REMEDIATION WORK PLAN
NRC RESPONSE

HARVARD AND BURT AVENUE SITES
NEWBURGH HEIGHTS, OHIO

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PREPARED FOR

NUCLEAR REGULATORY COMMISSION

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PROJECT NO. 88646

REMCOR, INC.
PITTSBURGH, PENNSYLVANIA

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1.0 INTRODUCTION

Under contract to Allegheny International, Inc. (AI), Remcor, Inc. (Remcor) has prepared this report as the response to the Nuclear Regulatory Commission's (NRC) Demand for Information dated June 15, 1988. The Demand for Information relates to the Harvard Avenue (plant) Site and the Burt Avenue (dump) Site, both located in Newburgh Heights, Ohio. The NRC Demand for Information requires AI to provide the following:

- A plan for decontamination of the Harvard Avenue Site including contractor's name, budget, and schedule
- A report on progress in developing work plans to decontaminate the Burt Avenue Site.

This report addresses both of these items. Chapter 1.0 describes the current physical condition and radioactive contamination data for both sites and defines the objectives of the effort to be accomplished under these work plans. Chapter 2.0 presents the proposed work plan for completion of remediation of the Harvard Avenue Site. Chapter 3.0 outlines the progress and approach to developing a work plan for removal of the Uranium-238 (U-238) contamination of the Burt Avenue Site. Chapter 4.0 lists target milestone dates for implementation of these work plans. Chapter 5.0 is estimates of the costs of work plan implementation. Chapter 6.0 and 7.0 identify the contractors and key personnel who will implement these work plans and summarizes the qualifications of both the firms and the individuals.

1.1 WORK PLAN OBJECTIVES

Chemetron Corporation (Chemetron), an AI subsidiary, holds NRC License No. SUB-1357 (Docket No. 40-8724) for possession of radioactive materials at the Harvard Avenue and Burt Avenue Sites. It is AI's intent to terminate this license. License termination requires compliance with NRC regulations and license conditions related to decontamination of licensed sites. To comply with those regulations and conditions, AI has established the following objectives for this work plan:

- Completion of decontamination of the Harvard Avenue Site to NRC criteria to allow unrestricted release of the property.

- Preparation of a work plan for decontamination of the Burt Avenue Site and radiological surveying to verify uncontaminated access to a storm sewer inlet on the property.

At both sites, decontamination will consist of removal of the radioactive materials placed on those sites as a result of Chemetron's operations. Activities related to license termination and site decontamination will comply with the applicable requirements of Title 10, Code of Federal Regulations (CFR), Parts 40 and 70 (10 CFR 40 and 10 CFR 70). Based on earlier correspondence with NRC, decontamination criteria of 35 pico-Curies per gram (pCi/g) average and 45 pCi/g peak at any four sample points have been used in developing this work plan.

1.2 DESCRIPTION OF SITES

AI's authority and responsibility at the Harvard Avenue and Burt Avenue Sites is limited to removal of the remaining low level radioactive contamination caused by materials placed at the sites by AI's subsidiary, Chemetron Corporation. The manufacturing plant at Harvard Avenue has been sold. The Burt Avenue Site is owned by other parties; AI has no past or present ownership interest in this property.

Harvard Avenue Site is vacant land which was the site of a manufacturing building. The building has been removed and the site is now graded level. The property is fenced on three sides and closed on the fourth side by building wall. There is direct access by gate, at grade level, to Harvard Avenue. The most recent available radiological survey data for this site is presented in Appendix A.

Burt Avenue Site is an industrial dump containing various waste materials from numerous sources. Some building rubble, primarily concrete and bricks, was placed in this dump by AI. After placement, this rubble was found to be contaminated with low levels of U-238. The property includes a ravine and the contaminated rubble is near the existing surface on one side of that ravine. The property is fenced and access is controlled by a locked gate. The most recent available radiological survey data for this site is presented in Appendix B.

2.0 WORK PLAN - HARVARD AVENUE SITE

The work plan section of this report will describe the following items:

- Health and Safety Program
- Site Preparation
- Excavation and Blending
- Packaging and Handling
- Transportation and Disposal
- Verification
- Remediation Report
- Restoration and Demobilization.

2.1 HEALTH AND SAFETY PROGRAM

The Remcor Health and Safety Program is designed to identify, evaluate, and control safety and health hazards to provide healthy and safe working conditions. The following sections under this heading will describe some of the methods used to obtain these conditions.

2.1.1 General Corporate Program

Each Remcor employee whose job assignments involve the potential for exposure to hazardous materials participates in an ongoing medical surveillance program and receives a minimum of 40 hours training as detailed in 29 Code of Federal Regulations (CFR) 1910.120 Hazardous Waste Operations and Emergency Response. In addition, each employee whose work requires supervision of employees involved in hazardous remediation receive an additional eight hours supervisor training in health and safety. Before beginning work at a hazardous waste site, each employee whose job assignment involves potential for exposure to hazardous materials is informed of site hazards, operations, and hazard mitigation activities.

Records of these training activities and the yearly medical monitoring program are maintained in the Corporate Health and Safety Department.

2.1.2 Health and Safety Plan

Remcor developes a "site-specific" Health and Safety Plan for each project location prior to initiating site activities. The responsibility for the development of the Health and Safety Plans is assumed by the Corporate Health and Safety Department. Each Health and Safety Plan is submitted to the designated owners representatives and to the Remcor Project Manager for review and approval to assure that all known or reasonably assumed hazards have been identified and appropriate controls have been provided.

All health and safety plans include, at a minimum, the following information:

- Program organization and responsibilities
- Site characterization and hazard assessment
- Medical surveillance requirements
- Work practices and site control
- Personal protective equipment
- Air Monitoring
- Materials handling and decontamination
- Emergency response
- Record keeping.

2.1.3 Personnel Protective Clothing and Equipment

The minimum level of personnel protection will consist of:

- Disposable Tyvek coveralls
- Cotton gloves
- Rubber steel toe boots
- Hard hat
- Safety glasses.

Depending on air monitoring results (refer to Section 2.1.4) a full-face air-purifying respirator or a half mask with goggles utilizing appropriate cartridges may be used.

2.1.4 Air Monitoring

Air quality monitoring will be an integral part of the health and safety program; the collected data will serve as input to decisions regarding worker protective measures, work procedures, and emergency responses.

During work activities, continuous air monitoring for dust concentrations will be established. Any dust concentration equal or in excess of 10 milligrams per cubic meter (mg/m^3) will be cause to initiate use of air-purifying respirators. This is equal to 1/100 of the National Institute of Occupational Safety and Health (NIOSH) recommended exposure limit for uranium. This calculation is based on the maximum known uranium concentration in the soil at the site.

2.1.5 Dust Control

The basic dust suppressant will be a water spray during work activities. The Environmental Protection Agency handbook, Dust Control at Hazardous Waste Sites, will be used as a reference for maximum dust control.

2.1.6 Access Control

Access control will be established and monitored at the outer perimeter of the contamination reduction zone (CRZ). The purpose of the access control is to minimize potential contamination of workers and protect the public from the site's potential hazards.

2.1.7 Decontamination Program

A designated area will be designed for personnel to drop off protective clothing in a manner as to minimize potential contamination via skin contact, inhalation, or ingestion. Boot wash water and contaminated material removed shall be collected and disposed in an environmentally-accepted manner.

2.2 SITE PREPARATION

A site must be controlled to reduce the possibility of exposure to any contaminants present and their transport by personnel or equipment from the site.

The possibility of exposure or transfer of contaminated substances can be reduced or eliminated in a number of ways, including:

- Setting up barriers to exclude unnecessary personnel from contaminated areas
- Minimizing the number of personnel and equipment at the site
- Establishment of work zones within the site
- Establishment of control points for access to and egress from work zones
- Conduct of operations in a manner to reduce exposure of personnel and equipment
- Implementation of appropriate decontamination procedures.

One method to prevent or reduce the migration of contamination is to delineate zones on the site where prescribed operations occur. Movement of personnel and equipment between zones and on to the site itself is limited by access control points. By these means, contamination is expected to be contained within certain relatively small areas on the site and its potential for transfer will be minimized. Three contiguous zones are recommended:

- Zone 1 - Exclusion Zone
- Zone 2 - Contamination Reduction Zone
- Zone 3 - Support Zone.

2.2.1 Exclusion Zone

The exclusion zone is the area where contamination exists. All personnel within the exclusion zone must wear the required level of protective gear.

2.2.2 Contamination Reduction Zone

The CRZ is located adjacent to the exclusion zone and will serve as an area of transition between the contaminated and clean zones. The decontamination stations for personnel and equipment will be established in the CRZ to reduce the possibility of support zone contamination.

2.2.3 Support Zone

The support zone will be established as the noncontaminated/clean zone. Support equipment and other functions needed to keep the exclusion and CRZ operating properly will be stationed in this zone.

2.3 REMEDIATION METHODS

The extensive data defining the residual U-238 contamination remaining at the Harvard Avenue Site has been used as the basis of remediation plan development. This data, as provided by NRC, is included with this work plan as Appendix A. Figure 1 displays a summary of this data on a schematic map of the Harvard Avenue Site. This section describes the methods to be used to complete remediation of this site and summarizes the excavation quantities projected as necessary to implement this plan.

2.3.1 Existing Data

Data mow available to describe current U-238 concentrations within Harvard Avenue Site (Appendix A and Figure 1) indicate the presence of small discrete areas of elevated U-238 concentrations. These areas are shallow, ranging in depth from a surficial deposit to a maximum, at one data point, of four feet. According to available data, most contaminated soils are one-foot deep or less. These areas are indicated in Figure 1. Table 1 presents locations, estimated dimensions, and estimated volumes of areas of U-238 contamination identified from the available data. These areas will be the primary targets of the excavation program.

2.3.2 Guide Excavation

The small number and sizes of the identified areas of elevated U-238 concentrations make guided excavation the practical approach to completion of remediation at the Harvard Avenue Site.

At each "hot spot", excavation will be guided by a health physics technician with an instrument designed for uranium detection. Field radiological surveys and excavation control will be done with a Field

Instrument for Detection of Low Energy Radiation (FIDLER). This instrument is designed specifically for detection of low energy photons such as those emitted by U-238. It utilizes a sodium iodide probe with diameter of five inches and thickness of one-quarter inch. Solid state electronics facilitate field use and provide durability.

Excavation will be done by a tractor mounted backhoe with a 0.25-cubic yard bucket. In some cases, excavation will be done with hand tools. Guided excavation will proceed generally from north to south starting at grid line 100N.

The health physics technician and the excavators will work closely to guide excavation with maximum precision to remove contaminated soils with minimum excavation of uncontaminated materials. The goal will be complete site remediation with minimum soil removal and disposal. Excavated material will be placed in shipping containers as it is removed from each hot spot. Field testing will be done continuously during excavation activities to direct those activities and assure that remediation criteria are met at each hot spot. Field testing also will reduce excavation of uncontaminated soils. An actual area and depth of each hot spot will be determined by the field testing program.

As the hot spot excavation proceeds, contaminated surface soils outside the identified hot spots will be removed or dispersed to attain the remediation criteria. This work will be done using the front-end loader bucket on the backhoe tractor. This soil work will be limited to the materials handling required to meet the criteria and will be done by shallow scraping. The scraped soils will be tested in the field before they are placed in shipping containers. Only contaminated surface material will be removed from the Harvard Avenue Site. Soils containing low U-238 concentrations will be returned to the work area to be placed and compacted with clean material disturbed during excavation. Excavation will continue until U-238 concentrations are at or below the criteria throughout the work area.

2.3.3 Target Areas and Estimated Volumes

The initial excavation target areas are shown in Figure 1 and described by location, size, and estimated volume, in Table 1. The estimated volume is 3,200 cubic feet. This includes estimated volumes of the identified hot spots plus allowances for additional excavation and surface scraping. Implementation of this guided excavation program will complete site remediation by attaining the applicable criteria for residual U-238 concentrations.

2.4 PACKAGING AND HANDLING

All excavated, contaminated material must be packaged in strong tight containers for shipping and disposal. This section describes the proposed shipping containers and the plans for filling and preparing these conditions for shipment.

2.4.1 Container Requirements and Selection

Container requirements are controlled by the regulations governing transportation and disposal. Under the definitions of the U.S. Department of Transportation (DOT), the contaminated material to be removed at Harvard Avenue Site is designated "Low Specific Activity" or LSA material. Regulations for containers and shipment are found in 49 CFR 173.425. Containers meeting these specifications are acceptable at the disposal site.

Container selection also considered efficient loading and handling. Excavated material will be packaged in fabricated steel boxes with 96 cubic feet of payload volume designated B-25 boxes. They are manufactured by Container Products Corporation of Wilmington, North Carolina. The gross weight limit for each loaded box will be 10,000 pounds.

2.4.2 Container Handling

The shipping containers will be loaded and prepared for shipment to the burial site in the following steps. (Contaminated material is buried in the shipping containers.)

- New containers will be received from the fabricator and stored in the support zone in an accessible location. Incoming containers will be unloaded with an all-terrain fork lift which will operate only in the support zone. As each container is unloaded, it will be inspected for physical condition as a check that it will meet the "strong, tight" requirement. This fork lift will move empty containers to the support zone, exclusion zone boundary as they are needed.

- A second all-terrain fork lift will pick up empty containers at the exclusion zone boundary and move them to the point of active excavation. Containers will be set on polyethylene sheeting to prevent contamination of container bottoms and shipping frames.

- Containers will be filled with contaminated material as it is excavated by the backhoe. Material will be compacted, in lifts, in each container to obtain full utilization of container space. Compacting will be done by a combination of box vibrators and air operated tampers.

- As each container is filled, it will be sealed with the cover and latches provided by the box fabricator.

- Filled, sealed containers will be moved to a work area within the exclusion zone for cleaning, testing, and marking. Each filled container will be cleaned with damp rags and brushes to remove external radioactive contamination. After cleaning, each container will be tested for external contamination by collecting and counting two cotton disc swipes from the container surfaces. If necessary, containers will be recleaned and retested. Cleaned containers will be inspected for physical condition, visible external contamination, and complete closure.

- Containers accepted as clean for shipment will be marked according to the requirements of 49 CFR 173.425. Each container will be marked with the legends "Radioactive - LSA" and "Class A - Unstable" in painted letters contrasting in color to the container exterior Each container will also be marked with a unique identifying number. The markings will appear in at least two locations on the exterior of each container.

- After cleaning, testing, and marking, containers will be moved to the exclusion zone boundary by the fork lift. They will be picked up at that boundary by the support zone fork lift and moved to a holding area for shipment.

- Containers will be loading sets of four on over-the-road, flat bed trailer for transportation to the disposal facility.

2.4.3 Shipping Preparations

As filled containers are loaded for shipment, pre-shipment activities will be completed as follows:

- Each container will be weighed on a 10,000-pound capacity platform scale.

- Each container will be surveyed for radiation activity due to contents. Based on net weight and average specific activity of excavated material, an estimate of the radioactive material weight (in milli-Curies) will be calculated for each container.

- Using forms provided by the disposal site operator, a shipping manifest will be prepared for each truck load of filled containers. The manifest will list container number, type, weight, and estimated activity for each container in the load. Copies of the manifest will be retained at the job site and mailed to the disposal site; the original manifest will accompany each load throughout shipment.

- In addition to the manifest, each load will be accompanied with exclusive use instructions defining the transportation route, reporting procedures, and emergency procedures.

- As each container is loaded, it will be visually inspected for complete, legible markings, complete closure, general exterior condition, and evidence of external contamination.

- A radiation survey of each loaded truck will be conducted; the results will be recorded and included with the shipping documents.

2.5 TRANSPORTATION AND DISPOSAL

2.5.1 Routing

Excavated low level radioactive soil material will be shipped to the waste disposal site via the most direct major highway routing by truck. The waste disposal site is located in Barnwell, South Carolina and is operated by Chem Nuclear Systems, Inc.

Requirements for the packaging, transportation, and disposal of low-level radioactive waste are established by various federal agencies and by the respositor at the wastes' destination. These requirements are listed below.

2.5.2 Transportation

Transportation of the material form Cleveland, Ohio to Barnwell, South Carolina will conform with DOT Regulations for Carriage by Public Highway (49 CFR 177). The carrier will be required show levels of financial responsibility and conform with driving and parking criteria in accordance with 49 CFR 387 and 397.

The DOT regulations for shipping of radioactive materials are contained in 49 CFR 173, Subpart I that sets forth the requirements for carriers of radioactive materials, including activity limits, labeling, packaging, transporting, and records manifesting. These regulations will be strictly adhered to.

2.6 VERIFICATION TESTING

At the conclusion of excavation, health physics technicians will conduct verification testing of the exclusion zone. This testing will be done using a shielded instrument so that the specific ground surface being counted can be controlled. Readings will be made and recorded at each location where elevated U-238 concentrations (greater than 35 pCi/g) were reported during the survey reported July 25, 1986. If the results of this survey indicate the presence of hot spots, additional excavation will be done and the hot spot locations will be resurveyed. When the hot spots have been remediated, the Harvard Avenue Site will be released for restricted use.

2.7 REMEDIATION REPORT

Upon completion of all field work testings and off-site transportation and disposal, Remcor will prepare a report detailing work accomplished on site, documentation of th site testing program, tabulation of the test results and verification of the packaging, transportation and disposal process, including a listing of manifests. This report will be appropriately illustrated with maps, tables, and figures as needed.

2.8 RESTORATION AND DEMOBILIZATION

When the Harvard Avenue Site has been verified for unrestricted release, restoration and demobilization will be done. This work will include decontamination, site controls, backfilling of excavated areas, equipment removal, and demobilization.

2.8.1 Equipment Decontamination

Equipment used in the exclusion zone (including the tractor backhoe, the fork lift, the air compressor and tamper, and the hand tools) will be cleaned of visible contamination and soil. The cleaning will be done with damp rags and brushes. The soil thus removed and the cleaning materials will be packaged with the excavated material. Equipment will be surveyed for radioactive contamination and recleaned as necessary. When the equipment is free of significant contamination, it will be removed from the exclusion zone.

2.8.2 Site Access Controls Removal

After excavation, verification, and equipment decontamination have been completed, all containers of contaminated material will be removed from the Harvard Avenue Site. At this time, the barriers delineating the exclusion zone will be removed and the entire site will be released to unrestricted use.

2.8.3 Backfilling

After site controls have been removed, the excavated areas will be backfilled with clean select material. This material will be compacted in place to provide a stable base for future activities. The site will be returned to current grade and contours.

2.8.4 Demobilization

At the conclusion of backfilling, all construction equipment and unused project materials will be returned to their owners. Tools, equipment, and support facilities will be removed and custody of the site will be returned to the current landowner.

3.0 WORK PLAN - BURT AVENUE SITE

The work plan sections of this report will describe the following items:

- Health and Safety Program
- Radiological Survey
- Survey Report
- Preparation of Site Remediation Plan.

3.1 HEALTH AND SAFETY PROGRAM

Refer to Section 2.1 for the structure and concept of the health and safety program.

3.2 RADIOLOGICAL SURVEY

This section describes the methods and instruments proposed to conduct a radiological survey of a pathway providing access to the storm sewer inlet at the east end of the Burt Avenue Site. The area to be surveyed and the pathway marking method also are addressed are defined.

3.2.1 Survey Methods

The pathway survey will be done using a FIDLER. This instrument is effective in detecting the low energy photons characteristic of emissions from U-238. It is a solid state electronic instrument with a sodium iodide metal sensor five inches in diameter and one-quarter inch thick. This instrument will be operated in a conical shield open to the ground at the point being surveyed to minimize interference from nearby sources of contamination. The instrument will be moved over the pathway area on a two-wheel cart.

The survey will be done as surface readings of radiation from the soils under the pathway. Readings will be taken on a three-meter grid over the length of the path and working outward six meters on both sides of the path center line. The pathway will extend from the east perimeter of the site to the storm sewer inlet structure. Readings will also be taken on the three-meter grid around the land side of the storm were inlet structure outward to a distance of nine meters. At each survey point, five one-minute readings will be taken and tabulated. The five values will be averaged to obtain a single representative reporting value for each survey point.

3.2.3 Pathway Marking

To facilitate access to the storm water inlet, the path will be marked with durable stakes. These stakes will be labeled to indicate their purpose and will be driven at the outermost grid points in the pathway survey.

3.3 SURVEY REPORT

A letter report summarizing radiological survey methods and results will be prepared. This result will describe the survey procedure, the instruments, and instrument calibration. The field data and the average result for each grid point in the survey will be tabulated. A map showing the pathway and grid points in relation to property boundaries and prominent physical features will be attached to this report.

3.4 PREPARATION OF REMEDIATION WORK PLAN

By letter dated July 25, 1986, NRC reported the results of radiological survey work done earlier at the Burt Avenue Site. These data will be used to develop a work plan for remediation of the U-238 based contamination in this site. This work plan will follow the general format and concept of the work plan for the Harvard Avenue Site. Like that plan, it will be based on guided excavation of field-identified contaminated material to attain the remediation criteria with minimum excavation and disposal. If appropriate, surface contamination will be removed from rubble pieces by washing or grinding; the surface material will be removed and disposed as low-level radioactive waste and the decontaminated rubble will be replaced in the Burt Avenue Site.

A preliminary outline of the work plan for remediation of the Burt Avenue Site has been developed as follows:

This work plan will be prepared for submission to NRC two months after the Remedial Work Plan for the Harvard Avenue Site is approved by NRC. Execution of the work plan for Burt Avenue Site will be done during the 1989 construction season. This work must be done during warm weather because of disposal facility prohibitions against receipt of frozen materials, containers with voids, and containers with free water. Remediation of Burt Avenue Site will be complete within one year of NRC approval of the work plan.

4.0 IMPLEMENTATION SCHEDULE

This chapter presents the proposed schedule for implementing the work plans described in Chapter 2.0 for the Harvard Avenue Site and in Chapter 3.0 for the Burt Avenue Site. This schedule is presented in terms of targeted milestone dates for major activities of work plan implementation. All milestone dates are expressed in elapsed calendar days from NRC approval of this work plan. Target milestones for Harvard Avenue Site and Burt Avenue Site are on the same time scale.

4.1 PREAPPROVAL ACTIVITIES

While NRC is approving this work plan, general preparation activities will be initiated. The activities to be initiated during this period are work items of a general nature which will be required for implementation of any remediation program at the Harvard and Burt Avenue Sites. The activities to be initiated during the NRC review period are as follows:

- Prepare and submit the application for the Transporter Permit required by the South Carolina Department of Health and Environmental Control (SCDHEC) for firms shipping low level radioactive wastes (LLRW) to the Barnwell Site.
- Negotiate and execute a contract with Chem Nuclear Systems, Inc. on a unit price basis for LLRW disposal at the Barnwell Site.
- Review proceedings for shipping container preparation and documentation and train appropriate field personnel in these procedures.
- Review all available data defining the levels, locations, and extracts at U-238 contamination at the Harvard and Burt Avenue Sites.
- Check available information for the sizes and locations of underground utility facilities (if any) of the Harvard and Burt Avenue Sites.

4.2 IMPLEMENTATION SCHEDULE - HARVARD AVENUE SITE

Target milestones have been established for implementation of the remediation work plan at the Harvard Avenue Site (Chapter 2.0). These milestones in elapsed calendar days from NRC approval of this work plan are as follow:

TARGET MILESTONE	ELAPSED CALENDAR DAY
Contractor Notice to Proceed	Day 7
Final Work Plan and Design	Day 14
Complete Mobilization	Day 28
Complete Site Preparation	Day 35
Start Excavation	Day 38
First Shipment to Disposal Facility Leaves Site	Day 40
Complete Excavation	Day 56
Complete Verification Survey by Owner	Day 60
Complete Verification Survey by NRC	Day 70
Complete Site and Equipment Decontamination	Day 77
Last Shipment to Disposal Facility Leaves Site	Day 77
Site Released to Unrestricted Use and Complete Backfilling	Day 84
Complete Demobilization	Day 84

4.3 IMPLEMENTATION SCHEDULE - BURT AVENUE SITE

Target milestones have been established for implementation of the survey and planning activities described in the work plan for the Burt Avenue Site (Chapter 3.0). These milestones have been coordinated with work items at the Harvard Avenue Site. These target milestones, in elapsed calendar days from NRC approval of this work plan, are as follow:

TARGET MILESTONE	ELAPSED CALENDAR DAYS
Contract or Notice to Proceed	Day 7
Mobilize to Site	Day 28
Start Pathway Survey	Day 31
Complete Pathway Survey and Mark Pathway	Day 35
Submit Draft Survey Report	Day 49
Submit Draft Remediation Work Plan	Day 63

5.0 IMPLEMENTATION COST ESTIMATE

This chapter summarizes the estimated quantity of contaminated soils to be removed from the Harvard Avenue Site and presents estimates of the costs of implementing the work plans described in Chapter 2.0 for the Harvard Avenue Site and Chapter 3.0 for the Burt Avenue Site.

5.1 EXCAVATION QUANTITIES

Based on the most recent available data describing contamination levels at the Harvard Avenue Site, the required excavation quantity has been estimated. The estimated quantity includes the specific "hot spots" identified during the NRC survey. The quantity estimate considered the area and depth information for the hot spots as developed from the survey data. It also includes an allowance for additional excavation and surface material removal. It is estimated that 3,200 cubic feet of contaminated soils must be removed from the Harvard Avenue Site to complete remediation and prepare the site for release to unrestricted use by the current land owner.

5.2 ESTIMATE OF COSTS

Based on the excavation quality estimate, a cost estimate for completion of remediation has been prepared. This estimate includes the radiation survey of the Burt Avenue Site and completion of remediation at the Harvard Avenue Site. This estimate is summarized as follows.

• Federal tax on disposal ($20/cubic foot volume shipped to disposal)	$ 67,200
• Transportation and disposal at Barnwell, South Carolina by Chem Nuclear Systems Inc.	$111,600
• Shipping containers	$ 27,400
• Excavation and remediation	$109,400
• Radiation surveys and health physics (including Burt Avenue Site)	$ 30,000

• Project supervision and engineering (includes work plan preparation for Burt Avenue Site)	$ 39,400
TOTAL	$385,000

6.0 PROJECT TEAM

Implementation of this work plan will be done by contractors under AI's control, supervision, and responsibility. Remcor will be the general contractor for on-site remediation, container preparation, engineering, and restoration. TMA/Eberline, Inc. will be a subcontractor to Remcor and provide radiation survey and health physics services during remediation. The corporate qualifications of these contractors are summarized in Chapter 7.0.

This chapter identifies the key contractor personnel who will be responsible for execution of the work plan. These key personnel are described in terms of their project duties and their qualifications for these assignments. The overall project organization also is described. Resumes for the key contractor personnel working on this project is presented in Appendix D.

PROJECT MANAGEMENT CAPABILITIES

Organization

An organizational framework has been developed for this project that allocates sufficient resources to complete the work in an efficient manner, while providing a high degree of managerial control. Project staff members have been identified who are well qualified to assume the duties and responsibilities of the key positions. The following are among the most significant attributes of the organizational framework and team:

- An experienced overall project director will be assigned to assure continuity of effort throughout the project.
- An experienced construction project manager will be assigned to manage construction activities.
- Personnel with strong technical backgrounds will fill all key positions in the project organization to assure quality control and design interface.

The project manager will be responsible for the overall planning and organization of project activities and for control of project status (i.e., technical, budget, and schedule). The construction project manager will manage the field personnel, coordinate site logistics, and provide status reports to the project manager. The following are brief descriptions of the roles of the key positions.

Project Manager

The project manager for this effort will be responsible for the day-to-day management of the project team, directly supervise the activities of the project team members, and serve as the primary contact throughout project execution. Specific responsibilities on the project include the following:

- Organizing and scheduling of Remcor technical staff for the work assigned
- Providing technical direction to the engineering and construction personnel
- Controlling schedules and budgets
- Incorporating the efforts of the technical advisors into the program
- Establishing project records
- Assuring that quality control procedures are followed
- Coordinating with the health and safety personnel for the project
- Participating in project-related meetings
- Review of all project reports.

Engineering Staff

The field effort requires strong technical input to assure quality control during construction. The technical team supporting the project manager will be led by a senior member of the engineering staff and will be assisted by project engineers and a quality assurance engineer as the project requires.

Construction Staff

The construction staff will be led by a construction site supervisor who will be responsible for on-site administration and direction of project activities. This supervisor will be supported by qualified technicians, heavy equipment operators, and general laborers as project activities dictate. All field personnel have been trained for activities at hazardous waste sites as required by the Occupational Safety and Health Administration (OSHA) Interim rule issued December 19, 1986.

Budget/Schedule Control

Continuous monitoring of the schedule and budget will be the responsibility of the project manager and will be accomplished by frequent communications with the project manager and other staff and by review of our administrative staff. The project director will communicate frequently with the client concerning project status.

Support Services

Remcor uses computerized text processors to prepare letters, reports, and other documentation in an efficient manner. The memory and editing capabilities of this system allows Remcor to create professional high-quality documents with optimum efficiency.

Remcor owns state-of-the-art computer aided drafting and design (CADD) equipment that provides for expanded flexibility in drafting services and the generation of high-quality prints. CADD personnel are experienced in drafting highly complex and detailed design work.

Subcontractor Associations

Remcor maintains solid working relationships with the following types of subcontractors that may be required.

- Excavating and drilling companies experienced in hazardous waste work
- Qualified analytical laboratory for radionuclide analysis (Eberline Analytical Services, Inc.).

HEALTH AND SAFETY

Remcor's Corporate Health and Safety Program provides health and safety standards and procedures for all Remcor personnel in compliance with the OSHA regulations. Particular emphasis has been given to those regulations which apply to hazardous waste and construction work found in 29 CFR 1910.120 and 1926. The program specifies that a written site-specific health and safety plan be provided for each project. The written plan utilizes site-specific information and background to perform a hazard assessment and develop protective measures for each task to be performed. Each site plan is prepared to comply with all applicable federal, state, and local regulations applicable to project tasks.

Assignments of Responsibilities

Key personnel assigned to this project and their experience are summarized below. In addition, detailed resumes are provided in Appendix D.

I. REMCOR

- Earl H. Rothfuss will be Remcor's Project Manager for this work drawing on his experience as site manager for the Montclair and Glen Ridge radium sites in New Jersey. Montclair and Glen Ridge are "Superfund" sites containing large volumes of low-level radium-bearing soils from carnotite ore residues used as structural fills during residential development. Mr. Rothfuss was assigned to the project during site investigation and his initial responsibilities included selection of excavation, packaging, shipping, and disposal methods, and preparation of work plans and health and safety plans. Mr. Rothfuss managed preparation of bid documents and bid procedures for construction, transportation, and disposal. For the eight-month construction period, he was resident site manager with responsibility for all technical and administrative services during remediation. This included overseeing a site health physics program, direction of excavation based on radioactivity testing, inspection of all shipping containers, and preparation of shipping and disposal manifests.

- Leo M. Brausch will be Remcor's Principal-in-Charge for this work providing high levels of responsiveness, effectiveness, and efficiency. Mr. Brausch served as the lead engineer for the environmental studies and permitting for the Waste Isolation Pilot Plant in New Mexico. This facility, which will commence operations this year, will receive and store/dispose of LLRW from power plants and fuel processers for the U.S. Department of Energy (DOE).

- William E. Rosenbaum will direct the engineering tasks for this work as Design Manager. Mr. Rosenbaum filled this position on the Montclair and Glen Ridge Superfund sites where he was responsible for engineering functions related to excavation planning, support design for structures during excavation, and restoration design. He was also responsible for bid document preparation, quantity and cost estimating, and home office engineering support during construction.

- Deborah T. Marsh will oversee the regulatory compliance and health and safety requirements of this work as Regulatory Affairs Manager. Ms. Marsh's experience includes site assessments and permitting for DOE facilities handling radioactive and mixed wastes in Tennessee, New Mexico, and Washington.

- Anita S. Reiser will participate in the regulatory affairs aspects of this work as Compliance Engineer. Before joining Remcor, Ms. Reiser worked for the DOE as a staff specialist managing mixed radioactive wastes. Her responsibilities included site audits at DOE facilities, permitting of DOE and contractor facilities, and development of DOE policies related to LLRW management.

- James A. Balint will draw on his experience in nuclear power plant safety engineer as Health and Safety Officer. Mr. Balint has served as safety engineer at the Beaver Valley and Midland atomic power plants. His work included training, work plan developments, and hazards removal.

- Steve J. Knezovich will be Superintendent of all field remediation activities, excavation, and other earthwork associated with site decontamination. He has 16 years of experience in sampling, assessment, management, and remediation of various sites.

II TMA/EBERLINE

- Federick F. Haywood will manager Eberline activities and direct radiochemical analyses. Mr. Haywood has been involved in nuclear energy and environmental programs for 32 years, including work on numerous sites containing radioactive wastes.

- Jerry A Brown will be responsible for health and physics aspects of Eberline activities on this project. His responsibilities will include directing projects within the Health Physics Service Group and supervision of assigned personnel.

- Dennis Frain will be responsible for radiological measurements and other laboratory services associated with the project and will coordinate the efforts of various field technicians.

A major element of Remcor's overall approach to client service is meshing specific environmental management expertise with basic construction management skills. The key project team members introduced above will provide the required environmental management by drawing on their experience to plan and guide the work to completion and attainment of applicable regulatory requirements. They will be joined by experienced construction managers and workers who will execute the remediation in a timely and cost-effective manner. The result will be solutions to LLRW problems that are complete, technically appropriate, in compliance with regulations, and cost-effective.

7.0 CONTRACTOR QUALIFICATIONS

The following brief statements of qualifications are for the remediation contractor, Remcor, and the radiation survey contractor, Eberline Analytical Services, Inc.

7.1 REMCOR

Remcor was formed in 1985 based on the recognition of the increasing demand for responsive, quality engineering and construction services related to facility closure under the Resource Conservation and Recovery Act (RCRA), remedial action at formerly utilized hazardous waste sites, and decontamination of facilities dealing with hazardous materials and materials with hazardous constituents. Remcor is staffed and organized to respond to this demand.

Remcor provides a turnkey approach to solving hazardous waste management problems, integrating engineering and scientific expertise with construction skills. The goal is to be responsive to our clients' needs and provide a valued service as measured in terms of high quality and equitable pricing. In adopting the turnkey approach to hazardous waste management, Remcor recognized an important need for the ability to follow good planning with good construction and to factor construction expertise and awareness into the engineering phase of the project.

At Remcor, the engineering functions of assessment, investigation, and design are supported by field personnel who assist in developing practical approaches that can be economically and effectively implemented. This field perspective is built into the planning of closure, selection of the preferred approach, and in development of cost estimates in the design phase. On the other hand, field remediation projects performed by Remcor benefit from the strong grounding that Remcor has in regulations, capabilities in control and treatment technologies, and on the requirements of regulatory agencies and clients. Remcor is committed to conducting assessments, completing investigations of alternatives, and designing and cost estimating the preferred approach. Uniquely among hazardous waste managements firms, Remcor is then able to follow up this study phase with actual implementation of the work plan by its construction crews. The turnkey approach is at the very foundation of the Remcor philosophy and is one of the major factors that defines its uniqueness in the hazardous waste management industry.

Remcor deals on a one-to-one relationship with clients, working together to find the right solution to a particular problem. Inhouse knowledge of regulations, technical requirements, liability issues, and sociopolitical environment brings the needed expertise for developing realistic answers to sometimes difficult c[illegible]rs.

Since beginning operations in 1985, Remcor has established a solid record of performance in remedial action engineering and implementation. We have successfully completed more than 150 projects covering a wide variety of activit[illegible]s, from site assessments and ground water recovery studies through fac[illegible]ity, building, and equipment decontamination and closure.

Capsule descriptions of representative project experiences are presented below, selected to illustrate the wide range of services and integrated project approaches provided by Remcor.

Turnkey Remediation Programs

- As part of the closure of a major industrial complex in the eastern United States, Remcor performed subsurface investigations an[illegible] waste sampling in areas of potential polychlorinated biphenyl (PCB), cyanide, and heavy metals contamination. From the results of these studies, we prepared plans and implemented remedial action to address soil contamination, continuing environmental release via surface water, and plant and equipment decontamination prior to reuse.

- At a contaminated manufacturing facility in West Virginia where Remcor performed interim remedial measures to secure the site (i.e., surface water controls, surface sealing, "hot-spot" removal, and fencing), and planned and executed a comprehensive sampling program. Remcor performed several demonstration projects for plant decontamination (high-pressure/high-temperature washing of contaminated areas and partial removal of concrete floors) and prepared the remedial investigation/ feasibility study (RI/FS) for site remediation. The full-scale site cleanup was completed by Remcor in accordance with our developed plans.

- As a result of a property transfer of an industrial facility in Mississippi, Remcor developed a revised closure plan for five surface impoundments. After regulatory approval of Remcor's closure plan and advantageous cleanup criteria, Remcor performed the actual site cleanup and closure, utilizing volume reduction measures that resulted in a cost-effective closure for our clients. Remcor's approach to closure resulted in a closure cost that was half the cost of the initial estimate developed by another firm, whose approach was stabilization.

- At plant sites in Mississippi, New Jersey, New York, Pennsylvania, Tennessee, and West Virginia, Remcor conducted investigations of interior PCB contamination resulting from known or suspected electrical equipment failures. In five of the cases, the studies led to Remcor's decontamination of affected equipment and structures by the application of state-of-the-art PCB decontamination methods.

- At a manufacturing plant site in the southeast, Remcor conducted a RCRA Facility Investigation (RFI) and implemented corrective measures at a formerly used landfill under the EPA continuing releases/corrective action program (CR/CAP). The EPA approved Remcor's plan without comment allowing for a focused and expeditious cleanup to minimize our client's liability.

Investigation/Assessment

- At a thorium-contaminated site in Pennsylvania, Remcor was engaged to conduct a site inspection, collect and analyze samples, and prepare a work plan for stabilization and remediation of a 22-acre site.

- At industrial plant sites in Texas and Pennsylvania, Remcor performed subsurface investigations to determine the degree and extent of volatile organic contamination in soil and prepared cleanup plans and cost estimates to address these situations.

- Remcor prepared and executed site investigation programs under the New Jersey Environmental Cleanup Responsibility Act (ECRA) for a closed oil terminal in central New Jersey and a small manufacturing plant in northern New Jersey. Remedial action programs included free-product recovery, ground water treatment, underground tank removal/closure, and contaminated soil removal.

Engineering

- Remcor developed work plans and cost estimates for waste removal and closure at five Midwestern disposal sites containing more than 600,000 cubic yards of solid PCB and 20 million gallons of liquid PCB wastes.

- Remcor designed modifications to a lagoon and landfill at a West Virginia site to meet RCRA double-liner specifications. Alternative plans for waste consolidation and liner installation/materials specifications were evaluated for technical and economic feasibility.

- Remcor developed a revised closure plan for two hazardous waste surface impoundments known to contain nearly one-half million gallons of material. The plan required Remcor to develop cleanup criteria and a construction plan detailing the actual site closure. Specific closure tasks included removal of liquids and sludges in the impoundments and removal of the high-density polyethylene (HDPE) liners and selective soils.

- Remcor designed the cleanup program for a formerly used disposal site in central New Jersey containing approximately 1,500 drums and indeterminate amounts of bulk wastes, both at- and below-grade.

Remediation

- Remcor decontaminated two large carbon disulfide storage tanks at a chemical manufacturing complex in northern New Jersey using a sophisticated boil-out procedure with vapor-phase carbon treatment.
- Remcor stabilized, removed, and arranged for the off-site disposal of more than 1,500 tons of oily sludges from an industrial plant in western Pennsylvania.
- Remcor decontaminated a thread plating operation at a steel facility in western Pennsylvania. The remediation program consisted of a detoxification procedure to address residual cyanides and the disposal of both liquid and solid cyanide-containing wastes.

These assignments have been performed for major United States corporations. Remcor has also served as a consultant/contractor to environmental attorneys and as a subcontractor to other environmental management firms.

CLIENT LIST

REMCOR, INC.

Industry

Allegheny International, Inc.
American Cyanamid Company
Amoco, Inc.
Ampco-Pittsburgh Corporation
Aristech Chemical Corporation
Armco Inc.
Baker International, Inc.
C-K Composites, Inc.
Consolidated Aluminum Corporation
Cyclops Corporation
DeSoto Inc.
Emhart Corporation
Fisher Scientific Company
FMC Corporation
General Electric Company
Joy Technologies Inc.
LTV Steel Company, Inc.
Monsanto Company
NVF Company
Rhône-Poulenc, Inc.
Union Carbide Corporation
USX Corporation
Vulcan Materials Company
Watson Standard, Inc.
Westinghouse Electric Corporation

Law Firms

Maddin, Weiner, Hauser, Wartell & Roth
Milligram, Thomajan, Jacobs & Lee
Pitney, Hardin, Kipp & Szuch
Reed Smith Shaw & McClay
Rivkin, Radler, Dunne, and Bayh
Sidley & Austin
Thompson & Knight

Other

American Iron and Steel Institute

7.2 TMA/EBERLINE

TMA/Eberline has been performing precise chemical and radiochemical analyses for nearly 30 years. Major clientele for these services have been nuclear utilities, government agencies and their contractors, uranium mines and mills, and nuclear fuel fabricators. Eberline's chemists and technicians have extensive experience in the analysis of a wide variety of radionuclides in many different forms and matrices. These years of experience have resulted accurate, expeditious, and economical procedures whereby the most current instrumental measurements and analytical techniques are used. A complete array of instrument systems is available including sensitive detectors and spectrometers for alpha, beta, gamma, and x-rays.

A broad range of activities have been supported routinely. Some of the generic tasks and activities for which TMA/Eberline has provided analytical services include: applied research, alternate energy sources, nuclear and non-nuclear power production, enhanced oil recovery, geological exploration, litigation, medicine, all segments of the nuclear fuel cycle, training, waste management, remedial investigations, decontamination and decommissioning, and rare earths recovery.

Participation in these activities has enabled TMA/Eberline to establish an enormous body of information, or data base, which is used by TMA/Eberline staff in key project positions to interpret data for the client, and thus guide decision making.

TMA/Eberline laboratory facilities are also used for work on specialized client projects. Typical of these are development of new procedures, and bench testing of pilot scale projects. Recent projects hav included testing of waste solidification matrices, determination of the solubility of aerosols in lung serum simulant or serum ultrafiltrates,fractionation of soil samples into discrete particle size distributions, and research into the availability of radionuclides to the soil/water matrix by use of EPA toxicity extraction procedures.

The laboratory uses proven analytical procedures for all radiochemical and other laboratory analyses. Solvent extraction, ion exchange and precipitation methods are employed to isolates and purify chemical elements and compounds containing radionuclides. The laboratory was designed specifically for low-level radiochemistry. Procedures are adaptations of those recommended by the EPA, the Environmental Measurements Laboratory (HASL-300), and other agencies, and are capable of determining the levels specified in consensus standards and regulatory guidance documents.

Seven generic measurement systems are used for radiometric determinations:

- Alpha scintillation counters
- Alpha spectrometry
- High resolution gamma-ray spectrometry
- Liquid scintillation
- Low background gas flow proportional alpha and beta counters
- Radon scintillation flasks and counters
- X-ray spectroscopy systems.

Instrumentation si also available for the following:

- Atomic absorption spectrophotometry
- Fluorimetry
- Specific ion measurement.

All analyses are carried out in strict accordance with a corporate Quality Assurance Program. Procedural changes are documented promptly, and written procedures are revised accordingly. Only those chemists and technicians who have been trained for a given procedure may serve as an analysis for that procedure. Each analytical step is supervised by a trained individual, who verifies that a work order has been completed. Analytical results are reviewed for quality control requirements prior to reporting in writing to the client. Accuracy is conformed by the use of NBS or NBS traceable calibration standards for all analyses, and by participation in the U.S. EPA cross-check program and other laboratory intercomparisons.

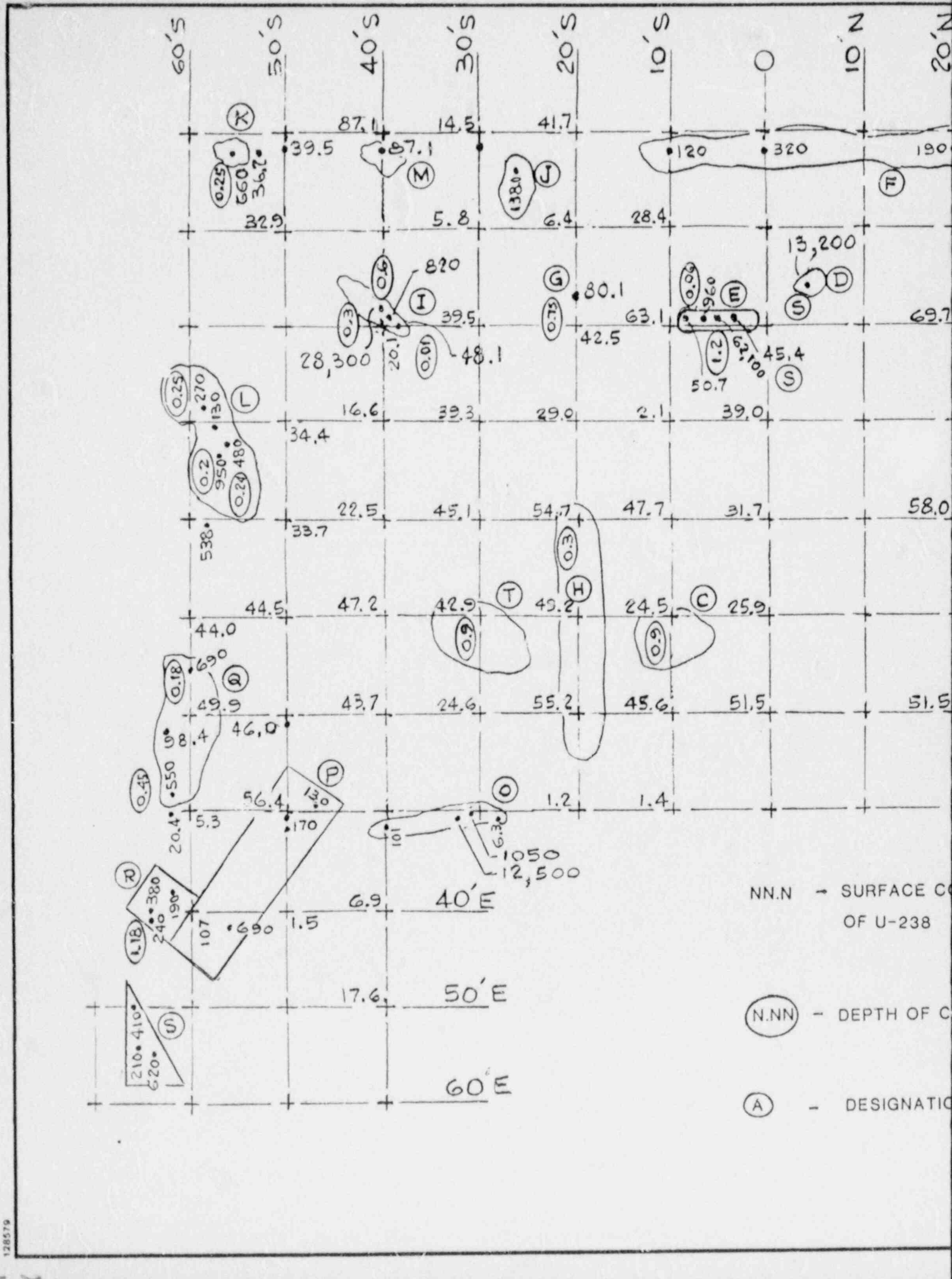
TABLE 1

LOCATIONS, DIMENSIONS, AND ESTIMATED VOLUMES
OF AREAS OF ELEVATED U-238 CONCENTRATION
HARVARD AVENUE SITE

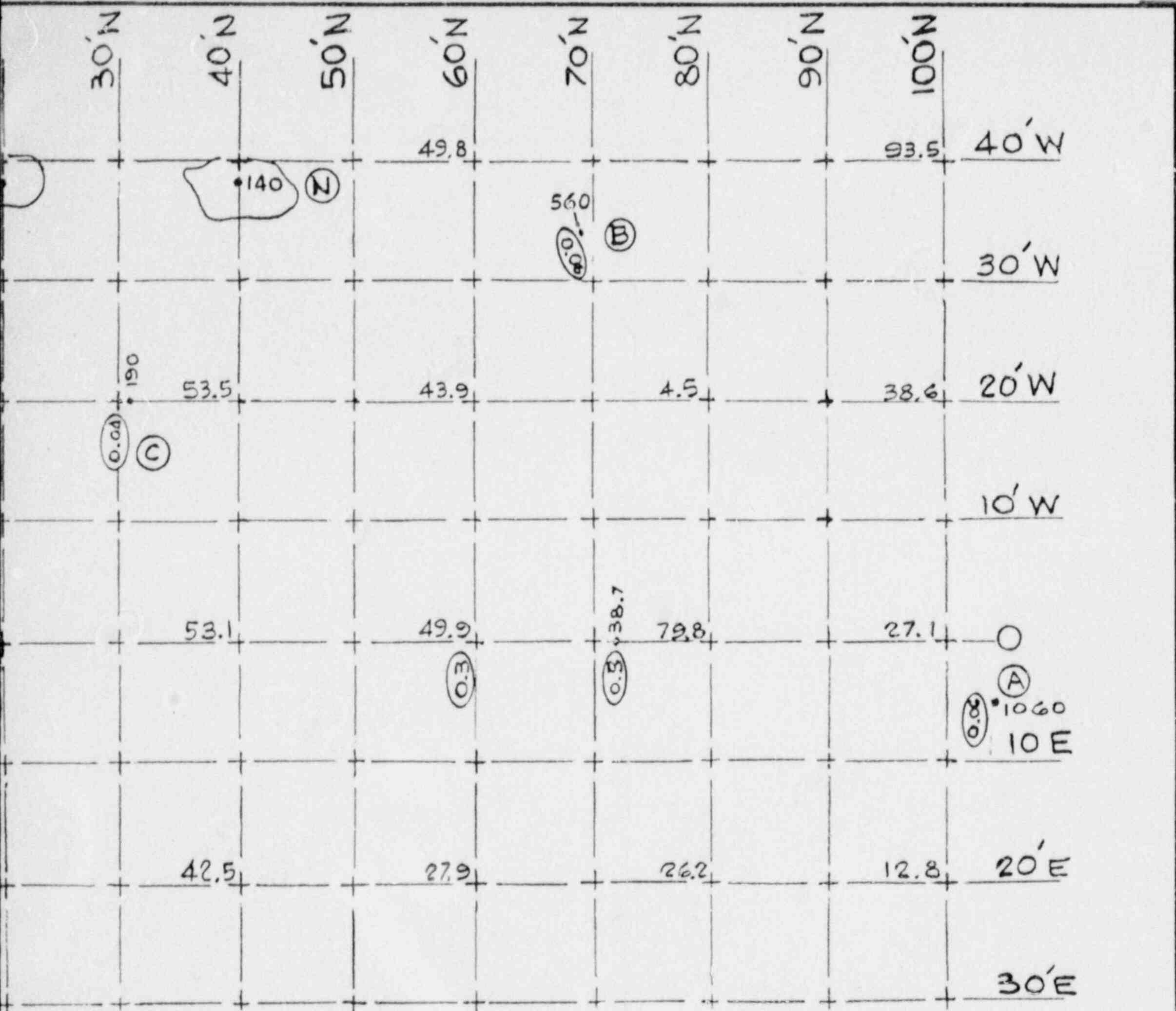
AREA OF ELEVATED U-238 CONCENTRATION	LOCATION BY NRC GRID	ESTIMATED DIMENSIONS	ESTIMATED VOLUME (cf)
A	104N, 5E	15' dia x 0.2' deep	50
B	69N, 34W	10' dia x 0.2' deep	20
C	31N, 20W	8' dia x 0.15' deep	20
D	4N, 24W	20' dia x 0.1' deep	50
E	5S, 21W 7S, 22W 8S, 21W 3S, 21W	30' x 20' x 0.1' deep + 6' dia x 4' deep	200
F	20N-10S, 40W	120' x 10' x 0.1	120
G	20S, 21W	8' dia x 2.5' deep	125
H	20S, 0-20E	60 x 7' x 1'	420
I	39S, 21W 40S, 22W 38S, 20W	30' x 10' x 1'	300
J	26S, 36W	6' dia x 1' deep	30
K	55S, 38W	6' dia x 1' deep	30
L	58S, 12W 56S, 8W 57S, 7W	25' x 10' x 1	250
M	40S, 37W	10' dia x 0.2' deep	25
N	40N, 38W	30' x 10' x 0.2'	60
O	31S, 30E 32S, 31E 40S, 31E	40' x 15' x 0.2	120

TABLE 1
(Continued)

AREA OF ELEVATED U-238 CONCENTRATION	LOCATION BY NRC GRID	ESTIMATED DIMENSIONS	ESTIMATED VOLUME (cf)
P	50S, 31E 47S, 29E 50S, 32E 56S, 42E 60S, 40E	70' x 25' x 0.1	175
Q	60S, 15E 62S, 20E 60S, 20E 62S, 28E	45' x 15' x 0.6'	405
R	64S, 41E 64S, 40E 62S, 38E	22' x 22' x 0.5'	240
S	64S, 55E 66S, 50E 66S, 54E	Triangle 40' x 20' Avg. depth = 0.1'	80
T	30S, 10E	10' dia x 3' deep	240
U	10S, 10E	10' dia x 3' deep	240
		TOTAL	3,200


60'S
50'S
40'S
30'S
20'S
10'S
0
10'N
20'N
40'E
50'E
60'E
NN.N → SURFACE C
OF U-238
N.NN - DEPTH OF C
A - DESIGNATIO

128579



8808150099-01

ONTAMINATION IN PICO-CURIES/GRAM (pCi/g)

ONTAMINATION EXCEEDING 45 (pCi/g) OF U-238

N OF EXCAVATION AREA

TI
APERTURE
CARD

Also Available On
Aperture Card

FIGURE 1

RADIOLOGICAL SURVEY DATA AND
SCHEMATIC PLOT PLAN
HARVARD AVENUE SITE

PREPARED FOR
ALLEGHENY INTERNATIONAL, INC.

DRAWN	7-29-88 G.T.	DRAWING NUMBER
CHECKED	7/29/88 LBL	88646-B1
APPROVED	7-29-88 EHR	

REMCOR

APPENDIX A

RADIOLOGICAL SURVEY DATA
HARVARD AVENUE SITE

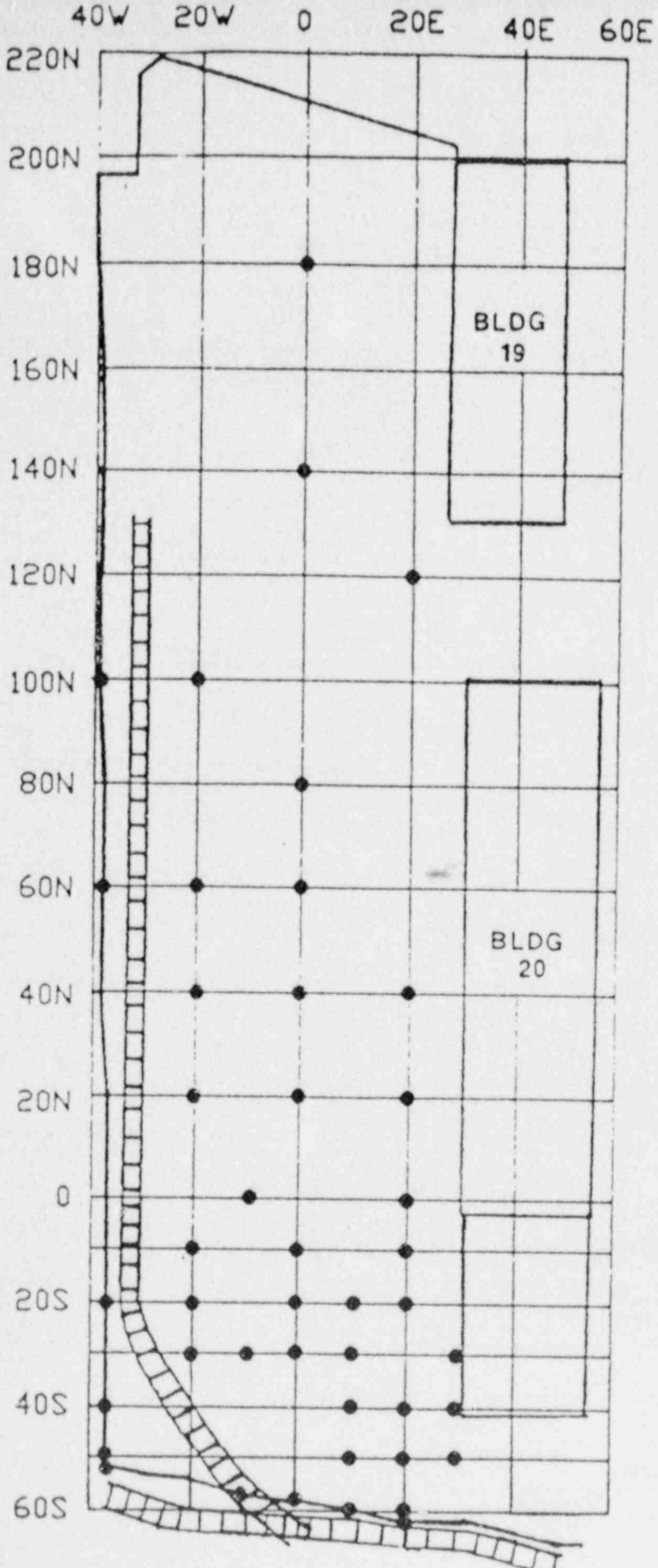


FIGURE 1: Locations of Grid Intersections Where Surface Soil Samples Exceed 35 pCi/g of U-238.

ALL INT'L.
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TABLE 1

RADIONUCLIDE CONCENTRATIONS IN SURFACE SOIL SAMPLES
CHEMETRON-MCGEAN HARVARD AVENUE SITE
NEWBURGH HEIGHTS, OHIO

Location[a]	Radionuclide Concentrations (pCi/g) U-238	U-235	Th-232
180N, 40W[b]	11.4 ± 2.9[c]	<0.24	0.85 ± 0.34
160N, 39W[b]	13.1 ± 1.6	0.49 ± 0.44	0.73 ± 0.44
140N, 39W[b]	13.9 ± 1.9	0.37 ± 0.56	0.53 ± 0.32
120N, 39W[b]	d	d	d
100N, 39W[b]	93.5 ± 6.8	2.05 ± 0.70	0.68 ± 0.36
80N, 38W[b]	d	d	d
60N, 38W[b]	49.8 ± 3.3	0.77 ± 0.69	0.57 ± 0.24
40N, 38W[b]	140 ± 4	2.82 ± 0.55	0.60 ± 0.36
20N, 37W[b]	190 ± 9	3.24 ± 1.35	0.92 ± 0.47
0N, 37W[b]	320 ± 6	5.16 ± 1.09	<0.21
10S, 37W[b]	120 ± 4	1.73 ± 0.52	0.45 ± 0.27
20S, 37W[b]	41.7 ± 1.3	1.69 ± 0.29	0.27 ± 0.13
30S, 37W[b]	14.5 ± 1.3	0.23 ± 0.33	0.31 ± 0.26
40S, 37W[b]	87.1 ± 5.4	1.38 ± 0.63	0.56 ± 0.37
50S, 37W[b]	39.5 ± 1.7	0.59 ± 0.21	0.66 ± 0.18
51S, 37W[b]	36.2 ± 1.05	0.63 ± 0.57	0.80 ± 0.36
217N, 33W[b]	3.68 ± 2.08	<0.30	1.61 ± 0.46
200N, 33W[b]	1.94 ± 0.67	<0.25	1.23 ± 0.41
219N, 29W[b]	3.52 ± 1.46	<0.22	1.23 ± 0.38
0N, 30W	d	d	d
10S, 30W	28.4 ± 1.0	0.68 ± 0.34	0.90 ± 0.23
20S, 30W	6.36 ± 2.10	<0.22	0.66 ± 0.30
30S, 30W	5.75 ± 1.24	0.32 ± 0.26	0.89 ± 0.24
40S, 30W	d	d	d
50S, 30W	d	d	d
53S, 30W[b]	32.9 ± 1.4	0.72 ± 0.34	0.94 ± 0.19
217N, 20W[b]	2.44 ± 1.73	<0.29	1.45 ± 0.64
200N, 20W	3.09 ± 0.98	<0.23	1.37 ± 0.55
180N, 20W	2.00 ± 2.39	<0.28	1.60 ± 0.43
160N, 20W	18.2 ± 1.3	0.34 ± 0.60	1.26 ± 0.39
140N, 20W	21.3 ± 3.6	<0.30	1.22 ± 0.50
120N, 20W	29.8 ± 2.2	0.87 ± 0.31	1.04 ± 0.29
100N, 20W	38.6 ± 2.1	0.55 ± 0.34	1.07 ± 0.21
80N, 20W	4.48 ± 0.67	<0.19	0.65 ± 0.32
60N, 20W	43.9 ± 4.8	<0.36	1.47 ± 0.49
40N, 20W	53.5 ± 2.3	0.77 ± 0.58	1.50 ± 0.35
20N, 20W	69.7 ± 6.1	1.04 ± 0.57	1.29 ± 0.77

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TABLE 1 (Continued)

RADIONUCLIDE CONCENTRATIONS IN SURFACE SOIL SAMPLES
CHEMETRON-MCGEAN HARVARD AVENUE SITE
NEWBURGH HEIGHTS, OHIO

Location	Radionuclide Concentrations (pCi/g)		
	U-238	U-235	Th-232
0N, 20W	d	d	d
10S, 20W	63.1 ± 3.2	1.37 ± 0.61	1.22 ± 0.33
20S, 20W	42.5 ± 4.5	0.62 ± 0.69	1.29 ± 0.40
30S, 20W	39.5 ± 1.9	0.58 ± 0.33	1.26 ± 0.29
40S, 20W	20.1 ± 2.6	0.43 ± 0.54	0.43 ± 0.24
50S, 20W	d	d	d
54S, 20W[b]	d	d	d
0N, 10W	39.0 ± 1.7	1.26 ± 0.35	1.08 ± 0.21
10S, 10W	2.13 ± 1.14	0.88 ± 0.50	1.16 ± 0.37
20S, 10W	29.0 ± 1.9	0.46 ± 0.31	0.81 ± 0.16
30S, 10W	39.3 ± 1.0	0.35 ± 0.28	0.94 ± 0.19
40S, 10W	16.6 ± 3.2	<0.26	0.99 ± 0.65
50S, 10W	34.4 ± 1.3	0.80 ± 0.32	0.99 ± 0.19
57S, 10W[b]	130 ± 9	1.95 ± 1.24	0.80 ± 0.59
211N, 0[b]	15.5 ± 2.3	<0.25	1.14 ± 0.31
200N, 0	21.8 ± 1.9	0.88 ± 0.65	1.38 ± 0.47
180N, 0	49.3 ± 4.6	0.99 ± 0.81	1.44 ± 0.47
160N, 0	31.0 ± 1.3	0.73 ± 0.33	1.14 ± 0.24
140N, 0	44.1 ± 1.2	0.56 ± 0.25	1.13 ± 0.19
120N, 0	34.0 ± 1.0	0.48 ± 0.33	1.18 ± 0.22
100N, 0	27.1 ± 2.7	0.47 ± 0.71	1.48 ± 0.67
80N, 0	79.8 ± 5.8	1.01 ± 0.88	1.33 ± 0.38
60N, 0	49.9 ± 4.9	1.13 ± 0.78	1.10 ± 0.51
40N, 0	53.1 ± 4.2	1.17 ± 0.55	0.88 ± 0.38
20N, 0	58.0 ± 4.7	1.14 ± 0.80	1.25 ± 0.43
0N, 0	31.7 ± 1.9	0.49 ± 0.29	1.07 ± 0.20
10S, 0	47.7 ± 3.3	0.78 ± 0.70	1.38 ± 0.64
20S, 0	54.7 ± 2.7	0.78 ± 0.52	0.88 ± 0.28
30S, 0	45.1 ± 3.0	1.10 ± 0.61	1.26 ± 0.47
40S, 0	22.5 ± 3.2	0.51 ± 0.55	1.33 ± 0.39
50S, 0	33.7 ± 2.1	0.72 ± 0.36	0.98 ± 0.25
58S, 0[b]	53.8 ± 3.5	1.32 ± 0.73	1.51 ± 0.56
0N, 10E	25.9 ± 2.5	0.88 ± 0.53	0.83 ± 0.45
10S, 10E	24.5 ± 0.7	0.48 ± 0.23	0.82 ± 0.16
20S, 10E	49.2 ± 4.2	0.71 ± 0.72	1.26 ± 0.47
30S, 10E	42.9 ± 1.1	0.59 ± 0.27	0.99 ± 0.16
40S, 10E	47.2 ± 3.1	0.57 ± 0.64	1.29 ± 0.41
50S, 10E	44.5 ± 1.6	0.71 ± 0.33	0.94 ± 0.20
60S, 10E[b]	44.0 ± 3.5	1.21 ± 0.59	0.92 ± 0.54

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TABLE 1 (Continued)

RADIONUCLIDE CONCENTRATIONS IN SURFACE SOIL SAMPLES
CHEMETRON-MCGEAN HARVARD AVENUE SITE
NEWBURGH HEIGHTS, OHIO

Location	Radionuclide Concentrations (pCi/g)		
	U-238	U-235	Th-232
205N, 20E[b]	2.34 ± 0.91	<0.22	1.23 ± 0.40
200N, 20E	4.22 ± 1.55	<0.30	1.65 ± 0.51
180N, 20E	23.6 ± 2.3	<0.33	1.50 ± 0.55
160N, 20E	29.9 ± 1.5	0.77 ± 0.37	1.34 ± 0.30
140N, 20E	27.0 ± 4.1	1.16 ± 0.65	1.45 ± 0.68
120N, 20E	55.0 ± 5.2	1.21 ± 0.71	1.00 ± 0.40
100N, 20E	12.8 ± 1.4	0.52 ± 0.48	1.07 ± 0.36
80N, 20E	26.2 ± 2.6	<0.31	1.67 ± 0.52
60N, 20E	27.9 ± 2.3	0.61 ± 0.30	1.24 ± 0.21
40N, 20E	42.5 ± 1.8	0.92 ± 0.50	1.03 ± 0.33
20N, 20E	51.5 ± 4.6	1.17 ± 0.75	1.08 ± 0.44
0N, 20E	51.5 ± 3.1	0.97 ± 0.59	1.15 ± 0.44
10S, 20E	45.6 ± 3.6	0.95 ± 0.50	0.61 ± 0.45
20S, 20E	55.2 ± 4.7	0.89 ± 0.77	1.02 ± 0.54
30S, 20E	24.6 ± 3.3	<0.31	1.03 ± 0.43
40S, 20E	43.7 ± 1.6	0.74 ± 0.32	0.94 ± 0.18
50S, 20E	46.0 ± 4.2	1.28 ± 0.71	0.89 ± 0.29
60S, 20E	49.9 ± 3.1	1.30 ± 0.66	1.74 ± 0.39
62S, 20E[b]	98.4 ± 3.4	1.62 ± 0.67	0.50 ± 0.25
204N, 26E[b]	d	d	d
200N, 26E	d	d	d
180N, 26E	d	d	d
160N, 26E	d	d	d
140N, 26E	d	d	d
120N, 30E	d	d	d
100N, 30E	d	d	d
80N, 30E	d	d	d
60N, 30E	d	d	d
40N, 30E	d	d	d
20N, 30E	d	d	d
0N, 30E	d	d	d
10S, 31E	1.35 ± 1.04	<0.33	1.23 ± 0.67
20S, 31E	1.22 ± 1.08	<0.14	0.66 ± 0.26
30S, 31E	76.3 ± 3.1	2.78 ± 0.76	0.76 ± 0.43
40S, 31E	101 ± 6	1.67 ± 1.05	0.46 ± 0.43
50S, 31E	56.4 ± 4.4	1.67 ± 0.78	1.61 ± 0.87
60S, 31E	5.27 ± 0.75	<0.17	0.46 ± 0.25
62S, 31E[b]	20.4 ± 2.9	0.47 ± 0.53	1.05 ± 0.45

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TABLE 1 (Continued)

RADIONUCLIDE CONCENTRATIONS IN SURFACE SOIL SAMPLES
CHEMETRON-MCGEAN HARVARD AVENUE SITE
NEWBURGH HEIGHTS, OHIO

Location	Radionuclide Concentrations (pCi/g)		
	U-238	U-235	Th-232
42S, 40E	6.90 ± 2.29	<0.28	0.51 ± 0.35
50S, 40E	1.46 ± 1.60	<0.17	0.40 ± 0.21
60S, 40E	107 ± 3	2.50 ± 0.69	0.62 ± 0.33
64S, 40E[b]	380 ± 7	6.61 ± 1.49	0.86 ± 0.41
42S, 50E	17.6 ± 2.7	0.65 ± 0.37	0.73 ± 0.46
50S, 50E	d	d	d
60S, 50E	d	d	d
66S, 50E	410 ± 5	6.64 ± 0.76	0.65 ± 0.26
41S, 54E	d	d	d
50S, 54E	d	d	d
60S, 54E	d	d	d
66S, 54E[b]	210 ± 10	3.93 ± 0.91	0.82 ± 0.79

[a]Refer to Figures 1 and 2.
[b]Indicates fenceline location.
[c]Errors are 2σ based on counting statistics.
[d]No sample collected due to paved surface or other obstruction.

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14	32
21	36
13	26
4	7
52	101

51.5%

TABLE 2

RADIONUCLIDE CONCENTRATIONS IN SURFACE SOIL SAMPLES
COLLECTED FROM LOCATIONS IDENTIFIED BY THE WALKOVER SCAN
CHEMETRON-MCGEAN HARVARD AVENUE SITE
NEWBURGH HEIGHTS, OHIO

Location	Radionuclide Concentrations (pCi/g)		
	U-238	U-235	Th-232
149N, 9W	69.4 ± 5.8[a]	0.64 ± 0.96	1.36 ± 0.63
104N, 5E	1060 ± 20	15.2 ± 2.6	1.47 ± 0.79
69N, 34W	560 ± 8	10.8 ± 1.7	0.44 ± 0.63
31N, 20W	190 ± 9	5.46 ± 1.93	2.49 ± 1.38
4N, 24W	13200 ± 30	150 ± 20	120 ± 20
5S, 21W	62100 ± 40	103 ± 7	<0.84
7S, 22W	960 ± 10	14.1 ± 2.5	1.51 ± 0.62
20S, 21W	80.1 ± 5.7	1.31 ± 0.80	0.82 ± 0.29
26S, 36W	1380 ± 10	24.7 ± 2.6	<0.29
31S, 30E	1050 ± 20	17.3 ± 2.2	<0.43
32S, 31E	12500 ± 50	150 ± 9	<1.20
38S, 20W	48.1 ± 2.4	0.87 ± 0.65	1.24 ± 0.57
39S, 21W	820 ± 6	12.4 ± 1.1	1.10 ± 0.47
40S, 22W	13.1 ± 2.3	<0.23	0.96 ± 0.35
47S, 29E	130 ± 40	<0.91	2.36 ± 1.25
50S, 32E	170 ± 6	4.80 ± 1.49	0.77 ± 0.42
56S, 8W	480 ± 10	6.88 ± 1.70	0.50 ± 0.74
56S, 42E	690 ± 10	11.3 ± 1.9	1.10 ± 1.01
57S, 7W	950 ± 20	14.4 ± 2.5	0.70 ± 0.83
60S, 15E	690 ± 10	12.3 ± 1.9	0.54 ± 0.52
62S, 38E	190 ± 6	3.59 ± 1.41	<0.24
64S, 41E	240 ± 5	3.93 ± 1.05	0.27 ± 0.32
64S, 55E	620 ± 10	9.09 ± 1.88	0.60 ± 0.45

[a]Errors are 2σ based on counting statistics.

62,100 — 1 | 1
>10000 — 2 | 3
>1000 — 3 | 6
>500 — 7 | 13
>200 — 2 | 15
>100 — 9 4 | 19
>25 — 3 | 22.

TABLE 4

RADIONUCLIDE CONCENTRATIONS IN BOREHOLE SOIL SAMPLES
CHEMETRON-MCGEAN HARVARD AVENUE SITE
NEWBURGH HEIGHTS, OHIO

Borehole No.	Location	Depth (m)	Radionuclide Concentrations (pCi/g) U-238	U-235	Th-232
H1	180N, 0	0-0.3	106 ± 8[a]	3.25 ± 1.90	2.08 ± 1.31
		0.3-0.6	53.0 ± 6.0	<0.83	1.43 ± 1.06
		0.6-0.9	53.5 ± 1.9	1.72 ± 0.66	1.41 ± 0.84
		0.9-1.2	25.8 ± 1.7	0.59 ± 0.55	1.22 ± 0.79
		1.2-1.5	4.28 ± 2.39	0.57 ± 1.02	0.94 ± 0.88
		1.5-1.8	<1.29	<0.55	1.99 ± 0.86
H2	160N, 20W	0-0.3	17.9 ± 2.3	<0.46	1.41 ± 0.81
		0.3-0.6	10.4 ± 1.6	0.56 ± 0.59	1.11 ± 0.55
		0.6-0.9	5.07 ± 3.50	<0.72	2.10 ± 1.05
		0.9-1.2	2.32 ± 2.25	<0.93	2.82 ± 2.34
		1.2-1.5	3.36 ± 3.04	<0.51	2.66 ± 1.28
		1.5-1.8	2.56 ± 3.06	<0.47	1.81 ± 1.56
H3	120N, 0	0-0.3	32.3 ± 2.9	0.78 ± 0.50	1.31 ± 0.37
		0.3-0.6	31.9 ± 1.9	1.75 ± 0.46	0.88 ± 0.32
		0.6-0.9	24.8 ± 3.0	<0.53	<0.60
		0.9-1.2	2.10 ± 2.45	<0.56	1.31 ± 0.66
		1.2-1.5	3.54 ± 3.36	<0.56	2.07 ± 0.92
		1.5-1.8	<1.14	<0.44	1.15 ± 0.80
H4	100N, 20W	0-0.3	31.4 ± 3.1	0.43 ± 0.51	1.09 ± 0.43
		0.3-0.6	6.89 ± 3.18	<0.56	0.48 ± 0.34
		0.6-0.9	6.43 ± 2.00	<0.51	1.63 ± 0.71
		0.9-1.2	<1.18	<0.45	1.05 ± 1.08
		1.2-1.5	2.01 ± 3.29	<0.56	1.62 ± 1.20
		1.5-1.8	2.52 ± 1.23	<0.49	1.27 ± 0.54
H5	60N, 0	0-0.3	62.4 ± 2.5	1.30 ± 0.67	1.21 ± 0.58
		0.3-0.6	21.0 ± 4.7	<0.62	2.08 ± 1.76
		0.6-0.9	3.87 ± 1.37	<0.51	1.19 ± 0.80
		0.9-1.2	3.49 ± 2.36	<0.56	1.75 ± 1.33
		1.2-1.5	1.52 ± 1.59	<0.58	2.71 ± 0.96
		1.5-1.8	<1.58	<0.62	2.29 ± 1.13
H6	40N, 20W	0-0.3	7.92 ± 4.10	<0.57	0.87 ± 1.46
		0.3-0.6	6.48 ± 1.94	0.87 ± 1.02	0.92 ± 0.52
		0.6-0.9	b	b	b
		0.9-1.2	2.64 ± 3.12	<0.47	1.03 ± 1.24
		1.2-1.5	<1.21	0.87 ± 0.80	1.70 ± 0.99
		1.5-1.8	1.77 ± 2.38	<0.53	1.86 ± 0.93

TABLE 4 (Continued)

RADIONUCLIDE CONCENTRATIONS IN BOREHOLE SOIL SAMPLES
CHEMETRON-MCGEAN HARVARD AVENUE SITE
NEWBURGH HEIGHTS, OHIO

Borehole No.	Location	Depth (m)	Radionuclide Concentrations (pCi/g) U-238	U-235	Th-232
H7	40N, 20E	0-0.3	33.5 ± 3.9	0.95 ± 0.61	1.78 ± 0.57
		0.3-0.6	33.9 ± 2.0	0.54 ± 0.54	1.55 ± 0.38
		0.6-0.9	9.79 ± 1.76	<0.46	1.10 ± 0.76
		0.9-1.2	2.50 ± 3.38	<0.60	1.96 ± 1.50
		1.2-1.5	1.49 ± 1.36	<0.43	1.32 ± 1.49
		1.5-1.8	2.49 ± 2.87	<0.48	2.00 ± 0.85
H8	20N, 0	0-0.3	34.9 ± 3.0	0.54 ± 0.67	1.78 ± 0.42
		0.3-0.6	4.35 ± 3.02	<0.57	1.45 ± 0.69
		0.6-0.9	2.17 ± 3.97	<0.49	1.35 ± 1.16
		0.9-1.2	3.04 ± 2.19	<0.47	1.69 ± 1.20
		1.2-1.5	2.22 ± 1.07	<0.23	1.63 ± 0.40
		1.5-1.8	4.96 ± 2.99	<0.63	1.39 ± 1.00
H9	10S, 10E	0-0.3	48.2 ± 4.4	0.98 ± 0.78	1.57 ± 1.09
		0.3-0.6	65.1 ± 5.3	1.79 ± 1.26	2.05 ± 1.42
		0.6-0.9	82.7 ± 5.7	1.97 ± 1.48	1.43 ± 0.75
		0.9-1.2	11.3 ± 3.2	<0.43	1.27 ± 0.50
		1.2-1.5	10.5 ± 2.2	<0.54	2.15 ± 1.01
		1.5-1.8	14.8 ± 2.3	<0.52	1.50 ± 0.89
		1.8-2.1	17.8 ± 2.3	<0.51	1.89 ± 0.91
		2.1-2.4	8.14 ± 1.97	<0.43	1.63 ± 1.42
		2.4-2.7	1.28 ± 1.18	<0.45	1.16 ± 0.90
		2.7-3.0	2.82 ± 3.03	<0.32	0.74 ± 0.62
H10	20S, 0	0-0.3	44.9 ± 5.3	0.78 ± 0.99	1.62 ± 0.71
		0.3-0.6	4.26 ± 1.94	<0.34	0.98 ± 0.53
		0.6-0.9	4.82 ± 1.72	<0.52	1.92 ± 0.79
		0.9-1.2	3.42 ± 1.61	<0.57	2.01 ± 0.98
		1.2-1.5	2.24 ± 2.58	<0.51	2.01 ± 0.73
		1.5-1.8	3.08 ± 1.47	<0.48	1.90 ± 1.06
		1.8-2.1	1.24 ± 1.64	<0.36	0.92 ± 0.73
		2.1-2.4	1.99 ± 2.64	<0.47	1.18 ± 0.54
		2.4-2.7	1.01 ± 1.19	<0.38	0.69 ± 0.49
		2.7-3.0	2.27 ± 3.34	0.80 ± 1.00	1.46 ± 1.01
H11	30S, 20W	0-0.3	b	b	b
		0.3-0.6	3.70 ± 3.87	<0.66	1.39 ± 0.71
		0.6-0.9	3.55 ± 4.42	<0.60	1.30 ± 0.72
		0.9-1.2	5.06 ± 1.72	0.43 ± 1.57	2.33 ± 0.96
		1.2-1.5	<1.39	<0.48	1.40 ± 0.67

TABLE 4 (Continued)

RADIONUCLIDE CONCENTRATIONS IN BOREHOLE SOIL SAMPLES
CHEMETRON-MCGEAN HARVARD AVENUE SITE
NEWBURGH HEIGHTS, OHIO

Borehole No.	Location	Depth (m)	Radionuclide Concentrations (pCi/g) U-238	U-235	Th-232
		1.5-1.8	4.24 ± 2.12	<0.41	1.44 ± 0.96
		1.8-2.1	1.27 ± 1.29	<0.46	1.33 ± 0.61
		2.1-2.4	1.95 ± 2.07	<0.41	1.46 ± 0.95
		2.4-2.7	1.99 ± 1.82	<0.46	1.10 ± 1.04
		2.7-3.0	1.13 ± 1.39	<0.56	1.36 ± 0.95
		3.0-3.3	1.84 ± 1.27	<0.43	0.61 ± 0.82
H12	30S, 10W	0-0.3	19.8 ± 3.5	1.22 ± 0.88	0.81 ± 0.63
		0.3-0.6	6.35 ± 2.81	<0.54	2.51 ± 1.31
		0.6-0.9	2.58 ± 4.35	<0.61	1.86 ± 0.93
		0.9-1.2	2.36 ± 2.07	<0.53	1.92 ± 0.83
		1.2-1.5	3.71 ± 3.80	<0.60	1.11 ± 1.01
		1.5-1.8	1.67 ± 2.49	<0.46	1.56 ± 0.77
		1.8-2.1	7.80 ± 3.15	<0.63	3.30 ± 1.38
		2.1-2.4	2.71 ± 2.82	<0.54	1.80 ± 1.17
		2.4-2.7	4.56 ± 1.98	<0.54	1.04 ± 0.59
		2.7-3.0	1.26 ± 1.75	<0.48	1.26 ± 0.62
H13	30S, 10E	0-0.3	83.1 ± 5.6	1.00 ± 1.32	0.89 ± 0.66
		0.3-0.6	49.4 ± 3.7	1.29 ± 1.30	0.82 ± 1.07
		0.6-0.9	46.2 ± 2.6	0.80 ± 0.62	1.43 ± 0.45
		0.9-1.2	15.2 ± 2.9	<0.67	2.36 ± 1.09
		1.2-1.5	6.98 ± 2.25	<0.61	2.13 ± 1.26
		1.5-1.8	4.46 ± 1.71	<0.60	3.97 ± 1.24
		1.8-2.1	25.1 ± 4.3	<0.46	1.45 ± 0.73
		2.1-2.4	8.88 ± 1.97	<0.48	1.24 ± 0.80
		2.4-2.7	4.90 ± 4.15	<0.38	0.75 ± 0.60
		2.7-3.0	1.37 ± 1.04	<0.32	0.76 ± 0.66
H14	38S, 0[c]	0-0.3	14.3 ± 2.3	0.72 ± 1.38	1.18 ± 0.84
		0.3-0.6	2.82 ± 2.94	<0.44	1.63 ± 0.97
		0.6-0.9	3.12 ± 3.07	<0.54	2.52 ± 1.39
		0.9-1.2	1.18 ± 1.04	<0.51	1.56 ± 1.89
		1.2-1.5	<1.33	<0.58	2.12 ± 1.17
		1.5-1.8	4.18 ± 2.65	<0.52	1.07 ± 0.74
		1.8-2.1	0.92 ± 1.55	<0.51	2.37 ± 1.08
		2.1-2.4	1.65 ± 1.95	<0.47	1.91 ± 0.71
		2.4-2.7	5.71 ± 2.36	0.78 ± 0.94	0.91 ± 0.45
		2.7-3.0	2.59 ± 2.15	<0.50	1.00 ± 0.94

TABLE 5

RADIONUCLIDE CONCENTRATIONS IN BOREHOLE SOIL SAMPLES
COLLECTED FROM LOCATIONS OF ELEVATED ACTIVITY
CHEMETRON-MCGEAN HARVARD AVENUE SITE
NEWBURGH HEIGHTS, OHIO

Borehole No.	Location	Depth (m)	Radionuclide Concentrations (pCi/g)		
			U-238	U-235	Th-232
H17	149N, 9W	0-0.10	69.4 ± 5.8[a]	0.64 ± 0.96	1.36 ± 0.63
		0.10-0.20	15040 ± 20	25.6 ± 4.1	1.75 ± 0.74
H18	132N, 7E	0-0.30	105 ± 6	4.17 ± 1.90	2.92 ± 1.14
		0.30-0.60	1.57 ± 1.07	<0.41	1.23 ± 0.75
		0.60-0.90	17.9 ± 4.0	<0.51	1.38 ± 0.56
		0.90-1.20	3.21 ± 1.84	<0.42	1.02 ± 0.94
		1.20-1.50	2.10 ± 4.00	<0.60	1.67 ± 1.04
		1.50-1.80	3.60 ± 3.70	<0.36	1.37 ± 0.54
H19	104N, 5E	0-0.06	1060 ± 20	15.2 ± 2.6	1.47 ± 0.79
		0.30-0.60	1.73 ± 1.71	<0.35	1.03 ± 0.60
		0.60-0.90	1.90 ± 1.97	<0.40	0.98 ± 0.90
		0.90-1.20	5.07 ± 2.86	<0.49	2.12 ± 0.82
		1.20-1.50	<0.46	<0.46	1.78 ± 0.98
H20	72N, 0	0-0.30	38.7 ± 1.4	0.73 ± 0.40	1.08 ± 0.23
		0.30-0.60	2.25 ± 1.36	<0.46	1.08 ± 0.73
		0.60-0.90	4.63 ± 2.11	<0.36	0.68 ± 0.44
		0.90-1.20	2.15 ± 1.66	<0.38	1.57 ± 0.60
		1.20-1.50	3.81 ± 2.35	<0.38	1.82 ± 0.79
H21	69N,34W	0-0.06	560 ± 8	10.8 ± 1.7	0.44 ± 0.63
		0.30-0.60	2.86 ± 1.18	<0.46	0.61 ± 0.42
		0.60-0.90	8.22 ± 3.83	<0.52	0.72 ± 0.53
		0.90-1.20	3.12 ± 1.59	<0.50	2.41 ± 1.02
		1.20-1.50	2.68 ± 2.55	<0.46	1.02 ± 0.57
		1.50-1.80	2.83 ± 2.81	<0.53	1.31 ± 0.70
H22	31N,20W	0-0.04	190 ± 9	5.46 ± 1.93	2.49 ± 1.38
		0.25-0.55	5.69 ± 2.64	<0.41	2.33 ± 0.71
		0.55-0.85	3.40 ± 2.35	<0.42	1.58 ± 0.85
		0.85-1.15	3.38 ± 1.59	<0.55	0.84 ± 0.57
		1.15-1.45	1.53 ± 2.50	<0.37	0.72 ± 0.69
H23	4N,24W	Surface Rock	13200 ± 30	150 ± 20	120 ± 20
		0.30-0.60	4.37 ± 1.88	<0.30	0.59 ± 0.49
		0.60-0.90	1.32 ± 1.25	<0.51	1.43 ± 1.75
		0.90-1.20	0.93 ± 2.49	<0.37	0.84 ± 0.40
		1.20-1.50	1.50 ± 1.68	<0.44	1.06 ± 0.63

TABLE 5 (Continued)

RADIONUCLIDE CONCENTRATIONS IN BOREHOLE SOIL SAMPLES
COLLECTED FROM LOCATIONS OF ELEVATED ACTIVITY
CHEMETRON-MCGEAN HARVARD AVENUE SITE
NEWBURGH HEIGHTS, OHIO

Borehole No.	Location	Depth (m)	Radionuclide Concentrations (pCi/g) U-238	U-235	Th-232
H24	5S,21W	Surface	62100 ± 40	103 ± 7	<0.84
		0.30-0.60	200 ± 8	4.47 ± 1.78	1.28 ± 1.09
		0.60-0.90	2.12 ± 1.91	<0.37	1.27 ± 0.83
		0.90-1.20	55.5 ± 4.4	1.44 ± 1.27	1.28 ± 0.91
		1.20-1.50	2.97 ± 2.76	<0.45	1.46 ± 0.80
H25	7S,22W	0-0.06	960 ± 10	14.1 ± 2.5	1.51 ± 0.62
		0.30-0.60	2.10 ± 1.73	<0.42	1.08 ± 0.51
		0.60-0.90	3.51 ± 1.90	<0.46	1.07 ± 1.17
		0.90-1.20	1.38 ± 1.48	<0.39	1.56 ± 0.77
		1.20-1.50	3.23 ± 1.46	<0.55	0.97 ± 0.54
H26	20S,21W	0.0.05	80.1 ± 5.7	1.31 ± 0.80	0.82 ± 0.29
		0.05-0.15	940 ± 20	13.8 ± 3.1	2.01 ± 1.14
		0.15-0.45	1070 ± 20	15.7 ± 3.5	1.06 ± 0.94
		0.45-0.75	410 ± 20	6.92 ± 2.24	2.10 ± 0.77
		0.75-1.05	33.9 ± 3.3	<0.62	1.00 ± 1.50
		1.05-1.35	2.99 ± 1.89	<0.46	<0.50
H27	38S,20W	0-0.01	48.1 ± 2.4	0.87 ± 0.65	1.24 ± 0.57
		0.30-0.60	5.14 ± 2.32	<0.50	1.43 ± 0.87
		0.60-0.90	3.69 ± 4.29	<0.57	1.41 ± 1.09
H28	39S,21W	Surface	820 ± 6	12.4 ± 1.1	1.10 ± 0.47
		0.30-0.60	110 ± 2	2.22 ± 0.59	1.25 ± 0.52
		0.60-0.90	4.19 ± 2.15	<0.42	0.86 ± 0.88
		0.90-1.20	11.8 ± 2.2	<0.50	1.12 ± 0.90
		1.20-1.50	3.96 ± 1.93	<0.36	0.66 ± 0.77
H29	40S,22W	0-0.30	28300 ± 32	43.4 ± 5.9	1.22 ± 1.48
		0.60-0.90	1.71 ± 2.64	<0.55	1.46 ± 0.73
		0.90-1.20	11.4 ± 3.6	<0.61	1.50 ± 1.12
H30	56S,8W	0-0.06	480 ± 10	6.88 ± 1.70	0.50 ± 0.74
		0.06-0.12	580 ± 10	9.19 ± 1.87	0.87 ± 0.41
		0.12-0.18	240 ± 8	3.41 ± 2.33	0.84 ± 0.43
		0.18-0.24	79.6 ± 4.5	1.62 ± 0.74	0.64 ± 0.34
H31	57S,7W	Surface	950 ± 20	14.4 ± 2.5	0.70 ± 0.83
		0.15-0.20	650 ± 10	11.2 ± 1.8	0.94 ± 0.39

TABLE 5 (Continued)

RADIONUCLIDE CONCENTRATIONS IN BOREHOLE SOIL SAMPLES
COLLECTED FROM LOCATIONS OF ELEVATED ACTIVITY
CHEMETRON-MCGEAN HARVARD AVENUE SITE
NEWBURGH HEIGHTS, OHIO

Borehole No.	Location	Depth (m)	Radionuclide Concentrations (pCi/g) U-238	U-235	Th-232
H32	60S,15E	0-0.06	690 ± 10	12.3 ± 1.9	0.54 ± 0.52
		0.06-0.12	250 ± 7	6.05 ± 1.19	0.92 ± 0.44
		0.12-0.18	160 ± 8	3.14 ± 0.99	1.06 ± 0.35
H33	64S,41E	0-0.06	240 ± 5	3.93 ± 1.05	0.27 ± 0.32
		0.06-0.12	260 ± 7	3.97 ± 1.17	0.51 ± 0.49
		0.12-0.18	260 ± 6	5.06 ± 1.23	0.70 ± 0.28

[a]Errors are 2σ based on counting statistics.

TABLE 6

RADIONUCLIDE CONCENTRATIONS IN BOREHOLE SOIL SAMPLES
COLLECTED NEAR THE 20W GRID LINE
CHEMETRON-MCGEAN HARVARD AVENUE SITE
NEWBURGH HEIGHTS, OHIO

Borehole No.	Location	Depth (m)	Radionuclide Concentrations (pCi/g) U-238	U-235	Th-232
H34	3S,21W	Surface	45.4 ± 2.2[a]	1.52 ± 0.69	1.57 ± 0.42
		0.15-0.30	28.0 ± 0.8	0.51 ± 0.22	0.75 ± 0.14
		0.30-0.60	0.81 ± 1.58	<0.45	1.40 ± 0.96
		0.60-0.90	<0.96	<0.39	1.00 ± 0.81
		0.90-1.20	4.26 ± 1.23	<0.35	0.79 ± 0.67
		1.20-1.50	5.74 ± 2.73	<0.51	1.79 ± 0.86
H35	8S,21W	Surface	50.7 ± 6.7	1.27 ± 1.56	0.75 ± 1.27
		0.15-0.30	11.0 ± 1.8	0.51 ± 0.51	0.93 ± 0.44
		0.30-0.60	1.96 ± 1.54	<0.25	0.95 ± 0.47
		0.60-0.90	<0.96	<0.41	0.80 ± 0.41
		0.90-1.20	<1.10	<0.41	0.93 ± 0.46
		1.20-1.50	15.9 ± 2.6	0.63 ± 1.28	1.91 ± 0.72
H36	16S,21W	Surface	15.3 ± 2.0	<0.27	1.58 ± 0.42
		0.15-0.45	12.6 ± 2.6	1.71 ± 0.58	0.63 ± 0.42
		0.45-0.75	2.58 ± 0.55	<0.18	0.84 ± 0.35
		0.75-1.05	1.77 ± 1.16	<0.46	1.56 ± 0.81
		1.05-1.35	3.06 ± 3.56	<0.43	2.31 ± 1.28
		1.35-1.65	2.56 ± 1.36	<0.52	2.37 ± 0.93
H37	19S,23W	0-10	12.7 ± 1.8	<0.29	1.23 ± 0.43
		0.10-0.30	3.18 ± 1.87	<0.23	0.66 ± 0.30
		0.30-0.60	2.95 ± 1.41	<0.38	0.83 ± 0.46
		0.60-0.90	2.76 ± 1.23	<0.40	1.23 ± 0.55
		0.90-1.20	3.22 ± 2.21	<0.47	2.89 ± 1.20
		1.20-1.50	1.94 ± 1.57	<0.43	1.12 ± 0.77
H38	38S,23W	0-0.07	4.69 ± 1.72	<0.36	1.00 ± 0.60
		0.07-0.17	26.2 ± 3.0	<0.58	2.14 ± 1.11
		0.45-0.75	3.14 ± 1.69	<0.61	1.41 ± 1.06
		0.75-1.05	2.47 ± 1.70	<0.58	2.75 ± 1.03

[a]Errors are 2σ based on counting statistics.

TABLE 8

RADIONUCLIDE CONCENTRATIONS IN SURFACE AND SUBSURFACE SOIL SAMPLES
COLLECTED FROM LOCATIONS IDENTIFIED
BY THE WALKOVER SCAN OUTSIDE THE SITE PERIMETER
CHEMETRON-MCGEAN HARVARD AVENUE SITE
NEWBURGH HEIGHTS, OHIO

Location	Depth (m)	Radionuclide Concentrations (pCi/g)		
		U-238	U-235	Th-232
55S, 38W	Surface	660 ± 20[a]	10.7 ± 2.3	<0.50
	0.15-0.25	51.1 ± 0.69	0.85 ± 0.69	0.79 ± 0 36
	0.25-0.30	2.85 ± 0.84	<0.23	1.11 ± 0.46
58S, 12W	Surface	270 ± 10	3.95 ± 1.47	0.98 ± 0.50
	0.15-0.25	64.9 ± 4.8	1.80 ± 0.86	0.73 ± 0.66
	0.25-0.30	22.1 ± 3.8	0.61 ± 0.66	0.41 ± 0.51
62S, 28E	Surface	550 ± 10	10.1 ± 1.9	0.63 ± 0.53
	0.15-0.25	130 ± 6	1.76 ± 0.84	0.66 ± 0.28
	0.25-0.30	120 ± 6	1.90 ± 0.86	0.59 ± 0.42
	0.30-0.45	41.0 ± 2.0	0.90 ± 0.27	0.99 ± 0.18
	0.45-0 60	12.3 ± 2.8	<0.29	1.37 ± 0.70

[a]Errors are 2σ based on counting statistics.

TABLE 9

RADIONUCLIDE CONCENTRATIONS IN SURFACE AND SUBSURFACE SOIL SAMPLES
COLLECTED SOUTH OF THE ALCOA PERMANENT MOLD CASTING DIVISION
CHEMETRON-MCGEAN HARVARD AVENUE SITE
NEWBURGH HEIGHTS, OHIO

Location	Depth (m)	Radionuclide Concentrations (pCi/g)[b] U-238	U-235	Th-232
45S, 65W	0-0.04	550 ± 20[a]	<4.55	620 ± 10
	0.15-0.30	69.0 ± 7.4	<1.51	92.2 ± 3.5
	0.30-0.45	8.10 ± 4.47	<0.78	13.1 ± 1.3
46S, 65W	Surface	42.9 ± 5.1	<1.05	56.4 ± 2.3
41S, 79W	Surface	67.3 ± 4.8	<1.32	69.0 ± 2.7
	0.15-0.30	4.66 ± 2.10	<0.52	12.8 ± 1.1
42S, 81W	Surface	27.7 ± 3.0	<0.76	15.5 ± 1.5
37S, 95W	Surface	12.2 ± 4.7	<0.74	20.6 ± 2.1
	0.15-0.30	1.64 ± 1.90	<0.52	2.16 ± 0.53
	0.30-0.45	6.72 ± 4.43	<0.51	4.77 ± 1.09

[a]Errors are 2σ based on counting statistics.

APPENDIX B

RADIOLOGICAL SURVEY DATA
BURT AVENUE SITE

CMC1

Dump 154 mgr.

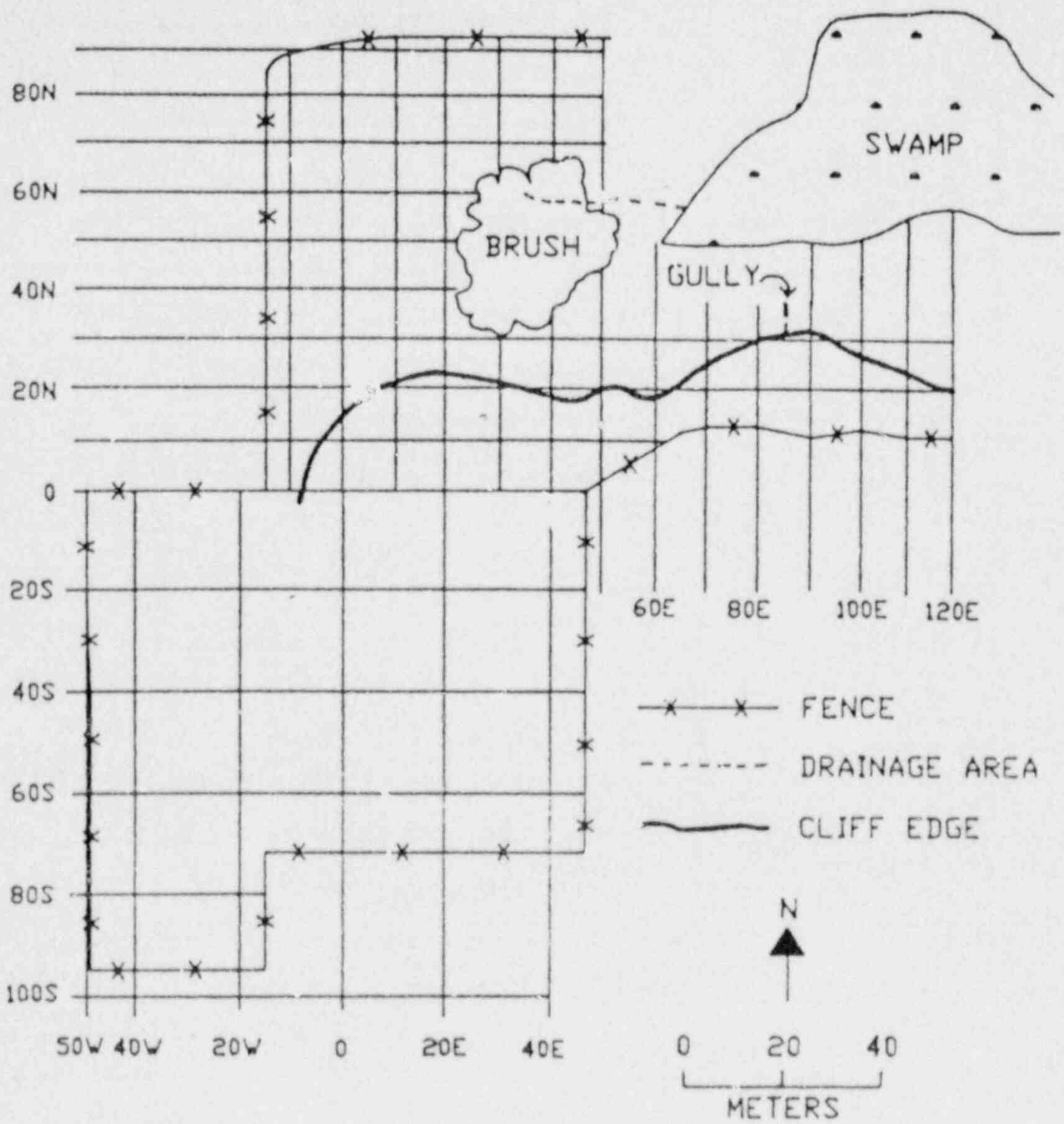

FIGURE 1: Plot Plan of Chemetron-McGean Industrial Dump Site Showing Reference Grid System

45 locations

TABLE 1 (Continued)

RADIONUCLIDE CONCENTRATIONS IN SURFACE SOIL SAMPLES COLLECTED FROM 10 M AND 20 M GRID INTERVALS AND PROPERTY BOUNDARIES CHEMETRON-MCGEAN INDUSTRIAL DUMP SITE NEWBURGH HEIGHTS, OHIO

Location	Radionuclide Concentrations (pCi/g)		
	U-238	U-235	Th-232
40N, 10W	3.60 ± 1.89	<0.32	1.47 ± 0.61
30N, 10W	6.04 ± 1.70	<0.30	0.77 ± 0.39
20N, 10W	0.75 ± 1.36	<0.27	0.89 ± 0.36
10N, 10W	2.68 ± 1.76	<0.24	0.56 ± 0.36
0N, 10W	5.81 ± 2.13	<0.28	0.49 ± 0.37
91N, 0[b]	1.45 ± 1.32	<0.30	0.71 ± 0.38
90N, 0	3.66 ± 3.24	<0.39	1.78 ± 0.94
80N, 0	10.8 ± 2.5	1.62 ± 0.92	0.89 ± 0.47
70N, 0	91.1 ± 3.9	1.77 ± 0.80	0.74 ± 0.31
60N, 0	3.42 ± 0.84	<0.16	0.64 ± 0.22
50N, 0	21.2 ± 2.2	0.59 ± 0.41	0.77 ± 0.23
40N, 0	19.0 ± 1.5	0.74 ± 0.49	0.52 ± 0.22
30N, 0	35.9 ± 2.8	0.48 ± 0.60	0.43 ± 0.44
20N, 0	14.0 ± 2.6	<0.32	1.20 ± 0.59
10N, 0	31.9 ± 5.7	0.55 ± 0.70	1.35 ± 0.37
0N, 0	39.2 ± 2.0	1.03 ± 0.66	1.00 ± 0.34
20S, 0	72.6 ± 7.2	2.57 ± 0.91	1.26 ± 0.64
40S, 0	13.6 ± 1.6	0.52 ± 0.42	1.02 ± 0.29
60S, 0	15.4 ± 3.3	<0.31	1.58 ± 0.62
73S, 0[b]	7.81 ± 1.37	<0.32	1.24 ± 0.53
92N, 10E[b]	3.38 ± 5.43	<0.36	1.14 ± 0.61
90N, 10E	10.4 ± 4.1	<0.31	1.39 ± 0.52
80N, 10E	56.1 ± 4.0	1.74 ± 0.83	1.00 ± 0.46
70N, 10E	47.9 ± 3.4	1.63 ± 0.78	1.49 ± 0.36
60N, 10E	56.6 ± 4.9	1.43 ± 0.47	0.[illegible]6 ± 0.47
50N, 10E	8.23 ± 1.74	<0.28	0.69 ± 0.30
40N, 10E	10.9 ± 3.2	<0.31	0.57 ± 0.53
30N, 10E	17.9 ± 1.9	0.70 ± 0.56	0.81 ± 0.36
20N, 10E	11.5 ± 2.9	0.43 ± 0.61	0.86 ± 0.40
10N, 10E	45.1 ± 2.3	1.09 ± 0.65	1.04 ± 0.59
0N, 10E	21.2 ± 2.6	0.46 ± 0.52	0.87 ± 0.25
92N, 20E[b]	4.41 ± 3.29	<0.37	0.91 ± 0.64
90N, 20E	0.93 ± 2.18	<0.18	0.70 ± 0.33
80N, 20E	5.98 ± 1.72	<0.24	<0.16
70N, 20E	55.8 ± 5.0	0.92 ± 1.24	1.27 ± 0.52
60N, 20E	3.82 ± 1.12	0.54 ± 0.52	1.72 ± 0.47
50N, 20E	59.3 ± 6.0	0.84 ± 0.84	<0.18

TABLE 1 (Continued)

RADIONUCLIDE CONCENTRATIONS IN SURFACE SOIL SAMPLES
COLLECTED FROM 10 M AND 20 M GRID INTERVALS AND PROPERTY BOUNDARIES
CHEMETRON-MCGEAN INDUSTRIAL DUMP SITE
NEWBURGH HEIGHTS, OHIO

Location	Radionuclide Concentrations (pCi/g)		
	U-238	U-235	Th-232
40N, 20E	140 ± 5	2.46 ± 1.02	0.38 ± 0.36
30N, 20E	5.89 ± 2.26	0.43 ± 0.42	<0.21
[illegible], 20E	55.5 ± 2.9	1.23 ± 0.78	1.37 ± 0.50
[illegible], 20E	26.2 ± 2.4	<0.27	0.77 ± 0.57
0N, 20E	2.01 ± 1.41	0.35 ± 0.44	0.87 ± 0.35
20S, 20E	16.7 ± 2.4	<0.34	1.48 ± 0.52
40S, 21E	10.9 ± 1.5	0.83 ± 0.69	1.38 ± 0.39
60S, 20E	3.43 ± 2.26	<0.33	1.81 ± 0.64
73S, 20E[b]	4.40 ± 1.55	<0.39	1.63 ± 0.82
92N, 30E[b]	3.90 ± 2.60	<0.35	1.18 ± [illegible]
90N, 30E	<0.86	<0.30	1.58 ± [illegible]
80N, 30E	19.2 ± 2.5	0.80 ± 0.69	1.86 ± 0.45
70N, 30E	52.7 ± 5.7	1.68 ± 1.24	0.56 ± 0.50
60N, 30E	12.1 ± 1.5	<0.26	1.06 ± 0.46
50N, 30E	e	e	e
40N, 30E	12.1 ± 1.5	0.47 ± 0.49	0.45 ± 0.23
30N, 30E	18.5 ± 3.2	<0.28	1.00 ± 0.53
20N, 30E	12.0 ± 2.7	<0.27	0.91 ± 0.35
10N, 30E	37.1 ± 4.0	0.65 ± 0.87	1.04 ± 0.47
0N, 30E	37.6 ± 2.4	1.45 ± 0.81	3.50 ± 0.81
92N, 40E[b]	0.93 ± 3.28	<0.22	0.85 ± 0.75
90N, 40E	1.83 ± 1.35	<0.30	1.35 ± 0.55
80N, 40E	36.2 ± 5.6	0.71 ± 0.73	1.42 ± 0.75
70N, 40E	32.0 ± 7.1	<0.93	<0.88
60N, 40E	2.49 ± 1.92	<0.24	1.41 ± 0.50
50N, 40E	1.85 ± 1.58	<0.28	0.88 ± 0.37
40N, 40E	1.71 ± 1.93	<0.26	1.06 ± 0.35
30N, 40E	25.1 ± 2.2	[illegible] ± 0.56	1.39 ± 0.47
20N, 40E	34.9 ± 3.7	[illegible]	1.05 ± 0.35
10N, 40E	51.1 ± 3.4	[illegible] ± 0.72	0.80 ± 0.52
0N, 40E	90.[illegible] ± 6.3	1.93 ± 0.98	1.19 ± 0.64
20S, 40E	2.87 ± 1.51	<0.35	1.72 ± 0.44
40S, 40E	4.76 ± 2.79	<0.25	1.41 ± 0.46
60S, 40E	3.64 ± 1.11	<0.33	1.22 ± 0.45
73S, 40E[b]	3.46 ± 1.10	<0.30	1.20 ± 0.57
0N, 47E[b]	11.2 ± 2.4	<0.29	1.07 ± 0.54
20S, 47E[b]	2.99 ± 3.35	<0.30	0.70 ± 0.72
40S, 47E[b]	7.65 ± 1.71	[illegible]	1.32 ± 0.66

TABLE 1 (Continued)

RADIONUCLIDE CONCENTRATIONS IN SURFACE SOIL SAMPLES
COLLECTED FROM 10 M AND 20 M GRID INTERVALS AND PROPERTY BOUNDARIES
CHEMETRON-MCGEAN INDUSTRIAL DUMP SITE
NEWBURGH HEIGHTS, OHIO

Location	Radionuclide Concentrations (pCi/g)		
	U-238	U-235	Th-232
60S, 47E[b]	6.29 ± 3.01	<0.35	2.40 ± 0.76
73S, 47E[b]	12.5 ± 2.1	0.73 ± 1.20	1.09 ± 0.45
50-92N, 50E	f	f	f
40N, 50E	16.7 ± 3.8	<0.33	0.71 ± 0.39
30N, 50E	19.0 ± 2.9	0.35 ± 0.78	2.06 ± 0.75
20N, 50E	6.80 ± 6.11	<0.37	1.73 ± 0.64
10N, 50E	38.8 ± 3.3	<0.37	1.26 ± 0.78
3N, 50E[b]	1[illegible].7 ± 4.7	<0.44	1.08 ± 0.54
50-92N, 60E	f	f	f
40N, 60E	d	d	d
30N, 60E	42.6 ± 3.1	0.84 ± 0.68	0.88 ± 0.43
20N, 60E	77.0 ± 6.3	1.35 ± 0.98	1.58 ± 0.56
10N, 60E	12.1 ± 2.6	<0.40	1.62 ± 0.66
9N, 60E[b]	23.5 ± 2.9	<0.43	1.62 ± 0.54
50-92N, 70E	f	f	f
40N, 70E	120 ± 4	2.72 ± 0.97	0.91 ± 0.46
30N, 70E	130 ± 8	2.58 ± 1.07	1.01 ± 0.49
20N, 70E	29.5 ± 2.2	1.07 ± 0.66	0.96 ± 0.47
13N, 70E[b]	34.0 ± 5.8	1.38 ± 0.73	1.76 ± 1.06
50-90N, 80E	f	f	f
40N, 80E	44.8 ± 5.3	0.98 ± 0.81	1.09 ± 0.59
30N, 80E	170 ± 5	3.17 ± 1.20	1.78 ± 0.66
20N, 80E	14.2 ± 2.0	0.51 ± 0.76	2.95 ± 0.52
13N, 80E[b]	11.3 ± 2.6	0.90 ± 0.63	1.29 ± 0.40
50-90N, 90E	f	f	f
40N, 90E	140 ± 6	2.67 ± 1.03	1.33 ± 0.44
30N, 90E	6.01 ± 2.18	<0.25	0.88 ± 0.40
20N, 90E	5.65 ± 1.26	0.56 ± 0.62	1.54 ± 0.50
12N, 90E[b]	11.6 ± 4.2	<0.38	1.49 ± 0.51
50-90N, 100E	f	f	f
40N, 100E	3.11 ± 3.[illegible]	<0.30	1.05 ± 0.33
30N, 100E	5.18 ± [illegible]	<0.32	0.81 ± 0.66
20N, 100E	7.86 ± 1.[illegible]	<0.37	2.91 ± 0.57
13N, 100E[b]	11.4 ± [illegible]	<0.43	1.30 ± 1.09

TABLE 2

RADIONUCLIDE CONCENTRATIONS IN SURFACE SOIL SAMPLES
FROM LOCATIONS IDENTIFIED BY THE WALKOVER SCAN
CHEMETRON-MCGEAN INDUSTRIAL DUMP SITE
NEWBURGH HEIGHTS, OHIO

Location[a]	Description	Radionuclide Concentrations (pCi/g)		
		U-238	U-235	Th-232
85N, 13E[b]	Soil	110 ± 9[c]	12.1 ± 4.1	1.05 ± 1.77
80N, 44E	Soil	13100 ± 20	19.9 ± 2.9	1.50 ± 0.68
76N, 39E[d]	Soil	30.2 ± 3.3	3.14 ± 1.41	2.57 ± 1.03
74N, 26E	Soil	1540 ± 20	24.7 ± 3.1	2.74 ± 0.81
73N, 31E	Soil	45.0 ± 5.1	0.67 ± 1.27	3.36 ± 1.00
70N, 40E	Soil	27.6 ± 4.4	<0.98	2.63 ± 1.77
68N, 11E	Soil	1780 ± 30	29.1 ± 4.2	2.24 ± 1.07
67N, 15E	Soil	60.3 ± 7.1	1.34 ± 1.29	1.92 ± 0.92
63N, 30E	Soil	66.7 ± 5.6	2.88 ± 1.50	0.50 ± 0.36
46N, 2E	Soil	1590 ± 20	27.8 ± 4.7	<0.69
46N, 21E	Soil	71.7 ± 5.0	2.24 ± 1.55	1.92 ± 0.87
45N, 3E	Soil	65400 ± 40	85.5 ± 9.4	<0.93
45N, 4E	Green/Yellow Material	2890 ± 20	52.2 ± 4.4	1.54 ± 1.02
44N, 1E	Rock	20000 ± 100	340 ± 10	<3.00
42N, 13E	Soil	17400 ± 50	210 ± 10	<1.51
40N, 85E[e]	Soil	9860 ± 50	180 ± 8	1.36 ± 1.76
38N, 15E	Green/Yellow Material	8410 ± 40	120 ± 8	<0.85
37N, 20E[f]	Green Material	520 ± 10	7.68 ± 1.64	<0.23
37N, 21E	Soil	400 ± 9	8.42 ± 2.55	3.17 ± 1.96
32N, 91E	Soil	1360 ± 20	22.1 ± 4.0	1.28 ± 0.89
31N, 25E	Soil	14800 ± 20	23.6 ± 3.7	2.06 ± 1.64
31N, 86E	Soil	1330 ± 10	29.6 ± 3.5	1.00 ± 0.77
31N, 89E	Soil	109000 ± 200	1040 ± 50	<6.90
30N, 90E	Soil	12000 ± 20	20.2 ± 3.4	1.02 ± 0.82
28N, 78E	Soil	630 ± 13	10.2 ± 2.7	2.00 ± 0.85
28N, 81E	Soil	380 ± 20	5.81 ± 3.08	1.69 ± 1.19
21-22N, 21E	Soil			
21N, 21E	Soil	14600 ± 20	25.7 ± 3.9	1.23 ± 1.54
20N, 32E[g]	Brick Chips	17300 ± 240	270 ± 40	<4.82
19N, 58E	Soil	450 ± 10	8.22 ± 1.99	1.39 ± 0.61
18N, 1W[h]	Rock	900 ± 30	105 ± 20	290 ± 30
17N, 26E	White Material	380 ± 10	7.56 ± 2.61	2.66 ± 0.83
17N, 33E	Slag Chips	14000 ± 80	220 ± 20	<1.93
17N, 110E	Soil	2580 ± 20	50.0 ± 4.2	1.54 ± 0.98
15N, 27E	Soil	23.5 ± 2.3	0.32 ± 0.61	1.05 ± 0.46
15N, 28E	Soil	280 ± 8	5.82 ± 1.54	1.92 ± 1.15
15N, 61E	Soil	69.1 ± 8.8	6.08 ± 1.94	1.71 ± 0.93
12N, 10E	Soil	540 ± 10	10.9 ± 2.1	0.95 ± 0.45

TABLE 2 (Continued)

RADIONUCLIDE CONCENTRATIONS IN SURFACE SOIL SAMPLES
FROM LOCATIONS IDENTIFIED BY THE WALKOVER SCAN
CHEMETRON-MCGEAN INDUSTRIAL DUMP SITE
NEWBURGH HEIGHTS, OHIO

Location	Description	Radionuclide Concentrations (pCi/g) U-238	U-235	Th-232
11N, 55E	Soil	37.4 ± 4.2	1.02 ± 0.81	1.66 ± 0.78
10N, 25E	Soil	180 ± 6	3.52 ± 1.19	1.02 ± 0.40
10N, 52E	Soil	500 ± 20	8.60 ± 2.33	0.98 ± 0.47
7N, 13E	Soil	550 ± 10	7.98 ± 1.87	1.54 ± 0.97
7N, 54E	Yellow Material	700 ± 10	14.3 ± 2.1	1.67 ± 0.61
6N, 25E	Soil	230 ± 10	3.24 ± 1.37	1.24 ± 0.59
6N, 51E	Yellow Material	510 ± 10	10.2 ± 1.8	1.13 ± 0.45
6N, 52E	Soil	370 ± 10	5.34 ± 1.78	<0.46
5N, 34E	Soil	1890 ± 20	37.7 ± 3.7	1.53 ± 0.79
4N, 10E	Soil	60.1 ± 4.5	1.49 ± 0.88	1.23 ± 0.45
3N, 13E	Soil	260 ± 10	5.46 ± 1.36	1.17 ± 0.56
2N, 41E	Soil	130 ± 5	2.90 ± 1.10	1.67 ± 0.52
1N, 1E	Soil	600 ± 10	10.3 ± 1.3	0.94 ± 0.49
3S, 29E	Soil	47.5 ± 3.5	<0.39	1.59 ± 0.46
10S, 30E	Soil	220 ± 10	3.82 ± 1.25	1.19 ± 0.80
11S, 17W	Green Material	930 ± 10	16.2 ± 2.3	0.63 ± 0.35
15S, 13E	Soil	500 ± 10	7.26 ± 2.46	1.23 ± 0.70
16S, 3E	Soil	360 ± 7	6.31 ± 1.43	1.49 ± 0.55
16S, 26E	Soil	260 ± 10	5.67 ± 1.44	2.04 ± 0.61
17S, 2E	White Material	490 ± 10	7.72 ± 2.13	1.37 ± 0.68
17S, 20E	Soil	270 ± 10	4.82 ± 1.49	2.19 ± 0.68
21S, 24E	Soil	1030 ± 10	20.4 ± 2.8	1.36 ± 0.49
21S, 25E	Soil	480 ± 10	11.3 ± 2.0	1.18 ± 0.60
26S, 0	Yellow Material	3640 ± 30	60.3 ± 5.0	1.91 ± 1.08
29S, 2W	Soil	3460 ± 20	64.1 ± 4.9	1.80 ± 1.11

[a]Refer to Figure 2.
[b]Also contains 99.2 ± 2.6 pCi/g Ra-226.
[c]Errors are 2σ based on counting statistics.
[d]Also contains 20.5 ± 0.9 pCi/g Ra-226.
[e]Collected from runoff gully on side of cliff.
[f]Collected from a mound of green material.
[g]Also contains 6.42 ± 9.89 pCi/g Ra-226.
[h]Also contains 19700 ± 20 pCi/g Ra-226.

TABLE 3

RADIONUCLIDE CONCENTRATIONS IN BOREHOLE SOIL SAMPLES
COLLECTED FROM REPRESENTATIVE LOCATIONS
CHEMETRON-MCGEAN INDUSTRIAL DUMP SITE
NEWBURGH HEIGHTS, OHIO

Borehole No.[a]	Location	Depth (m)	Radionuclide Concentrations (pCi/g)		
			U-238	U-235	Th-232
H1	40N, 0	0-0.3	5.39 ± 1.52[b]	<0.29	0.54 ± 0.60
		0.3-0.6	0.68 ± 1.66	<0.34	0.86 ± 0.52
		0.6-0.9	<0.73	<1.39	0.57 ± 0.35
		0.9-1.2	1.05 ± 1.35	0.40 ± 0.39	<0.21
		1.2-1.5	2.05 ± 2.29	<0.45	0.45 ± 0.46
		1.5-1.8	1.23 ± 0.76	<0.30	0.32 ± 0.32
H2	40S, 0	0-0.3	5.94 ± 1.96	0.72 ± 0.76	1.05 ± 0.62
		0.3-0.6	<1.67	<0.80	1.62 ± 1.36
		0.6-0.9	3.99 ± 3.61	<0.58	1.54 ± 0.99
		0.9-1.2	1.53 ± 2.51	<0.52	2.30 ± 0.80
		1.2-1.5	<1.35	0.78 ± 1.42	1.26 ± 1.27
		1.5-1.8	3.98 ± 2.13	<0.49	1.17 ± 0.76
H3	60S, 20W	0-0.3	<1.12	<0.52	1.29 ± 0.62
		0.3-0.6	2.42 ± 2.79	<0.53	0.89 ± 0.92
		0.6-0.9	1.48 ± 1.21	<0.38	0.83 ± 0.58
		0.9-1.2	3.10 ± 1.55	<0.35	0.77 ± 0.54
		1.2-1.5	1.69 ± 2.51	<0.42	1.15 ± 0.55
		1.5-1.8	1.60 ± 1.95	<0.46	1.38 ± 0.68
H4	70N, 10E	0-0.3	26.4 ± 3.8	<0.60	1.17 ± 0.85
		0.3-0.6	2.64 ± 1.02	<0.21	<0.20
		0.6-0.9	22.1 ± 2.7	<0.40	0.37 ± 0.52
		0.9-1.2	260 ± 20	6.00 ± 2.80	<0.82
		1.2-1.5	27.3 ± 3.2	1.11 ± 0.78	0.40 ± 0.75
		1.5-1.8	2.08 ± 3.62	<0.53	0.99 ± 0.76
H5	0N, 10E	0-0.3	11.7 ± 3.7	<0.57	1.33 ± 0.67
		0.3-0.6	21.1 ± 3.3	<0.70	1.80 ± 1.22
		0.6-0.9	28.1 ± 5.9	1.02 ± 0.94	2.06 ± 0.99
		0.9-1.2	7.54 ± 6.83	<1.11	3.36 ± 1.80
		1.2-1.5	101 ± 9	1.97 ± 1.83	1.75 ± 0.89
		1.5-1.8	22.5 ± 7.1	<1.18	3.16 ± 2.56
H6	20S, 20E	0-0.3	9.41 ± 4.35	<0.57	<0.50
		0.3-0.6	3.40 ± 4.11	<0.75	1.20 ± 1.24
		0.6-0.9	23.4 ± 6.4	<0.69	<0.80
		0.9-1.2	<1.38	<0.59	<0.39
		1.2-1.5	6.66 ± 4.14	<0.48	0.84 ± 0.86
		1.5-1.8	2.96 ± 2.56	<0.68	1.03 ± 1.20

TABLE 3 (Continued)

RADIONUCLIDE CONCENTRATIONS IN BOREHOLE SOIL SAMPLES
COLLECTED FROM REPRESENTATIVE LOCATIONS
CHEMETRON-MCGEAN INDUSTRIAL DUMP SITE
NEWBURGH HEIGHTS, OHIO

Borehole No.	Location	Depth (m)	Radionuclide Concentrations (pCi/g)		
			U-238	U-235	Th-232
H7	60S, 20E	0-0.3	3.14 ± 4.78	<0.69	2.40 ± 1.08
		0.3-0.6	1.53 ± 1.32	<0.72	1.12 ± 1.26
		0.6-0.9	3.26 ± 3.28	<0.85	2.58 ± 1.11
		0.9-1.2	1.63 ± 3.76	<0.68	1.66 ± 1.14
		1.2-1.5	1.17 ± 1.14	<0.47	<0.52
		1.5-1.8	5.70 ± 3.00	<1.11	1.69 ± 1.57
H8	0N, 40E	0-0.3	56.1 ± 6.4	1.22 ± 1.70	3.50 ± 1.45
		0.3-0.6	2.50 ± 4.24	<0.53	1.20 ± 0.95
		0.6-0.9	12.7 ± 3.0	<0.61	2.61 ± 1.02
		0.9-1.2	2.23 ± 2.52	<0.51	1.29 ± 0.97
		1.2-1.5	7.00 ± 5.56	<1.11	<0.99
		1.5-1.8	c	c	c
H9	40S, 40E	0-0.3	2.97 ± 4.72	<0.73	1.28 ± 0.87
		0.3-0.6	<1.95	<0.81	1.44 ± 1.32
		0.6-0.9	c	c	c
		0.9-1.2	1.89 ± 2.56	<1.21	1.59 ± 1.60
		1.2-1.5	2.71 ± 4.30	<0.64	2.66 ± 1.43
		1.5-1.8	<1.93	<0.93	0.66 ± 0.63
		1.8-2.1	c	c	c
		2.1-2.4	<1.10	<0.50	<0.47

[a]Refer to Figure 3.
[b]Errors are 2σ based on counting statistics.
[c]No sample collected by split-spoon technique - sampler inlet plugged by solid object.

TABLE 4

RADIONUCLIDE CONCENTRATIONS IN BOREHOLE SOIL SAMPLES
COLLECTED FROM LOCATIONS OF ELEVATED ACTIVITY
CHEMETRON-MCGEAN INDUSTRIAL DUMP SITE
NEWBURGH HEIGHTS, OHIO

Borehole No.[a]	Location	Depth (m)	Radionuclide Concentrations (pCi/g) U-238	U-235	Th-232
H10	45N, 4E	0-0.1	2890 ± 20[b]	52.2 ± 4.4	1.54 ± 1.02
		0.1 -0.3	11.4 ± 1.9	<0.44	<0.26
		0.3 -0.6	17.9 ± 4.8	<0.78	2.85 ± 1.11
		0.6 -0.9	42.9 ± 4.5	1.62 ± 1.47	1.85 ± 0.80
		0.9 -1.2	14.2 ± 5.5	<1.10	2.76 ± 1.48
H11	31N, 86E	0-0.1	1330 ± 10	29.6 ± 3.5	1.00 ± 0.77
		0.15-0.3	1710 ± 20	36.2 ± 4.3	0.88 ± 0.73
		0.3 -0.6	17.5 ± 2.1	<0.41	1.31 ± 0.47
		0.6 -0.75	46.9 ± 5.6	1.50 ± 1.18	1.58 ± 0.68
H12	19N, 58E	0-0.1	450 ± 10	8.22 ± 1.99	1.39 ± 0.61
		0.15-0.3	1570 ± 20	26.3 ± 3.0	1.35 ± 0.77
		0.3 -0.6	55.0 ± 3.7	0.95 ± 0.71	1.26 ± 0.54
H13	17N, 26E	0-0.1	380 ± 10	7.56 ± 2.61	2.66 ± 0.83
		0.1 -0.3	110 ± 8	2.97 ± 2.45	2.16 ± 1.04
		0.3 -0.6	64.0 ± 4.5	1.52 ± 1.13	0.60 ± 0.57
		0.6 -0.9	15.6 ± 4.3	<0.62	1.69 ± 0.98
		0.9 -1.2	37.7 ± 4.2	<0.70	0.94 ± 0.91
		1.2 -1.5	6.37 ± 2.68	<0.47	1.14 ± 0.62
		1.5 -1.8	17.1 ± 3.6	<0.60	0.99 ± 0.97
H14	17N, 110E	0-0.1	2580 ± 20	50.0 ± 4.2	1.54 ± 0.78
		0.15-0.3	1370 ± 20	20.2 ± 3.4	1.73 ± 0.96
		0.3 -0.6	92.1 ± 4.2	1.58 ± 1.02	1.48 ± 0.46
		0.6 -0.75	75.1 ± 6.9	0.91 ± 1.02	2.00 ± 0.63
H15	15N, 27E	0-0.1	23.5 ± 2.3	0.32 ± 0.61	1.05 ± 0.46
		0.10-0.3	10200 ± 60	210 ± 20	<1.56
		0-0.15[c]	540 ± 10	12.1 ± 2.1	0.91 ± 0.40
		0.3 -0.6	3610 ± 40	85.5 ± 9.7	6.31 ± 2.12
		0.6 -0.9	110 ± 6	1.99 ± 1.57	0.64 ± 0.47
		0.9 -1.2	160 ± 6	3.47 ± 1.72	1.33 ± 0.58
		1.2 -1.5	500 ± 10	12.3 ± 2.6	0.50 ± 0.94
		1.5 -1.8	520 ± 10	10.9 ± 2.1	2.22 ± 1.20
H16	15N, 61E	0-0.1	69.1 ± 8.8	6.08 ± 1.94	1.71 ± 0.93
		0.1 -0.3	260 ± 10	5.66 ± 1.45	2.00 ± 1.16
		0.15-0.3[c]	960 ± 20	17.6 ± 2.7	1.27 ± 1.08
		0.3 -0.6	17.1 ± 2.6	<0.59	1.79 ± 1.04
		0.6 -0.9	39.4 ± 3.6	<0.57	0.92 ± 0.70
		0.9 -1.2	2.58 ± 1.59	<0.63	<0.56

TABLE 4 (Continued)

RADIONUCLIDE CONCENTRATIONS IN BOREHOLE SOIL SAMPLES
COLLECTED FROM LOCATIONS OF ELEVATED ACTIVITY
CHEMETRON-MCGEAN INDUSTRIAL DUMP SITE
NEWBURGH HEIGHTS, OHIO

Borehole No.	Location	Depth (m)	Radionuclide Concentrations (pCi/g) U-238	U-235	Th-232
H17	12N, 10E	0-0.1	540 ± 10	10.9 ± 2.1	0.95 ± 0.45
		0.1 -0.3	58.7 ± 3.8	1.26 ± 1.38	1.52 ± 0.69
		0.3 -0.6	27.3 ± 2.9	1.25 ± 1.16	1.15 ± 1.03
		0.6 -0.9	57.6 ± 4.7	1.43 ± 1.36	0.93 ± 0.79
		0.9 -1.2	370 ± 20	5.80 ± 3.04	<0.70
		1.2 -1.5	60.8 ± 4.8	1.37 ± 1.34	1.35 ± 0.62
		1.5 -1.8	33.9 ± 5.7	1.95 ± 2.51	1.33 ± 1.36
H18	11N, 55E	0-0.1	37.4 ± 4.2	1.02 ± 0.81	1.66 ± 0.78
		0.1 -0.3	3060 ± 50	46.9 ± 10.6	3.53 ± 2.95
		0.3 -0.35[c]	1240 ± 20	24.5 ± 3.1	2.49 ± 0.83
		0.3 -0.6	83.4 ± 6.3	2.73 ± 1.08	1.74 ± 0.88
		0.6 -0.9	260 ± 10	4.68 ± 2.19	1.65 ± 1.20
		0.9 -1.2	12.1 ± 1.2	1.14 ± 0.76	2.37 ± 0.90
		1.2 -1.5	250 ± 10	4.98 ± 2.10	2.88 ± 1.11
		1.5 -1.8	360 ± 20	8.49 ± 3.34	2.68 ± 3.18
H19	10N, 52E	0-0.1	500 ± 20	8.60 ± 2.33	0.98 ± 0.47
		0.1 -0.2	270 ± 6	5.02 ± 1.38	1.38 ± 0.67
		0.2 -0.3	240 ± 10	4.10 ± 1.60	1.65 ± 0.68
H20	6N, 25E	0-0.1	230 ± 10	3.24 ± 1.37	1.24 ± 0.59
		0.1 -0.15[c]	110 ± 6	2.05 ± 0.93	1.29 ± 0.65
		0.1 -0.3	38.1 ± 5.1	1.44 ± 1.05	1.88 ± 0.71
		0.3 -0.6	44.4 ± 4.8	0.83 ± 2.02	2.75 ± 1.16
		0.6 -0.9	29.2 ± 7.3	<0.71	1.02 ± 0.57
		0.9 -1.2	13.9 ± 2.7	0.95 ± 1.05	1.04 ± 0.87
		1.2 -1.5	18.1 ± 3.4	<0.73	1.96 ± 1.27
		1.5 -1.8	<1.25	<0.49	<0.53
H21	5N, 34E	0-0.1	1890 ± 20	37.7 ± 3.7	1.53 ± 0.79
		0-0.15[c]	280 ± 8	4.61 ± 1.75	1.40 ± 0.88
		0.1 -0.3	42.0 ± 4.7	2.81 ± 1.60	1.63 ± 1.42
		0.3 -0.6	3.42 ± 2.08	<0.64	1.75 ± 0.81
		0.6 -0.9	5.10 ± 1.86	1.34 ± 1.27	1.73 ± 0.67
		0.9 -1.2	1.96 ± 2.41	<0.65	2.16 ± 1.09
H22	3N, 13E	0-0.1	260 ± 10	5.46 ± 1.36	1.17 ± 0.56
		0.1 -0.3	46.5 ± 6.0	1.96 ± 1.41	0.91 ± 0.90
		0.3 -0.6	3.30 ± 2.16	<0.23	0.60 ± 0.46
		0.6 -0.9	9.73 ± 2.20	<0.60	1.38 ± 1.05
		0.9 -1.2	24.9 ± 7.0	<1.23	3.56 ± 2.13
		1.2 -1.5	30.3 ± 4.0	0.78 ± 0.67	1.07 ± 0.43
		1.5 -1.8	9.90 ± 3.41	<0.67	0.96 ± 0.72

TABLE 4 (Continued)

RADIONUCLIDE CONCENTRATIONS IN BOREHOLE SOIL SAMPLES
COLLECTED FROM LOCATIONS OF ELEVATED ACTIVITY
CHEMETRON-MCGEAN INDUSTRIAL DUMP SITE
NEWBURGH HEIGHTS, OHIO

Borehole No.	Location	Depth (m)	Radionuclide Concentrations (pCi/g) U-238	U-235	Th-232
H23	2N, 41E	0-0.1	130 ± 5	2.90 ± 1.10	1.67 ± 0.52
		0.1 -0.3	7.34 ± 1.99	0.88 ± 1.14	2.52 ± 0.94
		0.3 -0.6	1.02 ± 5.97	<0.62	2.36 ± 1.27
		0.6 -0.9	26.8 ± 5.1	<0.71	1.96 ± 1.11
		0.9 -1.2	2.96 ± 1.83	<0.81	3.10 ± 1.27
H24	10S, 30E	0-0.1	220 ± 10	3.82 ± 1.25	1.19 ± 0.80
		0.1 -0.3	65.8 ± 5.5	1.39 ± 1.02	2.70 ± 1.18
		0.3 -0.6	1.24 ± 1.23	<0.56	1.80 ± 0.85
		0.6 -0.9	3.15 ± 1.55	<0.52	1.11 ± 0.81
		0.9 -1.2	2.79 ± 1.83	<0.58	<0.57
H25	11S, 17W	0-0.1	930 ± 10	16.2 ± 2.3	0.63 ± 0.35
		0-0.15[c]	120 ± 4	2.78 ± 0.55	0.68 ± 0.55
		0.1 -0.3	25.2 ± 2.6	<0.45	0.63 ± 0.43
		0.3 -0.6	26.9 ± 4.0	<0.63	1.22 ± 0.96
		0.6 -0.9	76.0 ± 6.3	1.44 ± 1.11	1.42 ± 0.67
		0.9 -1.05[c]	60.4 ± 6.0	1.03 ± 1.08	1.24 ± 0.56
		0.9 -1.2	17.2 ± 2.0	0.65 ± 0.58	1.16 ± 0.52
H26	15S, 13E	0-0.1	500 ± 10	7.26 ± 2.46	1.23 ± 0.70
		0.1 -0.3	14.9 ± 5.2	1.37 ± 1.36	0.33 ± 0.57
		0.3 -0.6	4.89 ± 1.65	<0.53	<0.40
		0.6 -0.9	15.7 ± 2.7	<0.64	2.24 ± 0.84
		0.9 -1.2	4.23 ± 4.39	<0.95	2.20 ± 1.26
H27	16S, 3E	0-0.1	360 ± 7	6.31 ± 1.43	1.49 ± 0.55
		0.1 -0.3	31.2 ± 4.2	1.82 ± 1.56	1.45 ± 1.23
		0.3 -0.6	6.54 ± 2.85	<0.67	2.31 ± 1.05
		0.6 -0.9	15.0 ± 2.4	<0.46	1.52 ± 0.61
		0.7 -0.8[c]	5.98 ± 2.76	<0.39	1.70 ± 0.72
		0.9 -1.2	15.7 ± 3.2	<0.74	1.74 ± 1.37
H28	17S, 2E	0-0.1	490 ± 10	7.72 ± 2.13	1.37 ± 0.68
		0-0.15[c]	330 ± 8	5.45 ± 1.56	1.57 ± 0.56
		0.1 -0.3	780 ± 20	12.2 ± 3.8	1.62 ± 0.93
		0.3 -0.6	310 ± 5	5.49 ± 1.16	2.06 ± 0.85
		0.6 -0.9	45.4 ± 4.4	1.10 ± 1.13	<0.44
		0.9 -1.2	8.37 ± 3.35	<0.64	0.95 ± 0.74

TABLE 4 (Continued)

RADIONUCLIDE CONCENTRATIONS IN BOREHOLE SOIL SAMPLES
COLLECTED FROM LOCATIONS OF ELEVATED ACTIVITY
CHEMETRON-MCGEAN INDUSTRIAL DUMP SITE
NEWBURGH HEIGHTS, OHIO

Borehole No.	Location	Depth (m)	Radionuclide Concentrations (pCi/g) U-238	U-235	Th-232
H29	17S, 20E	0-0.1	270 ± 10	4.82 ± 1.49	2.19 ± 0.68
		0.1 -0.3	12.5 ± 3.8	<0.54	1.04 ± 0.88
		0.3 -0.6	1.46 ± 1.14	<0.29	1.07 ± 1.06
		0.6 -0.9	4.92 ± 3.43	<0.62	1.99 ± 0.90
		0.9 -1.2	3.45 ± 2.68	<0.61	<0.24
H30	21S, 24E	0-0.1	1030 ± 10	20.4 ± 2.8	1.36 ± 0.49
		0-0.15[c]	22.9 ± 3.8	<0.54	0.89 ± 0.50
		0.15-0.3[c]	11.7 ± 2.0	<0.32	1.63 ± 0.54
		0.1 -0.3	190 ± 8	3.50 ± 1.77	2.04 ± 1.20
		0.3 -0.6	32.0 ± 2.7	<0.51	1.30 ± 0.65
		0.6 -0.9	13.1 ± 7.8	<0.69	1.69 ± 1.30
		0.9 -1.2	3.93 ± 3.65	<0.68	1.51 ± 1.36
H31	26S, 0	0-0.1	3640 ± 30	60.3 ± 5.0	1.91 ± 1.08
		0-0.15[c]	2460 ± 30	36.8 ± 4.1	0.48 ± 1.47
		0.1 -0.3	2770 ± 30	44.9 ± 7.0	1.55 ± 1.97
		0.3 -0.6	2.66 ± 2.68	<0.64	<0.55
		0.6 -0.9	260 ± 10	4.58 ± 2.41	1.65 ± 0.74
		0.9 -1.2	0.95 ± 1.72	0.40 ± 0.55	0.57 ± 0.55
H32	29S, 2W	0-0.1	3460 ± 20	64.1 ± 4.9	1.80 ± 1.11
		0-0.15[c]	800 ± 10	13.6 ± 2.7	1.37 ± 0.63
		0.1 -0.3	2050 ± 30	40.2 ± 7.2	<1.11
		0.3 -0.6	550 ± 20	8.79 ± 3.62	3.20 ± 1.95
		0.6 -0.9	30.8 ± 4.0	0.96 ± 0.81	0.73 ± 0.93
		0.9 -1.2	6.97 ± 2.65	<0.53	<0.47
		1.2 -1.5	12.3 ± 3.2	<0.51	1.86 ± 0.80
		1.5 -1.8	2.24 ± 1.20	<0.45	1.04 ± 0.67

[a]Refer to Figure 4.
[b]Errors are 2σ based on counting statistics.
[c]Sample collected from side of borehole.

APPENDIX C

COST QUOTATION FOR TRANSPORTATION AND DISPOSAL

CHEM-NUCLEAR SYSTEMS, INC.
220 Stoneridge Drive • Columbia, South Carolina 29210

July 27, 1988
SP-88-0189-P1

Mr. Earl H. Rothfuss
REMCOR, Inc.
701 Alpha Drive
Post Office Box 38310
Pittsburgh, PA 15238

Subject: Transport and Disposal of Contaminated Soil from Newburgh Heights, Ohio Facility

Dear Earl,

Enclosed is the Chem-Nuclear Systems, Inc. (Chem-Nuclear) quotation for the transport and disposal of approximately 10,000 cu ft of soil from the Newburgh Heights, Ohio Site, formerly owned by Allegheny International. It is our understanding that should the USNRC approve the site remediation plan, decommissioning of the site will begin immediately and disposal of the soil will be sent to the most cost-effective bidder from this RFQ. Pending timely review and approval of the plan by USNRC, the project is expected to be completed by December 31, 1988.

SCOPE OF SERVICES

Chem-Nuclear will provide one-way, common carrier, flat-bed transport for disposal of the waste at our Barnwell, South Carolina Waste Management Facility. Loading of the packages onto the flat-beds, DOT/NRC surveys, and completion of shipping papers is the responsibility of Allegheny International.

BASIS FOR QUOTATION

1. REMCOR letter dated July 20, 1988.
2. Approximately 10,000 cu ft of depleted uranium contaminated soil for disposal.
3. Packages will be standard B-25 metal boxes (4' x 4' x 6') 96 cu ft burial volume.
4. Price includes three hours for loading of boxes onto the truck at the Newburgh Heights, Ohio site. Additional detention charge will be billed at $30.00 per hour.
5. Allegheny will schedule shipments in such a manner as to minimize crane movements at the Barnwell Site. It is preferable that the Barnwell site receive several shipments in one day versus single shipments each day.

Mr. Earl H. Rothfuss
July 27, 1988
Page 2

BASIS FOR QUOTATION (Cont'd)

6. Project will be completed by December 31, 1988.

7. Disposal pricing includes all current fees and taxes plus the $20.00 per cu ft federal fee for Ohio out-of-compact waste.

PRICING

1.	Transport and disposal of a 4-box shipment	$20,980.00/shipment
2.	Transport and disposal of a 5-box shipment	$25,735.00/shipment

Please contact me at (803) 256-0450 for any questions.

Sincerely,

GABende for

George G. Jobson
Marketing Manager
Disposal and Special Projects

GCJ:mp
4139P

c S. Wilner - Allegheny International

APPENDIX D
RESUMES

LEO M. BRAUSCH
VICE PRESIDENT

EDUCATION

M.S., 1976, Civil and Environmental Engineering, University of Cincinnati

B.S.C.E., 1975, Civil and Environmental Engineering, University of Cincinnati

REGISTRATION

Professional Engineer: Mississippi, New Mexico, Ohio, Pennsylvania, South Carolina

Emergency Medical Technician: Pennsylvania

PROFESSIONAL EXPERIENCE

1985 to Present: Mr. Brausch is Vice President of Remcor in responsible charge of the Engineering and Project Development Division. In this role, he has served as the director and key technical contributor for approximately 100 site investigation and site cleanup projects. Examples of key experiences follows:

- Investigation and subsequent cleanup of a 90-acre industrial complex in western Pennsylvania. This project involved the assessment of contamination and design and implementation of remedial measures associated with: polychlorinated biphenyl (PCB) decontamination of plant buildings, equipment, and process sewers; closure of a former PCB waste disposal area; decontamination and closure of electroplating facilities; and plant-wide removal of asbestos-containing materials.

- Subsurface investigations and design of cleanup programs associated with petroleum hydrocarbon (PHC) contamination at two sites in New Jersey. Work involved assessing contamination from leaking underground storage tanks, spills, and other sources. Remedial measures evaluated include free product recovery, ground water treatment, tank removal, tank closure, bioreclamation, and slurry wall containment.

- Remedial investigation/feasibility study (RI/FS) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of a six-acre landfill containing an estimated 100,000 cubic yards of PCB-contaminated materials. After extensive site studies, three technically feasible, cost-effective remedial alternatives were developed.

- The Resource Conservation and Recovery Act (RCRA) closure plan development and implementation for five surface impoundments containing 8,000 cubic yards of electroplating sludge at a site in Mississippi. The closure involves on-site dewatering of the sludge, in-situ containment of contaminated soils, and ground water recovery/treatment. In addition, potential continuing releases from other on-site solid waste management units (SWMUs) are being investigated.

- Subsurface investigations of volatile organic contamination associated with former drummed and bulk solvent disposal areas and underground solvent storage tanks at five industrial plant sites. The investigations included borings, soil and ground water testing, and use of an organic vapor analyzer to determine the presence of subsurface volatile organic contamination.

Mr. Brausch has also served as an expert witness. For a major civil action involving PCB contamination of five industrial facilities in three states, Mr. Brausch testified relative to contamination assessment methods, decontamination procedures and costs, and PCB transport mechanisms and pathways in interior settings. In adjudicatory hearings for a proposed hazardous waste landfill in Ohio, Mr. Brausch addressed design, construction, operational, and closure issues.

1980 to 1985: Mr. Brausch served as the Manager of Project Development for IT Corporation in Pittsburgh, Pennsylvania (formerly D'Appolonia Waste Management Services). His primary role was in the planning and development of remedial response programs for formerly utilized waste disposal sites. Representative experiences included the following:

- Project manager for the investigation of the degree and extent of PCB contamination at seven facility locations in five states. These projects included development and execution of investigation programs, evaluation of alternative decontamination technologies, and preparation of detailed decontamination plans and cost estimates.

- Project manager for the preparation of a RCRA closure plan for a formerly used secondary lead smelter site in Florida. The project involved a comprehensive contamination survey, subsurface exploration, and ground water monitoring. Mr. Brausch headed the design team for waste removal, facility decontamination, and ground water treatment aspects of the closure.

- Project director for the preparation of the RCRA closure plan for two lagoons (containing nearly 100,000 cubic yards of mixed organic and inorganic sludges) at a plant site in southern Ohio. The closure plan calls for dewatering and physical stabilization of sludges preparatory to on-site containment.

In addition to such assignments, Mr. Brausch served as an in-house consultant in health and safety programs; air quality monitoring during waste site cleanup; and waste analysis, manifesting, transportation, and disposal.

1978 to 1980: Mr. Brausch served as the Lead Engineer, Environmental Issues, for the environmental and safety analysis of the Waste Isolation Pilot Plant (WIPP) proposed for a site east of Carlsbad, New Mexico. This position involved coordinating and leading investigations attendant to all environmental permits, approvals, and compliances required for this radioactive waste storage/disposal facility.

1976 to 1978: Mr. Brausch served as a project leader and technical contributor on interdisciplinary environmental investigations and engineering designs. His principal involvement was in environmental permitting and the design of pollution control facilities. Representative technical tasks and responsibilities included air quality and meteorological monitoring, preparation of emission inventories, and evaluations of control technologies for new-source air quality permitting. Mr. Brausch also prepared the process, hydraulic, and structural design of industrial wastewater treatment facilities. Key issues in the treatment schemes included the design and economic analysis of alternative treatment schemes (e.g., precipitation/clarification, ion exchange, biological); conveyance and disposal of metal hydroxide and organic sludges; and plant start-up, operation, and maintenance.

1972 to 1976: Prior to receiving his degrees, Mr. Brausch worked part time as an engineering technician in wastewater treatment design, highway planning, and surveying.

PUBLICATIONS AND PRESENTATIONS

Husak, A. D., L. M. Brausch, and B. P. Bundy, 1985, "Recent Experiences in Waste Site Remedial Action," Symposium Proceedings, American Institute of Chemical Engineers 1985 Spring National Meeting, March 25 through 28, Houston, Texas.

Brausch, L. M. and J. S. Lewis, Jr., 1984, "Case Study: Leachate Containment System Installation, Lipari Landfill, Pitman, New Jersey," Superfund Update: Cleanup Lessons Learned, symposium sponsored by Center for Energy and Environmental Management, May 21 and 22, Denver, Colorado.

Brausch, L. M., 1984, "Advances in Ground Water Treatment Technology," General Electric Environmental Protection Seminar, April 25 through 27, Philadelphia, Pennsylvania.

Brausch, L. M., 1983, "Implementation of Remedial Action Program, Enterprise Avenue Site," Proceedings, Conference on the Disposal of Solid, Liquid, and Hazardous Wastes, American Society of Civil Engineers, April 28 and 29, Bethlehem, Pennsylvania.

Brausch, L. M., 1982, "Siting and Design of Hazardous Waste Landfills," Hazardous Wastes Generation and Management Conference, June 9 and 10, 1982, Pittsburgh, Pennsylvania.

Brausch, L. M., 1982, "Design and Construction of Landfills for Hazardous Wastes," International Conference on Technology and Technology Exchange, May 3 through 6, 1982, Pittsburgh, Pennsylvania.

Hohmann, G. L. and L. M. Brausch, 1981, "Environmental Impact and Protection for the Waste Isolation Pilot Plant (WIPP)," Waste Management '81, American Nuclear Society Topical Meeting, Tuscon, Arizona.

Laushey, L. M. and L. M. Brausch, 1979, "The Geometrics of Rill Formation on Hillsides," Proceedings of the XVIII Congress of the IAHR, International Associated for Hydraulic Research, Caligari, Italy.

Brausch, L. M., 1976, "Observations on Rill Pattern Development," Master's Thesis, University of Cincinnati, Cincinnati, Ohio.

EARL H. ROTHFUSS, P.E.
PROJECT MANAGER

EDUCATION

M.S., 1969, Civil Engineering, Carnegie-Mellon University
B.S., 1967, Civil Engineering, Carnegie-Mellon University

REGISTRATION

Professional Engineer: Delaware, Florida, Illinois, Indiana, Kentucky, Maryland, New Jersey, North Carolina, Ohio, Pennsylvania, and West Virginia

PROFESSIONAL EXPERIENCE

1987 to Present: Mr. Rothfuss joined Remcor as a Project Manager in the Engineering and Project Development Division. His responsibilities include project management, client liaison, and technical contributions in remedial design, cost estimating, and construction management.

1979 to 1987: Mr. Rothfuss served as a Project Manager and Site Manager on a variety of environmental management projects at Baker/TSA, Inc.. His responsibilities included work plan development; budgeting, scheduling, and cost control; client liaison; technical direction; editorial and technical reviews; assistance in negotiations with regulatory agencies; and procurement and construction phase assistance. Mr. Rothfuss' project assignments have included site investigations and assessments and all phases of site design, and implementation and construction management. Mr. Rothfuss has appeared as an expert witness in Pennsylvania, New Jersey, Delaware, and North Carolina.

Mr. Rothfuss' major project experience at Baker/TSA, Inc. included the following:

- Project Manager for remediation of the Montclair and Glen Ridge/West Orange Superfund sites in Essex County, New Jersey. Both sites are areas of extensive low-level radium-bearing soils arising from the use of contaminated soils as fill materials during residential development. This was a pilot project to remediate 13 representative properties out of a total approximating 260 properties. Assignment began with site investigations to define levels and extents of contamination on each property and to inventory current condition of each homesite. Based on a client decision to remediate by excavation and off-site disposal, work proceeded to design of excavation and in-place support of structures during excavation and plans for complete restoration of each property after contaminated soil removal. The design phase also included planning for transportation and disposal of the contaminated soil. Design drawings and bid specifications were prepared for construction, transportation, and disposal and Mr. Rothfuss provided technical input during prebid meetings for all three groups of contractors. After directing bid evaluations and precontract negotiations, Mr. Rothfuss went to the field as site manager during remediation where he supervised field engineering, construction inspection, measurement of unit price pay items, construction administration, radiation testing of excavation and shipping containers, contractor and schedule coordination, and site health and safety. Throughout the project, Mr. Rothfuss managed a community relations program and made project presentations at various public meetings and hearings. At the conclusion of the construction effort, Mr. Rothfuss managed and provided technical input to detailed studies of alternate methods to manage the contaminated material and an extensive search for an in-state disposal site.

- Project Manager for development and implementation of a five county municipal solid waste management program in northeast New Jersey. In response to exhaustion of existing landfills, plans were developed to provide solid waste management through transfer stations and remote landfills. Mr. Rothfuss managed a planning and engineering effort to develop technical criteria, siting criteria, cost accounting methods, and a proposal evaluation process leading to franchise award in each county. This effort include bidding and evaluation assistance, negotiations with contractors, and technical assistance to implement the selected plan in each county.

- Project Manager for comprehensive site investigation and engineering services at a 15,000-acre peat reserve in North Carolina. Site investigation included assessment of the quantity and quality of recoverable peat and studies of existing ground water and water quality and flow nets. Engineering including a detailed mining plan, surface water and ground water management plans, reclamation plans, and design of access and on-site roads. Work also included permit applications and testimony at public hearings. On this project, Mr. Rothfuss managed a production effort involving 20,000 man-hours in six months.

- For Delmarva Power, Mr. Rothfuss managed projects including assessments, design, and permitting of ash landfills at two coal-fueled power plants. At the Edge Moor Station, he directed site selection, site investigations (including geotechnical and ground water studies), site design, access road design, permit application and support, operations plans, closure plans, and construction engineering for a multiple site ash disposal program. Assignment also included investigation of the safety and environmental aspects of co-disposing ash and dredge spoils. At the Indian River Station, he directed a multiyear program of site investigations and operations planning including laboratory and field leachate tests, contaminant transport/ground water flow modeling, site expansion design, and ash placement sequencing. The program involved successful negotiations with regulatory agencies to eliminate the liner under the disposal areas. Work also included performance monitoring of the operating landfill and preparation of closure plans for each landfill section. Assignment required Mr. Rothfuss to provide expert witness testimony at public hearings and administrative proceedings.

- Project Manager for landfill siting studies and landfill cost analyses for a new power plant being developed by the Baltimore Gas & Electric Company. Assignment included assessment of alternate waste disposal technologies, development of site selection and design criteria for a combined ash-scrubber product landfill, site screening, detailed investigation of candidate sites, and final site selection. Work also included development of preliminary designs and life-cycle cost estimates for each candidate site.

- Managed three projects for Allegheny Power Service. The first involved site selection, site investigations, and detail design for a new ash disposal area at an existing coal-fueled power plant in West Virginia. The second and third were detail designs of ash disposal area expansions at two coal-fueled power plants in southwest Pennsylvania.

- Project Manager for a plant-wide wastewater inventory at Westinghouse Electric Corporation's multibuilding, multifunction Cheswick plant. Project began with a plant process audit and tabulation of wastewater streams and potential spill sites for regulated materials (paints, solvents, and oils). The next step was a physical survey of all in-plant drains and sewers to determine waste flow routes and physical conditions. All of this information was compiled into a comprehensive audit report and used as the basis for planning corrective actions and system improvements. Plans included recommendations on prioritization of these actions, implementation plans, and cost estimates.

- Managed all engineering elements of a national study of potential economic impacts of proposed regulation of coal-fueled power plant waste products under the Resource Conservation and Recovery Act (RCRA). This study was done for the electric utility industry research agency, the Electric Power Research Institute, to measure potential costs to the industry of alternate regulatory scenarios for ash and scrubber products. Study involved site assessments at eight existing power plants chosen to represent the universe of plant types, waste management practices, and site conditions. These data were used to prepare conceptual designs and life-cycle cost estimates for waste management at each plant under the proposed RCRA rules for hazardous and nonhazardous waste. The results were extrapolated to predict nationwide and utility-specific costs associated with each regulatory scenario.

- Project Manager for a program of physical inventories of underground facilities including tanks, manholes, vaults, and utility lines at nine power plants and 20 support facilities for Detroit Edison Company.

<u>1974 to 1979</u>: Mr. Rothfuss served in increasing responsible positions at Dravo Corporation working on projects for electric utility and coal mining clients and on assignments at Dravo operating facilities. Specific assignments included:

- Project Manager for training, testing, and startup of a combined ash and scrubber slurry management system at Pennsylvania Power Company's Bruce Mansfield Power Plant. System included a fixation process, a pipeline, and a disposal impoundment. Directed work including system startup, equipment and process testing, process results analysis, equipment performance analysis, preparation of operations manuals and maintenance manuals and maintenance schedules, and presentation of training programs for operations and maintenance personnel.

- Project Manager for design, construction, and operation of a scrubber slurry fixation system at the Duquesne Light Company Phillips Station.

- Project Manager for design and construction of fine coal refuse fixation systems at several coal preparation plants in Ohio and West Virginia.

- Project Manager with complete responsibility for design, procurement construction, and startup of a 1,000-ton per hour limestone screening facility. Also responsible for a variety of projects related to bulk materials handling and site improvements.

- As Supervisor of Development Engineering, Mr. Rothfuss was responsible for research coordination system designs for slurry fixation and dewatering facilities and for technical services in these areas to clients in the electric utility and coal industries.

1970 to 1974: Mr. Rothfuss served as Project Engineer for Westinghouse Electric Corporation for the design of $25 million worth of specialized manufacturing facilities for the nuclear power plant industry. Participated in site selection and plant planning, directed detail design, developed design standards, controlled design and construction budgets, and audited contractor performance. Earlier, as a Supervisory Engineer, he directed the transportation and installation of large components of the nuclear steam supply system in several commercial atomic power plants, including reactors, steam and electric generators, and transformers. Designed the transportation fixtures, certified routes and carrying equipment, and had technical control over fabrication and field erection contractors.

1968 to 1970: Mr. Rothfuss served as an Associate Engineer at Dravo Corporation where he worked on projects for steel and nonferrous metals industries, including cost estimates and detailed structural designs. Developed corporate standards for conveyors and ore bridges and design of a specialized coolant structure for atomic power plant reactor containments.

PROFESSIONAL AFFILIATIONS

American Arbitration Association
American Society of Civil Engineers

PUBLICATIONS AND PRESENTATIONS

Rothfuss, E. H., 1988, "Solid Waste Management at Coal Fired Power Plants," Standard Handbook for Powerplant Engineers, McGraw-Hill.

Pluta, T. A., F. J. Cosolito, E. H. Rothfuss, and C. J. Touhill, 1986, "Montclair/Glen Ridge Radon Cleanup - A Superfund Case Study," Symposium - Where Do We Stand on Superfund, American Institute of Chemical Engineer, 1986 Summer National Meeting, August 24-27, 1986, Boston, Massachusetts.

Pluta, T. A., F. J. Cosolito, and E. H. Rothfuss, 1986, "New Jersey's Residential Radon Remediation Program - Methods and Experience," Indoor Radon, Proceedings of Air Pollution Control Association International Specialty Conference, February 1986, Philadelphia, Pennsylvania.

Cumming, W. T. and E. H. Rothfuss, 1981, "Yard Mapping Using Computer Graphics Reduces Cost of Information Management," Power, October 1981.

Workman, K. H. and E. H. Rothfuss, 1978, "FGD Waste Disposal Effective Despite Surprises," Power Engineering, November 1978.

Rothfuss, E. H., 1969, "Construction Bidding Strategies - A Computerized Teaching Game," Master's Thesis, Carnegie-Mellon University, Pittsburgh, Pennsylvania.

WILLIAM E. ROSENBAUM
PROJECT MANAGER

EDUCATION

M.S., 1983, Business Administration, Robert Morris College

B.S., 1974, Civil Engineering, University of Notre Dame

REGISTRATION

Professional Engineer: Pennsylvania

Certified Sewage Treatment Plant Operator: Pennsylvania

Certified Waterworks Operator: Pennsylvania

PROFESSIONAL EXPERIENCE

1987 to Present: Mr. Rosenbaum joined Remcor as a Project Manager in the Engineering Design Group. His responsibilities include project management and key technical contributions related to remedial action design. His project experience at Remcor includes:

- Design of modifications to the closure of a series of hazardous waste holding lagoons to optimize the design, reduce construction costs, and expedite completion of the closure.

- Development of a work plan for the site stabilization of a former metals processing facility. The site was contaminated with radioactive thorium and heavy metals.

- Preparation of plans and specifications for the upgrade of the hazardous waste landfill owned and operated by a major chemical manufacturer. The project included design of a double-lined leachate basin, capping of a portion of the landfill, and upgrade of the drainage and leachate collection system.

- Preparation of remedial investigation/feasibility studies (RI/FSs) for three manufacturing facilities contaminated with polychlorinated biphenyls (PCBs). Selected remediation activities included surface cleaning, concrete milling, and building subsoil excavation.

1981 to 1987: Mr. Rosenbaum served as a Senior Engineer and Assistant Engineering Manager responsible for the Environmental Design Group of Baker/TSA Inc. As Assistant Engineering Manager, he managed a group of 18 engineers and technicians and was responsible for the following:

- Technical quality control.
- Personnel performance reviews.
- Preparation of proposals.
- Budgetary control of design projects.

His major project experience at Baker/TSA Inc. included the following:

- Project Manager for grading and capping of a hazardous waste landfill in New Jersey. The project included regrading, installation of waterways, leachate collection system, gas vents, and low-permeability soil cap. Total construction cost of the grading and capping project was $4.5 million.

- Design Manager for the preparation of plans, specifications, operations and permitting for radiological contamination removal in Essex County, New Jersey. Project budget was $12 million and required the preparation of detailed plans and specifications in six weeks. The project included contracts for construction, transportation and disposal and involved resident relocation, radiological health and safety procedures, public relations, and utility coordination.

- Project Engineer for the preparation of plans and specifications for the closure of a hazardous waste landfill owned and operated by a major steel company. The project included regrading, installation of a clay cap, leachate, and runoff piping.

- Project Engineer for the preparation of plans and specifications for the design of a fly ash disposal landfill located on the banks of the Ohio River.

- Developed, for a major steel corporation, portions of a Comprehensive Hazardous Waste Management Plan dealing with wastewater treatment, storage, and disposal. The plan reviewed options and developed alternatives to economically comply with hazardous waste and National Pollution Discharge Elimination System (NPDES) regulations. Alternatives reviewed included recycle/reuse, operations and process modifications and waste reduction measures.

- Designed and supervised preparation of drawings and specifications for a wastewater treatment facility to store and treat runoff from a 35-acre coal handling facility in Ashtabula, Ohio. The project included an equalization lagoon constructed at lake level using slurry wall technology.

1977 to 1981: Mr. Rosenbaum served as a Process Project Engineer for The Chester Engineers, Inc., Coraopolis, Pennsylvania, where his duties included the following:

- Design Manager for the excavation and removal of a sanitary landfill in New Jersey. The landfill consisted of approximately 20,000 cubic yards of municipal sanitary waste. Out-of-state disposal was selected by the state for final disposition of the waste.

- Supervising facility design projects for various industries, including the design and construction of hazardous waste handling facilities in compliance with Resource Conservation and Recovery Act (RCRA) requirements.

- Obtaining permits from state and federal agencies.

- Preparation of itemized construction cost estimates and in-house construction supervision.

Following is a summary of Mr. Rosenbaum's major project experience:

- Designed and provided general inspection services for the construction of a double lined-hazardous waste holding lagoon for a major electronics manufacturer. The facility included two, one-million gallon compartments each equipped with a double liner with intermediate leak detection and collection system. All piping to and from the facility was installed in a casing pipe with a separate leak collection system.

- Project manager for the $5 million addition to the wastewater treatment facility owned by a heavy equipment manufacturer in Illinois. The project included API separation, clarification, thickening, vacuum filtration, shallow bed sand filtration, and chrome treatment.

- Lead project engineer for the design of additions to an existing treatment facility owned by a manufacturer of electronic components. The system, designed for the treatment of ion exchange spent regenerate, including softening, reverse osmosis, and double-lined solar evaporation ponds.

- Lead project engineer for the design of a batch treatment system to remove arsenic and selenium from rinse waters generated in the manufacture of copy equipment. The system was designed around a process utilizing activated alumina.

1976 to 1977: Mr. R senbaum served as a Resident Engineer for Black and Veatch Consultir [illegible] His responsibilities included construction supervision fo [illegible] pose of assuring compliance with plans and specifications and [illegible] ng.

1974 to 1976: [illegible] nba [illegible] served with U.S. Air Force, 351st Strategic Missile Wing as [illegible] ile [illegible] nch Officer.

P [illegible] SIONAL AFFILIATIONS

American Society of Civil Engineers
American Water Works Association
Water Pollution Control Federation

DEBORAH Y. MARSH
PROJECT MANAGER

EDUCATION

M.S., 1979, Civil Engineering, University of Colorado
B.S., 1978, Civil Engineering, University of Colorado

REGISTRATION

Professional Engineer: Ohio, Pennsylvania, West Virginia

PROFESSIONAL EXPERIENCE

1985 to Present: Ms. Marsh is a Project Manager in the Engineering and Project Development Division of Remcor. She is responsible for developing and managing hazardous waste projects, including:

- Project management for a $6.2 million turnkey remedial investigation/feasibility study (RI/FS) and decontamination of a site contaminated with polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins (PCDDs), and polychlorinated dibenzofurans (PCDFs). Tasks included preparation and execution of a sampling and analysis plan, implementation of a surface water control plan, cleaning demonstrations of building interiors by concrete milling, acid etching, and high-pressure/high-temperature washing, and excavation and removal of "hot spots." U.S. Environmental Protection Agency (EPA) approved the RI/FS, and the cleanup was completed in 1987. Two potentially responsible parties were involved in litigation at the site; Ms. Marsh provided factual and expert witness testimony during the trial.

  In an area of known PCB and PCDD/PCDF contamination, Remcor determined, by analysis of different sample media, that the PCDD/PCDF contamination was, for the most part, associated with a thin paint layer on wood. From all available data, Remcor developed a relationship between the tetrachlorinated dibenzofuran (TCDF) concentration in a sample to a calculated 2,3,7,8-tetrachlorinated dibenzo-p-dioxin (2,3,7,8-TCDD) equivalence value. This relationship was used as a screening aid, saving $400 for each analysis.

Cleanup criteria recommended in the RI/FS were accepted by the EPA and were readily achievable using the methods demonstrated previously at the site. The cleanup allows the site to be used for manufacturing or service industries with no continuing threat to human health or the environment.

- Project management of a fast-track preliminary design report evaluating alternatives for upgrading a chemical waste landfill and associated leachate collection basin to meet EPA's minimum technology standards. The study detailed engineering and construction work tasks necessary for implementing each recommended retrofit. Criteria utilized in comparing alternatives included:

  - Cost analysis
  - Technical feasibility
  - Regulatory compliance and implications
  - Impact on Resource Conservation and Recovery Act (RCRA) hazardous waste handling operations
  - Ease of construction.

  The client used this report as a basis for evaluating options concerning exemption petitioning, construction activities required, and long-term changes in the landfill operating plan.

  Remcor subsequently provided the client with engineering services to prepare detailed technical specifications for construction of the recommended alternative and has assisted in presentations of this and other material to the regulatory agency. Construction of landfill modifications is anticipated in 1988.

- Management of a subsurface investigation project designed to identify the lateral and vertical extent of wastes which were placed in a remote area about 27 years ago. These wastes are known to contain 2,3,7,8-TCDD.

- Tracking of RCRA regulations, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/Superfund developments, PCB regulations, New Jersey's Environmental Cleanup Responsibility Act regulations, Leaking Underground Storage Tank

(LUST) regulations and other developments from the 1984 Hazardous and Solid Waste Amendments, the 1986 Superfund Amendments and Reauthorization Act, as well as other major state developments. Ms. Marsh maintains a resource to provide regulatory interpretation and negotiating strategy. This knowledge has been applied to many environmental assessments of manufacturing facilities for compliance status. Reports have been developed for various clients that identify and quantify potential liabilities associated with environmental issues. In one instance, a facility faced in excess of $10 million in potential liabilities; the client was very satisfied with the report.

1984 to 1985: Ms. Marsh served as the Discipline Manager for Regulatory and Permitting projects for International Technology Corporation (IT) in Pittsburgh, Pennsylvania. She directed many projects, ranging from ground water contamination investigations, new facility designs, existing facility double-liner retrofitting projects, and closure plans, to preparing RCRA Part B permit applications for major, complex facilities. She assisted many industrial clients in responding to and negotiating items such as Notices of Deficiency (NOD), consent orders, administrative orders, and other enforcement actions. Some representative experiences include:

- Management of eight RCRA Part B permit application projects (and key input to over 20 others) involving plants with only simple container storage to multi-unit plants with landfill(s), surface impoundment(s), incinerator(s), and container and tank storage areas.

- Coordination of the design of two major new hazardous waste landfills to meet the double-liner requirements of the new regulations.

- Preparation of a detailed closure plan for a major industrial client's hazardous waste surface impoundments. This required developing a sampling plan to obtain representative sludge samples, characterizing the sludges, then evaluating several closure alternatives before choosing a stabilization agent and determining a design mix to prepare the sludge for capping.

1979 to 1984: Ms. Marsh served as a Senior Engineer in the Technical Center, Environmental Engineering Department for Union Carbide Corporation (Union Carbide) in South Charleston, West Virginia. She consulted to all Union Carbide chemicals and plastics plants, working mainly in the hazardous waste area, but also reviewed major capital projects for health and environmental concerns, designed a wastewater treatment facility for an acrylics manufacturing unit, and served on a National Pollution Discharge Elimination System (NPDES) team to negotiate a discharge permit for a major chemical plant. Ms. Marsh reviewed RCRA regulations for impact on Union Carbide's facilities and commented on the regulations for Chemical Manufacturer Association committees. She helped plants comply with the early ground water monitoring requirements by choosing well locations and depths and/or preparing sampling and analysis plans. Ms. Marsh also prepared RCRA documents for several facilities; ground water quality assessment plans, RCRA Part B permit applications, and closure plans are examples.

She managed several ground water contamination investigations, including deciding well locations, supervising drilling, developing analytical programs, and assessing and reporting results. These investigations were triggered by Superfund, RCRA imminent hazard concerns, or by RCRA Interim-Status Ground Water Quality Assessment Plan requirements.

Ms. Marsh developed solid and hazardous waste checklists for Union Carbide's internal environmental audit program, then coordinated and led several audits at different facilities. Some audits were specifically investigating hazardous waste activities; others were comprehensive and included good housekeeping practices in addition to regulatory requirements for air, water, and solids.

PROFESSIONAL AFFILIATIONS

American Society of Civil Engineers
Chi Epsilon
Hazardous Materials Control Research Institute
National Water Well Association
Tau Beta Pi
Water Pollution Control Federation

PUBLICATIONS AND PRESENTATIONS

Marsh D. T. and H. E. Thomson, Jr., 1986, "Small Quantity Generator Requirements with Emphasis on Used Oil Recycling," presented at The Equipment Service Association Conference, Las Vegas, Nevada, May 10, 1986.

Marsh, D. T., 1985, "Toxic Substances Control Act,"; "RCRA Basic Provisions,"; "RCRA Permit Process," Training Seminar on Environmental Regulations, presented to E. I. DuPont DeNemours and Company, Savannah River Plant, Aiken, South Carolina, June 20-21, 1985.

Marsh, D. T., L. Benefield, E. Bennett, D. Linstedt, D. Smith, and R. Hartman, 1981, "The Coupled Trickling Filter-Rotating Biological Contactor Nitrification Process: Design Considerations," Journal Water Pollution Control Federation.

Marsh, D. T., 1979, "The Coupled Trickling Filter-Rotating Biological Contactor Nitrification Process: Design Considerations," Water Pollution Control Federation Conference, Houston, Texas.

Marsh, D. T., 1979, "The Coupled Trickling Filter-Rotating Biological Contactor Nitrification Process: Design Considerations," Master's Thesis, University of Colorado, Boulder, Colorado.

ANITA S. REISER
ASSISTANT PROJECT ENGINEER

EDUCATION

M.E., 1983, Chemical Engineering, Oklahoma State University

B.S., 1977, Environmental Engineering, New Mexico Institute of Mining and Technology

REGISTRATION

Engineer-in-Training: New Mexico

PROFESSIONAL EXPERIENCE

1987 to Present: Ms. Reiser is an Assistant Project Engineer in the Engineering and Project Development Division of Remcor. She is responsible for providing technical assistance for a wide variety of hazardous waste projects, including:

- Substantially revising Resource Conservation and Recovery Act (RCRA) Part B permit applications for hazardous waste management. Revisions for a large chemical plant reflected the construction of new treatment units and retrofitting or closing several existing land treatment and disposal units. Revisions for another facility involved completely rewriting the application to reflect the ongoing facility closure and the resultant request for a post-closure care permit.

- Performing environmental audits of commercial and industrial property and assessment of the potential financial risks that could be incurred during purchase of the property.

- Performing compliance audits of hazardous waste and toxic chemical management practices at manufacturing facilities.

- Providing guidance on current regulatory requirements and future trends.

1986 to 1987: As a Project Engineer with Schneider Engineers in Bridgeville, Pennsylvania, Ms. Reiser was involved with solid waste and wastewater management projects, including the following:

- Feasibility studies addressing technical and economic aspects of managing sewage sludge, infectious hospital waste, and municipal refuse.

- Implementing an industrial wastewater pretreatment program. Activities included initial visits and inspections of large manufacturing facilities and hospitals to gather information for wastewater discharge permits.

1983 to 1985: Ms. Reiser served as an Environmental Engineer with the U.S. Department of Energy (DOE) in Albuquerque, New Mexico. She was an administrative staff specialist for environmental protection with emphasis on hazardous waste management. Ms. Reiser was responsible for the following:

- Periodically auditing hazardous waste management programs and practices at nine national laboratories and manufacturing facilities.

- Providing technical and political guidance to environmental personnel at those facilities.

- Acting as liaison between the DOE and federal and state agencies in matters concerning compliance with environmental rules and regulations.

- Assisting in development of DOE-wide policies and procedures for management of hazardous and hazardous/radioactive mixed waste in accordance with technical, legal, and national security requirements.

1978 to 1980: Ms. Reiser served as an Environmental Engineer for Ford Motor Company in Milan, Michigan. As a member of the Plant Engineering staff at the Milan Plastics Plant, she was involved in the following:

- Managing several contracts for waste removal and disposal. Activities included preparing bid documents, evaluating proposals and annually selecting contractors.

- Implementing an internal training system for managing hazardous wastes within the plant. An external manifest system was also required for compliance with Michigan waste management regulations.

- Setting up and operating a pilot plant to investigate the effectiveness of biological wastewater treatment methods. The investigation was part of an effort to achieve compliance with municipal wastewater standards. The data gathered was later used to design a successful full-scale facility.

- Preparing and updating applications for permits to install and operate industrial processes in accordance with federal and state air quality standards. The processes were modified frequently to accommodate changes in the production of automobiles.

PROFESSIONAL AFFILIATIONS

American Institute of Chemical Engineers

JAMES A. BALINT
ASSISTANT PROJECT SCIENTIST

EDUCATION

B.S., 1982, Safety Management, Indiana University of Pennsylvania

PROFESSIONAL EXPERIENCE

1987: Mr. Balint is an Assistant Project Scientist in the Engineering and Project Development Division of Remcor. He is responsible for the development and implementation of occupational health and safety projects at Remcor, including:

- Development and implementation of general health and safety training programs.
- Development and implementation of project health and safety plans and training of site personnel.
- Performing health, safety, and industrial hygiene audits at remedial sites and manufacturing facilities.

1986 to 1987: Mr. Balint served as a Health and Safety Coordinator with International Technology Corporation (IT) in Pittsburgh, Pennsylvania. He was responsible for development of Health and Safety Plans and training of site personnel and acted as on-site Health and Safety Coordinator responsible for all site health and safety on various remediation projects. He was responsible for conducting structured classroom training sessions for new employees and development of training sessions. Mr. Balint provided technical assistance in industrial hygiene and safety to the engineering and remediation groups.

1984 to 1986: Mr. Balint served as a Health and Safety Officer for GSX Services, Inc., Reidsville, North Carolina. He provided technical assistance in industrial hygiene and safety, including regulatory requirements and recommended protective clothing and safety procedures, and performed air sampling, analytical evaluation, and facility Resource Conservation and Recovery Act (RCRA) inspections. He also presented employee safety programs and in charge of purchasing and maintaining company safety supplies. Mr. Balint functioned as the on-site Health and Safety Officer for emergency response, remedial action projects, and detonation of shock-sensitive chemicals.

1984: Mr. Balint served as a Safety Engineer for Schneider Power Corporation, Beaver Valley Nuclear Power Plant Unit II, Shippingport, Pennsylvania. He was responsible for air monitoring of confined spaces, conducting weekly safety inspections, investigating accidents, identifying field hazards, and implementing corrective action.

1983: Mr. Balint served as a Safety Engineer for Spencer, White, and Prentis, Midland, Michigan. He was responsible for conducting safety training, confined space air monitoring, identifying field hazards, and implementing corrective action. He also performed U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) record keeping requirements.

PROFESSIONAL AFFILIATION

American Society of Safety Engineers

STEVE J. KNEZOVICH
PROJECT MANAGER

EDUCATION

B.A., 1976, Liberal Arts, West Liberty State College

PROFESSIONAL EXPERIENCE

1986 to Present: Mr. Knezovich is a Project Manager with Remcor who serves both the Engineering and Field Services Groups. This position was designed to take advantage of his considerable experience in sampling, assessment, and execution of decontamination and waste cleanup projects.

Since joining Remcor, Mr. Knezovich has been a key technical contributor and/or field program manager for the following:

- Decontamination of process equipment showing inacceptable levels of polychlorinated biphenyl (PCB) surface contamination in an industrial plant in the eastern United States.

- Field implementation of a process sewer inflow monitoring system at a closed steel mill in western Pennsylvania.

- Sampling of several media within a closed manufacturing plant where there is concern for PCB, tetrachlorodibenzo-p-dioxin (TCDD), and tetrachlorodibenzofuran (TCDF) contamination.

- Field Manager for sampling, assessment, and decontamination of idle steel facility in western Pennsylvania. This multimillion dollar project included remedial activities for PCBs, cyanides, and heavy metals located in various forms and media. Associated with this project was a comprehensive drum and tank and collection/characterization/disposal task.

- Project Manager for decontamination and detoxification of an electroplating process facility.

- Project Manager responsible for the cleaning and recycling of hazardous materials located in large-diameter pipe associated with the steelmaking process.

- Project Manager for the decontamination and successful closure of a building that had previously been utilized to store hazardous wastes.

1984 to 1986: Mr. Knezovich served as a Project Superintendent for the International Technology Corporation (IT), Pittsburgh, Pennsylvania. He was involved with a variety of waste remedial action projects. These projects and duties included:

- Assisting with slurry wall project at a municipal landfill with primary responsibilities in the quality assurance and quality control area.

- Asbestos abatement projects that included interior building (ceilings, ducts) removal and exterior plant (pipe and tank insulation) actions. Responsibilities included equipment, material, and personnel coordination to allow for orderly and timely completion of contracts.

- Directed sampling teams involved with extraction of both sludge and liquor samples from pond-type enclosures.

- Supervised PCB/TCDD/TCDF decontamination of electrical control room after a capacitor failure and fire. The high levels of contamination required innovative decontamination techniques and unique operating procedures. The scope of work included implementation of a health and safety program for both hot and cold weather operations; a sampling program that involved wipe, bulk, liquid, and air sampling; strong customer communications; and coordination of a fully staffed field office.

- Supervised TCDD cleanup of large areas of soils, railroad track, and miscellaneous private properties in an industrial-residential neighborhood. The scope of work included management of heavy equipment, labor, and materials within a tight schedule and budget context. This project also required a strong communication network between onsite customer representatives and state regulatory agency personnel.

1972 to 1983: Mr. Knezovich served as a Project Superintendent for Koppers Company, Inc., in the Engineering and Construction Group, Pittsburgh, Pennsylvania. He served in various management positions while at Koppers. As Project Superintendent he was responsible for the successful demolition and cleanup of several hazardous waste sites, including a complete coke plant and associated by-products facility. This included the shipping of approximately 20,000 cubic yards of hazardous waste to secure landfills.

He also gained experience in major excavations, foundations, structural steel erection, piping, and electrical installation.

TMA/Eberline
Biographical Data
Frederick F. Haywood
Health Physicist

Experience Summary

Mr. Haywood has been involved in nuclear energy and environmental programs for 32 years. Since 1975, he has directed programs related directly to environmental restoration with strong emphasis toward remedial investigations at sites encumbered with radioactive wastes. Earlier, he was involved in applied radiation protection, radiation dosimetry for mixed radiation fields, neutron and gamma-ray dosimetry research, and operation and supervision of the Oak Ridge National Laboratory's Health Physics Research Reactor.

Experience

1986 to present	TMA/Eberline, Technical Director for Health Physics Programs. Responsible for overview and for deciding the technical merit of health physics program development. Served as Eberline Project Manager for the Characterization Investigation Study (CIS) of the DOE Feed Materials Production Center of Fernald, Ohio.
1985 - 1986	TMA/Eberline, Technical Director for the Radiological and Chemical Characterization of the DOE Weldon Spring Chemical Plant, Weldon Spring, Missouri.
1981 - 1985	TMA/Eberline, Project Manager for Eberline's participation in DOE's Formerly Utilized Sites Remedial Action Program (FUSRAP). Responsible for planning, organizing, and controlling resources needed to provide radiological support ($3M per year) under a Subcontract to Bechtel National (DOE prime contractor).
1977 - 1981	Oak Ridge National Laboratory (ORNL), Research Staff Member, Health and Safety Research Division. Teacher of the Off-Site Pollutant Measurements Group. Managed and directed ORNL's participation in the FUSRAP for sites assigned to ORNL. Planned and conducted a series of radiological surveys to determine the current status of these FUSRAP sites. Documented survey findings in a series of technical reports.

1975 - 1977	Oak Ridge National Laboratory (ORNL), Group Leader, Health Physics Division. Directed the radiological characterization of 23 inactive uranium mills in western states. This work was in support of a program which lead to DOE's Uranium Mill Tailings Remedial Action Program.
1972 - 1975	Oak Ridge National Laboratory (ORNL), Section Head, Health Physics Division. Lead a team of ORNL health physicists in solid state dosimetry research for mixed radiation fields.
1959 - 1972	Oak Ridge National Laboratory (ORNL), Staff Member, Health Physics Division. Health physics monitoring, supervisor of experiments at the ORNL Health Physics Research Reactor, reactor operator and reactor supervisor. Organized and directed a series of nuclear accident dosimetry intercomparison studies (this program continues). Conducted field studies of radiation from nuclear weapons. Coordinated the design and fabrication of a high yield (10E13 n/s) 14 MEV neutron generator and directed its use on a 1,500 foot tower at the Nevada Test Site.
1956 - 1958	Babcock and Wilcox, Reactor Fuel Technician. Fabricated uranium/thorium fuel elements for test reactors, assisted in reactor experiments health physics surveys, recovery of enriched uranium from scrap materials.

Special Assignments

January 1962 - August 1962	Oak Ridge National Laboratory (ORNL), Radiation Safety Officer. Operation BREN (Bare Reactor Experiment, Nevada) at the Nevada Test Site.
July 1966 - August 1967	Oak Ridge National Laboratory (ORNL), Technical Director. Operation HENRE (High Energy Neutron Reactions Experiment) at the Nevada Test Site for Atomic Energy Commission/ Department of Defense.
June 1970 - December 1980	Oak Ridge National Laboratory (ORNL), Member. International Atomic Energy Agency Panel of Experts on Nuclear Accident Dosimetry.
June 1973 - June 1975	Oak Ridge National Laboratory (ORNL), Member. National Academy of Science, Advisory Committee on Civil Defense, Subcommittee on Radiiation Shielding.

Education

B.S. in Physics, Lynchburg College, 1958
M.S. in Physics, Vanderbilt University, 1964

JEFFREY A. BROWN

MANAGER OF HEALTH PHYSICS SERVICES

Mr. Brown has over 7 years of experience as a health physicist/radiological engineer and is currently Manager of Health Physics Services. His responsibilities include directing all projects within Health Physics Services and supervising all project managers/site managers within Health Physics Services and supervising all project managers/site managers assigned to these projects.

He has recently been the Eberline project manager for the Formerly Utilized Sites Remedial Action Program (FURSAP - Department of Energy) responsible for daily interface with the client, Bechtel National; contact administrating, cost and schedule control, technical planning, and supervision of site managers. Previous to this position, he was assigned to the FURSAP project office as a staff scientist providing technical and schedule direction to Eberline site managers. Mr. Brown has also served as an Eberline site manager with responsibility for environmental monitoring, field surveys, and personnel protection.

Prior to joining Eberline in 1984, Mr. Brown was employed with Knolls Atomic Power Laboratory (General Electric) as a radiological engineer responsible for radiation worker training of various trades involved with a major reactor overhaul.

Mr. Brown worked for NLO, Inc. from 1980 to 1983 on low-level decontamination projects in New Jersey and Pennsylvania. He was responsible as site manager/superintendent for directing/coordinating construction, engineering, and health physics subcontractors along with interfacing with Federal, state, and local officials.

Mr. Brown received a B.S. degree in Chemistry from Albright College (1977). He completed all course work for a M.S. In Health Physics from the University of Cincinnati. Mr. Brown has also completed graduate course work in Nuclear Engineering and Mechanical Engineering at Union College. Mr. Brown is a member of the Health Physics Society and the American Nuclear Society.

DENNIS FRAIN

SITE MANAGER (HEALTH PHYSICIST 1)

Mr. Frain first worked for Eberline from 1967 to 1972 in the Supplemental Test Site Program. He assisted in the health physics support for the Gasbuggy, Faultless, Cannikan, and Rulison nuclear detonations. From 1972 to 1979, he was with BDM Corporation where he initially organized and managed their purchasing department and then organized and helped manage the research and development program. After a period as Director of Manufacturing for MITS Computers, he returned to Eberline in 1979 to work on the cleanup of the Enewetak Atoll.

He has had extensive experience in radiological assessment and environmental monitoring for uranium resources and phosphate mining organizations. He was also responsible for health physics and radiological measurements at a large scale pilot study for coal liquefaction utilizing a colbalt catalyst with colbalt-60 for tracing analysis. In the Formerly Utilized Sites Remedial Action Program (U.S. Department of Energy with Bechtel) he has supported this cleanup work at Albany OR; Niagara Falls, NY; Wayne, Maywood, and Middlesex, N.J.: and Weldon Spring and Hazelwood, MO. He was the Site Manager for radiological assessment in the Montclair, NJ. area for the U.S. Environmental Protection Agency (CERCLA - Superfund) under contract with Camp Dresser and McKee. This latter project, in 1985, entailed radiological measurements of 258 properties, including 100 residences and buildings, and was completed in a two-month period.

Mr. Frain attended the University of New Mexico studying economics and mathematics.