water use
- Details on well depth and construction
- Willingness to allow sampling

The well construction information obtained from residents and available well records will be used to estimate which aquifer the well is screened in. (Direct measurement of well depth is a highly intrusive activity that generally requires opening the well and removing its pump. For this reason, owner information and available well records will be relied on for well construction information.) Where well depth information cannot be obtained, the well driller who drilled the well will be contacted for any available information. In the absence of well depth, the water level and pump depth can provide useful information for the identification of the aquifer. Ground surface elevations at the wells will be estimated using the 7.5' USGS topographic map.

An attempt will be made to contact all of the property owners or residents within the survey area. Where no residents are found at home, the property will be revisited at least once, with additional visits as time allows during the course of the field work. At high priority areas (areas known to be outside of municipal water service coverage and residences known to have a well) the residences will be revisited frequently until a contact is made. Often, neighbors will know whether the nearby residents have functioning wells, and if necessary, such second-hand information will be used to complete the inventory.

3.5.1.3 Residential Well Sampling

Residential well sampling will be performed, if possible, during the initial site visit. A Permission to Enter form will be presented and explained to the property owner or resident. The permission form will be signed by the property owner or resident prior to sampling. If necessary, the field team will schedule a return visit to perform the well sampling. Field measurements for the residential wells will include pH, temperature, specific conductivity, redox potential, and dissolved oxygen. Each well located during the inventory will be sampled for the following:

- Target compound list (TCL) organics [excluding pesticides and polychlorinated biphenyls (PCB)]
- Target analyte list (TAL) inorganics

The analytical methods used will be those appropriate for achieving detection limits below the MCLs or non-zero MCLGs. The QAPP addendum will cover the residential well sampling and analysis requirements in detail. EPA Region 5 will perform the data validation.

3.5.2 Ground-Water Monitoring Wells

Twelve additional monitoring wells will be installed for the purposes of determining background ground-water quality, filling data gaps, and better defining the contaminant plume. This activity has been divided into four subactivities: (1) monitoring system design, (2) drilling contractor procurement, (3) well installation, and (4) monitoring well sampling.

3.5.2.1 Monitoring System Design

The first step of this task will be to review all available data relating to the deep mine configuration and ground-water gradients. Based on this review, a monitoring plan will be developed to meet the objectives of the task. A well installation plan and ground-water sampling plan will be submitted as part of the field sampling plan in the QAPP addendum. These plans will detail well locations, well construction, and access requirements.

A total of 12 new wells are planned. Five of the wells' locations will be chosen based on the objective of better defining background ground-water quality in the shallow and coal mine aquifers. These wells will be located primarily east and northeast of the site. The location of five other wells will be chosen to better define ground-water quality and gradients (pathways) from the landfill to the coal mine aquifer. Two wells will be positioned for the purpose of better defining the range of chemical concentrations in areas known to be downgradient of the landfill.

There are several key variables controlling ground-water quality in the coal mine aquifer at this site, and these variables must be considered in the well installation and sampling plans. Background metals concentrations in the coal mine aquifer are expected to vary naturally, depending on the location in the aquifer. Eh and pH conditions in the water partially control the solubility of metals in the aquifer, and these conditions are expected to differ in flooded versus non-flooded sections of the mine. Thus, metals concentrations in the partially flooded mine sections north of the site are expected to differ from the completely flooded mine sections to the south (this effect was noted in the RI report). Furthermore, high precipitation conditions can cause large volumes of water to flood into the mine, resulting in considerable variation in water quality at any one location.

This sampling will attempt to estimate the range of background concentrations to be expected in the coal mine aquifer entering the site. The well installation plan will include a spatial distribution for background wells in both flooded and partially flooded mine sections. Multiple-round sampling will be performed, and water levels in the coal mine aquifer will be measured to help account for water quality variations caused by flooding.

Monitoring wells will be constructed using 2-inch I.D. PVC screens and risers. All screened zones will be sand packed to at least 2 feet, but not more than 3 feet, above the screen top. Annular well seals will consist of 3 to 5 feet of bentonite clay above the well screens, and bentonite-cement slurry grout to the ground surface. Protective casings will be grouted in place and the wells equipped with locking caps. Details of the drilling and well installation specifications will be provided in the QAPP addendum.

Property ownership at the planned well locations and access areas will be determined at the appropriate municipal office in Cambridge, Ohio. The investigation team will present the property owners with access agreement forms for their review and signature. The access agreement forms will be supplied by EPA. If necessary, property ownership information will be supplied to EPA, who will, in turn, negotiate and arrange the necessary access agreements.

3.5.2.2 Drilling Contractor Procurement

A bid specification package will be prepared for the drilling and monitoring well installation work, and the package will be circulated to five or more drilling contractors. (Note: this bid package will also include the installation of test borings, piezometers, wells, and test pits discussed later in this section). A pre-bid meeting will be conducted at the site to review the required work. Following the pre-bid meeting, a bid package addendum will be prepared and circulated to officially address questions and comments raised by the contractors at the pre-bid meeting and to revise the specifications, if needed.

The cost estimate for the well installation subcontract has been developed based on assumptions on average well depth and previous drilling costs. The cost estimate is discussed in Section 4.0.

3.5.2.3 Well Installation

Soil sampling will be performed in the well borings at approximate 5-foot intervals. Well borings will be advanced through bedrock using air rotary drilling methods. Details regarding monitoring well construction will be provided in the QAPP addendum. Drilling and well installation will be monitored full time by an ICF geologist.

3.5.2.4 Monitoring Well Sampling

The 12 new monitoring wells will be developed according to the QAPP (or QAPP addendum) and allowed to "rest" for a 2-week period prior to sampling. In addition, up to six of the existing monitoring wells will be selected for redevelopment and sampling. Each of the wells will be sampled on four occasions during a 1-year period (approximately once every quarter). Field measurements will include ground-water elevation, pH, redox potential, temperature, turbidity, specific conductivity, dissolved oxygen, and chloride. A sample collection method will be used that minimizes the loss of volatiles. Filtered and unfiltered ground-water samples will be analyzed for the following:

- TCL organics (excluding pesticides and PCBs)
- TAL inorganics.

The analytical methods used will be appropriate for achieving detection limits below MCLs. In some sampling rounds, consideration will be given to limiting the analytes to the risk-driving chemicals identified in the RI. The QAPP addendum will cover the monitoring well sampling and analysis requirements in detail. EPA Region 5 will perform the data validation. A summary report will be submitted quarterly.

3.5.3 Remedial Design Data Collection

This task will involve collecting additional data needed to support the remedial design elements identified in the ROD. The design elements requiring additional data include:

- Stabilization of the Ideal Coal Mine by the construction of grout pillars or by using mine flushing techniques where the mine underlies the fill
- Construction of a RCRA cap over the waste fill
- Construction of a ground-water extraction system to intercept and treat contaminated ground water and reduce water levels in the shallow aquifer
- Ground-water and surface water diversion structures on the northern or upgradient side of the fill
- Construction of a leachate collection system on the downgradient side of the fill
- Assessment of a new multipurpose detention pond, if needed for sedimentation and erosion control and wetland protection.

The additional data needed to support these design elements are as follows.

- Mine Stabilization:
  - Height and condition of the mine void
  - Stage of mine collapse
  - Degree of overburden fracturing
  - Strength of the floor material
- RCRA Cap:
  - Lateral extent of the waste fill
  - Detailed topographic mapping
- Ground-Water Extraction System
  - Specific capacity, transmissivity, hydraulic conductivity, and storage coefficient for the shallow aquifer
- Ground-Water Diversion Structures:
  - Water levels in natural materials at the elevation of the fill at the south side of the site
- Leachate Collection System:
  - Depth and profile of the waste near the north side of the landfill
  - Depth to bedrock
- Multipurpose Detection Pond (if necessary)
  - Geotechnical sampling and testing along the detention pond embankment

The following field investigation activities are designed to address the data needs listed above. Data collection locations discussed in the following sections are shown on Figure 4.

3.5.3.1 Investigation of Mine Voids

The southern portion of Fultz landfill is underlain by voids created by underground room and pillar mining. The location of rooms and pillars is known from old mine maps; however, this has to be verified with exploratory borings. Stabilization of mine voids underlying the landfill is essential for the long-term stability of the landfill and the closure cover. Design of stabilization measures (grout pillars) for the mine voids requires the following information:

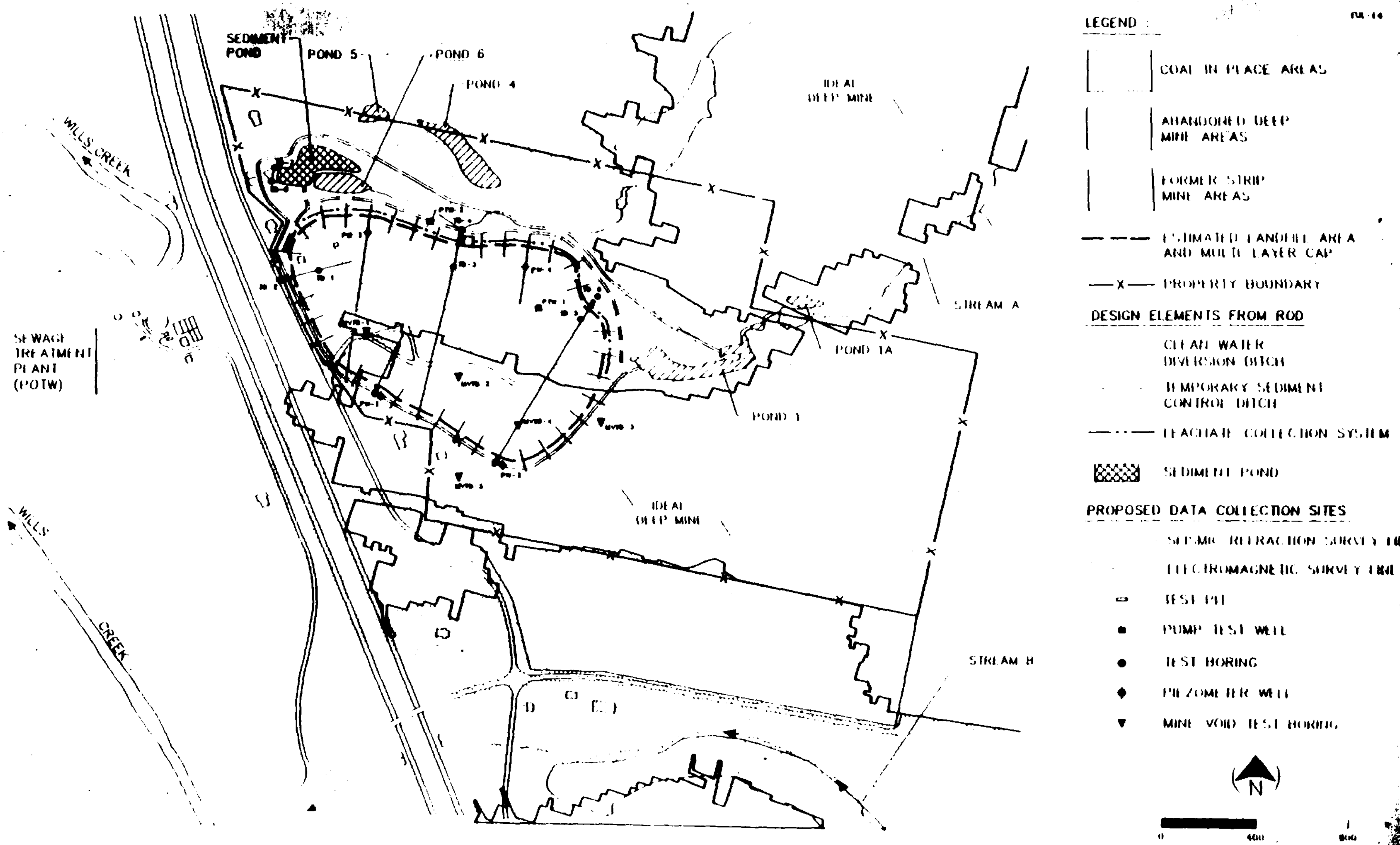

SEDIMENT POND
POND 5
POND 6
POND 4
WILLS CREEK
IDEAL DEEP MINE
STREAM A
POND 1A
POND 1
SEWAGE TREATMENT PLANT (POTW)
IDEAL DEEP MINE
WILLS CREEK
STREAM B
LEGEND :
COAL IN PLACE AREAS
ABANDONED DEEP MINE AREAS
FORMER STRIP MINE AREAS
ESTIMATED LANDFILL AREA AND MULTI LAYER CAP
PROPERTY BOUNDARY
DESIGN ELEMENTS FROM ROD
CLEAN WATER DIVERSION DITCH
TEMPORARY SEDIMENT CONTROL DITCH
LEACHATE COLLECTION SYSTEM
SEDIMENT POND
PROPOSED DATA COLLECTION SITES
SEISMIC REFRACTION SURVEY LINE
ELECTROMAGNETIC SURVEY LINE
TEST PIT
PUMP TEST WELL
TEST BORING
PIEZOMETER WELL
MINE VOID TEST BORING
N
0
400

FIGURE 4

- The height and width of mine openings
- Compressive strength of mine pillars
- Compressive strength of floor material and tensile strength of roof rock
- Condition of the mine openings and supports
- Slope of mine floor and roof
- Lithology, moisture content, dip, and bedding thickness of overlying bedrock

This information will be obtained by completing the following tasks:

- Collecting and analyzing existing mine maps
- Drilling five boreholes
- Logging of the soil and rock samples by a geologist

The existing mine maps will be reviewed to locate the five boreholes. The mine void test borings will be positioned at five locations. Approximate boring locations are shown on Figure 4. Two test borings will be placed through mine pillars and three borings will be through mine voids. Because it is impossible to accurately predict the location of void spaces and coal pillars inside the mine, it is possible, if not likely, that the borings will miss void spaces on the initial attempt. If mine voids are not encountered on the first attempt, the boring will be grouted and new borings will be drilled nearby. Borings drilled through the landfill for the purpose of the mine void investigation will be designed to prevent the migration of contaminants into the mind voids. The waste intervals will be sealed-off with casing prior to advancing the borings to mine level. This sealing, which must be done with every attempt, will be a significant part of the overall cost of the activity. Borings drilled outside the landfill area will be more economical because they will not undergo the sealing procedure.

The test borings will be constructed to serve as grouting holes for the later construction phase. The bore holes will be a minimum of 10 inches in diameter and will be bored at least 2 feet into the competent bedrock surface. A nominal 6-inch diameter, schedule-80, PVC surface casing will be centered in the hole and the annulus pressure grouted with a neat cement grout from the bottom of the hole up to 5 feet below land surface. The top 5 feet of the annulus will be grouted with concrete. The boring will be extended through the inside of the surface casing down through the bedrock using an NX-sized rock core drill. The rock core will extend down through the mine void to collect a sample from the mine floor. The lithologic characteristics, fracture description, and rock quality designation (RQD) index of the rock core will be recorded by the site geologist. If successfully completed, the rock will be reamed out to a finished diameter of 6 inches. This will allow a video camera to be lowered into the void space to examine the borehole sidewalls and condition of the mine in the area around the boring.

Samples of the rock core collected from the pillars and floor of the mine will be tested for compressive strength (ASTM D-2938-86), or for consolidation if the material recovered from the mine floor is unconsolidated (ASTM D-2435-90). Samples of the rock core collected from the mine roof will be broken using the Brazilian Test method to evaluate its tensile strength (ASTM D-3967-86).

The information complied from this effort will be used to determine the following:

- Number and location of the grout pillars required to stabilize the mine voids
- Composition of grout mix
- Method that will be used to install the grout pillars

3.5.3.2 Define Landfill Perimeter

The position of the landfill perimeter will be defined to support the design of the multi-layer RCRA landfill cap. This will be accomplished by one of two options.

- Option 1: Conduct an electromagnetic survey (EM) and seismic refraction (SR) survey along the fill perimeter, with confirmatory test pitting at selected locations
- Option 2: Conduct a test pitting operation to estimate the landfill limits

To determine which option will be used, a trial run will be performed using EM and SR instruments, thus testing their ability to define the landfill's perimeter at this site. To determine which option will be used, a trial run will be performed using EM and SR instruments, thus testing their ability to define the landfill's limits at this site. If it is found that the fill limits can be reliably located using this method, Option 1 will be fully implemented. If the EM survey produces inconclusive results, Option 2 will be implemented.

3.5.3.2.1 Option 1

The advantages of Option 1 are that it could provide the needed data at less cost than Option 2, with a minimal amount of intrusive work and with fewer potential health and safety problems. If Option 1 is implemented, an EM survey will be done around the perimeter of the fill at the locations shown on Figure 4. The results obtained from these geophysical tests will be correlated to the actual field conditions by constructing test pits through the landfill cover at five locations along the landfill perimeter.

The EM survey will be conducted by establishing 100-foot long survey lines, thus crossing the presumed fill perimeter at right angles. The lines will extend 50 feet on either side of the presumed perimeter. Conductivity readings of the subsurface materials will be taken at 5-foot intervals along each survey line. The lines will be placed at approximately 100-foot centers around the perimeter of the fill area. Two EM readings will be collected at each station.

An SR survey will be conducted around the perimeter of the fill at the approximate seven locations shown on Figure 4. These locations were selected primarily to investigate the thickness of the fill and the depth to the bedrock surface (see Section 3.8.3) but, where fill thickness equals 0 foot, the SR survey will also aid in defining the perimeter of the fill.

The EM and SR survey lines, and the location of the test pits, will be tied to the site's land coordinate survey system, thus the exact location of the lines and test pits can be reconstructed if marking stakes are damaged.

3.5.3.2.2 Option 2

The advantage of Option 2 is that it would provide a very accurate estimation of the extent of the landfill waste. However, Option 2 has a higher cost than Option 1, a substantial amount of waste-intrusive work, and an increased health and safety risk that would require photoionization detection (PID) and methane monitoring.

If Option 2 is implemented, test pits will be excavated at approximate 100-foot centers along the entire perimeter of the landfill. The current estimated landfill limit will be used to base the beginning of the test pitting, but the final length of the pits could be relatively long, depending on the actual waste configuration. The test pits, as proposed, would only be used to define the margin of the waste. The depth of the pits would be limited to the depth necessary to reveal the presence of waste, then extended laterally until the margin of the waste was defined. This procedure will minimize the handling of investigation derived waste. Details of handling the investigation derived waste are discussed in Section 3.5.4. Consequently, the pits would not be useful to determine the composition of the waste, to characterize the foundation soils, to ascertain the material excavatability, to determine leachate levels, or ground water levels. These data will be obtained from the various borings and piezometers drilled for this and other activities. Cost estimates are based on Option 2.

3.5.3.3 Define Depth of Waste and Depth to Bedrock

The thickness and profile of the waste and the underlying mine spoils will be determined by the SR survey performed as part of Option 1 in the above section. A limited test boring program will be performed with the SR survey to confirm the results.

A trial SR survey will be conducted to determine the utility of this method (see Section 3.5.3.2). Should the trial provide inconclusive results, a test boring program will be performed along the seven survey lines as an alternative, with five borings drilled on each line to the depth of the bedrock. The test boring program has been included in the cost estimates.

The SR survey lines will begin 50 feet off the fill and extend up onto the fill approximately 250 feet. The lines will be placed to investigate the thickness of the fill as it overlies the mine spoils and on the south side of the fill (the uphill side of the site) where the natural surface has likely been altered to provide cover material. The depths defined by the SR survey will be correlated to actual depths by constructing eight test borings, which will extend from the land surface to the bedrock depth at the approximate locations shown on Figure 4.

The test borings will be constructed using hollow stem augers, and continuous sampling will be conducted from the surface to the bedrock depth. Water levels will be observed in all test borings. Samples of the spoils underlying the fill and other competent materials will be obtained using split-spoon samplers. Past experience indicates that split-spoons will not provide adequate samples of the fill material, thus this material will be sampled from the auger cuttings. All waste and soil cuttings from borings drilled through the fill will be handled as described in Section 3.5.4. Cuttings produced from borings located off the landfill will be disposed of on the landfill surface under the cap.

Three of the test borings (TB-1, TB-3, and TB-5) will be completed as piezometers, P-1, P-2, and P-3, to evaluate the potential for subsurface drainage from the bedrock into the fill area (discussed in Section 3.5.3.4). Two test borings, TB-4 and TB-5, could be completed as observation wells to be used in conjunction with the planned aquifer pump test (discussed in Section 3.5.3.5), if their locations are appropriate. At the completion of this phase of the investigation, test borings serving no other intended purpose will be grouted using a neat cement grout.

3.5.3.4 Investigate On-Site Subsurface Drainage from Bedrock

Four of the test borings drilled as part of the work for this task will be completed as piezometer wells. The purpose of the wells will be to evaluate the potential for subsurface drainage to enter the fill from the upgradient side of the site. Because bedrock is fine grained and dips to the south, it is likely that subsurface drainage in the bedrock is limited and flows along the bedding planes to the south, away from the landfill. In the area where native soils overly the bedrock surface, ground water may flow along the bedrock surface and enter the fill. Piezometer well PW-1 will be placed where the bedrock outcrops at the fill perimeter, and piezometer well PW-2 will be placed where native soils overly the bedrock surface. These wells will be screened over a 25-foot-long interval beginning 5 feet below land surface.

3.5.3.5 Conduct Shallow Aquifer Pump Tests

Two aquifer pump tests are planned to evaluate the efficiency of the ground-water pump and treat system. This system will be used to reduce the water levels in the shallow aquifer sediments. Pump test well PTW-1 will be located in an area where the aquifer may reach its maximum depth and PTW-2 will be positioned where the shallow aquifer may consist of a significant thickness of natural alluvial sediments. The wells will be designed and built to serve as long-term extraction wells for the proposed ground-water pump and treat system. A minimum of three observation wells will be built in conjunction with the pumping wells. The observation wells (not shown on Figure 4) will be placed at distances of 20, 50 and 100 feet from the pumping wells, and one of the wells will be placed on a 90-degree axis from the axis formed by the other two wells. If properly located, the test borings (TB-4 and TB-5), constructed for activities discussed in Section 3.5.3.4, will be completed as two of the required observation wells.

Discharge from the pump test wells is anticipated to be between 1 and 2 gallons per minute with drawdowns at the wells between 10 and 15 feet. The expected test duration is 36 to 72 hours. The effluent will be contained and stored on site in one or two tank trucks as necessary. Samples of the effluent will be collected at 6-hour intervals for the duration of the test to estimate the equilibrium concentrations during pumping. The samples will be analyzed for the TAL inorganics using the EPA Contract Laboratory Program (CLP), plus sulfate and chloride. The results of this testing will be used as input parameters for the treatability study to be conducted under Section 3.5.3.6. The wastewater will be handled as described in Section 3.5.4.

3.5.3.6 Ground Water and Leachate Seep Treatability Studies

The available ground-water and leachate characterization data indicates the following contaminants would require treatment because of exceedances of discharge concentration levels:

- Organics: Methylene chloride, benzene, 2-methylnaphthalene, bis(2-ethylhexyl)phthalate, and N-nitrosodiphenylamine
- Inorganics: Antimony, barium, beryllium, cadmium, iron, lead, nickel, and thallium

Organic compounds can be treated using chemical oxidation and carbon adsorption, and inorganic compounds can be removed using precipitation and filtration, if necessary. Ancillary processing might include pH adjustment or neutralization.

PRC will perform treatability evaluations of the following treatment technologies:

- Chemical oxidation
- Granular activated carbon adsorption
- Chemical precipitation

Treatability evaluations of these technologies will provide a database for selecting appropriate technologies when there is better definition of limits for discharge to Stream A. The treatability evaluation will be performed on a representative mixture of contaminated ground water and leachate, and treated samples will be analyzed for volatile and base-neutral organic compounds and metals. The water quality based effluent limits established by OEPA will be used in the treatability evaluation. Specific details of the proposed treatability evaluation follows.

- Chemical Oxidation: Chemical oxidation tests will be performed in a one liter batch reactor that can be fitted to provide ultraviolet light (UV) radiation. In these tests, treatment with ozone, hydrogen peroxide, or a combination of both, with or without UV light, will be evaluated. A parametric set of 12 test runs will be performed to identify reasonable process design and operating parameters [for example, reaction time, oxidant dosage, pH, and catalyst effects (UV and FE++.)].

- Granular Activated Carbon Adsorption: Granular activated carbons (GAC) adsorption tests will be performed in 0.5-inch diameter glass columns according to ASTM procedures. Up to 20 liters of water will be run through the columns in an attempt to achieve breakthrough. Two test columns with different loads of carbon will be operated, and samples will be collected for analysis in 1-liter aliquots. Ten samples from each test run will be analyzed.

- Chemical Precipitation: Reduction of the metal contaminants in the ground-water/leachate mixture from the Fultz Landfill can be achieved by chemical precipitation. The objective of this treatability evaluation would be to determine precipitation conditions (for example, pH) and reagent dosage that would yield most effective all around reduction, recognizing that optimum precipitation conditions for different metals are variable. These tests will be conducted in jar-type reactors, and it is anticipated that a series of six to eight tests will be performed. To assist in the coagulation and flocculation of precipitate particles, an anionic polymer will be used at a dose of about 1 milligram per liter (mg/L). Treated water from half of the tests will be analyzed for the metals of concern with and without filtration. A total of 10 samples will be analyzed for the metals of concern.

  This evaluation will entail chemical analysis of about 34 samples for GC/MS [volatile organic compounds (VOC) and base-neutral] and 10 samples for inorganic metals analysis.

All sample residuals generated by the laboratory performing the treatability screening analysis will be returned to the site, and handled as described in Section 3.5.4. These residues include soils and untreated wash water. A technical memorandum will be prepared to summarize the results of the treatability study.

3.5.3.7 Evaluate Existing Publicly Owned Treatment Works

After the results of the treatability study are known (Section 3.5.3.6), the potential for using the nearby publicly-owned treatment works (POTW) will be investigated. The existing plant is located immediately west of the site, across US Highway 77. Municipal officials and state regulatory officials will be consulted to determine their willingness to allow the use of the existing plant or to upgrade the plant's capacity to handle the predicted effluent characteristics. If there is willingness to make use of the existing plant, an analysis will be undertaken to: (1) evaluate the costs required to convey the waste to the plant; (2) upgrade or modify the existing facility, as necessary, to accommodate the added flows; and (3) to amend the facility's existing permits. A study will be conducted to determine the benefits and costs associated with building an on-site treatment plant versus making use of the existing POTW. If an on-site treatment plant is needed, boreholes will be drilled at the proposed location of the plant to obtain data for foundation design.

3.5.3.8 Gas Monitoring Probes

Three to five gas monitoring probes will be located south of the landfill to determine if methane gas is migrating toward the residences or other structures located in this area. Gas samples will be collected to determine the composition of the gas.

3.5.3.9 Miscellaneous Sampling Activities

Samples will be collected from on-site spoils piles to characterize the suitability of these materials for use as on-site fill, for construction of berms, or for other on-site construction purposes. The samples will be tested for grain size distribution (ASTM Methods D1140 and C136) and compaction (ASTM Method D698). Two to three sampling locations will be located beyond the southeast portion of the landfill to determine if the soils will be suitable for use as landfill cap materials.

Three test borings will be drilled near Stream A for the purpose of collecting data for the design of the sedimentation pond. It is assumed that this pond will ultimately be positioned near the location indicated on Figure 4 (labeled "Sediment Pond"). The borings will be drilled to bedrock. Data of primary importance will be depth to bedrock, soil classification and consistency. Soil analyses will include grain-size distribution, shear strength, and laboratory permeability.

3.5.4 Handling of Investigation Derived Wastes

This activity will include the on-site management of investigation derived wastes. These wastes will include the following:

- Drill cuttings generated during the construction of monitoring wells, test borings, and aquifer pump test wells

- Waste water produced during purging of monitoring wells, during the aquifer pump test, and during the decontamination of equipment.
- Disposable protective clothing and other disposable health and safety equipment.

All solids (drill cuttings and disposable health and safety equipment) will be placed in ring top 55 gallon drums. Soils removed during the construction of test pits will be reinterred into the pit immediately after collection of all data from the pit construction. Surface soils will be stockpiled separately and used to cover waste. All storage drums and containers will be transferred to a fenced waste storage area.

All waste waters produced as part of sampling activities, during the aquifer test, or during equipment decontamination will be placed in a bulk storage container and will be appropriately sampled for disposal at an EPA and OEPA approved POTW or treatment facility.

At the completion of the investigation, all wastes and soils collected will be incorporated into the landfill, covered with clean soil as appropriate, and located beneath the landfill cap.

3.6 DESIGN ACTIVITIES

As required by the ROD, the RD will include the following:

- (1) An 18-inch thick gas collection layer, a multilayer RCRA cap, including (2) a 24-inch compacted clay layer having hydraulic conductivity less than or equal to 1 x 10^{-7} centimeter per second, (3) a 40-mil-thick high-density polyethylene (HDPE) liner, (4) a drainage layer, (5) a 30-inch-thick earth fill, and (6) a 6-inch thick topsoil layer. The use of very low density polyethylene (VLDPE) liner and other variations to the ROD may be evaluated in the preliminary design.
- A mine stabilization program
- A leachate collection system
- A ground-water extraction system
- A leachate and ground-water treatment system
- Surface water control systems
- A wetlands replacement program (if necessary)

The RD will be developed to (1) address compliance with all applicable and relevant and appropriate requirements (ARAR) specified in the ROD and (2) minimize any adverse impact on public health and the environment. The RD will incorporate the use of currently accepted environmental control measures, technologies, construction practices, and techniques. Guidance from EPA, OEPA, and COE will be utilized in developing the RD.

The design will be completed in three phases: (1) preliminary design, (2) intermediate design, and (3) prefinal and final design. The outcome of each design phase will be submitted to EPA and OEPA for review. The contents of all three design phases are described below.

3.6.1 Preliminary Design

PRC will submit a preliminary design report when RD activities are approximately 30 percent complete. The preliminary design report will present the following:

- Results of the predesign activities described in Sections 3.5, including any data on in situ permeability tests
- Technical requirements of the design to enable the final design to provide an operable and usable remedial action
- Overall strategy and basis for the RD
- A description of all assumptions and design parameters used to develop the design
- Methane gas collection and disposal systems
- The unit processes selected for the treatment of leachate and ground water
- Any limitations of the leachate and the ground-water treatment system
- Treatment system performance criteria
- The methods to be used to verify if cleanup standards provided in the ROD are met by executing the designed remedial action
- A preliminary construction cost estimate in accordance with COE guidelines
- A construction schedule
- A possible strategy for contracting the construction activities

PRC will submit supporting materials along with the preliminary design report. The supporting material will include preliminary drawings and sketches of the remedial action components. Comparative analysis of alternate cover components may be provided. The report may also include example calculations showing how design components were determined, an outline of required specifications, and a drawing of the proposed site layout during construction activities. All drawings and specifications will be prepared according to the Architect Engineering Instruction Manual, prepared by the U.S. Army Omaha Engineering District Corps of Engineers.

Review of the preliminary design report by EPA, OEPA, and other involved agencies is critical because the report will present the basic framework for the final RD. After the preliminary design report is submitted, PRC will schedule a review meeting to discuss the agencies' questions and comments on the preliminary design.

3.6.2 Intermediate Design

PRC will submit an intermediate design that contains the RD's plans and specifications. This will be submitted when the RD activities are approximately 60 percent complete. The intermediate design will address the review comments on the preliminary design report.

3.6.3 Prefinal And Final Design

PRC will submit a prefinal design when drawings and specifications for the RD are 95 percent complete. Before submitting the prefinal design, PRC will coordinate and cross-check all written technical specifications with the design drawings. The prefinal design will address review comments on the intermediate design. The prefinal design will also include a capital and O&M cost estimate, an O&M plan, a construction schedule, and a CQA plan. After submitting the prefinal design, PRC will schedule a meeting with EPA and other reviewing agencies to discuss the prefinal design.

PRC will submit a final design when drawings and specifications are 100 percent complete. The final design will include all elements contained within the prefinal design; it will also address review comments on the prefinal design.

3.7 DESIGN SUPPORT

PRC will prepare the following four documents to support the remedial design: (1) an O&M plan, (2) a capital and O&M cost estimate, (3) a construction schedule, and (4) a CQA plan to be followed during the implementation of the remedial action. Draft copies of these support documents will be submitted to EPA and OEPA when the RD is approximately 95 percent complete. Details of all four support documents are discussed below.

3.7.1 O&M Plan

PRC will prepare an O&M plan to be completed prior to start up at the Fultz site. PRC will submit a draft version of the O&M plan with the prefinal design. After addressing the review comments, PRC will submit a final O&M plan with the final design. The O&M plan will outline elements such as O&M activities and schedule, potential O&M problems, monitoring and testing requirements, corrective action requirements, safety precautions during O&M, O&M equipment, and recordkeeping and reporting requirements. The O&M manual produced from the plan can only be completed after all equipment is selected by the remedial action contractor. Individual elements of the O&M plan are briefly described below.

O&M Activities and Schedule -- The plan will include all tasks required to operate and maintain the constructed remedial alternative, normal operating conditions, and the schedule for O&M tasks.

Potential O&M Problems -- The O&M plan will identify potential problems that may occur with the remedial alternative over time. The plan will require that identification of sources of information and common or anticipated remedies for these problems be included in the O&M manual.

Monitoring and Testing Requirements -- The plan will detail requirements for the long-term ground-water monitoring program specified in the ROD. The plan will identify appropriate sample collection locations and procedures; required laboratory test methods and quality assurance and quality control; the monitoring frequency and requirements that must be satisfied before the frequency can be reduced; and verification sampling procedures if performance standards are exceeded during routine monitoring.

Alternate O&M -- The O&M plan will describe procedures to prevent releases of hazardous substances if systems were to fail. This section will also describe the availability of the resources required to prevent a release if a system failure were to occur.

Corrective Action Requirements -- The O&M plan will identify corrective action measures that may be taken if problems are observed during inspections of the constructed remedial alternative. This section of the plan will also include guidelines for selecting appropriate corrective actions if monitoring results show significant increases in ground-water contamination or if damage to structural components of the remedial action is identified. A tentative schedule for implementing corrective actions will also be included in the O&M plan.

Safety Precautions During O&M -- The plan will suggest protection levels and safety precautions to be addressed in an HASP to be prepared by the O&M crew.

O&M Equipment -- This section of the O&M plan will describe the equipment requiring O&M, equipment to be used to carry out the O&M activities, the maintenance requirements for the site equipment, the procedures for installing monitoring equipment, and the replacement schedule for site equipment.

Recordkeeping and Reporting Requirements -- The plan will describe procedures for recording and reporting O&M activities. Items covered will include operating logs (if necessary), inspection logs, laboratory records, monitoring data, maintenance records, records of O&M costs, emergency notification procedures, and monthly and annual reports to state agencies.

3.7.2 Capital and O&M Cost Estimate

PRC will submit an estimate of capital and O&M costs to EPA. This estimate will be submitted when the remedial design is 30 and 100 percent complete. These cost estimates will update the costs of the remedial action presented in the feasibility study, based on the final remedial design. The estimates will be in the form requested by COE.

3.7.3 Construction Schedule

PRC will submit an estimated schedule for implementing the remedial design to EPA. This schedule will also present the critical components of the RD's construction.

3.7.4 Construction Quality Assurance Plan

PRC will prepare a CQA Plan to be followed during construction of the remedial action. The CQA plan will cover the responsibility and authority of organizations involved in construction, CQA personnel qualifications, inspection activities, sampling and testing requirements, and CQA reporting and documentation requirements.

4.0 COST ESTIMATE

This section provides a cost estimate for all activities described in Section 3.0 of this work plan. Table 4-1 presents the total cost estimate for this work assignment. Table 4-2 summarizes the total hours. This estimate includes 5,660 level-of-effort (LOE) hours and 500 clerical hours for PRC and 6,481 LOE hours and 312 clerical hours for ICF. The total project LOE is 12,141 and 812 clerical hours with a total project budget of $1,307,480. The breakdown of ICF LOE hours is included in Appendix B. Other direct costs (ODC) by activity, and travel costs by activity are detailed in Appendix C.

The following sections briefly discuss the assumptions made to estimate the LOE and costs for each activity.

TABLE 4-1
TOTAL COST ESTIMATE

	ACTIVITIES	Project Management	Field Management	QAPP/ HASP	Field Support	Site Surveying and Fencing	Water Supply Inventory	Monitoring Wells	Design Data Collection	Remedial Design	Design Support	TOTAL
LOE Hours	Professional Level 4	200								700	100	1,000
	Professional Level 3	100								1,000	400	1,500
	Professional Level 2	100								1,000	400	1,500
	Professional Level 1	200								800	100	1,100
	Technical Level 2									800	0	800
	ICF LOE		224	458	192	404	468	2202	2000	464		6,461
	Total LOE Hours	600	224	458	192	404	468	2202	2000	4404	1000	12141
	Clerical Support	100								300	100	500
	ICF Clerical Support		60	48	24	24	12	64	32	48		312
Total Hours		*700*	*284*	*506*	*216*	*428*	*480*	*2,266*	*2,101*	*4,812*	*1,100*	*12,063*
	Direct Labor (a)	$16,190	$0	$0	$0	$0	$0	$0	$0	$69,184	$22,000	$127,266
	Fringe Benefits (@ 30%)	$6,317	$0	$0	$0	$0	$0	$0	$0	$34,302	$8,634	$49,842
	Overhead (@ 37%)	$6,090	$0	$0	$0	$0	$0	$0	$0	$32,028	$8,476	$47,097
Subtotal		*$28,595*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$156,204*	*$40,310*	*$224,627*
Travel												
	Travel (b)	$472	$0	$0	$0	$0	$0	$0	$0	$4,610	$0	$5,082
Total Travel Cost		*$472*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*	*$4,610*	*$0*	*$5,082*
Subcontracts												
	ICF (c)		$23,311	$32,096	$16,341	$27,607	$34,081	$194,016	$204,390	$34,390		$636,190
Special Pool Subcontracts												
	Fencing					$100,000						$100,000
	Drilling							$80,000	$134,700			$184,700
	Survey & Mapping					$35,000						$35,000
	Waste Disposal								$15,000			$15,000
Subtotal SPS		*$0*	*$0*	*$0*	*$0*	*$135,000*	*$0*	*$80,000*	*$149,700*	*$0*	*$0*	*$384,700*
Other Direct Costs (d)		$1,850	$0	$0	$0	$0	$0	$0	$0	$7,390	$1,150	$10,390
Subtotal		*2322*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*11010*	*1150*	*15302*
General & Administration (@ 5.4%)		$1,665	$1,290	$1,733	$880	$9,901	$1,840	$10,242	$15,184	$10,880	$2,230	$62,024
Subtotal (TOTAL COST)		*$32,482*	*$24,870*	*$33,829*	*$19,331*	*$229,478*	*$35,921*	*$224,280*	*$369,280*	*$212,363*	*$43,707*	*$1,225,232*
Base Fee (@ 3%) + 2% of Subcontr		$975	$504	$694	$307	$5,633	$737	$4,836	$8,296	$6,027	$1,311	$29,401
Award Fee (3.84 x Total LOE Hours) + SSP x .025		$2,336	$703	$1,621	$669	$6,306	$1,567	$9,045	$11,067	$15,803	$3,540	$52,847
Subtotal (Base Fee & Award Fee)		$3,311	$1,207	$2,315	$1,076	$11,939	$2,304	$13,883	$19,363	$21,830	$4,851	$82,248
TOTAL COST & FEE		$35,803	$25,067	$36,144	$20,406	$241,417	$38,318	$238,143	$388,632	$234,193	$48,558	$1,307,480

Notes:

(a) See ICF breakdown Appendix B for ICF labor LOE and costs.

(b) See ICF breakdown Appendix C for ICF travel costs.

(c) See ICF breakdown Appendix B for ICF P levels and labor costs.

(d) See ICF breakdown Appendix C for ICF ODC costs.

TABLE 4-2

TOTAL HOURS
SUMMARY BY P LEVEL

	PRC	ICF	TOTAL
P4	1,000	154	1,154
P3	1,500	1,230	2,730
P2	1,500	2,610	4,110
P1	1,160	1,671	2,831
T2	500	498	998
T1		318	318
Total LOE	5,660	6,481	12,141
C1	500	312	812
TOTAL	6,160	6,793	12,953

4.1 PROJECT MANAGEMENT

PRC estimates that project management activities will take place for approximately 18 months and require an average of 20 LOE hours per month. The preparation of this work plan is included in the total LOE and cost for project management. Other direct costs are based on typical use rates for telephones, computers, express mail, and photocopying. Travel costs for the kick-off meeting in October have been included.

4.2 FIELD MANAGEMENT

ICF will prepare and submit monthly financial, technical, and schedule status reports to PRC. This activity will be used to control project budget and schedule, and to select, coordinate, and schedule staff and subcontractors. The estimate for this task includes two 2-day trips to Chicago for ICF to meet with the EPA RPM.

4.3 QAPP AND HASP ADDENDUM

The costs for this task cover a complete review of the existing approved QAPP and HASP documents and preparation of an addendum to accompany the original document. The costs for this task include the development of a well installation plan and ground-water sampling plan. The cost estimate assumes a draft document, and one final draft document for both the QAPP and HASP.

4.4 FIELD SUPPORT

The cost estimate for field support includes a mobile trailer for a period of 9 months at $275 per month; maintenance of electric and telephone utilities for a period of 9 months; mobilization and monthly rental of basic equipment such as phone, answering machine, and sample storage; vermiculite and sample packaging materials; and CLP sample containers and CLP documentation forms for tracking. If possible, all sampling and health and safety (H&S) equipment will be obtained from the EPA Equipment Pool at no cost to the project.

Also included under this task is implementation of the site safety plan, including an H&S briefing meeting at initiation of the field activities and an internal H&S audit.

Equipmen: ·ental costs for other tasks have been included under the individual task estimates on the a. mption that EPA equipment will not be available.

4.5 FENCE INSTALLATION AND SITE SURVEYS

The fence design specifications will employ standardized details and drawings where possible. The fence bidding schedule assumes use of draft specifications to initiate the procurement process, with final specifications circulated to bidders following agency review and comment on the draft specifications. The estimated subcontractor cost for this activity is $160,000, as stated in the FS report. The final cost will be dependant on final design. Cost-saving measures will be considered, including alternate fence routing to shorten the total length. The task assumes part-time inspection of fence installation, with costs based on four 1-day visits by two project staff during the course of the construction work. Where possible, inspections will be done during the course of other site field activities.

The cost estimate assumes that the topographic mapping and the property survey will be performed by one subcontractor under a single subcontract.

4.6 WATER SUPPLY INVENTORY

The length of time required for the field survey will be dependant on the number of residences within the survey area. It is assumed for cost estimation that the field survey and residential well sampling work will be completed by a two-man team over a 3-week period.

4.7 GROUND-WATER MONITORING WELLS

The cost estimate for well installation and sampling is preliminary because the well locations, well depths, and site assess requirements are not yet established, and the ground-water sampling plan has not been developed. The drilling and well installation cost estimate is based on Fultz Landfill Phase II remedial investigation well costs of approximately $4,200 per well. Well installation time is assumed to require a two-man crew 5 weeks at 50 hours per week. Well sampling is estimated based on four sampling rounds. Each sampling round assumes that a two-man crew will require 2 weeks to sample 18 wells.

The schedule for this task assumes four sampling rounds at approximate 3-month intervals, a 3-week window for completion of each well sampling round, completion of laboratory analysis 4 weeks after each sampling round, and completion of data validation 4 weeks after laboratory analysis.

4.8 DATA COLLECTION TO SUPPORT RD

Mine Void Characterization: It is assumed that the mine void borings and borehole camera survey will require a two-man team 4 weeks for completion. The cost estimate assumes that three of the five mine void test borings (MVTBs) will penetrate in-place coal and will have to be redrilled. Actual project costs will reflect the cost to successfully complete five test borings through mine voids.

Landfill Perimeter Delineation: The cost to identify the landfill perimeter assumes that Option 2, installation of 37 test pits at 100-foot intervals, will be required to define the landfill perimeter. Option 2 assumes that a two-man team will require 4 weeks to conduct the work with the test pitting subcontractor. If the fill perimeter can be successfully defined with the proposed Option 1 (an EM survey at 100-foot centers with five conformational test pits) the project costs will be reduced.

Landfill Depth Characterization: The cost to define the depth of the landfill waste and the depth to bedrock assumes that Option 2 (installation of 35 test borings) will be required to adequately define the depths. Option 2 assumes that a two-man team will require 4 weeks to conduct the work with the drilling subcontractor. If the depths can be adequately defined with the proposed Option 1 (seismic refraction survey with 8 test holes to confirm the results) the project cost will be reduced.

Pump Testing: The cost estimate to conduct the shallow aquifer pump test assumes that two of the test borings used to confirm the depth of the bedrock will be completed as observation wells. The cost estimate assumes a two-man team three weeks for well installation, development, and pump testing, and waste water handling, with three man-weeks for preparation of a technical memorandum at the end of RD data collection. It is assumed that the pump test at each well will be completed in 72 hours, and that ground water will be contained.

4.9 REMEDIAL DESIGN

The cost for this task assumes there will be a preliminary, intermediate, prefinal, and final design submittal. It has been assumed that five copies of all reports, plans, and specifications will be submitted for each review.

The majority of ODCs will be needed for photocopying and reproduction of reports, plans, and specifications; computer drafting for project drawings; telephone; and mail.

It is assumed that there will be eight two-man 1-day trips to the site (one per month) during the design phase. It is assumed that all design review meetings will take place in Chicago.

4.10 DESIGN SUPPORT

The preparation of the various plans and reports will require ODCs for photocopying, telephone, computers for word processing, and mail.

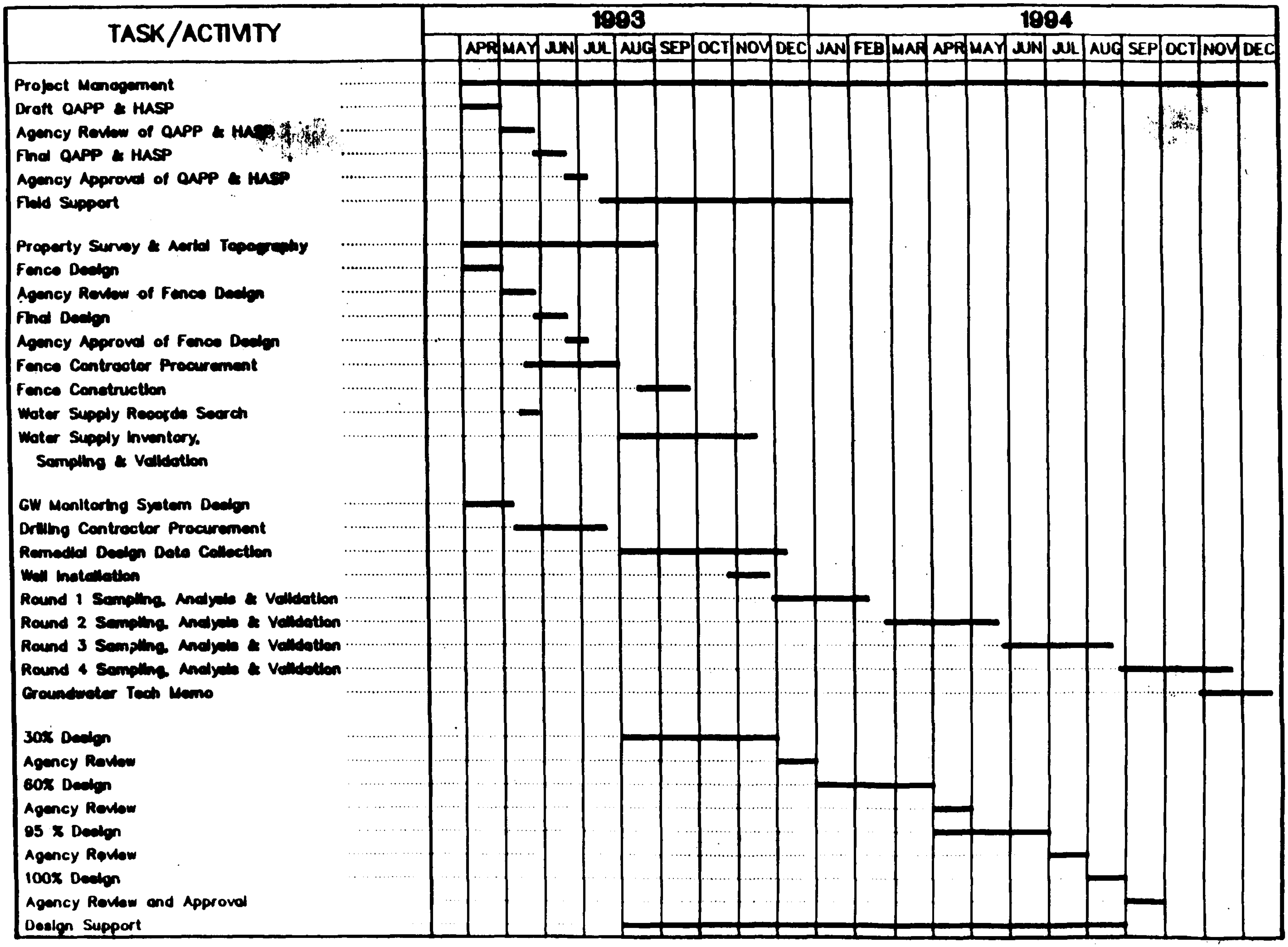
5.0 PROJECT SCHEDULE

PRC has developed a project schedule leading to submittal of the final remedial design by September 30, 1994. Figure 5 presents the master schedule. The schedule assumes that remedial design of the multilayer RCRA cap can begin prior to completion of all the predesign activities. Activities that would not be complete when cap design started would be hydraulic characterization of the landfill ground water and leachate and the subsurface characteristics around the site.

The project schedule is flexible and may fluctuate depending on site conditions, laboratory turnaround time, or other unanticipated reasons.

The PRC project manager will maintain frequent communications with the EPA RPM and will inform him of any significant variations from the schedule shown on Figure 5. The schedule includes 30 days for EPA and COE's review of major deliverables. Delays could impact the overall schedule.

FULTZ LANDFILL DESIGN - PRELIMINARY SCHEDULE



REFERENCES

Environmental Protection Agency (EPA), 1986. Superfund Remedial Design and Remedial Action Guidance. Office of Solid Waste and Emergency Response, OSWER Directive 9355.0-4A, June.

Environmental Protection Agency (EPA), 1991a. Record of Decision, Fultz Landfill Site, Byesville Ohio, September 1991.

Environmental Protection Agency (EPA), 1991b. Final Remedial Investigation Report, Fultz Landfill Site, Byesville Ohio, June 1991.

Environmental Protection Agency (EPA), 1991c. Public Comment Feasibility Study Report, Fultz Landfill Site, Byesville Ohio, June 1991.

Ohio Department of Natural Resources (ODNR), 1992. Division of Water, Groundwater Resources Section, personal communication with Joel Vormecker/Staff Geologist, July 20, 1992.

APPENDIX A
PROJECT TEAM

APPENDIX A
PROJECT TEAM

PRC Environmental Management, Inc. (PRC), and ICF personnel will be working on the predesign investigations and remedial design. The following people are expected to work on the Fultz Landfill Remedial Design (RD) during the life of the project. The résumes for the individuals are on file with U.S. Environmental Protection Agency (EPA).

<u>PRC</u>

Ronald Riesing	Kostas Dovantzis
Andy Suminski	Kurt Thomsen
Raj Rajaram	Mike Baker
Manoj Mishra	Bob Overman
Majid Chaudhry	Chris Rogers
Peggy Flaherty	Glen Barwegen
Harry Ellis	John Dirgo
Bhupen Gandhi	Kumar Topodurti
Chriso Petropoulou	Nelson Allen

<u>ICF</u>

Jim Ackerman	Patrick Sullivan
Jim Krueger	Arch Richardson
Dennis Guthrie	Kevin Hammer
Kathleen Conner	Jeanette Duvall
Lee Miller	Larry Deutsch
Dick McCracken	Biff Cummings
Dave Cercone	Teresa Lacaria
Angelo Pittone	George Wong-Chong
Kristine Uhlman	Joe Touhill