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REMEDIAL CONSTRUCTION WORK PLAN

VOLUME IV

APPENDIX G - CONSTRUCTION SPECIFICATIONS
SOIL REMOVAL AND TREATMENT

APPENDIX H - QUALITY ASSURANCE PROJECT PLAN
SOIL REMOVAL AND TREATMENT

APPENDIX I - CONSTRUCTION SPECIFICATIONS
SITE COVER

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SITE COVER

APPENDIX K - CONSTRUCTION SPECIFICATIONS
WELL INSTALLATION AND ABANDONMENT

Summit National Superfund Site
Deerfield Township of Portage County, Ohio

PRINTED ON

MAY 27 1993

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Summit National Superfund Site
Deerfield Township of Portage County, Ohio

MAY 1993
REF. NO. 2372 (52)
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CONESTOGA-ROVERS & ASSOCIATES

G

APPENDIX G

CONSTRUCTION SPECIFICATIONS

SOIL REMOVAL AND TREATMENT

BID DOCUMENTS

SOIL REMOVAL AND TREATMENT

Summit National Superfund Site
Deerfield, Ohio

MAY 1993

REF. NO. 2372 (32)

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CONESTOGA-ROVERS & ASSOCIATES

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SECTION 01010 - SUMMARY OF WORK

1. SCOPE OF WORK

The Works to be performed under this Contract consist of Soil Removal and Treatment at the Summit National Superfund Site located in Deerfield Township of Portage County, Ohio.

2. LOCATION

The Site is located at the southeastern corner of the intersection of Routes 224 and Route 225 in Deerfield Township of Portage County, Ohio.

3. ACCESS TO SITE

Access to the Site is available from Route 224.

The Contractor shall make all arrangements with the authorities having jurisdiction for the movement of his material, equipment and labor to and from the Site over public roadways.

4. DESCRIPTION OF WORK

Work includes, but is not limited to, the following:

1. preparation of submittals to the Engineer, USEPA and OEPA;
2. implementation and maintenance of a Site-specific Health and Safety Plan;
3. mobilization of construction facilities, materials, equipment, plant and personnel necessary to perform the Works;
4. provision and maintenance of construction facilities and temporary controls including , but not limited to, temporary utilities and new access roads (if necessary); improvement and maintenance of existing roads as required; protection of aboveground and underground facilities;
5. operation and maintenance of existing Equipment Decontamination Facility and Contaminated Soil Staging Area, Personnel Decontamination Facility, Drum Staging Area, Site office, emergency first aid facility, wastewater treatment facility; sanitary facilities and all other necessary construction facilities and temporary controls;
6. implementation of an air model to model the impact of thermal treatment unit emissions on ambient air concentrations;
7. design, supply and on-Site installation of a thermal treatment unit and associated facilities including site preparation, grading, construction of foundations, erection, setup, commissioning, shakedown, and implementation of Performance Demonstration;
8. completion of a successful Performance Demonstration;

9. demolition and on-Site disposal of existing utility poles, buried pipe, abandoned incinerator, sheds, EPA trailer, weigh scale and buildings, free standing wall, abandoned truck and metal container;

10. emptying and on- or off-Site treatment of contents of three existing underground storage tanks;

11. removal and on-Site disposal of three existing underground storage tanks;

12. in place abandonment of existing concrete septic tank;

13. excavation, segregation, handling, preparation and on-Site thermal treatment of visibly contaminated soil and on-Site backfilling of non-visibly contaminated soil in EPA soil stockpile;

14. excavation, overpacking, sampling, finger-printing, characterization, waste handling, preparation, on-Site thermal treatment or off-Site treatment/disposal of buried drums/containers and their contents removed from Areas of Buried Drums;

15. excavation and on-Site thermal treatment of visibly contaminated soil immediately associated with buried drums and containers in Areas of Buried Drums and around or below three existing underground storage tanks;

16. excavation and on-Site thermal treatment of the upper two feet of soil in designated grids, except Grid Nos. 3-5, 4-5 and 4-6;

17. excavation and on-Site thermal treatment or off-Site landfilling of PCB-contaminated soil from Grid Nos. 3-5, 4-5 and 4-6;

18. excavation, handling, consolidation and on-Site incineration or on-Site thermal desorption of stockpiled soils and sediments (which include the top two feet of soils from Grids 1-9 and 5-9, parts of Grids 6-4, 6-6, 6-7 and 4-8, and sediments from the east part of the east pond) in Contaminated Soil Staging Area;

19. removal of aqueous waste from existing drums in Soil Staging Area and sample jars in on-Site storage shed and EPA trailer, and transport to Trust's groundwater treatment plant;

20. backfilling on-Site soils contained in drums staged on Soil Staging Area, crushed emptied drums, and soil samples and jars in on-Site storage shed and EPA trailer;

21. removal of water in on-Site East and West Ponds and on-Site treatment or off-Site treatment;

22. excavation and on-Site thermal treatment of upper two feet of sediments from the East and West Ponds;

23. on-Site backfilling and compaction of approved ash;

24. construction of protective concrete cover around existing wells and piezometers;

25. regrading Site to base of final soil cover;

26. importing, placing and compacting of first six inches of final soil cover; and

27. project closeout including:

    1. decommissioning of Thermal Treatment Unit and associated facilities,
    2. final decontamination of all Site equipment and facilities, and
    3. demobilization from Site.

5. WORK NOT INCLUDED

The following items of work associated with the project do not form part of this Contract:

1. construction of final 18-inches of final soil cover.

6. SUPPLIED BY TRUST

The following items will be supplied by the Trust:

1. Equipment Decontamination Facility.

2. Contaminated Soil Staging Area.

7. CONSTRUCTION SCHEDULE

The Contractor shall perform the Works in accordance with the following construction schedule:

1. the first meeting between the Contractor and the Engineer to discuss the Contractor's detailed plans of startup procedures and of the Works and additional items of interest shall be held within thirty (30) calendar days of Notice to Proceed;

2. mobilization to the Site shall be commenced within one hundred and eighty (180) calendar days from the date of the Notice to Proceed;

3. mobilization of the Thermal Treatment Unit shall be commenced within one hundred and ninety (190) calendar days from the date of the Notice to Proceed and completion of erection within two hundred and fifty (250) calendar days from the date of the Notice to Proceed. Mobilization of the Thermal Treatment Unit shall not commence prior to the approval of the Performance Demonstration Plan, Facilities and Process Information Plan, Waste Preparation Plan and Thermal Treatment Unit Operations and Maintenance Plan by the Engineer, USEPA and OEPA;

4. the Performance Demonstration shall be completed no later than ninety (90) calendar days after being notified by the Engineer to commence mobilization of the Thermal Treatment Unit;

5. interim operation of Thermal Treatment Unit shall commence within thirty (30) calendar days of submission of an approvable Preliminary Performance Demonstration Report, subject to receipt of written notice from the Engineer;

6. on-Site thermal treatment shall be completed within three hundred and ninety (390) calendar days after receipt of written notice from Engineer to commence interim operation of the Thermal Treatment Unit;

7. removal of all materials designated for off-Site disposal or treatment shall be completed within three hundred and sixty (360) calendar days after receipt of written notice from Engineer to commence interim operation of the Thermal Treatment Unit;

8. off-Site disposal and treatment of materials removed from Site shall be completed within three hundred and ninety (390) calendar days after receipt of written notice from Engineer to commence interim operation of the Thermal Treatment Unit; and

9. the Works shall be completed within four hundred and fifty (450) calendar days after receipt of written notice from Engineer to commence interim operation of the Thermal Treatment Unit.

Rejection of specified work plans by USEPA and OEPA and revision by the Contractor will in no way relieve the Contractor of his responsibility to meet the Construction Schedule as specified.

8. DRAWINGS

Drawings issued with and forming part of the Contract Documents are listed below. Such Drawings are issued for bid purposes only.

Drawing No.	Rev. No.	Date of Drawing or Latest Revision	Title
E-1	2	February 1993	Existing Conditions
E-2	2	February 1993	Site Preparation and Demolition
E-3	2	February 1993	Excavation
E-4	2	February 1993	Typical Details
E-5	2	February 1993	Grading Plan
E-6	2	February 1993	Cross-Section Locations
E-7	2	February 1993	Cross-Sections 0 and 100
E-8	2	February 1993	Cross-Sections 200 and 300
E-9	2	February 1993	Cross-Sections 400 and 500
E-10	2	February 1993	Cross-Sections 600 and 700

The Contractor shall perform the Works in accordance with Drawings signed "Approved for Construction" by the Engineer. Such Drawings will be issued to the Contractor after Notice of Award of the Contract and will consist of bid Drawings revised as required by the Engineer and additional Drawings if required by the Engineer. Revised "Approved for Construction" Drawings may be issued from time to time by the Engineer and such Drawings shall supersede previous revisions.

If revised "Approved for Construction" Drawings are issued, which necessitate changes to the Contractor's Drawings not yet reviewed, no separate payment will be made for the Contractor's expenses involved in revising such Drawings.

9. MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for work under Section 01010.

END OF SECTION

SECTION 01015 - GENERAL REQUIREMENTS

1. PROJECT STARTUP

Pursuant to requirements specified elsewhere in the Contract Documents and prior to mobilizing to the Site, the Contractor shall provide all bonds and insurance.

Prior to commencing work at the Site, the Contractor shall mobilize all material and equipment required for performance of the Works; erect all temporary fencing; provide all construction facilities and temporary controls including parking areas, all necessary connections to power, water, telephone and sewer and access roads as required.

The Contractor shall site all construction facilities in areas designated by the Engineer. Any changes to the locations of construction facilities shall be approved by the Engineer.

The Contractor shall ensure all utilities and surface features potentially affected by the Works are located in and around all active work areas prior to commencement of the Works.

The Contractor shall ascertain and record the conditions of existing surface features at all work locations under this Contract.

2. CONTRACTOR'S REPRESENTATIVE

During the performance of the Works, the Contractor shall have on the Site during working hours a designated Superintendent empowered to act on behalf of the Contractor in all matters pertaining to the Contract. The Contractor shall within seven (7) calendar days of execution of the Contract, nominate such person or persons, in writing, to the Engineer. Such person or persons shall remain, in the context of this Contract, the Contractor's designated agent(s) until such time as notification to the contrary is received in writing by the Engineer.

3. MEASUREMENT METHODS

Further to Article 7 of the Agreement, measurement clauses in these Project Specifications define methods the Engineer will use to determine quantity of completed work for payment purposes.

The Contractor shall notify the Engineer sufficiently in advance of operations to permit required measurements for payment and shall provide reasonable and necessary opportunities and facilities for making such measurements.

The Contractor shall provide at his own expense a qualified assistant(s) to the Engineer to expedite the taking of these measurements and to facilitate agreement on pay item quantities.

4. DELIVERY OF EQUIPMENT AND MATERIAL

No material or equipment of any kind shall be delivered to the Site until approval in writing has been applied for and obtained by the Contractor from the Engineer that such material or equipment may be delivered.

The Contractor shall ensure that the delivery of material and equipment to the Site is coordinated with the work sequence and stored in areas approved by the Engineer. Delivered equipment and material shall be protected from contamination prior to and during use in the Works.

Delivery, storage and handling of all material and equipment shall be the sole responsibility of the Contractor and shall be subject to the approval of the Engineer.

5. OTHER CONTRACTORS

Other Contractors may be working on the Site. The Contractor shall cooperate with and coordinate his activities with Other Contractors. No additional payment will be made for delays, changes in schedule, or any other work due to the fact that Other Contractors are working on the Site.

6. QUALITY CONTROL

A. INSPECTION

The Engineer shall have access to the Works. If parts of the Works are in preparation at locations other than at the Site, the Contractor shall provide access to such work whenever it is in progress.

The Contractor shall give timely notice requesting inspection if work is designated for special tests, inspections or approvals or by instructions of the Engineer or other authorities having jurisdiction.

If the Contractor covers or permits to be covered any part of the Works that has been designated for special tests, inspections or approvals before such is made, the Contractor shall uncover such work, have the inspections or tests satisfactorily completed and make good such work at no additional cost to the Trust.

The Engineer may order any part of the Works to be examined if such work is suspected to be not in accordance with the Contract Documents. If, upon examination such work is found not in accordance with the Contract Documents, the Contractor shall correct such work and pay the cost of examination and correction. Except as specified above, if such work is found to be in accordance with the Contract Documents, the Trust will pay the cost of examination and replacement.

B. INDEPENDENT TESTING AGENCIES

Independent testing agencies may be engaged by the Trust for the purpose of inspecting and/or testing portions of the Works.

The Contractor shall allow inspection/testing agencies access to the Works whenever it is in preparation or progress and shall provide reasonable facilities for such access.

Employment of testing agencies by the Trust does not preclude or relax the responsibility of the Contractor to perform as specified.

If defects or deficiencies are revealed during inspection and/or testing, the appointed agency will request additional inspection and/or testing to ascertain the full degree of the defect or deficiency. The Contractor shall correct defects and deficiencies as directed by the Engineer at no additional cost to the Trust.

The Contractor shall pay costs for retesting and reinspection.

C. PROCEDURES

The Contractor shall notify the appropriate agency and the Engineer in advance of the requirement for tests, inspections or approvals, in order that attendance arrangements can be made.

The Contractor shall submit samples and/or materials required for testing, as specifically requested in the Project Specifications. The Contractor shall submit with reasonable promptness and in an orderly sequence so as not to cause delay in the performance of the Works.

The Contractor shall provide labor and facilities to obtain and handle samples and materials at the Site.

D. REJECTED WORK

The Contractor shall remove defective work, whether the result of poor workmanship, use of defective products or damage and whether incorporated in the Works or not, which has been rejected by the Engineer as failing to conform to the specified requirements.

The Contractor shall make good Other Contractor's work damaged by such removals or replacements promptly.

If in the opinion of the Engineer it is not expedient to correct defective work or work not performed in accordance with the Contract Documents and the Project Specifications, the Trust may deduct from the Contract Price the difference in value between the work performed and that called for in the Contract Documents and the Project Specifications, the amount of which shall be determined by the Engineer.

7. EXISTING CONDITIONS

A. SITE STRUCTURES AND FACILITIES

Prior to commencement of work at the Site, the Contractor shall inspect the Site with the Engineer to review and establish the condition of all surface features including existing buildings, trees and other plants, grassed areas, fencing, service poles, wires, paving and survey bench marks or monuments on or adjacent to the Site which may be affected by the Works. This inventory shall be mutually agreed between the Engineer and the Contractor and shall not thereafter be subject to dispute. Such inventory as may be amended, from time to time, will be used by the Engineer to check compliance by the Contractor with the requirements of the Contract Documents.

The Contractor shall provide ongoing review inspection and attendance during performance of the Works to properly document conditions. The Contractor shall inform

the Engineer within seven (7) calendar days of any existing conditions at the Site affected by the Works which may require restoration, repair or replacement. The Contractor shall not cover up any of the Works without prior approval from the Engineer.

The Contractor shall protect existing buildings and other surface features from damage which may be affected by the Works while work is in progress and repair any resulting damage from the Works to the Engineer's approval.

B. PROTECTION OF MONITORING WELLS AND PIEZOMETERS

Monitoring wells and piezometers which are located in the working area will be flagged by the Engineer. The Contractor shall protect identified monitoring wells and piezometers and shall take all necessary precautions to avoid damage to these monitoring wells and piezometers. Any monitoring well or piezometer damaged by the Contractor during performance of the Works shall be repaired or replaced by the Contractor, as directed by the Engineer, at no additional cost to the Trust.

8. RESTORATION

A. GENERAL

This Clause describes minimum requirements and not necessarily all the requirements for restoration work.

The Contractor shall supply all labor, materials and equipment and do all work necessary or required to restore the Site as specified and shown on the Drawings.

Restoration shall mean replacement, repairs or reconstruction to a condition at least as good as or better than the condition prior to commencement of the Works.

Except where specifically required by other Sections of the Project Specifications, the Contractor shall restore areas of the Works and areas affected by the performance of the Works to conditions that existed prior to commencement of the Works and to match condition of adjacent, undisturbed areas.

The Contractor shall be responsible to restore the Site, including all areas affected by the performance of the Works, and shall utilize construction methods and procedures during the performance of the Works which keeps disturbance and damage of whatever nature to existing conditions to the practical minimum. Where the works necessitate root or branch cutting, the Contractor shall do so only as approved by the Engineer.

Unless specified otherwise, the Contractor shall ensure that quality, grades, elevations and extent of bedding, backfill and other materials including subgrades, finish grades, thickness of pavements for roadways and parking areas are properly documented during their removal to ensure reconstruction to at least their original and functional condition.

B. MATERIAL

Material required for restoration work shall be provided by the Contractor subject to the approval of the Engineer prior to use.

Restoration material shall be new, except as otherwise specified, not damaged or defective and of the best quality for the purpose intended. If requested by the Engineer or specified in other Sections of the Project Specifications, the Contractor shall furnish evidence as to type, source and quality of materials or products provided.

Should any dispute arise as to the quality or fitness of materials, whether obtained on the Site or off the Site, whether previously inspected by the Engineer prior to use or not, the decision to use any material or product in the finished Works will rest strictly with the Engineer.

Material not approved for reuse shall become the property of the Contractor and shall be removed from the Site.

The Contractor shall handle and store products or materials in a manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

C. PERFORMANCE

The Contractor shall notify the Engineer sufficiently in advance of any required attendance to assess and/or document existing conditions.

Prior to commencement of restoration work, the Contractor shall inform the Engineer of proposed material, methods and procedures to repair, replace or reconstruct any disturbed, damaged areas of to the Works.

The Contractor shall perform cutting, remedial and coordination work required to make the parts of the Works fit together.

The Contractor shall ensure that restored areas match existing grade and surface drainage characteristics, except as otherwise specified, and ensure a smooth transition from restored surfaces to existing surfaces.

The Contractor shall not alter original conditions without approval from the Engineer.

The Contractor shall dismantle and/or salvage materials for reuse where practicable except as otherwise specified. The Contractor shall exercise due care when removing material for salvage. Materials damaged through improper handling or through loss after removal shall be repaired or replaced by the Contractor at no additional cost to the Trust.

The Contractor shall store and protect removed material approved for reuse in approved locations.

Unless otherwise specified, restoration of pavement shall be made by removing and replacing the entire portions between joints or scores and not merely refinishing or patching localized areas.

In removing pavements, curbs and gutters and similar structures or surfaces, the Contractor shall saw cut surfaces and protect adjacent joints and load transfer devices and underlying granular materials.

9. LAYOUT

The Engineer will establish reference bench marks and baselines adjacent to the Works. The Contractor shall notify the Engineer in writing at least five (5) working days in advance of the time he will commence work on any part of the construction to enable the Engineer to establish bench marks and baselines.

The Contractor shall be responsible for the preservation of all survey reference points as set or established by the Engineer. Any errors entering into the Works through failure of the Contractor to notify the Engineer concerning lack of preservation of such survey reference points shall be made good by the Contractor at no additional cost to the Trust.

The Contractor shall develop and make such additional detailed surveys as are needed for construction, such as slope stakes, line and grade stakes, batterboards, stakes for establishing the design elevations and other working points, lines and elevations. All bench marks, base lines, property boundaries, line and grade hubs, and other reference and construction or survey points shall thereafter be maintained by the Contractor.

The Engineer may, at any time, check the Contractor's survey and layout work but this shall not relieve the Contractor of any of his responsibilities to carry out the Works to the lines and grades as set out in accordance with the Drawings and Project Specifications.

The Contractor shall provide reasonable and necessary opportunities and facilities for setting points and making measurements during construction. The Contractor shall not proceed until he has made request to and has received from the Engineer, such points as may be necessary as the work progresses. The construction shall be done in conformance with such points.

10. WORK AREAS

The Trust will provide the right of access to certain lands in connection with the Works. The Contractor shall not unreasonably encumber these premises with its plant, equipment or materials. No other areas on the Site shall be used by the Contractor without the Engineer's written approval. Any access requirements for the Contractor's own convenience shall be constructed by the Contractor.

11. LANDS BY CONTRACTOR

The Contractor shall provide, with no liability to the Trust, any additional land and access thereto not shown or described that may be required for temporary construction facilities or storage of materials. Lands required off the Site shall be approved by the Engineer.

12. INTERFERENCE WITH TRUST'S EXISTING GROUNDWATER TREATMENT PLANT

The Contractor shall conduct operations to minimize interference with the Trust's existing groundwater treatment plant, and shall comply with any regulations in force. Where it is necessary to interrupt existing services for purposes of demolition work, connecting work, re-routing systems or changing over to new arrangements, all related and preliminary work shall be scheduled and completed in advance, except for necessary final connecting or removal, as the case may be, to ensure minimum shutdown time.

13. COORDINATION WITH ADJACENT OPERATIONS

The Contractor is advised that operations of facilities adjacent to the Site must be maintained (to the maximum extent possible) throughout the execution of the Works. The Contractor shall arrange and perform all work in such a manner as to cause minimum interference to adjacent operations or personnel.

14. DISRUPTION OF SERVICES

Where it is necessary to interrupt existing services, the Contractor shall advise the Engineer a minimum of 72 hours in advance of a proposed shutdown or interruption of services, utilities or access to any adjacent facility and shall not proceed with such shutdown or interruption until authorization to proceed has been issued by the Engineer. Where it is necessary to interrupt existing services, all related and preliminary work shall be scheduled and completed in advance, except for necessary final connecting or removal, as the case may be, to ensure minimum shutdown time. No additional payment will be made for delays resulting from failure to authorize the interruption within 72 hours or modifications required to the proposed sequence of work to accommodate adjacent operations.

The Contractor shall identify all potentially required shutdown or interruptions of service utilities or access to any adjacent facility and expected duration on the Contractor's detailed construction schedule.

The Contractor shall coordinate the Work to ensure alternate access routes, points of entry, or service connections are not interrupted at the facilities located adjacent to the Site.

15. MEETINGS WITH ENGINEER

Within thirty (30) calendar days from the date of Notice to Proceed, the Contractor shall attend a pre-construction meeting at a location at or near the Site to discuss the Contractor's project start-up procedures including, schedules, submittals, safety, environmental protection and any additional items of interest.

In addition to the pre-construction meeting the Contractor or selected qualified representatives shall also attend Site meetings to be held during the course of the Works at daily, one week and monthly intervals or at the request of the Engineer.

Daily meetings shall be attended by the Engineer and the Contractor's Representative and will include discussion on previous day's and upcoming day's activities, health and safety concerns and any problems or potential problems. Weekly meetings shall be attended by the Engineer, Contractor's Representative and if necessary the Contractor's quality assurance and Site safety personnel. Discussions shall include health and safety issues, activities of previous and upcoming weeks, comparison of actual and scheduled work activities and any problems or potential problems. Monthly meetings shall be attended by the Engineer, Contractor's Representative, Trust, USEPA, OEPA and Engineer's off-Site representatives. Discussion topics will be similar to those for the weekly meetings.

The Engineer will preside at the meetings, record the minutes and distribute the minutes within three (3) calendar days after each weekly and monthly meeting.

16. COMMUNITY RELATIONS

When required and solely at the request of the Engineer, the Contractor shall participate in the Community Relations program organized and directed by the USEPA, OEPA and the Trust. The Community Relations program may require the Contractor to provide a senior representative to attend and speak at community meetings during the Contract, to provide information for inclusion in meetings, letters and information packages, to provide a knowledgeable representative to participate in Site tours, and to assist in any fashion in the Community Relations program. The Contractor shall not communicate with any member of the public, media, government, authorities or any person regarding the Works and processes used in the Works without the written approval of the Engineer.

17. TERMINOLOGY

In addition to the definitions contained in Clause Gc.01 of the General Conditions, the following terminology shall apply:

"APCE" shall mean Air Pollution Control Equipment, included with the Thermal Treatment Unit.

"Approved Ash" shall mean ash meeting the criteria in Section 02090 and 02091 for metals and organics.

"Ash" shall mean bottom ash and flyash.

"Bottom Ash" shall mean thermally treated soil, sediment, sludge, drummed/containerized waste, abandoned incinerator kiln liner and contents, laboratory chemicals and investigative drum samples, contents of sumps, filter media, granular activated carbon sludges and any other material processed through the Thermal Treatment Unit.

"DRE" shall mean destruction and removal efficiency as defined in 40 CFR 264.343.

"Fly ash" shall mean debris removed from the Air Pollution Control Equipment.

"POHC" shall mean Principal Organic Hazardous Constituent.

"POTW" shall mean Publicly Owned Treatment Works for treatment of wastewater.

"Thermal Treatment Unit" shall mean rotary kiln or infrared incinerator or thermal desorption unit and all ancilliary facilities including APCE and feed mechanisms.

"TSD" facility shall mean a privately owned and operated off-Site Treatment, Storage and Disposal facility.

18. CLEAN UP

No material of any kind shall be removed from the Site without prior written approval from the Engineer.

The Contractor shall not allow any part of the Site to become littered with trash and/or waste material, and shall maintain the same in a neat and orderly condition throughout the performance of the Works.

Daily accumulations of solid waste material which have been in contact with contaminated materials, such as discarded safety equipment, debris and rubbish, shall be collected and properly containerized for disposal.

Non-contaminated solid waste materials from the Site offices, lunch room and security office shall be segregated from contaminated solid wastes removed from the work areas.

Non-contaminated solid waste materials shall be removed from the Site in a timely manner or as directed by the Engineer such that accumulation of waste materials at the Site is minimized. Greasy or oily rags or materials subject to spontaneous combustion shall be deposited and kept in approved receptacles for disposal.

On or before the completion of the Works, the Contractor shall carefully clean out all structures including pits, chambers and conduits and shall tear down and remove all temporary structures and facilities provided by him and shall remove rubbish of all kinds from any of the grounds which have been occupied or used and leave them in first-class condition approved by the Engineer.

19. MEASUREMENT AND PAYMENT

A. BONDS

Payment for bonds will be made at the lump sum price stipulated in the Schedule of Prices for Item A-1, which price and payment shall be full compensation for furnishing and maintaining all bonds required by the Contract Documents; and all other miscellaneous items for which separate payment is not provided under other Items.

B. INSURANCE

Payment for insurance will be made at the lump sum price stipulated in the Schedule of Prices for Item A-2, which price and payment shall be full compensation for furnishing and maintaining insurance required by the Contract Documents; and all other miscellaneous items for which separate payment is not provided under other Items.

C. MOBILIZATION, SET-UP AND PROJECT STARTUP

Payment for mobilization, set-up and project startup will be made at the lump sum price stipulated in the Schedule of Prices for Item A-3 which price and payment shall be full compensation for the supply of all labor, equipment, plant and materials and doing all work required for mobilizing (except for Thermal Treatment Unit); preparing Site; locating and delineating existing underground utilities; setting up construction facilities and temporary controls including Site grading; mobilizing and constructing Drum Staging Area; mobilizing and setting-up of personnel decontamination/hygiene facilities; mobilizing and setting-up of first aid facility and all other miscellaneous items for which separate payment is not provided under other Items.

Payment for mobilization and set-up of Thermal Treatment Unit, Waste Preparation Facility and associated facilities will be included under pay items of Sections 02003, 02090 and 02091.

END OF SECTION

SECTION 01121 - HEALTH AND SAFETY

1. GENERAL

A. GENERAL REQUIREMENTS

(1) Scope of Work

Work of this Section consists of the development, implementation and maintenance of a written Site-specific Health and Safety Plan.

The Contractor shall develop the Site-specific Health and Safety Plan prior to commencing any on-Site work and shall continue to implement, maintain and enforce the plan until final project closeout. The development, implementation and maintenance of the Site-specific Health and Safety Plan is the Contractor's sole responsibility. The Contractor's Site-specific Health and Safety Plan shall, as a minimum, address the specifications contained herein.

The health and safety guidelines contained herein are intended to provide for a safe and minimal risk working environment for on-Site personnel and to minimize the impact of activities involving contact with any hazardous materials or hazardous wastes on the general public and the surrounding environment.

Should the Contractor seek relief from or substitution for any portion or provision of the minimum health and safety guidelines specified herein or the reviewed Site-specific Health and Safety Plan, such relief or substitution shall be requested of the Engineer in writing, and if accepted by the Engineer, will be authorized in writing.

The Contractor is responsible for the safety of persons and property on the Site and for the protection of persons off the Site and the environment to the extent that they may be affected by the conduct of the Works. The Contractor shall comply with and enforce compliance by its employees and the employees of all of its Subcontractors, agents and invitees, with all safety requirements of the Contract Documents, all applicable federal, state and local statutes, regulations and ordinances, and with its Site-specific Health and Safety Plan. The Contractor acknowledges that safety and environment protection obligations are of paramount importance regarding all of the work performed under the Contract Documents.

(2) Basis

The Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29, Code of Federal Regulations, Parts 1910 and 1926 (29 CFR 1910 and 1926) shall provide the basis for the health and safety program. The program shall also reflect the position of the USEPA and NIOSH regarding procedures recommended or required to ensure safe operations at sites containing hazardous or toxic materials.

(3) Site Characterization

Work at the Site will involve contact with soils, sediments, drums/containers, aqueous water and other materials contaminated with a broad variety of organic compounds.

B. SUBMITTALS

(1) Contractor's Site-Specific Health and Safety Plan

Within twenty-one (21) calendar days of the date of Notice to Proceed. The Contractor shall submit to the Engineer a Site-specific Health and Safety Plan for review and approval The submitted Site-specific Health and Safety Plan shall address, as a minimum, all aspects of worker protection and measures designed to prevent migration of hazardous or contaminated material to the environment, including but not limited to the provisions and guidelines contained herein. Specific topics which must be addressed in the Contractor's Site-specific Health and Safety Plan include:

1. worker medical surveillance;

2. worker training;

3. a detailed description of planned movement of labor, equipment and materials from and between work areas as work progresses, including measures to be employed to prevent recontamination of previously cleaned areas and contamination of areas that do not now contain hazardous materials;

4. a detailed description of the personnel decontamination facilities to be employed including the planned phasing of decontamination facilities between work areas as work progresses, and the methods to be used to collect, store, treat and ultimately dispose of personnel decontamination waters and wastes;

5. a detailed description of the washdown area for decontamination of vehicles and equipment and methods to be used to collect, store, treat and ultimately dispose of washdown decontamination waters and sediment;

6. confined space entry program and procedures;

7. drum handling program in accordance with OSHA 29 CFR 1910.120(j);

8. personal protective equipment types to be used;

9. personal hygiene and personnel decontamination procedures;

10. respirator protection program and procedures;

11. personnel air monitoring;

12. emergency and first aid equipment and supply;

13. dust and particulate emission control (not including Thermal Treatment Unit);

14. monitoring and mitigation of worker heat and cold stress;

15. emergency contingency plan; and

16. air monitoring plan.

The Contractor's Site-specific Health and Safety Plan shall be submitted to and be reviewed by the Engineer before the Contractor commences Site activities involving the handling or any contact with potentially hazardous waste.

The Engineer will review the Contractor's Site-specific Health and Safety Plan and provide comments to the Contractor within ten (10) calendar days of receipt of the plan. The Contractor shall revise the plan as appropriate and resubmit the plan to the Engineer within seven (7) calendar days of receipt of comments.

Work in the Exclusion Zone or in the Contaminant Reduction Zone (including any areas expected to become an Exclusion Zone or Contaminant Reduction Zone), including work relating to the designation or establishment of an Exclusion Zone or Contaminant Reduction Zone, may not commence until the Contractor's Site-specific Health and Safety Plan is reviewed by the Engineer, USEPA and OEPA. Other on-Site work may be conducted after the submittal of the Site-specific Health and Safety Plan to, and prior to its review by, the Engineer, but any such work shall be conducted only with the prior approval of the Engineer. The Contractor shall be obligated to implement the proposed Site-specific Health and Safety Plan, as submitted to the Engineer, USEPA and OEPA, during the conduct of any work performed prior to the review of the Site-specific Health and Safety Plan.

(2) Proof of OSHA Training

Thirty (30) calendar days prior to mobilization to the Site, the Contractor shall submit to the Engineer a list of all personnel that will be employed throughout this Contract. For each of the listed personnel the Contractor shall provide proof of training for each employee as required under OSHA 29 CFR 1910.120. The Contractor shall provide proof of training for any additional employees at least seven (7) calendar days prior to the employee's arrival on the Site.

(3) Medical Surveillance

Thirty (30) calendar days prior to mobilization to Site, the Contractor shall submit to the Engineer a report for medical examination conducted within the last 12 months as part of compliance with OSHA medial surveillance requirements for each of the Contractor's personnel designated to be working on this Contract. As a minimum, the following information shall be submitted for each Contractor personnel:

1. name and Social Security Number and date of exam; and

2. physician's statement that the worker is approved to wear and use the types of respiratory protection proposed for the project and is able to work safely in hazardous environments capable of producing heat stress in the worker.

The Contractor shall provide the Engineer reports on medical examination for any additional employees at least seven (7) calendar days prior to the employee's arrival on Site.

C. JOB CONDITIONS

(1) Work Stoppage

The safety and health of the public and on-Site personnel and the protection of the environment shall take precedence over cost and schedule considerations for all project work. The Engineer and the Health and Safety Officer shall be responsible for decisions regarding when work shall be stopped or started for health or safety considerations and shall each have the authority to stop the work for health or safety considerations. The Health and Safety Officer shall have the obligation to stop the work when, in his discretion, it is necessary or advisable for reasons of health or safety.

(2) Unforeseen Hazards

Should any unforeseen or Site peculiar safety related factor, hazard, or condition become evident during the performance of the Works at the Site, it shall be the Contractor's responsibility to bring such to the attention of the Engineer verbally and in writing as quickly as possible, for resolution. In the interim, the Contractor shall take prudent action to establish and maintain safe working conditions and to safeguard employees, the public, the Trust, the Engineer and the environment.

2. HEALTH AND SAFETY OFFICER

The Contractor shall provide a Health and Safety Officer and sufficient assistants on the Site during the execution of all work. The Health and Safety Officer shall report directly to and be under the direction of a Certified Industrial Hygienist provided by the Contractor. The Certified Industrial Hygienist shall oversee operations as necessary to ensure the work is performed in accordance with the Site-specific Health and Safety Plan and shall oversee and be present during the health and safety training session and, as a minimum, complete qualitative respirator fit testing, perform periodic audits; and oversee the Health and Safety Officer's activities on a part-time basis and be available on an as-needed basis for emergency situations.

The Health and Safety Officer shall:

1. have a minimum of two years site-related working experience specific to the thermal treatment, handling and excavation of buried drummed/containerized waste and contaminated soils;

2. have a sound working knowledge of State and Federal occupational safety and health regulations;

3. have formal education and/or training in occupational safety and health and be trained and certified in administering cardiopulmonary resuscitation (CPR) and life saving first aid techniques;

4. be responsible for completing the health and safety training session;

5. be responsible for the implementation and daily enforcement and monitoring of the Site specific Health and Safety Plan;

6. be responsible for performing air monitoring;

7. ensure that all on-Site personnel have obtained the required medical examinations prior to arrival at the Site and at the termination of their assignment as required;

8. be responsible for the pre-construction indoctrination of all on-Site personnel with regard to the Site-specific Health and Safety Plan and other safety requirements to be observed during construction, including:

    1. potential hazards,
    2. personal hygiene principles,
    3. use of personal protective equipment and respiratory protection, including fit testing, and
    4. emergency procedures for dealing with fire and medical situations;

9. be responsible for incorporating the provisions of both on-Site and off-Site emergency contingency plans in the Site-specific Health and Safety Plan and maintaining a state of readiness to enact the provisions;

10. be responsible for alerting appropriate on-Site and/or off-Site emergency services and the Engineer before starting any particularly hazardous work;

11. assist the Engineer in contacting and advising all local authorities of the Works being performed; and

12. have the authority and obligation to stop all, or any part of the Works if, in his sole discretion, stoppage of the Works is necessary or advisable for considerations of health or safety.

3. PERSONNEL HEALTH, SAFETY AND HYGIENE

A. MEDICAL SURVEILLANCE

The Contractor shall conduct medical surveillance of employees as required by 29 CFR 1910.120 and 29 CFR 1910.134.

The Contractor shall retain the services of a licensed occupational physician or physician's group to provide the medical examinations and surveillance required. All pertinent Site characterization data, a copy of 29 CFR 1910.120, and a description of the intended personal protective equipment shall be provided to the occupational physician prior to completing medical surveillance. The name of the physician and evidence of examination of all on-Site personnel shall be provided to the Engineer prior to assigning personnel on-Site work activities in the Exclusion Zone or Contaminant Reduction Zone. Contractor personnel medical approvals shall be maintained by the Contractor at the Contractor's Site office for the duration of the Contract.

Medical surveillance protocol shall be the occupational physician's responsibility but shall meet the requirements of OSHA standard 29 CFR 1910.120 and 29 CFR 1910.134 for all personnel. This exam may include:

1. medical/occupation questionnaire with work history;

2. full physical examination;

3. screening audiometric test with otoscopic exam for occlusion or perforation;

4. visual acuity measurement, including color perception;

5. pulmonary function test (Spirometry - FVC and FEV-1.0 second);

6. resting EKG;

7. chest x-ray;

8. blood chemistry profile as deemed appropriate by the attending physician for hazardous waste work;

9. complete blood count with differential and platelet evaluation, including WBC, RBC, HGB, hematocrit;

10. urinalysis with microscopic examination; and

11. other Site-specific medical monitoring as required by Site-specific conditions.

All on-Site personnel requiring full medical surveillance shall be provided with medical surveillance within the twelve (12) month period prior to entering the Site, and at any time there is suspected to be excessive exposure to toxic chemicals or physical agents. On-Site personnel who become due for an annual physical examination will be removed from the work force immediately until medical requirements are met in accordance with 29 CFR 1910.120 and 29 CFR 1910.134.

B. TRAINING

The Contractor shall provide and require that all personnel assigned to or entering the Site, complete Site training or refresher sessions. Site-specific training and refresher sessions shall ensure that all personnel are capable of and familiar with the use of safety, health, respiratory and protective equipment and with the safety and security procedures required for this Site. The training session shall be completed by the Health and Safety Officer provided by the Contractor under the supervision of the Contractor's Certified Industrial Hygienist.

The training program shall include, as a minimum, the following items:

1. names and personnel responsible for Site health and safety;

2. Site-specific potential hazards;

3. use of personal protective equipment (PPE), including proper donning and doffing procedures;

4. work practices by which the employee can minimize risks from these potential hazards;

5. confined space entry procedures;

6. safe use of engineering controls and on-Site equipment;

7. discussion and completion of medical surveillance requirements and recognition of symptoms associated with exposure to hazards;

8. Site control methods;

9. on and off-Site contingency plans;

10. decontamination procedures;

11. Site-specific standard operating procedures;

12. delineation between work zones;

13. use of the buddy system;

14. scope of the intended work for the Contract;

15. review on-Site communications and appropriate hand signals between personnel working in the Exclusion Zone and/or Contaminant Reduction Zone; and

16. the content of the OSHA standards, including its Appendices.

In accordance with 29 CFR 1910.120, all employees assigned to or entering the Exclusion Zone or Contaminant Reduction Zone shall receive training including a minimum of 40 hours instruction off the Site and three days of actual field experience under direct supervision and an 8-hour annual refresher. The Contractor shall provide documentation stating that all on-Site personnel expected to enter potentially contaminated work areas have complied with this regulation. Each individual's name shall be included on this confirmatory letter.

The Health and Safety Officer shall be responsible for ensuring that personnel not successfully completing the required training are not permitted to enter the Site to perform work in the Exclusion Zone or Contaminant Reduction Zone.

The shall implement a hazard communication ("Right-to-Know") program in accordance with 29 CFR 1910.1200.

Exceptions to the above may only be made by the Engineer for authorized visitors.

C. LEVELS OF PROTECTION

Levels of protection for each work area shall be established based on planned activity, location of activity and air monitoring results. All waste handling activities shall be monitored with a photoionization device, oxygen level meter and explosimeter. This monitoring, shall be in addition to any monitoring associated with the Thermal Treatment Unit stack and fugitive emissions monitoring.

The anticipated levels of personal protection based on work activity are as follows:

Work Activity	*Anticipated Level of Personal Protection*
Regrading of the Site with Ash and Clean Imported Fill and Installation of the First Six Inches of Final Cover	• Level D, or Level C if air monitoring results indicate the need
Installation and demobilization of the Thermal Treatment Unit, Construction of a Drum Staging Area, Demolition in Place of the Underground Septic Tank	• Level D if working in the top two feet of uncontaminated surface grid areas during ground invasive activities • Level C for ground invasive activities in contaminated grid areas and below two feet in uncontaminated grid areas
Demolition of the Abandoned Incinerator, Dewatering Ponds, Excavation of Contaminated Soils and Sediments, Backfilling of Areas of Buried Drums, Sampling and Removal of Underground Storage Tanks, Disposal of Contaminated Dump Truck, Sampling Activities (Soil, Sediment, Surface Water) and Decontamination Activities	• Level C, or Level B if air monitoring results indicate the need
Soil Treatment	• Level D, C or B depending on Thermal Treatment Unit selected and air monitoring results.
Drum Excavation, Removal, Handling, Opening and Sampling	• Level B
Entry into Abandoned Incinerator or Underground Storage Tank	• see Clause 6.D of this Section

D. PERSONAL PROTECTIVE EQUIPMENT

The Contractor shall provide all on-Site Contractor personnel with appropriate PPE. The Contractor shall ensure that all safety equipment and protective clothing is kept clean and well maintained. As a minimum, the Contractor shall supply each worker entering or expected to enter the Exclusion Zone or Contaminant Reduction Zone with protection as specified in Clause 3.C. of this Section consisting of the following:

Level B

1. supplied-air respirator (MSHA/NIOSH approved). Respirators shall be positive pressure-demand, self-contained breathing apparatus (SCBA) or positive pressure-demand, airline respirator (with escape bottle for Immediate Danger to Life and Health (IDLH) or potential for IDLH atmosphere);

2. chemical-resistant clothing (overalls and long-sleeved jacket; hooded one or two-piece chemical-splash suit; disposable chemical-resistant; one-piece suits);

3. long cotton underwear or long-sleeved shirt and pants;

4. gloves (outer), chemical-resistant;

5. gloves (inner), chemical-resistant;

6. boots (outer), chemical-resistant, steel toe and shank;

7. boot covers (outer), chemical-resistant (disposable); and

8. hard hat with face shield.

Level C

1. air-purifying respirator, half-face or full-face (MSHA/NIOSH approved), equipped with organic vapor/acid gas (OV/AG) cartridge with a high efficiency particulate air (HEPA) filter;

2. chemical-resistant clothing (coveralls; hooded one-piece or two-piece chemical splash suit; chemical-resistant hood and apron; disposable chemical-resistant coveralls);

3. long cotton underwear or long-sleeved shirt and pants;

4. gloves (outer), chemical-resistant;

5. gloves (inner), chemical-resistant;

6. boots (outer), chemical-resistant, steel toe and shank;

7. boot covers (outer), chemical-resistant (disposable); and

8. hard hat (face shield).

Level D

1. coveralls;

2. gloves;

3. boots/shoes (leather or chemical-resistant) with steel toe and shank;

4. safety glasses;

5. hard hat; and

6. boot covers if traversing in contaminated areas on Site.

Additional protective equipment usage guidelines to be implemented shall include:

1. prescription eyeglasses in use on the Site shall be safety glasses;

2. contact lenses shall not be worn;

3. all disposable or reusable nitrile, latex and/or cotton gloves worn on the Site shall be changed, decontaminated or discarded at the end of each day;

4. during periods of respirator usage, respirator cartridges and filters shall be changed daily, or upon breakthrough, whichever occurs first;

5. on-Site personnel who have not passed a respirator fit test shall not enter or work in the Exclusion Zone. Personnel shall not have beards, or long sideburns or moustaches as these interfere with a proper fit of the respirator;

6. all PPE worn on Site shall be decontaminated or discarded at the end of each work day; and

7. duct tape shall be used to ensure that disposable coveralls and gloves are tightly secured when personnel are working within the Exclusion Zone; and

E. RESPIRATORY PROTECTION

All on-Site personnel shall receive extensive training in the usage and limitations of, and be qualitatively fit tested for, half- and full-facepiece respirators in accordance with 29 CFR 1910.134. This shall include both air purifying and supplied air type respirators.

The respirator program shall be developed and implemented by the Contractor and maintained by the Health and Safety Officer. A copy of the respirator program shall be incorporated or attached to the Contractor's Site-specific Health and Safety Plan.

The Contractor shall monitor, evaluate and provide respiratory protection for all on-Site personnel.

Levels of respiratory protection as listed in Section 01121, Clause 3.C., have been chosen to be consistent with Site-specific potential airborne hazards associated with the major contaminants identified at the Site. The selection of appropriate protection is based upon the potential presence of compounds with the lowest recommended threshold limit value.

In the absence of additional air monitoring information or substance identification, the following minimum levels of respiratory protection will be required:

Sustained Total Organic Vapor Concentration Above Background (ppm) *	Level of Respiratory Protection Required
0 - 1	Half- or full-facepiece respirator available
1 - 5	Half- or full-facepiece air purifying respirator
5 - 50	Wear supplied air respirator,
>50	Shut-down activities, implement additional controls.

* Note: greater than 45 seconds.

The Contractor shall be responsible for appropriate respiratory protection during all work activities. As a minimum, the Contractor shall ensure that all persons entering the Exclusion Zone or Contaminant Reduction Zone are supplied with and use appropriate respiratory protection.

Assessing the ability for on-Site personnel to wear respiratory protection shall be the responsibility of the Contractor. Cardiopulmonary system examination and pulmonary function testing are minimum requirements as previously specified in Section 01121, Clause 3.A.

On-Site personnel unable to pass a respirator fit test shall not enter the Exclusion Zone or Contaminant Reduction Zone. Proof of such fitting shall be provided to the Engineer prior to commencing work.

F. HEAT STRESS/COLD STRESS

The Contractor shall implement a heat stress and/or cold stress monitoring program as applicable. Specific components of the Contractor's program shall address:

1. training of employees to recognize and mitigate heat/cold stress situations and symptoms;

2. target conditions which will initiate monitoring of employees;

3. monitoring methods; and

4. the means and methods by which the Contractor will mitigate such conditions.

The Contractor shall base the heat stress/cold stress program on recommendations by ACGIH, NIOSH and other recognized authorities.

G. PERSONNEL HYGIENE AND PERSONNEL DECONTAMINATION PROCEDURES

The Health and Safety Officer shall be responsible for, and ensure that all Contractor personnel observe and adhere to the personal hygiene-related provisions of this Section.

On-Site Contractor personnel found to be disregarding the personal hygiene-related provisions of the Site-specific Health and Safety Plan or the Project Specifications (including but not limited to the requirements concerning PPE specified in Clause 3.D of this Section; respiratory protection specified in Clause 3.E of this Section; and personnel hygiene and personnel decontamination procedures specified in Clause 3.G of this Section shall be issued a written notice of such violation. The notice may be issued by the Engineer, the Health and Safety Officer or any supervisory personnel of the Contractor. A copy of the notice shall be given to the offending worker, to his immediate supervisor, to the Contractor's Superintendent and to the Engineer. Upon issuance of a second written notice of such violation, the worker shall be terminated from employment at the Site.

Failure of the Contractor's supervisory personnel to implement this warning/termination provision shall be deemed a material breach of the Contract.

The Contractor shall provide, as a minimum, the following:

1. suitable containers for storage and disposal of used disposable PPE;

2. potable water and a suitable sanitation facility; and

3. shower and locker facility for all on-Site personnel.

The Contractor shall enforce the following provisions:

1. on-Site personnel shall wear appropriate PPE at all times when entering or working in the Exclusion Zone or Contaminant Reduction Zone;

2. used disposable PPE shall not be reused, and when removed, shall be placed inside appropriate containers provided for that purpose;

3. smoking, chewing nicotine products, eating and drinking shall be prohibited except in a designated lunch or break area;

4. soiled disposable outerwear shall be removed prior to entering the lunch area, and prior to cleansing hands;

5. on-Site personnel shall thoroughly cleanse their hands and other exposed areas before entering the smoking or lunch area;

6. all personnel working in the potentially contaminated work areas and/or Contaminant Reduction Zone shall shower and change to fresh clothing after each working period or shift, prior to leaving the Site;

7. used work clothing shall be laundered daily in a facility provided by the Contractor, at a location specified by the Engineer;

8. water generated from washing and showering shall be stored in the designated wastewater storage tank in accordance with Section 01500.

Discarded disposable outerwear, gloves and outer footwear shall be placed in Contractor-supplied sealable containers.

H. FIRST AID EQUIPMENT

First aid equipment shall be located and maintained in the Emergency First Aid Facility. This equipment shall be stored on a portable pallet in order that it may be easily transported within the active work location. The required equipment shall include, at a minimum:

1. first-aid kit to accommodate on-Site personnel;
2. portable emergency eye wash and shower;
3. two 20-pound ABC type dry chemical fire extinguishers;
4. two self-contained breathing apparatus units (if confined space entry is to occur);
5. blankets and towels;
6. stretcher; and
7. one hand-held emergency siren.

As a minimum, the Contractor shall have one certified first aid technician on the Site at all times that work activities are in progress. This person may perform other duties but must be immediately available to render first aid when needed.

I. SITE COMMUNICATIONS

Emergency numbers shall be posted near Site telephones in accordance with both the on-Site and off-Site Contingency and Emergency Response Plans.

Additionally, personnel shall work under the use of a "buddy" system and shall develop a hand signal system appropriate for Site activities.

An employee alarm system shall be provided to notify employees of on-Site emergency situations or to stop work activities if necessary.

Selected personnel shall be provided with two-way radios in accordance with Section 01500.

J. SAFETY MEETINGS

The Health and Safety Officer shall routinely conduct daily safety meetings which shall be mandatory for all Site personnel. The meetings shall provide refresher training for existing equipment and protocols, review ongoing safety issues and protocols and shall examine new Site conditions as they are encountered. Additional safety meetings shall be held on an as-needed basis.

K. CUSTODIAN

The Contractor shall employ and provide a custodian who shall be responsible for keeping all safety equipment and project facilities clean, properly equipped and

maintained. The custodian may perform other duties for the Contractor but the custodian's first priority will be maintenance of protective equipment and the decontamination area. The custodian shall report directly to the Health and Safety Officer.

4. AIR MONITORING

A. AIR MONITORING PROGRAM

During the progress of work activities, the Contractor shall monitor air quality in and around the Exclusion Zone, to assess the impact of work practices on air quality on-Site personnel. Additional monitoring for PPE and respiratory equipment requirements is described in Clause 3.B of this Section. Monitoring shall be conducted on a regular periodic basis, and additionally as required by special or work-related conditions. Any departures from general background shall be reported to the Engineer who will, in conjunction with the Health and Safety Officer, determine when operations should be shut down and restarted.

The Contractor shall provide the required instruments (an organic vapor analyses and oxygen meter/explosimeter) for air monitoring specified herein, including sufficient backup equipment in case of equipment malfunction. The instruments shall be calibrated in accordance with the manufacturer's operating manual. The Contractor shall maintain copies of all calibration records on Site.

Contractor air monitoring equipment shall be operated by Contractor personnel trained in the use of the specific equipment provided and shall be under the control of the Health and Safety Officer. All monitoring equipment used within work zones shall be intrinsically safe.

Air monitoring for organic vapors, oxygen levels and explosive gases shall be conducted on a routine basis around the excavation area and periodically in the staging, waste consolidation and equipment decontamination area. Monitoring shall be performed as a minimum on an hourly basis and additionally as dictated by Site activities. All results shall be recorded and provided in summary form as specified in this Section.

The following action levels shall be adhered to:

Action Level	*Response*
Organic Vapor >1 ppm for 15 minutes at Site perimeter	Temporarily halt activities until controls are in place
Organic Vapor >5 ppm for 15 minutes in work area	Inform SSO Stop work. Take corrective action. Perform continuous monitoring at the Site perimeter.
Particulate over 150 $\mu g/m^3$ at Site perimeter	Temporarily halt activities until controls are in place

Specific requirements for PPE and respiratory protection are provided in Clauses 3.D and 3.E of this Section.

Action levels will be adjusted by the Engineer should time weighted average compound specific sampling at the Site perimeter indicate that action levels are not consistent with meeting OEPA regulatory levels (American Conference of Government Industrial Hygienists levels divided by 70).

A direction indicator (i.e. wind sock) shall be provided and installed by the Contractor at each active work location. At a minimum, four wind socks shall be placed at strategic locations around the excavation, staging and Thermal Treatment Unit areas. The placement of these wind socks shall be completed with the concurrence of the Engineer.

Wind socks shall be mounted approximately 10 feet above the ground surface.

A meteorological tower a minimum 30 feet in height will be located in the site office area. Meteorological monitoring, including wind speed, wind direction, and temperature data shall be recorded continuously on a data logger. Wind direction socks shall also be available in all working areas including the Staging Areas, the Waste Preparation Building, and at strategic locations at the Site perimeter.

C. AIR MONITORING REPORTING

The results of air monitoring programs shall be reported by the Contractor to the Engineer daily on specific forms and shall include the following information as applicable:

1. Site location/date;
2. work process/operation name;
3. temperature, wind speed and wind direction;
4. area sampling location diagram; and
5. field notes:
    1. description of operations and complaints/symptoms;
    2. chemicals/materials/equipment in use;
    3. engineering/administration controls in effect;
    4. personal protective equipment in use;
    5. sampling observations/comments.

In addition, all daily air monitoring activities shall be recorded in a hard cover log book which shall be maintained on the Site at all times by the Health and Safety Officer.

Information recorded on the data logger shall be submitted to the Engineer monthly.

5. CONTINGENCY AND EMERGENCY RESPONSE PLANS

A. GENERAL

Prior to mobilization to the Site the Contractor shall be required to prepare both on-Site and off-Site Contingency and Emergency Response Plans to ensure the safety of on-Site and off-Site personnel. The Contractor's on-Site and off-Site contingency and emergency response plans shall be incorporated into the Contractor's Site-specific Health and Safety Plan.

B. ON-SITE CONTINGENCY AND EMERGENCY RESPONSE PLAN

The Contractor's on-Site Contingency and Emergency Response Plan shall address the standard operating procedures to be implemented during emergency situations. Emergency situations and responses to be addressed shall include as a minimum the following:

1. in the event of injury to on-Site personnel or contact with hazardous materials requiring immediate medical attention, the following protocol shall be followed:

    1. activate Site alarm (three short blasts on air horn);

    2. notify the Engineer and the Health and Safety Officer,;

    3. phone the hospital previously identified to be closest to the Site and describe injury;

    4. decontaminate personnel and administer appropriate first aid. If personnel cannot be decontaminated alert hospital; and

    5. transport personnel to the specified hospital along the most direct route which will be predefined prior to commencing Site work;

2. in the event that canisters, pressurized gas cylinders or other unusual or potentially hazardous materials not anticipated are encountered during excavation, all work shall immediately cease and the Health and Safety Officer in conjunction with the Engineer shall determine appropriate modifications to the Contractor's Site-specific Health and Safety Plan;

3. in the event that excessive gases or vapors are detected at an excavation, the following actions shall be taken:

    1. notify the Engineer and Health and Safety Officer;

    2. remove all workers from the area;

    3. identify the contaminant and monitor contaminant concentrations to determine the type of respiratory protection and/or engineering controls required before workers re-enter the area; and

    4. notify the County Sheriff's or Police Department that a potential off-Site emergency exists;

4. in the event of a fire at an excavation the Engineer and Health and Safety Officer shall be notified, earth moving equipment shall be used to quickly backfill the area and smother the fire, or the firefighting equipment specified in Section 1500 shall be used to put out the fire if possible. If the presence of noxious gases prohibits this, proper evacuation procedures shall be employed; and

5. in the event of a major leak of toxic gas, such as might occur if a compressed gas cylinder were encountered and ruptured during excavation the Engineer and Health and Safety officer shall be notified. All on-Site personnel shall be evacuated to a safe distance, and the Police, County Sheriff and local hospital notified. Continuous repeated blasts on a air horn shall signify evacuation of all personnel from the Exclusion Zone to the Contaminant Reduction Zone, where a head count

will take place. Response Coordinator will assume responsibility for coordinating with the Engineer and the Contractor's Health and Safety officer for the proper emergency response strategy upon arrival.

C. OFF-SITE CONTINGENCY AND EMERGENCY RESPONSE PLAN

Prior to commencing work involving the handling of hazardous materials, the Contractor shall develop an off-Site Contingency and Emergency Plan. This plan is intended to provide immediate response to a serious Site occurrence such as explosion, fire or migration of significant quantities of toxic or hazardous material from the Site which could affect or endanger adjacent the public or public or private areas.

The Contractor shall attend a coordination meeting to be held with appropriate authorities which may include the City, Fire Department, Hospital, State and City Police, County Sheriff's Department, State Department of Transportation, the County Health Department and Civil Defense officials. The meeting shall identify the off-Site Emergency Response Coordinator through whom all information and coordination will occur in the event of an incident. Plans and procedures shall be developed, or existing plans and procedures adopted, for:

1. evacuation of Site adjacent areas;
2. fire fighting procedures;
3. transport of injured personnel to medical facilities;
4. priority transportation routes; and
5. coordination and/or modification of highway operations.

Techniques and recommended procedure for immediate first aid emergency response shall be developed by the Health and Safety Officer with local medical facilities.

D. EMERGENCY TELEPHONE NUMBERS

General Emergency (Portage County Sheriff's Dept.)	911 or (216) 678-7012
Ambulance	911 or (216) 584-2222
Hospital (Alliance Community Hospital)	(216) 821-1000
Ohio DOH (Akron)	(216) 379-1300
Ohio EPA (District)	(216) 425-9171
Ohio EPA Local Air Agency (Regional - Akron)	(216) 375-2480
Poison Control Center	(800) 962-1253
USEPA National Response Center	(800) 438-2427
State Police	(216) 297-1441
Portage County Health Department	(216) 296-9919

6. SITE HEALTH AND SAFETY

A. WORK AREAS

The Contractor shall clearly lay out and identify work areas in the field and shall limit equipment, operations and personnel in the areas as defined below. These work areas may be established as temporary or permanent, depending on the work activity and the sequence in which it is performed. These areas are:

1. the Exclusion Zone which includes all areas where hazardous or potentially contaminated (soils, debris and materials) are being, or may be contacted, disturbed or handled and all areas where contaminated equipment or personnel travel Temporary Exclusion Zones shall be established around all remote work areas beyond the limits of the Exclusion Zone located within the Site fence and shall be clearly delineated in the field by temporary snow fencing and/or barricades supplied and installed by the Contractor;

2. the Contaminant Reduction Zone which shall occur at the interface of the Exclusion Zone and Clean Zone and shall provide for the prevailing upwind transfer of construction materials from clean to Site-dedicated equipment, the decontamination of equipment and vehicles prior to entering the Clean Zone, the decontamination of personnel and clothing prior to entering the Clean Zone, and for the physical segregation of the Clean and Exclusion Zones;

3. the Clean Zone which is defined as a clearly delineated predominantly upwind area outside the Exclusion Zone(s) and Contaminant Reduction Zone(s), which functions include an entry area for personnel, material and equipment to the Contaminant Reduction Zone, an exit area for decontaminated personnel, materials and equipment from the Contaminant Reduction Zone, and a storage area for clean safety and work equipment.

The Exclusion Zone may be reclassified at the discretion of the Engineer once removal of hazardous or contaminated materials is complete to the satisfaction of the Engineer. Procedures shall be implemented to prevent active or passive contamination of the Clean Zone and Contaminant Reduction Zone.

B. TEMPORARY FENCING

The Contractor shall erect temporary fencing on the Site to delineate work areas in accordance with the Site-specific Health and Safety Plan.

Temporary fencing shall be constructed of standard snow fence or construction fence supported by posts.

The Contractor shall coordinate the erection of temporary fencing with the work specified under other Sections of the Project Specifications.

The Contractor may reuse existing temporary fencing. Temporary fencing to be reused or reset at another location shall first be decontaminated to the satisfaction of the Engineer.

C. DRUM HANDLING PROGRAM

Drums used during cleanup activities shall meet appropriate DOT, OSHA, USEPA and OEPA regulations for the wastes that they contain. Drums shall be labelled as to content and date filled.

Site operations shall be coordinated so as to minimize the amount of drum or container movement. Drums shall be inspected prior to shipment and shall be staged so as to facilitate inspection.

Appropriate salvage drums shall be kept available and used in areas where spills or leaks may occur. A spill containment program shall be implemented to contain and isolate any and all of the hazardous substances being transferred.

Prior to commencing work involving handling of drums and other containers, the Contractor shall submit to the Engineer procedures for safe handling of drums and other containers in accordance with OSHA 29 CFR 1910.120 (j). During any activities involving drummed waste characterization, including but not limited to handling, opening, sampling, staging and consolidating, the Contractor's Health and Safety Officer shall be responsible for and shall ensure that the drum handling program is implemented and enforced.

D. CONFINED SPACE ENTRY PROGRAM

(1) Responsibility

The Health and Safety Officer shall be responsible to ensure that minimum precautions as specified herein have been taken to assure safe entry of confined spaces.

(2) Procedure

(a) Time Period Covered by Permits

Site personnel shall not enter any confined space without a written confined space work permit.

The confined space work permit will be valid for a single shift only. On jobs requiring more than a single shift to bring to completion, a new permit shall be completed at the start of each shift.

(b) Variances

1. Inability to Follow Procedure

Should any circumstances be found where these rules cannot be met, rules to insure adequate safety for entering these specific confined spaces must be written out by the Site-specific Health and Safety Officer, for approval in accordance with the Health and Safety Plan. This variance shall detail any special conditions and shall be attached to the confined space work permit.

(c) Availability of Permit

Properly completed permits must be readily available at the Site. They must be kept on file indefinitely after the completion of the shift for which they were issued.

(d) Preparation of Equipment For Safety

Power must be de-energized, locked and tagged.

Every effort must be made to remove all hazardous contents from the confined space. Tests for flammable vapor and oxygen content must be taken on a continuous basis while anyone is in the confined space. If the tests do not meet the requirements of items (e)1. and (e)2. of this Clause, the workers must leave the confined space.

(e) Testing of Atmospheres Within Confined Spaces

1. Oxygen

Oxygen content must be above 19.5 percent and below 23.5 percent before entry will be allowed.

2. Flammable Vapors

Personnel shall leave confined spaces if the concentration of explosive gases exceeds 10 percent of the lower explosive limit (LEL). If hot work is to be conducted in the space, then explosive gasses cannot exceed 0% (LEL).

(f) Ingress and Egress

A safe means of ingress and egress, such as a portable ladder, must be kept in place at all times when personnel are occupying a confined space.

(g) Protective Clothing

Level C protection shall be worn as a minimum by personnel entering confined spaces where the confined space has been made vapor free, meaning the vapor concentration is below the Threshold Limit Value (TLV) of the vapor being monitored, the total organic vapor readings are less than 5 ppm, the LEL is zero and the oxygen content is between 19.5 and 23.5 percent, and continuous air monitoring with an HNU and explosimeter is maintained. If all these conditions are not met, Level B protection shall be worn. The Site-specific Health and Safety Plan shall include a full confined space entry program.

(h) Life Lines

Means shall be provided for quick removal of individuals from confined spaces in emergencies. Where the least dimension of the access opening is less than 24 inches, wrist straps or noose-type wristlets shall be worn. Where the least dimension of the access opening is greater than 24 inches, either a life belt, safety harness, wrist straps or noose-type wristlets may be worn. In either case, a life line shall be attached and securely anchored outside the confined space.

(i) Illumination

Temporary lighting used in the confined space shall be of the explosion proof design with heavy duty cords and fittings and insulations maintained in good condition.

Portable (battery powered) lighting shall be operated at a maximum of 12 volts.

Portable (battery powered) lighting shall be kept at-the-ready outside of the confined space access opening to be used as illumination in the event of failure of the principle system. These lights shall be capable of providing illumination for a period of at least one hour.

(j) Safety Monitors

A person designated as a safety monitor shall be stationed at the access opening of any confined space while it is occupied. He/she must have continuous visual or verbal contact with occupants. One of his/her major responsibilities is to summon additional help in emergency situations.

In addition to the safety monitor, there shall be another person located within 100 feet of the confined space opening. This individual may do work other than that related to the confined space entry but it should not be such as to prevent his/her responding to a call for aid.

(k) Equipment Immediately Available to the Safety Monitor

The following emergency items shall be located at the access opening of the confined space or not more than 15 feet from such opening:

1. respiratory equipment as specified for Level B protection.
2. life lines, as described in item h above.
3. a battery powered portable light, as described in item i)c. above.
4. a portable type air-horn, capable of being heard 100 feet away over background noises.

7. MEASUREMENT AND PAYMENT

A. DEVELOPMENT, IMPLEMENTATION AND MAINTENANCE OF THE SITE-SPECIFIC HEALTH AND SAFETY PLAN

Payment for the development, implementation and maintenance of the Site-specific Health and Safety Plan will be made at the lump sum price stipulated in the Schedule of Prices for Item B-1 which price and payment shall be full compensation for the development and preparation of a Site-specific Health and Safety Plan; provision of all required training; designation and maintenance of work areas; air monitoring; and all other miscellaneous items for which separate payment is not provided under other Items.

As the Contractors selected to bid on this particular job are considered to be involved in hazardous waste activities on a full-time basis, the Contractor shall provide personnel who have already complied with the medical requirements as specified herein.

B. PROVISION OF HEALTH AND SAFETY AND PERSONAL PROTECTIVE EQUIPMENT - LEVEL B

(1) Measurement

Measurement for provision of health and safety and personal protective equipment - Level B will be made in mandays for the actual number of days worked per man wearing the specified protective equipment as determined by the Engineer from daily time sheets provided by the Contractor and submitted to the Engineer on a daily basis for approval.

(2) Payment

Payment for the quantity determined above will be made at the unit price per manday stipulated in the Schedule of Prices for Item B-2 which price and payment shall be full compensation for providing and maintaining Level B personal protective equipment for for all Contractor, Engineer and Trust personnel; and all other miscellaneous items for which separate payment is not provided under other Items.

C. PROVISION OF HEALTH AND SAFETY AND PERSONAL PROTECTIVE EQUIPMENT - LEVEL C

(1) Measurement

Measurement for provision of health and safety and Level C personal protective equipment will be made in mandays for the actual number of days worked per man wearing the specified protective equipment as determined by the Engineer from daily time sheets provided by the Contractor and submitted to the Engineer on a daily basis for approval.

(2) Payment

Payment for the quantity determined above will be made at the unit price per manday stipulated in the Schedule of Prices for Item B-3 which price and payment shall be full compensation for providing and maintaining personal protective equipment for Level C for all Contractor personnel; and all other miscellaneous items for which separate payment is not provided under other Items.

D. PROVISION OF HEALTH AND SAFETY OFFICER

(1) Measurement

Measurement for provision of a Health and Safety Officer will be made at the actual number of days that the Health and Safety Officer works on Site, as determined by the Engineer from daily time sheets provided by the Contractor and submitted to the Engineer on a daily basis for approval.

(2) Payment

Payment for the quantity determined above will be made at the unit price per day stipulated in the Schedule of Prices for Item B-4 which price and payment

review is for the sole purpose of ascertaining conformance with general design concepts, and in no way constitutes approval of the detail design inherent in the Contractor's drawings, responsibility for which remains with the Contractor.

6. MANUFACTURER'S PRODUCT DATA

Where specified or as requested by the Engineer, the Contractor shall submit to the Engineer, prior to the products arrival on the Site, duplicate copies of product data sheets or brochures for requirements requested in the Project Specifications and as the Engineer may reasonably request where shop drawings will not be prepared due to standardized manufacture of product.

The Contractor shall also submit to the Engineer prior to a materials arrival on Site, duplicate copies of Material Safety Data Sheet for all materials brought to the Site requiring special handling procedures.

7. RECORD DRAWINGS

After Notice of Award of Contract, the Engineer will provide an extra set of Drawings to the Contractor for the purpose of maintaining record drawings during performance of the Works.

The Contractor shall accurately and neatly record deviations from the Contract Documents caused by Site conditions and changes ordered by the Engineer, on the extra set of Drawings.

Locations of concealed components of mechanical and electrical services also shall be recorded on the extra set of Drawings.

Such drawings shall be identified as "Record Drawings" and shall be maintained in new condition and made available for inspection on the Site, as required by the Engineer.

On completion of the Works and prior to final inspection, the Contractor shall submit record drawings and documents to the Engineer.

8. SUBMITTALS FOR WEEKLY MEETINGS

The following are minimum required submittals to be provided to the Engineer at least 24 hours prior to scheduled weekly meetings:

1. updated job progress schedules detailing all activities. Include review of progress with respect to previously established milestones and schedules, major problems and action taken, injury reports, equipment breakdown and all bulk material removal;

2. copies of all transport manifests, trip tickets and disposal receipts for all waste materials removed form the work area during the Works;

3. weekly copies of work-site entry logbooks with information on worker and visitor access; and

4. weekly logs documenting filter changes on wastewater treatment plant, and other engineering controls.

9. SITE LAYOUT

Within sixty (60) days of the date of Notice to Proceed, the Contractor shall submit drawings to the Engineer, showing all existing conditions and facilities and all facilities, utilities and structures, grades to be constructed by the Contractor including:

1. the existing property line fence, existing structures, any existing roads, existing utilities and any other existing Site feature or facility shown on the Drawings;
2. any temporary access roads;
3. any utilities;
4. the location and layout of the incinerator or thermal desorption unit and associated facilities;
5. the Drum and Contaminated Soil Staging Areas;
6. the vehicle decontamination pad and personnel decontamination areas;
7. the means of ingress and egress and any temporary traffic control facilities;
8. Contractor equipment staging areas;
9. Exclusion Zones, Contaminant Reduction Zones, and other zones specified in the Contractor's Site-specific Health and Safety Plan;
10. grading, including contours, required to construct any construction facility;
11. the Wastewater Treatment Plant;
12. the Waste Preparation Facility; and
13. any other data deemed pertinent by the Contractor or required by the Engineer.

10. PROJECT ORGANIZATION CHART

The Contractor shall submit to the Engineer a project organization chart within sixty (60) calendar days of the date of Notice to Proceed.

The organization chart shall identify all major positions and names of persons assigned to these positions. The chart shall name all on-Site personnel from Site superintendent to foremen, and shall also identify the off-Site principal in charge, including telephone numbers.

This chart shall be in addition to the chart provided with the Form of Bid. Changes to key personnel will only be made with the prior approval of the Engineer.

11. ANALYTICAL QUALITY ASSURANCE PROJECT PLAN

The Contractor shall submit to the Engineer for review and approval, within thirty (30) calendar days of the date of Notice to Proceed, an Analytical Quality Assurance Project Plan meeting the minimum requirements of "Interim Guidelines and Specifications for Preparing

shall be full compensation for providing a qualified Site Health and Safety Officer including salary, wages, taxes and benefits; and all other miscellaneous items for which separate payment is not provided under other items.

E. PROVISION OF CUSTODIAN

(1) Measurement

Measurement for provision of a custodian will be made at the actual number of days that the custodian works on Site, as determined by the Engineer from daily time sheets provided by the Contractor and submitted to the Engineer on a daily basis for approval.

(2) Payment

Payment for the quantity determined above will be made at the unit price per day stipulated in the Schedule of Prices for Item B-5 which price and payment shall be full compensation for providing a custodian including salary, wages, taxes and benefits; and all other miscellaneous items for which separate payment is not provided under other items.

END OF SECTION

SECTION 01300 - SUBMITTALS

1. GENERAL

Unless otherwise specified, drawings, product data and other technical information specified to be submitted by the Contractor to the Engineer shall be submitted in triplicate, consisting of one original and two copies. Copies shall be legible and shall clearly show all information contained on the original. Where this Section or other requirements of the Project Specifications specify that submittals shall be prepared and sealed by a professional engineer, such professional engineer shall be licensed in the State of Ohio.

Where submittals are to be reviewed and approved by the USEPA and/or OEPA, final approval of such submittals and the schedule of any work upon which such approval is dependent are subject to review times of the USEPA and OEPA.

2. CONTRACTOR'S CONSTRUCTION SCHEDULE

Within seven (7) calendar days of the date of Notice of Award, the Contractor shall submit a detailed construction schedule to the Engineer for review and approval. The Contractor's construction schedule shall show all activities required for construction of the Works in accordance with the construction schedule issued by the Engineer and identified in Section 01010 of the Project Specifications.

The schedule shall clearly show the proposed sequencing of the Works and the coordination of interrelated work activities and items. The proposed progress of the Works shall be shown on a weekly basis. The schedule shall, as a minimum, include each item of work identified in the Schedule of Prices as a work activity and identify the proposed start and completion date for each activity. The schedule shall be of sufficient detail to permit cross-referencing of items identified in other submittals. As a minimum, the schedule shall identify on a weekly basis: the size of the work force, anticipated man hours by trade, the type of equipment, and the equipment hours for each type of equipment. Actual progress of each activity of the Works shall be compared with progress indicated on the Contractor's construction schedule no less than once every month by the Contractor and such comparison shall be submitted to the Engineer for review.

If the Contractor believes it necessary or advantageous to change sequence of activities shown on the approved Contractor's construction schedule, he shall submit proposed revisions to the Engineer for approval. No change shall be made in order in which work activities are being performed until the Engineer's written approval for the revised schedule has been obtained.

3. CONSTRUCTION PROGRESS REPORTS

The Contractor shall submit weekly progress reports in a form acceptable to the Engineer indicating actual progress made the preceding week, showing cumulative progress toward scheduled completion, expressed as a percentage, of all items in the Contractor's construction schedule, number of workers and hours worked on the Site for each trade and the number and type of equipment and hours worked on the Site during the previous week. An updated schedule showing work tasks completed, any projected difficulties which may delay or alter the schedule and any modifications to the original schedule shall be included with the weekly progress report.

4. CONSTRUCTION QUALITY CONTROL LOGS

The Contractor shall record his daily quality control activities on a Daily Construction Quality Control Report provided in Attachment 3. All Site activities, Site inspections, and field testing of materials shall be recorded along with any unacceptable Site occurrences on a daily basis. The Daily Construction Quality Control Report shall be signed and reviewed by the Contractor and the Engineer at the completion of each work day. With the prior approval of the Engineer, the Contractor may use alternate forms providing at least the same information.

5. CONTRACTOR'S DRAWINGS

If specified, detailed drawings of material and structures to be supplied by the Contractor shall be prepared from typical details shown on "Approved for Construction" drawings and/or from specified requirements. Contractor's drawings shall be submitted to the Engineer for review and will be returned to the Contractor stamped and noted as being "Reviewed" by the Engineer before fabrication or construction commences.

All submittals shall bear the Contractor's approval stamp prior to their initial submission to the Engineer and shall be signed, dated and identified as to the specific project by the Contractor.

Dimensions shown on the Contractor's drawings shall conform with actual measurements of existing and/or completed associated structures and affected adjacent work.

Contractor's drawings shall indicate materials, methods of construction attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of the Works. Where articles or equipment attach or connect to other articles or equipment, the Contractor shall indicate that such work has been coordinated, regardless of the Project Specification Section under which the adjacent items will be supplied and installed. Contractor's drawings shall be cross-referenced to appropriate Project Specifications and Drawings.

The Contractor shall make changes in Contractor's drawings as the Engineer may require, consistent with the Contract Documents. When resubmitting drawings the Contractor shall notify the Engineer in writing of any revisions other than those requested.

Adjustments made on the Contractor's drawings by the Engineer are not intended to change the Contract Price. If adjustments affect the value of the Works, the Contractor shall state such in writing, as specified elsewhere in the Contract, to the Engineer prior to proceeding with the Works.

The Contractor shall submit three legible copies of drawings for each requirement requested in the Project Specifications and as the Engineer may reasonably request.

One print of each drawing will be returned stamped and noted as "Reviewed" by the Engineer, or marked up to show the Engineer's required modifications and noted as "Revise and Re-Submit". The Contractor shall correct and resubmit drawings as often as necessary until the Engineer returns drawings without marked modifications and stamped "Reviewed".

The Contractor shall not be relieved of any part of his responsibilities for correctness of his drawings or adequacy of his design bearing the Engineer's "Reviewed" stamp. The Engineer's

Quality Assurance Project Plans", QAMS-005/80. The Region V Model QAPP shall be used by the Contractor to develop the Plan. The Engineer will review the Contractor's Analytical Quality Assurance Project Plan and provide comments to the Contractor within seven (7) calendar days of receipt of the Plan by the Engineer. The Contractor shall address the Engineer's comments and resubmit the Site-Specific Quality Assurance Project Plan within seven (7) calendar days to the Engineer, USEPA and OEPA. The Contractor shall not perform any sampling or analysis prior to the approval of the Plan.

The Analytical Quality Assurance Project Plan shall address all analytical activities (except those associated with the Treatment Unit) including ash sampling and analysis, treated water sampling and analysis (excluding Trust's groundwater treatment plant), drum/container sampling and analysis and imported soil sampling and analysis. The Analytical Quality Assurance Project Plan shall address, as a minimum, the following items:

1. organization and responsibility of quality assurance;
2. quality assurance objectives for each parameter;
3. sampling procedures including locations, methods and frequencies;
4. analytical procedures;
5. specific calibration procedures and frequencies;
6. procedures for data reduction, validation and reporting;
7. specific internal quality control checks and frequency;
8. audit procedures and frequency;
9. preventative maintenance procedures and frequencies;
10. specific routine procedures to assess accuracy, precision and completeness;
11. procedures for corrective action; and
12. quality assurance reports.

The Quality Assurance Project Plan for the Thermal Treatment Unit is specified in Section 02090 and 02091.

12. SUBMITTALS SPECIFIED IN OTHER SECTIONS

In addition to the submittals specified in Section 01300, the following is a list of the major submittals but not necessarily all submittals referred to in other Project Specifications, including the timing for submission to the Engineer and cross-references to applicable detail sections of the Project Specifications:

Name of Submittal	*Cross-Reference*	*Timing (1)*	*Review and Approval by USEPA and OEPA*
Site-specific Health and Safety Plan	Section 01121	no later than 21 days after Notice to Proceed and before mobilization	Yes (2)
On-Site Spill and Hazardous Substances Release Control Plan	Section 01500	no later than 60 days prior to handling hazardous or contaminated substances	No
Drum Log and Waste Analyses Data Sheets	Section 02001	See Section 02001	Yes
Quality Assurance Submittals	Section 02001	See Section 02001	No
Air Modelling Plan	Section 02002	no later than 14 days after Notice to Proceed	Yes
Air Modelling Report	Section 02002	no later than 90 days after Notice to Proceed	Yes
Thermal Treatment Records	Section 02003	refer to Section 02002	Yes
Design Drawings and Certification	Section 02003	no later than 30 days after Notice to Proceed	Yes
Waste Preparation Facility Components and Plan	Section 02003	no later than 30 days after Notice to Proceed	Yes
Drum/Container Excavation Plan	Section 02081	60 days prior to excavating drums	No
Underground Storage Tank Removal Plan	Section 02082	60 days prior to removal	No
Performance Demonstration Plan	Section 02090 and Section 02091	no later than 30 days after Notice to Proceed	Yes
Facilities and Process Information Plan	Section 02090 and Section 02091	With Performance Demonstration Plan	Yes
Operations and Maintenance Plan	Section 02090 and Section 02091	With Performance Demonstration Plan	Yes

Thermal Treatment Unit Closure Plan	Section 02090 and Section 02091	no later than 60 days after Notice to Proceed	Yes
Ash Handling Plan	Section 02090 and Section 02091	no later than 60 days after Notice to Proceed	Yes
Ash Sampling and Analysis Plan	Section 02090 and Section 02091	no later than 60 days after Notice to Proceed	Yes
Consolidated Waste Sampling and Analysis Plan	Section 02090 and Section 02091	no later than 60 days after Notice to Proceed	No
Performance Demonstration Report	Section 02090 and Section 02091	no later than 21 days after completing Performance Demonstration	Yes
Combustion Gas by-Pass Vent Emergency Opening	Section 02090 and Section 02091	see Section 02090 and Section 02091	
Transportation and Disposal Submittals	Section 02098	as specified in Section 02098	No
Excavation Plan	Section 02220	no later than 30 days prior to commencing excavation	No
Source of Imported Materials	Section 02220	45 days prior to transporting	No

Notes:

(1) Initial submission of document to Engineer. Information on requirements for revision and resubmission provided in referenced Section.

(2) USEPA and OEPA do not approve Health and Safety Plan.

12. MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for work under Section 01300.

END OF SECTION

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1. SITE OFFICES

During the performance of the Works, the Contractor shall supply, operate and maintain separate and suitable offices at the Site for use by the Contractor, the Engineer, and USEPA/OEPA. The USEPA and OEPA will share an office. The offices shall be located in the existing Site Office Area as shown on the Drawings.

The Engineer's and USEPA/OEPA's offices shall have a minimum floor space of 600 and 300 square feet, respectively, and shall include a lockable storage closet (and storage area), toilet and hand washbasin, including piping to Contractor-supplied wastewater holding tanks. The offices shall be provided with adequate fluorescent lighting, as required. Heating and cooling facilities shall be provided to maintain an ambient temperature of 68°F to 72°F.

The Engineer's and USEPA/OEPA's offices each shall be equipped with two lockable 4-drawer filing cabinets, two office desks, six office chairs and one plan/reference table. The offices shall be lockable. Locks will be provided by the Engineer, USEPA and OEPA as their interests appear.

2. PERSONNEL HYGIENE/DECONTAMINATION FACILITY

The Contractor shall provide, operate, and maintain a Personnel Hygiene/Decontamination Facility which complies with the requirements of 29 CFR 1910.141. The facility shall contain, as a minimum, the following:

1. shower facilities with at least one shower for every six (6) on-Site Contractor personnel;
2. locker room with one locker for each on-Site Contractor personnel plus five (5) additional lockers for use by the Engineer , USEPA and OEPA;
3. toilet facilities with at least one toilet and one hand basin for every six (6) on-Site Contractor personnel;
4. an on-Site room where personnel can eat, drink or smoke;
5. a room where all personnel safety equipment and protective clothing can be stored;
6. boot washing facility and boot rack for washed boots to drain; and
7. separate sanitary waste and wastewater holding tanks and necessary pumping and piping from the Personnel Hygiene/Decontamination Facility to the holding tanks.

The Contractor shall connect the necessary pumping and piping to convey wastewaters from the shower facilities, boot washing facility, and hand basin to the designated wastewater storage tanks.

The Contractor shall supply, install and connect separate holding tanks for the sanitary waste from the toilet facilities. The Contractor shall remove the contents of the sanitary waste holding tanks and discharge the wastes to a municipal sewerage system on a periodic basis as required and in accordance with governing regulations of authorities having jurisdiction in

accordance with Section 02098. Other wastewater shall be handled in accordance with Clause 16 of this Section.

The Contractor shall provide sufficient sanitary facilities for workers in accordance with governing regulations and ordinances.

The Contractor shall post notices and take such precautions as required by local health authorities.

The Contractor shall maintain the Personal Hygiene/Decontamination Facility and premises in a clean and sanitary condition and on completion of the Works shall remove the facilities and disinfect the premises.

3. EQUIPMENT DECONTAMINATION FACILITY

The Contractor shall utilize the existing Equipment Decontamination Facility at the Site on a shared basis with other contractors. The Contractor shall provide pumps and piping or haulage as required to remove decontamination wastewater to tankage supplied by the Trust at the Trust's Groundwater Treatment Plant or tankage at the Contractor's wastewater treatment plant in accordance with Clause 16 of this Section.

The Contractor shall maintain the Equipment Decontamination Facility in a clean and usable condition at all times.

Equipment decontamination shall take place at the Equipment Decontamination Facility and shall consist of degreasing, if required, followed by high pressure, low-volume, hot water or stream lining supplemented by detergents or solvents as appropriate and approved by the Engineer.

Special attention shall be paid to removal of material on and within the tracks and sprockets of crawler equipment, and the tires and axles of trucks and rubber tire mounted equipment. The Contractor shall take measures to minimize the drift of mist and spray during decontamination. Such measures shall include the use of wind screens.

The Contractor shall supply and maintain his own decontamination wash unit which shall be portable, high pressure low volume with self-contained water storage tankage and pressurizing system. The unit shall be capable of heating and maintaining wash waters to 180°F and providing a nozzle pressure of 150 psi.

Sediment accumulating in the decontamination facilities sump shall periodically be collected and placed in the Contaminated Soil Staging Area for thermal treatment at the on-Site Thermal Treatment Unit. The Contractor shall supply and operate all equipment required to collect, contain and transfer decontamination wastewaters and sediments.

4. EMERGENCY FIRST AID FACILITY

The Contractor shall provide, operate and maintain an Emergency First Aid Facility which complies with the requirements of 29 CFR 1910.141. This facility may be housed within or adjacent to the Personnel Hygiene/Decontamination Facility. The Emergency First Aid Facility shall have available, as a minimum, the following equipment and supplies:

1. stretcher;

2. one set of crutches;

3. two fire extinguishers meeting the requirements of 29 CFR 1910.307;

4. two self contained breathing apparatus units including full face masks;

5. one counter and sink with running potable water connected to the sanitary wastewater holding tanks;

6. one cot;

7. blankets and towels as required;

8. first aid kit containing medications appropriate for the initial treatment of burns, abrasions, fractures, and ingestion or dermal contact with on-Site hazardous waste;

9. one hand-held area siren/alarm;

10. two complete sets of enhanced Level B personal protective equipment; and

11. portable emergency eye wash and shower.

The Contractor shall keep at the Site at all times a sufficient number of fully equipped first aid kits for availability at each work location and shall post emergency and ambulance phone numbers in large letters beside each Site telephone.

5. ACCESS ROADS

The Contractor will be permitted reasonable use of all existing access roads at the Site subject to the following conditions:

1. traffic on roads or parking areas shall not be interrupted or interfered with at any time except where open-trench crossings have been specified on the Drawings and proper notice regarding open-trench crossings has been given to the Engineer; and

2. all vehicles comply with weight and load size restrictions where applicable.

Maintenance of access roads during performance of the Works shall include provision of all signs, barricades, gatepersons, flagpersons, flares and lights and other measures required. The Contractor shall provide flag persons for all construction traffic crossing or entering local traffic routes or otherwise required on the Site.

The Contractor shall take appropriate measures to prevent contamination of access roads and other clean areas during performance of the Works. Debris or material on access roads which is suspected to be contaminated as determined by the Engineer shall be scraped up, transported and placed by the Contractor into a designated area as directed by the Engineer. The Contractor shall repair any wear and tear and damage to access roads arising out of the Contractor's construction operations.

6. TELEPHONE AND FACSIMILE

The Contractor shall provide and pay for separate telephone service at the Site office for use by the Engineer, Agencies and Contractor. The Engineer's telephone service shall include two telephone lines and one facsimile line. A radio telephone service will not be acceptable. The Agencies telephone service shall include one telephone line.

The Contractor shall not be responsible for long distance charges incurred by the Engineer or the Agencies but shall be responsible for the hook-up charge and monthly charge for the telephone service. Emergency numbers including police, fire, ambulance, hospital, poison control center and appropriate regulatory agencies shall be provided by the Contractor and prominently posted near each phone. The telephone service provided for the Engineer shall include two separate independent telephone lines.

The facsimile service for the Engineer shall include one plain paper facsimile machine capable of receiving and sending 8 1/2 x 11 inch and 8 1/2 x 14 inch plain sheets of paper and shall be a Xerox 7024 facsimile machine.

7. ELECTRICAL POWER AND SITE LIGHTING

The Contractor shall provide and pay for all power required for the performance of the Works, including provision of all necessary power distribution system and special connections to existing power system and/or a portable generator with fuel capable of producing sufficient power for all Site activities and facilities, including all operations of the Thermal Treatment Unit and ancilliary facilities.

The Contractor shall provide back-up generators with automatic kick-in to maintain power in case of failure of the primary power source in accordance with Sections 02090 and 02091.

The Contractor shall provide isolation between the Thermal Treatment Unit and each utility, unless otherwise specifically approved by the Engineer. Isolation shall be by automatic devices such as back flow preventers, circuit breakers, etc.

The Contractor shall supply, erect, operate and maintain adequate Site lighting to facilitate performance of the Works and to maintain a safe working condition. As a minimum, the Contractor shall provide outside area lighting in the office area and the decontamination area.

8. POTABLE WATER

The Contractor shall provide and pay for all necessary potable water, potable water holding tanks, distribution system and connections to a potable water supply. The Contractor shall maintain an adequate supply of potable water at the Site at all times.

9. TEMPORARY HEATING

The Contractor shall provide temporary heating, covering and enclosures as necessary to protect all work and material against damage by dampness, freezing and cold and to facilitate completion of the Works. The Contractor shall supply all fuel, equipment, materials and attendance required for temporary heating.

The Contractor shall be responsible for damage to the Works due to failure in providing adequate heat and protection during construction.

10. FENCING AND BARRICADES

The Contractor shall provide, erect and remove fencing and barricades as required by laws and codes for the performance of the Works. Fencing and barricades shall be erected in a timely manner around all excavations, open trenches and active work areas as shown on the Drawings and as directed by the Engineer. All excavations and work activity adjacent to Municipal, County or State roadways shall be fenced and barricaded to the standards and requirements of the respective Municipal, County or State maintenance authority as a minimum.

The Contractor shall ensure that all open excavations are flagged and barricaded prior to leaving the Site at the end of each work day.

SITE COMMUNICATIONS

The Contractor shall equip at least the following key Contractor personnel with two-way portable radios:

1. Superintendent;

2. Health and Safety Officer;

3. Security personnel; and

4. Each new Foreman.

In addition the Contractor shall equip and maintain the Engineer with two portable radios complete with batteries and charging system. The Engineer's radio frequencies shall be the same as those set for the Contractor's radios.

11. DEWATERING

Except as specified otherwise, the Contractor shall dewater the various parts of the Works including, without limitation, excavations, structures, foundations and work areas.

The Contractor shall employ construction methods, plant, procedures and precautions that will ensure the Works, including excavations, are stable, free from disturbance and dry.

Construction methods may include but are not limited to: sheeting and shoring; groundwater control systems; surface or free water control systems employing ditches, diversions, drains, pipes and/or pumps; and any other measures necessary to enable the whole of the Works to be carried out in the dry. Before dewatering is started, the Contractor shall obtain acceptance by the Engineer for the method, installation and details of the dewatering system.

The Contractor shall provide sufficient and appropriate labor, plant and equipment necessary to keep the Works free of water including standby equipment necessary to ensure continuous operation of dewatering system.

The Contractor shall take precautions necessary to prevent uplift of any structure or pipeline and shall protect all excavations from flooding and damage due to surface runoff.

All surface water from potentially contaminated materials and groundwater shall be contained and transferred to the Contractor's groundwater treatment plant or the Trust's groundwater treatment plant in accordance with Clause 16 of Section 01500.

12. SITE SECURITY

The Contractor shall provide Site security which as a minimum, shall include the following:

1. limit access to the Site to authorized vehicles and personnel only.

2. provide a list of authorized personnel and the name of their employer to the Engineer.

3. provide the Health and Safety Officer with radio communication to the Site office.

4. maintain a security log in which documentation is provided of all Contractor personnel, deliveries and any security incidents. This log shall include the date, name, address, company, time in and time out for each Contractor personnel. If unauthorized personnel are observed on the Site, the appropriate law enforcement officials shall be called upon for proper legal actions.

5. check that the perimeter fencing and all warning signs are secure and intact on a daily basis. If deterioration of the Site security fence is observed, or if warning signs are found to be removed, the situation shall be brought to the attention of the Engineer and shall be immediately rectified by the Contractor.

All Site access gates shall be locked at all times when there are no on-Site activities and shall be maintained in a closed position during active construction activities.

The Contractor shall maintain security on the Site in accordance with Gc.26.

13. DUST AND PARTICULATE CONTROL

The Contractor shall supply and maintain dust control measures such as water misting systems as required to prevent generation of dust during performance of the Works. Water used for dust control shall be potable water, treated water from the Trust's on-Site Groundwater Treatment Plant or treated water from the Contractor's wastewater treatment plant, if available.

14. VAPOR CONTAMINANT CONTROL

The Contractor shall supply vapor contaminant control measures to limit the emission of vapors to action levels specified in Section 01121. Vapor control measures include vapor suppressing foam, polyethylene sheet or soil cover.

15. SOIL EROSION AND SEDIMENT CONTROL

The Contractor shall implement a soil erosion and sediment control plan as specified and as shown on the Drawings. All collected sediments shall be disposed of at one of the designated

on-Site spoil areas as directed by the Engineer. The Contractor shall maintain sediment and erosion control measures at all times during construction.

The Contractor shall stabilize the disturbed soils as quickly as practical. Stripping of vegetation, regrading or other development shall be done in such a way as to minimize erosion. The Contractor shall remove accumulated sediment resulting from construction activity from all adjoining surfaces, drainage systems and watercourses and repair any damage caused by soil erosion and sedimentation as directed by the Engineer.

16. WASTEWATER TREATMENT

A. GENERAL

The Contractor shall design, supply, operate and maintain a wastewater treatment plant capable of treating various wastewaters generated during performance of the Works. Wastewaters to be treated by the plant may include shower, laundry, and boot wash waters from the Personnel Hygiene/Decontamination Facility and waters collected from excavation dewatering (including Ponds), Contaminated Soil/Drum Staging Areas runoff, Thermal Treatment Unit area runoff and Equipment Decontamination Facility.

The Contractor may also direct a maximum of 20 gallons per minute (gpm) of wastewater to the Trust's Groundwater Treatment Plant for treatment by the Trust at no charge to the Contractor. The allowance of 20 gpm is a maximum rate which may not be available every day or 24-hours per day. The Contractor shall provide the Engineer a written request to transport wastewater to the Trust's Groundwater Treatment Plant at least 48 hours prior to delivery of wastewater to the Trust's Groundwater Treatment Plant. The Engineer will review the request and provide written approval subject to availability of capacity and criteria in Attachment 4. Acceptance of waste from the on-Site underground storage tank will also be subject to additional analytical characterization meeting acceptance criteria. Wastewater from the operation of the Thermal Treatment Unit or ancilliary facilities will not be accepted at the Trust's Groundwater Treatment Plant.

B. QUALITY ASSURANCE

Quality Assurance protocol for analysis of treated wastewater are specified in the Quality Assurance Project Plan in accordance with Section 01300.

C. SUBMITTALS

The Contractor shall submit to the Engineer prior to delivery to the Site, Product Data Sheets or brochures of the key elements of the wastewater treatment plant for standardized components, and drawings and calculations sealed by a Professional Engineer for non-standardized components.

The Contractor shall submit to the Engineer the results of all analyses of treated wastewater analyzed in accordance with the protocol in Item G.3 and the Quality Assurance Project Plan.

D. TREATMENT CRITERIA

The wastewater shall be treated to the criteria provided in Attachment 4. The Contractor shall perform periodic testing to verify that treatment criteria are being met.

E. OPERATION

The Contractor shall not operate the wastewater treatment plant until it is inspected and approved by the Engineer.

The Contractor shall operate the wastewater treatment plant and do all work necessary to treat the collected wastewater on a periodic basis as required. Operation shall include treatment of wastewaters and backwashing of the filtration unit and GAC unit.

Treatment units shall be backwashed with potable water or treated water meeting discharge criteria as required to meet discharge criteria. Backwash effluent shall be conveyed to the feed tank for treatment in the wastewater treatment facility. Provision shall be made for removal of solids from backwash effluent as necessary.

The Contractor shall change the carbon media periodically. The Contractor shall contain removed media in approved Contractor supplied containers. The spent carbon media shall be reactivated at a facility licensed to provide these services, in accordance with Section 02098, or thermally treated on Site. Filter media shall be thermally treated on Site at no additional cost to the Trust.

F. DISCHARGE

The Contractor shall discharge treated wastewater to the ditch at the northeast corner of the Site.

G. QUALITY CONTROL

1. Testing by the Engineer

The Engineer will collect samples of treated water for analysis to determine if treated water meets specifications. Testing will include analyses of all compounds listed in Attachment 4. Copies of test reports will be provided to the Contractor on request. Testing by the Engineer will in no way relieve the Contractor of his responsibility to test treated water to verify that treatment criteria are being met.

2. Frequency of Testing

At least one test will be performed bi-weekly by the Engineer.

3. Methods of Testing

The following protocol for analysis will be followed:

Parameter (1)	Method of Analysis
P.P. VOC	SOP for EPA-MCA (2) 601/602
P.P. VOC	SOP for EPA-MCA 624
P.P. BNA	SOP for EPA-MCA 625
P.P. Metals Series	SOP for EPA-WW (3) 200

(1) VOC = Volatile Organic Compounds
P.P. = Priority Pollutant
BNA = Base/Neutral and Acid Extractable Organic Compounds

(2) EPA-MCA - "Methods for Organic Chemical Analysis of Industrial and Municipal Wastewater", EPA 600/4-82-057, July 1982.

(3) EPA-WW - "Methods for Chemical Analysis of Water and Wastes", EPA 600/4-79-020, revised March 1983.

H. FAILURE TO MEET CRITERIA

Should analyses indicate that the effluent has not met treatment criteria, discharge shall be contained immediately and stored on Site, at no additional cost to the Trust, until an additional sample yielding satisfactory result has been collected and analyzed. The Engineer will collect, and have analyzed, the additional sample and will charge the cost to the Contractor. The results of the analyses will be provided to the Contractor within 72 hours of collection. If the additional sample also fails to meet criteria, the Contractor shall perform a full check on his system, including replacement of the GAC if necessary, and make all repairs/replacements necessary to meet the discharge criteria at no additional cost to the Trust. The Contractor shall not be permitted to release treated water on Site or off Site until testing has verified that the system is capable of treating water to the specified criteria to the satisfaction of the Engineer.

17. ON-SITE SPILL AND HAZARDOUS SUBSTANCE RELEASE CONTROL

A. CONTROLS

Prior to commencement of excavation, approved absorbent materials, shovels and repack and overpack drums in sufficient quantity shall be provided at the Areas of Buried Drums, Drum Staging Area, Waste Preparation Area and along transportation routes for use in the event of a release.

In the event that a release of a hazardous or toxic substance occurs, the Engineer and the Contractor's Health and Safety Officer shall be notified immediately. The Engineer and the Health and Safety Officer shall assess the release and may implement air monitoring. If human health or the environment off Site is threatened, the notification of off-Site authorities and the implementation of measures in accordance with the

Off-Site Emergency Response and Contingency Plan shall be followed. If human health and the environment on Site beyond the immediate vicinity of the release are threatened measures shall be taken in accordance with the on-Site Contingency and Emergency Plan. If the release and its effects are confined to the immediate vicinity of the release, the following measures shall be taken:

1. in the event that a drum or container of liquid or solid is spilled the drum handling team shall immediately respond to the area;

2. liquids shall be confined by berming with native soil or inert absorbent. Liquids shall be pumped into a repack drum. Any residual liquid that cannot be pumped shall be absorbed with native soil or inert absorbant and placed into a repack drum;

3. solids or sludges shall be placed in repack drums. Inert absorbent material or native soil shall be used as necessary to absorb excess liquids;

4. visibly affected materials underlying the release area shall be excavated and placed in repacks, and thermally treated at no additional cost to the Trust;

5. released material shall be handled, sampled, analyzed, consolidated and thermally treated in accordance with Section 02001; and

6. the Contractor shall prepare a report describing the release, its location, extent, cause and clean-up procedures for the Engineer's, USEPA's and OEPA's review.

B. ON-SITE SPILL AND HAZARDOUS SUBSTANCE RELEASE CONTROL PLAN

The Contractor shall prepare and submit an On-Site Spill and Hazardous Substance Release Control Plan describing the methods, materials and personnel to be used to control the release of hazardous substances. As a minimum, the Plan shall describe:

1. notification procedures to report a release and to initiate procedures to control and clean-up a release;

2. the material and methods to be used to control and clean-up the release of liquids sludges and solids;

3. the personnel assigned to control and clean up a release;

4. the storage location of control and clean-up equipment and material; and

5. reporting procedures to describe the location, extent and cause, of a release, the clean-up procedures used and the efficiency of the clean-up.

The Plan shall be submitted to the Engineer at least sixty (60) calendar days prior to handling any hazardous materials.

18. DRUM STAGING AREA

The Drum Staging Area shall be used for interim storage of removed drums prior to, during and while sampling, analyses and compatibility testing of the contents is performed.

The Contractor shall construct, operate and maintain the Drum Staging Area to the details shown on the Drawings. The actual dimensions, in plan, will be dependent on construction sequencing and should be of sufficient size to support all proposed materials.

The Drum Staging Area shall be constructed with an integral sump as shown on the Drawings. The surface of the Drum of Soil Staging Area shall be sloped, as shown on the Drawings, to direct gravity drainage towards the sump. Liquids collected in the sump shall be pumped out and treated with the Contractor's wastewater treatment plant or the Trust's groundwater treatment facility (maximum 20 gallons per minute from all Contractor sources). The transfer of liquids from the sumps shall be the responsibility of the Contractor. Sediments which accumulate in the sump shall be collected periodically by the Contractor and staged in the Soil Staging Area for thermal desorption or incineration.

19. SOIL STAGING AREA

The Soil Staging Area shall be used for temporary storage of soils or sediments designated for treatment. Soils and sediments shall be moved to the Thermal Treatment Unit when there is capacity available.

The Soil Staging Area contains drums containing investigative wastes (PPE, soil cuttings) from the USEPA Remedial Investigation. These staged drums shall be backfilled on Site in accordance with Section 02050.

The Contaminated Soil Staging Area is existing. The Contractor may adjust the size of the area by removing or extending existing berm. Berms shall be constructed of uncontaminated soil. The base of the Staging Area will be unimproved (i.e. existing soils) and the Contractor shall not add any granular, asphalt or other material as a surface, as existing soils in this area are designated for on-Site incineration or desorption.

20. PHOTOCOPY MACHINE

The Contractor shall provide and pay for a separate photocopy machine capable of photocopying 8 1/2 x 11 inch and 11 x 17 inch sheets of plain paper. The Contractor shall not be responsible for providing the paper for the copy machine but shall be responsible for all rental and maintenance charges. The photocopy machine shall be a Xerox 5028, shall be located in the Engineer's office, and shall be for the exclusive use of the Engineer.

21. MEASUREMENT AND PAYMENT

A. SITE OFFICES

Payment for Site offices will be made at the lump sum price stipulated in the Schedule of Prices for Item C-1 which price and payment shall be full compensation for supply of all labor, plant, material and equipment required to supply, install and maintain the Contractor's Engineers and USEPA/DEPA's Site offices; lunch room area;furniture, filing cabinets, plan tables; telephone, facsimile and photocopy service; and all other miscellaneous items for which separate payment is not provided under other Items.

B. PERSONNEL HYGIENE AND DECONTAMINATION FACILITIES

Payment for personnel hygiene and decontamination facilities will be made at the lump sum price stipulated in the Schedule of Prices for Item C-2 which price and payment shall be full compensation for supply of all labor, plant, materials and equipment required to supply, install, maintain, clean and stock personnel hygiene and decontamination facilities, emergency first aid facility, and toilet facilities; personnel hygiene and decontamination materials; toilets; wastewater and potable water holding tanks; maintenance of existing equipment decontamination facility; and all other miscellaneous items for which separate payment is not provided under other Items.

C. SITE SECURITY

(1) Measurement

Measurement for Site security will be made in days for the actual number of days Site security is supplied by the Contractor as measured by the Engineer and calculated from daily time sheets submitted by the Contractor.

(2) Payment

Payment for the quantity determined above will be made at the unit price per day stipulated in the Schedule of Prices for Item C-3 which price and payment shall be full compensation for the supply of all labor, plant, materials and equipment required for provision of 24 hour Site security; supply and maintenance of security office and equipment at the entrance gate; and all other miscellaneous items for which separate payment is not provided under other Items.

D. SOIL EROSION AND SEDIMENT CONTROL

Payment for soil erosion and sediment control facilities will be made at the lump sum price stipulated in the Schedule of Prices for Item C-4 which price and payment shall be full compensation for supplying, constructing, maintaining and removing soil erosion and sediment control facilities; and all other miscellaneous items for which separate payment is not provided under other Items.

E. PROTECTION OF MONITORING WELLS AND PIEZOMETERS

Payment for protection of monitoring wells and piezometers will be made at the lump sum price stipulated in the Schedule of Prices for Item C-5 which price and payment shall be full compensation for supply of all labor, plant, materials and equipment required for protection of monitoring wells and piezometers; and all other miscellaneous items for which separate payment is not provided under other Items.

No separate measurements and payment will be made for other construction facilities and temporary controls required for implementation of the Works.

END OF SECTION

SECTION 01700 - PROJECT CLOSEOUT

1. GENERAL

The Contractor shall schedule and sequence demobilization activities such that all contaminated and potentially contaminated facilities and equipment to be removed from the Site can be decontaminated prior to removal of the Equipment Decontamination Facility in accordance with Section 01500.

The Thermal Treatment Unit and associated facilities shall not be demobilized until the requirements of the Closure Plan have been satisfied as specified in Sections 02090 or 02091.

The Contractor shall dismantle and remove all equipment, temporary structures and materials from the Site at the completion of the Works. All Contractor equipment and materials shall be thoroughly decontaminated prior to removal from the Site. The Contractor shall disconnect all temporary services and utilities.

2. WASTEWATER TREATMENT PLANT

Prior to closeout of the wastewater treatment plant, the Contractor shall treat all remaining wastewater and dispose of treated wastewater, as directed by the Engineer, in accordance with Section 01500.

Following emptying of all tanks, the tank interiors shall be decontaminated with a steam or high pressure low-volume water wash supplemented by detergent (Alconox). All rinse water generated as part of this cleaning shall be sampled and be directed to the on-Site groundwater treatment plant at a rate not to exceed 20 gallons per minute in accordance with Section 01500.

Following final decontamination, the carbon media and filtration media shall be removed, prepared and loaded for disposal at an approved off-Site facility permitted under TSCA or RCRA or regenerated by a facility licensed to provide this service. Transportation and disposal shall be performed in accordance with Section 02098.

3. DECONTAMINATION PADS

The Contractor shall relocate all decontaminated equipment off the decontamination pads and shall clean the pads by brushing to remove loose dirt, debris and adhered residues. It will also include a pressure hot water wash with cleaning agent and final pressurized wash with potable water. Sediments collected in the sump shall be removed and sent to an off-Site secure landfill permitted under RCRA or TSCA. The decontamination pad shall be fractured to a maximum dimension of three feet and left in place following decontamination and closeout of all equipment and facilities.

4. FENCING

The Contractor shall not dismantle perimeter security fencing. Snow and silt fences delineating work zones shall be removed and sent to an off-Site sanitary landfill.

5. THERMAL TREATMENT UNIT AND WASTE PREPARATION FACILITY

The incinerator or thermal desorption unit and Waste Preparation Facility shall be dismantled, decontaminated and removed in accordance with Sections 02003 and 02090 or 02091.

6. DRUM STAGING AREA

The sump shall be fractured in place and filled with native soil.

7. FINAL CLEANUP

The Contractor shall clean the Site of general litter and trash generated during the Works and leave the Site in a neat and orderly condition. Litter and trash so generated shall be disposed of at an off-Site sanitary landfill licensed to accept such waste and approved by the Engineer.

8. DEMOBILIZATION

Unless otherwise specified, the Contractor shall remove all waste materials, equipment, temporary structures, Site offices, personnel decontamination facility and materials from the Site at the completion of the Works. The perimeter chain link fence shall be inspected and any deficiencies corrected by the Contractor.

9. MEASUREMENT AND PAYMENT

A. DEMOBILIZATION AND PROJECT CLOSEOUT

Payment for demobilization and project closeout will be made at the lump sum price stipulated in the Schedule of Prices for Item D-1 which price and payment shall be full compensation for the provision of all labor, equipment, plant and materials for dismantling and removal of all construction facilities, equipment (except incinerator or thermal desorber, Waste Preparation Facility and associated facilities), temporary structures and materials from the Site; performing final decontamination of all equipment; disposal of contaminated wastewater and GAC; final Site cleanup and restoration; removal of staging areas; transportation and disposal of non-contaminated general office and miscellaneous waste at an approved sanitary landfill; and all other miscellaneous items for which separate payment is not provided under other Items.

END OF SECTION

SECTION 02001 - WASTE SAMPLING AND CHARACTERIZATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included

Work of this Section consists of waste sampling and characterization as specified.

The work includes, but is not necessarily limited to, the following:

1. opening , sampling and resealing of drums and containers excavated from Areas of Buried Drums;

2. fingerprint testing, PCB screening, characterization and compatibility testing of sampled waste from drums and containers;

3. opening, sampling and closing of underground storage tanks; and

4. characterization of contents of underground storage tanks.

1.02 QUALITY ASSURANCE

Quality assurance procedures shall be in accordance with the Contractor's Analytical Quality Assurance Project Plan as approved by the Engineer.

1.03 SUBMITTALS

A. General

The Contractor shall comply with Section 01300.

B. Drum Log and Waste Analyses Data Sheets

The Contractor shall submit, on a daily basis, drum and container log data sheets to the Engineer for all wastes sampled the previous work day. The Contractor shall submit copies of all waste, fingerprint, compatibility and/or characterization data sheets to the Engineer within 24 hours of receiving data from the laboratory.

C. Quality Assurance Submittals

During performance of the Works, the Contractor shall submit to the Engineer all submissions listed in the Analytical Quality Assurance Project Plan.

D. Compositing of Samples

The Contractor shall submit to the Engineer for review and approval a list of samples to be composited for characterization at least three (3) calendar days prior to the intention to characterize samples.

E. Disposal Proposal

The Contractor shall submit to the Engineer for review and approval a proposal(s) describing the disposal options for the drummed/containerized waste and the contents of the underground storage tanks based on the analytical data. The proposals for the drummed/containerized waste shall be submitted following receipt of analytical data and within seven (7) calendar days of notification from the Engineer for such a proposal. The proposal for the contents for the underground storage tanks shall be submitted within seven (7) calendar days of receipt of the analytical data by the Contractor and no later than forty-five (45) calendar days of collection of analytical samples. The Engineer will review and comment on the proposal within fourteen (14) calendar days. The Contractor shall resubmit the proposal within seven (7) calendar days.

1.04 PRODUCT DELIVERY AND HANDLING

A. Delivery

The Contractor shall deliver and ensure a sufficient supply of sample jars at the Site prior to the scheduled sampling activities.

B. Storage and Handling

All sampling jars shall be delivered to the Site and stored in the Contractor's office in an area free from contamination. All sample jars shall be stored in an area which is protected from the environment and is free from contaminated materials or substances.

1.05 JOB CONDITIONS

A. Existing Conditions

Drums and containers to be excavated from Areas of Buried Drums shall be opened and contents samples and analyzed to determine appropriate disposal/treatment alternatives, as determined by the Engineer.

Also, three underground storage tanks at the north-western corner of the Site are to be opened and contents sampled and analyzed to determine appropriate disposal/treatment alternatives, as determined by the Engineer. Contents of the tanks are expected to be aqueous.

PART 2 - PRODUCTS

2.01 GENERAL

A. Sampling Equipment

(1) Drum and Container Sampling

Materials and equipment required for sampling include but are not necessarily limited to the following:

1. sample containers in accordance with the Analytical Quality Assurance Control Plan;
2. a uniquely numbered sample identification label affixed to sample container;
3. glass sampling thiefs;
4. stainless steel trowel, spoon or trier for collection of solid or sludge samples;
5. remotely operated non-sparking pneumatic ram or check key device;
6. brass mallet and chisel; and
7. bung wrench.

(2) Tank Sampling

Materials and equipment required for soil and sediment sampling shall include but are not necessarily limited to the following:

1. sample containers in accordance with the Contractor's Quality Assurance Project Plan;
2. uniquely numbered sample identification label affixed to sample container;
3. oil phase interchange probe and/or tape with water sensing material to determine phasing in tank; and
4. bacon bomb, Kemmer and similar sampling device.

PART 3 - EXECUTION

3.01 PREPARATION

The Contractor shall have all the required health and safety and sampling equipment necessary to perform sampling, compatibility testing, fingerprinting, characterization and consolidation of samples on the Site prior to commencing opening and sampling activities.

3.02 PERFORMANCE

A. General

The Contractor shall follow the general procedures as specified herein when collecting samples of materials from drums, containers or tanks.

Sampling and analysis (fingerprint, compatibility and characterization) shall be conducted on excavated drummed/containerized wastes to aid in the selection and control of bulking methods and on or off-Site treatment requirements. Sampling and analyses (characterization) shall also be performed on the liquid waste contained in the underground storage tanks to aid in the determination of treatment requirements. Should liquid in tanks not be aqueous additional analyses may be required to determine treatment requirements. All sampling and analysis shall be carried out in accordance with the Contractor's Analytical Quality Assurance Project Plan, and shall reflect USEPA and OEPA approved soil treatment facility operating parameters.

After sample collection, sample jars shall be placed in their original shipping box which shall be clearly labelled on the outside with the assigned sample numbers of the samples contained. The samples shall be stored at the required temperature in a secured area which is protected from exposure to the environment or any other detrimental damage. Heat shall be supplied as necessary to prevent possible freezing.

B. Drummed and Containerized Waste Sampling

(1) General

Waste fingerprint, compatibility and characterization testing shall be conducted on drummed and containerized wastes to be excavated. As a minimum one sample shall be collected from each excavated drum or container. Where numerous containers of similar content with less than 5-gallon capacity are encountered, only one sample representing 50 gallons capacity need be sampled, as a minimum.

The following sections describe the minimum procedures which shall be implemented by the Contractor for sampling liquid and solid wastes for fingerprint, compatibility and/or characterization purposes.

(2) Presampling Safety Considerations

Extreme care shall be exercised in opening drums or other sealed containers in which the contents may be harmful to sampling personnel. When practical, a drum or container shall not be moved or opened unless it appears to be structurally sound. Drums/containers shall be moved by remote means as much as is practical and in seclusion from each other.

Drums and containers shall be examined for markings, bulging, corrosions, etc., to identify any materials or conditions which may pose a hazard to the sampler. Drums and containers shall be opened in such a manner that excess interior pressure, as evidenced by bulging or swelling, can been safely relieved. In all cases the lid or bung shall be opened slowly to allow for the release of pressure.

During the initial inspection, any customized containers, suspicious looking drums, or drums labeled as containing hazardous materials (explosives, etc.) shall be clearly marked for special handling.

(3) Drum and Container Entry

All drums and containers shall be grounded by the Contractor prior to sampling. A metal grounding rod shall be driven into the ground adjacent to the Drum Staging Area. A wire, leading from the rod, shall then be clipped to the drum or container prior to opening the drum or container.

The drum or container shall be opened by removing the bung. A drum or container that has a badly rusted bung, or that cannot be opened as above, shall be entered with a pneumatically operated non-sparking penetrating device operated remotely (i.e. brass rod attached to backhoe arm). All openings shall be plugged following the sampling operations.

(4) Sampling Procedures

The following procedures shall be adhered to by the Contractor during sampling of drummed/containerized liquid waste:

1. remove cover from sample container;

2. insert sampling thief almost to the bottom of the drum/container or until a solid layer is encountered. About one foot of tubing should extend above the drum/container;

3. allow the waste in the drum to reach its natural level in the tube;

4. cap the top of the sampling tube with a double-gloved thumb or stopper, ensuring liquids do not come into contact with the sampler's thumb or stopper;

5. carefully remove the capped tube from the drum or container;

6. if more than one phase of material is identified, each phase shall be sampled separately from mid-phase for compatibility testing and waste characterization as appropriate. If no phasing is apparent, then the sample shall be collected from the entire depth of the waste;

7. insert the uncapped end in the sample container, do not spill liquid on outside of bottle;

8. release the thumb or stopper and allow the glass thief to drain and fill the sample container. Repeat the above steps until sufficient volume has been collected for analysis;

9. remove tube from the sample container, break and place the tube in the drum;

10. cap the sample container tightly and place prelabeled sample container in a carrier;

11. replace the bung or otherwise seal drum or container. Replace bung on overpack drum (if applicable);

12. disposable gloves used as outer gloves during sampling shall be changed between each sample;

13. fill out Field Sampling Data Sheet and Chain-of-Custody Sheet (Attachment 3); and

14. transport the sample to the laboratory for analysis employing Chain-of-Custody procedures as specified in this Section.

Sampling of drummed/containerized solids or sludges shall in general conform to the preceding procedures with the following exceptions:

1. sample collection shall be accomplished using a stainless steel trowel, spoon or trier;

2. a representative sample of drummed/containerized solids or sludges shall be collected from a depth at least 12 inches from the top of the contents in the drum/container if practical;

3. the sample collected shall be a composite of a minimum of four 25-gram samples, collected from representative locations throughout the drummed/bulked solids or sludges;

4. All drums and containers to be excavated shall be opened and sampled by the Contractor in the Drum Staging Area. Drums and containers shall be sampled within 24 hours of arriving in the Drum Staging Area.

   Once sampled the drums and containers shall be segregated as liquid or solid, or unstable/dangerous and then placed accordingly in the Drum Staging Area. Drums shall be placed in double rows, with at least six feet between any adjacent row. Staging requirements for dangerous materials shall be assessed by the Engineer and the Contractor's Health and Safety Officer.

D. Tank Sampling

(1) General

Characterization testing shall be conducted on each phase of liquids within tanks. The following sections describe the minimum procedures which shall be implemented by the Contractor for sampling liquid waste for characterization purposes.

(2) Tank Entry Procedures

Extreme care shall be exercised in opening tanks in which the contents may be harmful to sampling personnel and shall be in accordance with the Contractor's Site-specific Health and Safety.

Prior to commencing tank sampling, cleaning and/or contents removal, the Contractor shall inspect each tank and conduct air monitoring of each tank, in accordance with the requirements of the Contractors Site-specific Health and Safety Plan, to determine the level of personal protective equipment required for sampling, cleaning and/or contents removal from each tank.

(3) Tank Sampling Procedures

The accessibility of each tank will determine how the tank shall be sampled. In general, the following procedure shall be followed to obtain a representative sample from each tank:

1. an oil phase interchange probe and/or tape covered with "water-cut" sensing material shall be lowered into the tank to determine the number of phases and depth of each phase of liquid contained in the tank;

2. a Bacon bomb, Kemmerer, or similar sampling device shall be lowered on a nylon rope into the tank;

3. a discreet sample shall be collected from each phase interval of contained liquid or sludge and placed in a pre-labeled sample container. If the phase interval is not adequate in volume to sample, a composite sample of the various phases shall be collected and homogenized;

4. the sample container shall be securely capped and transported to the laboratory;

5. sampling logs shall be kept to document the tank the sample was collected from, the depth interval sampled, the approximate volume of contained

liquid, the approximate volume of contained sludge material, any stratification of material, physical description of each sample, sampler's name, and date and time of collection;

6. the sampling device shall be decontaminated prior to each use according to procedures specified herein;

7. nylon rope shall be changed between each tank sampled; and

8. disposable gloves used as outer gloves during sampling shall be changed between each sample.

E. Sampling Equipment Cleansing

Reusable sampling equipment shall be cleaned between sampling events using the following rinse sequence:

1. scrub with detergent (Alconox) and clean water rinse to remove all visible foreign matter;
2. rinse with pesticide-grade isopropanol;
3. air dry for 15 minutes;
4. rinse with deionized water; and
5. repeat steps 2, 3 and 4.

Following final rinse, sampling equipment shall be visually inspected to verify that they are free of particulates and other solid material which may contribute to possible sample cross-contamination. Fluids used for cleaning shall not be recycled. All wash water, rinse water and decontamination fluids shall be collected and transferred to drums pending final disposal at the Trust's on-Site groundwater treatment plant or Contractor's wastewater treatment plant in accordance with Section 01500.

F. Sample Shipment

All samples shall be packed in coolers with appropriate cushioning material in accordance with the Contractor's Analytical Quality Assurance Project Plan. Samples to be analyzed off Site shall be shipped daily to the project laboratories by overnight courier or delivered directly by sampling personnel. All sample shipment shall conform to 49 CFR § 172.101 DOT regulations for shipping high hazard samples.

Each cooler shall be sealed with two transportation security seals containing the sampler's initials. The cooler shall then be sealed with packing tape.

G. Chain-Of-Custody

Samples shall remain, at all times, under the Contractor's control and responsibility. Samples shall remain under the control of sampling personnel in the field until relinquished to the laboratory. Chain-of-custody documents shall be completed for each cooler and the original and two copies enclosed within the cooler. In addition, Field Sampling Data Sheets and a sample log as provided in Attachment 3 of all samples collected and shipped off Site shall be maintained on Site by the Contractor. Copies of these daily logs, Field Sampling Data Sheet and copies of the completed Chain-of-Custody documents shall be provided to the Engineer on a daily basis. The Chain-of-Custody document shall consist of four carbon copies. One shall be retained by the Contractor's sampler, one shall be provided to the Engineer, one shall be retained by

the analytical laboratory and the original shall be returned by the analytical laboratory to the Contractor with the analytical results.

A typical chain-of-custody form which shall be employed during the sample transport is presented in Attachment 3. Alternate forms provided by the laboratory or the Contractor may be approved for use by the Engineer provided the form is functionally equivalent. Upon receipt of samples at the laboratory, the cooler and the seal shall be inspected for signs of tampering by the designated sample custodian. The conditions of the cooler and seal shall be noted on the chain-of-custody form by the sample custodian and the chain-of-custody form shall be signed by the sample custodian.

The laboratory shall employ chain-of-custody procedures throughout the handling of the samples in the laboratory from the time of receipt to the completion of analysis. Completed chain-of-custody forms describing the transport to and receipt at the laboratory, are required to be returned to the Contractor's Quality Control Manager with the hard copy of the analytical report. Testament to the proper chain-of-custody handling procedures employed in the laboratory shall be supplied by the laboratory upon request.

H. Drummed/Containerized Waste Fingerprint Testing

(1) Waste Fingerprint and Identification

Drummed and containerized wastes and tank contents shall be segregated according to waste classes prior to any consolidation, and any subsequent waste characterization for disposal. The waste classes determined will permit an assessment of material incompatibilities and chemical characteristics which need to be further addressed for disposal purposes. Segregated materials which are determined to have the same fingerprint characteristics as determined by the waste class, shall be subjected to compatibility testing prior to consolidation, if any, for treatment. All wastes shall be properly characterized (analyzed) in accordance with USEPA and OEPA approved operating procedures.

Waste shall be fingerprinted to determine, as a minimum, the following characteristics:

1. phase (liquid or solid);
2. ignitability;
3. water reactivity;
4. water solubility;
5. oxidizer;
6. peroxide;
7. pH;
8. presence of nitric/perchloric acid;
9. sulfide;
10. cyanide;
11. presence of halogens; and
12. flammability.

I. Drum/Containerized Waste PCB Screening

All drummed/containerized waste determined to fall under the same waste classification shall be screened for PCB contamination prior to compatibility testing. A ten drum/container sample composite shall be prepared by collecting a split sample in the

laboratory from the total volume collected. The composite sample shall be screened for PCBs using SW-846 Method 8080. Should the composite sampling yield PCBs at a concentration greater than 5 mg/kg, two 5-drum/container composite samples shall be screened for PCBs. Should the composite sampling yield PCBs at a concentration greater than 10 mg/kg, individual samples from which the 5-drum/container composite sample was prepared, shall be screened for PCBs.

J. Drummed/Containerized Waste Compatibility Testing

Drummed/containerized waste shall be consolidated prior to disposal in accordance with waste classification and compatibility data base developed by the Contractor. The mixing of incompatible materials shall be minimized by consolidating primarily materials which were determined to belong to the same waste class and which exhibit the same waste compatibility characteristics as indicated in the analytical data. Incompatible materials shall not be mixed or consolidated at any time unless approved by the Engineer. The mixing of materials from the same waste class should prevent incompatible reactions from occurring.

Where waste materials with different waste classes or with different compatibility characteristics are considered for consolidation, the information obtained from the tests shall be used in conjunction with the compatibility information contained in the USEPA document, "A Method for Determining the Compatibility of Hazardous Wastes",* for assessing the potential for incompatible reactions.

Compatibility testing for the purpose of consolidation shall be performed in a laboratory using small quantities of the materials proposed for consolidation. Compatibility testing shall typically be conducted for binary combinations by adding one component to the other and monitoring for resultant physical reactions that occur. The materials are incompatible when reaction consequences include any of the following:

1. heat generated by chemical reaction;

2. fire produced by extremely exothermic reactions;

3. generation of innocuous gases (i.e. N_2, CO_2, etc.) which can cause pressurization of closed containers potentially resulting in container rupture;

4. generation of toxic gases (i.e. HCN, H_2S, etc.);

5. generation of flammable gases (i.e. H_2, C_2H_2, etc.);

6. explosion due to extremely vigorous reactions or reactions producing sufficient heat to detonate unstable reactions or reaction products;

7. violent polymerization resulting in the generation of extreme heat and sometimes toxic/flammable gases; and

8. solubilization of toxic substances.

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* USEPA, "A Method for Determining the Compatibility of Hazardous Wastes", EPA 600/2-80-076, April, 1980.

Compatibility testing of ternary combinations shall not be attempted unless two of the materials have already been binary tested and the resulting compatible product is used for testing.

K. Drummed/Containerized Waste and Underground Storage Tank Contents Characterization

Individual samples of underground storage tank waste and composite samples of drummed/containerized waste shall be analyzed for treatment parameter and characterization purposes. Compositing of samples for characterization shall be approved by the Engineer in writing. The characterization of drummed/containerized waste shall include, as a minimum:

1. BTU;
2. chloride;
3. bromide;
4. sulfide;
5. percent ash;
6. percent water;
7. specific gravity;
8. viscosity;
9. TAL metal;
10. TCL Volatile Organic Compounds;
11. TCL Base/Neutral and Acid Extractable; and
12. pesticide/PCBs.

The contents of the underground storage tank shall be analyzed for items 9, 10, 11 and 12 in the above list provided that the tank contents are obviously aqueous. Additional testing, as determined by the Engineer, may be required should the tank contents be other than aqueous.

The Engineer shall be provided with split samples. The Engineer must be informed of the names of the laboratories being used prior to shipping the samples for analysis.

L. Sample Maintenance, Storage and Disposal

Samples shall be maintained and stored on Site in an air conditioned/heated trailer kept at standard temperature until the waste which the sample represents has been thermally treated on Site, treated at the water treatment plant or accepted at an off-Site facility. Samples from off-Site laboratories shall be returned to the Site and similarly stored. Prior to thermally treating samples the Contractor shall notify the Engineer in writing and shall proceed only upon written notification of the Engineer.

PART 4 - MEASUREMENT AND PAYMENT

4.01 DRUM AND CONTAINER CONTENTS SAMPLING AND ANALYSIS

A. Measurement

Measurement for drum and container contents sampling and analysis will be made at the actual number of drums and/or containers sampled as determined by the Engineer from the drum/container logs.

B. Payment

Payment for the quantity determined above will be made at the unit price per sample stipulated in the Schedule of Prices for Item E-1 which price and payment shall be full compensation for the supply of all labor, materials, plant and equipment and all work required for opening and resealing drums and containers; collecting samples; handling samples; packaging and transporting samples to an approved laboratory; fingerprint testing; compatibility testing; preparing and reporting analytical data; submitting analytical data to Engineer; storing samples; and all other miscellaneous items for which separate payment is not provided under other Items.

4.02 PCB SCREENING OF EXCAVATED DRUMMED/CONTAINERIZED WASTE

A. Measurement

Measurement for PCB screening of excavated drummed/containerized waste will be made at the actual number of samples (single, five and ten drum composites) analyzed as determined by the Engineer from analytical reports generated by the laboratory.

B. Payment

Payment for the quantity determined above will be made at the unit price per sample stipulated in the Schedule of Prices for Item E-2, which price and payment shall be full compensation for supply of all labor, materials, plant and equipment and doing all work required for compositing and handling samples; packaging and transporting samples to an approved laboratory; testing samples for PCB; preparing and reporting analytical data; submitting analytical data to the Engineer; storing samples; and all other miscellaneous items for which separate payment is not provided under other Items.

4.03 CHARACTERIZATION OF EXCAVATED DRUMMED/CONTAINERIZED WASTE

A. Measurement

Measurement for characterization of excavated drummed/containerized waste will be made at the actual number of composite samples analyzed as determined by the Engineer from analytical reports generated by the laboratory.

B. Payment

Payment for the quantity determined above will be made at the unit price per sample stipulated in the Schedule of Prices for Item E-3, which price and payment shall be full compensation for supply of all labor, materials, plant and equipment and doing all work required for compositing and handling samples; packaging and transporting samples to an approved laboratory; characterizing samples; preparing and reporting analytical data; submitting analytical data to the Engineer; storing samples; preparation and approval of drummed/containerized waste disposal proposal; and all other miscellaneous items for which separate payment is not provided under other Items.

4.04 UNDERGROUND TANK CONTENTS SAMPLING AND ANALYSIS

Payment for underground tank contents sampling and analysis will be made at the lump sum price stipulated in the Schedule of Prices for Item E-4 which price and payment shall be full compensation for supply of all labor, materials, plant and equipment and doing all work required for opening and resealing tanks; collecting samples; handling samples; packaging and transporting samples to analytical laboratory; analysis of samples; preparation and approval of tank contents disposal proposal; and all other miscellaneous items for which separate payment is not provided under other Items.

END OF SECTION

SECTION 02002 - AIR MODELING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included

Work of this Section consists of air modeling as specified.

The work includes, but is not necessarily limited to, the following:

1. development of an Air Modeling Plan;
2. collecting relevant topographic, meteorologic, demographic and land use data;
3. air dispersion modeling of emissions from the stack of the Thermal Treatment Unit;
4. determination of the impact on human health of selected contaminants emitted from the stack of the Thermal Treatment Unit; and
5. preparation and submission of an Air Modeling Report.

B. Related Work Specified In Other Sections

The following items of work related to work of this Section are specified in other Sections as noted:

1. On-Site Incineration, Section 02090; and
2. On-Site Thermal Desorption, Section 02091.

1.02 SUBMITTALS

A. Air Modeling Plan

Prior to commencing the development of the air model, the Contractor shall submit to the Engineer an Air Modeling Plan which as a minimum shall address the following:

1. contaminants to be evaluated;
2. assumed waste make-up;
3. assumed combustion chamber temperatures, partitioning of metals between bottom ash and flue gas/flyash and removal efficiency by the air pollution control system;
4. destruction and removal efficiencies;
5. modeling methodology;
6. health effect assessment methodology; and

7. relevant guidelines and regulations.

The Air Modeling Plan shall be submitted to the Engineer for review within fourteen (14) calendar days of the date of Notice to Proceed. The Engineer will review the Air Modeling Plan and provide comments to the Contractor within seven (7) calendar days. The Contractor shall resubmit the Air Modeling Plan to the Engineer within seven (7) calendar days for submission to USEPA and OEPA for review.

B. Air Modeling Report

The Contractor shall submit to the Engineer an Air Modeling Report within ninety (90) calendar days of the date of Notice to Proceed. The Engineer will review the Air Modeling Report and provide comments to the Contractor with fourteen (14) calendar days of receipt. The Contractor shall revise and return the Air Modeling Report to the Engineer within seven (7) calendar days for submission to USEPA and OEPA for review. As a minimum, the report shall include the following information:

1. meteorological input parameters;

2. topographic input parameters;

3. demographic and land use input parameters;

4. location of sensitive receptors within 5 km of the stack;

5. air concentrations of parameters listed in this Section at selected and critical locations at the Site perimeter, residences within 1 km of the stack and sensitive receptors within 5 km of the stack;

6. all input and output parameter results including input and output files on computer disks; and

7. demonstration of compliance of the modeled emission with the relevant guidelines and regulations.

1.03 JOB CONDITIONS

A. Sequencing and Scheduling

The Contractor shall not commence the Performance Demonstration of the Thermal Treatment Unit prior to approval of the Air Modeling Report by the Engineer, USEPA and OEPA.

B. Use of Model

The Contractor shall be responsible for ensuring that all air emissions from the Thermal Treatment Unit are in compliance with regulatory levels specified in Sections 02090 and 02091.

SECTION 02003 - WASTE PREPARATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included

Work of this Section consists of waste preparation as specified.

The work includes, but is not necessarily limited to the following:

1. design, supply and installation of a Waste Preparation Facility.

2. transporting from the Drum Staging Area and Contaminated Soil Staging Area to the Waste Preparation Facility all materials to be thermally treated on Site, including:

    1. soils excavated from the upper two feet of designated grid squares;

    2. sediments excavated from the upper two feet of the East Pond and West Pond;

    3. visibly contaminated soils excavated from the EPA stockpile;

    4. visibly contaminated soils and sediments associated with leaking buried drums/containers excavated from the Areas of Buried Drums;

    5. visibly contaminated soil excavated adjacent to and below existing underground storage tanks;

    6. existing soils and sediments staged on Contaminated Soil Staging Area;

    7. contents of abandoned incinerator kiln and kiln liner;

    8. laboratory chemicals and drum and soil investigative samples in EPA trailer and storage shed;

    9. laboratory chemicals and drum and soil investigative samples generated during the Works;

    10. sludges from Thermal Treatment Unit operation;

    11. sediments and sludges from sumps in Equipment Decontamination Facility, Waste Preparation Facility and Drum Staging Area;

    12. filter media and granular activated carbon (if applicable) from Contractor's wastewater treatment plant and Waste Preparation Facility;

    13. drummed (containerized waste removed from Areas of Buried Drums, if applicable; and

14. soils excavated from the upper two feet of Grid Nos. 3-5, 4-5 and 4-6 should performance criteria for thermal treatment of the soils be met in the Performance Demonstration.

3. weighing materials for payment purposes;

4. shredding and/or reducing in size all materials as required; and

5. consolidating and preparing all waste materials in preparation for on-Site thermal treatment.

B. Related Work Specified In Other Sections

The following items of work related to work of this Section are specified in other Sections as noted.

1. Waste Sampling and Characterization, Section 02001.

1.02 SUBMITTALS

A. General

The Contractor shall comply with Section 01300.

B. Design Drawings and Certification

The Contractor shall submit to the Engineer within thirty (30) calendar days of the date of Notice to Proceed design drawings and calculations, bearing the seal of a Professional Engineer, for all architectural, structural, electrical, fire code and ventilation aspects of the Waste Preparation Facility building, including, if necessary, details of additional geotechnical investigations to be conducted to determine the foundation requirements for the Waste Preparation Building.

C. Waste Preparation Facility Components and Plan

The Contractor shall submit to the Engineer for review and approval within thirty (30) calendar days of the date of Notice to Proceed a description of all soil, sediment and waste preparation equipment required for preparation and conditioning of the wastes to be treated at the Site, including layout in Waste Preparation Facility, trade names and model numbers, operating and performance parameters and any other information necessary to describe the equipment.

The Plan shall include techniques to be used to consolidate, prepare and condition all wastes to be fed to the Thermal Treatment Unit.

This submission shall be included as part of the submission specified in Section 02090 or Section 02091.

D. Records

The Contractor shall maintain inventory records of all materials brought into the Waste Preparation Facility and thermally treated. The record should indicate date brought into the Facility, date treated, weights, material description, and any other relevant

information. The record shall be updated daily and submitted to the Engineer within twenty-four (24) hours of material entering the Waste Preparation facility and being thermally treated.

1.03 JOB CONDITIONS

A. Sequencing and Scheduling

Drums , containers, soils and sediment, shall remain stored within the Drum Staging Area/Contaminated Soil Staging Area until ready to be prepared. Waste shall be prepared within 72 hours of arriving at the Waste Preparation Facility. Waste/soil/sediment shall be removed from the Drum Staging Area/Contaminated Soil Staging Area in a manner consistent with the capacity of the Waste Preparation Facility to receive the waste/soil/sediment.

B. Existing Conditions

1. Drummed/Containerized Waste

There is no information on drummed/containerized waste to be excavated in the Areas of Buried Drums. Waste characterization shall be performed in accordance with Section 02001. Waste found to be non-hazardous shall be disposed off Site in accordance with Section 02098. Waste found to be hazardous shall be thermally treated on Site or disposed/treated off Site. Thermal treatment of hazardous waste will be performed on Site if the waste meets feed requirements as determined during the Performance Demonstration and if treatment on Site can be performed more economically on Site than off Site. Otherwise the waste shall be disposed/treated off Site.

C. Frozen and Wet Conditions

The Contractor shall make due allowance and provide for preparation of frozen or wet soils and sediment and the variable consistency/viscosity of waste with temperature. Claims for additional payment and requests for schedule extension due for these conditions by the Contractor will not be accepted by the Engineer.

PART 2 - PRODUCTS

2.01 GENERAL

The Contractor shall supply all materials necessary for the work of this Section. All materials shall be approved by the Engineer and shall be suitable for the purpose intended.

2.02 WASTE PREPARATION FACILITY

A. General

A covered and contained Waste Preparation Facility shall be provided by the Contractor to facilitate the preparation, conditioning and consolidation of all waste streams. The Waste Preparation Facility shall contain the waste preparation and Thermal Treatment Unit feed systems.

B. Building

As a minimum, the Waste Preparation Facility shall consist of a roof, enclosing walls, and a Portland cement concrete floor and shall be of sufficient size to house any additional facilities required to prepare the waste prior to thermal treatment. The concrete floor shall be at least six inches thick and sufficiently reinforced to support all loads without cracking. The concrete shall have a minimum compressive strength of 3,500 psi at 28 days determined in accordance with ASTM C31 and 39. Concrete shall be air entrained in accordance with Table 3 of ASTM C143. The floor shall be sloped at 1 percent to sumps to facilitate cleanup of spill and final decontamination. The floor shall include minimum 4 inch high by 4 inch wide curbs at its edge to contain any spills. The building structure shall be of temporary construction sufficient to support all live and dead loads under static and dynamic conditions , and shall comply with all requirements of the applicable building codes and regulations. Fuel or oil, tanks shall be equipped with secondary containment sufficient to contain 100 percent of the contents of the tanks.

As a minimum, the Waste Preparation Facility building shall be designed in accordance with the requirements of the Ohio Building Code, National Electrical Code, Natural Fire Protection Association, American Institute of Steel Construction, American Concrete Institute, ASTM and American Welding Society.

C. Foundations

The Waste Preparation Facility shall be supported on foundations adequate for the purpose intended. The Contractor may perform additional geotechnical investigations and analysis, at no additional cost to the Trust.

D. Ventilation

If waste handling produces emissions exceeding Site action levels, the building shall include a system to ventilate the building and if necessary, treat the released air.

E. Crusher/Shredders

The Contractor shall provide a crusher/shredder to shred soil, solid wastes, wood, metal, drums and containers, contaminated drum and container carcasses, abandoned incinerator liner and any other material which may be fed into the Thermal Treatment Unit. The crusher/shredder shall be designed and operated in a manner to reduce all materials to less than two inches in maximum dimension or to the maximum dimensions specified for the Thermal Treatment Unit, whichever is smaller. The crusher/shredder shall be operated with a hydraulic motor, and shall be designed and operated to minimize emissions of VOCs. Wastes at the Site may be flammable and the crusher/shredder design and operation shall be performed in a manner to prevent explosion.

F. Bulking Containers

The Contractor shall provide bulking containers in sufficient number and of sufficient size to consolidate waste streams to be fed into the Thermal Treatment Unit. The bulking containers shall be liquid tight to prevent leaking and shall be designed and operated to minimize emissions of VOCs. Wastes at the Site may be flammable, therefore the bulking containers shall be designed and operated in a manner to prevent explosion.

G. Weigh Scale

(1) General

The Contractor shall provide, maintain and operate an on-Site weigh scale for weighing materials prior to treatment, where payment is based on weight.

(2) Testing and Certification

The Contractor shall give the State regulatory authority (Weights and Measures) having jurisdiction and the Engineer sufficient notice in advance of any test to be carried out on the weigh scale and all required tests shall be carried out in the presence of such authority and the Engineer.

Testing of the weigh scale shall be conducted in each of the following circumstances:

1. after initial installation and before use;

2. when the scale has undergone adjustments, alterations or repairs to the weighing mechanism;

3. when weighing is resumed after suspension and where duration of such suspension will adversely effect calibration; and

4. at the frequency specified by the manufacturer of the weigh scale, and at least once every month.

Copies of tests and certifications shall be on view in the scale house before weighing operations commence and at all times thereafter.

(3) Equipment

(a) General

The weigh scale provided by the Contractor shall meet all the applicable requirements of Federal, State and local regulations and shall have an accuracy of at least 0.5 percent. In addition, the weigh scale shall meet the requirements as hereinafter provided.

(b) Platform Scale

The platform shall be of sufficient capacity and dimension so as to fully contain the loaded box or vehicle in one setting and so as to permit weighing of the entire load in one operation. If wastes are to be weighed in truck boxes, weighing of various axle combinations in more than one operation will not be

permitted. Scale foundations shall be adequate to support the largest gross load to be carried without settlement.

In order to minimize the effect of impact loads on the scale adjustment and to reduce the effect of vehicle breaking and kickback on the scale platform and scale adjustments, the approach ramp shall be constructed on a straight and level grade at the same elevation as the scale platform. Vehicles shall enter and leave the platform at a speed not exceeding 4 mph.

The scale platform and mechanism shall at all times be maintained clean and free from encumbrances such as gravel, asphalt, snow, ice and debris.

The weight indicator mechanism shall be suitably enclosed in the scale house. Weights shall be shown in such a manner that weight tickets can be conveniently completed by the weigh person. Weight recording devices shall be enclosed in a suitable trailer or in the scale house. Span calibration controls shall be sealed during the period of operation, and accessible only to the testing personnel.

H. Drum/Container Weigh Scale

The Contractor shall provide a weigh scale for weighing drums and containers. The weigh scale shall be capable of weighing up to 2,000 pounds with an accuracy of ±0.5 percent. The weigh scale shall meet all applicable requirements of Federal, State and local regulations.

PART 3 - EXECUTION

3.01 PREPARATION

A. General

The Contractor shall have all the required health and safety equipment necessary to perform preparation of wastes on the Site prior to commencing activities involving handling of waste material. Spill containment materials shall be located in proximity of active work areas.

B. Materials to be Thermally Treated on Site

The materials requiring preparation prior to thermal treatment on Site include soils in designated grids, sediments, abandoned incinerator liner and content, visibly contaminated soil as determined by the Engineer, laboratory chemical and drum samples in EPA trailer and storage shed, Contractor's water treatment plant sludge and filter media, Equipment Decontamination Facility sediments and hazardous waste removed from Areas of Buried Drums, as approved by the Engineer.

3.02 PERFORMANCE

A. Waste Preparation Facility

(1) Site Preparation

The Contractor shall grade and prepare the Site for installation of the Waste Preparation Facility. Grading shall be performed to balance cut and fill quantities. Following grading the subgrade shall be compacted to a density sufficient to support the slab-on-grade and the imposed loads.

(2) Foundations

The Contractor shall construct foundations as required for the Waste Preparation Facility.

(3) Buildings

The Contractor shall construct a building housing all applicable waste preparation equipment meeting all applicable codes and regulations.

(4) Waste Preparation Equipment

The Contractor shall provide all waste preparation equipment necessary for the preparation for soil, sediments and other waste as specified. All equipment shall be suitably founded, and shall be installed and operated in accordance with the Manufacturer's recommendations.

B. Transportation of Soils, Sediment and Waste to Waste Preparation Facility

The Contractor shall transport drums/containers containing waste on the Drum Staging Area, and soil, sediment and the abandoned incinerator liner and contents and other material to be thermally treated on the Contaminated Soil Staging Area to be thermally treated to the Waste Preparation Facility. Sediments shall be staged a sufficient time, as determined by the Engineer, to permit gravity drainage of water.

C. Soil, Sediment and Waste Handling - General

The Contractor shall prepare, consolidate and condition all soil, sediments and waste materials to be treated on Site to a condition suitable for treatment by the Thermal Treatment Unit.

The Contractor shall weigh all drums and containers and soils/sediments to be thermally treated prior to preparation.

The Contractor shall prepare and consolidate materials in accordance with the classification and compatibility database developed by the Contractor in accordance with Section 02001. Any additional sampling and analysis required by the Contractor prior to treatment of the material shall be at no additional cost to the Trust.

D. Drum and Containerized Waste Handling

(1) General

This section applies to all activities involved in the handling of drums or containers that may have contained, or do contain, potentially hazardous materials in both solid and liquid state.

All drum and container handling activities shall be conducted in accordance with Section 01121, the protocols contained in the Federal Register, Vol. 54, No. 244, March 6, 1989, Occupational Safety and Health Administration, 29 CFR Part 1910, Hazardous Waste Operations and Emergency Response; Final Rule.

(2) Equipment

(a) Safety Equipment

During the handling of drummed or containerized waste, safety apparel and equipment as specified in Section 01121 shall be worn or used at all times.

(b) Handling Equipment

All handling, moving and transporting of drums or containers shall be performed with mechanical equipment whenever possible. Drums and containers shall be moved by grappler, non-metallic slings, within a backhoe bucket or front end loader or by other means that will minimize damage to drums and containers and release of contents therefrom. Movement or handling by personnel may be required in the event that mechanical means cannot be properly or safely employed due to drum or container breakage or leakage.

Portions of equipment that contact drums or containers shall preferably be constructed of non-ferrous metals. Should steel equipment be used, contact portions shall be coated or lined to preclude spark generation in accordance with 29 CFR § 1910.120(j)(1)(xii). Portable pumps, if used, shall be intrinsically safe.

All handling and transport equipment shall be equipped with Class ABC fire extinguishers and shall comply with 29 CFR § 1910.157. All equipment used for the handling and transport of drums or containers shall be regularly maintained. A separate maintenance sheet shall be available on Site for every piece of equipment on Site and completed as required. In particular, ignition, manifold and exhaust components shall be maintained to prevent backfiring or generation of sparks within the exhaust gases.

(3) Drum and Container Handling

All drummed and containerized waste shall be prepared at the Waste Preparation Facility area using appropriate equipment prior to treatment. Sufficient area to permit forklift truck access to drums within the Waste Preparation Facility shall be maintained at all times.

Extreme care shall be exercised in opening drums or containers, if necessary, in which the contents may be harmful to personnel. When practical, a drum or container shall not be moved or opened unless it appears to be structurally sound.

Drums or containers shall be opened in such a manner that excess interior pressure, as evidenced by bulging or swelling, is safely relieved. If pressure cannot be relieved from a remote location, appropriate shielding shall be placed between personnel and the drum or container to reduce the risks of injury.

E. Waste Feed Preparation

(1) General

The Contractor shall pretreat and consolidate the waste materials to be fed into the Thermal Treatment Unit in a manner to prevent incompatibilities with other waste streams. The waste shall be pretreated with additives, as applicable and as approved by the Engineer, in a manner to meet the physical feed requirements of the Thermal Treatment Unit. Any material such as steel plates or bars which cannot be property prepared shall be removed, decontaminated at the Equipment Decontamination Facility on-Site and placed under the final cover. Materials shall be consolidated such that the chemical feed parameters determined are within limits of the Performance Demonstration as approved by the Engineer, USEPA and OEPA.

(2) Soils and Sediment

Soils and sediments and any debris forming part of the soils and sediments when excavated shall be pretreated, if applicable, and crushed/shredded to produce a solid feed material to the smaller of maximum particle size of 2 inches or the dimension specified for the Thermal Treatment Unit. Wet soils and sediments shall have previously been drained by stockpiling and drying methods, as specified in Section 02220. Any additional pretreatment to remove excess moisture shall also be performed as necessary. Any excess water so generated shall be treated at the Trust's Groundwater Treatment Plant or the Contractor's wastewater treatment plant in accordance with Section 01500.

(3) Abandoned Incinerator Liner and Contents

The abandoned incinerator liner and contents shall be pretreated, if applicable, and crushed/shredded to produce a solid feed material to the smaller of a maximum particle size of two inches or the dimensions specified for the Thermal Treatment Unit.

(4) Laboratory Chemical Drum Investigative Samples

Laboratory chemical and drum investigative samples removed from the EPA trailer and storage sheds shall be removed from their containers and discretely mixed with the soils and sediments to be thermally treated. The chemicals and samples shall be added in such a manner to prevent any potential incompatibilities. Containers shall be shredded to the smaller of a maximum dimension of two inches or the dimensions specified for the Thermal Treatment Unit.

(5) Sump Sediments and Sludges

Sump sediments and sludges collected from the Drum Staging Area, Equipment Decontamination Facility and Waste Preparation Facility sumps shall be pretreated and prepared in accordance with those requirements specified for soils and sediments.

(6) Thermal Treatment Unit Sludges

Thermal Treatment Unit sludges shall be pretreated and prepared in accordance with those requirements specified for soils and sediments.

(7) Drummed and Containerized Liquids

Drummed and containerized liquids are not expected to be removed from the Areas of Buried Drums. Protocol for preparation of drummed and containerized liquids will be established if they are to be thermally treated on Site.

(8) Drummed and Containerized Solids

Drummed and containerized solids excavated from the Areas of Buried Drums shall be pretreated and prepared with the drums and containers in which they were excavated. The drummed and containerized solids and their drums and containers shall be shredded to the smaller of a maximum size of two inches or the dimensions specified for the Thermal Treatment Unit. These materials shall be consolidated with soils and sediments to be thermally treated in a manner to avoid incompatibilities and to remain within the feed limits established from the Performance Demonstration and approved by the Engineer, USEPA and OEPA.

(9) Spent Granular Activated Carbon and Filter Media

Spent granular activated carbon and filter media shall be pretreated and prepared in accordance with those requirements specified for soils.

F. Weighing

The Contractor shall weigh all materials prior to consolidation and prior to treatment. Weighing shall be performed in a manner suitable to distinguish payment items.

Soils with moisture contents exceeding limits specified below will, for payment purposes, have their weights corrected based on the following moisture contents:

Silt and Clay Content(1) (percent)	*Moisture Content (2) (percent)*
0	8
20	20
100	30

(1) As determined in accordance with ASTM D1140, soil finer than No. 200 (75 mm) sieve.

(2) As determined in accordance with ASTM D2216.

(3) Interpolate for silt and clay and moisture contents not tabulated.

No correction will apply to sediments.

G. Overpack/Repack Drums

Overpack/repack drums which can be reused shall be decontaminated at the Equipment Decontamination Facility using the high pressure, low volume hot water wash unit and detergent. Following decontamination the overpack/repack drums shall be transported and neatly staged at the active Area of Buried Drums excavation.

H. Maintenance of Waste Preparation Facility and Equipment

The Contractor shall maintain the Waste Preparation Facility, equipment and ventilation system in a neat, tidy and safe condition during performance of the Works. The Contractor shall clean out all sumps and drainage trenches associated with the Waste Preparation Facility. Spent carbon from the air treatment system shall be replaced with clean virgin or regenerated carbon, and the spent carbon shall be treated on Site in the Thermal Treatment Unit or off Site at a reactivation facility in accordance with Section 02098 by the Contractor as approved by the Engineer, at no additional cost to the Trust.

I. Closure of Waste Preparation Facility

The Contractor shall decommission and dismantle the Waste Preparation Facility at the completion of the Works. The Contractor shall sweep floors and steam clean the interior walls and floors. The floor shall be fractured to maximum dimensions of 3 feet and left in place. Waste generated during decommissioning shall be disposed of in accordance with all applicable Federal and State regulations at facilities approved by the Engineer. Wastewater shall be disposed of in accordance with Clause 16 of Section 01500. Following removal of the Waste Preparation Facility and fracturing of footings, the area shall be graded as shown on the Drawings.

PART 4 - MEASUREMENT AND PAYMENT

4.01 WASTE PREPARATION FACILITY AND EQUIPMENT

Payment for the Waste Preparation Facility and equipment will be made at the lump sum price stipulated in the Schedule of Prices for Item G-1 which price and payment shall be full compensation for the supply of all labor, equipment, plant and materials required to design, supply and install the Waste Preparation Facility; additional geotechnical investigations; preparation and submission of submittals; waste consolidation equipment; operation and maintenance of all equipment; decontamination, demobilization and all other miscellaneous items for which separate payment is not provided under other Items.

Payment for pretreating and consolidating wastes prior to thermal treatment is included under payment items for Sections 02090 or 02091 as appropriate.

END OF SECTION

SECTION 02050 - DEMOLITION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included

Work of this Section consists of demolition as specified and as shown on the Drawings.

Work includes, but is not necessarily limited to, the following:

1. grubbing, reduction and on-Site disposal of trees, bushes, debris, and stumps within the work area;

2. removal of soil samples and containers from EPA trailer and storage shed and placement as fill under final cover;

3. removal of drums containing soil cuttings from Temporary Drum Staging Area and placement of both as fill under final cover;

4. removal of water samples from containers in EPA trailer and storage shed, transporting water to treatment plant and placing containers as fill under final cover;

5. removal of aqueous waste from drums on Temporary Drum Staging Area, transporting water to treatment plant and crushing of drums and placement of drum carcasses as fill under final cover;

6. removal of investigative drum samples and laboratory chemicals and transporting to Thermal Treatment Unit for thermal treatment;

7. removal of drums containing personal protective equipment from Temporary Drum Staging Area and placement of both as fill under final cover;

8. demolition, reduction and on-Site disposal of existing scale facility, shed structures, existing EPA trailer, concrete walls, utility poles and overhead power lines;

9. in-place fracturing of underground concrete septic tank and filling with on-Site soils;

10. removal of three pole-mounted electrical transformers and co-ordinating with Ohio Edison Co. for their removal from Site;

11. demolition, reduction and on-Site filling of abandoned dump truck and metal containers; and

12. removal of kiln liner and contents of abandoned incinerator and stockpiling in Contaminated Soil Staging Area, and demolition, reduction and on-Site disposal of abandoned incinerator.

B. Technical Requirements Specified In Other Sections

The following items of work related to work of this Section are specified in other Sections as noted:

1. entry into abandoned incinerator under confined space entry procedures, Section 01121, Clause 6.D.

1.02 JOB CONDITIONS

A. Existing Conditions

(1) Drums on Temporary Drum Storage Area

Drums on the Temporary Drum Storage Area contain soil auger cuttings, personal protective equipment and aqueous wastes generated during the Remedial Investigation. Some of the drums are severely corroded.

(2) Samples and Chemicals in Existing EPA Trailer and Storage Shed

The existing EPA trailer and storage shed contain samples of soil, water and buried drum contents and containers of laboratory chemicals and waste generated during the Remedial Investigation. They also contain other miscellaneous non-hazardous waste including but not limited to paper, cardboard boxes, bags and containers.

(3) Transformers

Pole 67AK/3-21 as shown on the Drawings supports a bank of three 50 KVA transformers which are the property of and are to be returned to Ohio Edison Co.. Mr. P. M. Severyn, Akron Division Engineer, Akron, Ohio should be contacted at 216-384-4702 for further information.

(4) Drums in Shed in Southeast Corner of Site

Drums in the wooden shed in southeast corner of the Site are empty.

B. Protection

During demolition activities the Contractor shall prevent movement, settlement or damage of adjacent areas, structures, services, utilities, adjacent grades to remain or any other item not specified to be demolished. Demolition shall be performed in accordance with requirements of State and Federal regulations.

PART 2 - PRODUCTS

2.01 GENERAL

The Contractor shall supply all materials and equipment necessary or required for performance of clearing, grubbing and demolition operations, subject to the approval of the Engineer prior to use.

PART 3 - EXECUTION

3.01 PREPARATION

The Contractor shall notify the Engineer seven (7) days prior to commencing clearing, grubbing and/or demolition operations. Dust suppression systems and the soil erosion and sediment control measures shall be in place before commencing with clearing, grubbing and/or demolition operations.

3.02 PERFORMANCE

A. Clearing and Grubbing

The Contractor shall clear and grub all trees, stumps, debris, rubbish, down timber, logs, brush, hedges and vegetation within the limit of the work area as shown on the Drawings. All cleared and grubbed material shall be reduced to a manageable size for filling on-Site. Cleared and grubbed material shall be backfilled in accordance with Section 02220. Burning shall not be permitted.

B. Demolition

(1) General

The Contractor shall remove the contents of (as applicable) and demolish, reduce and dispose on Site (except as otherwise specified), in accordance with Section 02220, the following existing structures and associated facilities:

1. scale building and scale located in Grid No. 1-1;
2. storage shed located in Grid No. 1-1;
3. EPA trailer located in Grid No. 1-1 and 1-2;
4. wall structure located in Grid No. 2-3;
5. utility poles and associated wires, insulator and other hardware located in Grid Nos 3-6, 4-6 and 5-6;
6. metal storage shed located in Grid No. 5-6
7. abandoned incinerator located in Grid Nos. 5-6, 5-7 and 6-7;
8. wooden storage shed located in Grid Nos. 5-6 and 6-6; and
9. abandoned vehicle and cast iron container located in Grid Nos. 5-7 and 6-7.

(2) Removal of Contents of Sheds and EPA Trailer

The sheds and EPA trailer on Site have contents as described in Clause 1.02.A of this Section. Containers with soil samples in the storage shed and existing EPA trailer shall be removed by the Contractor and placed as fill on-Site. Water samples in the storage shed and existing EPA trailer shall be emptied from their jars into a suitable bulking container and transported to the Trust's groundwater treatment plant or the Contractor's wastewater treatment plant for treatment in accordance with Clause 15 of Section 01500. The emptied water sample jars shall be placed as fill on-Site. Laboratory samples and drum investigative samples, including their containers, shall be placed in 55-gallon overpack drums or suitable containers and transported to the Drum Staging Area. Laboratory chemicals and drum investigative samples which are leaking or are potentially incompatible shall be segregated from each other to prevent potential incompatibilities and

reactions. The empty drums in the metal shed shall be crushed and placed as fill on Site.

(3) Removal of Contents and Kiln Liner of Abandoned Incinerator

The Contractor shall remove the kiln liner and the contents of the abandoned incinerator and stockpile in the Contaminated Soil Staging Area pending thermal treatment on Site.

(4) Removal of Transformer on Utility Pole

The Contractor shall remove a bank of three Ohio Edison Co. 50 KVA transformers on Pole 67AK/3-21 as shown on the Drawings in such a manner as to avoid damaging the transformers. The Contractor shall contact Mr. P.M. Severyn of Ohio Edison Co., Telephone No. (216)-384-4720 to coordinate the removal. The transformers shall be loaded directly into a haulage unit with the bed covered with 10-mil polyethylene sheeting. The transformers shall not be permitted to contact the ground or any contaminated material. The transformers shall be transported to the on-Site equipment decontamination facility and decontaminated to remove any visible contamination. The transformers shall then be transported to the Site support area and placed on pallets, pending retrieval by Ohio Edison Co.

(5) Demolition and Reduction

The Contractor shall demolish, reduce and dispose on Site structures, poles, abandoned incinerator and any other object requiring demolition and/or reduction as shown on the Drawings or required to complete the Works.

All structures shall be demolished to existing grade or to the base of the final cover, whichever is lower. Where the existing grade is a higher than the base of the final cover, the Contractor shall remove the part of the structure which is below grade concurrent with the soil removal specified in Section 02220.

The Contractor shall carefully break concrete within specified demolition limits by mechanical means using air tools, hydraulic tools, drilling and wedging, or any other means approved by the Engineer. Blasting will not be permitted. The Contractor shall dismantle steel or metal by burning, cold cutting, shearing or other suitable means approved by the Engineer.

All demolition debris shall be broken or otherwise cut into manageable sizes and in such a manner that upon filling and covering with soil no voids will be formed around the buried debris.

The Contractor shall load demolition debris directly into haulage units in such a manner as to suppress and control dust generation. All demolition debris shall be placed as fill on Site in accordance with Section 02220.

C. Drums in Temporary Drum Storage Area

Drums containing aqueous waste shall be emptied and the contents transferred to the Trust's Groundwater Treatment Plant or the Contractor's wastewater treatment plant for treatment in accordance with Clause 15 of Section 01500. Drums containing soil auger cuttings shall be placed as fill in accordance with Section 02220. Drums containing personal protective equipment shall be emptied and the personal protective equipment

placed as fill in accordance with Section 02220. Drums found empty and drums emptied by the Contractor shall be crushed and placed as fill in accordance with Section 02220.

PART 4 - MEASUREMENT AND PAYMENT

4.01 DEMOLITION

Payment for demolition will be made at the lump sum price stipulated in the Schedule of Prices for Item H-1 which price and payment shall be full compensation for supply of all labor, equipment, plant and materials required to clear and grub trees, stumps, debris, rubbish, down timber, logs, brush, hedges and vegetation; empty contents of sheds and EPA trailer; demolish structures, poles, abandoned incinerator and any other object requiring demolition; load, chip, shred, crush and reduce debris; salvage transformers, decontaminate and place in support area; place in specified area; and all other miscellaneous items for which separate payment is not provided under other Items.

4.02 REMOVAL OF KILN LINER AND CONTENTS FROM ABANDONED INCINERATOR

Payment for removal of kiln liner and contents from abandoned incinerator will be made at the lump sum price stipulated in the Schedule of Prices for Item H-2 which price and payment shall be full compensation for supply of all labor, equipment, plant and materials required to remove the debris and lining from the abandoned on-Site incinerator; loading, transporting and placing debris and liner material in the Contaminated Soil Staging Area; and all other miscellaneous items for which separate payment is not provided under other Items.

END OF SECTION

SECTION 02081 - DRUM/CONTAINER REMOVAL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included

Work of this Section consists of drum/container removal as specified and as shown on the Drawings.

The work includes, but is not necessarily limited to, the following:

1. excavating soils and drums/containers to a minimum depth of eight feet in Areas of Buried Drums;

2. removing drums/containers and visibly contaminated soils and sediments associated with drums/containers;

3. overpacking drums/containers, if necessary;

4. loading drums/containers on haulage units, and transporting to Drum Staging Area;

5. loading visibly contaminated soils and sediments, as directed by the Engineer, for treatment onto haulage units and transporting to the Contaminated Soil Staging Area or to Waste Preparation Area; and

6. stockpiling uncontaminated soil, sediment and debris next to excavation.

B. Terminology

(1) Drum/Container

'Drum/container' shall be used to describe any drum or container of any size made of metal, plastic, fiber or any other material which has in the past, is presently or has been designed to contain a liquid, solid or sludge.

(2) Visibly Contaminated Soil and Sediment

'Visibly contaminated soil and sediment' shall mean those soils and sediments which are obviously stained and discolored as a result of leakage and spillage from adjacent drums/containers, as determined by the Engineer.

1.02 QUALITY ASSURANCE

A. General

Sampling and testing of materials shall not preclude further rejection if it is subsequently determined to lack uniformity or fail to meet the specified requirements. The Engineer will perform testing as described in Clause 3.04 of the Section, at no cost to the Contractor. The Contractor shall be responsible for testing costs to retest failed areas.

1.03 SUBMITTALS

A. General

The Contractor shall comply with Section 01300.

B. Drum/Container Excavation Plan

The Contractor shall prepare a Drum/Container Excavation Plan which describes the equipment and procedures to be used by the Contractor to excavate and remove drums from Areas of Buried Drums. The Drum/Container Excavation Plan shall be submitted to the Engineer no later than sixty (60) calendar days prior to excavating. The Engineer will review the Drum/Container Excavation Plan and provide comments within fifteen (15) calendar days of receipt. The Contractor's revised Drum/Container Excavation Plan shall be resubmitted to the Engineer within fifteen (15) calendar days. Specific topics which shall be addressed in the Contractor's Drum/Container Excavation Plan include but are not be limited to:

1. a description of the work teams and the function of the members of the work teams involved in drum/container excavation and removal;

2. air monitoring to be performed during drum/container excavation and removal;

3. equipment to be used during drum/container excavation and removal, with particular reference to how the equipment will limit damage to the drums/containers and limit sparking;

4. procedures to be followed to control and contain spilled liquids if a leaking drum is encountered;

5. procedures to be followed if an unusual or bulging drum/container is encountered;

6. procedures to be followed to remove drums/containers from excavations and place (if necessary) in overpack drums; and

7. equipment to be used to transport drums/containers to the Drum Staging Area.

1.04 JOB CONDITIONS

A. Environmental Requirements

The Contractor shall prevent surface water from entering excavations and control groundwater, if encountered, to maintain reasonably dry working conditions in accordance with Section 01500.

Non-visibly contaminated soil/sediment to be backfilled shall be protected from freezing.

B. Sequencing and Scheduling

Where an Area of Buried Drums to be excavated is in a grid/area where the upper two feet of soil/sediment are designated for treatment, soil and sediment shall be removed as specified in this Section. The Contractor shall not perform excavation in any adjacent area within twenty feet of the perimeter of an Area of Buried Drums until the drum/container excavation and removal has been completed in the area inside the Area of Buried Drums adjacent to the perimeter.

C. Frozen and Wet Conditions

The Contractor shall make due allowance and provide for excavation of frozen and wet materials. Claims for additional payment and requests for schedule extension due to frozen or wet materials by the Contractor will not be accepted by the Engineer.

D. Excavations Left Open

Unless otherwise specified, the Contractor shall leave excavations open until the Engineer directs backfilling to commence. All controls in place during the excavation shall be maintained by the Contractor until all areas have been backfilled.

PART 2 - PRODUCTS

2.01 GENERAL

The Contractor shall supply all materials necessary for the work of this Section. All materials shall be approved by the Engineer prior to use and shall be suitable for the purpose intended.

2.02 MATERIALS

A. Overpack/Repack Drums

Overpack/repack drums shall consist of 85-gallon Department of Transport approved drums. Overpack/repack drums may be reused if cleaned to remove gross contamination.

B. Polyethylene Sheeting

Polyethylene sheeting shall be continuous sheeting fabricated from a single ply of construction grade polyethylene plastic and shall be Griffolyn TX-120, 10-mil nylon reinforced material or equivalent.

C. Excavation Equipment

Teeth on backhoe or front-end loaders used to remove drums or containers shall be removed or covered. Metal parts of drum/container handling equipment which will potentially contact drums/containers shall be lined to reduce the potential for sparks. Equipment for the handling and transport of drums/containers shall be diesel powered and regularly maintained to prevent the generation of sparks or backfiring. Excavation equipment shall be capable of excavating to a minimum depth of fifteen feet.

D. Other Material

The Contractor shall supply all materials necessary for the work of this Section. All materials shall be approved by the Engineer and shall be suitable for the purpose intended.

PART 3 - EXECUTION

3.01 PREPARATION

A. General

The Contractor shall remove obstructions from surfaces to be excavated, within the limits shown on the Drawings or as required to construct the finished work.

B. Health and Safety

All work areas where excavation and associated activities are being carried out which disturb or require potential contact with buried drums/containers shall be defined as a Temporary Exclusion Zone as outlined in Section 01121. An area so classified shall remain as a Temporary Exclusion Zone until backfilled. Vehicles, equipment and personnel shall only enter and exit exclusion zones through the Contaminant Reduction Zone as specified in Section 01121.

C. Notification

Unless otherwise specified, the Contractor shall notify the Engineer a minimum of three working days prior to commencing excavation and backfilling operations to enable the Engineer to take pre- and post-excavation cross-sections.

3.02 INSPECTION

The Contractor shall perform all work of this Section in the presence of the Engineer. The Contractor shall not allow or cause any of the work performed to be covered up or enclosed by work of this Section prior to required inspections, measurements, tests or approvals.

3.03 PERFORMANCE

A. General

The Contractor shall excavate, as approved by the Engineer, soils, sediment, debris and drums/containers encountered in the Areas of Buried Drums as shown on the Drawings. The Contractor shall excavate to a minimum depth of eight feet below the existing surface or at least three feet below the lowest drum encountered within the Areas of Buried Drums, whichever is deeper. The Engineer shall approve the final depth of excavation. The Contractor shall excavate and remove any drums/containers which are encountered and all interstitial soil, sediment and/or debris associated with the drums/containers within the Areas of Buried Drums including:

1. drums/containers of any size or condition including contents;
2. visibly contaminated soils and sediment associated with buried drums/containers;

3. interstitial debris including parts of drums/containers; and
4. all other interstitial soils.

When the base of the excavation is reached as approved by the Engineer, the excavated surface shall be visually inspected by the Engineer for buried drums/containers. If no drums/containers are visible at the bottom of the 8-foot excavation, the excavation will be approved for backfill by the Engineer. Where drums/containers are visible, the drums/containers and any visibly contaminated soils or sediment and/or debris immediately associated with the drums/containers shall be removed and the excavation shall continue an additional three feet below the drum or container.

All excavations shall be completed in accordance with OSHA trenching requirements, 29 CFR Part 1826. Excavations shall be conducted systematically in maximum 1-foot lifts unless otherwise directed by the Engineer. Sequencing of the excavation shall be developed such that any damage to drums/containers and spillage of contents is prevented.

Additional drums/containers shall not be removed from the excavation until the previously excavated drum/container has been removed from the excavation and overpacked, if necessary.

B. Drummed and Containerized Waste Handling

(1) General

When drummed and/or containerized waste are encountered during the excavation, the Contractor shall, as a minimum, comply with Occupational Safety and Health Administration (OSHA) Standards presented in the Federal Register, Vol. 54, No. 42, Monday, March 6, 1989, Part 1910 - Hazardous Waste Operations and Emergency Response; Final Rule 1910-120(j) or the most recent update.

This section applies to all activities involved in the handling of drums or containers that may have contained, do contain or have been designed to contain potentially hazardous waste materials in a solid, sludge or liquid state. The procedures described herein specify the minimum requirements and not necessarily all the requirements that shall be implemented by the Contractor to maximize the protection of Site personnel and the environment and to minimize the potential for migration of hazardous or toxic waste constituents to the surrounding environment and exposure to the surrounding population.

The Contractor shall excavate and handle wastes using methods and equipment specifically designed to minimize any leakage or spillage to the maximum extent made possible by the condition of the drum and/or container.

(2) Equipment

All handling, moving and transporting of drums/containers shall be effected with mechanical equipment whenever possible, unless it is for the installation of slings. Drums/containers shall be moved by grappler, or if necessary with non-ferrous slings, within a backhoe bucket, front end loader or by other means that will prevent damage to drums/containers and release of contents therefrom. Movement or handling by personnel may be required in the event that mechanical means cannot be properly or safely employed due to drum/container breakage or leakage.

Portions of equipment that contact drums/containers shall preferably be constructed of non-ferrous metals. Should steel construction be used, contact portions shall be coated or lined to preclude spark generation in accordance with 40 CFR §1910.120(j)(1)(xii). Portable pumps, if used, shall be intrinsically safe.

All handling and transport equipment shall be equipped with Class ABC fire extinguishers complying with 40 CFR §1910.157, and self-contained full air respiratory systems if deemed necessary by the Health and Safety Officer. All equipment used for handling and transport of drums/containers shall be regularly maintained and repaired. A maintenance sheet for all equipment used on-Site shall be kept by the Contractor, completed as required and made available to the Engineer upon request. In particular, the ignition, manifold and exhaust components shall be maintained to prevent backfiring or generation of sparks within the exhaust gases.

(3) Drum/Container Excavation and Handling

During the excavation and handling of drums/containers, a team of personnel specifically trained in the handling of drummed or containerized waste shall be designated to perform this task. The team may carry out other tasks but shall be immediately available if a drum or container is encountered. This team shall be comprised of no fewer than two drum handling personnel as well as a supervisor. During the handling of drummed or containerized waste, visual contact shall be maintained among members of the working team at all times. The supervisor shall be located at the limits of the work zone. All team members shall be able to communicate with ease among themselves. If direct communication between crew members is not possible or effective for whatever reason, communications shall be transmitted via intrinsically safe two-way radios (during activities requiring SCBA) or verbal (during all other activities) in accordance with 40 CFR §1910-120(j)(5)(iv) with the exception of heavy equipment operations. Heavy equipment operators shall be in radio communication with the supervisor.

As drummed or containerized waste is encountered and prior to physically handling the drums or containers, a preliminary classification check list shall be completed. This list shall include a screening of the drum or container with an explosimeter, and an organic vapor detector for organic vapors and a visual description of the drum or container, contents, labeling information (if available and legible) and the condition of the drum or container as it appears in the excavation. Information indicating the generator or owner of the waste shall also be recorded. This information shall be included on the Container Data Sheet, shown in Attachment 3. If during this inspection an open or leaking drum or container is identified to contain liquids, the liquids shall be pumped or bailed into an appropriate sized repack drum prior to removing the drum or container from the excavation. All drums/containers shall be removed from the excavation and staged next to the excavation on a flat working area free of debris or any objects that would interfere with the safe handling of the drums/containers. The drums/containers shall be overpacked prior to removal and transportation to the Drum Staging Area if the drum/container is severally damaged, corroded or leaking. Overpack and repack drums shall be sealed when filled. The container or drum or the overpack drum (if overpacked) shall be marked to indicate the drum number using a paint stick. The top and two opposing sides of the drum shall be so numbered. The number shall take the form SN-XXXX, where XXXX refers to the unique drum/container number, starting at 0001.

(4) Drum Staging and Handling

All drums and containers shall be removed from the Area of Buried Drums and shall be transferred to the Drum Staging Area by flat bed truck, forklift or other means approved by the Engineer. The drums shall be secured during transport such that they remain upright and do not move from their position. All drums shall be placed on Contractor-supplied pallets within the Drum Staging Area and oriented to permit sampling of each individual drum for fingerprinting, compatibility, characterization and treatment parameters. Sufficient area to permit forklift and truck access to the drums shall be provided and maintained at all times.

(5) Spill Prevention and Response

The handling and transport of drummed or containerized waste shall be, at all times, conducted in a controlled and safe manner which will minimize damage to containers, the containerized materials and the environment. Spill control measures shall comply with the requirements of Section 01500.

C. Soil and Sediment Handling

Visibly contaminated soils and sediment immediately associated with and adjacent to a leaking drum or container at a depth less than eight feet, as directed by the Engineer, shall be segregated and loaded directly into haulage units. As the haulage units are filled and at the conclusion of the working day, they shall be transported to the Contaminated Soil Staging Area.

Other soils or sediments shall be segregated from visibly contaminated soils and sediments, as directed by the Engineer, and shall be placed in stockpiles around the excavation. The Engineer will be the sole judge of the degree of visible contamination by which soils and sediments shall be segregated.

D. Debris Handling

Debris shall include drum/container carcasses (removed empty from the excavation), drum/container parts, large rocks, concrete, metal, etc. which is excavated. Drum and container carcasses and metal shall be crushed. All not visibly contaminated debris shall be placed in stockpiles with not visibly contaminated soil or sediments.

Drum and container carcasses or debris which are severely chemically contaminated as determined by the Engineer shall be crushed and placed in roll-off boxes, sealed with a tarpaulin and transported to the Contaminated Soil Staging Area pending thermal treatment. A drum/container shall be considered severely chemically contaminated if more than one inch of residue remains on the bottom or if more than 3 percent by weight of the drum's/container's capacity remains if capacity is less than 110 gallons or as otherwise defined as hazardous waste in 40 CFR 261.7.

E. Backfilling

Backfilling shall be performed in accordance with Section 02220.

PART 4 - MEASUREMENT AND PAYMENT

4.01 REMOVING DRUMS/CONTAINERS

A. Measurement

Measurement for removing drums/containers will be made at the actual number of drums or overpack drums transferred to the Drum Staging Area as determined by the Engineer from the drum/container excavation logs.

B. Payment

Payment for the quantity determined above will be made at the unit price per drum/container stipulated in the Schedule of Prices for Item I-1 which price and payment shall be full compensation for the supply of all labor, materials, plant and equipment and doing all work required for removing drums and containers from excavation; completing Field Data Sheet; overpacking drums/containers, if necessary; loading drums/containers or repack/overpack drums containing waste onto transport vehicle; transporting; unloading drums/containers or repack/overpack drums containing waste at Drum Staging Area; segregating, staging and storing overpack/repack drums containing waste at Drum Staging Area; maintaining Drum Staging Area; and all other miscellaneous items for which separate payment is not provided under other Items.

4.02 EXCAVATING

A. Measurement

Measurement for excavating from the Area of Buried Drums will be made at the actual number of cubic yards of material excavated and calculated by the Engineer using the average end area method using cross-sections taken prior to and following excavation.

B. Payment

Payment for the quantity determined above will be made at the unit price per cubic yard stipulated in the Schedule of Prices for Item I-2 which price and payment shall be full compensation for the supply of all labor, materials, plant and equipment and doing all work required to excavate soil, sediments and debris from the Area of Buried Drums; transporting contaminated material to Contaminated Soil Staging Area; staging the contaminated material in the Contaminated Soil Staging Area; stockpiling contaminated material at the excavation; and all other miscellaneous items for which separate payment is not provided under other Items.

4.03 PROVISION OF OVERPACK/REPACK DRUMS

A. Measurement

Measurement for provision of overpack/repack drums will be made at the actual number of overpack drums used by the Contractor as determined by the Engineer from the drum/container logs.

B. Payment

Payment for the quantity determined above will be made at the unit price per overpack/repack drum stipulated in the Schedule of Prices for Item I-3 for which price and payment shall be full compensation for the supply of all labor, materials, plant and equipment and doing all work required for supplying overpack/repack drums; temporary storage on Site; removal of unused drums from Site; decontamination and reuse of drums; and all other miscellaneous work for which separate payment is not provided under other Items.

END OF SECTION

SECTION 02082 - UNDERGROUND STORAGE TANK REMOVAL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included

Work of this Section consists of removal of underground storage tank as specified and as shown on the Drawings.

Work includes, but is not necessarily limited to, the following:

1. excavating around and over tanks and segregating visibly contaminated soils;
2. transporting visibly contaminated soils to Contaminated Soil Staging Area;
3. removing liquid contents of tanks and transferring to haulage units;
4. purging, inerting or venting tanks, if an explosive environment exists, to remove flammable vapors;
5. lifting tanks out of the excavations;
6. backfilling excavations with non-visibly contaminated soil;
7. dismantling tanks;
8. removing sediments from tanks and transporting to Contaminated Soil Staging Area; and
9. stockpiling or placing in fill areas dismantled tank pieces on Site.

B. Related Work Specified In Other Sections

The following items of work related to work of this Section are specified in other Sections as noted:

1. sampling and characterization of liquid waste in tanks, Section 02001.
2. backfilling of excavation, Section 02220.

C. Technical Requirements Specified In Other Sections

The following items of work shall be carried out in accordance with the technical requirements of the Sections noted below:

1. entry into tanks, if necessary, Section 01121, Clause 6.D.
2. excavation and backfilling, Section 02220.

D. Terminology

'Visibly contaminated soil' shall mean those materials which are obviously stained and discolored as a result of leakage and spillage from adjacent tanks, as determined by the Engineer.

UST shall mean underground storage tanks.

1.02 QUALITY ASSURANCE

A. General

Sampling and testing of materials shall not preclude further rejection if it is subsequently determined to lack uniformity or fail to meet the specified requirements. The Engineer will perform testing as described in Clause 3.04 of the Section, at no cost to the Contractor. The Contractor shall be responsible for testing costs to retest failed areas.

1.03 SUBMITTALS

A. General

The Contractor shall comply with Section 01300.

B. Work Plans

(1) UST Removal Plan

The Contractor shall prepare an Underground Storage Tank Removal (USTR) Plan describing in detail procedures and equipment to be used to remove and dismantle the underground storage tanks. The USTR Plan shall include, but not be limited to, equipment and procedures to be used to monitor air in and around the tanks, to excavate around the tanks, to remove liquids and sludges from the USTs, to purge, vent or inert the tanks, to lift out the tanks and to dismantle the USTs. The USTR Plan shall also describe the work team to be used to remove the tanks and the qualifications of the Contractor's supervisor monitoring the excavation. The USTR Plan shall be submitted to the Engineer no later than sixty (60) days prior to removal. The Engineer will review the USTR Plan and within seven (7) days of submission provide comments to the Contractor. The Contractor shall resubmit the revised USTR Plan within seven (7) calendar days.

1.04 JOB CONDITIONS

A. Existing Conditions

Based on a previous investigation the UST contents are expected to be aqueous. The USTs are in poor condition and have rusted through at some locations near their tops.

UST dimensions are as follows:

Tank (ft)	*Length (feet)*	*Diameter (inches)*	*Material*
1	12	64	steel
2	12	64	steel
3	24	72	steel

B. Environmental Requirements

The Contractor shall control water in the excavations to maintain reasonably dry conditions and shall suppress and control dust in accordance with Section 01500.

C. Sequencing and Scheduling

The Contractor shall sequence and schedule transportation of aqueous wastewater to the Trust's Groundwater Treatment Plant in accordance with Section 01500, Clause 15.

PART 2 - PRODUCTS

2.01 GENERAL

The Contractor shall supply all materials necessary for the Work of this Section. All materials shall be approved by the Engineer prior to use and shall be suitable for the purpose intended.

2.02 MATERIALS

A. Pumps

Pumps for the removal of liquids from USTs shall be explosion proof or air driven.

PART 3 - EXECUTION

3.01 PREPARATION

A. Tank Contents Sampling and Analyses

The Contractor shall perform the sampling and analyses of the tank contents, and provide the Engineer with the analytical results and a proposal to dispose of the contents as specified in Section 02001.

B. Notification

The Contractor shall notify the Engineer at least three (3) working days in advance of intention to commence excavating for the removal of the tanks.

3.02 INSPECTION

The Contractor shall not commence excavation or backfilling until the Engineer has completed pre-excavation and post-excavation cross-sections. Excavations shall only be performed in the presence of the Engineer. The Contractor shall obtain approval from the Engineer prior to backfilling the excavation.

3.03 PERFORMANCE

A. General

Work of this Section shall be performed in accordance with Ohio and Federal regulations. The removal shall be supervised by a certified installer pursuant to rule 1301:7-9-11 of the Ohio Administrative Code. The Contractor shall perform real-time air monitoring during all phases of the Work to identify explosive environments, should they exist. This air monitoring shall be in addition to overall Site air monitoring specified in Section 01121.

B. Removal of UST Liquid Contents

The Contractor shall make an opening in the UST and transfer the liquid contents of the tank to an approved tanker truck. The Contractor shall use explosion-proof or air-driven pumps. Pumps shall be bonded to the tank or otherwise grounded. Should the Contractor use a vacuum truck to remove the liquids, the truck shall be located upwind of the UST and the exhaust shall be outletted through a hose downwind of the UST. If the contents are to be treated on Site the liquids shall be transported to the Trust's Groundwater Treatment Plant or the Contractor's wastewater treatment plant for treatment in accordance with Clause 15 of Section 01500. If the liquids cannot be treated on Site the liquids shall be transported off Site for treatment in accordance with Section 02098.

C. Excavation

Soil surrounding and adjacent to the UST shall be excavated to expose the UST and allow for the safe removal of the UST. Excavation shall be performed in a manner which prevents sparking. As soils are excavated they shall be segregated as visibly contaminated or not visibly contaminated, as directed by the Engineer. Soils which are not visibly contaminated shall be stockpiled adjacent to the excavation pending backfilling into the excavation. Soils which are visibly contaminated shall be placed directly into the haulage unit and transported to the Contaminated Soil Staging Area or Waste Preparation Facility, as applicable.

The excavation shall continue to a minimum depth of eight feet or to the base of the UST, whichever is lower. Visibly contaminated soil below a depth of eight feet, if excavated to facilitate removal of the UST, shall be stockpiled with not visibly contaminated soil for backfilling into the excavation.

D. Tank Removal

Following excavation the Contractor shall lift the UST out of the excavation using non-ferrous slings.

E. Tank Purging, Inerting and/or Venting

The Contractor shall purge, inert or vent the UST if a potentially explosive environment exists. The Contractor shall conduct air monitoring to verify that the venting, purging or inerting has removed the explosive gases.

If the UST is not to be dismantled immediately, the UST shall be positioned such that its opening is on the side, midrange in the tank's height.

F. Tank Cleaning

The tank interior shall be cleaned following purging, inerting and/or venting as directed by the Engineer. Used cleaning water shall be transported to the Trust's groundwater treatment plant for treatment in accordance with Clause 16 of Section 01500.

G. Dismantling and Sediment Removal

The Contractor shall check the UST and surrounding area for an explosive environment prior to dismantling the tank. If a potentially explosive environment exists, the tank shall be purged, inerted or vented.

If UST entry is necessary during any stage of dismantling, entry shall be in accordance with confined space entry procedures specified in Section 01121. Tanks shall be dismantled by cold cutting techniques to a manageable dimension for backfilling. Dismantled pieces shall be transported to Grid Nos. 3-2 and 4-2 and temporarily stockpiled (if necessary) pending filling on Site or placed in an on-Site fill area. Sediments encountered in the UST during dismantling shall be transported to and placed in the Contaminated Soil Staging Area or Waste Preparation Area pending on-Site thermal treatment.

H. Backfilling

The resulting excavation shall be backfilled with the excavated soil stockpiled adjacent to the excavation. The backfill shall be compacted in lifts not exceeding eight inches in thickness to 90 percent of the maximum dry density as determined in accordance with ASTM D698. Supplemental backfilling to surrounding grade shall be performed in accordance with Section 02220.

3.04 FIELD QUALITY CONTROL

A. Quality Control by the Engineer

The Engineer will perform tests in field and in laboratory on samples of uncompacted and compacted fill to determine if materials meet Specification and except as otherwise specified, tests will be at expense of the Trust. Copies of test reports will be supplied to the Contractor on request.

B. Frequency of Testing

At least one density test and one moisture content determination for each tank or each shift will be performed.

C. Method of Testing by the Engineer

Maximum dry density of backfill will be determined in laboratory in accordance with ASTM D698.

Bulk wet density of backfill will be determined in field in accordance with ASTM D2922.

Moisture content of backfill in place will be determined in accordance with ASTM D3017.

PART 4 - MEASUREMENT AND PAYMENT

4.01 UNDERGROUND STORAGE TANK REMOVAL AND DISMANTLING

Payment

Payment for underground storage tank removal will be made at the lump sum price stipulated in the Schedule of Prices for Item J-1 which price and payment shall be full compensation for supply of all labor, plant, equipment and materials required to remove liquid from USTs; transport liquids to treatment plant; excavate soil around USTs and segregate visibly and non-visibly contaminated soil; transport visibly contaminated soil to Contaminated Soil Staging Area; lift USTs out of excavation; dismantle USTs; remove sediments and transport, temporarily stockpile or place in onto Contaminated Soil Staging Area; transport, temporarily stockpile or place in on-Site fill area dismantled parts of USTs to stockpile area; monitor air during all stages of removal and dismantling; and all other miscellaneous items for which separate payment is not provided under other Items.

END OF SECTION

SECTION 02090 - ON-SITE INCINERATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included

Work of this Section consists of on-Site incineration as specified and as shown on the Drawings.

The work includes, but is not necessarily limited to, the following:

1. preparation and submission of submittals to the Engineer and the regulatory agencies as specified until approval;

2. provision of all utilities (including but not limited to fuel, water, power) and support facilities necessary for the operation of an on-Site incinerator;

3. design, supply and on-Site installation and construction of an incinerator and associated facilities as specified, including connection to support facilities and utilities as required for the complete and proper operation of an on-Site incinerator and associated facility;

4. commissioning and shakedown;

5. completion of a successful Performance Demonstration;

6. operation and maintenance of the approved on-Site incinerator;

7. feeding waste to the incinerator;

8. incineration of contaminated material including but not limited to the following:

    1. soils excavated from the upper two feet of designated grid squares;

    2. sediments excavated from the upper two feet of the East Pond and West Pond;

    3. visibly contaminated soils excavated from the EPA stockpile;

    4. visibly contaminated soils and sediments associated with leaking buried drums/containers excavated from the Areas of Buried Drums;

    5. visibly contaminated soil excavated adjacent to and below existing underground storage tanks;

    6. contents of abandoned incinerator kiln and kiln liner;

    7. laboratory chemicals and drum and soil investigative samples in EPA trailer and storage shed;

    8. laboratory chemicals and drum and soil investigative samples generated during the Works;

9. sludges from incinerator operation;

10. sediments and sludges from sumps in Equipment Decontamination Facility, Waste Preparation Facility and Drum Staging Area;

11. filter media and granular activated carbon (if applicable) from Contractor's wastewater treatment plant and Waste Preparation Facility;

12. drummed/containerized waste removed from Areas of Buried Drums, if applicable;

13. severely contaminated debris; and

14. soils excavated from the upper two feet of Grid Nos. 3-5, 4-5 and 4-6 should performance criteria for thermal treatment of the soils be met in the Performance Demonstration.

9. staging generated ash, and sampling and analysis; and

10. handling and re-incineration of ash residue not in compliance with the specified performance criteria for PAH and PCB concentration.

B. Related Work Specified In Other Sections

The following items of work related to work of this Section are specified in other Sections as noted:

1. Waste Preparation, Section 02003;

2. Air Modelling, Section 02002; and

3. Sampling and Characterization, Section 02001.

C. Supplied By Trust

The following items will be supplied by the Trust for incorporation into the work by the Contractor:

1. 35 gallons per minute of water will be provided for the Contractor's use from the Trust's groundwater treatment plant. Water will be provided from a point shown on the Drawings. The water will meet the criteria provided in Attachment 4. The Contractor shall treat and polish the water as necessary to meet the requirements of the incinerator. The Contractor shall make provisions for the immediate supply of process water should the supply of water from the Trust's groundwater Treatment plant be temporarily suspended.

   The Contractor shall provide sufficient on-Site storage capacity such that stoppage of the thermal treatment process, when the Trust's provision of water has been suspended, does not occur. The Trust shall not be responsible for any delays or start-up costs associated with the suspension or resumption of water supply.

1.02 QUALITY ASSURANCE

Quality assurance shall be in accordance with the Contractor's Site-specific Quality Assurance Project Plan (QAPP) and Thermal Treatment Unit Quality Assurance Project Plan approved by the Engineer, USEPA and OEPA.

1.03 SUBMITTALS

A. General

The Contractor shall comply with Section 01300.

All submittals associated with the incinerator requiring the approval of the USEPA and OEPA shall be coordinated through the Engineer.

B. USEPA and OEPA Submittal Requirements

The Contractor shall be responsible for supplying all necessary information concerning the incinerator operations in appropriate form to ensure compliance with applicable USEPA and OEPA requirements.

Information submitted shall be sufficient to demonstrate or allow a proper evaluation of the ability of the incinerator to comply with the applicable performance standards of 40 CFR 264, 40 CFR 50, 40 CFR 52, 40 CFR 761, OAC 3745, the USEPA Hazardous Waste Incineration Guidance Series, the requirements specified in this Section and any other regulatory standards which may apply. This information will be reviewed by the Engineer for completeness prior to submission to USEPA and OEPA for their review and approval.

The Contractor shall submit to the Engineer for review and approval within thirty (30) days of the date of Notice to Proceed, except as specified otherwise, Plans and Reports as specified in Clause 1.03.B of this section, to satisfy the requirements specified in "Hazardous Waste Incineration Guidance Series", 40 CFR 264.340 to 264.351 and 40 CFR 270.19. The Engineer will review the Plans and Reports and provide comments within thirty (30) days of receipt by the Engineer. The Contractor shall submit revised Plans and Reports to the Engineer for submission to USEPA and OEPA within seventy five (75) calendar days of the date of Notice to Proceed.

The Contractor shall submit the following:

1. Facilities and Process Information Plan

   The Facilities and Process Information Plan shall include as a minimum, the following:

   1. Component Descriptions and Specifications

      The Contractor shall provide information concerning:

      1. equipment physical size and layout drawings;
      2. specifications including face and insulating refractory specifications; and

3. capacity of equipment as a function of size, weight, quality and feed rate.

The Contractor shall describe the burner or heating capacities of the incinerators (each chamber) and prime movers (pumps and fans) of the incinerator, and shall supply the internal and external dimensions of its major components.

The Contractor shall provide calculations of residence time versus temperature for the waste streams as well as the exhaust gas system.

The Contractor shall provide mass and energy balance calculations for the entire incinerator system and calculations supporting the specified destruction efficiency.

2. Process Flow Diagram

The Contractor shall provide a process flow diagram showing the incinerator and all process equipment associated with the incinerator.

All feed and waste streams for the incinerator and associated facilities shall be designated as to range of flow rate and range of composition and shall be identified by lines and arrows denoting the direction and destination of the flow.

3. Process and Instrumentation Diagram

The Contractor shall provide a process and instrumentation diagram indicating:

1. all process equipment;
2. instrumentation;
3. piping and valves;
4. stacks, vents, dampers and drains;
5. control equipment (including interlocks); and
6. the locations of monitoring and sampling ports.

The process and instrumentation diagram shall include labels and other necessary information to correlate to the process flow diagram.

4. Back-up and Redundancy

The Contractor shall describe provisions that have been made for back-up and redundancy of the incinerator, including but not limited to:

1. feed pumps;
2. burners and air ports;
3. temperature control mechanisms;
4. instrumentation relating to monitoring compliance; and
5. refractory repairs.

The Contractor shall provide a failure mode analysis containing the procedures to be utilized in the event of the occurrence of the contingencies set forth in the analysis.

5. Reliability and Operational History

The Contractor shall describe the operational history of the prototype or unit(s) of similar design and any significant components of the incinerator or ancillary equipment and detail the previous performance supported by operational data if available.

The Contractor shall discuss the types of problems anticipated with the incinerator during the start-up phase of the operation. The Contractor shall also discuss the estimated "down time" that has been historically experienced for the incinerator, including the length of time it will take before the incinerator is fully operational after set up at the Site, the percentage of time the Contractor estimates the incinerator will be fully operative after the initial start-up phase, and the time required to break down and decontaminate the incinerator and remove it from the Site when incineration is completed.

6. Operation Controls

The Contractor shall provide the location and a description of all temperature, pressure, flow measurement, and other instrumentation.

The Contractor shall describe the interlocking systems that are built into the operational control system in narrative form to supplement the process and instrumentation diagram.

7. Material Handling Systems

The Contractor shall provide complete specifications for the waste feed and ash handling systems including the prior operational experience of each system.

The Contractor shall describe the size limitations of the particular wastes to be fed into the incinerator and the methods to be used to prepare the wastes in excess of these limitations.

The Contractor shall describe in detail the feed mechanism(s) of the incinerator including but not limited to:

1. type and size of the equipment to handle various solids and/or liquids;
2. performance specifications of each mechanism;
3. limitations of the feed and removal mechanisms;
4. horsepower requirements;
5. transfer network, including the conveyors, feeders, and rams;
6. description of the mechanisms for isolating the feed and removal trains from the combustion zone;
7. method of charging solid waste to the combustion zone. In the event the charging method is by batch, describe:
    1. size of batch, and
    2. use of containers, if applicable; and
8. discuss the explosion vents for the charging systems.

8. Air Pollution Control Equipment

The Contractor shall provide information on the air pollution control equipment for the incinerator including:

1. description;
2. specifications;
3. drawings; and
4. utility requirements (water [quantity and quality], electricity, compressed air, steam, etc.).

The Contractor shall identify and characterize the air pollution control equipment residues, treatment and ultimate disposal plans for solids, sludges and liquids.

In the event the Contractor proposes the use of a wet scrubber system, complete specifications shall be provided, including, but not limited to:

1. scrubber type;
2. construction materials;
3. design ranges of air and liquid flow rates;
4. location and method of pH and operational controls; and
5. scrubber efficiencies.

The Contractor shall provide a complete description of the scrubber wastewater treatment system (if utilized), including treatment methods to prevent dissolved solids and chlorinated organics build-up in the scrubber water.

The Contractor shall describe disposal methods for spent scrubber water, and other wastewaters and sludges.

9. Mobility

The Contractor shall describe the mobility of the incinerator components with respect to:

1. method of transportation;
2. number of vehicles required; and
3. permits and licensing necessary in order to move the unit.

2. Noise Impacts

The Contractor shall submit to the Engineer a report describing the impact of the incinerator and ancillary equipment upon the surrounding area with respect to the amount of noise generated by the incinerator at a distance of 200 feet from the center of the incinerator at the following octave band frequencies: 31.5, 63, 125, 250, 500, 1,000, 2,000, 4,000, and 8,000 Hertz.

3. Performance Demonstration Plan

The Contractor shall submit a Performance Demonstration Plan to the Engineer. The Performance Demonstration Plan shall address all the substantive technical requirements outlined in 40 CFR 761.7, 40 CFR 270.19 and 40 CFR 270.62 and in due

consideration of Volumes I through VI of the USEPA's Hazardous Waste Incineration Guidance Series. The Performance Demonstration Plan shall be formatted in accordance with the outline in Attachment 5.

The Performance Demonstration Plan shall be designed to establish representative operating conditions for the actual production burn and shall take into consideration the varied waste stream on the Site, and shall include the following information:

1. quantity and type of wastes to be incinerated and the identification of POHCs. The Performance Demonstration Plan shall identify if waste are to be spiked for the Performance Demonstration. The Performance Demonstration Plan shall identify that the Performance Demonstration is to be performed with a PCB concentration of 590 mg/kg in addition to any other POHCs as identified in the Performance Demonstration Plan. The total quantity and expected composition of each test matrix or waste blend to be included in the Performance Demonstration, as well as each matrix or waste blend expected to be incinerated as part of the remedial effort;

2. process parameters to be monitored and locations of sampling points. The analytical program shall include sampling of feed and waste streams for POHCs, metals, PCBs, PAHs, hexachlorobenzene and bis(2-ethylhexyl)phthalate. Stack monitoring and sampling shall incorporate as a minimum the following:

Parameter		Sampling Method
CO, O_2, CO_2	•	Performance Specification in 40 CFR 266 Appendix IX, Section 2.1
Particulate	•	Reference EPA Method 5(1)(3)
Moisture	•	Reference EPA Method 4 (1)(3)
Total Hydrocarbons	•	FID EPA Method 25A (40 FR 37595)
SO_2	•	Reference EPA Method 6(1)(3)
NOx	•	Reference EPA Method 7(1)(3)
Metals	•	Modified Method 5-Multiple Metal Train(2)(3)
HCl	•	Method 5 (2)(3)
PCB	•	Modified Method 5(2)(3)
Dioxins, Furans	•	EPA Modified Method 5, Method 0010, (SVOST) (2)(3)
Volatile Organic (POHCs only)	•	EPA Modified Method 5, Method D030, (VOST) (2)(3)

Base/Neutral-Acid (POHCs only)	•	EPA Modified Method 5, Method 0010, SW846, (SVOST) (2)(3)

Notes:

(1) 40 CFR 60 Appendix A
(2) Test Methods for Evaluating Solid Waste - Physical/Chemical Methods, EPA-Sw846, Third Edition November 1986, Washington, D.C.
(3) During Performance Demonstration Only

3. monitoring and sampling frequency and methods and schedules for monitoring and sample analysis, including those for items noted above; and

4. waste analysis program to identify stack emissions for calculation of PCBs, DRE with respect to POHCs, and ash characteristics with respect to TCLP metals, PCBs, PAHs, hexachlorobenzene and bis(2-ethylhexyl)phthalate (Clause 3.03C of this Section).

4. Performance Demonstration Report

Within twenty one (21) calendar days of completion of the Performance Demonstration the Contractor shall prepare and submit to the Engineer, USEPA and OEPA a Preliminary Performance Demonstration Report (Report) meeting the requirements of 40 CFR 270.62. The Report shall be prepared in due consideration of Volume I through VI of the USEPA Hazardous Waste Incineration Guidance Series. The Engineer will provide comments on the Preliminary Report within thirty (30) calendar days of receipt of the Preliminary Report by the Engineer, and the Contractor shall make changes and additions to the Report as required by the Engineer. The Contractor shall submit the Final Performance Demonstration Report to the Engineer, USEPA and OEPA within seventy-five (75) calendar days of completion of Performance Demonstration.

5. Thermal Treatment Unit Quality Assurance Project Plan (Thermal Treatment Unit QAPP)

The Contractor shall provide an incinerator QAPP for all activities associated with the incinerator in support of the regulatory application. This Plan shall be in accordance with the requirements specified in "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans", document (QAMS-005/80) and Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration EPA/625/6-89/023, January 1990, PB91-145979. The Region V Model QAPP (1991) shall be used by the Contractor to develop the Thermal Treatment Unit QAPP which shall address all data-generating activities including process monitors, controllers, and sampling and analysis activities. The Thermal Treatment Unit QAPP shall also include protocol for analyses of waste feed streams to verify that the feed meets waste feed limits. The implementation of procedures and protocols in the incinerator QAPP shall establish a quality assurance program which will ensure the collection of accurate, reproducible and comparable data to demonstrate operational compliance.

The Thermal Treatment Unit QAPP shall address, as a minimum, the following items:

1. project description;
2. organization and responsibility for quality assurance;
3. quality assurance objectives for each measurement parameter, in terms of accuracy, precision, completeness, representativeness, and comparability;
4. monitoring procedures, including methods and frequencies for each parameter;
5. sampling procedures and frequency for each parameter;
6. sample custody procedure;
7. analytical procedures;
8. specific calibration procedures and frequencies;
9. procedures for data reduction, validation and reporting including reporting deadlines;
10. specific internal quality control checks and frequencies;
11. audit procedures and frequencies;
12. preventive maintenance procedures and frequencies;
13. specific routine procedures to assess accuracy, precision, and completeness;
14. procedures for corrective action; and
15. quality assurance reports.

C. Operations and Maintenance Manual

The Contractor shall prepare an Operations and Maintenance Manual. The Operations and Maintenance Manual shall detail the standard operating procedures of the incinerator, including the following:

1. procedures for the routine operation of the incinerator, including:

    1. drawings showing major components and functions;
    2. equipment manuals; and
    3. spare parts lists;

2. emergency procedures which shall, as a minimum, detail the appropriate response procedures to be undertaken under the circumstances set forth below:

    1. partial or complete stoppage of auxiliary fuel feed to all burners and to only one burner;
    2. partial or complete stoppage of solids feed including jamming of the feed mechanism;
    3. puffing or sudden occurrence of fugitive emissions;
    4. failure of forced air supply to solids feed, burners, and air ports;
    5. combustion temperature too high;
    6. combustion temperature too low;
    7. sudden loss of integrity of refractory lining;
    8. excess opacity of stack plume;
    9. high monitor readings of CO or hydrocarbons in exhaust gases;
    10. indication of failure of induced draft fan;
    11. increase in gas temperature after quench zone;
    12. partial or complete stoppage of water to scrubber;
    13. deposition of solids in scrubber;
    14. pH of scrubber water outside specifications;
    15. failure of demister operation; and
    16. failure of the ash removal system;

3. circumstances which will cause an opening of the emergency combustion by-pass vent, including design calculations indicating the rationale for selection of combustion chamber temperatures and pressures and APCE temperature action level, and also indicating normal operating temperatures and pressures;

4. details of the fugitive emissions monitoring program of the incinerator, including the instrumentation used and frequency of monitoring. The Contractor shall describe the monitoring procedures which will be used and the corrective action procedures which will be implemented to control fugitives emissions. The monitoring program shall include at a minimum, the following areas and any other areas where fugitive emissions may occur:

   1. seals;
   2. piping joint;
   3. ductwork;
   4. valves;
   5. ash removal system;
   6. feed handling system;
   7. quench/scrubber water handling systems; and
   8. volatile emissions from fuel oil tank (if used);

   The Contractor's description of the fugitive emissions program shall include:

   1. description of the parameters to be monitored;
   2. the methods used to determine acceptable levels of these parameters in accordance with requirements;
   3. the steps to be taken when the levels are out of specifications;
   4. preventive measures such as limiting the freefall of feed materials and the use of windscreens, if applicable; and
   5. obtaining appropriate background data;

5. key personnel who will have primary responsibility for operation and maintenance of the incinerator at the Site in the areas set forth below. Each person's job or task function shall be described and detailed resumes for each key person included. In the event the Contractor has not yet selected a person for a specific area, he shall indicate the training and qualifications the prospective employee shall be required to have to qualify for employment in the following areas:

   1. testing/start-up;
   2. operations;
   3. maintenance;
   4. on-Site laboratory (if used);
   5. control room;
   6. air emission testing;
   7. certification of operation of equipment; and
   8. certification of safety of equipment.

6. management and disposal of scrubber water. The plan shall identify expected quantities of scrubber water, blowdown, analytical make-up of the blowdown water, and treatment of the blowdown water including the address of the disposal facility proposed by the Contractor for unsuitable blowdown water should the Contractor not treat this water on Site; and

7. the tasks and frequency thereof for preventive maintenance procedures. Procedures shall be detailed and the down-time for each procedure shall be stated.

The Operations and Maintenance Manual shall be revised as necessary depending on the results of the Performance Demonstration.

D. Ash Handling Plan

The Contractor shall submit to the Engineer an Ash Handling Plan within sixty (60) calendar days of Notice to Proceed. The Engineer will review the Ash Handling Plan and provide comments within fifteen (15) calendar days. The Contractor shall revise and submit the Ash Handling Plan to the Engineer within fifteen (15) calendar days for submission to USEPA and OEPA. The Ash Handling Plan shall outline the following:

1) ash storage container details;

2) methods to reintroduce ash to feed should ash fail organics delisting requirements; and

3) methods and equipment to be utilized to handle the ash should it fail TCLP metals test delisting requirements.

E. Ash Sampling and Analysis Plan

The Contractor shall submit to the Engineer an Ash Sampling and Analysis Plan within sixty (60) calendar days of Notice to Proceed. The Engineer will review the Ash Sampling and Analysis Plan and provide comments within fifteen (15) calendar days. The Contractor shall revise and submit the Ash Sampling and Analysis Plan to the Engineer within fifteen (15) calendar days for submission to USEPA and OEPA. The Ash Sampling and Analysis Plan shall, at minimum, contain the following information:

1) ash sampling frequencies and methods;

2) ash analysis test methods and contracted laboratory;

3) sampling and analysis scheduling and sequencing; and

4) record keeping and logging of ash batches.

F. Consolidated Waste Sampling and Analysis Plan

The Contractor shall submit to the Engineer for review and approval within sixty (60) calendar days of the date of Notice to Proceed a Consolidated Waste Sampling and Analysis Plan describing methodology to be used to sample consolidated waste prior to feeding to the incinerator and analytical protocol, for purposes of verifying that the waste feed stream complies with approved feed limitations.

G. Thermal Treatment Unit Closure Plan

The Contractor shall submit a Thermal Treatment Unit Closure Plan to the Engineer for approval within sixty (60) calendar days of the date of Notice to Proceed. The Engineer will review the Thermal Treatment Unit Closure Plan and provide comments within fifteen (15) calendar days. The Contractor shall revise and submit the Thermal

Treatment Unit Closure Plan to the Engineer within fifteen (15) calendar days for submission to USEPA and OEPA. The plan shall include the following as a minimum:

1. procedures to be utilized for decontamination of incinerator components;
2. test methods for verification of decontamination;
3. time required for decontamination and removal from the Site; and
4. the disposition of wastes generated from incinerator decontamination.

H. Combustion Gas By-Pass Vent Emergency Opening

The Contractor shall notify the Engineer immediately of a combustion by-pass vent emergency opening. A report shall be prepared with 24 hours describing the circumstances of the opening, the process parameters, temperatures of combustion chambers, waste feed rate, waste description and any other information necessary to describe the release as requested by the Engineer.

I. Design Drawings and Certification

The Contractor shall submit to the Engineer within thirty (30) calendar days of the date of Notice to Proceed documentation bearing the seal of a Professional Engineer certifying that the incinerator has been designed and fabricated in accordance with all applicable regulations and codes and good engineering practice.

J. Other Documentation

The Contractor shall submit to the Engineer the documentation and information listed below:

1. weekly reports of sources of wastewater and quantities generated by each source, and method of handling/disposal of wastewater from each generating source;

2. laboratory analytical data; and

3. any other data of a reasonable nature requested by the Engineer.

1.04 JOB CONDITIONS

A. Existing Conditions

(1) General

The Trust will provide to the Contractor a location at the Site as shown on the Drawings on an "as-is-where-is" basis for the purposes of on-Site incineration.

(2) Health and Safety

All activities associated with the incinerator involving the handling of contaminated or hazardous materials shall be conducted in accordance with the Contractor's approved Site-Specific Health and Safety Plan.

B. Environmental Requirements

The Contractor shall be responsible for providing and operating an incinerator capable of continuous year round operation in accordance with all Federal and State regulations.

C. Sequencing and Scheduling

The Contractor shall be responsible for sequencing and scheduling the Works in accordance with specified requirements subject to the following conditions:

1. the incinerator operation prior to and following the completion of the Performance Demonstration shall be subject to the provisions of 40 CFR 264.344 (c)(1) and (c)(3), and subject to the approval of USEPA and OEPA.

2. the incinerator and ancillary facilities shall not be installed on Site until submittals in Clause 1.03 of this Section, with the exception of the Performance Demonstration Report have been approved by the Engineer, USEPA and OEPA.

PART 2 - PRODUCTS

2.01 GENERAL

The Contractor shall provide all materials required for the work of this Section including mobilization, set-up, operation, monitoring, maintenance, repair and demobilization of the on-Site incinerator.

Materials shall be selected by the Contractor for the purpose intended, shall be suitable for daily decontamination, shall comply with local codes and shall be subject to the Engineer's approval.

2.02 INCINERATOR AND ASSOCIATED COMPONENTS

A. Operating Requirements

The incinerator shall be capable of meeting or outperforming the following general operating conditions:

1. minimum throughput capacity of 6 tons per hour of contaminated soils and sediments, and 1 ton per hour of approved drummed/containerized waste;

2. continuous operation at a minimum capacity factor of 0.80;

3. year round operations of incinerator.

In addition, the incinerator shall be capable of operation within the parameters established in the successful Performance Demonstration and specified in the approved Performance Demonstration Report.

B. System Component Design Requirements

(1) General

The design of the incinerator, air pollution control systems and ancillary facilities shall employ the 'best available technology', in accordance with Chapter 3745-31-05(A)(3) of Ohio regulation and 40 CFR 52.21 (b) (12). Guidance documents for evaluating Ohio's' best available technology' are provided in Attachment 6.

(2) Waste Feed System

A waste feed system shall be provided which is capable of conveying contaminated solids separately or in combination (e.g. mixing supplementary fuel with solids to enhance their handling characteristics) to the incinerator.

The feed system capacity shall be consistent with the incinerator capacity and the specified production burn schedule. The feed system shall be designed and operated to prevent the generation of dust, and shall be capable of feeding wastes from the Waste Preparation Facility directly into the incinerator.

The incinerator shall also be equipped with a system for injecting liquid wastes for incineration either separately or concurrently with the solid waste feed.

The feed system shall include the provision for the collection of samples for feed composition and feed rate determination.

The feed system shall include the provision for explosion vents.

(3) Ash Removal System

An ash removal system shall be provided which is capable of removing ash residues resulting from thermal destruction of the wastes specified. The maximum moisture content of the ash upon discharge or following preparation shall be such that the ash may be compacted in accordance with requirements of Section 02220.

The ash removal and handling system capacity shall be consistent with incinerator capacity and the specified remedial schedule.

The ash removal system shall not allow the mixing of any fly ash with the bottom ash until it has been determined whether the ash meets the performance criteria. The blending of ash to meet the performance criteria will not be permitted.

(4) Emergency Combustion Gas By-Pass Vent

Should the incinerator include an emergency combustion gas by-pass vent, the interlock control systems operating the vent shall be designed to open the vent only in case of abnormally high temperatures and/or pressures in the primary or secondary combustion chamber or APCE threatening the incinerator or operators. The interlock control parameter shall be reviewed and approved by the Engineer and USEPA.

(5) Control Room

A control room shall be provided in an enclosure separate from the process equipment. Equipment in the control room shall include process controls and continuous data recording devices for monitoring process performance. Monitoring shall be conducted such that compliance with the performance criteria can be demonstrated. At a minimum, the performance monitoring shall include the following process parameters and such others as may be required in accordance with Federal and State standards and good engineering practices:

1. primary and secondary chamber temperatures and pressures;

2. stack gas and/or scrubber entry gas concentrations of:

    1. oxygen (continuous);
    2. carbon dioxide (continuous);
    3. carbon monoxide (continuous);
    4. total hydrocarbons (continuous);
    5. hydrogen chloride (continuous), if required by trial burn results;
    6. oxides of nitrogen, SO_X; and
    7. backup monitoring for items 1, 2 and 3 above;

3. combustion gas velocity; and

4. waste feed rates.

The control room shall have an automatic control system which:

1. maintains the incinerator operating conditions within acceptable process ranges for:

    1. primary and secondary combustion chamber temperatures;
    2. waste feed rates,
    3. emission gas concentrations for oxygen, carbon monoxide and total hydrocarbon; and
    4. negative pressure within the combustion zone components;

2. will shut down the waste feed system automatically should conditions deviate outside approved and/or normal operating parameters including, but not necessarily limited to, the following:

    1. secondary chamber temperature high or low;
    2. secondary chamber gas retention time high or low;
    3. secondary chamber oxygen level high or low;
    4. forced and induction draft fan off;
    5. primary chamber pressure high;
    6. primary chamber temperature high or low;
    7. feed System cooling water high;
    8. stack carbon monoxide high;
    9 kiln drive off;
    10. loss of fuel to primary or secondary chamber;
    11. failure of forced air system;
    12. sudden increase in stack gas opacity;

13. ash conveying system off;
14. baghouse temperature high;
15. spray chamber temperature high;
16. exceedance of any performance parameter; and
17. air pollution control system failure; and

3. activates combustion gas by-pass if required.

(6) Air Pollution Control System

The air pollution control system shall be capable of controlling gaseous, particulate and aerosol type emissions from the incinerator as required by the performance criteria and by other applicable emission standards.

The air pollution control system shall include an exhaust stack and fan system which meets the USEPA and OEPA standards for Good Engineering Practice. The system shall be designed to prevent exceedance of limits in Clause 3.03 B of this Section and as verified with the air model in Section 02002.

The incinerator shall be maintained at a negative pressure by means of an induced draft fan to prevent fugitive emissions.

(7) Wastewater Treatment System

The Contractor's wastewater treatment system shall be capable of treating incinerator generated scrubber wastewaters to a quality which can be discharged to an off-Site treatment facility or to the drainage ditch at the north-east corner of the Site as approved by the Engineer. In the latter case the discharged water shall meet the treatment standards included in Attachment 4. The Contractor shall obtain all required permits.

(8) Auxiliary Fuel Systems

An auxiliary fuel system shall provide storage capacity and feed capacity as required by the incinerator. The auxiliary fuel system shall have the following design features as a minimum:

1. auxiliary fuel blending with contaminated soils;
2. direct feed to incinerator burners; or
3. any of the above combinations.

(9) Back-Up Power Supply

The incinerator shall include an uninterruptable power supply to provide immediate power to instruments should there be a failure of the primary power supply. A back-up generator shall also be provided which will kick-in automatically in the event of a failure of the primary power supply. The back-up generator shall be sufficient to power, as a minimum, the kiln drive, induction fan, combustion air fan, pumps, lighting and other essential equipment.

(10) Foundations

The incinerator shall be supported on foundations adequate for the purpose intended based on soil groundwater and frost conditions. The Contractor shall

perform all investigations and analyses, at his sole cost, as he deems necessary to determine the foundation conditions for the incinerator. Foundation conditions shall be the Contractor's responsibility.

(11) Mobility

The incinerator shall be comprised of systems which are mobile (components which are trailer mounted) or transportable (components which can be easily shipped and assembled at the Site), or combination thereof and require a minimum of set-up at the Site.

PART 3 - EXECUTION

3.01 PREPARATION

A. Installation

(1) General

The Contractor shall coordinate sufficient Site preparation activities to carry out the incineration.

The Contractor shall provide all labor, materials, design and equipment and do all work necessary for the proper and complete erection and installation of the incinerator and associated facilities.

The incinerator shall be located in the general area shown on the Drawings.

(2) Incinerator Spare Parts

The Contractor shall stock sufficient spare parts which shall be available on Site. The list of spare parts may include:

1. Kiln

    1. pillow block bearings;
    2. rotational drive parts (bearings, gears, chains, rubber tires);
    3. end seals;
    4. variable frequency drive parts (electrical); and
    5. refractory (castable/brick);

2. Electrical

    1. computer parts (circuit boards, etc.);
    2. thermocouples and thermocouple wire (temperature, flow, pressure);
    3. processor controller parts (circuit boards);
    4. process logic controller (PLC parts);
    5. motor starters and relays;
    6. shut down valve kits (Maxon);
    7. miscellaneous spare motors;
    8. load cells for weigh belt;
    9. air monitoring instrument parts (CO, CO_2, O2, HCL, THC);

10. ionizing wet scrubber parts (wires and insulators); and
11. uninterruptable power supply batteries and replacement parts;

3. Mechanical

1. air compressor parts;
2. electric power generator parts;
3. hydraulic hoses and parts for system;
4. burner tips and guns;
5. fuel pump impeller;
6. spare miscellaneous pumps;
7. boiler tubes; and
8. packing to treating systems (Tellerates);

4. Other Equipment

1. conveyor belts and repair kits;
2. combustion air fan rotor;
3. induced draft fan rotor;
4. bags for bag house;
5. spray nozzles for the quench and spray dryer absorber;
6. ash and slag handling parts (flights, bearings, chains, motors);
7. drum elevator parts;
8. drum and solids shredder rotary cutters (blades); and
9. hydraulic hoses, pressure switches, belts and clutch parts.

(3) Utilities and Utility Connections

The Contractor shall provide all utilities in accordance with all applicable codes and utility company requirements.

(4) Foundations

The Contractor shall construct all foundations as required for the incinerator.

(5) Surface Preparation

The Contractor shall prepare the area to receive the incinerator and associated facilities including but not limited to removal of vegetation and topsoil, grading the area to suit his requirements, and as approved by the Engineer, balancing cut and fill quantities.

(6) Other Items

Without limiting the generality of the foregoing, the Contractor shall provide all other items necessary for Site work to mobilize, erect, maintain, operate and remove the incinerator.

B. Commissioning

Following completion of the installation of the incinerator, the Contractor shall implement an initial operation test in accordance with the procedures developed by the Contractor and approved by the Engineer, USEPA and OEPA and as hereinafter provided:

1. each part of the incinerator shall be tested by the Contractor as soon as possible after its installation in accordance with approved procedures, and the Contractor shall make any adjustments required;

2. when installation of the total facility is complete, including individual component or system testing, the Contractor shall conduct an initial trial operation of each system and shall make adjustments to each system until each system has completed its required initial operation period;

3. such trial operation testing shall be performed at no load and a complete check shall be made, including its mechanical operation, alignment, clearance and rigidity;

4. during trial operation, all components shall be checked for mechanical operation as well as for overload and undue vibration. Any necessary readjustments or alterations of the components or systems shall be made to enable the components or systems to fulfill the specification under full load operation; and

5. the Contractor shall provide the Engineer with at least two (2) working days notice of intention to commence any initial trial operation testing of the incinerator.

C. Performance Demonstration

After successful commissioning of the incinerator and upon approval of the Contractor's Performance Demonstration Plan by USEPA and OEPA, the Contractor shall perform a Performance Demonstration (consisting of a series of tests, as applicable) in accordance with the approved Performance Demonstration Plan to meet the requirements of the USEPA and OEPA.

The Contractor shall submit results of the Performance Demonstration in a Performance Demonstration Report to the Engineer, USEPA and OEPA for review.

The Engineer, the USEPA and the OEPA will review the Performance Demonstration Report and determine if acceptable performance and operating parameters were achieved as follows:

1. if acceptable performance and operating parameters were achieved, the Engineer, USEPA and OEPA will approve full-scale operation contingent on the specified operating conditions as developed from the Performance Demonstration and approved by the USEPA and OEPA; and

2. if acceptable performance and operating parameters were not achieved for RCRA waste, the Engineer and USEPA will not approve the incinerator for full-scale operation. The results of the Performance Demonstration shall be analyzed and causes of deficiencies evaluated. The Contractor shall make the required changes to the incinerator or his operational procedures to bring the incinerator in compliance with the specified performance and operating parameters. Additional Performance Demonstrations shall then be performed by the Contractor at no additional cost to the Trust. Upon successful completion, the Engineer will approve full-scale operation contingent on the specified operating conditions as developed from the successful Performance Demonstration and approved by USEPA and OEPA. The Contractor shall be allowed only three unacceptable Performance Demonstrations at which point the Contract may be terminated by the Trust at no

additional cost to the Trust. Unacceptable Performance Demonstrations shall be at no additional cost to the Trust.

3. if acceptable performance parameters were not achieved for PCBs, soils from Grids Nos. 3-5, 4-5 and 4-6 shall not be treated on-Site and shall be excavated and transported off Site to a TSCA permitted facility, in accordance with Section 02098.

D. Interim Operation

Within thirty (30) calendar days of submission of an approvable (as determined by the Engineer) Preliminary Performance Demonstration Report and upon written notice of the Engineer, the Contractor shall commence interim operation of the incinerator.

3.02 INSPECTION

The Contractor shall notify the Engineer five (5) calendar days in advance of his intention to commence any activity at the Site that requires attendance by the Engineer as hereinafter provided.

Activities requiring attendance by the Engineer include but are not necessarily limited to the following:

1. initial trial operation testing;
2. Performance Demonstration;
3. initiation of interim or full scale burn; and
4. scheduled maintenance shutdowns.

3.03 PERFORMANCE

A. On-Site Incineration

The Contractor shall operate and maintain the incinerator and conduct all work required to process contaminated soils, sediments, drummed/containerized waste and contaminated debris. Performance, operation and monitoring shall comply with the performance criteria in this Section, the approved operating conditions based on the successful Performance Demonstration and detailed in the USEPA and OEPA approved final Performance Demonstration Report, and the procedures in the approved incinerator Operations and Maintenance Manual.

B. Performance Criteria

(1) General

The incinerator shall treat soil, sediment and waste to the criteria specified herein. The following criteria shall apply as a minimum:

1. the generated flyash and bottom ash shall individually have a residual organic compound content such that:

$$14.85 > [PCB] \times CSF_{PCB} + [PAH] \times CSF_{PAH} + [HEX] \times CSF_{HEX} + [BIS] \times CSF_{BIS}$$

where:

[PCB]	is the sum of the concentrations of all congenors of polychlorinated biphenyl in parts per million (ppm)
[PAH]	is the individual concentration of each carcinogenic* polynuclear aromatic hydrocarbons in ppm.
[HEX]	is the concentration of hexachlorobenzene in mg/kg.
[BIS]	is the concentration of bis(2-ethylhexyl)phthalate in mg/kg.
CSF_X	is the current cancer slope factor for the four individual chemical based on the USEPA Integrated Risk Information System and Health Effects Assessment Summary Tables. The CSF for PAHs shall employ the CSF for benzo(a)pyrene.

*Carcinogenic PAHs: fluorothene, benzo(b)fluorothene, benzo(k)fluorothene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene and dibenzo(a,h)anthracene

2. stack air emissions when feeding RCRA POHC shall have concentrations of less than 0.1 g/kg of the RCRA POHC introduced into the incinerator to obtain a DRE of at least 99.99%, in accordance with 40 CFR 264.343(a)(1).

3. stack particulate emissions shall be less than 180 mg/dscm (0.08 gr/dscf) when corrected to 7% oxygen, in accordance with 40 CFR 264.343(2)(c).

4. stack emissions of more than 1.8 kg/hr (4 lbs/hr) of hydrogen chloride (HCl) shall be controlled such that the HCl emission rate is no greater than the larger of either 1.8 kg/hr or 1% of the HCl in the stack gas prior to entering any pollution control equipment (99% removal efficiency), in accordance with 40 CFR 264.343(b).

5. the emission of metals shall not exceed levels as calculated based on the air model specified in Section 02002 based on a total additional lifetime cancer risk not exceeding 1×10^{-5}, adjusted up by 70 years/duration of project in years for carcinogenic compounds and a Hazard Index not exceeding 1.0.

6. average stack emissions of carbon monoxide must not exceed 100 ppm by volume calculated as the rolling average of the last 60 readings over an hour corrected to 7 percent oxygen in accordance with the guidelines in the USEPA Hazardous Waste Incineration Guidance Series.

7. sound levels at 200 feet from the incinerator shall not exceed 60 dB, or 10dB more than background levels at any property line.

8. the incinerator and air pollution control equipment shall be operated to prevent exceedances of Natural Ambient Air Quality Standards, New Source Performance Standards, National Emission Standards for Hazardous Air Pollutants, Prevention of Significant Deterioration and OEPA (Threshold Limit Values (ACGIH) divided by 70) requirements.

The Contractor shall identify and ensure compliance with any other criteria which may apply including applicable Federal, State, and local regulations and standards.

(2) Soils from Grid Nos. 3-5, 4-5 and 4-6

When incinerating soils from Grid Nos. 3-5, 4-5 and 4-6, the following performance criteria shall apply:

1. all performance criteria specified in Clause 3.03.B.1 of this Section;

2. combustion efficiency shall be at least 99.9 percent computed as follows:

$$\text{Combustion Efficiency} = \frac{\text{Concentration of } CO_2}{\text{Concentration of } CO_2 + CO} \times 100$$

If emissions contain non-detectable concentrations of PCB in the stack, based on USEPA sampling Method 0010 (Modified Method 5) collecting 100 cubic feet of emissions, extraction Method 3540 and analytical Method 8080, the soil from the grids shall be treated on Site.

Soil or that portion of the soil which cannot be treated to the specified criterion shall be transported off Site and disposed at an approved TSCA permitted secure landfill in accordance with Section 02098.

C. Ash Residue Characterization and Staging

The Contractor shall immediately place bottom ash in the Ash Staging Area upon exit from the incinerator. Fly ash shall be placed in roll-off boxes and kept separate from bottom ash. Roll-off boxes containing ash shall be securely sealed with tarpaulins.

Prior to ash characterization, bottom ash and fly ash shall not be mixed. Upon completion of characterization, similar materials may be combined for disposal as approved by the Engineer.

Staged ash will be sampled and analyzed by the Contractor for PCB and PAHs to verify that performance criteria have been met and for TCLP metals.

D. Ash Residue Disposition

Ash classified as hazardous based on TCLP metal concentrations shall remain in the Ash Staging Area pending direction by the Engineer.

Ash not meeting the PCB and PAH requirements shall be reintroduced into the incinerator for retreatment by the Contractor at no additional cost to the Trust.

Ash which is classified non-hazardous and satisfies the ash PCB and PAH criteria shall be used as backfill material in accordance with Section 02220.

E. Incinerator Generated Wastewater and Sludges

Sludges generated by the on-Site incinerator operations shall be incinerated on Site. Wastewater generated by the incinerator shall be treated by the Contractor on Site to the discharge criteria in Attachment 4. Incinerator wastewater may not be treated at the Trust's Groundwater Treatment Plant. Alternatively, wastewater may be removed off Site to a TSD in accordance with Section 02098.

Water generated by the incinerator shall be tested by the Contractor in accordance with the requirements of the TSD at the Contractor's sole expense.

No separate measurement or payment will be made for the handling and disposal of incinerator generated water and sludges as they are considered incidental to the operation of the incinerator.

F. Closure of the Incinerator

The Contractor shall decommission and dismantle the incinerator by steam cleaning the interior and exterior of the incinerator, in accordance with the approved Incinerator Closure Plan. Also, in accordance with the approved Incinerator Closure Plan, the Contractor shall:

1. decontaminate incinerator components prior to removal from the Site; and
2. verify decontamination as being complete.

For purposes of this Contract, all components of the incinerator shall be deemed to be contaminated unless Contractor-provided tests indicate otherwise.

Wastes generated during decommissioning shall be disposed of in accordance with all applicable Federal and State regulations at facilities approved by the Engineer. Wastewater from decommissioning shall be disposed of in accordance with Clause 16 of Section 01500.

PART 4 - MEASUREMENT AND PAYMENT

4.01 SUBMITTALS

Payment for submittals will be made at the lump sum price stipulated in the Schedule of Prices for Item K-1, which price and payment shall be full compensation for the preparation, submission, and revision as required, of submittals including the information required for Facilities Process Information, Performance Demonstration Plan, Performance Demonstration Report, Incinerator Quality Assurance Project Plan, Incinerator Operations and Maintenance Manual and the Incinerator Closure Plan; Ash Handling Plan, Ash Sampling and Analysis Plan, Noise Impacts, Design Drawings and Certification; and all other miscellaneous items for which separate payment is not provided under other Items.

4.02 MOBILIZATION AND SET-UP OF INCINERATOR AND ASSOCIATED FACILITIES

Payment for mobilization and set-up of the incinerator and associated facilities will be made at the lump sum price stipulated in the Schedule of Prices for Item K-2 which price and payment shall be full compensation for the supply of all labor, equipment, plant and materials and doing all work required for preparing of incinerator site; site grading; installing of

foundation; connecting to all utilities; mobilizing to Site and setting-up of the incinerator, waste feed system, control room, air pollution control systems, wastewater treatment equipment and all other facilities associated with the operation of the incinerator; shake down and all other miscellaneous items for which separate payment is not provided under other Items.

4.03 PERFORMANCE DEMONSTRATION

Payment for the completion of a successful Performance Demonstration will be made at the lump sum price stipulated in the Schedule of Prices for Item K-3 which price and payment shall be full compensation for the supply of all labor, materials, plant and equipment and doing all work required to implement and complete a successful Performance Demonstration in accordance with the approved Performance Demonstration Plan; successful completion of the Performance Demonstration; any adjustments or alterations to the facility to achieve required results; repeating the Performance Demonstration, if required, up to two times; and all other miscellaneous items for which separate payment is not provided under other Items.

4.04 ON-SITE INCINERATION OF SOILS AND SEDIMENT (EXCEPT GRID NOS. 3-5, 4-5 AND 4-6)

A. Measurement

Measurement for on-Site incineration of soil and sediment (except Grids Nos. 3-5, 4-5 and 4-6) will be made in tons for the actual weight of soil, sediments, debris, contaminants and moisture incinerated as determined by the Engineer, calculated using weigh records generated at the on-Site weigh scale prior to delivery to the incinerator. Weights will be adjusted for moisture in accordance with Section 02003.

B. Payment

Payment for the quantity determined above, will be made at the unit price per ton stipulated in the Schedule of Prices for Item K-4 which price and payment shall be full compensation for the supply of all labor, materials, plant and equipment and doing all work necessary for operation, maintenance and monitoring the incinerator; transporting soil, sediment and waste to Waste Preparation Facility; preparation of soil, sediment and waste prior to treatment; feeding soil, sediment and wastes; on-Site incineration of soil, sediment and wastes; loading flyash residue in roll-off boxes ; staging bottom ash; and all other miscellaneous items for which separate payment is not provided under other Items.

4.05 ON-SITE INCINERATION OR OFF-SITE LANDFILLING OF SOILS FROM GRIDS NOS. 3-5, 4-5 AND 4-6

A. Measurement

Measurement for on-Site incineration or off-Site landfilling of soils from Grids Nos. 3-5, 4-5 and 4-6 will be made in tons for the actual weight of soil, sediments, debris, contaminants and moisture incinerated or landfilled off-Site as determined by the Engineer, calculated using weigh records generated at the on-Site or off-Site weigh scale for on-Site incineration and off-Site landfilling, respectively. Weights will be adjusted for moisture in accordance with Section 02003 if soil is incinerated on Site.

B. Payment

Payment for the quantity determined above, will be made at the unit price per ton stipulated in the Schedule of Prices for Item K-5 which price and payment shall be full compensation for the supply of all labor, materials, plant and equipment and doing all work necessary for; operation, maintenance and monitoring of the incinerator; soil, sediment and waste preparation prior to incineration; transporting soil, sediment and waste to Waste Preparation Facility; loading and staging fly ash residue in roll-off boxes; staging bottom ash; or landfilling at an off-Site facility; decontaminating haul unit; placarding vehicle; transporting to licensed off-Site landfill; permitting fees; payment of any penalties or fines charged for overloading, improper procedures or otherwise; cleaning up any spilled waste along haul routes; acceptance testing and disposing of soil at off-Site landfill; paying all taxes and disposal fees; and all other miscellaneous items for which separate payment is not provided under other Items.

4.06 DISMANTLING AND DEMOBILIZING INCINERATOR AND ASSOCIATED FACILITIES

Payment for dismantling and demobilizing of incinerator and associated facilities will be made at the lump sum price stipulated with the Schedule of Prices for Item K-6, which price and payment shall be full compensation for the supply of all labor, equipment, plant and materials and doing all work required for dismantling and demobilizing incinerator and associated facilities including Waste Preparation Facility, waste feed systems, control room, air pollution control equipment, wastewater treatment equipment and all other facilities associated with operation of the incinerator; disconnecting utilities; decontamination; and all other miscellaneous items for which separate payment is not provided under other Items.

END OF SECTION

SECTION 02091 - ON-SITE THERMAL DESORPTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included

Work of this Section consists of on-Site thermal desorption as specified and as shown on the Drawings.

The work includes, but is not necessarily limited to, the following:

1. preparation and submission of submittals to the Engineer and the regulatory agencies as specified until approval;

2. provision of all utilities (including but not limited to fuel, water, power) and support facilities necessary for the operation of an on-Site thermal desorber;

3. design, supply and installation and construction of a thermal desorber and associated facilities as specified, including connection to support facilities and utilities as required for the complete and proper operation of an on-Site thermal desorber and associated facility;

4. commissioning and shakedown;

5. completion of a successful Performance Demonstration;

6. operation and maintenance of the approved on-Site thermal desorber;

7. feeding waste to the thermal desorber;

8. thermal desorption of contaminated material including but not limited to the following:

    1. soils excavated from the upper two feet of designated grid squares;

    2. sediments excavated from the upper two feet of the East Pond and West Pond;

    3. visibly contaminated soils excavated from the EPA stockpile;

    4. visibly contaminated soils and sediments associated with leaking buried drums/containers excavated from the Areas of Buried Drums;

    5. visibly contaminated soil excavated adjacent to and below existing underground storage tanks;

    6. contents of abandoned thermal desorber kiln and kiln liner;

    7. laboratory chemicals and drum and soil investigative samples in EPA trailer and storage shed;

8. laboratory chemicals and drum and soil investigative samples generated during the Works;

9. sludges from thermal desorber operation;

10. sediments and sludges from sumps in Equipment Decontamination Facility, Waste Preparation Facility and Drum Staging Area;

11. filter media and granular activated carbon (if applicable) from Contractor's wastewater treatment plant and Waste Preparation Facility;

12. drummed/containerized waste removed from Areas of Buried Drums, if applicable;

13. severely contaminated debris; and

14. soils excavated from the upper two feet of Grid Nos. 3-5, 4-5 and 4-6 should performance criteria for thermal treatment of the soils be met in the Performance Demonstration.

8. collection of condensed liquids desorbed from waste;

9. staging generated ash, and sampling and analysis; and

10. handling and re-thermal desorption of ash residue not in compliance with the specified performance criteria for PAH and PCB concentration.

B. Related Work Specified In Other Sections

The following items of work related to work of this Section are specified in other Sections as noted:

1. Waste Preparation, Section 02003;

2. Air Modelling, Section 02002; and

3. Sampling and Characterization, Section 02001.

C. Supplied By Trust

The following items will be supplied by the Trust for incorporation into the work by the Contractor:

1. 35 gallons per minute of water will be provided for the Contractor's use from the Trust's groundwater treatment plant. Water will be provided from a point shown on the Drawings. The water will meet the criteria provided in Attachment 4. The Contractor shall treat and polish the water as necessary to meet the requirements of the thermal desorber. The Contractor shall make provisions for the immediate supply of process water should the supply of water from the Trust's groundwater treatment plant be temporarily suspended.

The Contractor shall provide sufficient on-Site storage capacity such that stoppage of the Thermal treatment process, when the Trust's provision of water has been suspended, does not occur. The Trust shall not be responsible for any delays or start-up costs associated with the suspension or resumption of water supply.

1.02 QUALITY ASSURANCE

Quality assurance shall be in accordance with the Contractor's Site-specific Quality Assurance Project Plan (QAPP) and Thermal Treatment Unit Quality Assurance Project Plan approved by the Engineer, USEPA and OEPA.

1.03 SUBMITTALS

A. General

The Contractor shall comply with Section 01300.

All submittals associated with the thermal desorber requiring the approval of the USEPA and OEPA shall be coordinated through the Engineer.

B. USEPA and OEPA Submittal Requirements

The Contractor shall be responsible for supplying all necessary information concerning the thermal desorber operations in appropriate form to ensure compliance with applicable USEPA and OEPA requirements.

Information submitted shall be sufficient to demonstrate or allow a proper evaluation of the ability of the thermal desorber to comply with the applicable performance standards of 40 CFR 264, 40 CFR 50, 40 CFR 52, 40 CFR 761, OAC 3745, the USEPA Hazardous Waste Incineration Guidance Series, the requirements specified in this Section and any other regulatory standards which may apply. This information will be reviewed by the Engineer for completeness prior to submission to USEPA and OEPA for their review and approval.

The Contractor shall submit to the Engineer for review and approval within thirty (30) days of the date of Notice to Proceed, except as specified otherwise, Plans and Reports as specified in Clause 1.03.B of this section, to satisfy the requirements specified in "Hazardous Waste Incineration Guidance Series", 40 CFR 264.340 to 264.351 and 40 CFR 270.19. The Engineer will review the Plans and Reports and provide comments within thirty (30) days of receipt by the Engineer. The Contractor shall submit revised Plans and Reports to the Engineer for submission to USEPA and OEPA within seventy five (75) calendar days of the date of Notice to Proceed.

The Contractor shall submit the following:

1. Facilities and Process Information Plan

The Facilities and Process Information Plan shall include as a minimum, the following:

1. Component Descriptions and Specifications

The Contractor shall provide information concerning:

1. equipment physical size and layout drawings;
2. specifications including face and insulating refractory specifications; and
3. capacity of equipment as a function of size, weight, quality and feed rate.

The Contractor shall describe the burner or heating capacities (as applicable) of the thermal desorbers (each chamber) and prime movers (pumps and fans) of the thermal desorber, and shall supply the internal and external dimensions of its major components.

The Contractor shall provide calculations of residence time versus temperature for the waste streams as well as the exhaust gas system.

The Contractor shall provide mass and energy balance calculations for the entire thermal desorber system and calculations supporting the specified destruction efficiency.

2. Process Flow Diagram

The Contractor shall provide a process flow diagram showing the thermal desorber and all process equipment associated with the thermal desorber.

All feed and waste streams for the thermal desorber and associated facilities shall be designated as to range of flow rate and range of composition and shall be identified by lines and arrows denoting the direction and destination of the flow.

3. Process and Instrumentation Diagram

The Contractor shall provide a process and instrumentation diagram indicating:

1. all process equipment;
2. instrumentation;
3. piping and valves;
4. stacks, vents, dampers and drains;
5. control equipment (including interlocks); and
6. the locations of monitoring and sampling ports.

The process and instrumentation diagram shall include labels and other necessary information to correlate to the process flow diagram.

4. Back-up and Redundancy

The Contractor shall describe provisions that have been made for back-up and redundancy of the thermal desorber, including but not limited to:

1. feed pumps;
2. burners and air ports;
3. temperature control mechanisms;
4. instrumentation relating to monitoring compliance; and
5. refractory repairs.

The Contractor shall provide a failure mode analysis containing the procedures to be utilized in the event of the occurrence of the contingencies set forth in the analysis.

5. Reliability and Operational History

The Contractor shall describe the operational history of the prototype or unit(s) of similar design and any significant components of the thermal desorber or ancillary equipment and detail the previous performance supported by operational data if available.

The Contractor shall discuss the types of problems anticipated with the thermal desorber during the start-up phase of the operation. The Contractor shall also discuss the estimated "down time" that has been historically experienced for the thermal desorber, including the length of time it will take before the thermal desorber is fully operational after set up at the Site, the percentage of time the Contractor estimates the thermal desorber will be fully operative after the initial start-up phase, and the time required to break down and decontaminate the thermal desorber and remove it from the Site when thermal desorption is completed.

6. Operation Controls

The Contractor shall provide the location and a description of all temperature, pressure, flow measurement, and other instrumentation.

The Contractor shall describe the interlocking systems that are built into the operational control system in narrative form to supplement the process and instrumentation diagram.

7. Material Handling Systems

The Contractor shall provide complete specifications for the waste feed and a. h handling systems including the prior operational experience of each system.

The Contractor shall describe the size limitations of the particular wastes to be fed into the thermal desorber and the methods to be used to prepare the wastes in excess of these limitations.

The Contractor shall describe in detail the feed mechanism(s) of the thermal desorber including but not limited to:

1. type and size of the equipment to handle various solids and/or liquids;
2. performance specifications of each mechanism;
3. limitations of the feed and removal mechanisms;
4. horsepower requirements;
5. transfer network, including the conveyors, feeders, and rams;
6. description of the mechanisms for isolating the feed and removal trains from the combustion zone;
7. method of charging solid waste to the combustion zone. In the event the charging method is by batch, describe:
    1. size of batch, and
    2. use of containers, if applicable; and
8. discuss the explosion vents for the charging systems.

8. Air Pollution Control Equipment

The Contractor shall provide information on the air pollution control equipment for the thermal desorber including:

1. description;
2. specifications;
3. drawings; and
4. utility requirements (water [quantity and quality], electricity, compressed air, steam, etc.).

The Contractor shall identify and characterize the air pollution control equipment residues, treatment and ultimate disposal plans for solids, sludges and liquids.

In the event the Contractor proposes the use of a wet scrubber system, complete specifications shall be provided, including, but not limited to:

1. scrubber type;
2. construction materials;
3. design ranges of air and liquid flow rates;
4. location and method of pH and operational controls; and
5. scrubber efficiencies.

The Contractor shall provide a complete description of the scrubber wastewater treatment system (if utilized), including treatment methods to prevent dissolved solids and chlorinated organics build-up in the scrubber water.

The Contractor shall describe disposal methods for spent scrubber water, and other wastewaters and sludges.

9. Mobility

The Contractor shall describe the mobility of the thermal desorber components with respect to:

1. method of transportation;
2. number of vehicles required; and
3. permits and licensing necessary in order to move the unit.

2. Noise Impacts

The Contractor shall submit to the Engineer a report describing the impact of the thermal desorber and ancillary equipment upon the surrounding area with respect to the amount of noise generated by the thermal desorber at a distance of 200 feet from the center of the thermal desorber at the following octave band frequencies: 31.5, 63, 125, 250, 500, 1,000, 2,000, 4,000, and 8,000 Hertz.

3. Performance Demonstration Plan

The Contractor shall submit a Performance Demonstration Plan to the Engineer. The Performance Demonstration Plan shall address all the substantive technical requirements outlined in 40 CFR 761.7, 40 CFR 270.19 and 40 CFR 270.62 and in due consideration of Volumes I through VI of the USEPA's Hazardous Waste Incineration Guidance Series. The Performance Demonstration Plan shall be formatted in accordance with the outline in Attachment 5.

The Performance Demonstration Plan shall be designed to establish representative operating conditions for the actual production burn and shall take into consideration the varied waste stream on the Site, and shall include the following information:

1. quantity and type of wastes to be incinerated and the identification of POHCs. The Performance Demonstration Plan shall identify if waste are to be spiked for the Performance Demonstration. The Performance Demonstration Plan shall identify that the Performance Demonstration is to be performed with a PCB concentration of 590 mg/kg in addition to any other POHCs as identified in the Performance Demonstration Plan. The total quantity and expected composition of each test matrix or waste blend to be included in the Performance Demonstration, as well as each matrix or waste blend expected to be incinerated as part of the remedial effort;

2. process parameters to be monitored and locations of sampling points. The analytical program shall include sampling of feed and waste streams for POHCs, metals, PCBs, PAHs, hexachlorobenzene and bis(2-ethylhexyl)phthalate. Stack monitoring and sampling shall incorporate as a minimum the following:

Parameter		Sampling Method
CO, O_2, CO_2	•	Performance Specification in 40 CFR 266 Appendix IX, Section 2.1
Particulate	•	Reference EPA Method 5(1)(3)
Moisture	•	Reference EPA Method 4 (1)(3)
Total Hydrocarbons	•	FID EPA Method 25A (40 FR 37595)
SO_2	•	Reference EPA Method 6(1)(3)
NOx	•	Reference EPA Method 7(1)(3)

Metals	•	Modified Method 5-Multiple Metal Train[(2)(3)]
HCl	•	Method 5 [(2)(3)]
PCB	•	Modified Method 5[(2)(3)]
Dioxins, Furans	•	EPA Modified Method 5, Method 0010, (SVOST) [(2)(3)]
Volatile Organic (POHCs only)	•	EPA Modified Method 5, Method D030, (VOST) [(2)(3)]
Base/Neutral-Acid (POHCs only)	•	EPA Modified Method 5, Method 0010, SW846, (SVOST) [(2)(3)]

Notes:

(1) 40 CFR 60 Appendix A
(2) Test Methods for Evaluating Solid Waste - Physical/Chemical Methods, EPA-Sw846, Third Edition November 1986, Washington, D.C.
(3) During Performance Demonstration Only

3. monitoring and sampling frequency and methods and schedules for monitoring and sample analysis, including those for items noted above; and

4. waste analysis program to identify stack emissions for calculation of PCBs, DRE with respect to POHCs, and ash characteristics with respect to TCLP metals, PCBs, PAHs, hexachlorobenzene and bis(2-ethylhexyl)phthalate (Clause 3.03C of this Section).

4. Performance Demonstration Report

Within twenty one (21) calendar days of completion of the Performance Demonstration the Contractor shall prepare and submit to the Engineer, USEPA and OEPA a Preliminary Performance Demonstration Report (Report) meeting the requirements of 40 CFR 270.62. The Report shall be prepared in due consideration of Volume I through VI of the USEPA Hazardous Waste Incineration Guidance Series. The Engineer will provide comments on the Preliminary Report within thirty (30) calendar days of receipt of the Preliminary Report by the Engineer, and the Contractor shall make changes and additions to the Report as required by the Engineer. The Contractor shall submit the Final Performance Demonstration Report to the Engineer, USEPA and OEPA within seventy-five (75) calendar days of completion of Performance Demonstration.

5. Thermal Treatment Unit Quality Assurance Project Plan (Thermal Treatment Unit QAPP)

The Contractor shall provide an thermal desorber QAPP for all activities associated with the thermal desorber in support of the regulatory application. This Plan shall be in accordance with the requirements specified in "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans",

document (QAMS-005/80) and Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration EPA/625/6-89/023, January 1990, PB91-145979. The Region V Model QAPP (1991) shall be used by the Contractor to develop the Thermal Treatment Unit which shall address all data-generating activities including process monitors, controllers, and sampling and analysis activities. The Thermal Treatment Unit QAPP shall also include protocol for analyses of waste feed storm to verify that the feed meets waste feed limits. The implementation of procedures and protocols in the Thermal Treatment Unit QAPP shall establish a quality assurance program which will ensure the collection of accurate, reproducible and comparable data to demonstrate operational compliance.

The Thermal Treatment Unit QAPP shall address, as a minimum, the following items:

1. project description;
2. organization and responsibility for quality assurance;
3. quality assurance objectives for each measurement parameter, in terms of accuracy, precision, completeness, representativeness, and comparability;
4. monitoring procedures, including methods and frequencies for each parameter;
5. sampling procedures and frequency for each parameter;
6. sample custody procedure;
7. analytical procedures;
8. specific calibration procedures and frequencies;
9. procedures for data reduction, validation and reporting including reporting deadlines;
10. specific internal quality control checks and frequencies;
11. audit procedures and frequencies;
12. preventive maintenance procedures and frequencies;
13. specific routine procedures to assess accuracy, precision, and completeness;
14. procedures for corrective action; and
15. quality assurance reports.

C. Operations and Maintenance Manual

The Contractor shall prepare an Operations and Maintenance Manual. The Operations and Maintenance Manual shall detail the standard operating procedures of the thermal desorber, including the following:

1. procedures for the routine operation of the thermal desorber, including:

    1. drawings showing major components and functions;
    2. equipment manuals; and
    3. spare parts lists;

2. emergency procedures which shall, as a minimum, detail the appropriate response procedures to be undertaken under the circumstances set forth below:

    1. partial or complete stoppage of auxiliary fuel feed to all burners and to only one burner;
    2. partial or complete stoppage of solids feed including jamming of the feed mechanism;
    3. puffing or sudden occurrence of fugitive emissions;
    4. failure of forced air supply to solids feed, burners, and air ports;

5. combustion temperature too high;
6. combustion temperature too low;
7. sudden loss of integrity of refractory lining;
8. excess opacity of stack plume;
9. high monitor readings of CO or hydrocarbons in exhaust gases;
10. indication of failure of induced draft fan;
11. increase in gas temperature after quench zone;
12. partial or complete stoppage of water to scrubber;
13. deposition of solids in scrubber;
14. pH of scrubber water outside specifications;
15. failure of demister operation; and
16. failure of the ash removal system;

3. circumstances which will cause an opening of the emergency combustion gas by-pass vent;

4. details of the fugitive emissions monitoring program of the thermal desorber, including the instrumentation used and frequency of monitoring. The Contractor shall describe the monitoring procedures which will be used and the corrective action procedures which will be implemented to control fugitives emissions. The monitoring program shall include at a minimum, the following areas and any other areas where fugitive emissions may occur:

   1. seals;
   2. piping joint;
   3. ductwork;
   4. valves;
   5. ash removal system;
   6. feed handling system;
   7. quench/scrubber water handling systems; and
   8. volatile emissions from fuel oil tank (if used);

   The Contractor's description of the fugitive emissions program shall include:

   1. description of the parameters to be monitored;
   2. the methods used to determine acceptable levels of these parameters in accordance with requirements;
   3. the steps to be taken when the levels are out of specifications;
   4. preventive measures such as limiting the freefall of feed materials and the use of windscreens, if applicable; and
   5. obtaining appropriate background data;

5. key personnel who will have primary responsibility for operation and maintenance of the thermal desorber at the Site in the areas set forth below. Each person's job or task function shall be described and detailed resumes for each key person included. In the event the Contractor has not yet selected a person for a specific area, he shall indicate the training and qualifications the prospective employee shall be required to have to qualify for employment in the following areas:

   1. testing/start-up;
   2. operations;
   3. maintenance;
   4. on-Site laboratory (if used);
   5. control room;

6. air emission testing;
7. certification of operation of equipment; and
8. certification of safety of equipment.

6. management and disposal of scrubber water. The plan shall identify expected quantities of scrubber water, blowdown, analytical make-up of the blowdown water, and treatment of the blowdown water including the address of the disposal facility proposed by the Contractor for unsuitable blowdown water should the Contractor not treat this water on Site; and

7. the tasks and frequency thereof for preventive maintenance procedures. Procedures shall be detailed and the down-time for each procedure shall be stated.

The Operations and Maintenance Manual shall be revised as necessary depending on the results of the Performance Demonstration.

D. Ash Handling Plan

The Contractor shall submit to the Engineer an Ash Handling Plan within sixty (60) calendar days of the date of Notice to Proceed. The Engineer will review the Ash Handling Plan and provide comments within fifteen (15) calendar days. The Contractor shall revise and submit the Ash Handling Plan to the Engineer within fifteen (15) calendar days for submission to USEPA and OEPA. The Ash Handling Plan shall outline the following:

1) ash storage container details;

2) methods to reintroduce ash to feed should ash fail organics delisting requirements; and

3) methods and equipment to be utilized to handle the ash should it fail TCLP metals test delisting requirements.

E. Ash Sampling and Analysis Plan

The Contractor shall submit to the Engineer an Ash Sampling and Analysis Plan within sixty (60) calendar days of the date of Notice to Proceed. The Engineer will review the Ash Sampling and Analysis Plan and provide comments within fifteen (15) calendar days. The Contractor shall revise and submit the Ash Sampling and Analysis Plan to the Engineer within fifteen (15) calendar days for submission to USEPA and OEPA. The Ash Sampling and Analysis Plan shall, at minimum, contain the following information:

1) ash sampling frequencies and methods;

2) ash analysis test methods and contracted laboratory;

3) sampling and analysis scheduling and sequencing; and

4) record keeping and logging of ash batches.

F. Consolidated Waste Sampling and Analysis Plan

The Contractor shall submit to the Engineer for review and approval within sixty (60) calendar days of the date of Notice to Proceed a Consolidated Waste Sampling and

Analysis Plan describing methodology to be used to sample consolidated waste prior to feeding to the thermal desorber and analytical protocol, for purposes of verifying that the waste feed stream complies with approved feed limitations.

G. Thermal Treatment Unit Closure Plan

The Contractor shall submit a Thermal Treatment Unit Closure Plan to the Engineer for approval within sixty (60) calendar days of the date of Notice to Proceed. The Engineer will review the Thermal Treatment Unit Closure Plan and provide comments within fifteen (15) calendar days. The Contractor shall revise and submit the Thermal Treatment Unit Closure Plan to the Engineer within fifteen (15) calendar days for submission to USEPA and OEPA. The plan shall include the following as a minimum:

1. procedures to be utilized for decontamination of thermal desorber components;
2. test methods for verification of decontamination;
3. time required for decontamination and removal from the Site; and
4. the disposition of wastes generated from thermal desorber decontamination.

H. Combustion Gas By-Pass Vent Emergency Opening

The Contractor shall notify the Engineer immediately of a combustion by-pass vent emergency opening. A report shall be prepared with 24 hours describing the circumstances of the opening, the process parameters, temperatures of combustion chambers (as applicable), waste feed rate, waste description and any other information necessary to describe the release as requested by the Engineer.

I. Design Drawings and Certification

The Contractor shall submit to the Engineer within thirty (30) calendar days of the date of Notice to Proceed documentation bearing the seal of a Professional Engineer certifying that the thermal desorber has been designed and fabricated in accordance with all applicable regulations and codes and good engineering practice.

J. Other Documentation

The Contractor shall submit to the Engineer the documentation and information listed below:

1. weekly reports of sources of wastewater and quantities generated by each source, and method of handling/disposal of wastewater from each generating source;

2. laboratory analytical data; and

3. any other data of a reasonable nature requested by the Engineer.

1.04 JOB CONDITIONS

A. Existing Conditions

(1) General

The Trust will provide to the Contractor a location at the Site as shown on the Drawings on an "as-is-where-is" basis for the purposes of on-Site thermal desorption.

(2) Health and Safety

All activities associated with the thermal desorber involving the handling of contaminated or hazardous materials shall be conducted in accordance with the Contractor's approved Site-Specific Health and Safety Plan.

B. Environmental Requirements

The Contractor shall be responsible for providing and operating an thermal desorber capable of continuous year round operation in accordance with all Federal and State regulations.

C. Sequencing and Scheduling

The Contractor shall be responsible for sequencing and scheduling the Works in accordance with specified requirements subject to the following conditions:

1. the thermal desorber operation prior to and following the completion of the Performance Demonstration shall be subject to the provisions of 40 CFR 264.344 (c)(1) and (c)(3), and subject to the approval of USEPA and OEPA.

2. the thermal desorber and ancillary facilities shall not be installed on Site until submittals in Clause 1.03 of this Section, with the exception of the Performance Demonstration Report have been approved by the Engineer, USEPA and OEPA.

PART 2 - PRODUCTS

2.01 GENERAL

The Contractor shall provide all materials required for the work of this Section including mobilization, set-up, operation, monitoring, maintenance, repair and demobilization of the on-Site thermal desorber.

Materials shall be selected by the Contractor for the purpose intended, shall be suitable for daily decontamination, shall comply with local codes and shall be subject to the Engineer's approval.

2.02 THERMAL DESORBER AND ASSOCIATED COMPONENTS

A. Operating Requirements

The thermal desorber shall be capable of meeting or outperforming the following general operating conditions:

1. minimum throughput capacity of 6 tons per hour of contaminated soils and sediments, and 1 ton per hour of approved drummed/containerized waste;

2. continuous operation at a minimum capacity factor of 0.80;

3. year round operations of thermal desorber.

In addition, the thermal desorber shall be capable of operation within the parameters established in the successful Performance Demonstration and specified in the approved Performance Demonstration Report.

B. System Component Design Requirements

(1) General

The design of the thermal desorber, air pollution control systems and ancillary facilities shall employ the 'best available technology', in accordance with Chapter 3745-31-05(A)(3) of Ohio regulation and 40 CFR 52.21 (b) (12). Guidance documents for evaluating Ohio's' best available technology' are provided in Attachment 6.

(2) Waste Feed System

A waste feed system shall be provided which is capable of conveying contaminated solids separately or in combination (e.g. mixing supplementary fuel with solids to enhance their handling characteristics) to the thermal desorber.

The feed system capacity shall be consistent with the thermal desorber capacity and the specified production burn schedule. The feed system shall be designed and operated to prevent the generation of dust, and shall be capable of feeding wastes from the Waste Preparation Facility directly into the thermal desorber.

The thermal desorber shall also be equipped with a system for injecting liquid wastes for thermal desorption either separately or concurrently with the solid waste feed.

The feed system shall include the provision for the collection of samples for feed composition and feed rate determination.

The feed system shall include the provision for explosion vents.

(3) Ash Removal System

An ash removal system shall be provided which is capable of removing ash residues resulting from thermal destruction of the wastes specified. The maximum moisture content of the ash upon discharge or following preparation shall be such that the ash may be compacted in accordance with requirements of Section 02220.

The ash removal and handling system capacity shall be consistent with thermal desorber capacity and the specified remedial schedule.

The ash removal system shall not allow the mixing of any fly ash with the bottom ash until it has been determined whether the ash meets the performance criteria. The blending of ash to meet the performance criteria will not be permitted.

(4) Control Room

A control room shall be provided in an enclosure separate from the process equipment. Equipment in the control room shall include process controls and continuous data recording devices for monitoring process performance. Monitoring shall be conducted such that compliance with the performance criteria can be demonstrated. At a minimum, the performance monitoring shall include the following process parameters and such others as may be required in accordance with Federal and State standards and good engineering practices:

1. primary and secondary chamber temperatures and pressures;

2. stack gas and/or scrubber entry gas concentrations of:

    1. oxygen (continuous);
    2. carbon dioxide (continuous);
    3. carbon monoxide (continuous);
    4. total hydrocarbons (continuous);
    5. hydrogen chloride (continuous), if required by trial burn results;
    6. oxides of nitrogen, SO_X; and
    7. backup monitoring for items 1, 2 and 3 above;

3. combustion gas velocity; and

4. waste feed rates.

The control room shall have an automatic control system which:

1. maintains the thermal desorber operating conditions within acceptable process ranges for:

    1. primary and secondary combustion chamber temperatures;
    2. waste feed rates,
    3. emission gas concentrations for oxygen, carbon monoxide and total hydrocarbon; and
    4. negative pressure within the combustion zone components;

2. will shut down the waste feed system automatically should conditions deviate outside approved and/or normal operating parameters including, but not necessarily limited to, the following:

    1. secondary chamber temperature high or low;
    2. secondary chamber gas retention time high or low;
    3. secondary chamber oxygen level high or low;
    4. forced and induction draft fan off;

5. primary chamber pressure high;
6. primary chamber temperature high or low;
7. feed System cooling water high;
8. stack carbon monoxide high;
9 kiln drive off;
10. loss of fuel to primary or secondary chamber;
11. failure of forced air system;
12. sudden increase in stack gas opacity;
13. ash conveying system off;
14. baghouse temperature high;
15. spray chamber temperature high;
16. exceedance of any performance parameter; and
17. air pollution control system failure; and

3. activates combustion gas by-pass if required.

(5) Air Pollution Control System

The air pollution control system shall be capable of controlling gaseous, particulate and aerosol type emissions from the thermal desorber as required by the performance criteria and by other applicable emission standards.

The air pollution control system shall include an exhaust stack and fan system which meets the USEPA and OEPA standards for Good Engineering Practice. The system shall be designed to prevent exceedance of limits in Clause 3.03 B of this Section and as verified with the air model in Section 02002.

The thermal desorber shall be maintained at a negative pressure by means of an induced draft fan to prevent fugitive emissions.

(6) Wastewater Treatment System

The Contractor's wastewater treatment system shall be capable of treating thermal desorber generated scrubber wastewaters to a quality which can be discharged to an off-Site treatment facility or to the drainage ditch at the north-east corner of the Site as approved by the Engineer. In the latter case the discharged water shall meet the treatment standards included in Attachment 4. The Contractor shall obtain all required permits.

(7) Auxiliary Fuel Systems

An auxiliary fuel system shall provide storage capacity and feed capacity as required by the thermal desorber. The auxiliary fuel system shall provide direct feed to thermal desorber burners.

(8) Back-Up Power Supply

The thermal desorber shall include an uninteruptable power supply to provide immediate power to instruments should there be a failure of the primary power supply. A back-up generator shall also be provided which will kick-in automatically in the event of a failure of the primary power supply. The back-up generator shall be sufficient to power, as a minimum, the kiln drive, induction fan, combustion air fan, pumps, lighting and other essential equipment.

(9) Foundations

The thermal desorber shall be supported on foundations adequate for the purpose intended based on soil groundwater and frost conditions. The Contractor shall perform all investigations and analyses, at his sole cost, as he deems necessary to determine the foundation conditions for the thermal desorber. Foundation conditions shall be the Contractor's responsibility.

(10) Condensed Liquid Storage

The thermal desorber shall include, if applicable, tanks for the collection of condensed liquids. Tanks shall be leak proof. Sufficient tankage shall be supplied such that incompatible liquids are not stored together.

(11) Mobility

The thermal desorber shall be comprised of systems which are mobile (components which are trailer mounted) or transportable (components which can be easily shipped and assembled at the Site), or combination thereof and require a minimum of set-up at the Site.

PART 3 - EXECUTION

3.01 PREPARATION

A. Installation

(1) General

The Contractor shall coordinate sufficient Site preparation activities to carry out the thermal desorption.

The Contractor shall provide all labor, materials, design and equipment and do all work necessary for the proper and complete erection and installation of the thermal desorber and associated facilities.

The thermal desorber shall be located in the general area shown on the Drawings.

(2) Thermal Desorber Spare Parts

The Contractor shall stock sufficient spare parts which shall be available on Site. The list of spare parts may include:

1. Kiln

    1. pillow block bearings;
    2. rotational drive parts (bearings, gears, chains, rubber tires);
    3. end seals;
    4. variable frequency drive parts (electrical); and
    5. refractory (castable/brick);

2. Electrical

1. computer parts (circuit boards, etc.);
2. thermocouples and thermocouple wire (temperature, flow, pressure);
3. processor controller parts (circuit boards);
4. process logic controller (PLC parts);
5. motor starters and relays;
6. shut down valve kits (Maxon);
7. miscellaneous spare motors;
8. load cells for weigh belt;
9. air monitoring instrument parts (CO, CO_2, O2, HCL, THC);
10. ionizing wet scrubber parts (wires and insulators); and
11. uninterruptable power supply batteries and replacement parts;

3. Mechanical

1. air compressor parts;
2. electric power generator parts;
3. hydraulic hoses and parts for system;
4. burner tips and guns;
5. fuel pump impeller;
6. spare miscellaneous pumps;
7. boiler tubes; and
8. packing to treating systems (Tellerates);

4. Other Equipment

1. conveyor belts and repair kits;
2. combustion air fan rotor;
3. induced draft fan rotor;
4. bags for bag house;
5. spray nozzles for the quench and spray dryer absorber;
6. ash and slag handling parts (flights, bearings, chains, motors);
7. drum elevator parts;
8. drum and solids shredder rotary cutters (blades); and
9. hydraulic hoses, pressure switches, belts and clutch parts.

(3) Utilities and Utility Connections

The Contractor shall provide all utilities in accordance with all applicable codes and utility company requirements.

(4) Foundations

The Contractor shall construct all foundations as required for the thermal desorber.

(5) Surface Preparation

The Contractor shall prepare the area to receive the thermal desorber and associated facilities including but not limited to removal of vegetation and topsoil, grading the area to suit his requirements, and as approved by the Engineer, balancing cut and fill quantities.

(6) Other Items

Without limiting the generality of the foregoing, the Contractor shall provide all other items necessary for Site work to mobilize, erect, maintain, operate and remove the thermal desorber.

B. Commissioning

Following completion of the installation of the thermal desorber, the Contractor shall implement an initial operation test in accordance with the procedures developed by the Contractor and approved by the Engineer, USEPA and OEPA and as hereinafter provided:

1. each part of the thermal desorber shall be tested by the Contractor as soon as possible after its installation in accordance with approved procedures, and the Contractor shall make any adjustments required;

2. when installation of the total facility is complete, including individual component or system testing, the Contractor shall conduct an initial trial operation of each system and shall make adjustments to each system until each system has completed its required initial operation period;

3. such trial operation testing shall be performed at no load and a complete check shall be made, including its mechanical operation, alignment, clearance and rigidity;

4. during trial operation, all components shall be checked for mechanical operation as well as for overload and undue vibration. Any necessary readjustments or alterations of the components or systems shall be made to enable the components or systems to fulfill the specification under full load operation; and

5. the Contractor shall provide the Engineer with at least two (2) working days notice of intention to commence any initial trial operation testing of the thermal desorber.

C. Performance Demonstration

After successful commissioning of the thermal desorber and upon approval of the Contractor's Performance Demonstration Plan by USEPA and OEPA, the Contractor shall perform a Performance Demonstration (consisting of a series of tests, as applicable) in accordance with the approved Performance Demonstration Plan to meet the requirements of the USEPA and OEPA.

The Contractor shall submit results of the Performance Demonstration in a Performance Demonstration Report to the Engineer, USEPA and OEPA for review.

The Engineer, the USEPA and the OEPA will review the Performance Demonstration Report and determine if acceptable performance and operating parameters were achieved as follows:

1. if acceptable performance and operating parameters were achieved, the Engineer, USEPA and OEPA will approve full-scale operation contingent on the specified operating conditions as developed from the Performance Demonstration and approved by the USEPA and OEPA; and

2. if acceptable performance and operating parameters were not achieved for RCRA waste, the Engineer and USEPA will not approve the thermal desorber for full-scale operation. The results of the Performance Demonstration shall be analyzed and causes of deficiencies evaluated. The Contractor shall make the required changes to the thermal desorber or his operational procedures to bring the thermal desorber in compliance with the specified performance and operating parameters. Additional Performance Demonstrations shall then be performed by the Contractor at no additional cost to the Trust. Upon successful completion, the Engineer will approve operation contingent on the specified operating conditions as developed from the successful Performance Demonstration and approved by USEPA and OEPA. The Contractor shall be allowed only three unacceptable Performance Demonstrations at which point the Contract may be terminated by the Trust at no additional cost to the Trust. Unacceptable Performance Demonstrations shall be at no additional cost to the Trust.

3. if acceptable performance parameters were not achieved for PCBs, soils from Grids Nos. 3-5, 4-5 and 4-6 shall not be treated on-Site and shall be excavated and transported off Site to a TSCA permitted facility, in accordance with Section 02098.

D. Interim Operation

Within thirty (30) calendar days of submission of an approvable (as determined by the Engineer) Preliminary Performance Demonstration Report and upon written notice of the Engineer, the Contractor shall commence interim operation of the thermal desorber. Interim operation shall be at a rate approved by USEPA and OEPA.

3.02 INSPECTION

The Contractor shall notify the Engineer five (5) calendar days in advance of his intention to commence any activity at the Site that requires attendance by the Engineer as hereinafter provided.

Activities requiring attendance by the Engineer include but are not necessarily limited to the following:

1. initial trial operation testing;
2. Performance Demonstration;
3. initiation of interim or full scale burn; and
4. scheduled maintenance shutdowns.

3.03 PERFORMANCE

A. On-Site Thermal Desorption

The Contractor shall operate and maintain the thermal desorber and conduct all work required to process contaminated soils, sediments, drummed/containerized waste and contaminated debris. Performance, operation and monitoring shall comply with the performance criteria in this Section, the approved operating conditions based on the successful Performance Demonstration and detailed in the USEPA and OEPA approved final Performance Demonstration Report, and the procedures in the approved thermal desorber Operations and Maintenance Manual.

B. Performance Criteria

(1) General

The thermal desorber shall treat soil, sediment and waste to the criteria specified herein. The following criteria shall apply as a minimum:

1. the generated flyash and bottom ash shall individually have a residual organic compound content such that:

$$14.85 > [PCB] \times CSF_{PCB} + [PAH] \times CSF_{PAH} + [HEX] \times CSF_{HEX} + [BIS] \times CSF_{BIS}$$

where:

[PCB] is the sum of the concentrations of all congenors of polychlorinated biphenyl in parts per million (ppm)

[PAH] is the individual concentration of each carcinogenic* polynuclear aromatic hydrocarbons in ppm.

[HEX] is the concentration of hexachlorobenzene in mg/kg.

[BIS] is the concentration of bis(2-ethylhexyl)phthalate in mg/kg.

CSF_x is the current cancer slope factor for the four individual chemical based on the USEPA Integrated Risk Information System and Health Effects Assessment Summary Tables. The CSF for PAHs shall employ the CSF for benzo(a)pyrene.

*Carcinogenic PAHs: fluorothene, benzo(b)fluorothene, benzo(k)fluorothene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene and dibenzo(a,h)anthracene

USEPA and OEPA may re-evaluate residual organic criteria following completion of the Performance Demonstration.

2. stack air emissions when feeding RCRA POHC shall have concentrations of less than 0.1 g/kg of the RCRA POHC introduced into the thermal desorber to obtain a DRE of at least 99.99%, in accordance with 40 CFR 264.343(a)(1).

3. stack particulate emissions shall be less than 180 mg/dscm (0.08 gr/dscf) when corrected to 7% oxygen, in accordance with 40 CFR 264.343(2)(c).

4. stack emissions of more than 1.8 kg/hr (4 lbs/hr) of hydrogen chloride (HCl) shall be controlled such that the HCl emission rate is no greater than the larger of either 1.8 kg/hr or 1% of the HCl in the stack gas prior to entering any pollution control equipment (99% removal efficiency), in accordance with 40 CFR 264.343(b).

5. the emission of metals shall not exceed levels as calculated based on the air model specified in Section 02002 based on a total additional lifetime cancer

risk not exceeding 1×10^{-5}, adjusted up by 70 years/duration of project in years for carcinogenic compounds and a Hazard Index not exceeding 1.0.

6. average stack emissions of carbon monoxide must not exceed 100 ppm by volume calculated as the rolling average of the last 60 readings over an hour corrected to 7 percent oxygen in accordance with the guidelines in the USEPA Hazardous Waste Incineration Guidance Series.

7. sound levels at 200 feet from the thermal desorber shall not exceed 60 dB, or 10dB more than background levels at any property line.

8. the thermal desorber and air pollution control equipment shall be operated to prevent exceedances of Natural Ambient Air Quality Standards, New Source Performance Standards, National Emission Standards for Hazardous Air Pollutants, Prevention of Significant Deterioration and OEPA (Threshold Limit Values (ACGIH) divided by 70) requirements.

The Contractor shall identify and ensure compliance with any other criteria which may apply including applicable Federal, State, and local regulations and standards.

(2) Soils from Grid Nos. 3-5, 4-5 and 4-6

When incinerating soils from Grid Nos. 3-5, 4-5 and 4-6, the following performance criteria shall apply:

1. all performance criteria specified in Clause 3.03.B.1 of this Section;

2. combustion efficiency shall be at least 99.9 percent computed as follows:

$$\text{Combustion Efficiency} = \frac{\text{Concentration of } CO_2}{\text{Concentration of } CO_2 + CO} \times 100$$

If emissions contain non-detectable concentrations of PCB in the stack, based on USEPA sampling Method 0100 (Modified Method 5) collecting 100 cubic feet of emissions, extraction Method 3540 and analytical Method 8080, the soil from the grids shall be treated on Site.

Soil or that portion of the soil which cannot be treated to the specified criterion shall be transported off Site and disposed at an approved TSCA permitted secure landfill in accordance with Section 02098.

C. Ash Residue Characterization and Staging

The Contractor shall immediately place bottom ash in the Ash Staging Area upon exit from the thermal desorber. Fly ash shall be placed in roll-off boxes and kept separate from bottom ash. Roll-off boxes containing ash shall be securely sealed with tarpaulins.

Prior to ash characterization, bottom ash and fly ash shall not be mixed. Upon completion of characterization, similar materials may be combined for disposal as approved by the Engineer.

Staged ash will be sampled and analyzed by the Contractor for PCB and PAHs to verify that performance criteria have been met and for TCLP metals.

D. Ash Residue Disposition

Ash classified as hazardous based on TCLP metal concentrations shall remain in the Ash Staging Area pending direction by the Engineer.

Ash not meeting the PCB and PAH requirements shall be reintroduced into the thermal desorber for retreatment by the Contractor at no additional cost to the Trust.

Ash which is classified non-hazardous and satisfies the ash PCB and PAH criteria shall be used as backfill material in accordance with Section 02220.

E. Thermal Desorber Generated Wastewater and Sludges

Sludges generated by the on-Site thermal desorber operations shall be incinerated on Site. Wastewater generated by the thermal desorber shall be treated by the Contractor on Site to the discharge criteria in Attachment 4. Thermal Desorber wastewater will not be treated at the Trust's Groundwater Treatment Plant. Alternatively, wastewater may be removed off Site to a TSD in accordance with Section 02098.

Water generated by the thermal desorber shall be tested by the Contractor in accordance with the requirements of the TSD at the Contractor's sole expense.

No separate measurement or payment will be made for the handling and disposal of thermal desorber generated water and sludges as they are considered incidental to the operation of the thermal desorber.

F. Condensed Liquids

Condensed liquids, if applicable, shall be transported off-Site and incinerated in accordance with Section 02098.

G. Closure of the Thermal Desorber

The Contractor shall decommission and dismantle the thermal desorber by steam cleaning the interior and exterior of the thermal desorber, in accordance with the approved Thermal Desorber Closure Plan. Also, in accordance with the approved Thermal Desorber Closure Plan, the Contractor shall:

1. decontaminate thermal desorber components prior to removal from the Site; and
2. verify decontamination as being complete.

For purposes of this Contract, all components of the thermal desorber shall be deemed to be contaminated unless Contractor-provided tests indicate otherwise.

Wastes generated during decommissioning shall be disposed of in accordance with all applicable Federal and State regulations at facilities approved by the Engineer. Wastewater from decommissioning shall be disposed of in accordance with Clause 15 of Section 01500.

PART 4 - MEASUREMENT AND PAYMENT

4.01 SUBMITTALS

Payment for submittals will be made at the lump sum price stipulated in the Schedule of Prices for Item L-1, which price and payment shall be full compensation for the preparation, submission, and revision as required, of submittals including the information required for Facilities Process Information, Performance Demonstration Plan, Performance Demonstration Report, Thermal Desorber Quality Assurance Project Plan, Thermal Desorber Operations and Maintenance Manual and the Thermal Desorber Closure Plan; Ash Handling Plan, Ash Sampling and Analysis Plan, Noise Impacts, Design Drawings and Certification; and all other miscellaneous items for which separate payment is not provided under other Items.

4.02 MOBILIZATION AND SET-UP OF THERMAL DESORBER AND ASSOCIATED FACILITIES

Payment for mobilization and set-up of the thermal desorber and associated facilities will be made at the lump sum price stipulated in the Schedule of Prices for Item L-2 which price and payment shall be full compensation for the supply of all labor, equipment, plant and materials and doing all work required for preparing of thermal desorber site; site grading; installing of foundation; connecting to all utilities; mobilizing to Site and setting-up of the thermal desorber, waste feed system, control room, air pollution control systems, wastewater treatment equipment and all other facilities associated with the operation of the thermal desorber; shake down and all other miscellaneous items for which separate payment is not provided under other Items.

4.03 PERFORMANCE DEMONSTRATION

Payment for the completion of a successful Performance Demonstration will be made at the lump sum price stipulated in the Schedule of Prices for Item L-3 which price and payment shall be full compensation for the supply of all labor, materials, plant and equipment and doing all work required to implement and complete a successful Performance Demonstration in accordance with the approved Performance Demonstration Plan; successful completion of the Performance Demonstration; any adjustments or alterations to the facility to achieve required results; repeating the Performance Demonstration, if required, up to two times; and all other miscellaneous items for which separate payment is not provided under other Items.

4.04 ON-SITE THERMAL DESORPTION OF SOILS AND SEDIMENT (EXCEPT GRID NOS. 3-5, 4-5 AND 4-6)

A. Measurement

Measurement for on-Site thermal desorption of soil and sediment (except Grids Nos. 3-5, 4-5 and 4-6) will be made in tons for the actual weight of soil, sediments, debris, contaminants and moisture incinerated as determined by the Engineer, calculated using weigh records generated at the on-Site weigh scale prior to delivery to the thermal desorber. Weights will be adjusted for moisture in accordance with Section 02003.

B. Payment

Payment for the quantity determined above, will be made at the unit price per ton stipulated in the Schedule of Prices for Item L-4 which price and payment shall be full compensation for the supply of all labor, materials, plant and equipment and doing all

work necessary for operation, maintenance and monitoring the thermal desorber; transporting soil, sediment and waste to Waste Preparation Facility; preparation of soil, sediment and waste prior to treatment; feeding soil, sediment and wastes; on-Site thermal desorption of soil, sediment and wastes; loading flyash residue in roll-off boxes ; staging bottom ash; and all other miscellaneous items for which separate payment is not provided under other Items.

4.05 ON-SITE THERMAL DESORPTION OR OFF-SITE LANDFILLING OF SOILS FROM GRIDS NOS. 3-5, 4-5 AND 4-6

A. Measurement

Measurement for on-Site thermal desorption or off-Site landfilling of soils from Grids Nos. 3-5, 4-5 and 4-6 will be made in tons for the actual weight of soil, sediments, debris, contaminants and moisture incinerated or landfilled off-Site as determined by the Engineer, calculated using weigh records generated at the on-Site or off-Site weigh scale for on-Site thermal desorption and off-Site landfilling, respectively. Weights will be adjusted for moisture in accordance with Section 02003 if soil is thermally desorbed on Site.

B. Payment

Payment for the quantity determined above, will be made at the unit price per ton stipulated in the Schedule of Prices for Item L-5 which price and payment shall be full compensation for the supply of all labor, materials, plant and equipment and doing all work necessary for; operation, maintenance and monitoring of the thermal desorber; soil, sediment and waste preparation prior to thermal desorption; transporting soil, sediment and waste to Waste Preparation Facility; loading and staging fly ash residue in roll-off boxes; staging bottom ash; or landfilling at an off-Site facility; decontaminating haul unit; placarding vehicle; transporting to licensed off-Site landfill; permitting fees; payment of any penalties or fines charged for overloading, improper procedures or otherwise; cleaning up any spilled waste along haul routes; acceptance testing and disposing of soil at off-Site landfill; paying all taxes and disposal fees; and all other miscellaneous items for which separate payment is not provided under other Items.

4.06 DISMANTLING AND DEMOBILIZING INCINERATOR AND ASSOCIATED FACILITIES

Payment for dismantling and demobilizing of thermal desorber and associated facilities will be made at the lump sum price stipulated with the Schedule of Prices for Item L-6, which price and payment shall be full compensation for the supply of all labor, equipment, plant and materials and doing all work required for dismantling and demobilizing thermal desorber and associated facilities including Waste Preparation Facility, waste feed systems, control room, air pollution control equipment, wastewater treatment equipment and all other facilities associated with operation of the thermal desorber; disconnecting utilities; decontamination; and all other miscellaneous items for which separate payment is not provided under other Items.

END OF SECTION

SECTION 02098 - TRANSPORTATION AND OFF-SITE DISPOSAL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included

Work of this Section consists of transportation and off-Site disposal of support facilities waste materials as specified and as shown on the Drawings.

The work includes, but is not necessarily limited to, the following:

1. arranging with off-Site facility for disposal of waste;

2. performing any acceptance testing required by the off-site facility;

3. preparing for off-Site transportation and disposal off-Site of the following materials:

    1. sanitary wastewater;
    2. general uncontaminated refuse;
    3. used granular activated carbon;
    4. Thermal Treatment Unit wastewater;
    5. sump, wastewater treatment plant and Thermal Treatment Unit sludges following closing of Thermal Treatment Unit;
    6. soil from Grid Nos. 3-5, 4-5 and 4-6, should performance criteria in Sections 02090 or 02091 not be met;
    7. drummed/containerized waste, if drummed containerized waste cannot be thermally treated on Site; and
    8. condensate from thermal desorber, if applicable;

4. loading and securing waste on transport vehicles;

5. decontaminating vehicles;

6. weighing at nearest off-Site weigh scale;

7. transporting to approved off-Site facility; and

8. disposing and/or treating of waste at off-Site facility.

1.02 SUBMITTALS

A. General

The Contractor shall comply with Section 01300.

B. Transportation and Disposal Proposal

Fourteen days prior to transportation and disposal of material from the Site, the Contractor shall submit a proposal to the Engineer for transportation and disposal of the

materials. The proposal shall include all relevant transporter and disposal facility identifications and status, methods of transportation and disposal, contingency plans for spills during transportation, and schedule for transportation and disposal.

C. Letters of Commitment

Prior to mobilization to the Site, the Contractor shall submit to the Engineer a copy of the letter of commitment from proposed disposal facility for sanitary wastewater, general uncontaminated refuse, used granular activated carbon, Thermal Treatment Unit wastewater and sludges. Letters of committment for PCB soils from Grid Nos. 3-5, 4-5 and 4-6 (if applicable) and drummed containerized waste (if applicable) shall be provided no later than seven (7) calendar days prior to transportation of materials from the Site. Each letter shall state:

1. that the facility is in compliance with specified requirements;

2. that the facility can and will accept the materials proposed for disposal at the facility;

3. any disposal facility restrictions which may cause rejection of transported materials;

4. any additional sampling and analysis of materials which are required prior to delivery to the facility; and

5. any restrictions on delivery schedules.

Each facility shall disclose information concerning any existing or imminent corrective action programs which may impact the ability of the facility to accept materials from the Site during performance of this Contract.

D. Operating Licenses and Permits

No later than seven (7) calendar days prior to transportation of materials from the Site, the Contractor shall submit to the Engineer, copies of operating licenses and permits for each proposed transporter as required by Federal, State, and local authorities.

E. Spill and Hazardous Substance Control Plan

The Contractor shall submit a copy of the transporter's spill and hazardous substance control plan for each transporter hauling hazardous substances. The plan shall describe procedures that will be implemented to control the migration of the spilled material and the notification procedures to SNFT and to authorities with jurisdiction over spills.

F. Transportation Routes

No later than seven (7) calendar days prior to transportation of materials from the Site, the Contractor shall submit detailed plans showing the transportation routes which will be used to transport materials to each disposal facility. Transportation routes shall comply with applicable Federal, State, and local regulations.

G. Manifests

Copies of manifests for hazardous materials shall be submitted to the Engineer on standard approved forms and shall include a copy of the manifest generated at the Site and a copy of the manifest signed by the receiving disposal facility.

H. Weigh Scale Receipts

Copies of weigh scale receipts shall be submitted to the Engineer on approved forms and shall be signed by the weigh scale operator or his designated agent and shall include the following:

1. location, date and time of weighing;

2. measured weights;

3. vehicle and container identification; and

4. shipment identification number.

1.03 JOB CONDITIONS

A. Environmental Requirements

The Contractor shall not spill, leak or otherwise release potentially contaminated materials during transport which may cause nuisance or expose the general public to hazardous substances.

When handling materials which are potentially hazardous, the Contractor shall implement measures to suppress and control the generation of dust. These measures shall include, but not be limited to, the use of water spray to suppress dust, the limiting of freefall of materials being loaded and the use of box covers . Measures taken by the Contractor shall be subject to the Engineer's prior approval.

PART 2 - PRODUCTS

2.01 GENERAL

Material required for the work shall be selected by the Contractor subject to the Engineer's approval.

2.02 MATERIALS

A. Containers

Containers, packing material and labels shall comply with Federal, State and local regulations.

B. Polyethylene Sheeting

Polyethylene sheeting shall be continuous sheeting of minimum 0.006 inch (6-mil) thickness fabricated from a single ply of construction grade polyethylene plastic.

PART 3 - EXECUTION

3.01 PREPARATION

The Contractor shall perform all acceptability testing of waste materials as required by and to the satisfaction of the operators of the disposal facilities and Federal and State regulatory agencies prior to transport from the Site. Sampling and analysis protocols shall be subject to the approval of the Engineer. Failure of the Contractor to sample and analyze materials shall not relieve the Contractor of the responsibility of ensuring that transported materials will be accepted by the disposal facility.

The Engineer may perform confirmatory sampling and/or analysis. The Contractor shall not remove materials from the Site which have been sampled by the Engineer and are awaiting analytical results. The Engineer will provide the analytical results to the Contractor upon request.

Any transported material delivered to a disposal facility which is rejected shall be returned to the Site. The cost of transporting materials from the Site to the disposal facility and returning materials to the Site and the subsequent handling of the material on the Site shall be the Contractor's sole expense.

The Contractor shall provide the results of any analyses of contaminated or hazardous material performed by and on behalf of the Contractor to the Engineer.

3.02 INSPECTION

The Contractor shall notify the Engineer sufficiently in advance of his intention to commence activities at the Site that requires attendance by the Engineer as provided hereinafter.

Activities that may require attendance by the Engineer include, but are not necessarily limited to, the following:

1. placement of polyethylene sheeting in transport vehicles/containers;

2. final securement of loaded materials/containers prior to transport from the Site; and

3. decontamination of transport vehicles/containers prior to leaving the Site.

The Contractor shall not cover up any loaded material or containers prior to the Engineer's inspection.

3.03 PERFORMANCE

A. Segregation of Materials

The Contractor shall segregate materials for disposal in accordance with the delivery requirements of the disposal facilities for which the materials are destined.

B. Preparation for Transport

(1) General

Transport vehicles and/or containers delivered to the Site for the transport of contaminated or waste materials shall comply with all applicable Federal, State and local laws and regulations concerning transport of hazardous or waste materials and shall have all required Federal and State licenses and permits prior to delivery to the Site.

In addition, each transport vehicle and container shall be numbered and the number visibly displayed.

(2) Securing of Waste Materials

All hazardous and non-hazardous materials shall be secured in transport vehicles and/or containers in accordance with the regulations governing the transporting of these materials.

(3) Decontamination

Transport vehicles and containers shall be decontaminated after loading and prior to leaving the Site. Special attention shall be paid to the removal of material on the tires and axles of trucks and material on the vehicle resulting from loading operations.

(4) Manifesting Contaminated Materials

The transport of contaminated materials to off-Site disposal facilities shall be documented on appropriate State and/or Federal manifests as required. The Contractor shall prepare and provide the Engineer with copies of manifests and/or other records for each shipment of contaminated materials from the Site. The Contractor shall be responsible for maintaining manifests from the time the manifested materials leave the Site to the time of ultimate disposal. Certificates of disposal/destruction/treatment/recycle issued by the facility shall be submitted to the Engineer following disposal.

(5) Notification

The Contractor shall notify all applicable Federal, State and local representatives of authorities having jurisdiction over the route and mode of transport prior to commencing transport of hazardous or waste materials from the Site.

C. Pre-Transport Weighing

The Contractor shall weigh transport vehicles prior to and after loading at the State certified scale closest to the Site. Weighing operations shall be performed in such a

manner that the net weight of loaded materials can be determined to the satisfaction of the Engineer.

The net weight shall be reported verbally to the Engineer and verbal approval granted from the Engineer prior to commencing transport to the disposal facility. Transport vehicles may be instructed by the Engineer to return to the Site following weighing if loads are determined to be excessively light or heavy.

Written weigh scale receipts shall be submitted to the Engineer within 24 hours of weighing and shall agree with the verbally reported quantity.

D. Transportation

All waste streams generated at the Site shall be transported by the Contractor directly from the Site to the disposal facility approved by the Engineer. The Contractor shall not change either the route or mode of transport after commencing off-Site operations without the Engineer's written approval.

The Contractor shall comply with the applicable requirements of regulatory publications which include, but are not limited to, the following:

1. 40 CFR 262 - Standards Applicable to Generators of Hazardous Waste.

2. 40 CFR 263 - Standards Applicable to Transporters of Hazardous Waste.

3. 49 CFR 171 - General Information Regulations and Definitions.

4. 49 CFR 172 - Hazardous Materials Tables and Hazardous Materials Communications Regulations.

5. 49 CFR 173 - Shippers - General Requirements for Shipments and Packaging.

6. 49 CFR 174 - Carriage by Rail.

7. 49 CFR 174 - Carriage by Water.

8. 49 CFR 177 - Carriage by Public Highway.

Shipments of PCB materials shall be marked and placarded in accordance with 40 CFR 761 and other shipments shall be properly marked and placarded in accordance with all applicable regulatory requirements.

Transport vehicle operators shall be trained in conformance with Federal and State regulations for non-hazardous and hazardous waste haulers.

The Contractor shall cleanup any and all spills or leaks in transit. The Contractor shall only use transporters which have been previously identified and approved by the Engineer for the transport of hazardous materials. Any transporters who have not received prior approval shall be required to provide documentation that they are licensed to transport wastes both in the State of Ohio and for wastes scheduled for facilities outside the State of Ohio, transporters shall be required to provide documentation of licensing in the appropriate States as well as compliance with other applicable Federal laws including DOT requirements.

The Contractor shall not transport contaminated materials from the Site to an intermediate waste storage or transfer facility en route to an approved disposal facility. The only exception shall be for containerized materials which are being transferred from one mode of carrier to another as approved by the Engineer. In such instances, the Contractor shall comply with 40 CFR 263.14. Transfer shall involve only the handling of containers and shall not involve the direct rehandling of contaminated materials.

E. Disposal

(1) General

The Contractor shall make all arrangements with disposal facilities for the receipt and acceptance of contaminated or waste materials removed from the Site unless otherwise specified.

The Contractor shall be responsible for and shall do all work necessary to ensure that contaminated or waste materials removed from the Site are properly prepared and will be accepted by the disposal facility. All costs associated with returning loads to the Site if rejected by a disposal facility for any reason for additional waste handling or removal costs at the disposal facility for any reason, shall be paid directly by the Contractor at no additional cost to the Trust. The Contractor shall dispose of contaminated or waste materials in disposal facilities approved by the Engineer and which are in compliance with all applicable regulations, including:

1. 40 CFR 761 - Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibition;

2. 40 CFR 264 - Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities; and

3. 40 CFR 265 - Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities.

The facility shall be inspected by the appropriate Federal and State officials responsible for the TSCA or RCRA program within six months prior to receipt of contaminated material under this Contract.

The facility shall not have any significant regulatory violations or other environmental conditions that could affect its satisfactory operation or its ability to accept contaminated materials from the Site during performance of the Contract. Such regulatory violations shall include violations under TSCA, RCRA or other Federal or State laws.

The Contractor recognizes that the work under this Contract is being performed under CERCLA and agrees that all disposal and/or treatment facilities used must be in compliance with USEPA's CERCLA Off-Site Policy.

The Contractor shall weigh transport vehicles/containers at approved off-Site disposal facility weigh scales both before and after discharging their contents, and shall provide copies of records of weights to the Engineer. Weight measurements shall be of a comparable precision and accuracy to those taken for completion of hazardous waste shipment manifests.

Such measurements will be used by the Engineer to verify proper delivery of waste materials which have been removed from the Site and delivered to approved disposal facilities. The Engineer will suspend transport operations to an off-Site facility in the event of discrepancy between the net weight as recorded by the State certified scale and the disposal facility scale.

(2) Disposition of Materials

The Contractor shall submit to the Engineer for approval, proposals for the appropriate disposition of all contaminated, hazardous or non-hazardous materials removed from the Site in accordance with applicable regulations. Proposals for disposition of materials shall, as a minimum, include off-Site incineration at approved permitted RCRA/TSCA incinerators for all waste streams at the Site. The Contractor shall be responsible for disposition of materials to approved off-Site facilities including hazardous waste incinerators, secure landfills, sanitary landfills, industrial wastewater treatment facilities, sanitary wastewater facilities and cement kilns.

Non-hazardous, uncontaminated and decontaminated materials shall be disposed of at a sanitary landfill or scrap yard.

The Contractor shall not load materials for transport for disposal without the Engineer's approval. The Contractor shall not cover or otherwise obstruct access to materials to be sampled and analyzed by the Engineer to confirm its appropriate disposition. The Engineer will provide the analytical results of such sampling and analysis to the Contractor upon request.

(3) Granular Activated Carbon Reactivation Facility

The Contractor shall transport spent granular activated carbon to a reactivation facility licensed to accept and reactivate the granular activated carbon. Alternatively, the spent granular activated carbon may be thermally treated on Site at the Contractor's sole cost.

(4) Off-Site Secure Landfill

The Contractor shall dispose of filter media, sump sediments and Thermal Treatment Unit sludges from the Contractor's wastewater treatment system, following closure of the on-Site Thermal Treatment Unit, at a secure landfill approved by the Engineer.

The Contractor shall dispose of soil from the upper two feet of soil from Grid Nos. 3-5, 4-5 and 4-6 at a secure landfill approved by the Engineer if performance criteria in Section 02090 and 02091 are not met. The Contractor shall dispose of drum/containerized waste identified by the Engineer, at a secure landfill, if applicable, approved by the Engineer.

The location of contaminated materials placed within the landfill shall be determined and documented with respect to permanent horizontal and vertical control points.

(5) Sanitary Landfill

The Contractor shall dispose of uncontaminated trash or debris at a sanitary landfill approved by the Engineer. The Contractor shall dispose of drummed containerized waste from the Areas of Buried Drums, as applicable and identified by the Engineer, at a sanitary landfill approved by the Engineer.

The facility shall be permitted to receive solid wastes, other than hazardous wastes, by EPA and/or all other authorities having jurisdiction.

(6) Off-Site Incinerator or Cement Kiln

The Contractor shall dispose of drummed/containerized waste from the Areas of Buried Drums, as applicable and as identified by the Engineer, at a hazardous waste incinerator or cement kiln, approved by the Engineer. Organic condensate (if applicable) from the thermal desorber shall be sent to a hazardous waste incinerator approved by the Engineer. The facilities shall provide the submittals specified in this Section prior to accepting any materials removed from the Site.

The facility shall be USEPA permitted to receive RCRA and/or TSCA wastes as applicable and shall be in compliance with the applicable requirements of 40 CFR 264, 40 CFR 265 and any other regulatory requirements.

(7) Wastewater Treatment Facility

The Contractor shall dispose of wastewater in the underground storage tanks, and Thermal Treatment Unit wastewater if applicable, which cannot be treated on Site, at an industrial wastewater treatment facility approved by the Engineer.

(8) Drum Recycling Facility, Waste Oil Recycling Facility and TSD Facility

The Contractor shall dispose of drums, waste oil and excavated drummed inorganic waste, inorganic condensate from the thermal desorber (if applicable) approved by the Engineer, at facilities approved by the Engineer and in compliance with all applicable regulations, including RCRA, TSCA, USEPA, OEPA, Federal, State and local regulations.

PART 4 - MEASUREMENT AND PAYMENT

4.01 DISPOSAL OF DRUMMED/CONTAINERIZED WASTE FROM AREAS OF BURIED DRUMS

Payment for disposal of drummed/containerized waste from Areas of Buried Drums will be made on an extra work basis, in accordance with Clause Gc.34 of the General Conditions as mutually agreed by the Contractor and the Engineer.

4.02 DISPOSAL OF SOIL FROM GRID NOS. 3-5, 4-5 AND 4-6

Payment for disposal of soil from Grids Nos. 3-5, 4-5 and 4-6 will be made under payment items in Section 02090 or 02091, as applicable.

4.03 DISPOSAL OF CONDENSATE FROM THERMAL

No seperate payment will be made for disposal of condensate from thermal desorber.

4.04 OFF-SITE DISPOSAL OF ALL OTHER WASTE

No separate payment will be made for disposal of miscellaneous waste including sanitary wastewater, general uncontaminated refuse, used granular activated carbon, Thermal Treatment Unit Wastewater, sump, wastewater treatment plant and Thermal Treatment Unit sludges and any other miscellaneous Contractor generated waste.

END OF SECTION

SECTION 02220 - EARTHWORKS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included

Work of this Section consists of earthworks as specified and as shown on the Drawings.

The work includes, but is not necessarily limited to, the following:

1. removing of water from East Pond and West Pond and directing removed water to Trust's on-Site Groundwater Treatment Plant or to Contractor's wastewater treatment plant;

2. excavating soils and sediments designated for thermal treatment (except from Grid Nos. 3-5, 4-5 and 4-6) and stockpiling in Contaminated Soil Staging Area;

3. excavating soils from Grid Nos. 3-5, 4-5 and 4-6 in preparation for off-Site disposal, should performance criteria specified in Section 02090 or Section 02091 not be met during the Performance Demonstration;

4. excavating soils from Grid Nos. 3-5, 4-5 and 4-6 designated for thermal treatment and stockpiling in Contaminated Soil Staging Area, should performance criteria specified in Section 02090 or Section 02091 be met during the Performance Demonstration;

5. excavating soils in existing EPA stockpile, backfilling not visibly contaminated soil on Site, and transporting and stockpiling visibly contaminated soils in the Contaminated Soil Staging Area;

6. excavating soil and rubble from stockpiles as shown on the Drawings to subgrade level and filling on Site;

7. filling on-Site demolition debris;

8. filling on-Site ash meeting criteria in Section 02090 and 02091;

9. grading Site to subgrade levels shown on the Drawings;

10. completing backfilling in Areas of Buried Drums and underground storage tank excavations;

11. providing concrete surround for existing wells and piezometers; and

12. supplying, placing and compacting imported loam fill to provide a 6-inch layer of the final cover.

B. Related Work Specified In Other Sections

The following items of work related to work of this Section are specified in other Sections as noted:

1. Wastewater Treatment, Section 01500.

C. Terminology

'Excavation limits' shall mean areal excavation limits shown on the Drawings to the specified depth or as directed by the Engineer.

'Visibly contaminated soil' shall mean soil which is obviously contaminated as evidenced by discoloration or odor due to leakage or spillage of chemicals.

'Contaminated soil and sediment' shall mean soil and sediment which is designated for thermal treatment as shown on the Drawing.

'Pond' or 'Ponds' shall mean East Pond and West Pond.

1.02 QUALITY ASSURANCE

A. General

Sampling and testing of materials shall not preclude further rejection if they are subsequently determined to lack uniformity or fail to meet the specified requirements.

The Engineer will perform testing as described in Clause 3.04 of this Section, at no cost to the Contractor. The Contractor shall be responsible for testing costs to retest failed areas.

B. Source of Imported Loam Fill

The Contractor shall inform the Engineer of source of imported loam fill to be incorporated into the Works and shall provide access to the source and processed material for the purposes of sampling and testing prior to delivery to the Site. The Contractor shall provide the Engineer with sufficient documentation showing that the source of loam fill complies with the specified requirements for the use of the material.

If in the opinion of the Engineer, loam fill from the proposed source does not meet, or cannot reasonably be processed to meet specified requirements, the Contractor shall obtain an alternate source or demonstrate that loam fill from the source in question can be processed to meet specified requirements.

Should a change of loam fill source be proposed during the Works, the Contractor shall advise the Engineer sufficiently in advance of proposed change to allow sampling and testing.

Acceptance of loam fill at source or failing conduct of sampling and testing at source by the Engineer does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.

1.03 SUBMITTALS

A. General

The Contractor shall comply with Section 01300.

B. Source of Imported Loam Fill

The Contractor shall submit to the Engineer for approval the location of the proposed source of imported loam fill and relevant geotechnical data for the loam fill, at least forty five (45) calendar days prior to commencing transport of materials to the Site.

The Contractor shall provide analyses for grain size, permeability, moisture content, and chemistry (for TCL VOCs, TCL BNAs, pesticides, TAL metals and PCBs in accordance with methods in Clause 3.04C of this Section) of at least three representative samples.

In the event of changes to the approved sources of loam fill during the performance of the Works, the Contractor shall immediately advise the Engineer and shall not bring the material to the Site until the Contractor has provided the Engineer opportunity to inspect the Site, has provided test results as specified and until approved in writing by the Engineer.

C. Excavation Plan

At least thirty (30) calendar days prior to commencement of excavation activities, the Contractor shall submit a detailed Excavation Plan to the Engineer for review and approval to ascertain compliance with the requirements specified.

The Excavation Plan shall, as a minimum, address each of the following items:

1. the equipment and procedures which will be used to perform excavations;
2. the sequencing of excavation and backfill activities;
3. the procedures which will be implemented to prevent contaminant tracking and cross-contamination;
4. procedures which will be used to prevent water from entering excavations; and
5. methods to control dust and VOC emissions from excavation, handling and stockpiling activities.

1.04 PRODUCT DELIVERY AND HANDLING

A. Delivery of Imported Loam Fill

The Contractor shall handle and transport imported loam fill at all times in a manner and with equipment that will prevent segregation or contamination of the loam fill.

B. Storage and Handling of Imported Loam Fill

When necessary, as approved by the Engineer, the Contractor shall stockpile imported loam fill on the Site on grids with soils not designated for treatment, in locations approved by the Engineer.

The Contractor shall ensure that stockpile sites are level, well drained, free of foreign materials, and of adequate bearing capacity to support the weight of the materials to be placed thereon.

The Contractor shall provide and maintain access to stockpile areas and shall stockpile imported loam fill in a manner to prevent segregation.

Equipment and methods of handling material shall be such as to prevent contamination by foreign material, intermixing and segregation.

1.05 JOB CONDITIONS

A. Frozen and Wet Conditions

The Contractor shall make due allowance and provide for excavation of frozen and wet materials. The Contractor shall suspend operations whenever climatic conditions as determined by the Engineer are unsatisfactory for placing fill. After occurrence of heavy rains, the Contractor shall not operate equipment on previously placed materials or in excavations until the materials or in excavations until the material has dried sufficiently to prevent occurrence of excessive disturbance. Claims for additional payment and requests for schedule extensions due to frozen or wet materials by the Contractor will not be accepted by the Engineer.

B. Sequencing and Scheduling

The Contractor shall excavate and backfill areas shown on the Drawings in an approved sequence. Sequencing shall be such as to excavate soils and sediments designated for treatment furthest from the Thermal Treatment Unit first and to progressively excavate towards the Thermal Treatment Unit. Excavation of soils and sediments designated for thermal treatment shall be performed in sequence as follows: Grid 3-1, 1-2, 2-2, 4-3, 6-4, 5-4, 4-4, 5-7, 5-6, 4-7, 4-6, 4-5, 2-6, 2-4, 2-5 and 3-5. Sediments designated for thermal treatment shall be excavated as adjacent contaminated grids are excavated.

Backfilling of grids and Pond where soil/sediment designated for thermal treatment has been excavated shall occur immediately following excavation of such soil/sediment to limit emissions of VOCs, if necessary.

Excavation of soils and sediments in Areas of Buried Drums as shown on the Drawing shall be performed in accordance with Section 02081. Soils and sediments within twenty feet of the perimeter of an Area of Buried Drums shall not be excavated until excavation within the Area of Buried Drums at the perimeter is completed. Backfilling of Areas of Buried Drums and Underground Storage Tank excavations shall be completed to adjacent ground level within such time as to avoid ponding in the excavation.

Regrading of the Site to the subgrade of the final cover and placing of a 6-inch layer of the final imported loam cover shall be sequenced such that completion is progressively from higher areas to lower areas.

C. Protection

When placing or compacting fill or backfill, the Contractor shall not disturb satisfactorily placed materials. The Contractor shall keep surface crowned or sloped to the surfaces drain readily. Immediately prior to the temporary suspension of filling operations, surfaces under construction shall be rolled with a smooth cylindrical roller so as to leave surface free of ruts, depressions or areas that will pond or collect water. Fill or backfill shall also be placed in a manner to avoid damage to wells and piezometers.

PART 2 - PRODUCTS

2.01 GENERAL

A. Sources

Imported materials shall be provided from a source or sources approved by the Engineer. The Contractor shall locate and develop alternate sources, subject to the Engineer's approval, in the event material from previously approved sources fails to comply with material specifications or is exhausted.

B. Unsuitable Imported Material

Imported loam provided by the Contractor shall be free of unsuitable materials as determined by the Engineer. Unsuitable materials shall include the following:

1. material containing roots or organic matter;
2. frozen material or material containing snow or ice;
3. clays which are classified as inorganic clays of high plasticity in accordance with ASTM D2487;
4. organic clays and silts of low strength;
5. swelling clays;
6. trees, stumps, branches and any other wood or lumber;
7. any foreign or artificial material; and
8. hazardous or toxic chemical substances or soils containing hazardous or toxic substances at hazardous or toxic concentrations.

2.02 MATERIALS

A. Native Fill

Native fill for backfilling and grading purposes shall be material approved by the Engineer. Approved material shall mean material that is free of the following unsuitable materials as determined by the Engineer:

1. frozen material or material containing snow or ice; and

2. rocks and lumps of material with dimensions greater than specified layer thickness before compaction.

B. Loam

Fill to be used for the 6 inches of final cover shall be clean, well graded imported sandy loam soil material free of unsuitable material as specified in Clause 2.01.B of this Section. The maximum aggregate size shall be 2 inches measured through any axis and D_{10} (particle size which 10% of particles by mass are smaller than) shall be less than 0.01 mm. The permeability of the sandy loam shall not exceed 1×10^{-4} cm/s.

PART 3 - EXECUTION

3.01 PREPARATION

A. Health and Safety

All work areas where excavation and associated activities are being carried out which disturb or require contact with contaminated soils and sediments as designated on the Drawings shall be defined as a Temporary Exclusion Zone as outlined in Section 01121. An area so classified shall remain as a Temporary Exclusion Zone until backfilled with uncontaminated soils. Vehicles, equipment and personnel shall only enter and exit exclusion zones through the contaminant reduction zone as specified in Section 01121.

B. Notification

Unless otherwise specified, the Contractor shall advise the Engineer a minimum of two working days in advance of excavation and backfilling operations to enable the Engineer to take pre- and post-excavation cross-sections. Where excavation in an area is to include excavation to remove both soil designated for thermal treatment as well as soil designated for removal and backfilling in another area of the Site as part of the regrading operations, the Engineer will take post-excavation cross sections of both stages of excavation.

3.02 INSPECTION

The Contractor shall not allow or cause any of the work performed or installed to be covered up or enclosed by work of this Section prior to required inspections, measurements, tests or approvals by the Engineer.

The Contractor shall obtain approval from the Engineer for completed excavations and previously placed material prior to placement of successive lifts.

3.03 PERFORMANCE

A. Pond Dewatering

Water in the Ponds shall be removed by the Contractor prior to performing excavation or backfilling in the Ponds. Dewatering shall consist of removing standing water from the Ponds and dewatering of Ponds' sediments to two feet below the Ponds' existing bases.

The Contractor shall employ suitable dewatering techniques including, but not limited to, the construction of temporary sumps and drainage ditches. Sediment excavated from below two foot depth for the purpose of dewatering shall be segregated from sediment designated for thermal treatment, and shall be stockpiled on a grid not designated for thermal treatment and returned to the point of excavation at the completion of dewatering and/or excavation.

Water collected from Pond dewatering shall be directed to the Trust's on-Site Groundwater Treatment Plant or the Contractor's wastewater treatment plant in accordance with Clause 15 of Section 01500.

B. Field Measurements

The Contractor shall take measurements during excavation and backfilling to ensure that the limits of excavation and backfilling are not exceeded. Field measurements by the Engineer for payment purposes or otherwise shall in no way relieve the Contractor of the Contractor's responsibility to control excavation and backfilling to the limits defined herein or on the Drawings.

C. Excavation

(1) General

The Contractor shall excavate soils, sediments and associated debris including foundations of structures demolished as specified in Section 02050 to depths and dimensions as shown on the Drawings or as directed by the Engineer.

Excavated soils and sediments designated for thermal treatment shall be loaded directly into haulage units and transported to the Contaminated Soil Staging Area and stockpiled or alternatively transported directly to the Waste Preparation Facility. Where directed by the Engineer, the wet material shall be first stockpiled in the area where or near to where excavated until drained by gravity, as determined by the Engineer. Loading shall be performed in such a manner as to minimize contamination of the exterior of the haulage units and the loading area.

Excavation shall be performed in such a manner that only the excavation bucket and boom will be in contact with contaminated materials.

The Contractor shall notify the Engineer in writing upon completion of an excavation area to permit the Engineer to complete a survey of the base of the excavation.

Excavation tolerances shall be within two (2) inches greater or less than the specified depth, but shall not be uniformly greater or less. Maximum pay limits for excavation and backfilling shall be to the grades and levels shown on the

Drawings. The expense to excavate, backfill, compact and/or thermally treat overexcavated soils and sediments shall be at no additional cost to the Trust.

The Engineer will take field measurement of excavations of soils/sediments designated for treatment after notification from the Contractor that the excavations have been completed.

(2) Soil

Soils and associated buried rubble in grids designated for thermal treatment shall be excavated to a depth of two feet below existing grade, as shown in the Drawings, loaded and transported to the Contaminated Soil Staging Area or directly to the Waste Preparation Facility, as applicable pending on-Site thermal treatment.

Soils from Grid Nos. 3-5, 4-5 and 4-6 shall be excavated to a depth of two feet below existing grade, loaded directly into haulage units and transported to an approved off-Site landfill facility should treatment performance criteria specified in Section 02090 or 02091 not be achieved. Should performance criteria be met soils from Grid Nos. 3-5, 4-5 and 4-6 shall be transported to the Contaminated Soil Staging Area or directly to the Waste Preparation Area, as applicable, pending on-Site thermal treatment.

Soils not designated for thermal treatment shall be excavated to subgrade levels shown on the Drawings, as applicable.

Foundations of demolished structures shall be removed to subgrade level, reduced to manageable size for backfilling and transported to a fill area.

(3) Pond Sediments

The Contractor shall not commence excavation in the Ponds until the Engineer has completed a survey of the base of the Ponds. The Contractor shall notify the Engineer in writing when the base of the Ponds or portion of a Pond are sufficiently dewatered to permit excavation such that the Engineer may survey the base of the Pond.

Sediments in the Ponds shall be excavated to a depth of two feet below existing grade. The existing grade in the Ponds will be surveyed by the Engineer following dewatering.

The Contractor shall excavate sediments, as practical, from the perimeter of the Ponds. Should it be necessary to excavate sediments by establishing excavation equipment within the Pond perimeter, the Contractor shall establish a working base by first excavating sediments designated for thermal treatment, and backfilling with a sufficient quantity of treated soil/sediment or uncontaminated soil to support the Contractor's excavation and haulage units.

(4) Existing Concrete/Rubble/Sediment/Soil Stockpile

The existing concrete/rubble/sediment/soil stockpiles shall be excavated to subgrade levels shown on the Drawings and transported to fill areas.

Any brush, concrete or rubble encountered shall be reduced to a manageable dimension for backfilling.

(5) EPA Stockpile

The existing EPA stockpile shall be excavated in the presence of the Engineer. Visibly contaminated soil shall be segregated, as directed by the Engineer, loaded onto haulage units, transported to the Contaminated Soil Staging Area and stockpiled, or transported to the Waste Preparation Facility. Soil which is not visibly contaminated shall be transported to fill areas.

D. Stockpiling in Contaminated Soil Staging Area

Soil and sediments stockpiled in the Contaminated Soil Staging Area shall be covered during periods of precipitation with polyethylene sheeting to prevent materials from wetting. During periods of dry weather, polyethylene sheeting shall be removed to allow drying.

The Contaminated Soil Staging Area shall be maintained to prevent ponding of water and wetting of stockpiled soil and sediment.

E. Backfilling and Grading

The Contractor shall backfill areas designated for filling with thermally treated soils and sediments, fly ash, thermally treated abandoned incinerator liner and contents, other thermally treated materials, existing stockpiled concrete/rubble/sediment, EPA stockpile soils not visibly contaminated, demolition and cleared/grubbed material and soil in areas designated for cutting as shown on the Drawings. Fill areas also include excavations formed by tank removals (Section 02082) and drum/container removal (Section 02082) following backfilling of not visibly contaminated soils as specified in those sections.

The Contractor shall not proceed with backfilling operations within grids designated for thermal treatment and in Ponds until the excavation area is approved as complete by the Engineer. The Contractor shall not cause excavations to be covered until the Engineer has obtained field measurements.

Areas to be backfilled shall be free from debris and/or water. Wet materials shall be spread out and dried or otherwise stabilized prior to backfilling . Stabilizing agents must be reviewed and approved by the Engineer. Water in areas to be backfilled shall be pumped to the Trust's on-Site groundwater treatment plant or the Contractor's wastewater treatment plant in accordance with Section 01500 prior to commencing backfilling.

Prior to filling around wells and piezometers, the Contractor shall place a concrete well surround as shown on the Drawings.

The Contractor shall fill carefully around monitoring wells or piezometers by placing layers simultaneously on all sides to equalize loading. Heavy compaction equipment shall not operate closer than 3 feet to monitoring wells or piezometers. Backfill shall not be dumped directly against monitoring wells or piezometers. The Engineer will make repairs to any monitoring wells or piezometers damaged during filling operations. The costs of repair/replacement of damaged monitoring wells or piezometers will be charged to the Contractor.

Except as specified otherwise, the Contractor shall place backfill material continuously and in uniform layers not exceeding ten inches compacted thickness up to grades shown on the Drawings. The initial lift of backfill in the Ponds may be placed to a thickness of 24 inches, if necessary, should the excavated surface not be sufficiently stable to support construction equipment.

The Contractor shall compact each layer to the specified density before placing succeeding layers, except for the first 24-inch layer in the Ponds.

Concrete, rubble, cleared /grubbed material and demolition debris shall be placed such that it is not thicker than one foot at any location. Overlying soil shall be placed such that voids between pieces of concrete, rubble and demolition debris are filled. Concrete, rubble and demolition debris shall be placed at least one foot below the base of the final cover.

All equipment which has handled contaminated or potentially contaminated material shall be decontaminated at the decontamination facility prior to being used for backfilling operations.

F. Placing 6-Inch Final Cover

Following placement and compaction of soils to the subgrade level as shown on the Drawings, the Contractor shall place the 6-inch loam final cover over the entire Site, except the Trust's Groundwater Treatment Plant, in a manner to avoid segregation.

G. Compaction

Except as specified otherwise, the Contractor shall compact each layer of fill or backfill placed as specified to achieve at least 90% of maximum dry density determined in accordance with ASTM D698. Soil within the 24-inch lift above the sediments remaining after removal of sediment designated for thermal treatment shall be compacted by the best possible effort. Soil immediately above concrete, rubble, demolition debris and cleared/grubbed material may not be compactible as specified and shall be compacted as specified in Clause 3.03.G of this Section.

The Contractor shall apply water as necessary during compaction to obtain the specified density. If fill is excessively moist, the Contractor shall aerate the material with suitable equipment and methods until the moisture content is corrected. In areas not accessible to rolling equipment, backfill shall be compacted to the specified density with mechanical tampers approved by the Engineer.

H. Compaction Equipment

Type, size and efficiency of compaction equipment shall be approved by the Engineer and shall be capable of achieving specified degree of compaction. Soil immediately above concrete, rubble, demolition debris and cleared/grubbed material shall be compacted with a heavy roller with a minimum static weight of ten tons.

3.04 FIELD QUALITY CONTROL

A. Testing by the Engineer

The Engineer will select samples of uncompacted imported fill material intended for the Works and samples of compacted backfill and imported fill in the Works.

The Engineer will perform tests in the field and in the laboratory on samples of backfill and imported fill to determine if materials meet specification. Testing of imported fill will include analysis for the presence of contaminants, grain size analysis, moisture content determination, bulk wet density, maximum dry density and permeability. Testing for backfill will include moisture content determination, maximum dry density and bulk wet density. Copies of test reports will be supplied to the Contractor on request. This testing is in addition to the testing by the Contractor as specified in Clause 1.03.B of this Section.

Testing by the Engineer will in no way relieve the Contractor of his responsibility to test all material prior to notifying the Engineer of the materials' suitability for the work involved.

B. Frequency of Testing by Engineer

At least one density test and one moisture content determination for each lift placed will be made by the Engineer for each 2,500 square feet of compacted loam fill.

At least one particle size analysis will be made by the Engineer for each 1,000 cubic yards of imported loam fill and for any change in imported loam fill.

At least one permeability test will be made by the Engineer for each 1,000 cubic yards of imported loam fill and for any change in imported loam fill.

At least one sample for chemical characterization of imported fill will be obtained and analyzed by the Engineer for each 2,000 cubic yards.

C. Methods of Testing

Maximum dry density will be determined in the laboratory in accordance with ASTM D698.

Moisture content in laboratory will be determined in accordance with ASTM D2216.

Bulk wet density will be determined in the field in accordance with ASTM D2922.

Moisture content will be determined in the field in accordance with ASTM D3017.

Particle size analysis will be performed in accordance with ASTM D422 or ASTM D1140, whichever is appropriate to material being tested.

Permeability will be determined in accordance with ASTM D2434 on a representative sample compacted in the laboratory to the field bulk wet density and moisture.

Chemical characterization will be performed in the laboratory in accordance with the following methods:

Parameter	*Extraction/Preparation*[1]	*Analysis*[1]
TCL[2] Volatile Organic Compound	5050	8260 and 8240
TCL Base, Neutral and Acid Extractable	3540/3550	8270
Pesticide/PCB	3540/3550	8080
TAL[3] Metals	3050	6010/7000 Series

(1) Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods", EPA SW-846, 3rd Edition, September, 1986.

(2) TCL - Target Compound List

(3) TAL - Target Analyte List

D. Failure to Meet Specified Requirements

When tests indicate that material specifications have not been achieved or cannot be obtained with equipment in use, the procedure being followed, or the material being incorporated, the Contractor shall, at no additional cost to the Trust, modify his operation so that the equipment, procedures and materials will produce the required results.

3.05 ADJUSTMENT AND CLEANING

The Contractor shall backfill or fill surfaces to within two inches greater or less than shown on the Drawings but not uniformly high or low. Surface irregularities shall be corrected at no additional cost to the Trust by loosening and adding or removing material until the surface is within specified grade. Should there be an insufficient or over abundant quantity of material on Site to attain design grades, the Engineer will reissue Contract Drawings showing revised grades.

The Contractor shall clean and reinstate work areas and areas affected by equipment outside areas specified to be excavated, to specified restoration condition.

Upon completion of backfilling, the Contractor shall remove all excess material and debris from work areas and travel routes.

PART 4 - MEASUREMENT AND PAYMENT

4.01 EXCAVATION OF SOIL

A. Measurement

Measurement for excavation of soil will be made at the number of bank cubic yards of soil excavated as determined by the Engineer, calculated from cross-sections using the end area method.

B. Payment

Payment for the quantity determined above will be made at the unit price per cubic yard stipulated in the Schedule of Prices for Item M-1 which price and payment shall be full compensation for supply of all labor, plant, materials and equipment required to excavate soils and concrete/rubble/soil/sediment stockpile (excluding soils in Areas of Buried Drums, soils around underground storage tanks and existing soil/sediment in Contaminated Soil Staging Area); loading soil into Contractor supplied haulage units; transportation to and placement in specified areas; cleaning up any spilled waste; maintaining excavation free of water; vapor and dust suppression control; maintaining Contaminated Soil Staging Area; controlling grades; and all other miscellaneous items for which separate payment is not provided under other Items.

4.02 EXCAVATION OF SEDIMENTS DESIGNATED FOR THERMAL TREATMENT

A. Measurement

Measurement for excavation of sediments designated for thermal treatment will be made at the number of bank cubic yards of sediment excavated as determined by the Engineer, calculated from cross-sections using the end area method.

B. Payment

Payment for the quantity determined above will be made at the unit price per cubic yard stipulated in the Schedule of Prices for Item M-2 which price and payment shall be full compensation for supply of all labor, plant, material and equipment to remove water and dewater sediments; excavate sediments; load sediments into Contractor supplied haulage units; transfer and place sediments in Contaminated Soil Staging Area or Waste Consolidation Facility; clean up any spilled waste; maintain contaminated Soil Staging Area; control grades; and all other miscellaneous items for which separate payment is not provided under other Items.

4.03 BACKFILLING

A. Measurement

Measurement for backfilling will be made at the number of bank cubic yards backfilled as determined by the Engineer, calculated from cross-sections using the end area method.

B. Payment

Payment for the quantities determined above will be made at the unit price per cubic yard stipulated in the Schedule of Prices for Item M-3 which price and payment shall be full compensation for the supply of all labor, plant materials and equipment required to backfill Site materials including all thermally treated materials, fly ash, regraded soils, demolition debris and cleared/grubbed materials, EPA soil stockpile, UST excavation and Areas of Buried Drum excavation; transporting thermally treated materials to fill areas; compact materials; control grades; control dust and vapor emissions; and all other miscellaneous items for which separate payment is not provided under other Items.

4.04 FINAL SOIL COVER (6-INCH)

A. Measurement

Measurement for final soil cover (6-inch) will be made at the actual number of cubic yards of soil cover (6-inch) installed as measured in place by the Engineer.

B. Payment

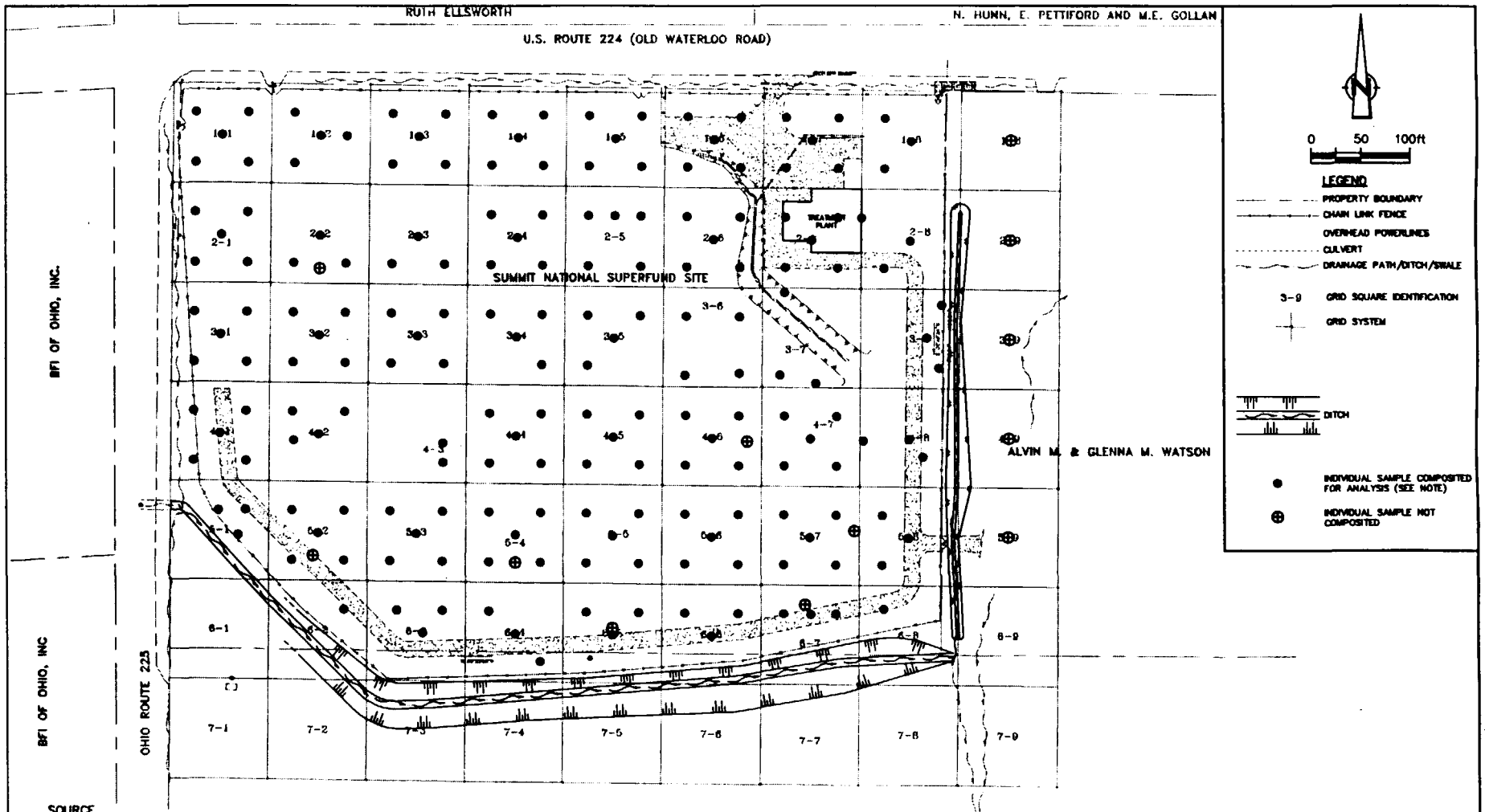
Payment for the quantity determined above will be made of the unit price per cubic yard stipulated in the Schedule of Prices for Item M-4 which price and payment shall be full compensation for the supply of all labor, plant, materials and equipment required to construct the 6-inch soil cover; compact soil; control grades; prepare submittals; perform acceptance testing; and all miscellaneous items for which separate payment is not provided under other Items.

END OF SECTION

ATTACHMENT 1

SUBSURFACE CONDITIONS

- ANALYTICAL INFORMATION
- GEOTECHNICAL ENGINEERING STUDY
- TECHNICAL MEMORANDUM NO. 3



SOURCE
DEERFIELD TOWNSHIP, LOT 56
PORTAGE COUNTY,OHIO

SURVEYED BY:
ENVIRONMENTAL DESIGN GROUP
1833 COMMERCE DR. STOW, OH. 44224
OCTOBER 1991

BASIS OF BEARING: NORTH LINE OF LOT56 (S 88°25'00"E)AS RECORDED IN DEED VOLUME 668, PAGE 261 OF PORTAGE COUNTY RECORDS OF DEEDS.

NOTES:

1. COMPOSITE SAMPLES PREPARED FROM INDIVIDUAL SAMPLES (0-2 FEET IN DEPTH) WITHIN EACH GRID SQUARE
2. ALL SAMPLES WERE TAKEN PRIOR TO THE INSTALLATION OF DITCH, TREATMENT PLANT AND ROADS. THESE FEATURES ARE INCLUDED IN THIS FIGURE FOR REFERENCE PURPOSES ONLY.

figure G.1

SAMPLE LOCATIONS
SUMMIT NATIONAL SUPERFUND SITE
Deerfield Township of Portage County, Ohio

CRA

2372 (51) FEB 17/93 REV.0 (P-95)

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	*1-1*	*1-2*	*1-3*	*1-4*	*1-5*	*1-6*	*1-7*	*1-8*	*1-9*	*1-9*
Sample Number:	*SS024001*	*SS025001*	*SL007001*	*SL006001*	*SL005001*	*SL004001*	*SL003001*	*SL002001*	*SS19001*	*SS19002*
Sample Type:	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Individual*	*Individual*
Date Sampled:	*11/13/84*	*11/13/84*	*11/7/84*	*11/7/84*	*11/7/84*	*11/7/84*	*11/7/84*	*11/7/84*	*12/12/85*	*12/12/85*
OTR Number:	*E9765*	*E9767*	*E9747*	*E9746*	*E9745*	*E9744*	*E9743*	*E9742*	*E9722*	*E9723*
OTR Number:	*E9766*	*E9768*								
ITR Number:	*MEA273*	*MEA274*	*MEA255*	*MEA254*	*MEA253*	*MEA252*	*MEA251*	*MEA250*	*ME4463*	*ME4464*
Volatile Organic Compound (VOCs)										
(units - µg/kg)										
chloromethane										
vinyl chloride										
methylene chloride			6 B, J	2 J, B	7 B	4 B, J	5 J, B	4 J, B	15 B	27 B
acetone				56	30	51	96	81	25 B	27 B
carbon disulfide										
1,1-dichloroethene										
1,1-dichloroethane										
trans-1,2-dichloroethene				31						
chloroform				2 J	42					
1,2-dichloroethane								44		
2-butanone					62	34	220		26 B	27 B
1,1,1-trichloroethane			6		7			4 J		
1,1,2,2-tetrachloroethane										
trichloroethene			10	17	2 J	50		32		
1,1,2-trichloroethane										
benzene	6.6 B	21 B		1 J	3 J					
2-hexanone				29						
4-methyl-2-pentanone										
tetrachloroethene				1 J	1 J	1 J		1 J		
toluene		34 B						3 J	20	16
chlorobenzene										
ethylbenzene	36	6.8		3 J, B						
styrene										
Total xylenes		13		13 B						
Total Volatiles	42.6	74.8	22	155	154	140	321	169	86	97
Total Tentatively Identified Volatiles	228	603	52	0	0	0	0	0	0	0

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	*1-1*	*1-2*	*1-3*	*1-4*	*1-5*	*1-6*	*1-7*	*1-8*	*1-9*	*1-9*
Sample Number:	*SS024001*	*SS025001*	*SL007001*	*SL006001*	*SL005001*	*SL004001*	*SL003001*	*SL002001*	*SS19001*	*SS19002*
Sample Type:	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Individual*	*Individual*
Date Sampled:	*11/13/84*	*11/13/84*	*11/7/84*	*11/7/84*	*11/7/84*	*11/7/84*	*11/7/84*	*11/7/84*	*12/12/85*	*12/12/85*
OTR Number:	*E9765*	*E9767*	*E9747*	*E9746*	*E9745*	*E9744*	*E9743*	*E9742*	*E9722*	*E9723*
OTR Number:	*E9766*	*E9768*								
ITR Number:	*MEA273*	*MEA274*	*MEA255*	*MEA254*	*MEA253*	*MEA252*	*MEA251*	*MEA250*	*ME4463*	*ME4464*
Base/Neutrals and Acids (BNAs)										
(units - µg/kg)										
n-nitrosodimethylamine										
phenol										
aniline										
1,3-dichlorobenzene										
1,4-dichlorobenzene										
benzyl alcohol										
1,2-dichlorobenzene										
2-methylphenol										
bis(2-chloroisopropyl)ether										
4-methylphenol										
hexachloroethane										
isophorone										
2-nitrophenol										
2,4-dimethylphenol										
benzoic acid										
1,2,4-trichlorobenzene										
naphthalene	5500	6600							2000	2000
4-chloro-3-methylphenol										
2-methylnaphthalene	6100	12000							2900	3200
hexachlorocyclopentadiene										
dimethyl phthalate										
acenaphthylene										
acenaphthene		330 J								240 J
4-nitrophenol										
dibenzofuran	890	2500							700	870
diethylphthalate										
fluorene		330 J								480
n-nitrosodiphenylamine (1)										
hexachlorobenzene										

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	*1-1*	*1-2*	*1-3*	*1-4*	*1-5*	*1-6*	*1-7*	*1-8*	*1-9*	*1-9*
Sample Number:	SS024001	SS025001	SL007001	SL006001	SL005001	SL004001	SL003001	SL002001	SS19001	SS19002
Sample Type:	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Individual*	*Individual*
Date Sampled:	*11/13/84*	*11/13/84*	*11/7/84*	*11/7/84*	*11/7/84*	*11/7/84*	*11/7/84*	*11/7/84*	*12/12/85*	*12/12/85*
OTR Number:	E9765	E9767	E9747	E9746	E9745	E9744	E9743	E9742	E9722	E9723
OTR Number:	E9766	E9768								
ITR Number:	*MEA273*	*MEA274*	*MEA255*	*MEA254*	*MEA253*	*MEA252*	*MEA251*	*MEA250*	*ME4463*	*ME4464*
Base/Neutrals and Acids (cont'd)										
(units - µg/kg)										
pentachlorophenol										
phenanthrene	1800	5200							1700	6500
anthracene										910
di-n-butylphthalate	4100	1700							110 J	130 J
fluoranthene	740	1600							890	7100
pyrene	400	590							690	4700
butylbenzylphthalate		330							67 J	
benzo(a)anthracene		330 J							660	3000
bis(2-ethylhexyl)phthalate	2800 B	550 B							97 J	140 J
chrysene	520	910							240 J	2400
di-n-octyl phthalate	330 J	330 J								
benzo(b)fluoranthene	360	990							720	3200
benzo(k)fluoranthene									720	3200
benzo(a)pyrene		330 J							400	1700
indeno (1,2,3-cd)pyrene		330 J							320 J	1200
dibenz(a,h)anthracene									89 J	410
benzo(g,h,i)perylene		330 J							290 J	1200
Total Base/Neutrals and Acids	23540	35280							12593	42580
Total Tentatively Identified Base/Neutrals and Acids	2538368	1921727	30100	0	49200	0	0	0	34865	30523

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	*1-1*	*1-2*	*1-3*	*1-4*	*1-5*	*1-6*	*1-7*	*1-8*	*1-9*	*1-9*
Sample Number:	*SS024001*	*SS025001*	*SL007001*	*SL006001*	*SL005001*	*SL004001*	*SL003001*	*SL002001*	*SS19001*	*SS19002*
Sample Type:	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Individual*	*Individual*
Date Sampled:	*11/13/84*	*11/13/84*	*11/7/84*	*11/7/84*	*11/7/84*	*11/7/84*	*11/7/84*	*11/7/84*	*12/12/85*	*12/12/85*
OTR Number:	*E9765*	*E9767*	*E9747*	*E9746*	*E9745*	*E9744*	*E9743*	*E9742*	*E9722*	*E9723*
OTR Number:	*E9766*	*E9768*								
ITR Number:	*MEA273*	*MEA274*	*MEA255*	*MEA254*	*MEA253*	*MEA252*	*MEA251*	*MEA250*	*ME4463*	*ME4464*
<u>Inorganics</u>										
(units - mg/kg dry weight)										
Aluminum	13200	2630	8636	7377	6380	8652	9822	7205	7710	9650
Antimony										
Arsenic		11 R	16 R			9.8 R	11 R	12 R	12	11
Barium	[47]	[54]	134 R	[111] R	[112]	[81] R	[91] R	[54] R	218	295
Beryllium		[.83]							[0.62]	[0.73]
Cadmium				3.0 R	7.8 R				[2.8]	[2.9]
Calcium	[3130]	4840	[2640]	5766	38029	[2134]	[864]	[1657]	7250	19700
Chromium	18	11	17 R	13 R	23 R	23 R	22 R	18 R	15	17
Cobalt	[11]		[20] R	[15] R	[15] R	[20] R	[15] R		[11]	[13]
Copper	17	[10]	31	25	26	14	18	31	35	34
Iron	31600	20900	26601	31072	39098	29251	29449	38752	27800	25900
Lead	69 +	25 +	19 R	17 R	23 R	19 R	50 R	43 R	164	175
Cyanide	.4 R	.36 R								
Magnesium	3590	[920]	[2406]	[2623]	[2892]	[2649]	[1897]	[1940]	[1690]	[2300]
Manganese	271	87	217 R, E	386 R, E	683 R, E	483 R, E	612 R, E	155 R, E	879 J	1350 J
Mercury		0.8	0.5	0.33	0.22	0.17	0.39	0.47	0.55	0.4
Nickel	[25]		43 R	28 A	36 R	[22] R	[17] R	[17] R	[19]	[21]
Potassium	[862]	[969]	[970]	[1007]	[846]	[760]		[1804]	[1910]	[1810]
Selenium										
Silver									[3.5] J, R	
Sodium	[106]	[156]							[674]	[850]
Thallium										
Tin										
Vanadium	[25]	[14]	[28] R	[22] R	[25] R	31 R	34 R	[30] R	[21]	[25]
Zinc	65	40	123 R	99 R	507 R	98 R	61 R	64 R	124	139
Percent Moisture										
Percent Solids	79.7	79.7	78.1	83.5	83.7	86.8	81.6	80.5	74.0	75.0

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	*1-1*	*1-2*	*1-3*	*1-4*	*1-5*	*1-6*	*1-7*	*1-8*	*1-9*	*1-9*
Sample Number:	*SS024001*	*SS025001*	*SL007001*	*SL006001*	*SL005001*	*SL004001*	*SL003001*	*SL002001*	*SS19001*	*SS19002*
Sample Type:	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*	*Individual*	*Individual*
Date Sampled:	*11/13/84*	*11/13/84*	*11/7/84*	*11/7/84*	*11/7/84*	*11/7/84*	*11/7/84*	*11/7/84*	*12/12/85*	*12/12/85*
OTR Number:	*E9765*	*E9767*	*E9747*	*E9746*	*E9745*	*E9744*	*E9743*	*E9742*	*E9722*	*E9723*
OTR Number:	*E9766*	*E9768*								
ITR Number:	*MEA273*	*MEA274*	*MEA255*	*MEA254*	*MEA253*	*MEA252*	*MEA251*	*MEA250*	*MEA463*	*MEA464*
Pesticides and PCBs (units - µg/kg)										
Alpha-BHC										
Beta-BHC										
Delta-BHC										
Gamma-BHC (Lindane)										
Heptachlor										
Aldrin										
Heptachlor Epoxide	20 J									
Endosulfan I										
Dieldrin										
4,4-DDE										
Endrin										
4,4-DDT										
Toxaphene										
Arochlor-1232										
Arochlor-1242										
Arochlor-1248										
Arochlor-1254										
Mirex										
Total Pesticides and PCBs	20									
Percent Moisture (Volatiles)	13	13	22	14	18	16	20	14	26	27

Notes:

(1) B - Analyte has been found in the laboratory blank as well as the sample. Indicates possible/probable contamination.
(2) C - Applies to pesticide parameters where the identification has been confirmed by GC/MS.
(3) E - Value is estimated due to presence of interference.
(4) J - An estimated value.
(5) R - Spike sample recovery is not within control limits.
(6) S - Value is determined by standard addition.
(7) + - Duplicate analysis is not within control limits.
(8) ++ - Samples analyzed at medium concentrations.
(9) [ ] - Positive values less than required detection limit by contract.
(10) Ind. - Refers to Individual Samples.
(11) All samples taken from surface (0-2 ft) unless otherwise indicated.
Indicates soils to be treated.

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	2-1	2-2	2-2	2-2	2-2	2-2	2-3	2-4	2-5	2-5
Sample Number:	SL015001	SL014001	SS22001	SS22001	SS22001	SS22002	SL012001	SL011001	SS026001	SS026001d
Sample Type:	Composite	Composite	Ind.(0-2ft)	Ind.(4-6ft)	Ind.(6-8ft)	Individual	Composite	Composite	Composite	Composite
Date Sampled:	11/8/84	11/8/84	12/20/85	12/20/85	12/20/85	12/20/85	11/7/84	11/7/84	11/13/84	11/13/84
OTR Number:	E9756	E9755	E9881	E9883	E9884	E9882	E9753	E9752	E9769	E9771
OTR Number:									E9770	E9772
ITR Number:	MEA264	MEA263	ME4479	ME4481	ME4482	ME4480	MEA261	MEA260	MEA275	MEA276
Volatile Organic Compound (VOCs)										
(units - µg/kg)										
chloromethane										
vinyl chloride										
methylene chloride	68 B	8 B	14 B	16 B	69 B	11 B	14 B	13 B		
acetone			53 B	32 B	46 B	50 B	120			
carbon disulfide										
1,1-dichloroethene										
1,1-dichloroethane			7		3 J	10				
trans-1,2-dichloroethene										
chloroform										
1,2-dichloroethane										
2-butanone		8 J	36 B	18 B	28 B	40 B	150	5 J		
1,1,1-trichloroethane			20	5		25	4 J			
1,1,2,2-tetrachloroethane										
trichloroethene										
1,1,2-trichloroethane										
benzene				4 J	4 J				3.1	2.2
2-hexanone										
4-methyl-2-pentanone										
tetrachloroethene										
toluene	3 J		5	36	17	4 J		3 J	6.0	2.2
chlorobenzene		18		4 J						
ethylbenzene				7	3 J					
styrene										
Total xylenes				30	24					
Total Volatiles	71	34	135	152	194	140	288	21	9.1	4.4
Total Tentatively Identified Volatiles	9		0	117	16.3		49	72	200	200

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	2-1	2-2	2-2	2-2	2-2	2-2	2-3	2-4	2-5	2-5
Sample Number:	SL015001	SL014001	SS22001	SS22001	SS22001	SS22002	SL012001	SL011001	SS026001	SS026001d
Sample Type:	Composite	Composite	Ind.(0-2ft)	Ind.(4-6ft)	Ind.(6-8ft)	Individual	Composite	Composite	Composite	Composite
Date Sampled:	11/8/84	11/8/84	12/20/85	12/20/85	12/20/85	12/20/85	11/7/84	11/7/84	11/13/84	11/13/84
OTR Number:	E9756	E9755	E9881	E9883	E9884	E9882	E9753	E9752	E9769	E9771
OTR Number:									E9770	E9772
ITR Number:	MEA264	MEA263	ME4479	ME4481	ME4482	ME4480	MEA261	MEA260	MEA275	MEA276
Base/Neutrals and Acids (BNAs)										
(units - µg/kg)										
n-nitrosodimethylamine										
phenol		290 J						24000 ++		
aniline										
1,3-dichlorobenzene									330 J	330 J
1,4-dichlorobenzene			76 J			130 J				330 J
benzyl alcohol										
1,2-dichlorobenzene			52 J			100 J			330 J	
2-methylphenol									330 J	
bis(2-chloroisopropyl)ether										
4-methylphenol										
hexachloroethane			66 J							
isophorone										
2-nitrophenol										
2,4-dimethylphenol										
benzoic acid										1600 J
1,2,4-trichlorobenzene									300 J	330 J
naphthalene	1000	290 J	1000	460	660	1600			3100	2500
4-chloro-3-methylphenol										
2-methylnaphthalene	2100		1000	340	620	1200			5300	4400
hexachlorocyclopentadiene										
dimethyl phthalate										
acenaphthylene										
acenaphthene			48 J						330 J	330 J
4-nitrophenol										
dibenzofuran	490 J		300 J	130 J	170 J	460			1600	1100
diethylphthalate										330 J
fluorene			130 J	69 J	110 J	200 J			470	330 J
n-nitrosodiphenylamine (1)										330 J, B
hexachlorobenzene			48 J			180 J			610	1000

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	2-1	2-2	2-2	2-2	2-2	2-2	2-3	2-4	2-5	2-5
Sample Number:	SL015001	SL014001	SS22001	SS22001	SS22001	SS22002	SL012001	SL011001	SS026001	SS026001d
Sample Type:	Composite	Composite	Ind.(0-2ft)	Ind.(4-6ft)	Ind.(6-8ft)	Individual	Composite	Composite	Composite	Composite
Date Sampled:	11/8/84	11/8/84	12/20/85	12/20/85	12/20/85	12/20/85	11/7/84	11/7/84	11/13/84	11/13/84
OTR Number:	E9756	E9755	E9881	E9883	E9884	E9882	E9753	E9752	E9769	E9771
OTR Number:									E9770	E9772
ITR Number:	MEA264	MEA263	ME4479	ME4481	ME4482	ME4480	MEA261	MEA260	MEA275	MEA276
Base/Neutrals and Acids (cont'd)										
(units - µg/kg)										
pentachlorophenol					110 J					
phenanthrene	1500		810	330	360	1000			3800	2700
anthracene					41 J					
di-n-butylphthalate			350 B	380 B	180 B, J	460 B			2800	3200
fluoranthene	280 J		93 J	58 J	98 J	160 J			1200	840
pyrene			260 J	120 J	190 J	350			510	350
butylbenzylphthalate				59 J						440
benzo(a)anthracene				56 J	72 J	170 J			520	380
bis(2-ethylhexyl)phthalate	1900	2900	10000	4500	630	12000		26000 ++	2500 B	2200 B
chrysene			110 J	60 J	90 J	190 J			700	540
di-n-octyl phthalate							8300 ++		2500	1600
benzo(b)fluoranthene			140 J	71 J	140 J	540				
benzo(k)fluoranthene			140 J	71 J	140 J	540			370	340
benzo(a)pyrene			80 J	49 J	81 J	260 J			340	420
indeno (1,2,3-cd)pyrene			77 J		100 J	180 J				330 J
dibenz(a,h)anthracene					66 J					
benzo(g,h,i)perylene			150 J	75 J	160 J	600			330 J	330 J
Total Base/Neutrals and Acids	7270	3480	14930	6828	4018	20320	83000	50000	28300	26580
Total Tentatively Identified Base/Neutrals and Acids	106230		14333	12946	9688		399900	0	783459	686081

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	2-1	2-2	2-2	2-2	2-2	2-2	2-3	2-4	2-5	2-5
Sample Number:	*SL015001*	*SL014001*	*SS22001*	*SS22001*	*SS22001*	*SS22002*	*SL012001*	*SL011001*	*SS026001*	*SS026001d*
Sample Type:	*Composite*	*Composite*	*Ind.(0-2ft)*	*Ind.(4-6ft)*	*Ind.(6-8ft)*	*Individual*	*Composite*	*Composite*	*Composite*	*Composite*
Date Sampled:	*11/8/84*	*11/8/84*	*12/20/85*	*12/20/85*	*12/20/85*	*12/20/85*	*11/7/84*	*11/7/84*	*11/13/84*	*11/13/84*
OTR Number:	*E9756*	*E9755*	*E9881*	*E9883*	*E9884*	*E9882*	*E9753*	*E9752*	*E9769*	*E9771*
OTR Number:									*E9770*	*E9772*
ITR Number:	*MEA264*	*MEA263*	*ME4479*	*ME4481*	*ME4482*	*ME4480*	*MEA261*	*MEA260*	*MEA275*	*MEA276*
Inorganics										
(units - mg/kg dry weight)										
Aluminum	3029	11696	5990	6120	8850	6870	6029	10859	6030	4460
Antimony				[16] J, R						
Arsenic	10 R		15 J	17 J	14 J	21 J	19 R	23 R	15 R	17 R
Barium	[51] R	158 R	[75]	[107]	[65]	[80]	[91] R	[109] R	[109]	[93]
Beryllium			[0.65]	[0.92]	[0.63]	[1.4]			[.97]	[1.1]
Cadmium							4.3 R	3.0 R		
Calcium	[2819]	10333	11300	7880	5880	9940	7069	7910	18600	34200
Chromium	10 R	18 R	15	14	18	16	10 R	25 R	22	102
Cobalt		[15] R	[11]	[10]	[16]	[15]		[15] R	[9.1]	[7.4]
Copper	[7]	29	30	43	27	29	19	23	25	29
Iron	11489	31560	26900	24700	33100	29000	30058	38225	28800	33400
Lead	15 R	17 R	20	45	17	31	16 R	26 R	103 +	116 +
Cyanide							0.78	0.52	1.2 R	1.9 R
Magnesium	[858]	4471	3450	[2510]	5140	4220	[2332]	4650	[2750]	3400
Manganese	65 R, E	435 R, E	267	182	369	380	193 R, E	553 R, E	403	2620
Mercury	0.34			0.19	0.13	0.14	0.33	0.17		
Nickel		40 R	29	26	36	32	[21] R	41 R	29	[20]
Potassium		[1811]	[1330]	[1040]	[1350]	[1480]	[1229]	[1664]	[1400]	[793]
Selenium										
Silver										
Sodium									[179]	[217]
Thallium										
Tin										[15]
Vanadium	[16] R	[27] R	[17]	[16]	[21]	[19]	[21] R	30 R	[20]	34
Zinc	32 R	145 R	190	359	90	141	127 R	152 R	483	803
Percent Moisture										
Percent Solids	84.3	84.0	82.0	84.0	84.0	84.0	86.5	87.3	82.5	86.2

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	2-1	2-2	2-2	2-2	2-2	2-2	2-3	2-4	2-5	2-5
Sample Number:	SL015001	SL014001	SS22001	SS22001	SS22001	SS22002	SL012001	SL011001	SS026001	SS026001d
Sample Type:	Composite	Composite	Ind.(0-2ft)	Ind.(4-6ft)	Ind.(6-8ft)	Individual	Composite	Composite	Composite	Composite
Date Sampled:	11/8/84	11/8/84	12/20/85	12/20/85	12/20/85	12/20/85	11/7/84	11/7/84	11/13/84	11/13/84
OTR Number:	E9756	E9755	E9881	E9883	E9884	E9882	E9753	E9752	E9769	E9771
OTR Number:									E9770	E9772
ITR Number:	MEA264	MEA263	ME4479	ME4481	ME4482	ME4480	MEA261	MEA260	MEA275	MEA276
Pesticides and PCBs (units - µg/kg)										
Alpha-BHC										
Beta-BHC										
Delta-BHC										
Gamma-BHC (Lindane)										
Heptachlor										
Aldrin										
Heptachlor Epoxide										
Endosulfan I										
Dieldrin										
4,4-DDE										
Endrin										
4,4-DDT										
Toxaphene										
Arochlor-1232										
Arochlor-1242										
Arochlor-1248	766	2600						12300 C, ++	720	640
Arochlor-1254										
Mirex										
Total Pesticides and PCBs	766	2600						12300	720	640
Percent Moisture (Volatiles)	17	16	17	16	15	18	15	16	13	13

Notes:

(1) B - Analyte has been found in the laboratory blank as well as the sample. Indicates possible/probable contamination.
(2) C - Applies to pesticide parameters where the identification has been confirmed by GC/MS.
(3) E - Value is estimated due to presence of interference.
(4) J - An estimated value.
(5) R - Spike sample recovery is not within control limits.
(6) S - Value is determined by standard addition.
(7) + - Duplicate analysis is not within control limits.
(8) ++ - Samples analyzed at medium concentrations.
(9) [ ] - Positive values less than required detection limit by contract.
(10) Ind. - Refers to Individual Samples.
(11) All samples taken from surface (0-2 ft) unless otherwise indicated.
Indicates soils to be treated.

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	2-6	2-7	2-8	2-9	3-1	3-2	3-3	3-4	3-5
Sample Number:	SL010001	SL009001	SL008001	SS29001	SL016001	SS044001	SS045001	SS046001	SS047001
Sample Type:	Composite	Composite	Composite	Individual	Composite	Composite	Composite	Composite	Composite
Date Sampled:	11/7/84	11/7/84	11/7/84	12/12/85	11/8/84	11/15/84	11/15/84	11/15/84	11/15/84
OTR Number:	E9750	E9749	E9748	E9724	E9757	E9805	E9807	E9809	E9811
OTR Number:						E9806	E9808	E9810	E9812
ITR Number:	MEA258	MEA257	MEA256	ME4465	MEA265	MEA293	MEA294	MEA295	MEA296
Volatile Organic Compound (VOCs)									
(units - µg/kg)									
chloromethane									
vinyl chloride									
methylene chloride	5 J, B	4 B, J	6 B	19 B	7 B	13	3.8	17	8.4
acetone	10 J, B		24	34 B	6 J	52			71
carbon disulfide									
1,1-dichloroethene									
1,1-dichloroethane									
trans-1,2-dichloroethene						2.4			
chloroform									
1,2-dichloroethane									
2-butanone				25 B					
1,1,1-trichloroethane							37	30	
1,1,2,2-tetrachloroethane									
trichloroethene						24	8.9	15	11
1,1,2-trichloroethane									
benzene						3.7	5.1	4.9	3.6
2-hexanone									
4-methyl-2-pentanone									
tetrachloroethene	5 J		1 J						
toluene	5 J			16		15	7.7	217	14
chlorobenzene	4 J					4.9		8.5	
ethylbenzene						3.7		16	
styrene									
Total xylenes						28	14	206	26
Total Volatiles	29	4	31	94	13	147	76.5	514	135
Total Tentatively Identified Volatiles	89	0	0	0	0	282	200	347	200

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	2-6	2-7	2-8	2-9	3-1	3-2	3-3	3-4	3-5
Sample Number:	SL010001	SL009001	SL008001	SS29001	SL016001	SS044001	SS045001	SS046001	SS047001
Sample Type:	Composite	Composite	Composite	Individual	Composite	Composite	Composite	Composite	Composite
Date Sampled:	11/7/84	11/7/84	11/7/84	12/12/85	11/8/84	11/15/84	11/15/84	11/15/84	11/15/84
OTR Number:	E9750	E9749	E9748	E9724	E9757	E9805	E9807	E9809	E9811
OTR Number:						E9806	E9808	E9810	E9812
ITR Number:	MEA258	MEA257	MEA256	ME4465	MEA265	MEA293	MEA294	MEA295	MEA296
Base/Neutrals and Acids (BNAs)									
(units - µg/kg)									
n-nitrosodimethylamine									
phenol									
aniline									
1,3-dichlorobenzene									
1,4-dichlorobenzene									
benzyl alcohol									
1,2-dichlorobenzene									
2-methylphenol									
bis(2-chloroisopropyl)ether									
4-methylphenol									
hexachloroethane									
isophorone									
2-nitrophenol									
2,4-dimethylphenol									
benzoic acid									
1,2,4-trichlorobenzene									
naphthalene				1400 J, ++	830				
4-chloro-3-methylphenol									
2-methylnaphthalene				2300 J, ++	1300				
hexachlorocyclopentadiene									
dimethyl phthalate									
acenaphthylene									
acenaphthene									
4-nitrophenol									
dibenzofuran					290 J				
diethylphthalate									
fluorene									
n-nitrosodiphenylamine (1)									
hexachlorobenzene					280 J				

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	2-6	2-7	2-8	2-9	3-1	3-2	3-3	3-4	3-5
Sample Number:	SL010001	SL009001	SL008001	SS29001	SL010001	SS044001	SS045001	SS046001	SS047001
Sample Type:	Composite	Composite	Composite	Individual	Composite	Composite	Composite	Composite	Composite
Date Sampled:	11/7/84	11/7/84	11/7/84	12/12/85	11/8/84	11/15/84	11/15/84	11/15/84	11/15/84
OTR Number:	E9750	E9749	E9748	E9724	E9757	E9805	E9807	E9809	E9811
OTR Number:						E9806	E9808	E9810	E9812
ITR Number:	MEA258	MEA257	MEA256	ME4465	MEA265	MEA293	MEA294	MEA295	MEA296
Base/Neutrals and Acids (cont'd)									
(units - µg/kg)									
pentachlorophenol									
phenanthrene				1700 J, ++	730				
anthracene									
di-n-butylphthalate									
fluoranthene					230 J				
pyrene									
butylbenzylphthalate									
benzo(a)anthracene									
bis(2-ethylhexyl)phthalate	5900				5700	22800 B, ++	7140 B, J, ++	22700 B, ++	
chrysene					250 J				
di-n-octyl phthalate					520	2330 J, ++		2300 J, ++	
benzo(b)fluoranthene									
benzo(k)fluoranthene									
benzo(a)pyrene									
indeno (1,2,3-cd)pyrene									
dibenz(a,h)anthracene									
benzo(g,h,i)perylene									
Total Base/Neutrals and Acids	5900			5400	10140	25130	7140	25000	
Total Tentatively Identified Base/Neutrals and Acids	7990	7180	25800	20428	95410	86400	11000	163300	142480

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	2-6	2-7	2-8	2-9	3-1	3-2	3-3	3-4	3-5
Sample Number:	SL010001	SL009001	SL008001	SS29001	SL016001	SS044001	SS045001	SS046001	SS047001
Sample Type:	Composite	Composite	Composite	Individual	Composite	Composite	Composite	Composite	Composite
Date Sampled:	11/7/84	11/7/84	11/7/84	12/12/85	11/8/84	11/15/84	11/15/84	11/15/84	11/15/84
OTR Number:	E9750	E9749	E9748	E9724	E9757	E9805	E9807	E9809	E9811
OTR Number:						E9806	E9808	E9810	E9812
ITR Number:	MEA258	MEA257	MEA256	ME4465	MEA265	MEA293	MEA294	MEA295	MEA296
Inorganics									
(units - mg/kg dry weight)									
Aluminum	13028	7028	14808	2300	9965	14900	18100	16600	14900
Antimony						46 R	67 R	76 R	545 R
Arsenic	26 R	28 R		20	[35] R	14	17	16	7.3 S
Barium	[112] R	[67] R	[103] R	[53]	120 R	233	242	163	244
Beryllium				[0.56]		[1.5]	[1.6]	[0.97]	[1.9]
Cadmium	3.2 R	3.5 R							
Calcium	4139	[2086]	[1387]	[540]	15532	16200	30900	7420	19800
Chromium	28 R	23 R	25 R	22	20 R	36	44	46	54
Cobalt	[15] R			[5]		[19]	[28]	[20]	[26]
Copper	28	22	24	56	18	51	66	61	60
Iron	39557	37021	32586	34300	43649	77300	94500	80100	74300
Lead	23 S+R	46 R	95 R	50	54 S+R	18 S	32	33	55
Cyanide						.95 +	.63 +	2.7 +	2.4 +
Magnesium	3887	[1889]	[2540]	[515]	[2665]	4710	6120	5030	5590
Manganese	543 R, B	207 R, E	194 R, E	54 J	263 R, B	381	661	316	718
Mercury	0.18	0.19	0.31	1.1	0.27		0.1		0.1
Nickel	38 R	[21] R	[22] R	[18]	24 R	42	53	30	56
Potassium	[2887]	[1874]	[1432]	[2110]	[1260]	3230	3720	4250	3210
Selenium				3.3	8.2 R				
Silver				[4.2] J, R	5.8				
Sodium				[759]		[294]	[1280]	[271]	[269]
Thallium									
Tin							[15] R		[15] R
Vanadium	33 R	[23] R	38 R	[20]	30 R	48	62	59	51
Zinc	117 R	200 R	137 R	36	107 R	255	304	196	626
Percent Moisture									
Percent Solids	84.7	79.4	75.4	82.0	85.5	83.6			81.8

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	2-6	2-7	2-8	2-9	3-1	3-2	3-3	3-4	3-5
Sample Number:	SL010001	SL009001	SL008001	SS29001	SL016001	SS044001	SS045001	SS046001	SS047001
Sample Type:	Composite	Composite	Composite	Individual	Composite	Composite	Composite	Composite	Composite
Date Sampled:	11/7/84	11/7/84	11/7/84	12/12/85	11/8/84	11/15/84	11/15/84	11/15/84	11/15/84
OTR Number:	E9750	E9749	E9748	E9724	E9757	E9805	E9807	E9809	E9811
OTR Number:						E9806	E9808	E9810	E9812
ITR Number:	MEA258	MEA257	MEA256	ME4465	MEA268	MEA293	MEA294	MEA295	MEA296
Pesticides and PCBs (units - µg/kg)									
Alpha-BHC									
Beta-BHC									
Delta-BHC									
Gamma-BHC (Lindane)						9.2 J			
Heptachlor									
Aldrin									
Heptachlor Epoxide									
Endosulfan I									
Dieldrin									
4,4-DDE									
Endrin									
4,4-DDT									
Toxaphene									
Arochlor-1232									
Arochlor-1242									5003
Arochlor-1248	7200 C				3200				
Arochlor-1254									
Mirex									
Total Pesticides and PCBs	7200				3200	9.2			5003
Percent Moisture (Volatiles)	17	18	23	25	14	18	22	18	17

Notes:

(1) B - Analyte has been found in the laboratory blank as well as the sample. Indicates possible/probable contamination.
(2) C - Applies to pesticide parameters where the identification has been confirmed by GC/MS.
(3) E - Value is estimated due to presence of interference.
(4) J - An estimated value.
(5) R - Spike sample recovery is not within control limits.
(6) S - Value is determined by standard addition.
(7) + - Duplicate analysis is not within control limits.
(8) ++ - Samples analyzed at medium concentrations.
(9) [ ] - Positive values less than required detection limit by contract.
(10) Ind. - Refers to Individual Samples.
(11) All samples taken from surface (0-2 ft) unless otherwise indicated.
Indicates soils to be treated.

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	*3-6*	*3-7*	*3-8*	*3-9*	*4-1*	*4-2*	*4-3*	*4-4*	*4-5*
Sample Number:	*SS048001*	*SS049001*	*SL013001*	*SS39001*	*SL017001*	*SS043001*	*SS038001*	*SL021001*	*SL022001*
Sample Type:	*Composite*	*Composite*	*Composite*	*Individual*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*
Date Sampled:	*11/15/84*	*11/15/84*	*11/8/84*	*12/12/85*	*11/8/84*	*11/14/84*	*11/14/84*	*11/9/84*	*11/9/84*
OTR Number:	*E9813*	*E9815*	*E9754*	*E9725*	*E9758*	*E9803*	*E9793*	*E9763*	*E9764*
OTR Number:	*E9814*	*E9816*				*E9804*	*E9794*		
ITR Number:	*MEA297*	*MEA298*	*MEA262*	*ME4466*	*MEA266*	*MEA292*	*MEA287*	*MEA271*	*MEA272*
Volatile Organic Compound (VOCs)									
(units - µg/kg)									
chloromethane									
vinyl chloride									
methylene chloride	13	6.2	16 B	19 B	13 B	11	6.1	910 J, B, ++	
acetone				41 B	7J	38		4800 ++	
carbon disulfide									
1,1-dichloroethene									
1,1-dichloroethane									
trans-1,2-dichloroethene						14			
chloroform									
1,2-dichloroethane								6900 ++	4300 ++
2-butanone				32 B	6 J			5900 ++	
1,1,1-trichloroethane			4 J		3 J	30		5600 ++	2400 J, ++
1,1,2,2-tetrachloroethane									
trichloroethene	2.6					85	3.8		86000 ++
1,1,2-trichloroethane									
benzene	3.9	3.7				3.6	4.7		
2-hexanone									4400 J, ++
4-methyl-2-pentanone									
tetrachloroethene									
toluene			4 J	5	6	88	14	28000 ++	13000 ++
chlorobenzene						20		3600 ++	
ethylbenzene						16		4700 ++	1900 J, ++
styrene									
Total xylenes						103		18000 ++	6700 J, ++
Total Volatiles	19.5	9.9	24	97	35	409	28.6	78410	118700
Total Tentatively Identified Volatiles	200	200	11	0	6	200	200	11600	0

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	*3-6*	*3-7*	*3-8*	*3-9*	*4-1*	*4-2*	*4-3*	*4-4*	*4-5*
Sample Number:	*SS048001*	*SS049001*	*SL013001*	*SS39001*	*SL017001*	*SS043001*	*SS038001*	*SL021001*	*SL022001*
Sample Type:	*Composite*	*Composite*	*Composite*	*Individual*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*
Date Sampled:	*11/15/84*	*11/15/84*	*11/8/84*	*12/12/85*	*11/8/84*	*11/14/84*	*11/14/84*	*11/9/84*	*11/9/84*
OTR Number:	*E9813*	*E9815*	*E9754*	*E9725*	*E9758*	*E9803*	*E9793*	*E9763*	*E9764*
OTR Number:	*E9814*	*E9816*				*E9804*	*E9794*		
ITR Number:	*MEA297*	*MEA298*	*MEA262*	*ME4466*	*MEA266*	*MEA292*	*MEA287*	*MEA271*	*MEA272*
Base/Neutrals and Acids (BNAs)									
(units - µg/kg)									
n-nitrosodimethylamine									
phenol								1900	
aniline									
1,3-dichlorobenzene									
1,4-dichlorobenzene									
benzyl alcohol									
1,2-dichlorobenzene								670	
2-methylphenol								310 J	
bis(2-chloroisopropyl)ether									
4-methylphenol								830	
hexachloroethane									
isophorone								3000	
2-nitrophenol									
2,4-dimethylphenol									
benzoic acid								2900 J	
1,2,4-trichlorobenzene									
naphthalene		592 ++		1200	1100			1900	
4-chloro-3-methylphenol									
2-methylnaphthalene		955 ++	590 J	1700	1800			1400	
hexachlorocyclopentadiene									
dimethyl phthalate								290 J	
acenaphthylene									
acenaphthene									
4-nitrophenol									
dibenzofuran		258 ++		340 J	460				
diethylphthalate									
fluorene								210 J	
n-nitrosodiphenylamine (1)									
hexachlorobenzene								1400	

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	*3-6*	*3-7*	*3-8*	*3-9*	*4-1*	*4-2*	*4-3*	*4-4*	*4-5*
Sample Number:	*SS048001*	*SS049001*	*SL013001*	*SS39001*	*SL017001*	*SS043001*	*SS038001*	*SL021001*	*SL022001*
Sample Type:	*Composite*	*Composite*	*Composite*	*Individual*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*
Date Sampled:	*11/15/84*	*11/15/84*	*11/8/84*	*12/12/85*	*11/8/84*	*11/14/84*	*11/14/84*	*11/9/84*	*11/9/84*
OTR Number:	*E9813*	*E9815*	*E9754*	*E9725*	*E9758*	*E9803*	*E9793*	*E9763*	*E9764*
OTR Number:	*E9814*	*E9816*				*E9804*	*E9794*		
ITR Number:	*MEA297*	*MEA298*	*MEA262*	*ME4466*	*MEA266*	*MEA292*	*MEA257*	*MEA271*	*MEA272*
Base/Neutrals and Acids (cont'd)									
(units - µg/kg)									
pentachlorophenol									
phenanthrene		662 ++		810	2340			2100	
anthracene									
di-n-butylphthalate				320 J				360 J	
fluoranthene		150 J, ++			340 J			350 J	
pyrene		170 J, ++		210 J	280 J			330 J	
butylbenzylphthalate								1700	
benzo(a)anthracene					190 J				
bis(2-ethylhexyl)phthalate	49900 B, ++		2600		9000	29000 B, ++	5210 J, B, ++		81000 ++
chrysene					250 J			230 J	
di-n-octyl phthalate					1100			3100	
benzo(b)fluoranthene									
benzo(k)fluoranthene									
benzo(a)pyrene									
indeno (1,2,3-cd)pyrene									
dibenz(a,h)anthracene									
benzo(g,h,i)perylene									
Total Base/Neutrals and Acids	49900	2787	3190	4580	16860	29000	5210	22970	81000
Total Tentatively Identified Base/Neutrals and Acids	121000	17959		20479		0	0	27140	656400

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	*3-6*	*3-7*	*3-8*	*3-9*	*4-1*	*4-2*	*4-3*	*4-4*	*4-5*
Sample Number:	*SS048001*	*SS049001*	*SL013001*	*SS39001*	*SL017001*	*SS043001*	*SS038001*	*SL021001*	*SL022001*
Sample Type:	*Composite*	*Composite*	*Composite*	*Individual*	*Composite*	*Composite*	*Composite*	*Composite*	*Composite*
Date Sampled:	*11/15/84*	*11/15/84*	*11/8/84*	*12/12/85*	*11/8/84*	*11/14/84*	*11/14/84*	*11/9/84*	*11/9/84*
OTR Number:	*E9813*	*E9815*	*E9754*	*E9725*	*E9758*	*E9803*	*E9793*	*E9763*	*E9764*
OTR Number:	*E9814*	*E9816*				*E9804*	*E9794*		
ITR Number:	*MEA297*	*MEA298*	*MEA262*	*ME4466*	*MEA266*	*MEA292*	*MEA287*	*MEA271*	*MEA272*
Inorganics									
(units - mg/kg dry weight)									
Aluminum	15900	14300	13064	8290	4941	18200	5600	5610	5550
Antimony	57 R	42 R				46 R			
Arsenic	33	9.4		14		22 S	15 R	31 R	16 R
Barium	197	171	[87] R	[66]	153 R	185	[50]	[77]	[83]
Beryllium	[1.6]	[1.2]		[0.52]		[1.5]	[0.74]		
Cadmium				4					
Calcium	3570	[1140]	[2683]	[921]	7845	10500	21400	13600	14900
Chromium	50	34	16 R	17	14 R	37	10	22	27
Cobalt	[22]	[18]	[20] R	[8.6]		[20]		[6.1]	[4.6]
Copper	54	43	[15]	33	[13]	58	[12]	34	52
Iron	95300	82900	28973	30700	38361	68500	12200	33100	30900
Lead	23 S	22 S	10 R	20	17 R	29 S	41 +	28 +	57 +
Cyanide		.31 +				3.0 +	1.2 R	2.4 R	10.9 R
Magnesium	5100	4340	4258	[2380]	[1143]	5880	[326]	[1660]	[1690]
Manganese	543	451	847 R, E	145 J	88 R, E	462	29	136	162
Mercury			0.16		0.42		0.2	0.2	0.2
Nickel	46	45	42 R	[22]	[13] R	40		[12]	[15]
Potassium	[3040]	3260	[1133]	[1740]	[1590]	3390	[1120]	[1520]	[1130]
Selenium					3.0 R				
Silver					[4.8]				
Sodium	[222]	[202]		[1150]		[241]	[132]	[178]	[157]
Thallium									
Tin						[13] R		[18]	
Vanadium	60	59	[25] R	[20]	[28] R	50	[14]	[23]	[22]
Zinc	231	327	67 R	75	50 R	272	26	192	120
Percent Moisture									
Percent Solids	78.8	80.0	80.3	71.0	83.3	81.9	78.0	88.2	80.5

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	3-6	3-7	3-8	3-9	4-1	4-2	4-3	4-4	4-5
Sample Number:	SS048001	SS049001	SL013001	SS39001	SL017001	SS043001	SS038001	SL021001	SL022001
Sample Type:	Composite	Composite	Composite	Individual	Composite	Composite	Composite	Composite	Composite
Date Sampled:	11/15/84	11/15/84	11/8/84	12/12/85	11/8/84	11/14/84	11/14/84	11/9/84	11/9/84
OTR Number:	E9813	E9815	E9754	E9725	E9758	E9803	E9793	E9763	E9764
OTR Number:	E9814	E9816				E9804	E9794		
ITR Number:	MEA297	MEA298	MEA262	ME4466	MEA266	MEA292	MEA287	MEA271	MEA272
Pesticides and PCBs (units - µg/kg)									
Alpha-BHC									
Beta-BHC									
Delta-BHC									
Gamma-BHC (Lindane)									
Heptachlor									
Aldrin									
Heptachlor Epoxide									
Endosulfan I									
Dieldrin							21.9 J, ++		
4,4-DDE									
Endrin									
4,4-DDT									
Toxaphene									
Arochlor-1232									
Arochlor-1242							4809 ++		
Arochlor-1248								6,900	590000 C,++
Arochlor-1254									
Mirex									
Total Pesticides and PCBs							4831	6900	590000
Percent Moisture (Volatiles)	23	20	23	27	13	17	22	17	19

Notes:

(1) B - Analyte has been found in the laboratory blank as well as the sample. Indicates possible/probable contamination.
(2) C - Applies to pesticide parameters where the identification has been confirmed by GC/MS.
(3) E - Value is estimated due to presence of interference.
(4) J - An estimated value.
(5) R - Spike sample recovery is not within control limits.
(6) S - Value is determined by standard addition.
(7) + - Duplicate analysis is not within control limits.
(8) ++ - Samples analyzed at medium concentrations.
(9) [ ] - Positive values less than required detection limit by contract.
(10) Ind. - Refers to Individual Samples.
(11) All samples taken from surface (0-2 ft) unless otherwise indicated.
Indicates soils to be treated.

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	4-6	4-6	4-6	4-7	4-8	4-9	5-1	5-1	5-2
Sample Number:	SS037001	SS46001	SS46001	SS033001	SS030001	SS49001	SL018001	SL018001d	SS042001
Sample Type:	Composite	Ind.(0-2ft)	Ind.(6-8ft)	Composite	Composite	Individual	Composite	Composite	Composite
Date Sampled:	11/14/84	01/07/86	01/07/86	11/14/84	11/13/84	12/12/85	11/8/84	11/8/84	11/14/84
OTR Number:	E9791	E9899	E9900	E9783	E9781	E9869	E9759	E9760	E9801
OTR Number:	E9792			E9784	E9782				E9802
ITR Number:	MEA286	ME4497	ME4498	MEA282	MEA281	ME4467	MEA267	MEA268	MEA291
Volatile Organic Compound (VOCs)									
(units - µg/kg)									
chloromethane									
vinyl chloride									
methylene chloride	6.0	290 B	4900 J, ++	29	6.2	9 B	6 B	7 B	15
acetone		100 B	35000 B,++			25 B	7J	9 J	
carbon disulfide		10							
1,1-dichloroethene		33							
1,1-dichloroethane		9	41000 ++						
trans-1,2-dichloroethene									
chloroform	19	10		2.6					
1,2-dichloroethane		140							
2-butanone		130 B	33000 B,++			25 B	6 J		
1,1,1-trichloroethane	171	1100	14000 ++	81					
1,1,2,2-tetrachloroethane									
trichloroethene	2.7	240	2500 J,++	112	8.2				12
1,1,2-trichloroethane		46							
benzene	4.6	14		4.4	4.3 J, B				3.7
2-hexanone									
4-methyl-2-pentanone									
tetrachloroethene		12	2500 J,++	5.5					
toluene	440	370	140000 ++	224	46	4 J		4 J	
chlorobenzene	12	82							
ethylbenzene	7.2	19	76000 J,++	22					
styrene									
Total xylenes	38	700	270000 ++	244	9.5				7.3
Total Volatiles	700	3306	618900	724	74.2	63	19	20	38
Total Tentatively Identified Volatiles	200	208	61872.9	444	200	0	0	0	200

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	4-6	4-6	4-6	4-7	4-8	4-9	5-1	5-1	5-2
Sample Number:	SS037001	SS46001	SS46001	SS033001	SS030001	SS49001	SL018001	SL018001d	SS042001
Sample Type:	Composite	Ind.(0-2ft)	Ind.(6-8ft)	Composite	Composite	Individual	Composite	Composite	Composite
Date Sampled:	11/14/84	01/07/86	01/07/86	11/14/84	11/13/84	12/12/85	11/8/84	11/8/84	11/14/84
OTR Number:	E9791	E9899	E9900	E9783	E9781	E9869	E9759	E9760	E9801
OTR Number:	E9792			E9784	E9782				E9802
ITR Number:	MEA286	ME4497	ME4498	MEA282	MEA281	ME4467	MEA267	MEA268	MEA291
Base/Neutrals and Acids (BNAs)									
(units - µg/kg)									
n-nitrosodimethylamine									
phenol		7900 ++							
aniline									
1,3-dichlorobenzene									
1,4-dichlorobenzene									
benzyl alcohol									
1,2-dichlorobenzene									
2-methylphenol				1600 J					
bis(2-chloroisopropyl)ether									
4-methylphenol									
hexachloroethane									
isophorone				2900					
2-nitrophenol									
2,4-dimethylphenol				1600 J	800 J				
benzoic acid									
1,2,4-trichlorobenzene				1400					
naphthalene	6630 J, ++	14000 ++	7000 ++	7000	9300				
4-chloro-3-methylphenol				1600 J					
2-methylnaphthalene		13000 ++	3500 J, ++	10000	14000				
hexachlorocyclopentadiene									
dimethyl phthalate									
acenaphthylene									
acenaphthene				1600 J	800 J				
4-nitrophenol									
dibenzofuran					2800				
diethylphthalate				1600 J	800 J				
fluorene				1600 J	800 J				
n-nitrosodiphenylamine (1)				1600 J	800 J				
hexachlorobenzene	4860 J, ++	59000 ++	2600 J, ++	1600 J					

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	4-6	4-6	4-6	4-7	4-8	4-9	5-1	5-1	5-2
Sample Number:	SS037001	SS46001	SS46001	SS033001	SS030001	SS49001	SL018001	SL018001d	SS042001
Sample Type:	Composite	Ind.(0-2ft)	Ind.(6-8ft)	Composite	Composite	Individual	Composite	Composite	Composite
Date Sampled:	11/14/84	01/07/86	01/07/86	11/14/84	11/13/84	12/12/85	11/8/84	11/8/84	11/14/84
OTR Number:	E9781	E9899	E9900	E9783	E9781	E9869	E9759	E9760	E9801
OTR Number:	E9782			E9784	E9782				E9802
ITR Number:	MEA284	ME4497	ME4498	MEA282	MEA281	ME4467	MEA267	MEA268	MEA291
Base/Neutrals and Acids (cont'd)									
(units - µg/kg)									
pentachlorophenol									
phenanthrene		8700 ++	3100 J, ++	4000	4800				
anthracene				1600 J					
di-n-butylphthalate				11000 B	3700 B	45 J			
fluoranthene				1600 J	1200				
pyrene				1600 J	900				
butylbenzylphthalate		9000 ++	4900 J, ++	6400					
benzo(a)anthracene				1600 J	800 J				
bis(2-ethylhexyl)phthalate	16600 ++	330000 ++	65000 ++	20000	4400		48000		4400 J, B, ++
chrysene				1600 J	830				
di-n-octyl phthalate		8000 ++	4300 J, ++	4300	800 J		11000 J		
benzo(b)fluoranthene					800 J				
benzo(k)fluoranthene					800 J				
benzo(a)pyrene					800 J				
indeno (1,2,3-cd)pyrene									
dibenz(a,h)anthracene									
benzo(g,h,i)perylene					800 J				
Total Base/Neutrals and Acids	28090	449500	90400	10200	50730	45	59000		4400
Total Tentatively Identified Base/Neutrals and Acids	171920	744623		1879915	1755482	4382	60000	76000	0

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	*4-6*	*4-6*	*4-6*	*4-7*	*4-8*	*4-9*	*5-1*	*5-1*	*5-2*
Sample Number:	*SS037001*	*SS46001*	*SS46001*	*SS033001*	*SS030001*	*SS49001*	*SL018001*	*SL018001d*	*SS042001*
Sample Type:	*Composite*	*Ind.(0-2ft)*	*Ind.(6-8ft)*	*Composite*	*Composite*	*Individual*	*Composite*	*Composite*	*Composite*
Date Sampled:	*11/14/84*	*01/07/86*	*01/07/86*	*11/14/84*	*11/13/84*	*12/12/85*	*11/8/84*	*11/8/84*	*11/14/84*
OTR Number:	*E9791*	*E9899*	*E9900*	*E9783*	*E9781*	*E9869*	*E9759*	*E9760*	*E9801*
OTR Number:	*E9792*			*E9784*	*E9782*				*E9802*
ITR Number:	*MEA286*	*ME4497*	*ME4498*	*MEA282*	*MEA281*	*ME4467*	*MEA267*	*MEA268*	*MEA291*
Inorganics									
(units - mg/kg dry weight)									
Aluminum	7560	4780	6880	7830	7810	12700	8726	7452	9900
Antimony									[16] R
Arsenic	14 R	26 J	22 J	16 S, R, +	13 R	14	[30] R		22 S
Barium	[83]	[84]	[57]	[78]	[58]	[71]	[83] R	[89] R	[92]
Beryllium	[.65]	[1.1]	[0.7]	[0.98]	[0.87]	[0.55]			
Cadmium		4.7							
Calcium	12900	17600	3950	[2430]	[2520]	[1670]	25549	21258	37000
Chromium	21	36	16	25	18	19	14 R	16 R	17
Cobalt	[7.3]	[8.8]	[13]	[12]	[8.5]	[15]			[5.6]
Copper	32	51	25	28	26	31	[11]	[12]	[12]
Iron	33500	32300	23700	43400	38300	26100	30178	30820	33200
Lead	26 S, +	48	19 R	27 +	16.5 +	17	26 R	25 R	32
Cyanide	8.6 R	1.5		.6 R	.6 R				1.7 +
Magnesium	[2700]	[1930]	3260	[2670]	[2720]	3180	[1208]	[1375]	[1670]
Manganese	227	131	347	292	236	655 J	116 R, E	127 R, E	124
Mercury		0.65		0.2			0.34	0.26	
Nickel	[19]	[18]	30	24	[20]	30	[12] R	[14] R	[12]
Potassium	[1560]	[1680]	[1540]	[1350]	[1030]	[1800]	[2140]	[1021]	[2510]
Selenium									
Silver									
Sodium	[145]			[153]	[109]	[1090]			[283]
Thallium									
Tin				[15] R					
Vanadium	[23]	[18]	[18]	[27]	[25]	[25]	[24] R	[25] R	[24]
Zinc	120	448	95	112	85	100	52 R	110 R	51
Percent Moisture									
Percent Solids	84.2	84.0	86.0	85.2	82.3	84.0	84.0	86.8	80.8

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	*4-6*	*4-6*	*4-6*	*4-7*	*4-8*	*4-9*	*5-1*	*5-1*	*5-2*
Sample Number:	*SS037001*	*SS46001*	*SS46001*	*SS033001*	*SS030001*	*SS49001*	*SL018001*	*SL018001d*	*SS042001*
Sample Type:	*Composite*	*Ind.(0-2ft)*	*Ind.(6-8ft)*	*Composite*	*Composite*	*Individual*	*Composite*	*Composite*	*Composite*
Date Sampled:	*11/14/84*	*01/07/86*	*01/07/86*	*11/14/84*	*11/13/84*	*12/12/85*	*11/8/84*	*11/8/84*	*11/14/84*
OTR Number:	*E9791*	*E9899*	*E9900*	*E9783*	*E9781*	*E9869*	*E9759*	*E9760*	*E9801*
OTR Number:	*E9792*			*E9784*	*E9782*				*E9802*
ITR Number:	*MEA286*	*ME4497*	*ME4498*	*MEA282*	*MEA281*	*ME4467*	*MEA267*	*MEA268*	*MEA291*
Pesticides and PCBs									
(units - µg/kg)									
Alpha-BHC									
Beta-BHC									
Delta-BHC									
Gamma-BHC (Lindane)									
Heptachlor									
Aldrin									
Heptachlor Epoxide									
Endosulfan I									
Dieldrin									
4,4-DDE									
Endrin									
4,4-DDT									
Toxaphene									
Arochlor-1232									
Arochlor-1242									
Arochlor-1248	13700 ++	310000 C,++	37000 ++	15000					
Arochlor-1254									
Mirex									
Total Pesticides and PCBs	13700	310000	37000	15000					
Percent Moisture (Volatiles)	17	20	14	10	16	16	13	15	18

Notes:

(1) B - Analyte has been found in the laboratory blank as well as the sample. Indicates possible/probable contamination.
(2) C - Applies to pesticide parameters where the identification has been confirmed by GC/MS.
(3) E - Value is estimated due to presence of interference.
(4) J - An estimated value.
(5) R - Spike sample recovery is not within control limits.
(6) S - Value is determined by standard addition.
(7) + - Duplicate analysis is not within control limits.
(8) ++ - Samples analyzed at medium concentrations.
(9) [ ] - Positive values less than required detection limit by contract.
(10) Ind. - Refers to Individual Samples.
(11) All samples taken from surface (0-2 ft) unless otherwise indicated.
Indicates soils to be treated.

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	5-2	5-2	5-3	5-4	5-4	5-4	5-4	5-5	5-6	5-7
Sample Number:	SS52001	SS52001	SS039001	SL020001	SS54001	SS54001	SS54002	SL001001	SS036001	SS032001
Sample Type:	Ind.(0-2ft)	Ind.(4-6ft)	Composite	Composite	Ind.(0-2ft)	Ind.(6-8ft)	Individual	Composite	Composite	Composite
Date Sampled:	12/28/85	12/28/85	11/14/84	11/9/84	12/30/85	12/30/85	12/30/85	11/6/84	11/14/84	11/13/84
OTR Number:	EA454	EA453	E9795	E9762	EB187	EB189	EB188	E9741	E9789	E9779
OTR Number:			E9796						E9790	E9780
ITR Number:	MEB372	MEB371	MEA288	MEA270	MEB385	MEB387	MEB386	MEA249	MEA285	MEA280
Volatile Organic Compound (VOCs)										
(units - µg/kg)										
chloromethane										
vinyl chloride										
methylene chloride	81 B	35 B	18		18000 B,++	6000 B, J,++	5400 B, J,++	60 B	8.4	
acetone	150 B	120 B	153		520000 B,++	42000 B,++	44000 B,++	95		
carbon disulfide	8									
1,1-dichloroethene			3.2			7600 J, ++				
1,1-dichloroethane			15			13000 ++		14		
trans-1,2-dichloroethene			381			5400 J, ++				
chloroform	4 J				4300 J, ++			16		
1,2-dichloroethane				23000 ++	76000 ++	64000 ++	80000 ++	2100 J		
2-butanone	28 B	30 B		19000 ++	35000 B, ++	40000 B, ++	38000 B, ++	610 J		
1,1,1-trichloroethane	19		822	7400 ++	47000 ++	230000 ++	51000 ++	240 J	6.0	4.5
1,1,2,2-tetrachloroethane				4400 J, ++						
trichloroethene	220	4 J	1100	9800 ++	150000 ++	430000 ++	16000 ++	1700 J	4.6	46
1,1,2-trichloroethane								29		
benzene	24	31	5.0						4.8	2.3
2-hexanone			19	4400 ++				58		
4-methyl-2-pentanone				45000 ++		6400 J, ++		78		
tetrachloroethene			7.5	4600 J, ++				5 J		
toluene	66	91	202	260000 ++	62000 ++	7100 J, ++	36000 ++	53	4.0	
chlorobenzene										
ethylbenzene	8	11	52	3600 ++	180000 ++	45000 ++	75000 ++			
styrene									2.9	
Total xylenes	71	110	394	210000 ++	730000 ++	260000 ++	280000 ++			
Total Volatiles	679	432	3172	623600	1822300	1156500	769400	5058	30.7	52.8
Total Tentatively Identified Volatiles	56.4	56	200	44200	101938.7	71648	36524.3	1500	204	200

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	5-2	5-2	5-3	5-4	5-4	5-4	5-4	5-5	5-6	5-7
Sample Number:	SS52001	SS52001	SS039001	SL020001	SS54001	SS54001	SS54002	SL001001	SS036001	SS032001
Sample Type:	Ind.(0-2ft)	Ind.(4-6ft)	Composite	Composite	Ind.(0-2ft)	Ind.(6-8ft)	Individual	Composite	Composite	Composite
Date Sampled:	12/28/85	12/28/85	11/14/84	11/9/84	12/30/85	12/30/85	12/30/85	11/6/84	11/14/84	11/13/84
OTR Number:	EA454	EA453	E9795	E9762	EB187	EB189	EB188	E9741	E9789	E9779
OTR Number:			E9796						E9790	E9780
ITR Number:	MEB372	MEB371	MEA288	MEA279	MEB385	MEB387	MEB386	MEA249	MEA285	MEA280
Base/Neutrals and Acids (BNAs)										
(units - µg/kg)										
n-nitrosodimethylamine										
phenol				44000 ++						
aniline										
1,3-dichlorobenzene										
1,4-dichlorobenzene					18000 J, ++	2300 J, ++				
benzyl alcohol										
1,2-dichlorobenzene	100 J	54 J		13000 J, ++	140000 ++	17000 ++	67000 ++			
2-methylphenol										
bis(2-chloroisopropyl)ether									800 J	
4-methylphenol										
hexachloroethane										
isophorone	63 J								800 J	
2-nitrophenol										
2,4-dimethylphenol										
benzoic acid									4000 J	8000 J
1,2,4-trichlorobenzene									800 J	
naphthalene	1300	850		43000 ++					2600	1900
4-chloro-3-methylphenol										
2-methylnaphthalene	1800	850		110000 ++					6500	3100
hexachlorocyclopentadiene				53000 ++	2800000 ++	130000 ++	2300000 ++			
dimethyl phthalate										
acenaphthylene										
acenaphthene									800 J	
4-nitrophenol										
dibenzofuran	660	300 J								
diethylphthalate									800 J	
fluorene	65 J	57 J							800 J	
n-nitrosodiphenylamine (1)									800 J	
hexachlorobenzene				32000 ++	250000 ++	34000 ++	160000 ++		800 J	20000

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	5-2	5-2	5-3	5-4	5-4	5-4	5-4	5-5	5-6	5-7
Sample Number:	SS52001	SS52001	SS039001	SL020001	SS54001	SS54001	SS54002	SL001001	SS036001	SS032001
Sample Type:	Ind.(0-2ft)	Ind.(4-6ft)	Composite	Composite	Ind.(0-2ft)	Ind.(6-8ft)	Individual	Composite	Composite	Composite
Date Sampled:	12/28/85	12/28/85	11/14/84	11/9/84	12/30/85	12/30/85	12/30/85	11/6/84	11/14/84	11/13/84
OTR Number:	EA454	EA453	E9795	E9762	EB187	EB189	EB188	E9741	E9789	E9779
OTR Number:			E9796						E9790	E9780
ITR Number:	MEB372	MEB371	MEA288	MEA270	MEB385	MEB387	MEB386	MEA249	MEA285	MEA280
Base/Neutrals and Acids (cont'd)										
(units - µg/kg)										
pentachlorophenol										
phenanthrene	1200	670		13000 J, ++					3800	1900
anthracene				13000 J, ++						
di-n-butylphthalate	350 B	700 B			12000 J, ++				7700 B	11000
fluoranthene	340	120 J							1000	
pyrene	350	210 J							800 J	1600 J
butylbenzylphthalate				12000 J, ++					800 J	1600 J
benzo(a)anthracene	240 J	110 J							800 J	
bis(2-ethylhexyl)phthalate	3100 B	3600 B	52900 B, ++	200000 ++	3300000 ++	160000 ++	450000 ++		15000	36000
chrysene	220 J	130 J							800 J	
di-n-octyl phthalate	1700	1300			170000 ++	22000 ++	110000 ++		800 J	3800
benzo(b)fluoranthene	320 J	130 J							800 J	
benzo(k)fluoranthene	320 J	130 J								
benzo(a)pyrene	200 J	45 J							800 J	
indeno (1,2,3-cd)pyrene	56 J									
dibenz(a,h)anthracene										
benzo(g,h,i)perylene	130 J	84 J							800 J	
Total Base/Neutrals and Acids	12514	9340	52900	533000	6690000	365300	3067000		53400	88900
Total Tentatively Identified Base/Neutrals and Acids	27590	15058	130200		3339342	481124	7398209	0	455294	2760000

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	*5-2*	*5-2*	*5-3*	*5-4*	*5-4*	*5-4*	*5-4*	*5-5*	*5-6*	*5-7*
Sample Number:	*SS52001*	*SS52001*	*SS039001*	*SL020001*	*SS54001*	*SS54001*	*SS54002*	*SL001001*	*SS036001*	*SS052001*
Sample Type:	*Ind.(0-2ft)*	*Ind.(4-6ft)*	*Composite*	*Composite*	*Ind.(0-2ft)*	*Ind.(6-8ft)*	*Individual*	*Composite*	*Composite*	*Composite*
Date Sampled:	*12/28/85*	*12/28/85*	*11/14/84*	*11/9/84*	*12/30/85*	*12/30/85*	*12/30/85*	*11/6/84*	*11/14/84*	*11/13/84*
OTR Number:	*EA454*	*EA453*	*E9795*	*E9762*	*EB187*	*EB189*	*EB188*	*E9741*	*E9789*	*E9779*
OTR Number:			*E9796*						*E9790*	*E9780*
ITR Number:	*MEB372*	*MEB371*	*MEA288*	*MEA270*	*MEB385*	*MEB387*	*MEB386*	*MEA249*	*MEA285*	*MEA290*
Inorganics										
(units - mg/kg dry weight)										
Aluminum	1790	3920	5610	6140	4690	4530	3410	7783	8480	8790
Antimony							[18] J, R			
Arsenic	28 J	14 J	23 S, R	22 R	25 J	28 J	23 J	20 R	14 R	17 R
Barium	[70]	[64]	[108]	[58]	[110]	[55]	[119]	[74] R	[68]	[65]
Beryllium	[0.32]	[0.32]	[1.1]	[0.64]	[0.61]	[0.57]	[0.46]		[1.1]	[1.1]
Cadmium		[2.9]			3.2	5	4.3			
Calcium	[2020]	[2070]	4070	5520	[2920]	[1210]	[1160]	[2586]	13600	3130
Chromium	8.7	11	27	18	24	21	89	25 R	24	24
Cobalt		[8.5]	[7.2]	[9.6]	[9.4]	[13]	[6.3]	[18] R	[14]	[20]
Copper	22	29	43	33	148	66	175	34	44	41
Iron	27800	28800	24300	33400	29800	39400	30400	43464	39200	39400
Lead	19 R	22 R	24 +	49 +	64	42	147	19 R	37 S, +	28 +
Cyanide			3.7 R	43.6	22	9.4	67		8.4 R	11.3 R
Magnesium	[407]	[1260]	[1650]	[2590]	[1740]	[2260]	[1380]	[2869]	[2840]	3160
Manganese	33	105	209	245	153	324	115	247 R, E	300	642
Mercury	0.52	0.025	0.2		0.15	[0.11]	0.15	0.26	0.2	
Nickel	[5.3]	[16]	[21]	28	[20]	25	[23]	27 R	24	33
Potassium	[1640]	[1790]	[1420]	[1530]	[1740]	[1640]	[1320]	[1539]	[1560]	[1660]
Selenium										
Silver	[3.1] J, R					[4.1] J, R	[3] J			
Sodium			[212]	[247]					[206]	[168]
Thallium										
Tin							106			
Vanadium	[16]	[16]	[22]	[20]	[18]	[19]	[18]	[31] R	[24]	[26]
Zinc	24	59	74	103	104	112	421	105 R	194	130
Percent Moisture										
Percent Solids	83.0	83.0	79.8	81.1	79.0	85.0	82.0	77.8	84.8	82.0

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	5-2	5-2	5-3	5-4	5-4	5-4	5-4	5-5	5-6	5-7
Sample Number:	SS52001	SS52001	SS039001	SL020001	SS54001	SS54001	SS54002	SL001001	SS036001	SS032001
Sample Type:	Ind.(0-2ft)	Ind.(4-6ft)	Composite	Composite	Ind.(0-2ft)	Ind.(6-8ft)	Individual	Composite	Composite	Composite
Date Sampled:	12/28/85	12/28/85	11/14/84	11/9/84	12/30/85	12/30/85	12/30/85	11/6/84	11/14/84	11/13/84
OTR Number:	EA454	EA453	E9795	E9762	EB187	EB189	EB188	E9741	E9789	E9779
OTR Number:			E9796						E9790	E9780
ITR Number:	MEB372	MEB371	MEA288	MEA270	MEB385	MEB387	MEB386	MEA249	MEA285	MEA280
Pesticides and PCBs										
(units - µg/kg)										
Alpha-BHC										
Beta-BHC										
Delta-BHC										
Gamma-BHC (Lindane)										
Heptachlor										
Aldrin										
Heptachlor Epoxide			19.8 J, ++							
Endosulfan I										
Dieldrin										
4,4-DDE										
Endrin										
4,4-DDT										
Toxaphene										
Arochlor-1232										
Arochlor-1242										
Arochlor-1248				21000 ++					680	640
Arochlor-1254										
Mirex										
Total Pesticides and PCBs			19.8	21000					680	640
Percent Moisture (Volatiles)	17	17	23	15	22	17	20	16	17	16

Notes:

(1) B - Analyte has been found in the laboratory blank as well as the sample. Indicates possible/probable contamination.
(2) C - Applies to pesticide parameters where the identification has been confirmed by GC/MS.
(3) E - Value is estimated due to presence of interference.
(4) J - An estimated value.
(5) R - Spike sample recovery is not within control limits.
(6) S - Value is determined by standard addition.
(7) + - Duplicate analysis is not within control limits.
(8) ++ - Samples analyzed at medium concentrations.
(9) [ ] - Positive values less than required detection limit by contract.
(10) Ind. - Refers to Individual Samples.
(11) All samples taken from surface (0-2 ft) unless otherwise indicated.
Indicates soils to be treated.

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	5-7	5-7	5-7	5-8	5-9	5-9	6-2	6-3	6-4
Sample Number:	SS57001	SS57001	SS57002	SS029001	SS59001	SS59002	SS041001	SS040001	SL019001
Sample Type:	Ind.(0-2ft)	Ind.(6-8ft)	Individual	Composite	Individual	Individual	Composite	Composite	Composite
Date Sampled:	01/06/86	01/06/86	01/06/86	11/13/84	12/12/85	12/12/85	11/14/84	11/14/84	11/9/84
OTR Number:	EB191	EB193	EB192	E9755	E9870	E9871	E9799	E9797	E9761
OTR Number:				E9776			E9800	E9798	
ITR Number:	MEB389	MEB391	MEB390	MEA278	MEA464	MEA469	MEA290	MEA289	MEA269
Volatile Organic Compound (VOCs)									
(units - µg/kg)									
chloromethane									
vinyl chloride									
methylene chloride	81 B	70 B	53 B		47 B	26 B	13	11	
acetone	74 B	260 B			110 B	81 B	24	309	8200 ++
carbon disulfide		3 J	5						
1,1-dichloroethene									
1,1-dichloroethane									
trans-1,2-dichloroethene		3 J						4.9	
chloroform								2.4	
1,2-dichloroethane									1300 J, ++
2-butanone	31 B	36 B			29 B	24 B			3500 J, ++
1,1,1-trichloroethane			3 J					46	19000 ++
1,1,2,2-tetrachloroethane									
trichloroethene	5	11	9				22	189	76000 ++
1,1,2-trichloroethane									
benzene	8	7		3.1			4.9	4.9	
2-hexanone									
4-methyl-2-pentanone									
tetrachloroethene									1300 J, ++
toluene	34 B	31 B	20 B		28	14	6.1	41	26000 ++
chlorobenzene									
ethylbenzene		4 J						4.9	
styrene									
Total xylenes	12	11	9				15	68	
Total Volatiles	245	436	99	3.1	214	145	85	681	135300
Total Tentatively Identified Volatiles	42	39.5	59.7	200	53.4	0	200	212	0

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	5-7	5-7	5-7	5-8	5-9	5-9	6-2	6-3	6-4
Sample Number:	SS57001	SS57001	SS57002	SS029001	SS59001	SS59002	SS041001	SS040001	SL019001
Sample Type:	Ind.(0-2ft)	Ind.(6-8ft)	Individual	Composite	Individual	Individual	Composite	Composite	Composite
Date Sampled:	01/06/86	01/06/86	01/06/06	11/13/84	12/12/85	12/12/85	11/14/84	11/14/84	11/9/84
OTR Number:	EB191	EB193	EB192	E9755	E9870	E9871	E9799	E9797	E9761
OTR Number:				E9776			E9800	E9798	
ITR Number:	MEB389	MEB391	MEB390	MEA278	ME4468	ME4469	MEA290	MEA289	MEA268
Base/Neutrals and Acids (BNAs)									
(units - µg/kg)									
n-nitrosodimethylamine									
phenol									
aniline									
1,3-dichlorobenzene									
1,4-dichlorobenzene									
benzyl alcohol									
1,2-dichlorobenzene								11200 J	
2-methylphenol									
bis(2-chloroisopropyl)ether									
4-methylphenol									
hexachloroethane									
isophorone									
2-nitrophenol									
2,4-dimethylphenol									
benzoic acid					500 J				
1,2,4-trichlorobenzene									
naphthalene	430	340	260 J	470	750	370			
4-chloro-3-methylphenol									
2-methylnaphthalene	540	480	370	660	1200	540		2820 J, ++	
hexachlorocyclopentadiene									
dimethyl phthalate									
acenaphthylene									
acenaphthene									
4-nitrophenol									
dibenzofuran	120 J	110 J	85 J		310 J	120 J			
diethylphthalate				330 J					
fluorene		67 J							
n-nitrosodiphenylamine (1)									
hexachlorobenzene	180 J		96 J	3300					

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	5-7	5-7	5-7	5-8	5-9	5-9	6-2	6-3	6-4
Sample Number:	SS57001	SS57001	SS57002	SS029001	SS59001	SS59002	SS041001	SS040001	SL019001
Sample Type:	Ind.(0-2ft)	Ind.(6-8ft)	Individual	Composite	Individual	Individual	Composite	Composite	Composite
Date Sampled:	01/06/86	01/06/86	01/06/86	11/13/84	12/12/85	12/12/85	11/14/84	11/14/84	11/9/84
OTR Number:	EB191	EB193	EB192	E9755	E9670	E9671	E9799	E9797	E9761
OTR Number:				E9776			E9800	E9798	
ITR Number:	MEB389	MEB391	MEB390	MEA278	ME4468	ME4469	MEA290	MEA289	MEA269
Base/Neutrals and Acids (cont'd)									
(units - µg/kg)									
pentachlorophenol									
phenanthrene	380	530	270 J	580	680	440			
anthracene									
di-n-butylphthalate	250 J	410	290 J	4900 B		60 J			
fluoranthene	81 J	130 J	54 J		120 J	86 J			
pyrene	110 J	200 J	82 J	330 J	160 J	130 J			
butylbenzylphthalate									
benzo(a)anthracene	49 J		41 J		110 J	88 J			
bis(2-ethylhexyl)phthalate	1000 B	310 J, B	630	2700	45 J		5710 J, ++	28000 B, ++	1400000 ++
chrysene	68 J	95 J	53 J		110 J	83 J			
di-n-octyl phthalate	54 J	66 J	48 J	330 J				3620 J, ++	
benzo(b)fluoranthene	90 J	120 J			120 J	120 J			
benzo(k)fluoranthene	90 J	120 J			120 J	120 J			
benzo(a)pyrene						41 J			
indeno (1,2,3-cd)pyrene									
dibenz(a,h)anthracene									
benzo(g,h,i)perylene	120 J		110 J		140 J	120 J			
Total Base/Neutrals and Acids	3562	2978	2434	13600	4335	2318	5710	45640	1400000
Total Tentatively Identified Base/Neutrals and Acids	24998	13892	21737	896800	35993	8030	0	40400	0

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	5-7	5-7	5-7	5-8	5-9	5-9	6-2	6-3	6-4
Sample Number:	SS57001	SS57001	SS57002	SS029001	SS59001	SS59002	SS041001	SS040001	SL019001
Sample Type:	Ind.(0-2ft)	Ind.(6-8ft)	Individual	Composite	Individual	Individual	Composite	Composite	Composite
Date Sampled:	01/06/86	01/06/86	01/06/86	11/13/84	12/12/85	12/12/85	11/14/84	11/14/84	11/9/84
OTR Number:	EB191	EB193	EB192	E9755	E9870	E9871	E9799	E9797	E9761
OTR Number:				E9776			E9800	E9798	
ITR Number:	MEB389	MEB391	MEB390	MEA278	ME4468	ME4469	MEA290	MEA289	MEA269
Inorganics									
(units - mg/kg dry weight)									
Aluminum	6560	7080	6270	9780	7180	9960	15300	14600	5530
Antimony		[17] J, R					66 R	45 R	
Arsenic	22 J	21 J	22 J	17 R	12	9.9	22	14 S	18 R
Barium	[57]	[46]	[39]	[52]	135	[130]	186	[123]	122
Beryllium	[0.72]	[0.98]	[0.73]	[1.1]		[0.48]	[1.6]		
Cadmium	3.7	[2.9]				4.2			
Calcium	3470	[2550]	[988]	4240	[392]	[402]	11700	15200	[1630]
Chromium	23	28	28	19	16	22	35	60	67
Cobalt	[14]	[18]	[12]	[19]	[10]	[13]	[20]	[16]	
Copper	39	36	28	43	29	37	49	51	67
Iron	31600	47000	29700	54600	30900	40600	73300	72000	33900
Lead	34	36	32	17 +	22	21	32	20	65 +
Cyanide	1.1			.95 R			.57 +	.88 +	10.6 R
Magnesium	[2650]	3400	[2540]	3750	3280	4700	3990	4460	[1940]
Manganese	334	680	224	477	170 J	239 J	333	356	199
Mercury	[0.084]						0.1	0.1	
Nickel	28	34	[21]	28	[19]	[25]	37	41	[11]
Potassium	[1630]	[1770]	[1950]	[1820]	[2190]	[2230]	[2800]	3310	[1770]
Selenium									
Silver		[3.4] J, R	[2.6] J, R		[2.7] J, R	[4.5] J, R			
Sodium				[124]	[707]		[464]	[231]	[166]
Thallium									
Tin									
Vanadium	[20]	[26]	[21]	[29]	[16]	[22]	50	41	[15]
Zinc	162	100	85	113	89	109	130	132	67
Percent Moisture									
Percent Solids	83.0	84.0	82.0	82.9	77.0	76.0	81.3	81.1	84.4

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	5-7	5-7	5-7	5-8	5-8	5-9	6-2	6-3	6-4
Sample Number:	SS57001	SS57001	SS57002	SS029001	SS59001	SS59002	SS041001	SS040001	SL019001
Sample Type:	Ind.(0-2ft)	Ind.(6-8ft)	Individual	Composite	Individual	Individual	Composite	Composite	Composite
Date Sampled:	01/06/86	01/06/86	01/06/86	11/13/84	12/12/85	12/12/85	11/14/84	11/14/84	11/9/84
OTR Number:	EB191	EB193	EB191	E9755	E9870	E9871	E9799	E9797	E9761
OTR Number:				E9776			E9800	E9798	
ITR Number:	MEB389	MEB391	MEB390	MEA278	ME4464	ME4469	MEA290	MEA289	MEA269
Pesticides and PCBs									
(units - µg/kg)									
Alpha-BHC									
Beta-BHC									
Delta-BHC									
Gamma-BHC (Lindane)									
Heptachlor									
Aldrin									
Heptachlor Epoxide									
Endosulfan I									
Dieldrin									
4,4-DDE									
Endrin									
4,4-DDT									
Toxaphene									
Arochlor-1232									
Arochlor-1242									
Arochlor-1248		990							
Arochlor-1254									
Mirex									
Total Pesticides and PCBs		990							
Percent Moisture (Volatiles)	20	13	19	10	21	24	18	18	16

Notes:

(1) B - Analyte has been found in the laboratory blank as well as the sample. Indicates possible/probable contamination.
(2) C - Applies to pesticide parameters where the identification has been confirmed by GC/MS.
(3) E - Value is estimated due to presence of interference.
(4) J - An estimated value.
(5) R - Spike sample recovery is not within control limits.
(6) S - Value is determined by standard addition.
(7) + - Duplicate analysis is not within control limits.
(8) ++ - Samples analyzed at medium concentrations.
(9) [ ] - Positive values less than required detection limit by contract.
(10) Ind. - Refers to Individual Samples.
(11) All samples taken from surface (0-2 ft) unless otherwise indicated
Indicates soils to be treated.

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	6-5	6-5	6-5	6-5	6-6	6-7	6-7	6-7	6-7	6-8
Sample Number:	SS035001	SS65001	SS65001	SS65002	SS034001	SS031001	SS67001	SS67001	SS67002	SS028001
Sample Type:	Composite	Ind.(0-2ft)	Ind.(6-8ft)	Individual	Composite	Composite	Ind.(0-2ft)	Ind.(6-8ft)	Individual	Individual
Date Sampled:	11/15/84	01/06/86	01/06/86	01/06/86	11/15/84	11/13/84	01/06/86	01/06/86	01/06/86	11/13/84
OTR Number:	E9787	EA457	EA459	EA458	E9785	E9777	EA460	EB182	EB181	E9773
OTR Number:	E9788				E9786	E9778				E9774
ITR Number:	MEA284	MEB375	MEB377	MEB376	MEA283	MEA279	MEB378	MEB380	MEB379	MEA277
Volatile Organic Compound (VOCs)										
(units - µg/kg)										
chloromethane										
vinyl chloride										
methylene chloride	5.8	16 B	5100	47 B	4.1		25 B	220 B	91 B	
acetone	16	28 B	19000 B	30 B			42 B	47 B	52 B	
carbon disulfide								5		
1,1-dichloroethene										
1,1-dichloroethane										
trans-1,2-dichloroethene		70	7100	51				30		
chloroform		6								
1,2-dichloroethane										
2-butanone			16000 B	25 B			34 B	39 B	30 B	
1,1,1-trichloroethane	55	19		6			12			
1,1,2,2-tetrachloroethane										
trichloroethene	51	1600	99000	1400	99	49	59	130	18	
1,1,2-trichloroethane										14
benzene	6.0	13.0		11.0	4.1	1.9 J, B	11	8	14	2.4 J, B
2-hexanone										
4-methyl-2-pentanone										
tetrachloroethene										
toluene	53	47	1900 J	34	14		72	24	72	
chlorobenzene				3 J						
ethylbenzene			2500 J	4 J					10	
styrene										
Total xylenes	9.6	11	9000	14			35	9	120	
Total Volatiles	196	1810	159600	1625	121	50.9	300	512	407	16.4
Total Tentatively Identified Volatiles	200	27.6		0	200	200	133	13.2		200

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	*6-5*	*6-5*	*6-5*	*6-5*	*6-6*	*6-7*	*6-7*	*6-7*	*6-7*	*6-8*
Sample Number:	*SS035001*	*SS65001*	*SS65001*	*SS65002*	*SS034001*	*SS031001*	*SS67001*	*SS67001*	*SS67002*	*SS028001*
Sample Type:	*Composite*	*Ind.(0-2ft)*	*Ind.(6-8ft)*	*Individual*	*Composite*	*Composite*	*Ind.(0-2ft)*	*Ind.(6-8ft)*	*Individual*	*Individual*
Date Sampled:	*11/15/84*	*01/06/86*	*01/06/86*	*01/06/86*	*11/15/84*	*11/13/84*	*01/06/86*	*01/06/86*	*01/06/86*	*11/13/84*
OTR Number:	*E9787*	*EA457*	*EA459*	*EA458*	*E9785*	*E9777*	*EA460*	*EB182*	*EB181*	*E9773*
OTR Number:	*E9788*				*E9786*	*E9778*				*E9774*
ITR Number:	*MEA284*	*MEB375*	*MEB377*	*MEB376*	*MEA283*	*MEA279*	*MEB378*	*MEB380*	*MEB379*	*MEA277*
Base/Neutrals and Acids (BNAs)										
(units - µg/kg)										
n-nitrosodimethylamine	8200 J, B									
phenol						960	330		290 J	
aniline										
1,3-dichlorobenzene										
1,4-dichlorobenzene										
benzyl alcohol										
1,2-dichlorobenzene			49 J							
2-methylphenol						4800	1100		1900	
bis(2-chloroisopropyl)ether										
4-methylphenol							270 J		640	
hexachloroethane										
isophorone										
2-nitrophenol										
2,4-dimethylphenol						7000	1100		2500	
benzoic acid					4000 J	2100				
1,2,4-trichlorobenzene		1400	100 J	1000						
naphthalene		630		720	980	2400	520	260 J	490	1200
4-chloro-3-methylphenol			140 J							
2-methylnaphthalene		1000	1100	1200	1800	4000	770	420	740	1800
hexachlorocyclopentadiene										
dimethyl phthalate										
acenaphthylene										
acenaphthene										
4-nitrophenol										
dibenzofuran		190 J	150 J	220 J			93 J	110 J		382
diethylphthalate					800 J	800 J				330 J
fluorene			63 J							
n-nitrosodiphenylamine (1)					800 J	800 J				
hexachlorobenzene		220 J		140 J	930	800 J				

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	*6-5*	*6-5*	*6-5*	*6-5*	*6-6*	*6-7*	*6-7*	*6-7*	*6-7*	*6-8*
Sample Number:	*SS035001*	*SS65001*	*SS65001*	*SS65002*	*SS034001*	*SS031001*	*SS67001*	*SS67001*	*SS67002*	*SS028001*
Sample Type:	*Composite*	*Ind.(0-2ft)*	*Ind.(6-8ft)*	*Individual*	*Composite*	*Composite*	*Ind.(0-2ft)*	*Ind.(6-8ft)*	*Individual*	*Individual*
Date Sampled:	*11/15/84*	*01/06/86*	*01/06/86*	*01/06/86*	*11/15/84*	*11/13/84*	*01/06/86*	*01/06/86*	*01/06/86*	*11/13/84*
OTR Number:	*E9787*	*EA457*	*EA459*	*EA458*	*E9785*	*E9777*	*EA460*	*EB182*	*EB181*	*E9773*
OTR Number:	*E9788*				*E9786*	*E9778*				*E9774*
ITR Number:	*MEA284*	*MEB375*	*MEB377*	*MEB376*	*MEA283*	*MEA279*	*MEB378*	*MEB380*	*MEB379*	*MEA277*
Base/Neutrals and Acids (cont'd)										
(units - µg/kg)										
pentachlorophenol										
phenanthrene		500	400	590	820	1900	270 J	270 J	350	1100
anthracene										
di-n-butylphthalate	8200 J	630 J, B	130 J, B	140 J, B	8200	5400	170 J, B	180 J		6900 B
fluoranthene		150 J	80 J	150 J	800 J	800 J		58 J		
pyrene		120 J	150 J	170 J	800 J	800 J	200 J	140 J	220 J	330
butylbenzylphthalate					800 J		930		2100	
benzo(a)anthracene		120 J	78 J	130 J	800 J	800 J				
bis(2-ethylhexyl)phthalate	46000	16000 B	880 B	5200 B	7700	11000	3100 B	120 J, B	4200 B	760
chrysene			70 J	140 J	800 J	800 J		83 J		
di-n-octyl phthalate	64000	490	44 J	220 J	1900	3900	770		600	
benzo(b)fluoranthene		160 J	120 J	210 J	800 J	800 J				
benzo(k)fluoranthene			120 J	210 J						
benzo(a)pyrene			50 J	160 J		800 J				
indeno (1,2,3-cd)pyrene										
dibenz(a,h)anthracene										
benzo(g,h,i)perylene		120 J	100 J	220 J		800 J				
Total Base/Neutrals and Acids	126400	21730	3824	10820	32730	51460	9633	1641	14030	12802
Total Tentatively Identified Base/Neutrals and Acids	14048517	30289		18620	767169	588268	20294	9951	29973	616359

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	*6-5*	*6-5*	*6-5*	*6-5*	*6-6*	*6-7*	*6-7*	*6-7*	*6-7*	*6-8*
Sample Number:	*SS035001*	*SS65001*	*SS65001*	*SS65002*	*SS034001*	*SS031001*	*SS67001*	*SS67001*	*SS67002*	*SS028001*
Sample Type:	*Composite*	*Ind.(0-2ft)*	*Ind.(6-8ft)*	*Individual*	*Composite*	*Composite*	*Ind.(0-2ft)*	*Ind.(6-8ft)*	*Individual*	*Individual*
Date Sampled:	*11/15/84*	*01/06/86*	*01/06/86*	*01/06/86*	*11/15/84*	*11/13/84*	*01/06/86*	*01/06/86*	*01/06/86*	*11/13/84*
OTR Number:	*E9787*	*EA457*	*EA459*	*EA458*	*E9785*	*E9777*	*EA460*	*EB182*	*EB181*	*E9773*
OTR Number:	*E9788*				*E9786*	*E9778*				*E9774*
ITR Number:	*MEA284*	*MEB375*	*MEB377*	*MEB376*	*MEA283*	*MEA279*	*MEB378*	*MEB380*	*MEB379*	*MEA277*
<u>Inorganics</u>										
(units - mg/kg dry weight)										
Aluminum	7090	6580	6660	6010	7600	7840	7030	8190	6640	8740
Antimony										
Arsenic	15 R	20 J	19 J	23 J	18 R	16 R	21 J	22 J	21 J	22 S, R
Barium	343	[45]	[50]	[52]	[46]	[54]	[51]	[51]	[69]	[55]
Beryllium	[1.0]	[0.75]	[0.49]	[0.64]	[0.74]	[0.94]	[0.75]	[0.77]	[0.88]	[1.1]
Cadmium	112	[2.4]					3.4			
Calcium	[1830]	[2540]	[2530]	[1990]	[2020]	2870	4210	4670	3460	3180
Chromium	21	18	19	17	15	44	36	16	20	17
Cobalt	[8.0]	[13]	[11]	[12]	[8.1]	[12]	[15]	[13]	[20]	[14]
Copper	57	36	34	33	29	43	36	25	33	27
Iron	32700	28100	31600	30300	34100	34000	33100	31000	35200	34900
Lead	39 +	26	24	36	70 +	31 +	22	14	34	33 +
Cyanide	12.7 R	8.8	3.9	1.4	.83 R	.86 R				.34 R
Magnesium	[2750]	3070	3190	[2750]	[2790]		3190	3010	[2650]	3160
Manganese	281	407	270	326	268	365	457	208	683	527
Mercury		0.81								
Nickel	[23]	25	26	[24]	24	26	36	28	38	29
Potassium	[1480]	[1530]	[2170]	[1840]	[1520]	[1500]	[1610]	[1410]	[1880]	[1890]
Selenium										
Silver										
Sodium	[277]	[528]	[797]	[572]	[174]	[627]	[678]	[759]	[652]	[114]
Thallium										
Tin										
Vanadium	[20]	[18]	[19]	[19]	[19]	[25]	[19]	[19]	[20]	[22]
Zinc	347	109	91	88	89	89	112	69	115	100
Percent Moisture										
Percent Solids	81.9	86.0	84.0	83.0	85.2	88.4	86.0	83.0	86.0	83.7

TABLE 1

ON-SITE SOIL SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SITE
DEERFIELD, OHIO

Grid Location:	*6-5*	*6-5*	*6-5*	*6-5*	*6-6*	*6-7*	*6-7*	*6-7*	*6-7*	*6-8*
Sample Number:	*SS035001*	*SS65001*	*SS65001*	*SS65002*	*SS034001*	*SS031001*	*SS67001*	*SS67001*	*SS67002*	*SS028001*
Sample Type:	*Composite*	*Ind.(0-2ft)*	*Ind.(6-8ft)*	*Individual*	*Composite*	*Composite*	*Ind.(0-2ft)*	*Ind.(6-8ft)*	*Individual*	*Individual*
Date Sampled:	*11/15/84*	*01/06/86*	*01/06/86*	*01/06/86*	*11/15/84*	*11/13/84*	*01/06/86*	*01/06/86*	*01/06/86*	*11/13/84*
OTR Number:	*E9787*	*EA457*	*EA459*	*EA458*	*E9785*	*E9777*	*EA460*	*EB182*	*EB181*	*E9773*
OTR Number:	*E9788*				*E9786*	*E9778*				*E9774*
ITR Number:	*MEA284*	*MEB375*	*MEB377*	*MEB376*	*MEA283*	*MEA279*	*MEB378*	*MEB380*	*MEB379*	*MEA277*
Pesticides and PCBs										
(units - µg/kg)										
Alpha-BHC										
Beta-BHC										
Delta-BHC										
Gamma-BHC (Lindane)										
Heptachlor										
Aldrin										
Heptachlor Epoxide										
Endosulfan I										
Dieldrin										
4,4-DDE										
Endrin										
4,4-DDT										
Toxaphene										
Arochlor-1232										
Arochlor-1242										
Arochlor-1248						300				
Arochlor-1254										40 J
Mirex										
Total Pesticides and PCBs						300				40
Percent Moisture (Volatiles)	17	19	16	16	13	12	16	17	15	13

Notes:

(1) B - Analyte has been found in the laboratory blank as well as the sample. Indicates possible/probable contamination.
(2) C - Applies to pesticide parameters where the identification has been confirmed by GC/MS.
(3) E - Value is estimated due to presence of interference.
(4) J - An estimated value.
(5) R - Spike sample recovery is not within control limits.
(6) S - Value is determined by standard addition.
(7) + - Duplicate analysis is not within control limits.
(8) ++ - Samples analyzed at medium concentrations.
(9) [ ] - Positive values less than required detection limit by contract.
(10) Ind. - Refers to Individual Samples.
(11) All samples taken from surface (0-2 ft) unless otherwise indicated.
Indicates soils to be treated.

TABLE 2

ON-SITE POND SEDIMENT SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SUPERFUND SITE
DEERFIELD TOWNSHIP OF PORTAGE COUNTY, OHIO

	East Pond Sediments							
Sample Number:	*SD001001*	*SD002001*	*SD003001*	*SD004001*	*SD033001*	*SD037001*	*SD038001*	*AVERAGE*
Date Sampled:	*11/26/84*	*11/26/84*	*11/26/84*	*11/26/84*	*09/16/86*	*09/17/86*	*09/17/86*	
OTR Number:	*E9726*	*E9727*	*E9728*	*E9729*	*EC356*	*EC361*	*EC362*	
ITR Number:	*MEA234*	*MEA235*	*MEA236*	*MEA237*	*MEG806*	*MEG811*	*MEG812*	
Volatile Organic Compound (VOCs) *(units - µg/kg)*								
chloromethane								
vinyl chloride						102		14.6
methylene chloride	89.9	361	32 A	192	8 J, B	656 B	870 B	316
acetone	85	510 A		424		46 B	240 B	186
carbon disulfide								
1,1-dichloroethene					13			1.9
1,1-dichloroethane					69	1410	2261	534
trans-1,2-dichloroethene								
chloroform								
1,2-dichloroethane						13115	16608	4246
2-butanone	200			156				22
1,1,1-trichloroethane	30.5 A				105	787	777	243
1,1,2,2-tetrachloroethane								
trichloroethene	15 A	18		23 A	10	20		12.3
dibromochloromethane								
1,1,2-trichloroethane								
benzene						10 J	25	5.0
2-hexanone							2792	399
4-methyl-2-pentanone								
tetrachloroethene								
toluene						20	32	7.4
chlorobenzene	20 A			130		184	329	95
ethylbenzene		24 A		146			74	35
styrene								
Total xylenes						43	67	15.7
Total Volatiles	240	913	32	1071	205	16393	24075	6133
Total Tentatively Identified Volatiles	153	270	0	0	0	2468	2680	796

TABLE 2

ON-SITE POND SEDIMENT SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SUPERFUND SITE
DEERFIELD TOWNSHIP OF PORTAGE COUNTY, OHIO

	East Pond Sediments							
Sample Number:	*SD001001*	*SD002001*	*SD003001*	*SD004001*	*SD033001*	*SD037001*	*SD038001*	*AVERAGE*
Date Sampled:	*11/26/84*	*11/26/84*	*11/26/84*	*11/26/84*	*09/16/86*	*09/17/86*	*09/17/86*	
OTR Number:	*E9726*	*E9727*	*E9728*	*E9729*	*EC356*	*EC361*	*EC362*	
ITR Number:	*MEA234*	*MEA235*	*MEA236*	*MEA237*	*MEG806*	*MEG811*	*MEG812*	
Base/Neutrals and Acids (BNAs)								
(units - µg/kg)								
n-nitrosodimethylamine								
phenol								
aniline								
1,3-dichlorobenzene								
1,4-dichlorobenzene								
benzyl alcohol								
1,2-dichlorobenzene								
2-methylphenol								
bis(2-chloroisopropyl)ether								
4-methylphenol								
hexachloroethane								
isophorone								
2-nitrophenol								
2,4-dimethylphenol								
benzoic acid								
1,2,4-trichlorobenzene								
naphthalene	750 A				210 J			137
4-chloro-3-methylphenol								
2-methylnaphthalene	1100 A				182 J			183
hexachlorocyclopentadiene								
dimethyl phthalate								
acenaphthylene								
acenaphthene								
4-nitrophenol								
dibenzofuran								
diethylphthalate								
fluorene								
n-nitrosodiphenylamine (1)					490 J	122951 J	1095 J	17791
hexachlorobenzene	1080 A				518 J			228

TABLE 2

ON-SITE POND SEDIMENT SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SUPERFUND SITE
DEERFIELD TOWNSHIP OF PORTAGE COUNTY, OHIO

East Pond Sediments

Sample Number:	*SD001001*	*SD002001*	*SD003001*	*SD004001*	*SD033001*	*SD037001*	*SD038001*	*AVERAGE*
Date Sampled:	*11/26/84*	*11/26/84*	*11/26/84*	*11/26/84*	*09/16/86*	*09/17/86*	*09/17/86*	
OTR Number:	*E9726*	*E9727*	*E9728*	*E9729*	*EC356*	*EC361*	*EC362*	
ITR Number:	*MEA234*	*MEA235*	*MEA236*	*MEA237*	*MEG806*	*MEG811*	*MEG812*	
Base/Neutrals and Acids (cont'd)								
(units - µg/kg)								
pentachlorophenol								
phenanthrene	490 A				168 J			94
anthracene								
di-n-butylphthalate					2521 B		6714 B	1319
fluoranthene								
pyrene								
butylbenzylphthalate								
benzo(a)anthracene								
bis(2-ethylhexyl)phthalate	52000	15000	18000	96000	9244	291808	8481	70076
chrysene								
di-n-octyl phthalate	5200	2500		14000		55738 J	339 J	11111
benzo(b)fluoranthene								
benzo(k)fluoranthene								
benzo(a)pyrene								
indeno (1,2,3-cd)pyrene								
dibenz(a,h)anthracene								
benzo(g,h,i)perylene								
Total Base/Neutrals and Acids	60620	17500	18000	110000	13333	370497	16629	86654
Total Tentatively Identified Base/Neutrals and Acids	2000	7000	3000	49000	20800	25000	8400	16457

TABLE 2

ON-SITE POND SEDIMENT SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SUPERFUND SITE
DEERFIELD TOWNSHIP OF PORTAGE COUNTY, OHIO

	East Pond Sediments							
Sample Number:	*SD001001*	*SD002001*	*SD003001*	*SD004001*	*SD033001*	*SD037001*	*SD038001*	*AVERAGE*
Date Sampled:	*11/26/84*	*11/26/84*	*11/26/84*	*11/26/84*	*09/16/86*	*09/17/86*	*09/17/86*	
OTR Number:	*E9726*	*E9727*	*E9728*	*E9729*	*EC356*	*EC361*	*EC362*	
ITR Number:	*MEA234*	*MEA235*	*MEA236*	*MEA237*	*MEG806*	*MEG811*	*MEG812*	
Inorganics								
(units - mg/kg dry weight)								
Aluminum	7328	7527	7529	6453	7310	11900	12000	8578
Antimony					68	[85] R		21.8
Arsenic					14		23	5.3
Barium	[89] R	[87] R	[101] R	[82] R	[98]	[136]	[151]	106
Beryllium								
Cadmium								
Calcium	[812]	[940]	[848]	[1124]	10500	[4170]	[4910]	3329
Chromium	35 R	12 R	55 R	46 R	37	73	51	44
Cobalt					[13]	[17]	[14]	6.3
Copper	41 R	45 R	49 R	44 R	62	65	56	51.7
Iron	38514	30728	36676	30921	31800	118000	118000	57806
Lead		48	16	0.47	92	59	85	43
Cyanide						74 R	3 R	11
Magnesium	[1878]	[1952]	[2153]	[1824]	[2510]	[3270]	[2820]	2344
Manganese	104 R	102 R	103 R	92 R	390	621	598	287
Mercury	0.26	0.17	0.29	0.19				0.13
Nickel		[24] R	[21] R	[21] R	32	[38]	[29]	23.6
Potassium	[767]			[1226]	[1310]	[1680]	[1540]	932
Selenium								
Silver								
Sodium						[1870]	[1960]	547
Thallium								
Tin								
Vanadium	[26] R	[22] R	[23] R	[24] R	[14]	[18]	[17]	20.6
Zinc	100 R, E	280 R, E	195 R, E	195 R, E	413	1570	545	471
Percent Moisture								
Percent Solids	68.3	58.4	51.6	57.1	71.0	27.0	33.0	52

TABLE 2

ON-SITE POND SEDIMENT SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SUPERFUND SITE
DEERFIELD TOWNSHIP OF PORTAGE COUNTY, OHIO

	East Pond Sediments							
Sample Number:	***SD001001***	***SD002001***	***SD003001***	***SD004001***	***SD033001***	***SD037001***	***SD038001***	***AVERAGE***
Date Sampled:	***11/26/84***	***11/26/84***	***11/26/84***	***11/26/84***	***09/16/86***	***09/17/86***	***09/17/86***	
OTR Number:	***E9726***	***E9727***	***E9728***	***E9729***	***EC356***	***EC361***	***EC362***	
ITR Number:	***MEA234***	***MEA235***	***MEA236***	***MEA237***	***MEG806***	***MEG811***	***MEG812***	
Pesticides and PCBs								
(units - µg/kg)								
Alpha-BHC								
Beta-BHC								
Delta-BHC								
Gamma-BHC (Lindane)								
Heptachlor								
Aldrin								
Heptachlor Epoxide								
Endosulfan I								
Dieldrin								
4,4-DDE								
Endrin								
4,4-DDT								
Toxaphene								
Arochlor-1232								
Arochlor-1242								
Arochlor-1248					8171	21000	4063	4748
Arochlor-1254								
Mirex								
Total Pesticides and PCBs					8171	21000	4063	4748
Percent Moisture (Volatiles)					28.6	69.5	71.7	24

Notes:

(1) B - Analyte has been found in the laboratory blank as well as the sample. Indicates possible/probable contamination.
(2) C - Applies to pesticide parameters where the identification has been confirmed by GC/MS.
(3) E - Value is estimated due to presence of interference.
(4) J - An estimated value.
(5) R - Spike sample recovery is not within control limits.
(6) S - Value is determined by standard addition.
(7) + - Duplicate analysis is not within control limits.
(8) ++ - Samples analyzed at medium concentrations.
(9) [ ] - Positive values less than required detection limit by contract.

TABLE 2

ON-SITE POND SEDIMENT SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SUPERFUND SITE
DEERFIELD TOWNSHIP OF PORTAGE COUNTY, OHIO

	West Pond Sediments									
Sample Number:	***SD006001***	***SD007001***	***SD008001***	***SD009001***	***SD010001***	***SD034001***	***SD034001***	***SD035001***	***SD036001***	***AVERAGE***
Date Sampled:	***11/26/84***	***11/26/84***	***11/26/84***	***11/26/84***	***11/26/84***	***09/17/86***	***09/16/86***	***09/16/86***	***09/17/86***	
OTR Number:	***E9731***	***E9732***	***E9733***	***E9734***	***E9735***	***EC357***	***EC358***	***EC359***	***EC360***	
ITR Number:	***MEA239***	***MEA240***	***MEA241***	***MEA242***	***MEA243***	***MEG807***	***MEG808***	***MEG809***	***MEG810***	
Volatile Organic Compound (VOCs)										
(units - µg/kg)										
chloromethane										
vinyl chloride										
methylene chloride	41000 ++	2200 ++	8300 A, ++	4600 ++		50	46 B	59 B	215 B	6274
acetone		2600 ++					8 B	15 B	63 B	298
carbon disulfide										
1,1-dichloroethene						14	16	13		4.8
1,1-dichloroethane										
trans-1,2-dichloroethene										
chloroform										
1,2-dichloroethane		4800 ++	8900 ++	7400 ++		14	5 J	3 J	18	2349
2-butanone		12000 ++	18000 ++	15000 ++						5000
1,1,1-trichloroethane			2500 A, ++	1200 A, ++		495	738 J	633 J	411 J	664
1,1,2,2-tetrachloroethane										
trichloroethene		500 ++							10	56.7
dibromochloromethane										
1,1,2-trichloroethane										
benzene										
2-hexanone										
4-methyl-2-pentanone										
tetrachloroethene										
toluene	174000 ++		21000 ++	15000 ++	12 A					23335
chlorobenzene		1000 ++		610 A, ++		8 J			25	180
ethylbenzene	16000 A,++	4300 ++	28000 ++	24000 ++	16 A				20	895
styrene										
Total xylenes	78000 ++	8200 ++	92000 ++	83000 ++					4 J	29022
Total Volatiles	309000	35600	178700	150810	1395	581	813	723	760	75376
Total Tentatively Identified Volatiles	0	1800	0	2000	20	64	20	0	84	443

TABLE 2

ON-SITE POND SEDIMENT SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SUPERFUND SITE
DEERFIELD TOWNSHIP OF PORTAGE COUNTY, OHIO

	West Pond Sediments									
Sample Number:	***SD006001***	***SD007001***	***SD008001***	***SD009001***	***SD010001***	***SD034001***	***SD034001***	***SD035001***	***SD036001***	***AVERAGE***
Date Sampled:	***11/26/84***	***11/26/84***	***11/26/84***	***11/26/84***	***11/26/84***	***09/17/86***	***09/16/86***	***09/16/86***	***09/17/86***	
OTR Number:	***E9731***	***E9732***	***E9733***	***E9734***	***E9735***	***EC357***	***EC358***	***EC359***	***EC360***	
ITR Number:	***MEA239***	***MEA240***	***MEA241***	***MEA242***	***MEA243***	***MEG807***	***MEG808***	***MEG809***	***MEG810***	
Base/Neutrals and Acids (BNAs)										
(units - µg/kg)										
n-nitrosodimethylamine										
phenol										
aniline										
1,3-dichlorobenzene										
1,4-dichlorobenzene										
benzyl alcohol										
1,2-dichlorobenzene										
2-methylphenol										
bis(2-chloroisopropyl)ether										
4-methylphenol										
hexachloroethane										
isophorone										
2-nitrophenol										
2,4-dimethylphenol										
benzoic acid										
1,2,4-trichlorobenzene										
naphthalene		390 A	830 A		100 A					147
4-chloro-3-methylphenol										
2-methylnaphthalene					1200 A					133
hexachlorocyclopentadiene										
dimethyl phthalate										
acenaphthylene										
acenaphthene										
4-nitrophenol										
dibenzofuran										
diethylphthalate										
fluorene										
n-nitrosodiphenylamine (1)								8262 J	11546 J	2201
hexachlorobenzene			2700 A	2400						567

TABLE 2

ON-SITE POND SEDIMENT SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SUPERFUND SITE
DEERFIELD TOWNSHIP OF PORTAGE COUNTY, OHIO

	West Pond Sediments									
Sample Number:	***SD006001***	***SD007001***	***SD008001***	***SD009001***	***SD010001***	***SD034001***	***SD034001***	***SD035001***	***SD036001***	***AVERAGE***
Date Sampled:	***11/26/84***	***11/26/84***	***11/26/84***	***11/26/84***	***11/26/84***	***09/17/86***	***09/16/86***	***09/16/86***	***09/17/86***	
OTR Number:	***E9731***	***E9732***	***E9733***	***E9734***	***E9735***	***EC357***	***EC358***	***EC359***	***EC360***	
ITR Number:	***MEA239***	***MEA240***	***MEA241***	***MEA242***	***MEA243***	***MEG807***	***MEG808***	***MEG809***	***MEG810***	
Base/Neutrals and Acids (cont'd)										
(units - µg/kg)										
pentachlorophenol										
phenanthrene			1500	1000 A	620 A					347
anthracene										
di-n-butylphthalate										
fluoranthene										
pyrene										
butylbenzylphthalate										
benzo(a)anthracene										
bis(2-ethylhexyl)phthalate	71000	31000	87000	54000	24000	29703 J	16398 J	5128 J	12133 J	36707
chrysene										
di-n-octyl phthalate		2300	9400	5700 A						1933
benzo(b)fluoranthene										
benzo(k)fluoranthene										
benzo(a)pyrene										
indeno (1,2,3-cd)pyrene										
dibenz(a,h)anthracene										
benzo(g,h,i)perylene										
Total Base/Neutrals and Acids	71000	33690	101430	63100	26920	29703	16398	13390	23679	42146
Total Tentatively Identified Base/Neutrals and Acids	52600	23100	351300	229800	15800	0	0	7000	0	75511

TABLE 2

ON-SITE POND SEDIMENT SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SUPERFUND SITE
DEERFIELD TOWNSHIP OF PORTAGE COUNTY, OHIO

	West Pond Sediments									
Sample Number:	***SD006001***	***SD007001***	***SD008001***	***SD009001***	***SD010001***	***SD034001***	***SD034001***	***SD035001***	***SD036001***	***AVERAGE***
Date Sampled:	***11/26/84***	***11/26/84***	***11/26/84***	***11/26/84***	***11/26/84***	***09/17/86***	***09/16/86***	***09/16/86***	***09/17/86***	
OTR Number:	***E9731***	***E9732***	***E9733***	***E9734***	***E9735***	***EC357***	***EC358***	***EC359***	***EC360***	
ITR Number:	***MEA239***	***MEA240***	***MEA241***	***MEA242***	***MEA243***	***MEG807***	***MEG808***	***MEG809***	***MEG810***	
Inorganics										
(units - mg/kg dry weight)										
Aluminum	7239	7454	4860	4947	5228	8540	5490	7690	10900	6928
Antimony	148 R									16.4
Arsenic						26	27	25	26	11.6
Barium	[95] R	[88] R	[72] R	[64] R	[56] R	[120]	[80]	[96]	[132]	89.2
Beryllium			4.3							0.5
Cadmium										
Calcium	6445	[2367]	[1044]	[916]	[692]	[1240]	[690]	[865]	[1400]	1740
Chromium	55 R	48 R	24 R	15 R	20 R	36	19	26	46	32.1
Cobalt						[10]	[6.7]	[7.5] R	[11]	3.9
Copper	42 R	44 R	23 R	24 R	18 R	50	34	43	57	37.2
Iron	60625	72667	47407	44309	34354	45300	36800	41100	47900	47829
Lead	62	43	33	23	24	48	36 S	55 S	56	42.2
Cyanide						5.2 R	2.1 R	25 R	7 R	4.4
Magnesium	[2447]	[2363]	[1691]	[1870]	[1886]	[2410]	[1590]	[2080]	[2940]	2142
Manganese	206 R	328 R	124 R	90 R	113 R	141	112	132	166	157
Mercury	0.3	0.18	0.16		0.21					0.09
Nickel	[27] R	37 R	[23] R	[18] R	[19] R	[23]	[15]	[19]	[26]	23
Potassium	[1301]	[1033]	[808]	[1006]	[780]	[2110]	[1540]	[1910]	[2330]	1424
Selenium										
Silver										
Sodium						[1310]	[793]	[991]	[1240]	482
Thallium										
Tin										
Vanadium	[34] R	[35] R	[27] R	[27] R	[27] R	[18]	[14]	[17]	[21]	24.4
Zinc	477 R, E	915 R, E	254 R, E	71 R, E	134 R, E	167	82	102	162	263
Percent Moisture										
Percent Solids	66.1	56.8	64.2	70.2	71.9	50.0	75.0	71.0	50.0	63.9

TABLE 2

ON-SITE POND SEDIMENT SAMPLE RESULTS
REMEDIAL INVESTIGATION REPORT
SUMMIT NATIONAL SUPERFUND SITE
DEERFIELD TOWNSHIP OF PORTAGE COUNTY, OHIO

	West Pond Sediments									
Sample Number:	*SD006001*	*SD007001*	*SD008001*	*SD009001*	*SD010001*	*SD034001*	*SD034001*	*SD035001*	*SD036001*	*AVERAGE*
Date Sampled:	*11/26/84*	*11/26/84*	*11/26/84*	*11/26/84*	*11/26/84*	*09/17/86*	*09/16/86*	*09/16/86*	*09/17/86*	
OTR Number:	*E9731*	*E9732*	*E9733*	*E9734*	*E9735*	*EC357*	*EC358*	*EC359*	*EC360*	
ITR Number:	*MEA239*	*MEA240*	*MEA241*	*MEA242*	*MEA243*	*MEG807*	*MEG808*	*MEG809*	*MEG810*	
Pesticides and PCBs										
(units - µg/kg)										
Alpha-BHC										
Beta-BHC										
Delta-BHC										
Gamma-BHC (Lindane)										
Heptachlor										
Aldrin										
Heptachlor Epoxide										
Endosulfan I										
Dieldrin										
4,4-DDE										
Endrin										
4,4-DDT										
Toxaphene										
Arochlor-1232										
Arochlor-1242			6900 A	6100 A						1444
Arochlor-1248	35000 C	5100 A			1100 A					4578
Arochlor-1254										
Mirex										
Total Pesticides and PCBs	35000	5100	6900	6100	1100					6022
Percent Moisture (Volatiles)						49.5	26.8	28.9	48.9	38.5

Notes:

(1) B - Analyte has been found in the laboratory blank as well as the sample. Indicates possible/probable contamination.
(2) C - Applies to pesticide parameters where the identification has been confirmed by GC/MS.
(3) E - Value is estimated due to presence of interference.
(4) J - An estimated value.
(5) R - Spike sample recovery is not within control limits.
(6) S - Value is determined by standard addition.
(7) + - Duplicate analysis is not within control limits.
(8) ++ - Samples analyzed at medium concentrations.
(9) [ ] - Positive values less than required detection limit by contract.

TECHNICAL MEMORANDUM NO. 3

INVESTIGATION OF MAGNETIC ANOMALIES, BURIED TANKS AND SEDIMENTS

Ref. No. 2372

TECHNICAL MEMORANDUM NO. 3

INVESTIGATION OF MAGNETIC ANOMALIES, BURIED TANKS AND SEDIMENTS SUMMIT NATIONAL SUPERFUND SITE DEERFIELD TOWNSHIP OF PORTAGE COUNTY, OHIO

A. INVESTIGATION OF MAGNETIC ANOMALIES

Investigation of magnetic anomalies at the Summit National Superfund Site (Site) was performed during the period of October 16 to 23, 1991, in accordance with the United States Environmental Protection Agency (USEPA) and Ohio Environmental Protection Agency (OEPA) approved Remedial Design Work Plan (RD Work Plan) for the Site. Exploratory trenches were excavated in areas of magnetic anomalies that were identified by USEPA during the Remedial Investigation (RI).

Prior to excavation of the exploratory trenches, the exploratory trench alignments were staked at 15-foot centres by the project surveyor. Exploratory trenches then were excavated along the staked alignments to locate buried containerized materials, if any.

The exploratory trenches were excavated the width of the backhoe bucket (48 inches) to a minimum depth of eight feet below ground surface, or shallower if buried containerized material or visually contaminated soils were encountered. The maximum depth of excavation was to the water table if deeper than eight feet below ground surface or the extent of the backhoe reach (approximately 12 feet below ground surface) if buried containerized material or visually contaminated soils were not encountered. All excavated soils were placed on polyethylene sheeting adjacent to the exploratory trenches during the trench excavation, and the excavated soils then were used to backfill the trenches.

The areal extent of buried containerized materials, as determined from the exploratory trench excavations, is presented on the attached Plan TM3-1. Also presented on Plan TM3-1 is the areal extent of visually contaminated soils encountered during the exploratory trench excavations. However, these visually contaminated soils generally occurred at the depth of the soil/groundwater interface and were not associated with "leaking buried containers". Based on observations during the test trench excavations, only one "leaking buried container" was identified, and therefore the quantity of soils associated with "leaking buried containers" that would require treatment is anticipated to be minimal.

Buried containerized material encountered during the exploratory trench excavations included 55-gallon drums, 30-gallon and 5-gallon containers and a plastic container. Drum lids and metal objects also were encountered throughout the magnetic anomaly areas. Cross-sections through each test trench showing depth and length of excavation and material encountered in the excavation are provided in Attachment TM3-1. Based on the number of containers encountered during the exploratory trench excavations, it is estimated there could be approximately 600 containers buried within the magnetic anomaly areas.

Air monitoring, as required by the Health and Safety Plan (HSP), was conducted on a daily basis as trench excavations progressed. The results of the air monitoring, presented in Attachment TM3-2, indicated that isolated organic vapor readings in the breathing zone peaked at 15 parts per million (ppm) for periods of less than one second during active trenching operations. Organic vapor readings recorded within one inch of excavated soils ranged from 0 to 400 ppm.

B. INVESTIGATION OF UNDERGROUND TANKS

Investigation of underground tanks at the Site was undertaken during the period October 23 to 25, 1991, in accordance with the USEPA and OEPA approved RD Work Plan for the Site. A backhoe was used to locate the underground tanks by excavating shallow trenches across the anticipated location of the underground tanks, until the tanks were located. Three underground tanks were located in Grid 1-1 and one underground tank was located in Grid 1-2 as shown on the attached Plan TM3-1. The sizes of the tanks and materials of construction are presented in Table TM3-1.

For the three underground tanks located in Grid 1-1, the backhoe was used to expose the full length of the top of each tank, and an attempt was made to excavate the soil from one end of each tank to determine the tank diameter, groundwater level and presence of visually contaminated soils, if any. However, the tanks appeared to be in poor condition with rust holes apparent on the exposed surfaces of each tank and it was not considered safe or prudent to excavate the soils adjacent to the tanks. Fill/inspection/breathing port covers, where found, were rusted such that it was not possible to remove them without causing damage to the tanks. An attempt was made to visually characterize the contents of the tanks through the rust holes on the top surface of each tank. All three tanks were observed to be full of a clear liquid, which appeared to be water, and there appeared to be some sediment at the

bottom of Tanks #1 and #2. It was not determined if there is sediment in Tank #3. On completion of the characterization of each of the three underground tanks in Grid 1-1, the excavations to expose the tanks were backfilled with the soil that was removed to expose the tanks. Prior to backfill of the tank excavations, the exposed rust holes were covered with polyethylene sheeting. Visually contaminated soils were not observed during the excavations.

Trenches were excavated at 10-foot centres to a depth of 4.5 feet across Grid 1-2, from the Site fence to the coal tipple ramp, to locate the underground tank in Grid 1-2. An underground septic tank was located as shown on the attached Plan TM3-1. The septic tank was not opened.

Air monitoring, as required by the HSP, was conducted on a daily basis during the locating, exposing, characterization and backfilling of the underground storage tanks. The results of the air monitoring, presented in Attachment TM3-2, indicated that organic vapor readings occasionally reached 2 ppm above background readings in the breathing zone. Organic vapor readings recorded within one inch of the exposed soils adjacent to the underground buried tanks reached levels of 21 ppm above background readings.

C. SEDIMENTS

Investigation of the sediments in the perimeter Site drainage ditches and impoundment, as required by the RD Work Plan, was not conducted as these sediments were removed from the perimeter Site drainage ditches and impoundment and stockpiled on Site during an interim response action conducted at the Site by the Summit National Facility Trust during the period of September 30 to October 29, 1991. This interim response action has been summarized in a report entitled "Construction Report, Sediment Removal Interim Response Action, Summit National Superfund Site, Deerfield Township of Portage County, Ohio" dated December 1991, and submitted to USEPA and OEPA on December 19, 1991.

D. PROJECT MANAGEMENT/OVERSIGHT

Enroserv Midwest, Inc. of Dayton, Ohio was selected by SNFT as the remedial investigation contractor for the above activities.

Project Management was provided by Conestoga-Rovers & Associates (CRA) with a full-time resident engineer observing and directing all activities at the Site.

Oversight for the above activities was provided by Black & Veatch Waste Science Technology on behalf of USEPA, and by OEPA personnel on an intermittent basis. As recorded in the Site's sign in/sign out log, representatives for USEPA and OEPA were on Site on the following days:

Date	*USEPA Representative*	*OEPA Representative*
10/1/91		X
10/3/91	X	
10/4/91	X	
10/7/91	X	
10/8/91	X	X
10/17/91	X	
10/18/91	X	X
10/22/91		X
10/23/91	X	
10/24/91	X	X
10/29/91		X

During the above operations, USEPA and OEPA representatives expressed concurrence with all activities conducted at the Site as required by the RD Work Plan.

TABLE TM3-1

UNDERGROUND STORAGE TANK DESCRIPTIONS
SUMMIT NATIONAL SUPERFUND SITE
DEERFIELD TOWNSHIP OF PORTAGE COUNTY, OHIO

UST #	*Grid No.*	*Length*	*Diameter*	*Material of Construction*
1	1-1	12 feet	64 inches	steel
2	1-1	12 feet	64 inches	steel
3	1-1	24 feet	72 inches	steel
4	1-2	NM	NM	concrete (septic tank)

Notes:

UST # = Underground Storage Tank Number
NM = Not Measured

ATTACHMENT TM3-1

CROSS-SECTIONS

EXPLORATORY TRENCH EXCAVATIONS

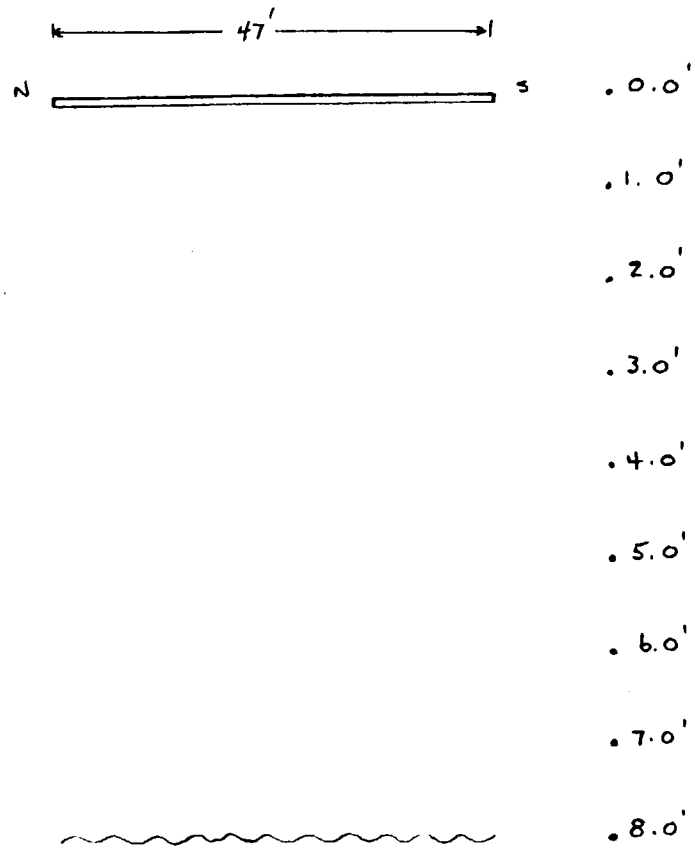
INVESTIGATION OF MAGNETIC ANOMALIES

SUMMIT NATIONAL SUPERFUND SITE

DEERFIELD TOWNSHIP OF PORTAGE COUNTY, OHIO

A1 N-S

2372



SOIL: 0'-2' DARK BROWN CLAY BACKFILL
2'-8' LIGHT BROWN STIFF CLAY.

GROUNDWATER: 5'

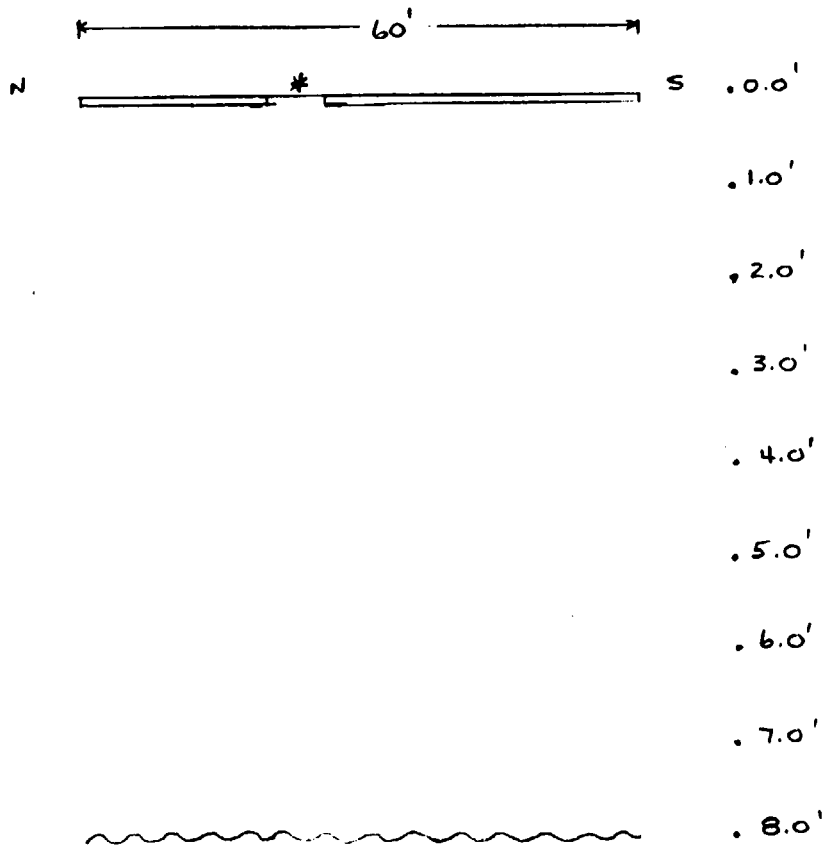
NOTE: SOUTHEND OF TRENCH INFRINGES ON EAST POND.

LEGEND:
TRENCHED AREA
BOT. OF EXCAV.

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

A 2 N - S

2372



SOIL: 0'-2' DARK BROWN CLAY FILL
2'-8' LIGHT BROWN STIFF CLAY.

GROUNDWATER: 5'-6'

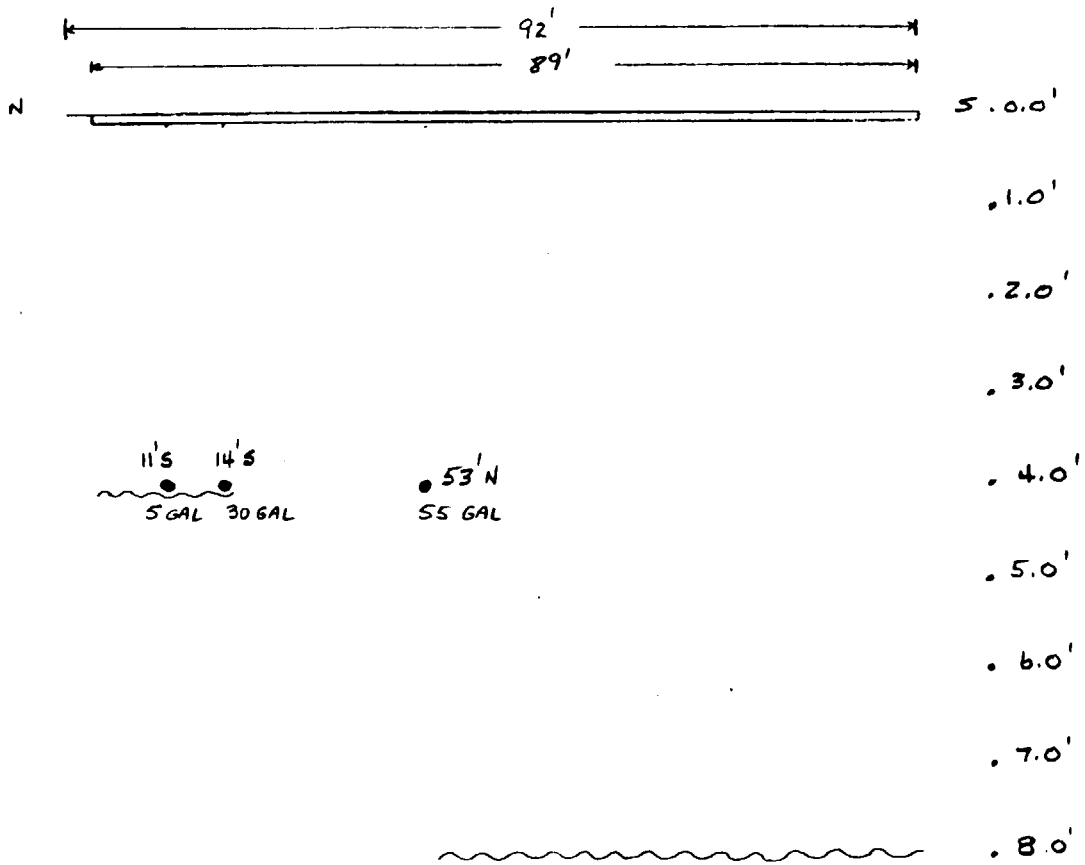
NOTE: SOUTHEND OF TRENCH INFRINGES OF EAST POND.

LEGEND:
BOT. OF EXCAV.
TRENCHED AREA.
* PIEZOMETER

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

A 3 N - S

2372



SOIL: 0'-2' LOOSE FILL CLAYS
2'-8' MEDIUM COMPACTED CLAYS WITH TRACES OF COAL

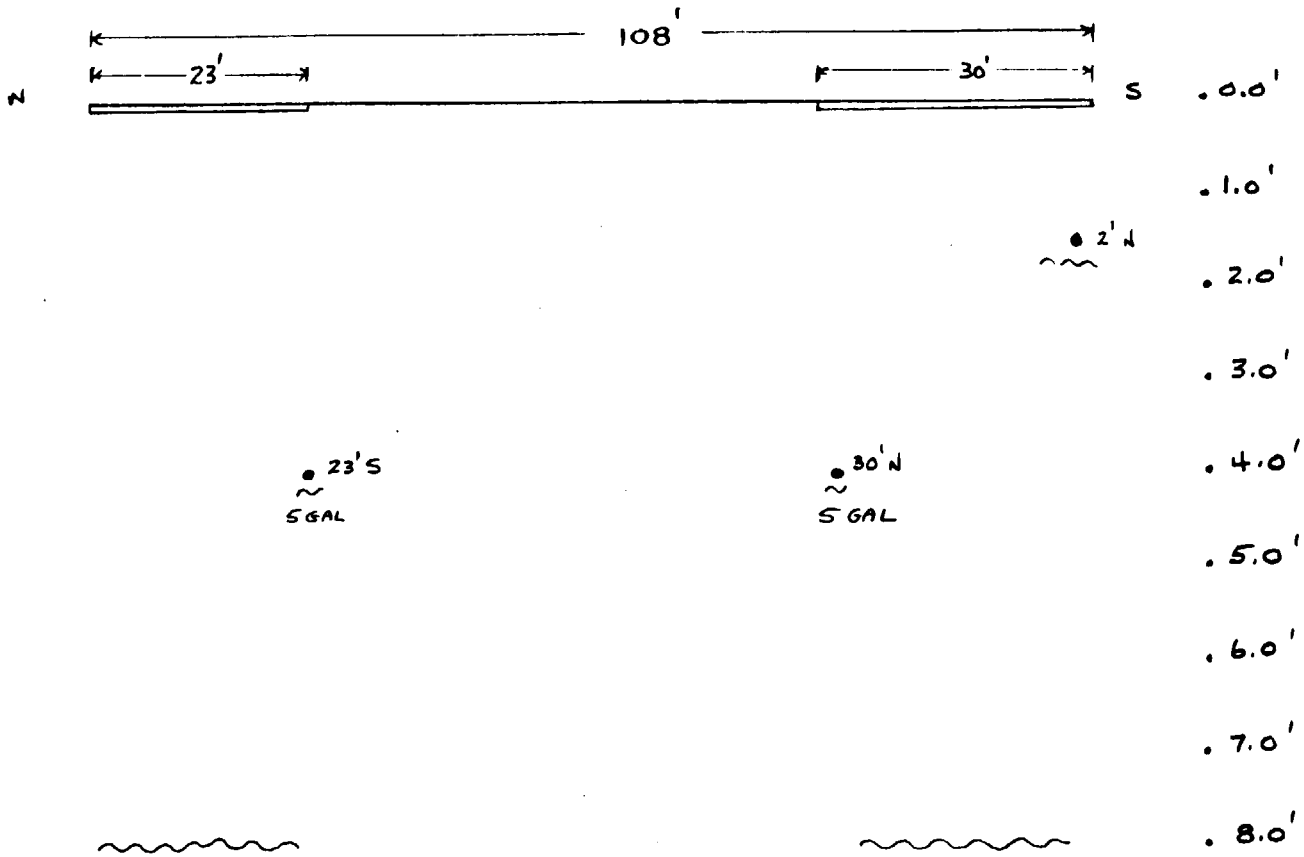
GROUNDWATER: 5'-6'

NOTE: NORTHEND OF TRENCH IN EAST POND, STARTED TRENCH 3' S.

LEGEND:
~ BOT OF EXCAV.
▭ TRENCHED AREA
● DRUMS/CONTAINERS.

A 4 S-N

2372



SOIL: 0'-2' SOFT BACKFILL CLAYS
2'-8' COMPACTED FILL CLAYS, TRACES OF COAL.

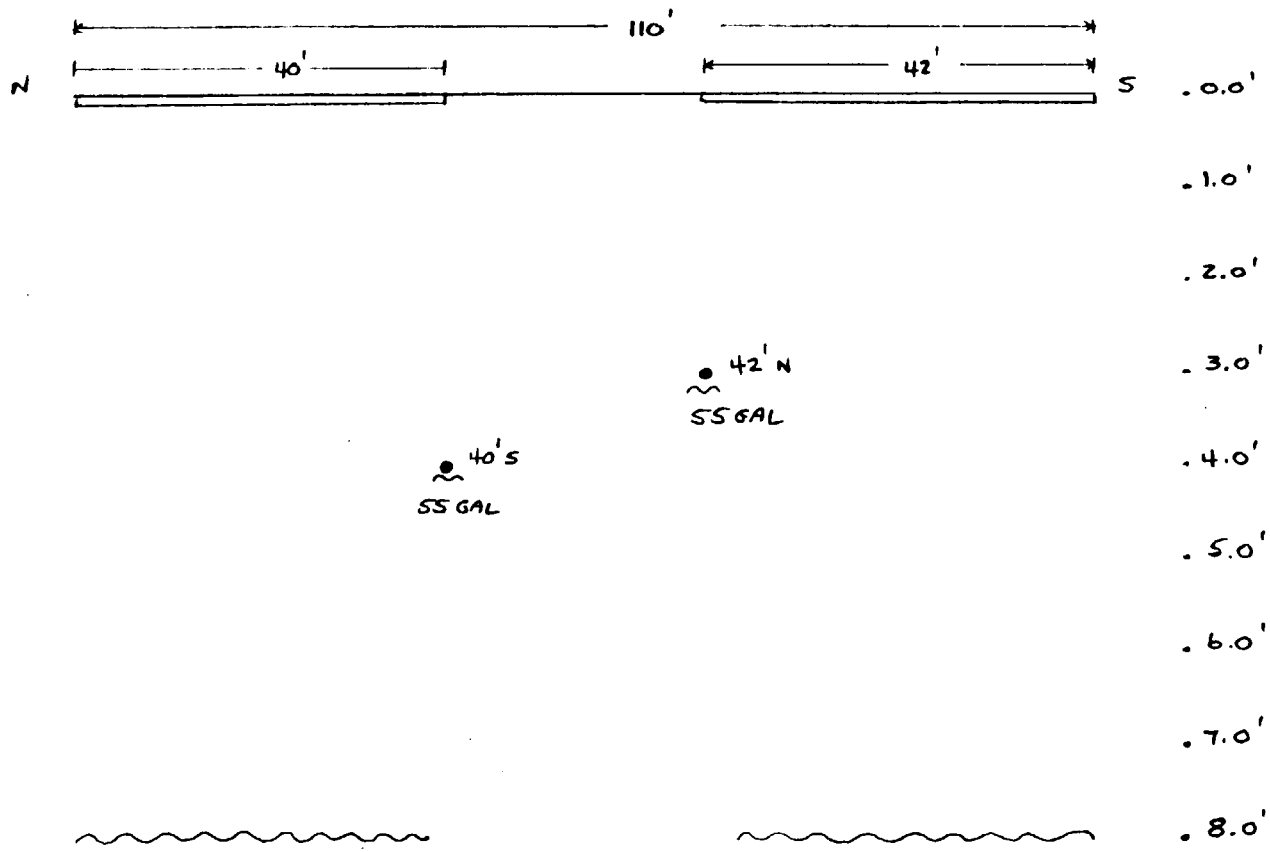
GROUNDWATER: 7.5'

LEGEND:
BOT OF EXCAV.
TRENCHED AREA.
DRUM/CONTAINERS.

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

A 5 N - S

2372



SOIL: 0'-2' LOOSE FILL CLAYS
2'-8' BROWN/BLACK CLAYS, TRACES OF COAL

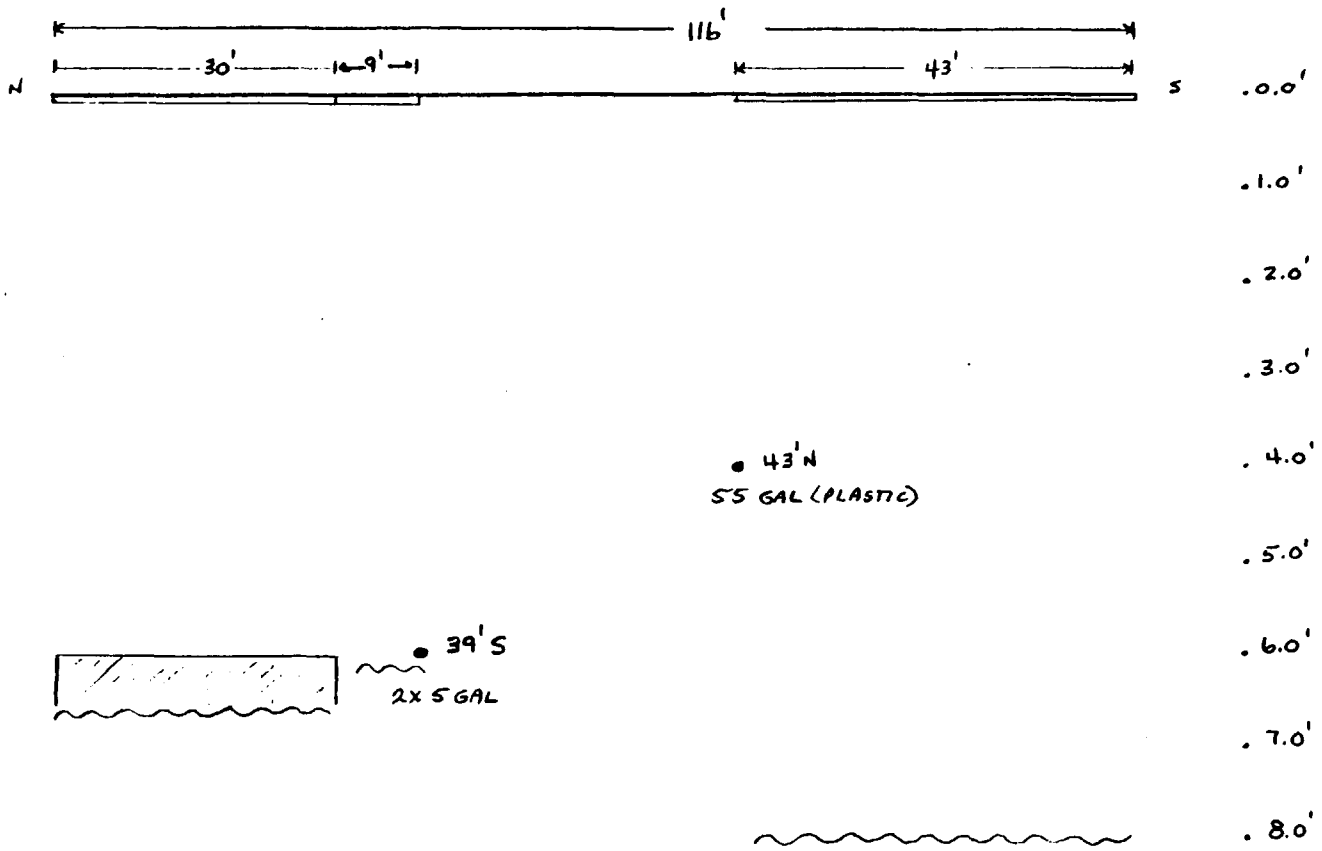
GROUNDWATER: 7' TO 8'

LEGEND:
BOT OF EXCAV.
TRENCHED AREA
DRUM/CONTAINER

SCALE: HORZ: 1" TO 20'
VERT: 1' TO 2'

A 6 S-N

2372



SOIL: 0'-2' BACKFILL CLAY, DEBRIS
2'-8' MOIST CLAY DARK BROWN TO BLACK

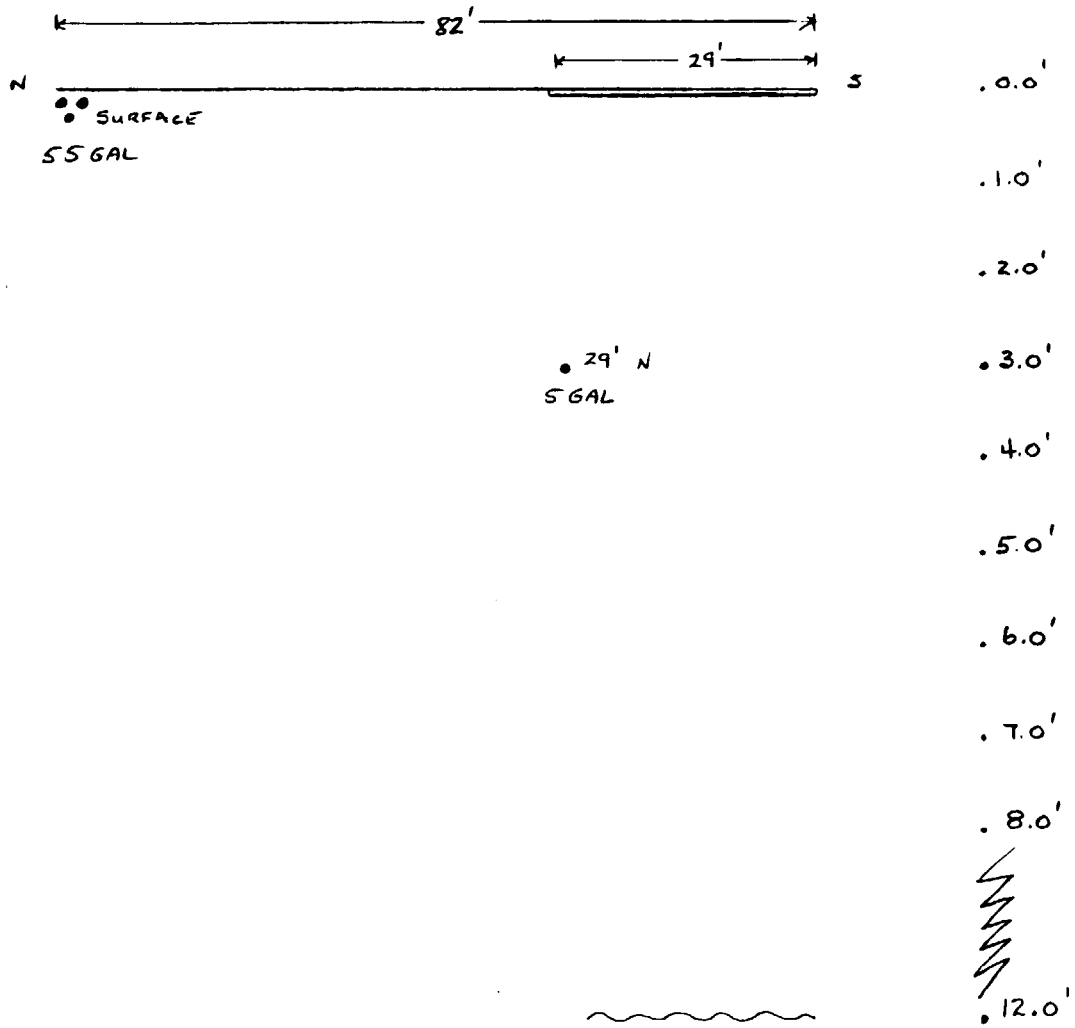
GROUNDWATER: 7'-8'

LEGEND:
BOT OF EXCAV.
TRENCHED AREA
DRUM/CONTAINER.
VISUAL CONTAMINATION

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

A7 S-N

2372



Soil: 0'-3' Brown dark clay fill
3'-7' Light brown clay
7'-12' Light brown clay, traces of coal.

Groundwater: 8'

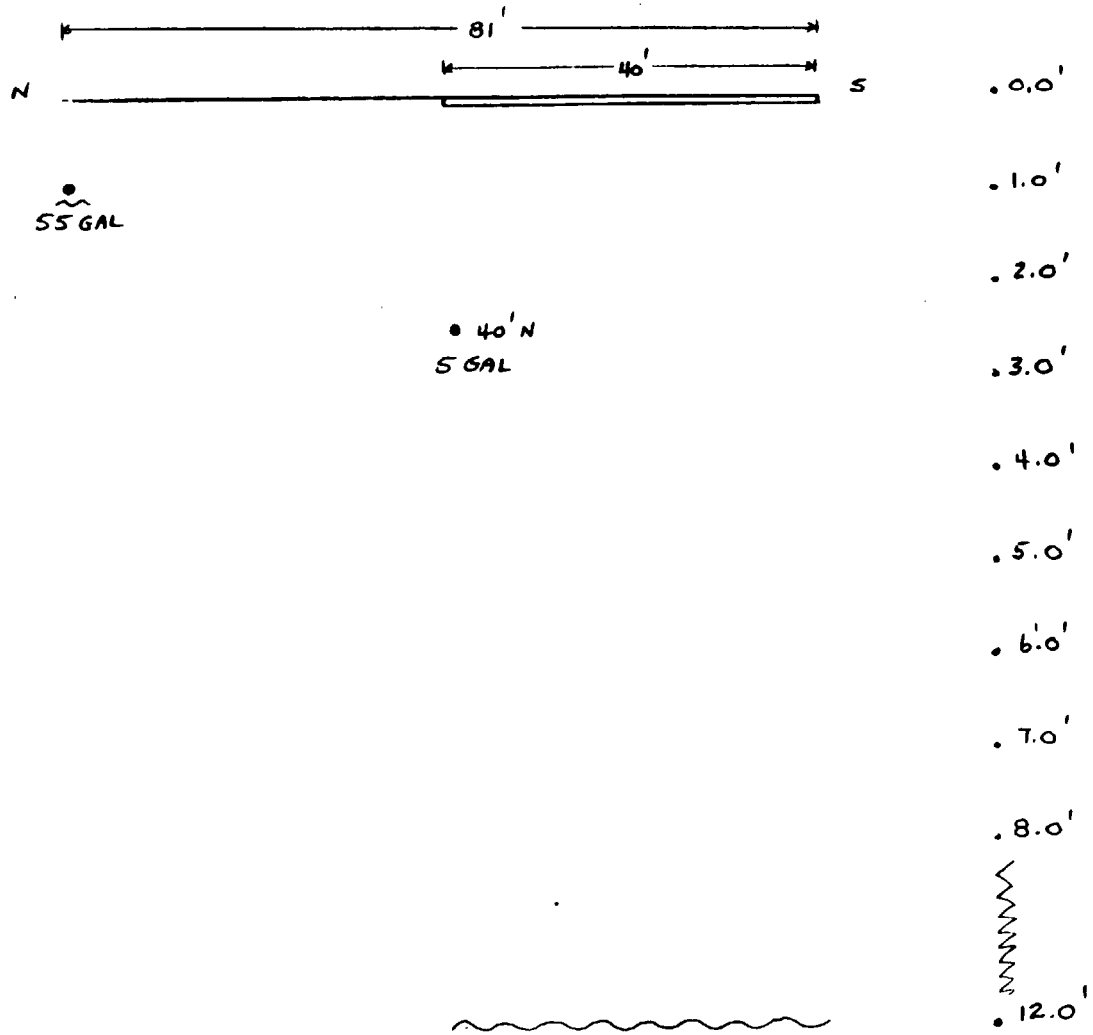
Note: Excavated to 12' depth at southend

Legend:
Bot of Excav.
Trenched area
Drum/container

Scale: Horz: 1" to 20'
Vert: 1" to 2'

A 8 S-N

2372



LEGEND:
- Bot of Excav.
- Trenched Area
- Drum/Container

SCALE: Horz: 1" to 20'
Vert: 1" to 2'

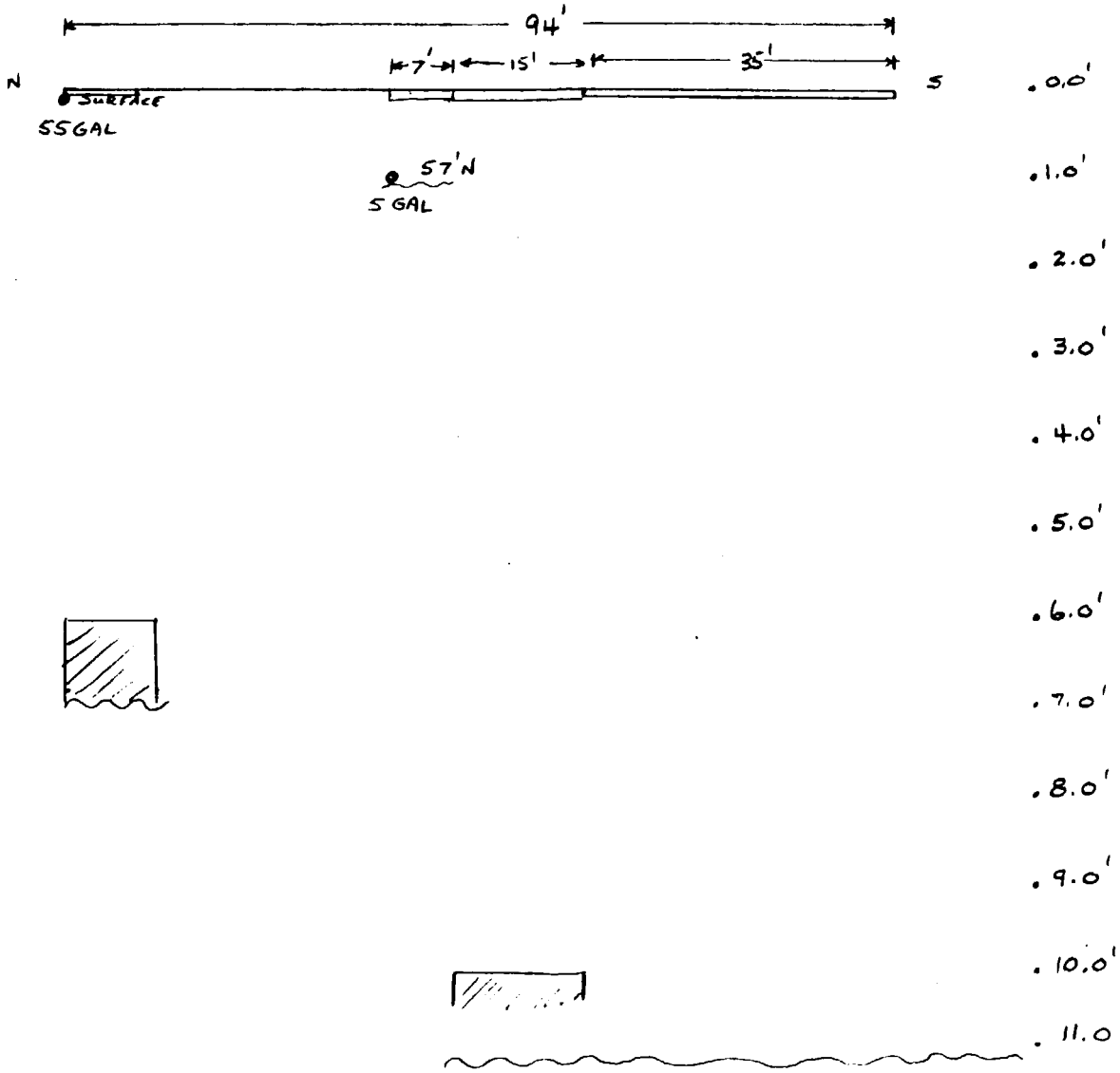
SOIL: 0'-3' DARK BROWN LOOSE FILL CLAY
3'-9 BROWN CLAY TRACES OF COAL
9'-12' MOIST BLUE CLAY

GROUNDWATER: 8'

NOTE: EXCAVATED TRENCH TO 12' DEPTH.

A 9 S-N

2372



SOIL: 0-3' LOOSE BACKFILL CLAY
3'-11' BROWN MOIST DARK CLAY

GROUNDWATER: 4' TO 5'

NOTE: MISC DEBRIS, RINGS, LIDS 0'-2'

LEGEND:

BOT OF EXCAVATION

TRENCHED AREA

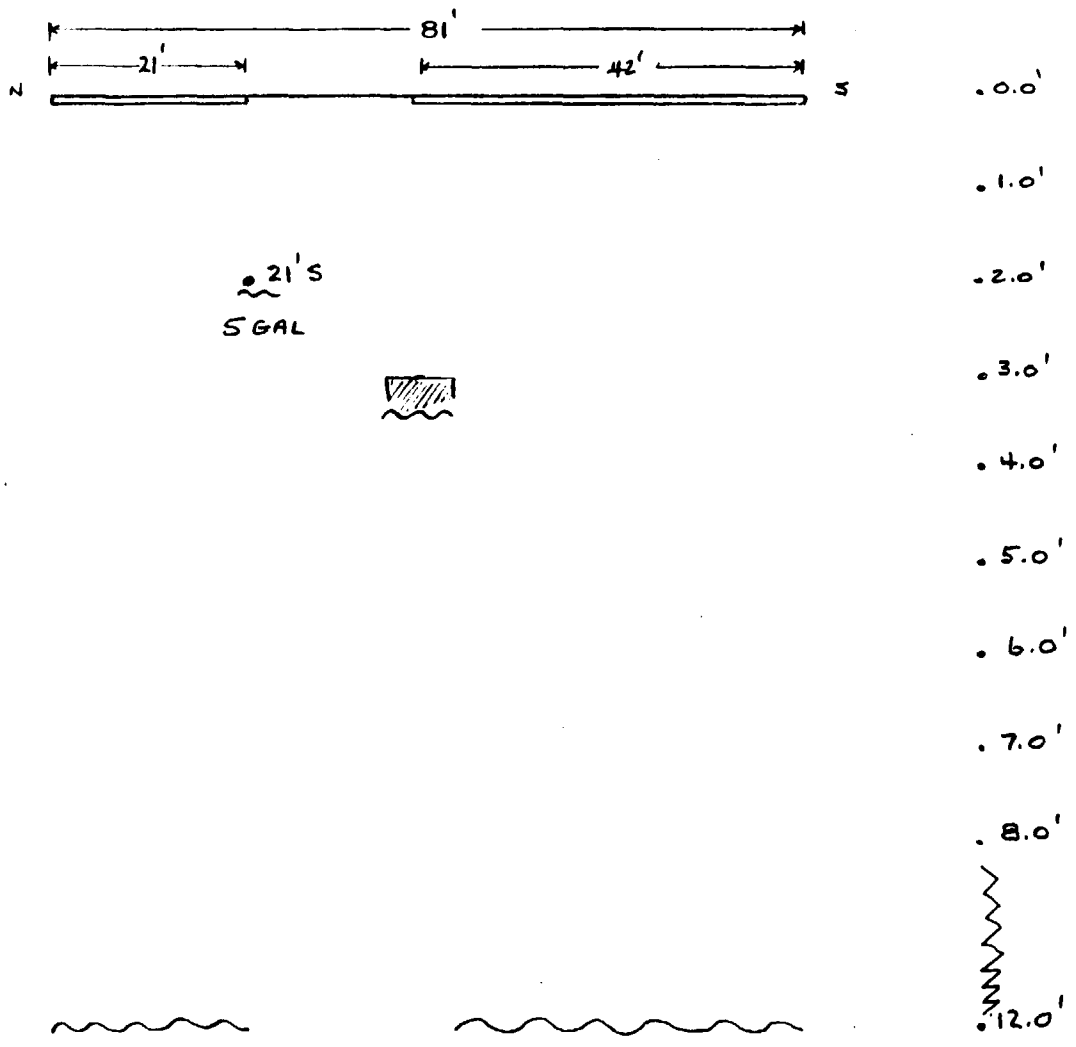
DRUM/CONTAINER.

VISUAL CONTAMINATION

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

A 10 N - 5

2372



Soil: 0'-3' BACKFILL CLAY, DEBRIS
3'-8' BROWN CLAY, TRACES OF COAL
8'-12' LIGHT BROWN CLAY TRACES OF COAL SLATE

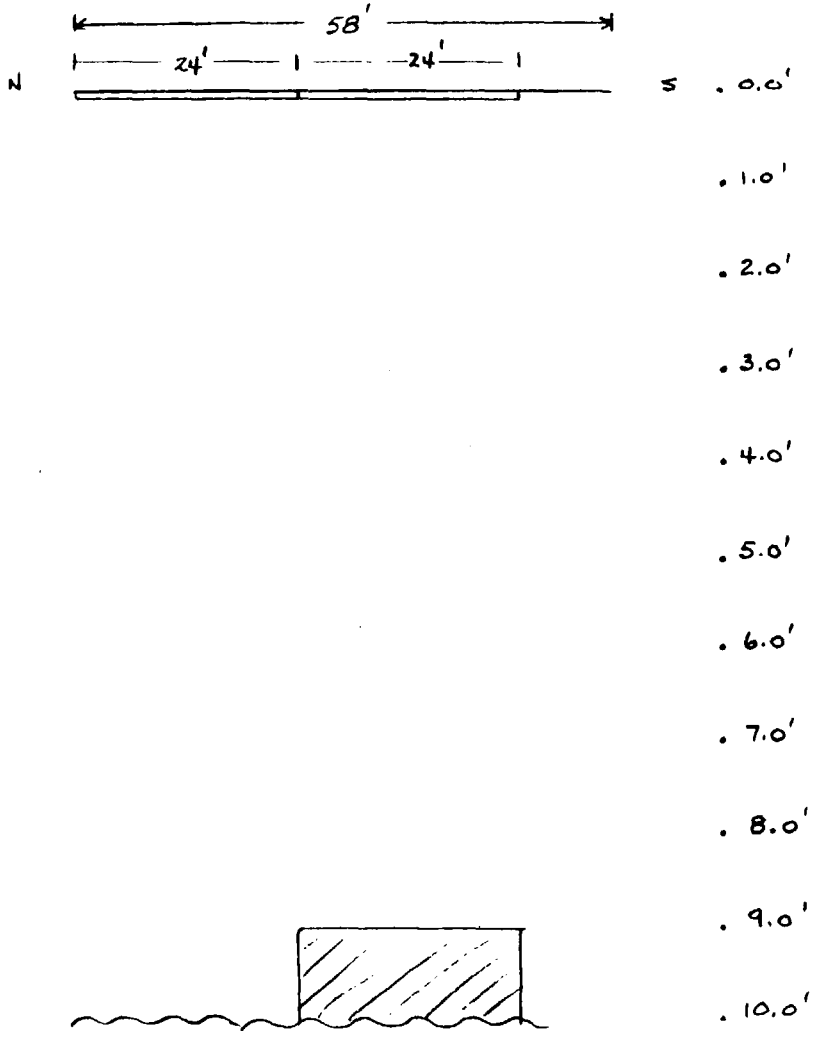
GROUNDWATER: 7'

LEGEND:
BOT OF EXCAV.
TRENCHED AREA
DRUM/CONTAINERS.
VISUAL CONTAMINATION

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

A 11 N - S

2372



LEGEND:

- BOT. OF EXCAV.
- TRENCHED AREA
- VISUAL CONTAMINATION

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

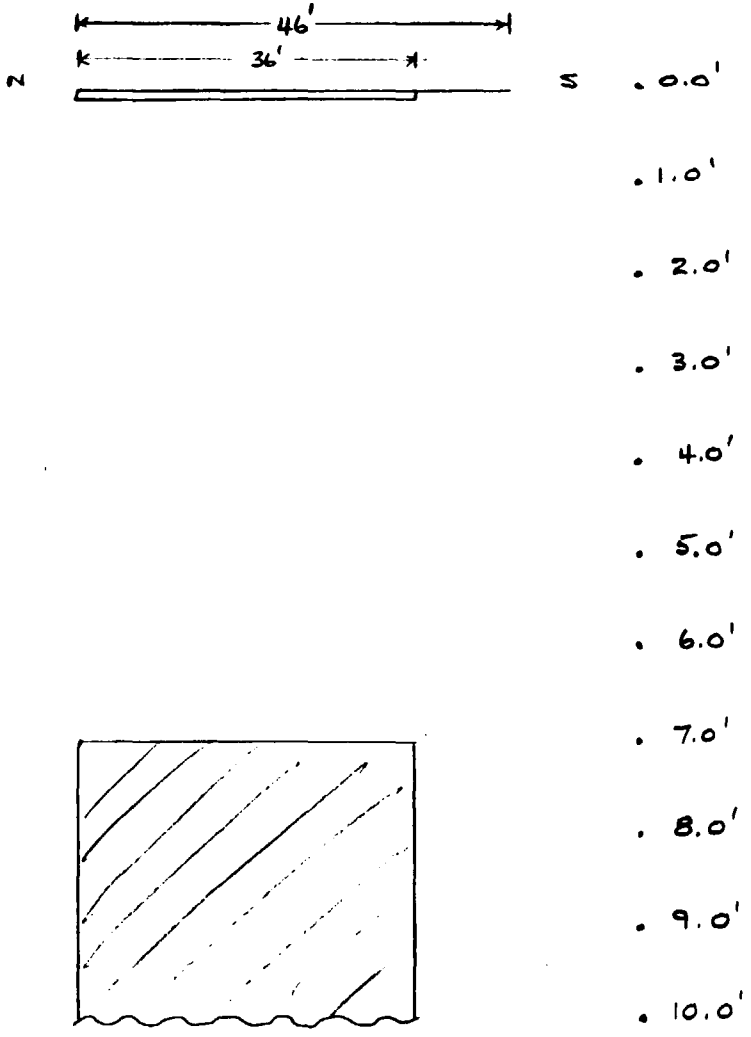
SOIL: 0'-3' BROWN FILL CLAY, DEBRIS
3'-10' DARK BROWN LOOSE CLAY TRACES OF COAL

GROUNDWATER: 8.5'

NOTE: MISC DEBRIS, LIDS, RINGS 0'-2'

A 12 N - S

2372



SOIL: 0'-3' BROWN LOOSE CLAY, DEBRIS
3'-10' DARK BROWN CLAY, MOIST.

GROUNDWATER: 8'

LEGEND:
BOT OF EXCAV.
TRENCHED AREA.
VISUAL CONTAMINATION

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

B 1

2372.

TRENCH 50'

NOTE: DUE TO TRENCH LINE FALLING OUTSIDE OF FENCE, UNABLE TO PERFORM TRENCHING.

B 2 E-W

2372

• NOTE: • COULD NOT EXCAVATE FULL TRENCH LENGTH DUE TO FENCE LINE.
• FRENCH DRAIN RUNNING E-W 18" WIDE, EXTENDED DEPTH OF TRENCH.

LEGEND:
BOT. OF EXCAV.
TRENCHED AREA.

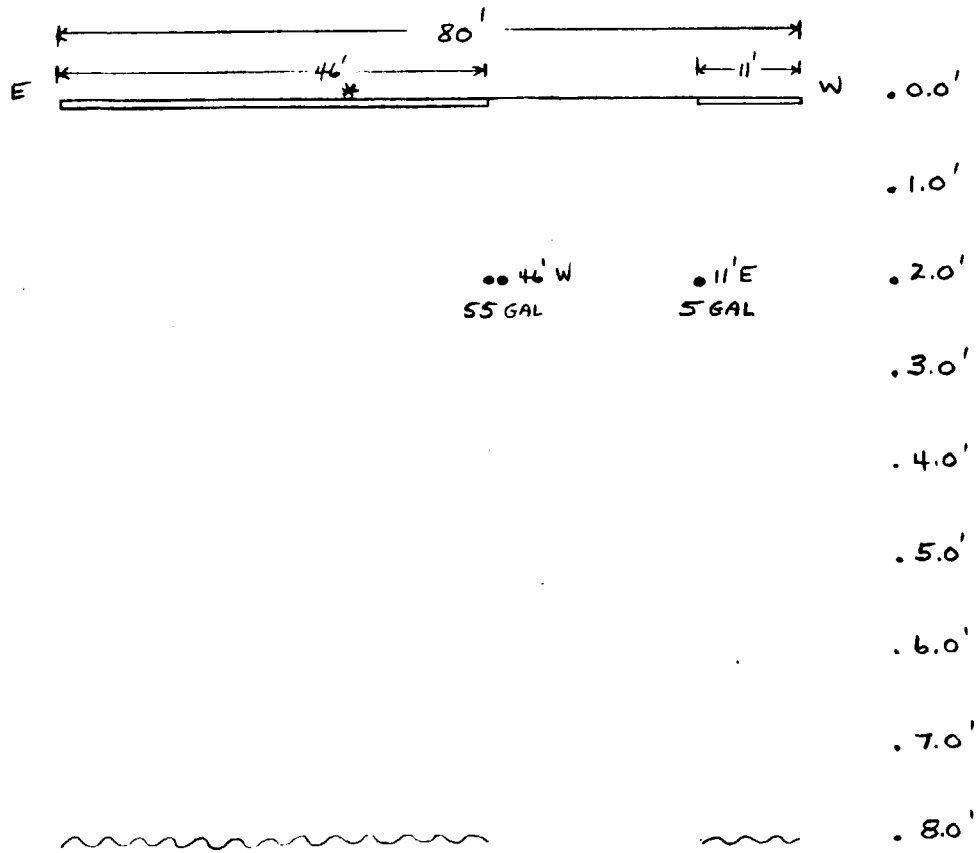
SCALE:
HORZ: 1" TO 20'
VERT: 1" TO 2'

SOIL: 0'-3' STIFF BROWN CLAY
3'-10' STIFF BROWN CLAY TRACES OF COAL

GROUNDWATER: DID NOT ENCOUNTER

B 3 E-W

2372



LEGEND:

- ~ BOT OF EXCAV.
- ═ TRENCHER AREA
- ✳ PIEZOMETER
- ● DRUM/CONTAINER

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

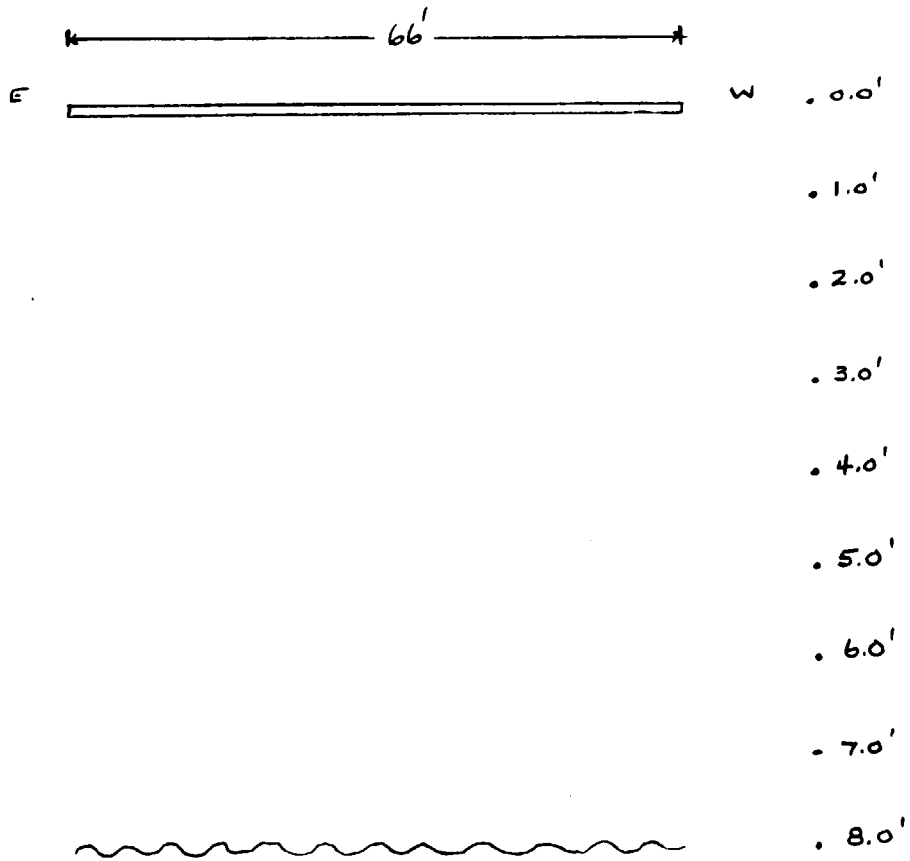
SOIL: 0'-8' STIFF BROWN CLAY

GROUNDWATER: NOT ENCOUNTERED.

NOTE:
- MISC DEBRIS, LIDS, RINGS
- FRENCH DRAIN, 18" WASHED STONE RUNNING E-W DEPTH OF EXCAVATION.
- PIEZOMETER LOCATED 31.5' W, 1.5' SOUTH.

B 4 E-W

2372



SOIL: 0'-2' LOOSE BACKFILL CLAY
2'-8' STIFF LIGHT BROWN CLAY TRACES OF COAL.

GROUNDWATER: NOT ENCOUNTERED

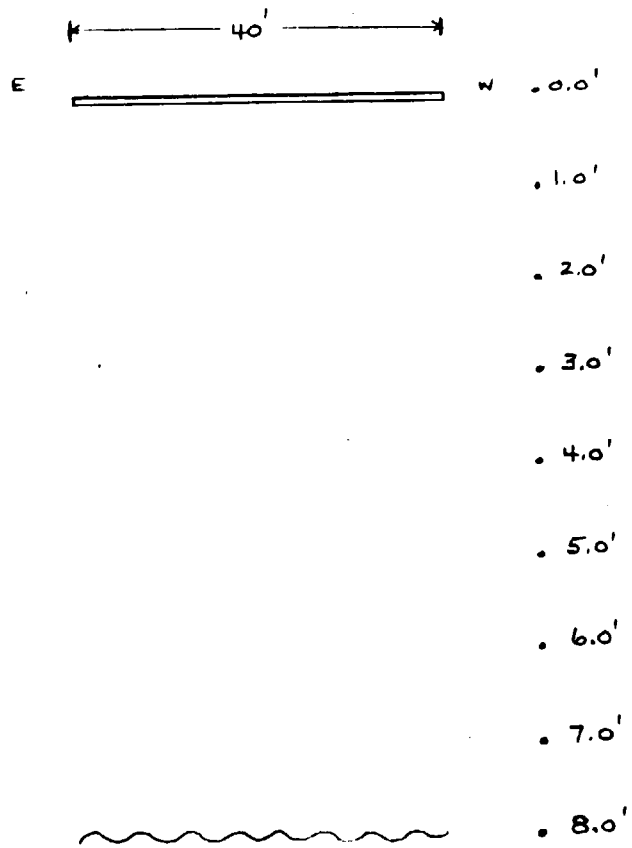
NOTE: MISC SCRAP METAL 0'-2'

LEGEND:
~ BOT OF EXCAV.
═ TRENCHED AREA.

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

B 5 E-W

2372



SOIL: 0'-2' BACKFILL CLAY
2'-8' STIFF BROWN CLAY WITH TRACES OF COAL.

GROUNDWATER: NOT ENCOUNTERED

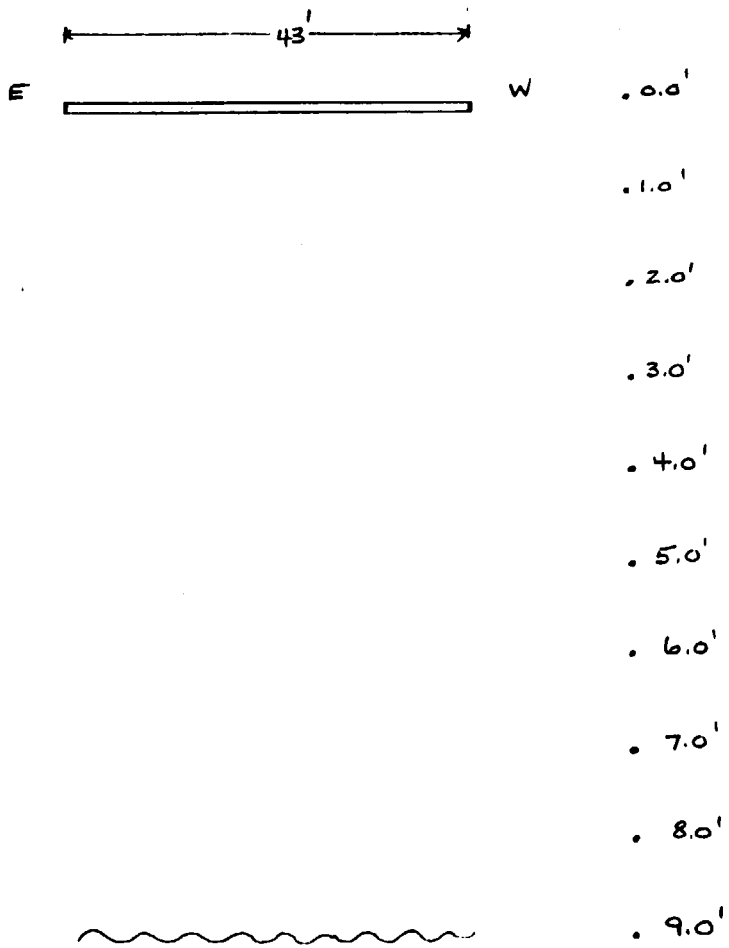
NOTE: • DUE TO OBSTRUCTIONS IN WAY OF EXCAVATOR OFF-SET TRENCH 4' NORTH.
• WEST-END OF TRENCH 5 GAL CONTAINER ON SURFACE

LEGEND:
~ BOT. OF EXCAV.
═ TRENCHED AREA.

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

C 1 E-W

2372



SOIL: 0'-2' LOOSE CLAY BACKFILL
2'-9' BROWN MIXED CLAYS.

GROUNDWATER: NOT ENCOUNTERED

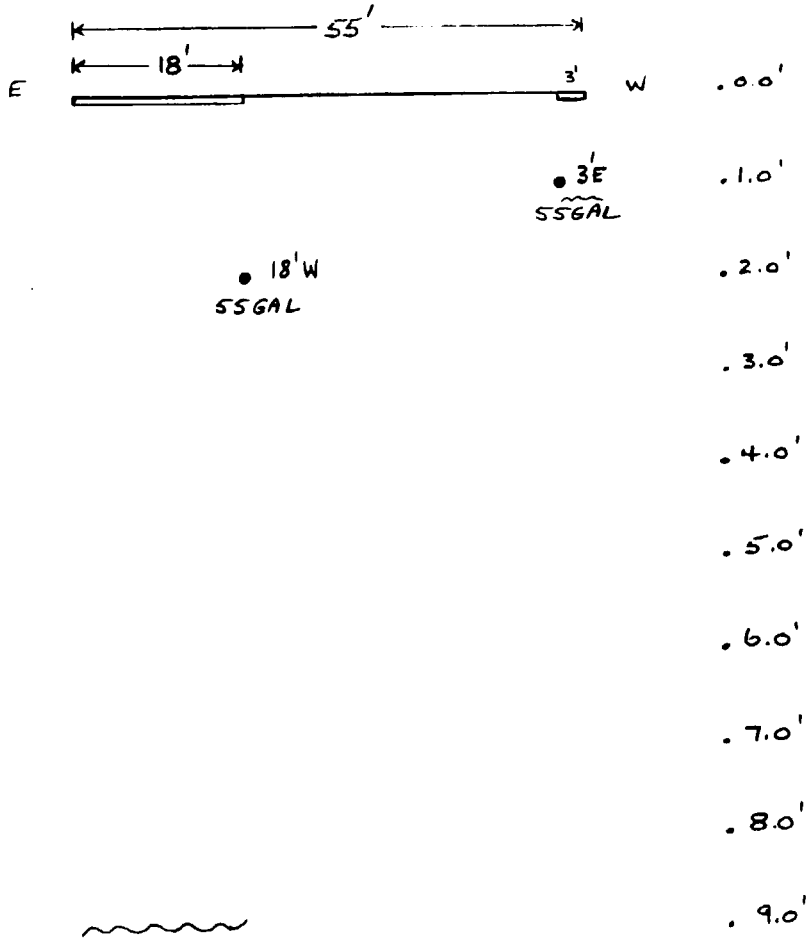
NOTE:
- FRENCH DRAIN RUNNING E-W DEPTH OF TRENCH.
- OFF-SET TRENCH 2' NORTH DUE TO FENCE LINE.
- MISC METAL 0'-2'

LEGEND:
BOT. OF EXCAV.
TRENCHED AREA.

SCALE:
HORZ: 1" TO 20'
VERT: 1" TO 2'

C2 E-W

2372



LEGEND:
~ BOT OF ELEV.
═ TRENCHED AREA

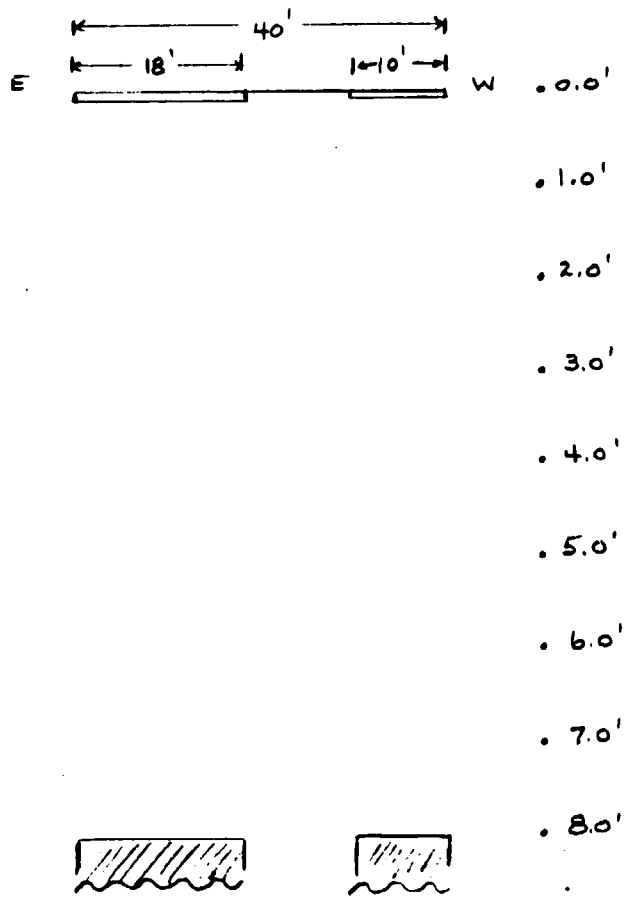
SOIL: 0'-2' CLAY FILL MATERIAL WITH METAL DEBRIS.
2'-9' BROWN CLAY WITH TRACES OF COAL.

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

GROUNDWATER: NOT ENCOUNTERED.

C 3 E-W

2372



SOIL: 0'-2' DEBRIS AND FILL CLAY
2'-8' LOOSE BACKFILL CLAY.

GROUNDWATER: NOT ENCOUNTERED.

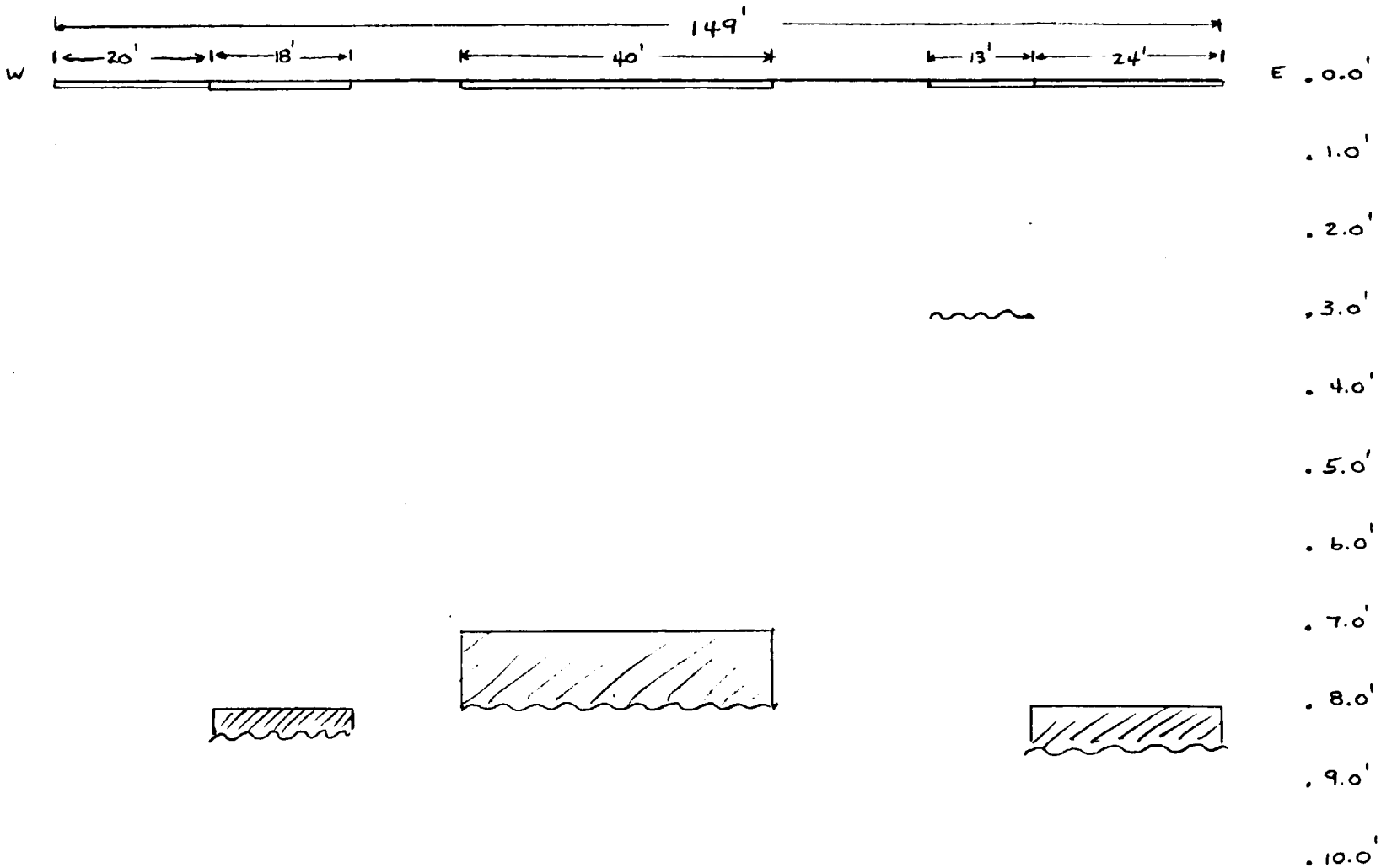
NOTE: MISC METAL AND TRASH 0'-2'

LEGEND:
BOT OF ELEV.
TRENCHED AREA
VISUAL CONTAMINATION.

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

D 1 W-E

2372



SOIL: 0'-2' BROWN CLAY FILL, DEBRIS
2'-3' CLAY FILL, SOME ROCK
3'-4' CLAY AND COAL FILL
4'-8' LIGHT/DARK CLAY BACKFILL, SOME ROCK

GROUNDWATER: 8' OILY SHEEN

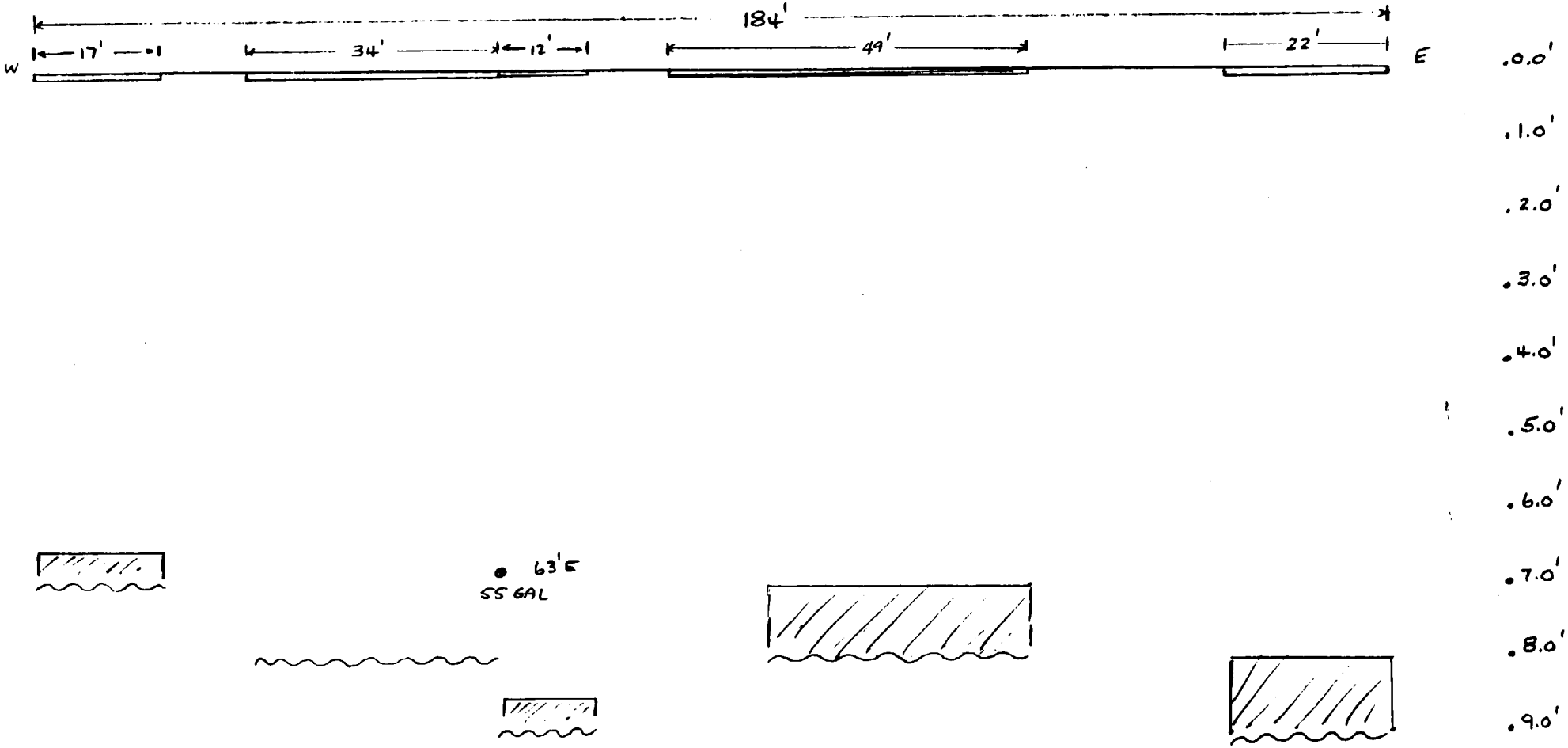
NOTE: MISC DEBRIS, ROCKS, LIDS AND RINGS 0'-2'

LEGAND:
BOT. OF EXCAV.
TRENCHED AREA
DRUMS/CONTAINERS
VISUAL CONTAMINATION.

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

D 2 W-E

2372



SOIL: 0'-2' CLAY BACKFILL, DEBRIS.
2'-3' CLAY BACKFILL, TRACES OF COAL
3'-9' LIGHT/DARK CLAY BACKFILL, SOME ROCK.

GROUNDWATER: 8'

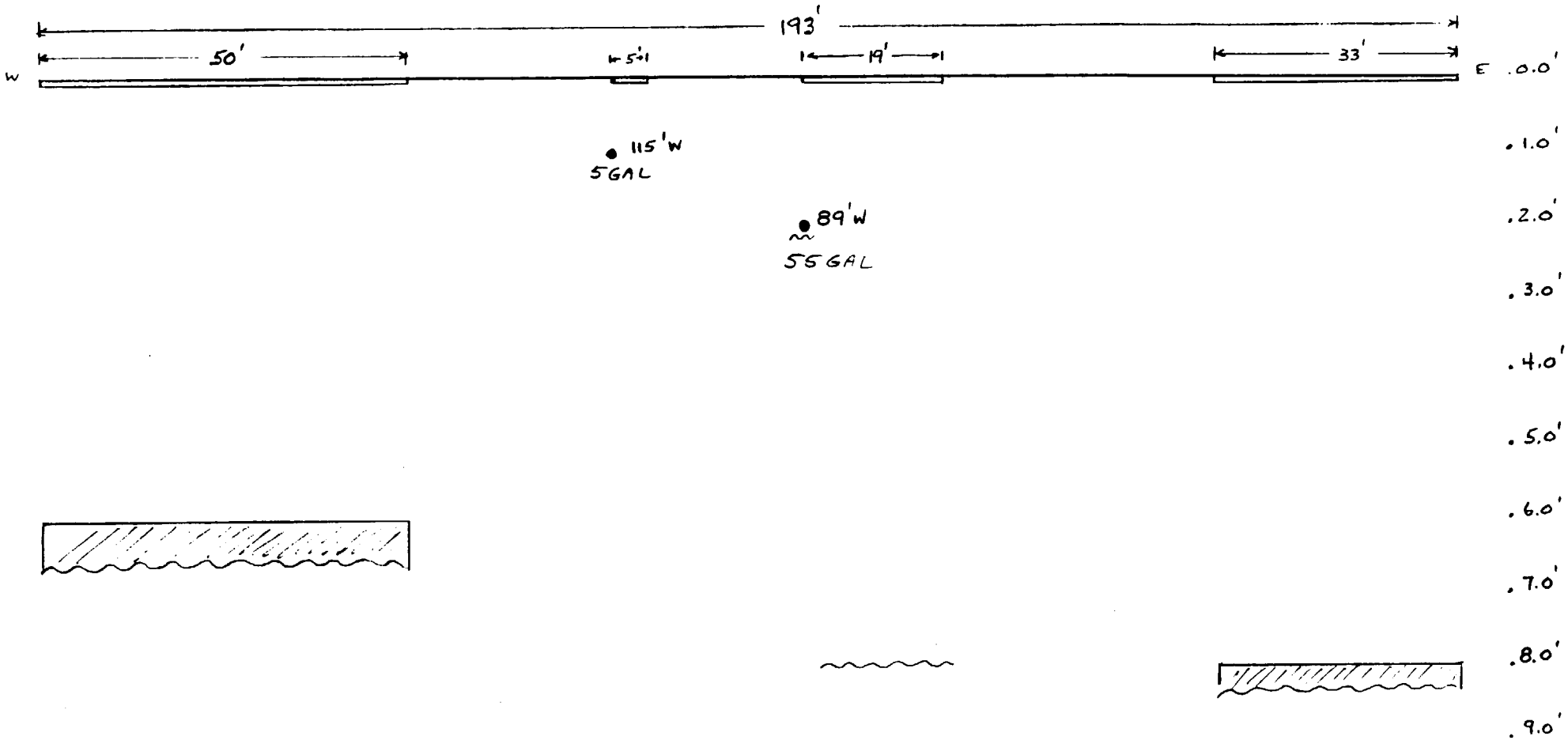
NOTE: MISC DEBRIS, LIDS, RINGS 0'-2'

LEGEND:
BOT. OF EXCAV.
TRENCHED AREA
DRUMS/CONTAINERS
VISUAL CONTAMINATION

SCALE: HORZ: 1" TO 20'
VERT 1" TO 2'

D 3 E-W

2372



SOIL: 0'-1' CLAY BACKFILL, DEBRIS.
1'-2' COAL AND CLAY BACKFILL
2'-8' LIGHT/DARK CLAY FILL, SOME ROCK.

GROUNDWATER: 8'

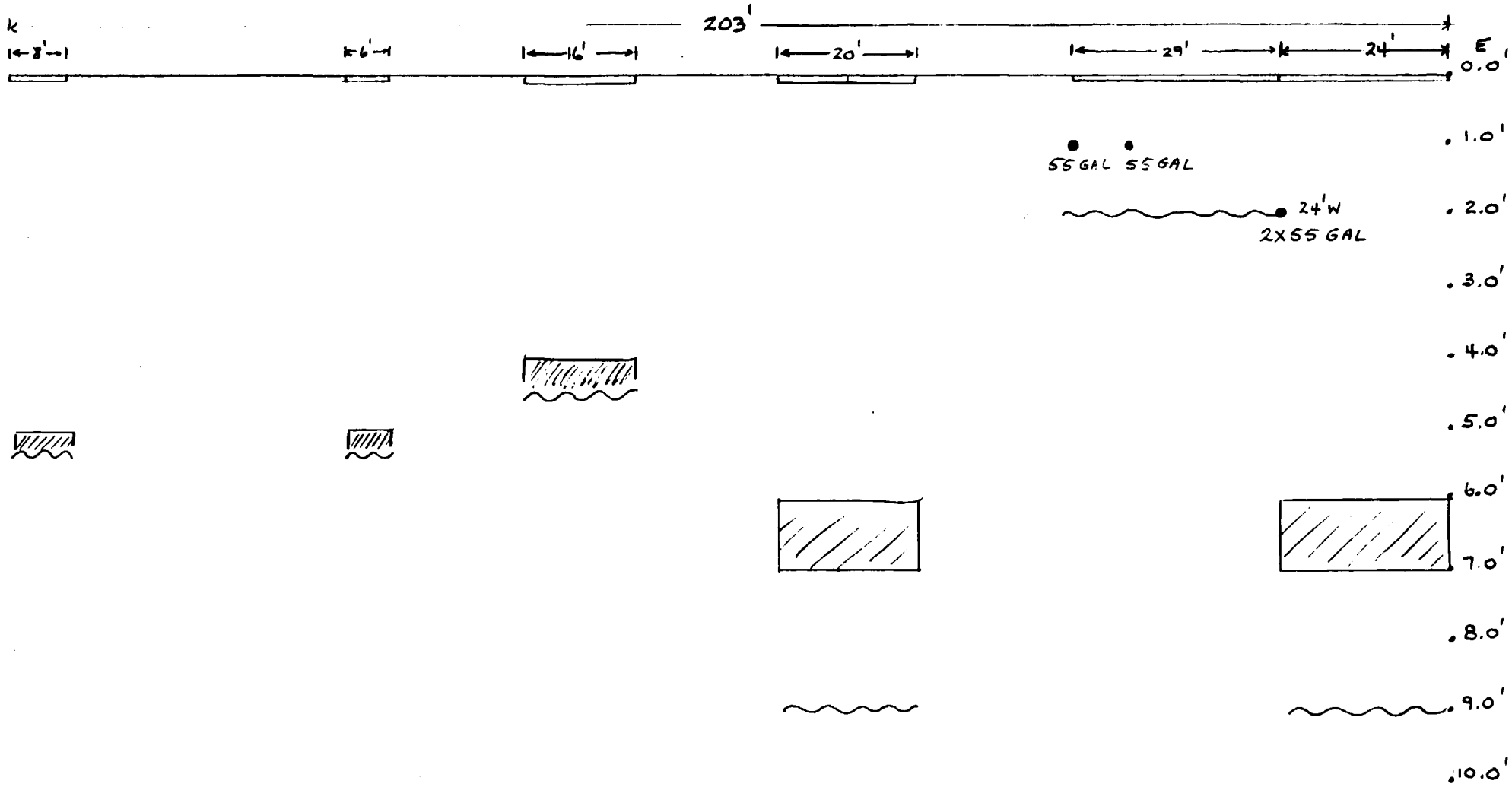
NOTE: MISC DEBRIS LIDS, RINGS 0'-2'

LEGEND:
BOT. OF EXCAV.
TRENCHED AREA
DRUMS/CONTAINERS.
VISUAL CONTAMINATION

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

D 4 E-W

2372



SOIL: 0'-2' BACKFILL CLAYS, DEBRIS.
2'-9' LIGHT/DARK BROWN LOOSE CLAY, TRACES OF COAL.

GROUNWATER: 5' TO 9'

NOTE: MISC CONCRETE DEBRIS AND METAL LIDS, RINGS 0'-2'

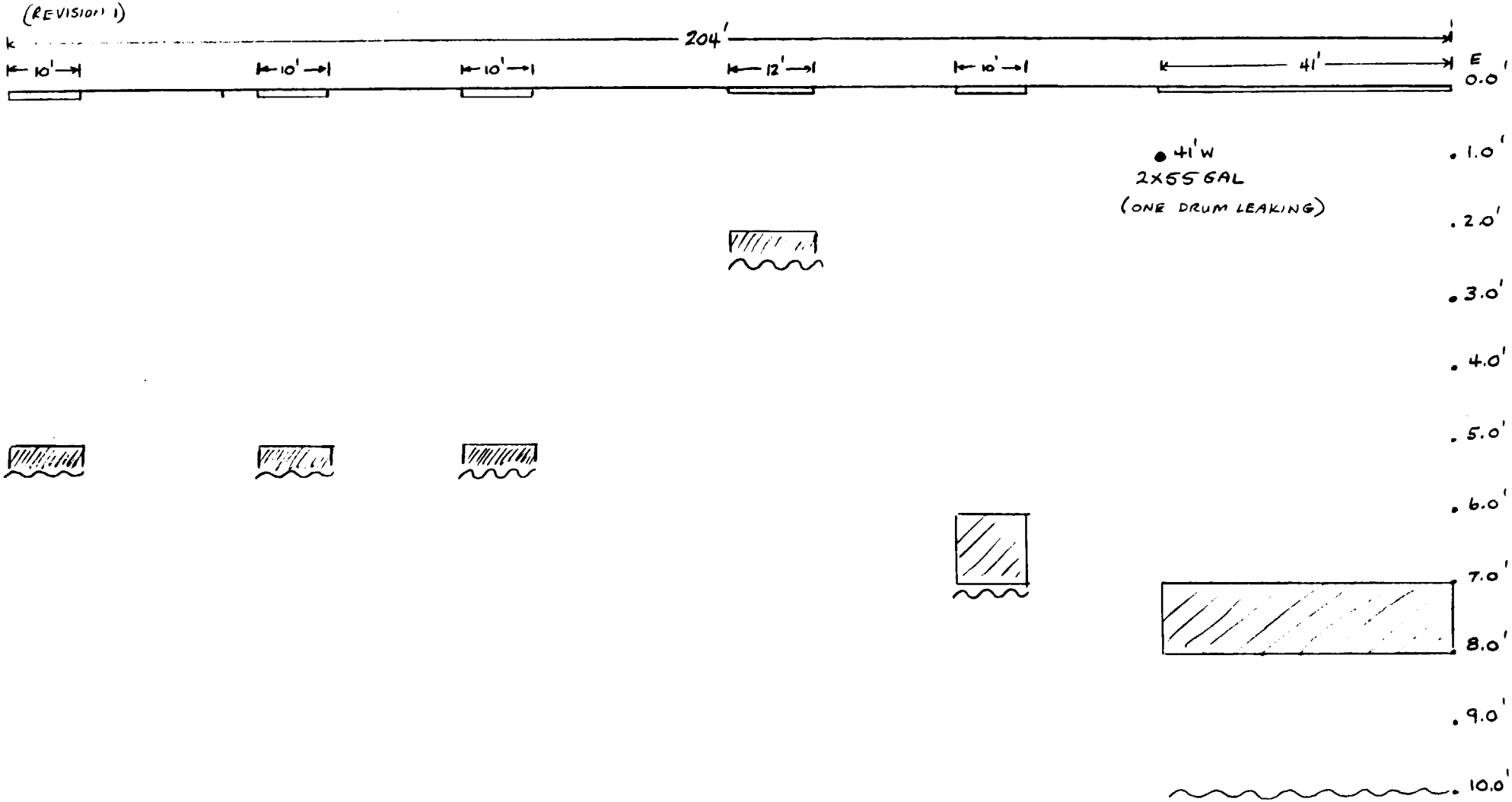
LEGEND:
- BOT. OF TRENCH
- AREA TRENCHED
- DRUM/CONTAINER
- VISUAL CONTAMINATION

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

D5 E-W

(REVISION 1)

2372



Soil: 0'-3' BACK FILL CLAYS, DEBRIS
3'-10' LIGHT/DARK BROWN CLAY, TRACES OF COAL

GROUNDWATER: 10' SLIGHT OIL SHEEN.

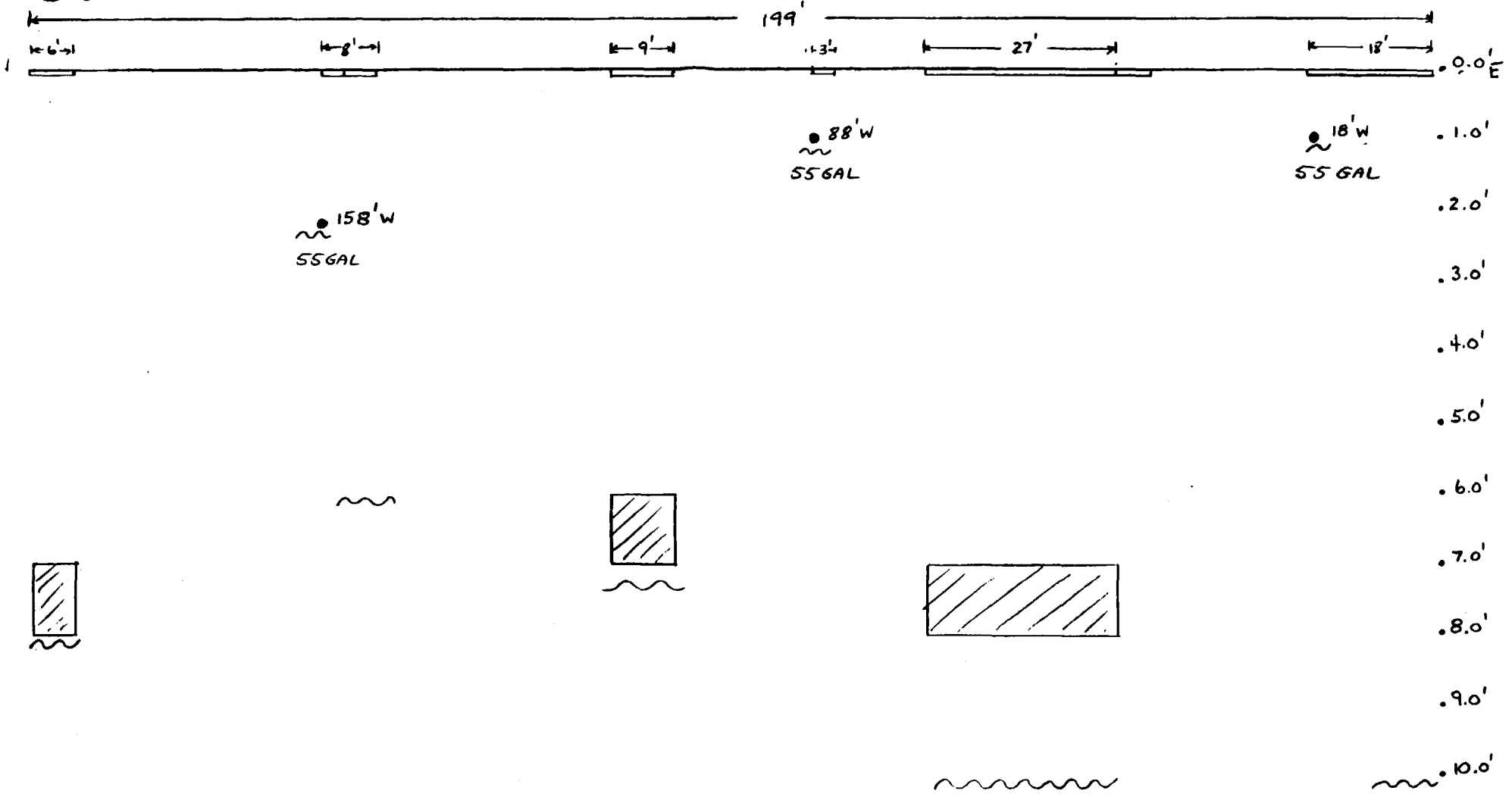
NOTE: CONCRETE DEBRIS AND METAL RINGS, LIDS ENCOUNTERED 0'-3'

LEGEND:
- BOT OF TRENCH
- AREA TRENCHED
- DRUM/CONTAINER
- VISUAL CONTAMINATION

SCALE: HORZ: 1" TO 20'
VERT: 1' TO 2'

D6 E-W

2372



SOIL: 0'-3' BACKFILL CLAY
3'-10' LIGHT/DARK BROWN LOOSE BACKFILL CLAY.

GROUNDWATER: 9.5'

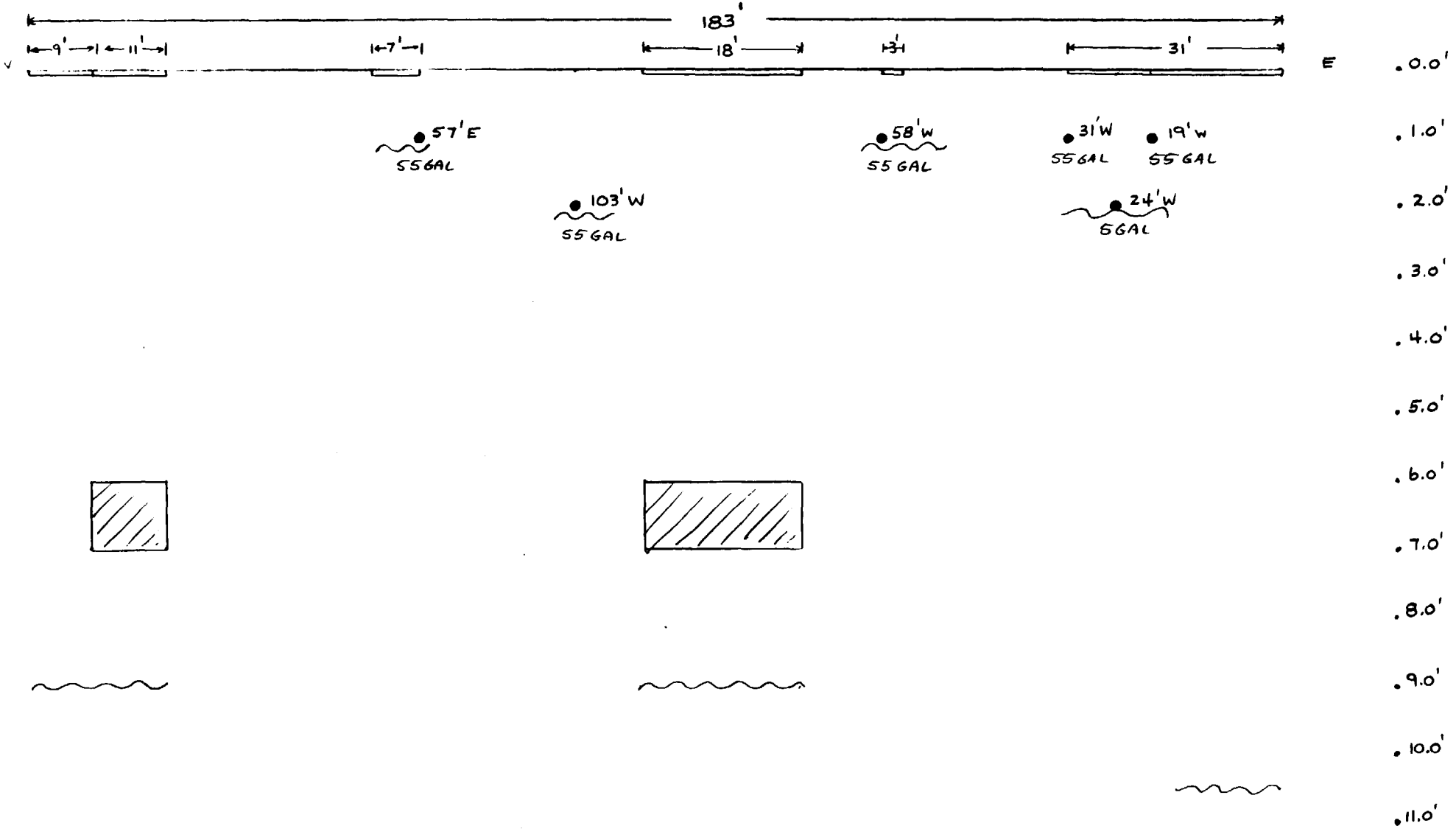
NOTE: METAL OBJECTS, LIDS, RINGS ENCOUNTERED 0'-2'

LEGEND:
- BOT. OF EXCAV.
- AREA TRENCHED
- DRUM / CONTAINER
- VISUAL CONTAMINATION

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

D7 E-W

2372



SOIL: 0'-2' BLUE/BLACK BACKFILL CLAY
2'-10' LIGHT/DARK BROWN LOOSE CLAY

GROUNDWATER: 9' TO 10'

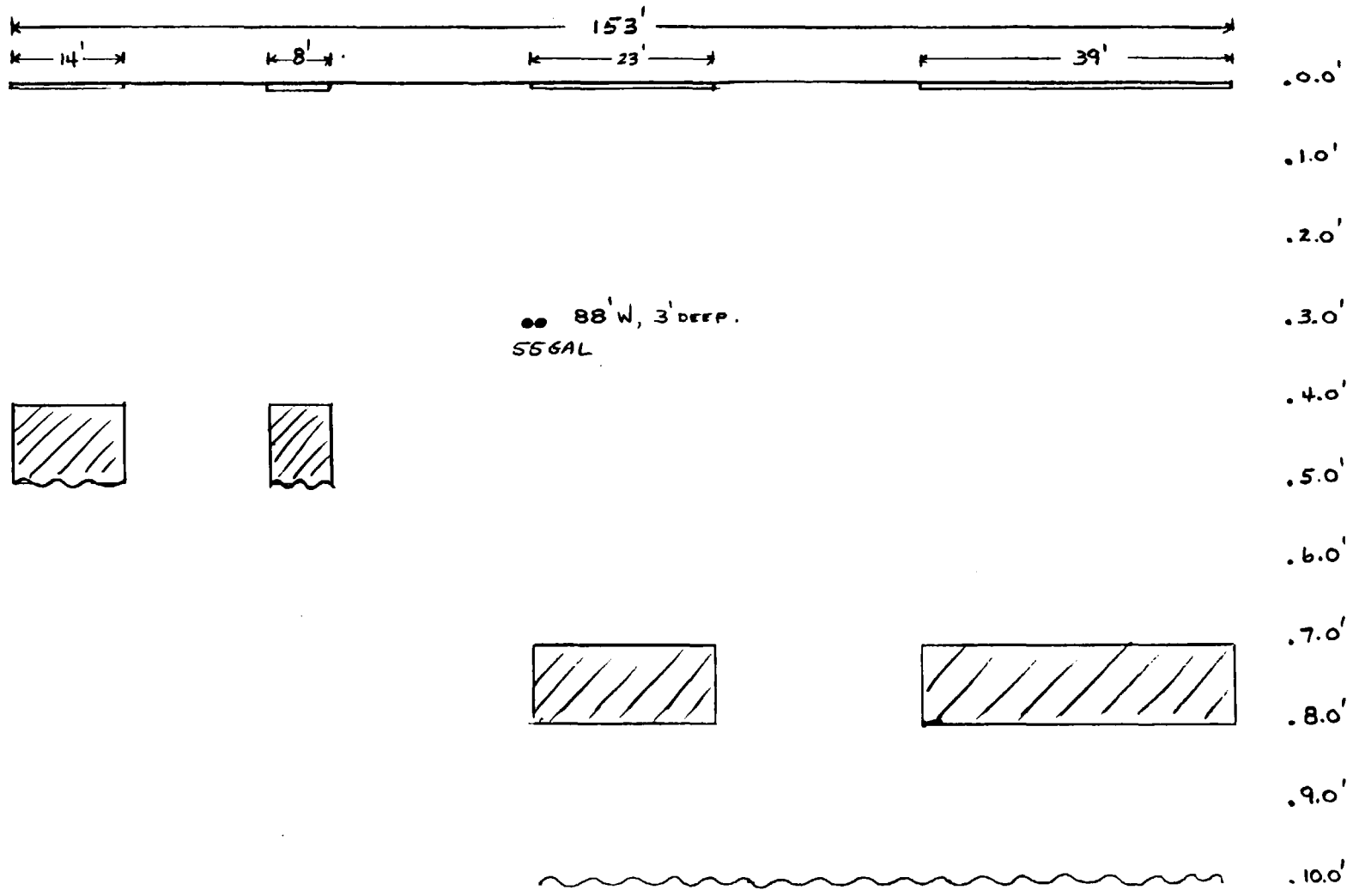
NOTE: MISC LIDS, RINGS ENCOUNTERED 0'-2'

LEGEND:
- BOT. OF EXCAV.
- TRENCHED AREA
- DRUM/CONTAINER
- VISUAL CONTAMINATION

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

D 8 E-W

2372



LEGEND:

- BOTT. OF EXCAV.
- TRENCHED AREA
- DRUM/CONTAINER
- VISUAL CONTAMINATION

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

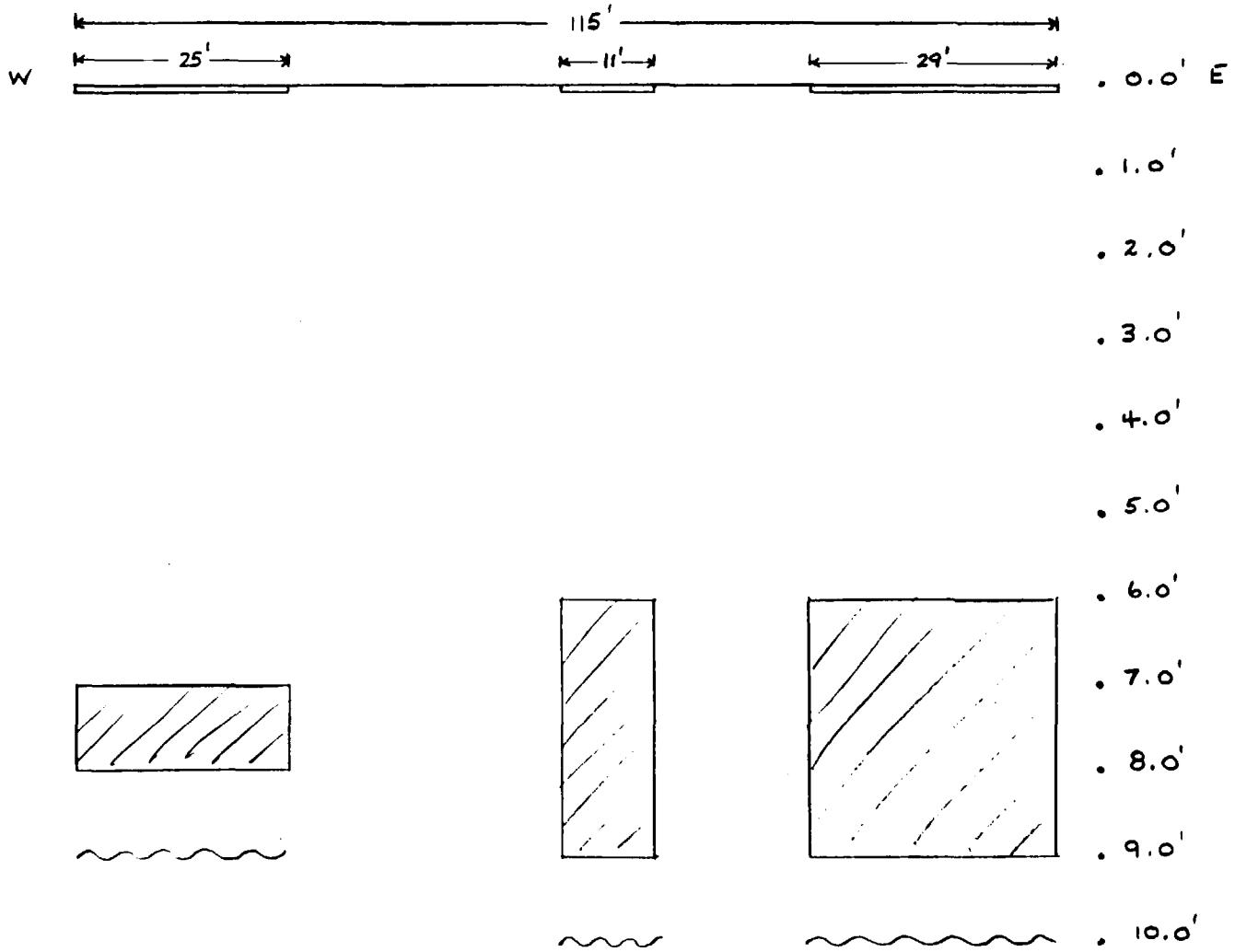
SOIL: 0'-2' DARK LOOSE CLAY BACKFILL
2'-10' MIXED LIGHT/DARK BROWN CLAY, TRACES OF CLAY.

GROUND WATER: 10'

NOTE: MISC METAL LIDS, RINGS ENCOUNTERED FROM 0'-2'

D9 E-W

2372



SOIL: 0'-2' BACKFILL CLAYS.
2'-10' LIGHT/DARK BROWN CLAYS, TRACES OF COAL.

GROUNDWATER: 9' TO 10'

NOTE: MISC METAL OBJECTS, LIDS, RINGS ENCOUNTERED 0'-2'

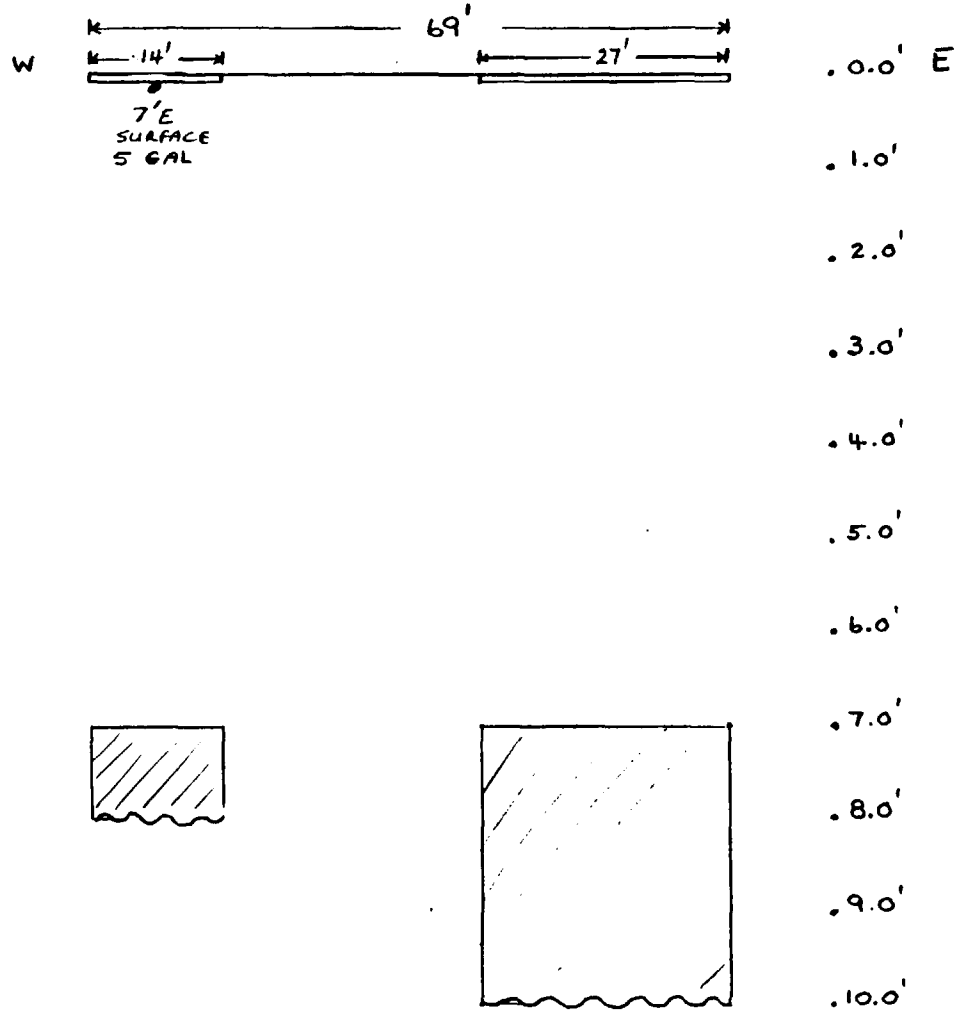
LEGEND: BOT. OF EXCAV.
TRENCHED AREA
DRUM/CONTAINER
VISUAL CONTAMINATION

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

D 10 E-W

(REVISION 1)

2372



SOIL: 0'-2' BACKFILL CLAYS
2'-10' MIXED LOOSE BROWN CLAYS, TRACES OF COAL.

GROUNDWATER: ENCOUNTERED 7' TO 8'

NOTE: MISC METAL OBJECTS, LIDS, RINGS ENCOUNTERED 0'-2'

LEGEND: BOT OF EXCAV.
TRENCHED AREA
DRUM/CONTAINER
VISUAL CONTAMINATION

SCALE: HORZ: 1" TO 20'
VERT: 1" TO 2'

E 1

2372

DUE TO EMBANKMENT AND EAST POND UNABLE TO TRENCH.

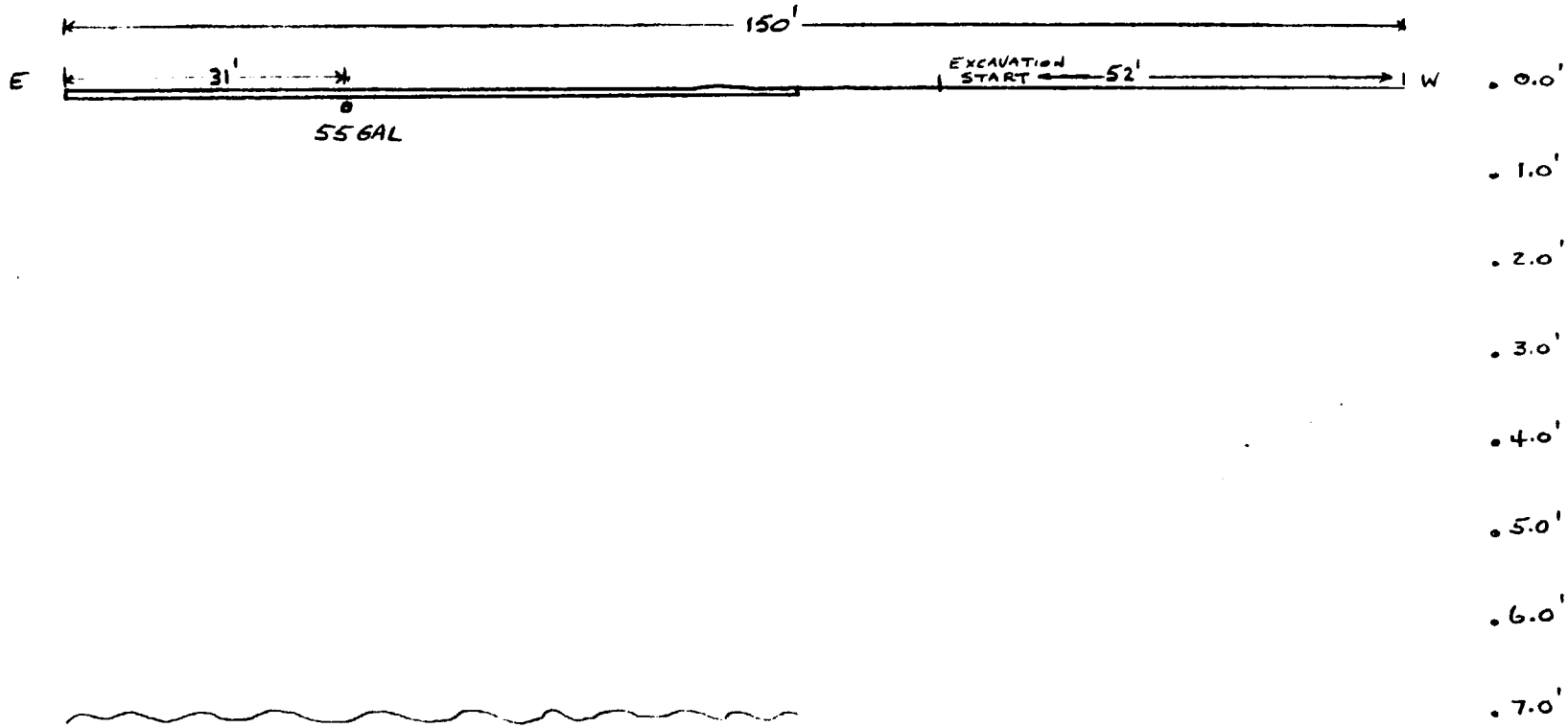
A TEST PIT WAS EXCAVATED AT THE WEST END OF TRENCH LINE 5' SOUTH OFF-SET

SOIL: 0'-7' CLAY AND ROCK FILL MATERIAL.

GROUNDWATER: 7'

E 2 E-W

2372



SOIL: 0'-2' CLAY FILL, SOME DEBRIS
2'-7' LOOSE CLAY FILL.

GROUNDWATER: VARIED FROM 1.5' TO 7.5' DUE TO TERRAIN AND EAST AND WEST PONDS.

NOTE: • TRENCH WAS NOT EXCAVATED TO TOTAL LENGTH DUE TO EMBANKEMENTS AND EAST AND WEST PONDS.

• MISC DEBRIS, METAL LIDS AND RINGS 0'-2'

• 1-55 GAL DRUM ON SURFACE 31'W BETWEEN C2 AND C3 TRENCH.

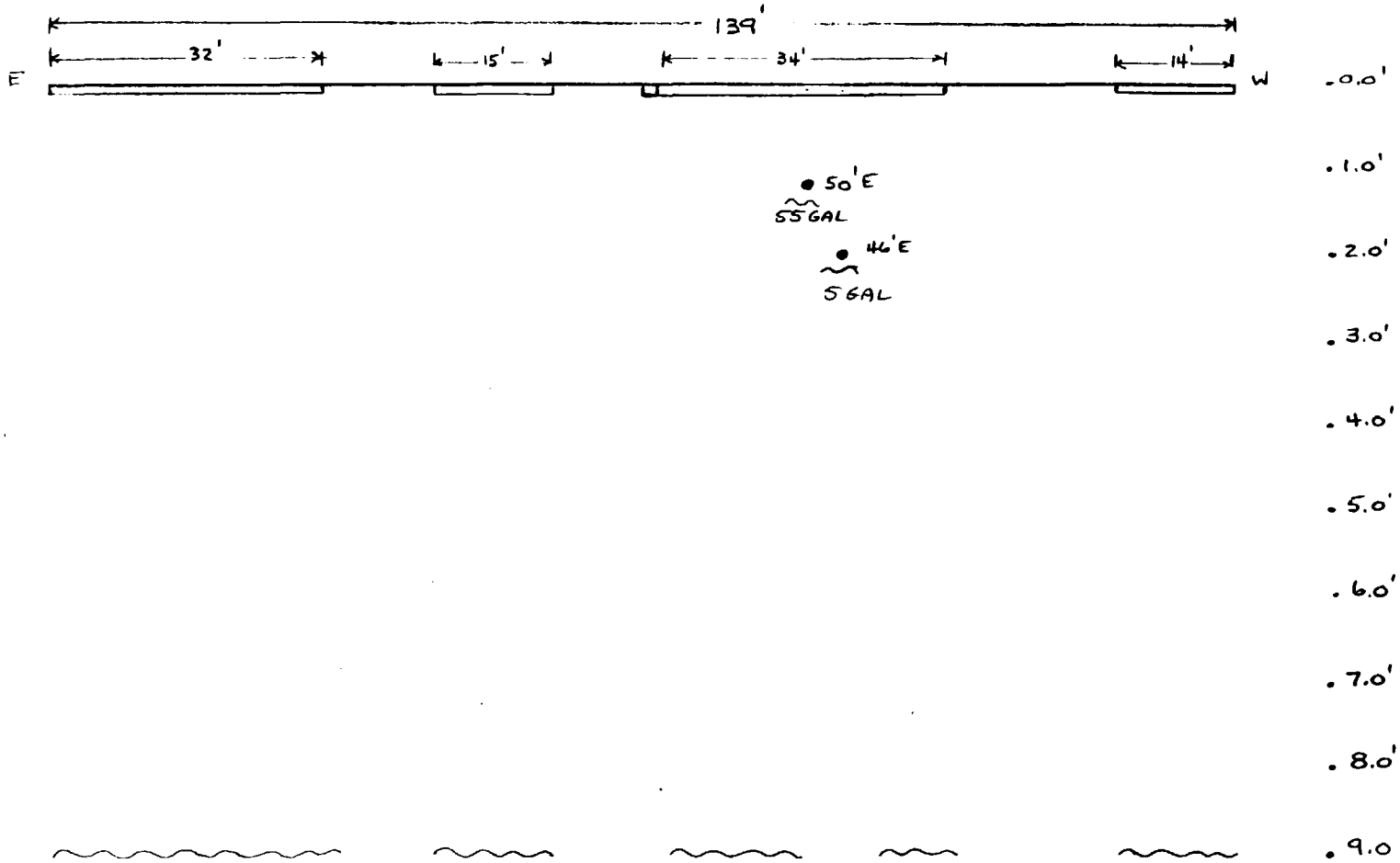
LEGEND:
~ BOT OF TRENCH
═ TRENCHED AREA
● DRUM

SCALE: HORZ: 1" TO 20'
VERT: 1' TO 2'

E 3

2372

E-W



SOIL: 0'-2' CLAY FILL, DEBRIS, VEGATATION, SOME ROCK.
2'-6' CLAY FILL, SOME ROCK
6'-9' CLAY FILL, ROCK, GRAY CLAY.

GROUNDWATER, WESTEND 8'
EASTEND 6'

NOTE: • DUE TO TRENCH INFRINGING OF EAST AND WEST PONDS, HAD TO OFF-SET TRENCH AT CERTAIN LOCATIONS.
• MISC METAL DEBRIS, LIDS, RINGS 0'-2'

LEGEND:
BOT. OF EXCAV.
TRENCHED AREA.
DRUMS

SCALE: HORZ: 1" - 20'
VERT: 1" - 2'

ATTACHMENT TM3-2

RESULTS OF AIR MONITORING
INVESTIGATION OF MAGNETIC ANOMALIES
SUMMIT NATIONAL SUPERFUND SITE
DEERFIELD TOWNSHIP OF PORTAGE COUNTY, OHIO

QSOURCE
ENVIRONMENTAL SERVICES, INC.

Industrial Hygiene Project Notes

10-22-91

Project #: 691424	Client: Exxon Serv	Page 3 Of 4
Date: 10/16/91	Notes By: JR / Qsource	CC:

HNu Readings

Location	Time	Background	Site	Net (ppm)
A-1 trench from south to north = Bz	920 to 950	0.4	0.4 to 0.6	0 to 0.2
A-1 trench = Bz	950 to 1017	0.4	0.4	0
A-2 trench = Bz	1098 to 1110	0.4	0.4 to 1.2	0 to 0.8
A-3 trench = Bz	1117 to 1140	0.6	0.6 to 2.6	0 to 2.0
A-3 trench: in trench = 1 to 3 inches from drums	1140	0.6	50	49.4
A-3 trench = Bz	1336 to 1405	0.6 to 2.0	2.6 to 5.4 (1)	2.0 to 4.4
" " = 1 to 3 inches above trench soil pile	1400	1.0	15 to 20	14 to 19
A-3 trench = Bz using CRA's photoionizer	1410	0	0	0
A-4 trench = Bz	1446 to 1515	0.4	0.4 to 1.2	0 to 0.8
" " = 1 to 3 inches above trench soil pile	1446 to 1515	0.4	50 to 60	49.6 to 59.6
" " = Bz	1520 to 1543	0.6	0.6	0
" " = 1 to 3 inches above trench soil	1520 to 1543	0.6	10 to 300	9.4 to 299.4
A-5 trench = Bz	1605 to 1629	0.4 to 0.6	0.4 to 0.6	0
A-5 trench south to north = Bz	1700 to 1730	0.4	0.4 to 1.4	0 to 1.0
A-6 trench south to north = Bz	1805 to 1820	0.4	0.4 to 1.0	0 to 0.6

(1) At some times there were significant HNu reading peaks of 10 to 15 ppm in the Bz but the duration was less than one second

F# DANISO05

QSOURCE ENVIRONMENTAL SERVICES, INC.

Industrial Hygiene Project Notes

received 10-22-91

Project # C91424	Client: Enro Serv	Page 4 Of 5
Date: 10/17/91	Notes By: JPE / Qsource	CC:

HNu Readings

Location	Time	Background	Site	Net (ppm)
A-6 trench from south to north. ≈ Bz	905	0.6	0.6	—
" " north to south ≈ Bz	910 to 920	0.6	0.6 to 1.4	0 to 0.8
" " " ≈ Bz	930	0.6	0.6 to 5.2	0 to 4.6
" " " ≈ 1 inch from trench soil (black colored)	930	0.6	20 to 60	19.4 to 59.4
A-6 trench north to south ≈ Bz	945	0.6	up to 6.0	5.4
A-6 trench from 1 inch above trench soil	945	0.6	50 to 60	49.4 to 59.4
A-7 trench upwind ≈ Bz	1317	0.6	0.6	—
A-8+ A-7 trench upwind ≈ Bz	1320 to 1424	0.6	0.6 to 5.0	0 to 4.4
A-8+ A-7 trench downwind ≈ 1 inch from trench soil pile	1320 to 1424	0.6	2.4 to 130.0	1.8 to 129.4
A-9 trench upwind ≈ Bz	1455 to 1517	0.4	0.4 to 3.0	0 to 2.6
A-9 trench downwind ≈ 1 inch from trench soil pile	1455 to 1517	0.4	50 to 240	49.6 to 239.6
A-9 trench black layer of soil	1610	0.4	up to 60	0 to 59.6
A-9 trench upwind ≈ Bz	1600 to 1612	0.4	0.4 to 4.0	0 to 3.6
A-10 trench (north to south) upwind ≈ Bz	1635 to 1647	0.6	0.6 to 5.2	0 to 4.6
* Note: Had some peak readings of 10 to 15 ppm but lasted ≤ 1 second				
A-10 trench downwind ≈ 1 inch from trench soil	1635 to 1647	0.6	90 to 100	89.4 to 99.4
A-10 trench (south to north) upwind ≈ Bz	1701 to 1745	0.4	0.4 to 1.0	0 to 0.6
A-10 trench downwind ≈ 1 inch from trench soil from 4-6 feet in depth.	1701 to 1745	0.4	50.0	49.6

SOURCE ENVIRONMENTAL SERVICES, INC.

Industrial Hygiene Project Notes

received 10-22-91

Project # 691424	Client: Enrosource	Page 3 Of 4
Date: 10/18/91	Notes By: JR/Source	CC:

HNu Readings

Location	Time	Background	Site	Net (ppm)
A-11 trench north to south ≈ Bz upwind	850 to 935	0.4	0.4 to 1.4	0 to 1.0
" " ≈ Bz downwind	850 to 935	0.4	0.4 to 200	0 to 199.6
" " ≈ 1 inch above soil pile	930	0.4	200 to 300	199.6 to 299.6
" " ≈ Bz downwind about 12 ft from pile	930	0.4	50	49.6
" " ≈ Bz downwind w/CLA's	940	0	223 max reading	
" " ≈ Bz upwind	935 to to 15	0.4	0.4 to 1.4	0 to 1.0
" " ≈ Bz downwind	935 to 1015	0.4	up to 220	up to 219.6
" " ≈ 1 inch above soil pile	950	0.4	400	399.6
" " ≈ Bz upwind	1005 to 1045	0.4	0.4 to 1.0	0 to 0.6
B-2 trench ≈ Bz	1450 to 1537	0.4	0.4	0
" " ≈ 1 inch above soil pile	1450 to 1537	0.4	0.4	0
B-3 trench ≈ Bz (east to west)	1605 to 1640	0.8	0.8 to 1.8	0 to 1.0
B-3 trench (west to east) ≈ Bz	1645 to 1658	0.6	0.6 to 0.8	0 to 0.2

ENVIRONMENTAL SERVICES, INC

received 10-22-91

Industrial Hygiene Project Notes

Project # 691424	Client: EnroSev	Page 2 Of 3
Date: 10 / 19 / 91	Notes By: [illegible]	CC:

HNu Readings

Location	Time	Background	Site	Net (ppm)
No HNu Readings between 830 to 1000 due to rain.				
B-5 Trench ≈ Bz	1020	0.8	0.8 to 1.0	0 to 0.2
No HNu Readings between 1247 to 1335 due to rain.				
C-2 trench ≈ Bz	1340	2.8	2.8	0
C-3 trench ≈ Bz	1345 to 1400	3.0	3.0 to 3.2	0 to 0.2
C-3 trench ≈ Bz	1400 to 1412	3.0	3.0 to 5.0	0 to 2.0
C-3 trench ≈ 1 inch above black soil from trench	1420	3.0	50	47.0

QSOURCE ENVIRONMENTAL SERVICES, INC.

Industrial Hygiene Project Notes

received 10-27-91

Project # 691424	Client: EnroServ	Page 4	Of 5
Date: 10/21/91	Notes By: JR/Qsource	CC:	

HNu Readings

Location	Time	Background	Site	Net (ppm)
D-10 trench (east to west) ≈ Bz upwind	893 to 900	0.6	0.8 to 3.0	0.2 to 2.4
" " ≈ 1 inch from black oily soil	856	0.6	94.0	93.4
" " ≈ Bz downwind	893 to 900	0.6	15 to 20	14.4 to 19.4
" " ≈ 1 inch from black oily soil	900	0.6	100	99.4
D-10 trench (west to east) ≈ Bz upwind	900 to 1000	0.8	1 to 3	0.2 to 2.2
" " ≈ Bz down wind	900 to 1000	0.8	20.0	19.2
" " ≈ 1 inch above black soil	1000	0.8	200.0	199.2
D-9 trench (east to west) ≈ Bz upwind	1000 to 1037	0.8	1.0 to 2.0	0.2 to 1.2
" " at trench/ground level	1033	0.8	50.0	49.2
" " ≈ 1 inch above soil pile	1040	0.8	250.0	249.2
" " ≈ Bz downwind 20 feet from pile	1045	0.8	up to 10.0	up to 9.2
D-8 trench (east to west) ≈ Bz upwind	1110	0.8	1.0 to 2.0	0.2 to 1.2
" " ≈ 1 inch above soil pile	1115	0.8	400.0	399.2
" " ≈ Bz downwind 8 feet from pile	1120	0.8	up to 200.0	up to 199.2
" " ≈ Bz downwind 20 feet from pile	1120	0.8	10.0	9.2
D-8 trench ≈ Bz upwind	1338 to 1415	0.8	1.8	1.0
" " ≈ 1 inch above soil pile	1338 to 1415	0.8	50.0	49.2
D-7 trench ≈ Bz upwind	1430 to 1530	0.8	1.8	1.0
" " ≈ Bz downwind 8 feet from pile	1430 to 1530	0.8	50.8	50.0
" " ≈ at trench level	1515	0.8	15.0	14.2
D-7 trench ≈ Bz upwind	1530 to 1605	0.8	0.8 to 1.8	0 to 1.0
D-6 trench ≈ Bz upwind	1625 to 1650	0.6	0.6	0
" " ≈ Bz upwind	1650 to 1720	0.6	0.6 to 1.4	0 to 0.8
" " ≈ Bz downwind	1650 to 1720	0.6	15 to 20	14.4 to 19.4
" " ≈ 1 inch above soil pile	1650 to 1720	0.6	200 to 300	199.4 to 299.4

QSOURCE
ENVIRONMENTAL SERVICES, INC.

Industrial Hygiene Project Notes

received 10-24-91 JPB

Project # G91424	Client: Enaoserv	Page Of
Date: 10/22/91	Notes By: JE / Qsource	CC:

HNu Readings

Location	Time	Background	Site	Net (ppm)
D-5 trench ≈ Bz upwind	850	0.6	2.6	2.0
" " ≈ 1 inch above soil pile	855	0.6	+200.0	+199.4
D-5 trench ≈ Bz upwind	850 to 925	0.6	1 to 5	0.4 to 4.4
" " ≈ Bz upwind peaks < 1 second in duration		0.6	20.0	19.4
" " ≈ 1 inch above soil pile	850 to 925	0.6	400.0	399.4
" " ≈ at side of trench	850 to 925	0.6	200.0	199.4
" " ≈ Bz upwind	930 to 1000	0.4	1.4	1.0
" " ≈ 1 inch above soil pile	955	0.4	150.0	149.6
" " ≈ Bz upwind	1010	0.4	1.4	1.0
D-4 trench ≈ Bz upwind	1025 to 1037	0.4	0.8	0.4
" " ≈ 1 inch above soil pile	1040 to 1112	0.4	50.0	49.6
" " ≈ Bz upwind	1040 to 1112	0.4	1.8	1.0
D-3 trench (east to west) ≈ Bz upwind	1325 to 1355	0	0 to 3.0	up to 3.0
" " peaked < 1 second duration	1325 to 1355	0	4.3	4.3
" " ≈ Bz downwind	1325 to 1355	0	15 to 20	15 to 20
" " ≈ 1 inch above soil pile	1325 to 1355	0	263.0	263.0
" " ≈ Bz of operator	1325 to 1355	0	3 to 4.5	3.0 to 4.5
↳ peaked to 10 ppm but last less than 1 second				
D-3 trench ≈ Bz upwind	1356 to 1415	0.8	3.0	2.2
↳ peaked to 5.0 ppm, lasted less than 1 second				
" " ≈ Bz downwind	1356 to 1415	0.8	200	199.2
" " ≈ Bz operator	1356 to 1415	0.8	up to 4.0	3.2
↳ peaked up to 8.0 ppm but duration is less than 1 second.				
" " ≈ Bz upwind	1415 to 1445	0.8	1.0	0.2
" " ≈ Bz operator	1415 to 1445	0.8	1.6	0.8
D-2 trench ≈ Bz upwind	1500 to 1545	0	0 to 2.0	up to 2.0
↳ peaked to 4.2 ppm but duration of exposure < 1 second.				
" " ≈ 1 inch above soil pile downwind	1500 to 1545	0	268.0	268.0
" " ≈ Bz operator	1500 to 1545	0	up to 2.0	up to 2.0

QSOURCE
ENVIRONMENTAL SERVICES, INC.

Industrial Hygiene Project Notes

received 10-24-91

Project # 691424	Client: Emcser	Page 01
Date: 10/22/91	Notes By: JR / Qsource	CC:

HNu Readings (con't)

Location	Time	Background	Site	Net (ppm)
D-2 trench = Bz upwind	1545 to 1620	0	up to 2.0	up to 2.0
" " = 1 inch above soil pile downwind	1545 to 1620	0	268.0	268.0
" " = Bz of operator	1545 to 1620	0	up to 2.0	up to 2.0
" " = Bz upwind	1657	0.4	1.2	0.8
" " = downwind 5 feet from pile	1657	0.4	100.0	99.6
" " = 1 inch above soil pile	1657	0.4	200 to 225	199.6 to 224.6
D-1 trench = Bz upwind	1730 to 1753	0	up to 3.6	up to 3.6
" " = Bz of operator	1730 to 1753	0	up to 4.0	up to 4.0

QSOURCE
ENVIRONMENTAL SERVICES, INC.

Industrial Hygiene Project Notes

received 10-24-91

Project # 691424	Client: Encoserv	Page 01
Date: 10/23/91	Notes By: JPE/Qsource	CC:

HNu Readings

Location	Time	Background	Site	Net (ppm)
D-1 trench ≈ Bz upwind	840 to 910	2.0	2.0 to 5.0	up to 3.0
" " ≈ Bz operator	840 to 910	2.0	2.0 to 5.0	up to 3.0
" " ≈ Bz downwind of soil pile	840 to 910	2.0	10 to 15	8 to 13
" " ≈ 1 inch from soil pile	840 to 910	2.0	20 to 50	18 to 48
E-3 trench ≈ Bz upwind	1110 to 1147	0.8	0.8	0
" " ≈ 1 inch above pile (soil)	1110 to 1147	0.8	1.0	0.2
E-2 trench ≈ Bz upwind	1330 to 1420	0.6	0.6 to 2.0	0 to 1.4
E-2 trench ≈ downwind of soil pile	1330 to 1420	0.6	up to 2.6	up to 2.0
" " Bz upwind	1430 to 1442	0.6	up to 1.2	up to 0.6
" " 1 inch above soil pile	1430 to 1442	0.6	up to 1.2	up to 0.6
E-2 trench ≈ Bz upwind	1555 to 1630	1.0	up to 1.6	0.6
≈ 1 inch above soil pile	1555 to 1630	1.0	up to 1.6	0.6
E-1 trench ≈ Bz upwind	1637 to 1700	1.0	up to 2.0	1.0
↳ peaks to 22 ppm but duration of exposure is < 1 second.				
Grid 1-1 locating UST #1 ≈ Bz upwind	1715-1750	1.0	up to 3.0	2.0
" " ≈ Trench level	1715-1750	1.0	up to 22.0	21.0
↳ these levels were peaks				

F# DANIS005

Industrial Hygiene Project Notes

Project # 691424	Client: Enro Seev	Page 2 Of 3
Date: 10/24/91	Notes By: [illegible]	CC:

HNu Readings

Location		Time	Background	Site	Net (ppm)
S. impoundment - sediment removal	3/Bz	915 to 1000	3.8	3.8 to 4.2	0 to 0.4
"	" 3/Bz	1040 to 1115	1.2	1.4	0.2
"	" 2 inch @ soil	1100	1.2	1.2	0
"	" 3/Bz	1320 to 1642	1.2 to 1.4	1.2 to 1.6	0 to 0.2
In CRZ	3/Bz	1845	1.2	1.2	0

Note: No trenching activities today on-site.

F# DANIS005

TOTAL P.04

Industrial Hygiene Project Notes

Project # 691424	Client: Enro Serv	Page 3 Of 4
Date: 10/25/91	Notes By: JPL	CC:

HNu Readings

Location		Time	Background	Site	Net (ppm)
In south impoundment (sediment removed) = Bz before work		756	2.4	3.0	0.6
During search of UST #2	= Bz removed	815 & 850	2.6	3.0	0.4
"	" = in trench	815-850	2.6	3.6	1.0
At fill hole of UST		845	2.6	200 to 300	197 to 297
During search of UST #3	= Bz removed	930 to 955	2.6	3.0	0.4
	= in trench	930 to 955	2.6	5.0	2.4
UST #3 search	= Bz removed	1000 to 1030	2.6	3.0	0.4
During search of UST #4	= Bz	1032 to 1035	2.8	3.0	0.2
	= in trench	1032 to 1035	2.8	3.0	0.2
" "	= Bz	1101 to 1125	1.8	2.2	0.4
" "	= Bz	1250 to 1422	1.8 to 2.0	1.8 to 2.0	0
In south impoundment (sediment removed) = Bz		1635 to 1715	2.4	2.6	0.2
During cleanup with Hitachi 270LE		1745	2.2	2.2	0
During decon		1800	2.0	2.0	0

Industrial Hygiene Project Notes

Project # G91424	Client: Enco Sav	Page 2 Of 3
Date: 10/26/91	Notes By: [illegible]	CC:

HNu Readings

Location	Time	Background	Site	Net (gm)
Decon procedures ≈ Bz	850 to 950	1.8	0.8	0
On-site leveling trench piles + rows ≈ Bz	1020 to 1140	0.8	1.0	0.2
Decon procedures ≈ Bz	1300 to 1515	0.6	0.6	0
Clean-up activities	1850	0.6	0.6	0

Note: No other activities but decon and clean-up today.

F# DANI8005

ATTACHMENT 2

CONSENT DECREE

ATTACHMENT 3

TYPICAL REPORTING SHEETS

CONTAINER DATA SHEET
SUMMIT NATIONAL SUPERFUND SITE
DEERFIELD TOWNSHIP OF PORTAGE COUNTY, OHIO

A. CONTAINER IDENTIFICATION

Unique Container I.D. No.: _____

Finger Print Grouping: _____

Labels: _____

_____

Description: _____

_____

B. EXPOSURE AND REMOVAL **(Circle Choices)**

Date: _____ Time: _____

Ambient Temperature: _____

Location: _____

Container Size: *5* *15* *30* *55* *85 gallon* *Other:* _____

Type: *Steel* *Plastic* *Other:* _____

Lid: *Open Head* *Closed Head*

Condition: *Good* *Bad* *Bulging* *Perforated* *Leaking*

Description: _____

PID: _____ Explosimeter: _____

Contents (If Visible): *Solid* *Liquid* *Clear* *Opaque*

Description: _____

Overpacked? *YES* *NO*

Field Observer: _____

C. SAMPLING AND COMPATIBILITY **(Circle Choices)**

Ambient Temperature: _____

Sample Number: _____

Date: _____ Time: _____

Method of Opening: *Already Open* *Remote* *Other:* _____

PID: Before: _____ After: _____ EXPLOSIMETER: Before: _____ After: _____

Condition: *Good* *Bad* *Bulging* *Perforated* *Leaking*

Contents: *Solid* *Liquid* *Solid/Liquid* *Clear* *Opaque*

Description: _____

Liquid/Solid Ratio: _____

Percent (%) Full: *25%* *50%* *75%* *100%* *Other:* _____%

If Liquid: *Pumpable* *Not Pumpable*

If Solid: *Easily Emptied* *Not Easily Emptied*

Comments: _____

_____

Sampler: _____

	SHIPPED TO (Laboratory name):

CHAIN OF CUSTODY RECORD	PROJECT Nº:	PROJECT NAME:

SAMPLER'S SIGNATURE _____ (SIGN)

SEQ. Nº	SAMPLE Nº	DATE	TIME	SAMPLE LOCATION	SAMPLE TYPE	Nº OF CONTAINERS	REMARKS (ANALYSES)
				TOTAL NUMBER OF CONTAINERS			

ANTICIPATED CHEMICAL HAZARDS:

RELINQUISHED BY: 1 (SIGN)	DATE/TIME	RECEIVED BY: 2 (SIGN)
RELINQUISHED BY: 2 (SIGN)	DATE/TIME	RECEIVED BY: 3 (SIGN)
RELINQUISHED BY: 3 (SIGN)	DATE/TIME	RECEIVED BY: 4 (SIGN)
RELINQUISHED BY: 4 (SIGN)	DATE/TIME	RECEIVED BY: 5 (SIGN)
RELINQUISHED BY: 5 (SIGN)	DATE/TIME	RECEIVED BY: 6 (SIGN)
RELINQUISHED BY: 6 (SIGN)	DATE/TIME	RECEIVED BY: 7 (SIGN)

METHOD OF SHIPMENT:	SHIPPED BY:	RECEIVED FOR LABORATORY BY: (SIGN)	DATE/TIME
CONDITION OF SEAL UPON RECEIPT: GENERAL CONDITION OF COOLER:		COOLER OPENED BY: (SIGN)	DATE/TIME

WHITE – OFFICE COPY
YELLOW – RECEIVING LABORATORY COPY
PINK – LABORATORY COPY
GOLDEN ROD – SHIPPERS

SAMPLE

figure 6.1
SAMPLE CHAIN OF CUSTODY FORM
REMEDIAL CONSTRUCTION ACTIVITIES
SUMMIT NATIONAL SUPERFUND SITE
Deerfield Township of Portage County, Ohio

2372 (49) NOV 11/92 REV.0 (F-09)

METAMORA LANDFILL SOURCE REMOVAL AND DISPOSAL PROGRAM

CONSTRUCTION QUALITY CONTROL DAILY REPORT

REPORT NUMBER: _____ DATE: _____

DESCRIPTION: _____

WEATHER: _____ RAINFALL _____ INCHES, TEMP.:MIN. _____ MAX. _____

---

1. Work Performed Today by Prime Contractor (include Plant and Labor Breakdown):

2. Work Performed Today by Subcontractor (include Plant and Labor Breakdown):

3. Incineration Performed Today (include approximate quantities and types, and include plant and labor breakdown):

4. Type and Results of Inspection: (indicate whether: P-Preparatory, I-Initial, or F-Follow-up and Include Satisfactory Work Completed or Deficiencies with Action to be Taken:

5. List Type and Location of Tests Performed and Results of These Tests:

6. Verbal Instructions Received from Engineer on Construction Deficiencies or Re-testing Required:

_____

_____

_____

_____

7. Safety Violations Observed and Actions Taken:

_____

_____

_____

_____

8. Remarks:

_____

_____

_____

_____

9. CERTIFICATION: I certify that the above report is complete and correct and that I, or my authorized representative, have inspected all work performed this day by the prime contractor and each subcontractor and have determined that all materials, equipment, and workmanship are in strict compliance with the plans and specifications, except as may be noted above.

_____

CONTRACTOR'S DESIGNATED QUALITY
CONTROL REPRESENTATIVE

ATTACHMENT 4

WASTEWATER ACCEPTANCE AND TREATMENT CRITERIA

ATTACHMENT 4

WASTEWATER
ACCEPTANCE AND RELEASE CRITERIA

		EPA Water Quality Standards						Ohio Water Quality Standards		
		Drinking Water Standards		For The Protection of Aquatic Life	For The Protection of Human Life				Aquatic Life Habitat(6)	
Chemical	Acceptance(1) Criteria (µg/L)	Maximum Contaminant Level MCL (µg/L)	Proposed Maximum Contaminant Level pMCL (µg/L)	Freshwater Protection Acute/Chronic (µg/L)	AWQC Water and Fish Ingestion (µg/L)	AWQC Fish Only Ingestion (µg/L)	Effluent Target Level HI of 1 Based on Individual Compounds (µg/L)	Public Water Supply (µg/L)	30-Day Average (µg/L)	Human Health 30-Day Average (µg/L)
Organic Compounds										
Acetone	46,347						3,500		78,000	
Benzene	7									
1,1-Dichlorethane	359						3,500			
1-2-Dichlorethane	1,049	5(1,5)		118,000/20,000(1)	0.94(1,2)/0.38(5)	243(1,2)/98.6(5)		3.80	3,500	990
1,1-Dichloroethylene	2	7(1,5)		11,600(1,2)	0.033(1,2)/0.057(5)	1.85(1,2)/3.2(5)	315	0.57	78	32
1,2-Dichloroethylene	1,223	5(3)							310	
Ethylbenzene	26	700(3)		32,000(1,2)	1,400(1,2)/3,120(5)	3,280(1,2)/28,720(5)	3,500	3,100	62	29,000
Methylene Chloride	145			11,000(1)	0.19(1)/4.7(5)	15.7(1)/1,578(5)	2,100		430	
Methyl Ethyl Ketone	22,103						1,750		7,100	
Methyl Isobutyl Ketone	756						1,750			
Toluene	260	1000(3)		17,500(1)	14,300(1,2)/6,765(5)	424,000(1,2)/201,300(5)	7,000	10,000	1,700	300,000
1,1,1-Trichloroethane	602	200(1,5)			18,400(1,2,5)	1,030,000(1,2,5)	70,000	200	88	1,030,000
Trichloroethylene	1.5	5(6)								
Xylene (Total)	289	10,000(3)								
Base/Neutral Compounds										
Benzoic Acid	309						140,000			
Bis(2-Ethylhexyl)Phthalate	1			400/360(4)	1.76(5)	5.9(5)	700	18	8.4	59
Isophorone	38			117,000(1,2)	5,200(1,2)/8.4(5)	520,000(1,2)/598(5)	7,000			
2-Methyl Naphthalane	1									
Naphthalene	1			2,300/620(2)			140		44	
Acid Compounds										
4 Chloro 3 Methyl Phenol	2									
2,4-Dimethyl Phenol	1			2,120(2)	400(5)		700			
2-(O-Cresol) Methyl Phenol	3						1,750		22	
4-(P-Cresol) Methyl Phenol	20						1,750		6.2	
Phenol	158			10,200/2,560(1)	300(1,5)	46,163 ppm(5)	21,000	1.0	200	
Filtered Inorganic Compounds										
Antimony	5	6(6)		9,000/1,600(1) and 88/30(4)	14(1,5)	4,400(5)	14	14	190	4,300
Arsenic	7	50(3)	50(1)	360/190(1)	0.0022(1)/0.018(5)	0.018(1)/0.14(5)	35	50	190	
Iron	149,691	300(1)		11,000(2.5)	300(2,5)			300	1,000	

ATTACHMENT 4

WASTEWATER
ACCEPTANCE AND RELEASE CRITERIA

		EPA Water Quality Standards						Ohio Water Quality Standards (6)		
		Drinking Water Standards		For The Protection of Aquatic Life	For The Protection of Human Life				Water Hardness Dependent Parameters	
									Water Hardness (mg/L CaCo3)	
Chemical	Acceptance(1) Criteria (µg/L)	Maximum Contaminant Level MCL (µg/L)	Proposed Maximum Contaminant Level pMCL (µg/L)	Freshwater Protection Acute/Chronic (µg/L)	AWQC Water and Fish Ingestion (µg/L)	AWQC Fish Only Ingestion (µg/L)	Effluent Target Level HI of 1 Based on Individual Compounds (µg/L)	Public Water Supply (µg/L)	100 30-Day Average (µg/L)	500 30-Day Average (µg/L)
Filtered Inorganic Compounds										
Aluminum	536			750/87(5)						
Barium	219	2000(6)			1,000(5)		2,450	1,000		
Calcium	403,571									
Chromium VI	5	100(3)*		16/11(1,2,5,)	50(1,2,5)		175	50	210	770
Cobalt	14									
Copper	2		1,300(5)	9/6.5(5)	1,000(5)		1,295	1,000	12	52
Lead	1	50(3)		82/3.2(1)	50(1,2,5)		49	50	6.9	54
Magnesium	144,301									
Manganese	6,818				30(5)	100(2)	3,500	50		
Nickel (Soluble Salts)	14	100(6)		789/87.7(5)	610(5)	4,600(5)	700	610	170	700
Potassium	12,829						7,000			
Zinc	188	5,000(1)		65/58.9(5)	5,000(5)			5,000	110	410
Temperature	<100°F									
pH	6 - 9									
TSS+TDS	<300 mg/L									

Notes:

(1) Acceptance criteria for wastewater at Trust's Groundwater Treatment Plan 1

ARARs do not exist for all chemicals presented, EPA classifies only primary MCLs, Promulgated state MCLs, and National Ambient Air Quality Standards (NAAQs) as ARARs for CERCLA Sites. Proposed MCLs, OSHA PELs, and health-based state criteria such as AALs and ALs, are classified as "to be considered" (TBC) Standards.

ARAR: Applicable or Relevant and Appropriate Requirements
AWQC: Ambient Water Quality Criteria
MCL: Maximum Contaminant Level
pMCL: Proposed Maximum Contaminant Level
WQC: Water Quality Criteria
* Effective Date July 30,1992
TSS - Total Suspended Solids
TDS - Total Dissolved Solids

Sources:

1. ARIS: EPA Integrated Risk Information System Database; October 1991
2. USEPA Quality Criteria For Water 1986 EPA 440/5-86-0001 May 1986, 51 Federal Register 43665; Update September 1987
3. USEPA National Primary and Secondary Drinking Water Regulations 40 CFR 141-3 (56 FR No. 20) January 1991
4. EPA Ambient Water Quality Criteria 55 FR 19986; May 1990
5. EPA Regional IV "Toxic Substance Spreadsheet", EPA Water Quality Standards Unit
6. Ohio Water Quality Standards (OAC 3745-1)

ATTACHMENT 5

FORMAT FOR PERFORMANCE DEMONSTRATION PLAN

ATTACHMENT 5

FORMAT FOR PERFORMANCE DEMONSTRATION PLAN

Section 1.0	Introduction
Section 2.0	Project Organization
Section 3.0	Waste Analysis and POHC Selection • Background • Waste Analysis • Viscosity • Selection of POHC
Section 4.0	Performance Standards • Stack Gas • Background Monitoring
Section 5.0	Process Description • Auxiliary Equipment • Incineration Train
Section 6.0	Operating Plan • Operating Procedures • Residual Managements • Startup and Shutdown • Emergency Shutdowns
Section 7.0	Sampling, Monitoring and Analysis Plan • Sampling of Feed • Sampling of Stack Gas • Sampling of Process Soil • Sampling of Residual Ash • Monitoring of DRE
Section 8.0	Analytical Sensitivity
Section 9.0	Data Reporting • Waste Feed Data • Operating Data • Stack Gas Sampling and Analytical Data
Section 10	Miscellaneous Tests • Operational Readiness • Automatic Waste Feed Shutoff, Interlocks • Heightbelt Feeder • CEM Calibration

ATTACHMENT 5

FORMAT FOR PERFORMANCE DEMONSTRATION PLAN

Section 11	Test Schedule
Section 12	Quality Assurance • Quality Assurance Objectives • Sampling Quality Control • Laboratory Quality Control • Continuous Emission Monitors

ATTACHMENT 6

OHIO REGULATION FOR BEST AVAILABLE TECHNOLOGY

Ohio EPA

Division of Air Pollution Control

Engineering Section

Engineering Guide #42

Question:

The permit to install rule (OAC rule 3745-31-05) requires the application of best available technology (BAT) on all new sources. What is the definition of BAT?

Answer:

For each new source, regardless of size or location, BAT is a case-by-case determination of an emission limit and/or control technique which, taking into account environmental, energy, and economic considerations, represents the maximum emission control achievable by the source. In no instance shall the emission level or control measure specified in the BAT determination be less stringent than that allowed under any applicable state or federal rule.

The primary purpose of this requirement is to assure that all new sources are controlled with BAT at the time of source installation. This level of control is necessary to ensure that the ambient air impact of the new source is minimized. When the impact of a new source is minimized, air quality is protected as much as possible with clean areas remaining attainment and non-attainment areas continuing progress toward the ambient air quality standards as expeditiously as possible.

A secondary purpose of the BAT determination is to ensure that any new source must meet uniform emission requirements regardless of the proposed location. By applying standards consistently throughout the state sources will not gain economic advantage by selecting one location over another. The application of uniform BAT will avoid the situation whereby cities or counties may use less stringent air pollution requirements as an economic bargaining incentive to attract new industry.

The BAT determination also considers the energy and economic costs of controls which should be estimated through a cost-effectiveness analysis. The primary purpose of such an analysis is to eliminate control technologies with excessive costs, although the analysis can also be used in the selection of competing technologies. The environmental analysis includes air and water quality, land, and aesthetic impacts and is included to avoid excessive degradation of these environmental areas.

The applicable federal and state requirements which must be met are as follows:

Federal	State
SIP NSPS NESHAPS PSD Section 173 of the CAA RCRA (for hazardous waste incinerators only)	Chapters 15, 17, 21, 23, 25, 31, and 71 of the Ohio Administrative Code

For each permit to install the BAT determination will be made with state and federal rules providing a ceiling wherever applicable. BAT may be more stringent than any of the above rules, but BAT may never be more lenient. If a source is equipped with control measures which meet the LAER requirement of Section 173 of the CAA, the BAT requirement of OAC 3745-31-05 is also satisfied.

Please note that the appropriate SIP or OAC emission rule establishes the emission ceiling regardless of location. Thus, a new source locating in one of the "rural" counties must meet the RACM or RACT requirements as would be required in an "Appendix A" or urban demonstration area.

JP/BH/rt
4004 &
4005

December 30, 1982

Ohio EPA

Office of Air Pollution Control

Engineering Section

Engineering Guide #46

Question:

How should capital cost, annualized cost, cost-effectiveness be determined in order to select or evaluate an emission requirement based on Best Available Technology (BAT), Reasonably Available Control Technology (RACT) or Reasonably Available Control Measures (RACM)? (This question was originated by the Air Quality Modeling and Planning Section of the Division of Air Pollution Control.)

Answer:

Generally, the more efficient a control device is in reducing the emission rate of a pollutant, the greater the cost of the device. Many times in the process of trying to ascertain what is BAT for new or modified sources and RACT or RACM for existing sources, the cost-effectiveness of a control device becomes the primary determining factor.

The following document entitled "Guidance for Estimating Capital and Annual Costs of Air Pollution Control Systems" is a guideline to assist in determining capital costs, annualized costs and other information necessary in calculating the cost-effectiveness of a pollution control device.

Costs associated with a pollution control device include the capital cost and the annualized cost. Capital cost includes the direct cost of purchasing the control device along with the labor and installation costs. Annualized costs are the total expenditures, on an annual basis, required to amortize, operate and maintain the control device. Interest paid on borrowed money for the equipment, plus taxes, insurance and overhead are all included in the annualized cost. Cost-effectiveness is determined by dividing the total annualized cost of the device by the total annual emission reduction achieved by the device, and is normally expressed in dollars per unit weight emission reduction (e.g., $/ton or $/pound).

The determination of whether or not a particular cost-effectiveness value is economically reasonable is not within the scope of this engineering guide. Questions in this regard should be directed to either the Engineering Section or Air Quality Modeling and Planning Section of the Division of Air Pollution Control.

MH/JO/vs

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GUIDANCE FOR ESTIMATING CAPITAL AND ANNUAL COSTS OF AIR POLLUTION CONTROL SYSTEMS

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SECTION 1

INTRODUCTION

1.1 PURPOSE

Regulations of the Ohio Environmental Protection Agency (OEPA) require that any person intending to install a new source - or modify an existing source - of air emissions apply for and obtain a permit-to-install (PTI). The review of PTI applications is conducted by local air agencies and OEPA district offices. Cost analyses are an important aspect of the review and it is extremely important that costs be derived in a consistent manner. The purpose of this document is to provide guidance on cost estimating and related methodologies that will promote statewide uniformity and consistency in the estimation of costs for air pollution control systems. The methods and procedures presented should provide cost estimates accurate to within ±20 to 30 percent for specific cases where adequate data are available.

1.2 SCOPE AND FORMAT

In the preparation of cost estimates for air pollution control systems it is common practice to separate costs into two interrelated cost centers - capital and annualized costs. The capital investment cost includes the direct cost of purchased equipment, the labor and materials to install the system and the

indirect costs associated with the design, construction and startup expenses. Annualized cost is the total annual expenditure to operate and maintain the facility and includes the day-to-day operating costs and expenditures for interest on borrowed capital, taxes, insurance and overhead.

A methodology for developing total installed capital cost and total annualized cost estimates is presented. Since the purpose is to establish consistency in estimating techniques a generalized approach is presented and specific process or equipment costs are not included. The methodology is based on the factoring technique developed for the United States Environmental Protection Agency (U.S. EPA) by GARD, Inc. (Reference 1). Emphasis is on costs of systems that employ air pollution control hardware; however, by following the general procedures and basic principles, costs can be derived for control by process change, material or fuel substitution and for the secondary costs associated with the treatment and disposal of waste materials captured by the control system.

Section 2 presents a discussion of the many variables that affect the costs of emission reduction systems and points out process parameters, regulatory and control system requirements that influence system design and cost. The average unit cost, scaling and factoring techniques commonly used to estimate costs are briefly described in Section 3 and the limitations of each technique are explained. The factoring method is best suited to permit review cost analyses since it offers reasonable accuracy,

can be adapted to reflect costs for specific installations and can be conducted with moderate effort.

Section 4 discusses capital costs components, suggests sources of cost information and lists average factors for deriving direct and indirect installation costs as a function of purchased equipment expenditures. Adjustment multipliers and criteria for their use in preparing refined estimates for a specific system are provided and the use of cost indexes to equalize costs on a current, constant dollar base is discussed.

Section 5 is devoted to estimation of annualized costs and contains subsections on direct operating costs, indirect operating costs, cost factors and their use. Control system and operational variables have a major affect on direct operating costs, can differ substantially between both similar and dissimilar plants and control systems, are case specific in nature and require judgement in their definition. General guidelines are provided to assist in this judgement. Information, data and formula useful in estimating control system utility requirements and capital recovery costs are provided. Section 6 discusses the cost-effectiveness concept and illustrates the calculation and use of cost-effectiveness and incremental cost-effectiveness values.

SECTION 2

VARIABLES AFFECTING EMISSION CONTROL COSTS

Published air pollution control costs are frequently generalized data representing industry averages and are often presented as cost per capacity parameter (such as dollars per ton of production or per cubic foot of exhaust gas treated per minute). These averages represent a range of costs, may be based on a number of different installations and hide the fact that costs vary widely. The capital and operating costs are subject to many of the same variables that are or should be considered in the selection and design of the control system itself. Variables or factors that influence control system selection, design and costs include:

- Plant/source status - location, new/existing facility.
- Process/source parameters - type, size/capacity, continuous or intermittent, operating methods/cycles.
- Gas stream characteristics - temperature, pressure, volume, pollutant concentration(s), chemical composition, physical nature.
- Regulatory requirements - emission limitations, opacity, performance/process/equipment/monitoring standards.
- System requirements - type, size, auxiliary and gas conditioning equipment, capture/collection system efficiencies and configurations, construction materials, insulation, utilities, instrumentation, waste disposal/reclaim/treatment, operating and maintenance materials/supplies.

Plant location, local climate, geography and demography may dictate more stringent emission limitations, sophisticated control and increased costs. Retrofit applications can result in installation costs that greatly exceed the costs at new facilities because of space restrictions, difficult tie-ins and outdated process equipment. Process operating methods and cycles necessarily influence both system design and costs. Cyclic or fluctuating gas flow rates affect system performance, must be accommodated in system design/selection and affect ultimate costs.

Exhaust stream characteristics of major importance include volume, pressure, temperature, moisture content, pollutant concentration(s), and corrosiveness. Gas conditioning equipment to preclean, cool, dry, humidify or chemically treat the gas stream may be required. Acidic components require that corrosion resistant materials be used in the capture and collection systems. Physical properties of pollutants - such as particle size and electrical properties - affect costs and design.

Collected materials must be handled, stored and disposed of in an acceptable manner. Significant expenses can be involved in providing land area, treatment/disposal facilities and in bringing utilities to the disposal site. When collected materials can be reclaimed or recovered a credit may be realized as product, by-product, heat or fuel. Standby (redundant) equipment, safety margin provisions, instrumentation and automated operation to

improve reliability and reduce maintenance can have substantial effect on costs.

In summary the total cost of an air pollution control system is influenced by many variables and these variables must be taken into account in making reliable cost estimates. Non-specific cost data based on industry averages can be misleading since the average represents many different types of installations with a wide range of costs. The low end of the range might represent an installation using a minimum of standard equipment installed by plant personnel that just meets regulatory emission limits. The high end of the cost range may be for a sophisticated customized system that included redundant equipment, automation, expensive construction materials, waste treatment/disposal, auxiliaries and other special or custom features. These differences or variables affect both purchased equipment and installation costs. Each variable should be examined and quantified as precisely as possible in order to preserve the accuracy of the estimate.

SECTION 3

METHODS FOR ESTIMATING CAPITAL COSTS

pital costs of a control system include the cost of the
d equipment, i.e., the control device, auxiliary equip-
d accessories, and all direct and indirect installation
The direct installation costs include the labor and
costs for erection and handling, foundations and sup-
electrical, piping, insulation, painting, site prepara-
acilities and buildings. Indirect installation costs
engineering, supervision, construction and field expense,
start-up, performance tests and contingencies.
here are a number of methods for estimating capital costs.
curacy of any method is directly related to the amount and
l of information available and the manner in which it is
The estimate may be "order of magnitude" (when based on
ry averages), accurate to within ±20 to 30 percent (when
ved from preliminary designs) or to within ±5 percent (when
ed from complete plans and specifications). Detailed cost
mates (±5 percent accuracy) require complete and detailed
rmation and data that is site-specific and based on mate-
energy balances, site/soil surveys, complete process and

structure plans/specifications and other engineering works. Less detailed estimates are adequate for permit review needs. Several commonly used estimating methods are discussed below.

3.1 AVERAGE UNIT COST ESTIMATES

This method is based on the average cost per size or capacity parameter. For example the basis of cost estimates may be dollars per 1000 standard cubic feet per minute (scfm) of treated exhaust gas, per kilowatt (kW) of boiler size or per ton of production. The average unit cost represents a range of costs. Non-specific cost data based on industry averages can be misleading and the range of capital costs derived from such data can be very wide. This method leads to an order of magnitude estimate and is best used for general comparison only.

3.2 SCALED ESTIMATES

Where costs are known for a given size or capacity, a scaled estimate can be made to obtain the costs for similar equipment or for control systems of a different size. The "power rule" is a technique for scaling of cost data using the equation:

$$C_a = C_b \frac{(S_a)^n}{(S_b)}$$

Where C_a and C_b are the desired and known costs respectively S_a and S_b are the size or capacity of the "desired" and "known" control device or equipment respectively, and n is the scaling exponent. For equipment costs the exponent or factor

has been shown to average 0.6 and the rule is commonly referred to as the "six tenths factor." The scaling factor of six-tenths is most accurate when applied to single equipment items but has been used for approximation of complete system costs. The six-tenths technique may produce errors of 50 percent or more because of differences in size, location, auxiliary equipment, system sophistication, or other dissimilarities. Accuracy is highly questionable when costs are scaled to reflect more than an order of magnitude in size. Since scaling methods are relatively inaccurate they should only be used when no other costs are available. Examples of scaling exponents and an indication of the wide variation in exponents that can be expected are shown in Table 3-1.

3.3 FACTORED ESTIMATES

A factored estimate is a total capital cost estimate based on only one or two items. Accuracies within ±20 to 30 percent are possible using the so-called "factored" method when adequate data are available. An example is the modified Lang method developed for the U.S. Environmental Protection Agency (US EPA). In this method the basic purchase prices of equipment are multiplied by appropriate factors to compute the other costs. The multiplier factors are derived from experience with previous construction and system costs. Adjustment of the multiplier factors allows development of costs that more closely reflect the specifics of a given system. The method is therefore well suited

TABLE 3-1. SCALING EXPONENTS FOR CONTROL DEVICE AND AUXILIARY EQUIPMENT[2]

Equipment item	Scaling exponent	
	Unit	Exponent
Fabric filter	ft^2 cloth	0.95
Electrostatic precipitator	ft^2 plate	0.37
Wet collector	acfm	0.70
Cyclones	acfm	0.80
Absorption units	acfm	0.62
Carbon adsorber	lb carbon	0.90
Catalytic incinerator	acfm	0.60
Thermal incinerator		
• with heat exchanger	acfm	0.70
• without heat exchanger	acfm	0.4-0.5
Condensers	acfm	0.70
Fan system	BHP	0.96
Pump system		
Reciprocating	BHP	0.52
Centrifugal	BHP	0.52
Quench tower	acfm	0.85
Spray chamber	acfm	0.43
Reheater	acfm	0.78
Ductwork	ft^2	0.55
Exhaust stack	ft	1.0
Hoppers	ft^3	0.68
Screw conveyors	length, ft	0.8
Storage tanks		
• Less than 40,000 gal	gal	0.29
• More than 40,000 gal	gal	0.63

to permit review cost analyses since it offers reasonable accuracy, can be adapted to reflect specific installations and can be conducted with moderate effort. For these reasons the methods for estimating capital and annualized costs presented in Sections 4.0 and 5.0 are those developed for the US EPA by Gard, Inc. (Reference 1).

SECTION 4

CAPITAL COSTS

4.1 CAPITAL COST COMPONENTS

The capital cost of an air pollution control system is defined as the direct and indirect expenses incurred to the date when the facility begins full scale or commercial operation and major start-up problems have been resolved. Direct expenses (costs) consist of the purchased equipment cost for the system plus the direct installation costs for labor and materials needed to install the system. Indirect expenses (costs) are those not directly related to specific equipment but necessary to complete the design, construction and start-up of the overall control system facility. Table 4-1 is a listing of capital cost components categorized as direct costs (the delivered equipment costs) and installation costs - direct and indirect. Examples of each cost component are given and accompanied by appropriate explanatory remarks.

4.1.1 Equipment Costs

Purchased equipment cost is the most important item in a capital cost estimate and includes the price of the control device, auxiliary equipment, instruments, controls, taxes and freight. In a factored estimate the equipment costs provide the basis for developing the remaining capital costs, i.e., the

TABLE 4-1. CAPITAL COST COMPONENTS

Capital cost component	Example items	Remarks
Direct costs		Direct costs consist of the delivered cost of equipment and instrumentation directly related to capture, collection and handling of the exhaust stream and collected pollutants.
Purchased equipment		
° Control device	Fabric filter, ESP, scrubber, afterburner, absorber, equipment for process change/fugitive emission control, etc.	Where control option is process change the equipment costs may include conveyors, reactors, mixers, etc., i.e., process equipment. A road dust reduction program might include the cost of oiling trucks or additional haul trucks due to vehicle speed reduction controls. Price of items is on an F.O.B. basis.
° Auxiliary equipment	Pumps, fans, hoods/ductwork, stacks, dust hoppers/conveyors, gas conditioners, sprinklers, mist eliminators, etc.	Process change may involve ductwork changes and add-on retrofit systems may require duct work modifications. Since most ductwork is fabricated for the specific application it is included in the auxiliary equipment cost rather than as an installation cost.
° Instruments/controls	Recorders, sensors, transmitters and control room equipment.	Control device costs may include internal electricals and some or all controls and instrumentation.
° Taxes	Sales/use taxes.	Ohio and many other states exempt certified air pollution control equipment from certain taxes.

(continued)

Table 4-1 (continued)

Capital cost component	Example items	Remarks
° Freight		Cost of loading, rigging, delivery and unloading if not included in purchase price of equipment.
Installation direct costs		These costs consist of the direct expenses for material and labor to install the purchased equipment.
° Foundations/supports	Labor and material for foundation, excavation, steel, concrete, backfill, etc.	In retrofit cases involving installation on an existing structure any reinforcement or modification would be included or, if not necessary, this item would be deleted.
° Erection/handling	Labor and materials to assemble, and set in place and connect.	In retrofit applications this cost includes removal of existing equipment.
° Electrical	Labor and materials for installation of wiring, switchgear, circuit breakers, substation, etc.	ESP installation may have high electrical costs and require that supplemental power be provided (higher capacity service, substation, transformer, etc.).
° Piping	Labor and materials to install piping, hangers, fittings, valves, etc.	This can be a high cost item for wet collection (scrubber) systems and for control by process change.
° Insulation	Labor and materials for installing insulation, steam tracing or other freeze protection.	Insulation and/or heaters on device itself may be included in purchased cost.

(continued)

Table 4-1 (continued)

Capital cost component	Example items	Remarks
° Painting	Labor and materials for painting or coating to provide weather/corrosion protection.	Usually a minor cost item but may be a high cost where gas/liquid streams are corrosive requiring special internal/external liners or coatings.
° Site preparation	Labor and materials for road grading, clearing, piers, sidings, disposal/parking areas removal of existing structures, etc.	This cost is highly sensitive to case specifics. May require land survey, study, dewatering, etc.
° Facilities/buildings	Labor and materials for administrative/maintenance/process buildings and other structures directly related to the air pollution control system. Includes access roads, fencing, lighting, heating, cooling, etc.	Some systems may require storage facilities for consumable materials used in the collection system, i.e., oil tanks for oil-fired incinerators, lime storage for flue gas desulfurization systems, etc. Buildings and facilities with heating/cooling, sanitation facilities, shops and offices for system operating personnel are included in this item. Also railroad sidings, truck depot and parking are included as necessary.
<u>Indirect costs</u>		Indirect costs of installation include those costs not directly related to a specific equipment item but necessary to complete the design, construction, startup and operation of the system.
° Engineering/supervision	Design of system, construction supervision and management.	Project size usually determines these costs. Small systems using standard equipment require less engineering and supervision than large prototype systems or process changes.

(continued)

Table 4-1 (continued)

Capital cost component	Example items	Remarks
° Construction/field expense	Costs of maintaining and supporting a labor force in the field.	These costs are affected by project size.
° Construction fee	Fee covers payroll additions, subcontractor supervision, risk insurance, etc.	Fee size dependent on project size and sophistication, single vs. multiple contractors, in-house vs. vendor vs. contractor erection.
° Startup	Costs of labor, materials, equipment and modifications needed to place system in good operating order.	Startup expenses are those incurred after the facility has been completed.
° Performance test	Cost of acceptance/performance/compliance testing.	Normally a fixed cost item.
° Model study		In unusual circumstances a model study may be necessary where little data is available from past installations.
° Contingencies	Design changes, completion delays (weather, strikes, etc.) and associated penalties, price increases, etc.	Contingency costs are real costs that may be experienced due to unforeseen circumstances.

direct and indirect costs of installation. Factored estimates rely upon good estimates of equipment costs because all other costs are derived from them. The importance of obtaining good equipment costs and defining what those costs include cannot be over-emphasized.

Sources of Cost Information--

Equipment costs may be obtained from vendors, fabricators and suppliers. Written quotations are preferred because the scope of the equipment or control device supplied at a given cost is better defined than in oral quotations. Several quotations can be obtained to allow a cross-check of costs and project scope. Useful sources containing the names of equipment vendors include the Chemical Engineering Equipment Buyers Guide, the classified section of telephone directories, pollution control magazines and trade journal advertisements. Prices from suppliers or vendors are a preferred source of such information. Care must be taken to clearly define what is and is not included when obtaining prices from vendors or other sources. One quote may be for "flange-to-flange" costs only whereas another may include all or part of such items as electricals, instruments, controls, foundations, etc. Because of these variations it is extremely important to determine and define the scope of the project and the coverage of quoted prices.

Published reports and articles in technical journals are another source of cost information. Typical are such examples as the Control Techniques Guideline Documents (CTGD) and the Back-

ground Information Documents (BID) published by US EPA. The difficulty in using this information is that documents are sometimes general in their treatment of processes and control systems and/or are "model" studies for similar but general processes. An exceptional and excellent publication for obtaining equipment costs is the Gard Manual.[1] This manual contains information useful in the sizing of control systems and provides flange-to-flange costs for common control equipment and for auxiliary equipment. When extracting capital expenditures from published information care should be taken to clearly define the scope and basis for the costs.

Industry supplied cost information may be obtained from direct query, past purchase orders or from such sources as US EPA Section 114 letters, plant surveys and published reports. Generally such information requires explanation, verification and scope definition to be useful since the cited costs may be equivalent, rather than actual cost data, or may be composites that are not broken down adequately for direct use.

In the absence of other cost information rough estimates can be made using cost indexes, average unit costs and scaling methods. Cost curves that display purchased equipment costs, total capital costs and annualized costs can be found in US EPA documents and other published reports. The accuracy of these curves relative to a specific application depends upon the similarities between

the assumptions used in the example curves (frequently not adequately explained) and the conditions under which the system under review will actually be used. Accordingly both the accuracy of the costs and applicability to a given case may be highly questionable.

Cost Escalation--

Since prices vary widely from one time period to another, cost data from various time periods must be adjusted to a constant data base to make meaningful comparisons. A cost index provides a method for upgrading costs to account for inflation without doing in-depth studies of individual project or cost items. The Chemical Engineering Plant Index (CE Index) is frequently used to extrapolate control equipment to current dollars. Reference 1 recommends use of the CD Index in conjunction with the U.S. Department of Labor, Bureau of Labor Statistics (BLS) wholesale price indexes and suggests they be used as shown in Table 4-2. The CE Index is used for updating costs of all major equipment items. Table A-1 of Appendix A is a tabulation of CE Index values for the years 1957 through 1982.

Where costs for one year (B) are known they can be adjusted to another year (A) by simple ratio of costs and indexes.

$$\text{Year A cost} = \text{Year B cost} \times \frac{\text{(Year A Index)}}{\text{(Year B Index)}}$$

TABLE 4-2. COST ADJUSTMENT INDEXES FOR AIR POLLUTION CONTROL SYSTEM EQUIPMENT

Equipment item	Use of the Index or Composite Index shown
Control Equipment	
Absorber	CE Fabricated Equipment Index
Absorber	
° Package unit	CE Process Equipment Index
° Custom unit	CE Fabricated Equipment Index
Electrostatic Precipitators	CE Fabricated Equipment Index
° Insulation*	½ (BLS No. 1392 factor) + (CE Fabricated Equipment Factor)
Fabric Filter	CE Fabricated Equipment Index
° Insulation*	½ (BLS No. 1392 factor) + (CE Fabricated Equipment Factor)
° Stainless steel construction*	BLS No. 10130264 - for adjustment of stainless steel cost only
° Filter media*	BLS No. 0312 or No. 0334 - for filter media cost only
Flare	CE Fabricated Equipment Index
Incinerators-Thermal/Catalytic	
° Package unit	CE Process Equipment Index
° Custom unit	CE Fabricated Equipment Index
Mechanical Collectors	CE Process Machinery Index
Refrigeration	CE Process Equipment Index
Venturi Scrubber	CE Fabricated Equipment Index
° Rubber liner*	BLS No. 07
Auxiliary Equipment	
Cooling tower	CE Fabricated Equipment Index

(continued)

Table 4-2 (continued)

Equipment item	Use of the Index or Composite Index shown
Dampers	CE Fabricated Equipment Index
° Automatic control	CE Process Instruments/Controls Index on that portion of price attributable to automatic control
Ductwork	CE Fabricated Equipment Index
Dust removal/handling	CE Fabricated Equipment Index
Fans/motors/starters	
° Fans	BLS No. 1147 Index
° Motors	BLS No. 1173 Index
° Starters	BLS No. 11750781 Index
° V-belts	BLS No. 11450133 Index
Heat Exchanger	CE Fabricated Equipment Index
Pumps	BLS No. 1141 Index
Stacks	CE Fabricated Equipment Index

* Apply index values only to that portion of the price, or the price increment, attributable to the special "add-on" feature or material, i.e., the difference in price between carbon and stainless steel construction, additional price of add-on insulation or rubber lining and mechanical vs automatic controls.

In summary it is appropriate to re-emphasize that equipment cost is the most important item of a capital cost estimate and the more accurate this information, the better is the capital cost estimate. The parameters and other factors on which the equipment cost is based, the source of cost information, how it was derived and what it does (and does not) include should be clearly understood and specified in the cost statement.

4.1.2 Installation Costs

The installation costs can generally be considered as a fixed percentage of the equipment costs. However this percentage factor is influenced by the type of installation. Many of the individual items in the direct and indirect installation categories are subject to site-specific adjustment. For example installation costs vary depending on: whether or not the installation is new or retrofit (foundations, supports, site preparation factors), the geographic location and topography of the site (site preparation factor), whether the auxiliary and control device equipment are factory or field assembled (erection and handling factors), the availability and proximity of service facilities (electricity, water, etc.) at the site and whether the equipment is to be outside or enclosed in buildings (facility and building factors). While equipment costs represent a firm cost since they are obtainable from supplier's quoted prices it is evident that knowledge of the specific application is important in deriving installation costs. Use of the appropriate cost adjustments is an important aspect of capital cost derivation and

proper use can provide cost estimates tailored to a specific installation.

4.2 COST FACTORS AND THEIR USE[1]

Estimation of the capital costs for air pollution control systems requires that information and data be available that clearly define:

- All system details and requirements, i.e., the components, size, configuration, design and operating parameters, gas stream and site characteristics, etc. of the capture, control and disposal systems necessary to satisfy the pollution control requirements for the specific source. Section 2.0 discusses variables that affect system requirements and costs.

- Control device and auxiliary equipment costs. Previous discussion in Section 4.1.1 indicated sources of equipment cost information and emphasized the importance of obtaining accurate prices that specify what is included and/or excluded in the cited price.

The method of estimating costs presented here is based on the factoring technique of establishing direct and indirect installation costs as a function of direct (purchased equipment) costs. Table 4-3 gives average cost factors for common types of air pollution control equipment and Table 4-1 shows example items that are covered by cost factors and indicates applicability. The cost factors are applied to the cost of delivered purchased equipment (direct costs) to estimate the direct and indirect installation costs. The capital cost estimate for the entire system is the sum of direct costs for purchased equipment and the direct and indirect installation costs.

TABLE 4-3. AVERAGE COST FACTORS FOR ESTIMATING CAPITAL COSTS OF COMMON EMISSION CONTROL SYSTEMS[1]

Cost category	Electrostatic precipitator	Venturi scrubber	Fabric filter	Thermal and catalytic incinerator	Carbon adsorber	Gas absorber	Refrigerator	Flare
Direct costs								
Purchased equipment:*								
a) Control device (A)	Purchased cost of control device (A)							
b) Auxiliary equipment (B)	Purchased cost of auxiliary equipment (B)							
c) Instruments and controls	0.10 x (A+B)							
d) Taxes (unless exempt)	0.05 x (A+B)							
e) Freight	0.05 x (A+B)							
Base price (C)	Total of above							
Installation:**								
a) Foundations and supports	0.04	0.06	0.04	0.08	0.08	0.12	0.08	0.12
b) Erection and handling	0.50	0.40	0.50	0.14	0.14	0.40	0.14	0.40
c) Electrical	0.08	0.01	0.08	0.04	0.04	0.01	0.08	0.01
d) Piping	0.01	0.05	0.01	0.02	0.02	0.30	0.02	0.02
e) Insulation	0.02	0.03	0.07	0.01	0.01	0.01	0.10	0.01
f) Painting	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01
g) Site preparation***				As required				
h) Facilities and buildings***				As required				
Subtotal-multiplier for direct installation costs	0.67	0.56	0.72	0.30	0.30	0.85	0.43	0.57
Indirect costs								
Installation:**								
a) Engineering and supervision	0.20	0.10	0.20	0.05	0.05	0.10	0.05	0.10
b) Construction and field expense	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10
c) Construction fee	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
d) Startup	0.01	0.01	0.01	0.02	0.02	0.01	0.02	0.01
e) Performance test	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
f) Model study	0.02	-	-	-	-	-	-	-
g) Contingencies	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Subtotal-multiplier for indirect installation costs	0.57	0.35	0.45	0.31	0.31	0.35	0.31	0.35

* Direct cost factors (c,d,e) for purchased equipment are the same for all equipment and are applied to the sum of control device (A) and auxiliary equipment (B) costs.

** Cost factor multipliers for direct and indirect installation costs are applied to the base price (C).

*** Costs for site preparation, facilities and buildings, if such are required, are added to the other direct installation costs.

The cost factors in Table 4-3 are typical or average multipliers derived from previous experience with construction and system costs. As discussed in Sections 2.0 and 4.1.1 there are many variables that can affect the overall control system costs - particularly with respect to the cost of installation. Installation costs can vary substantially from one system to another depending on such considerations as whether it is a new or retrofit installation, equipment is delivered as a package unit or requires field assembly, utilities are available at or near the site, equipment is to be enclosed or outside and in or on new or existing buildings, and whether the system involves standard, customized or untried prototype equipment. For these reasons it is desirable to adjust those cost items that are heavily influenced by system size, location, sophistication and the like. Table 4-4 presents adjustment factors for selected cost categories that can be used to develop refined estimates that more closely reflect the nature and characteristics of a specific system. The table lists general criteria on which to base use of the adjustment factors. The use of cost factors and adjustments is discussed in the following sections.

4.2.1 Direct Costs

Direct costs consist of the combined purchase price of the primary (control device) and auxiliary equipment, the instrumentation and control costs, taxes and freight charges. All system components that are not field fabricated should be accounted for an includes in the purchased equipment costs. The cost factors

TABLE 4-4. COST ADJUSTMENT FACTORS FOR SELECTED COST CATEGORIES[1]

Cost category and adjustment criteria	Cost adjustment factor
Instrumentation	
1. Simple, continuous, manually operated	0.5 to 1.0
2. Intermittent operation, modulating flow with emissions monitoring instrumentation	1.0 to 1.5
3. Hazardous operation with explosive gases and safety backups	3
Freight	
1. Major metropolitan areas in continental U.S.	0.2 to 1.0
2. Remote areas in continental U.S.	1.5
3. Alaska, Hawaii, and foreign	2
Handling and erection	
1. Assembly included in delivered cost with supports, base, and skids included. Small to moderate size equipment	0.2 to 0.5
2. Equipment supplied in modules, compact area site with duct and pipe runs less than 200 feet. Moderate-size system	1
3. Large system, scattered equipment with long runs. Equipment requires fabrication at site with extensive welding and erection	1.0 to 1.5
4. Retrofit of existing system; includes removal of existing equipment and renovation of site. Moderate to large system	2
Site preparation	
1. Within boundary limits of existing plant; minimum effort to clear, grub, and level	None
2. Outside plant limits; extensive leveling and removal of existing structures; includes land survey and study	1
3. Requires extensive excavation and land ballast and leveling. May require dewatering and pilings	2
Facilities and buildings	
1. Outdoor units, utilities at site	None
2. Outdoor units with some weather enclosures. Requires utilities brought to site, access roads, fencing, and minimum lighting	1
3. Requires building with heating and cooling, sanitation facilities, with shops and office. May include railroad sidings, truck depot with parking area	2
Engineering and supervision	
1. Small-capacity standard equipment, duplication of typical system, turnkey quote	0.5
2. Custom equipment, automated controls	1 to 2
3. New process or prototype equipment, large system	3
Construction and field expenses	
1. Small-capacity systems	0.5
2. Medium-capacity systems	1
3. Large-capacity systems	1.5
Construction fee	
1. Turnkey project, erection and installation included in equipment cost	0.5
2. Single contractor for total installation	1
3. Multiple contractors with A&E firm's supervision	2
Contingency	
1. Firm process	1
2. Prototype or experimental process subject to change	3 to 5
3. Guarantee of efficiencies and operating specifications	5 to 10

in Table 4-3 for calculating instrumentation, taxes and freight costs are applied to freight-on-board (FOB), flange-to-flange equipment prices that generally include internals only. Instrumentation and controls are listed as a separate cost factor item since they may be an optional feature and/or may be purchased from a different vendor. Accordingly it is preferable to obtain price quotations and purchase price data for control and auxiliary equipment on a FOB, flange-to-flange basis and to list instrumentation costs separately. Other price bases can be used providing the inclusions/exclusions in the price are well defined so that appropriate adjustment in the use (or non-use) of affected cost factors can be made. The purchased equipment cost - the total cost of FOB equipment, instrumentation/control (if purchased separately or otherwise not included in equipment cost), freight and taxes - is multiplied by adjusted cost factors (Tables 4-3 and 4-4) to obtain direct and indirect installation costs.

4.2.2 Installation Costs - Direct and Indirect

The direct installation costs consist of the direct expenses associated with installation of equipment. They include materials and labor for foundations, structural supports, handling and erection, electrical, piping and ductwork, insulation, painting, site preparation, buildings and facilities. The installation cost factors in Table 4-3 assume that the installation is done by outside contractors rather than plant personnel. Since site preparation and buildings or facilities have little relation

to purchased equipment costs appropriate adjustment (Table 4-4 factors) should be made when unusual situations or requirements are encountered such as removal of existing structures, swampy or unstable subsurface, deep excavation, etc. Direct installation costs can also vary considerably and may require adjustment depending on whether equipment is factory assembled or field erected, the installation is new or retrofit and equipment will be located outdoors, enclosed, on the ground, on or in a new or existing structure, etc.

Indirect installation costs include expenses for engineering and supervision, construction and field expenses, construction fees, startup, performance tests, model studies and contingencies. Items such as engineering, construction fees and contingencies are related to contracting methods, complexity and overall size of the project. Cost adjustment is based on system size, contracting arrangement and whether standard, custom or prototype equipment is installed. Model studies are normally not necessary and usually pertain to large electrostatic precipitator systems.

SECTION 5

ANNUALIZED COSTS

Annualized costs consist of the direct expenses for operation and maintenance of the air pollution control system and the indirect operating costs associated with capital investment and overhead. Direct costs include the expenses for operating and maintenance labor, replacement parts, utilities and waste disposal. Indirect operating costs include overhead, taxes, insurance, administration and capital recovery charges. The operating costs are adjusted for any credits obtained from reuse or sale of recovered products or materials or from heat or energy recovery. The sum of the direct and indirect costs (less any credits) is the annualized operating cost.

5.1 DIRECT OPERATING COSTS

System variables (such as degree of system automation) and operational variables (such as continuous or intermittent operation and number of shifts) influence the operating labor and supervision requirements. Maintenance requirements depend on the nature of the gas stream, i.e., corrosiveness or abrasiveness, construction materials, system size and type. The operation and maintenance (O&M) requirements and the associated labor costs can

vary substantially between plants and control system types. Accordingly considerable judgement is required in estimating direct operating costs for a specific air pollution control system type and application. Some general guidelines that may be helpful in making these judgements are presented below. In general:

- The labor and material costs for O&M normally range between 2 to 8 percent of the total annualized costs. The remainder is primarily utility costs and capital charges.
- Operating labor and supervision decrease with increased system automation.
- Small systems that operate intermittently or on demand are labor intensive and may require a full time operator in attendance during system operation for purposes of start-up, control and shutdown.
- Larger automated and continuously operated systems may require operator presence for only a short period per shift; primarily for monitoring purposes.
- Total annual labor cost is a function of the number of 8-hour operating shifts per year. For example, small plant operation of one shift per day, 5 days per 50 week year versus three shifts per day, 365 days per year for large plants in the basic metals, petroleum and chemical industries. Therefore the operator labor should be estimated on a man-hours per shift basis for the particular system types.

5.2 INDIRECT OPERATING COSTS

Major cost centers for indirect operating costs are the capital investment and overhead expenses. The annualized capital charges reflect the costs for capital recovery over the depreciable life of the system. Overhead expenses include payroll overhead (salaries of supervisory personnel, plant guards, janitors, etc.) and plant overhead (employee fringe benefits, costs of

administrative buildings, cafeterias, change houses, medical facilities, plant protection, auxiliary services for plant operation). Overhead costs are not charged directly but are allocated to the control facility as a percentage of the direct payroll for O&M labor and supervision.

5.3 COST FACTORS AND THEIR USE

Table 5-1 lists annualized cost categories and provides example cost factors and cost data that can be used for estimating annualized costs. As discussed in Section 5.1 the direct operating costs are influenced by system and operational variables that in turn cause fluctuation in unit costs. Accordingly the cost factors are presented as examples that require judgement in their use. The discussion and explanation that follows will be helpful as guidance in proper use of the factors.

5.3.1 Direct Cost Factors

Operating labor depends on the size, type and complexity of the control system. The degree of system automation and the continuity of operation also influence operating labor requirements. A large, complex system such as a flue gas desulfurization (FGD) system may require the continuous effort of several operators (16 or more hours/shift) whereas a small wet collector may require only occasional observation (0.5 to 1.0 hours/shift). Consequently labor demands are best determined on a case-by-case basis, considering each major system component and overall system operation. Reasonable values must be assigned for direct labor costs because some of the other annualized costs are dependent on

TABLE 5-1. COST FACTORS AND COST DATA FOR ESTIMATING ANNUALIZED COSTS[a]

Direct operating costs	Cost factor[a]	Reference
Operating labor		
Operator	$10.62/man-hour	3
Supervisor	15% of operator labor	1
Operating materials	As required	
Maintenance		
Labor	$11.36/man-hour	3
Material	100% of maintenance labor	1
Replacement parts	As required	
Utilities		
Electricity	$0.065/Kwh	4,5,6
Fuel oil	$1.05/gal	4,7,8
Natural gas	$5.75/1000 cu. ft.	4,5,9
Plant water	$0.37/1000 gal	1
Water treatment and cooling water	$0.15/1000 gal	1
Steam	$7.53/1000 lb	1
Compressed air	$0.03/1000 ft^3	1
Waste disposal	$7.50-15.00/ton	1
Indirect operating costs		
Overhead	80% of operating labor and maintenance labor	1
Property tax[b]	1% of capital costs	1
Insurance	1% of capital costs	1
Administration	2% of capital costs	1
Capital recovery cost	0.16275 (as an example of 10% interest rate and an equipment life of 10 years	See Table 5-3 and Table B-1 for other interest rates and equipment lives
Credits		
Recovered product	As required	

[a] All costs are in December 1982 dollars.

[b] Delete this item if facility is certified as tax exempt by the State Department of Taxation.

them. Supervisory personnel are estimated as a percentage (15%) of the direct labor.

Control equipment vendors can often supply good estimates of operating labor needs. The best source of operating labor requirements are those derived from similar or identical operations but such information is often held as proprietary by the company. Published reports provide data that is often based on actual operating systems. For large systems that are automated and continuously operated the values in Table 5-2 can be used to estimate operating labor requirements. As pointed out in Section 5.1, considerable judgement is necessary in establishing operating costs - particularly where the control system is complex or of prototype nature or has redundant subsystems. The general guidelines in Section 5.1 and case-by-case consideration will assist the estimator in adjusting Table 5-2 values to more closely represent operating labor requirements for a specific case. The total man-hours per shift (or hour) is multiplied by the number of shifts per year (or annual system operating hours) and the labor rate to determine annual operating labor costs.

Operating material costs include the delivered cost of raw materials and special chemicals required for operation of certain control systems. Examples are the lime, limestone and soda ash for a flue gas desulfurization (FGD) scrubber, absorbent and adsorbent chemicals, sulfur trioxide for electrostatic precipitator (ESP) gas conditioning, wetting agents for dust suppression systems and the chemicals used in wastewater treatment of the

TABLE 5-2. ESTIMATED LABOR HOURS PER SHIFT[1]

Control device	Operating labor[a] (man-hours/shift)	Maintenance labor[b] (man-hours/shift)
Fabric filters	2 - 4	1 - 2
Precipitators	0.5 - 2	0.5 - 1
Scrubbers	2 - 8	1 - 2
Incinerators	0.5	0.5
Adsorbers	0.5	0.5
Absorbers	0.5	0.5
Refrigeration	0.5	0.5
Flares	-	0.5

[a] Applicable to large, automated and continuously operated control systems.
[b] Preventive maintenance labor only.

effluent from a control device. Prices can be obtained from chemical suppliers and catalogues. Annual consumption is determined and is multiplied by the unit cost to obtain the annual cost of raw materials. Incremental costs for control by fuel and material substitution are computed in the same manner.

Maintenance labor values in Table 5-2 pertain to preventive maintenance only for large capacity systems handling relatively non-corrosive materials. The degree of maintenance required is analagous to operating labor requirements discussed above, i.e., system complexity, exhaust gas conditions, etc. largely determine maintenance needs. For example an FGD system is a highly complex system, frequently has problems with scaling and corrosion, and high maintenance costs can be expected. Conversely a medium energy wet collector controlling an ambient temperature exhaust is an example of a simple system with little mechanization and low maintenance costs. Sources of maintenance labor data are similar to those discussed for operating labor, i.e., vendors published reports, case histories and industry data. The estimator must decide whether maintenance will be low, typical or high based on the information in hand and adjust maintenance labor values accordingly to fit a specific system. Annual maintenance hours are multiplied by the maintenance labor rate to determine annual maintenance labor costs.

In addition to the preventive maintenance costs discussed above some systems require periodic replacement of parts in order

to sustain system performance and integrity. Filter bag replacement is an example. The labor costs for parts replacement is in addition to the labor costs for normal preventive maintenance and is generally equal to the cost of replacement parts. The cost of replacement parts is accounted for as a separate cost item (see Table 5-1) and is discussed below.

Replacement parts are those system components or materials which have a limited useful life and are normally replaced on a periodic schedule. Filter bags, catalyst elements and adsorbents are examples of routinely replaced parts. The frequency of replacement is a function of severity of service, operating hours and gas stream characteristics. The annual cost of replacement parts can be determined by dividing their cost by their expected life. Table 5-3 provides estimates of expected life for parts and equipment items. The values are based on a qualitative judgement of the service life expected for differing applications, maintenance service and duty cycles.

Utility costs include outlays for electricity, fuels, water, steam and compressed air to operate the control device and auxiliary equipment including waste treatment/disposal equipment. The utility requirements can be obtained from vendors or other sources and can be estimated by use of the following equations:

- Fan power

$$kwh = 0.746\ (hp)(H) = \frac{0.746\ (CFM)(\Delta P)(SG)(H)}{6356\ n}$$

TABLE 5-3. GUIDELINES FOR PARTS AND EQUIPMENT LIFE[1]

	Service life expectancy, years		
	Low[a]	Average[b]	High[c]
Equipment life			
Electrostatic precipitators	5	20	40
Venturi scrubbers	5	10	20
Fabric filters	5	20	40
Thermal incinerators	5	10	20
Catalytic incinerators	5	10	20
Adsorbers	5	10	20
Absorbers	5	10	20
Refrigeration	5	10	20
Flares	5	15	20
Materials and Parts Life			
Filter bags	.3	1.5	5
Adsorbents	2	5	8
Catalyst	2	5	10
Refractories	1	5	10

[a] Low life expectancy based on continuous operation, handling moderate to high temperature gas streams with high concentrations of corrosive or abrasive materials.

[b] Average life expectancy based on continuous operation for three shifts per day, five to seven days per week and handling moderate concentrations of non-corrosive or non-abrasive materials.

[c] High life expectancy based on intermittent operation or approximately one shift per day handling gas streams with low concentrations and low temperature.

where:

kwh = kilowatt-hours
hp = horsepower
CFM = actual volumetric flow rate, acfm
ΔP = pressure loss, inches WG
n = efficiency, usually 60-70%
H = hours of operation
SG = specific gravity as compared to air @ 70°F, 29.92 inches mercury.

- Pump power

$$kwh = 0.746\ (hp)(H) = \frac{0.746\ (GPM)(hd)(SG)(H)}{3960\ n}$$

where:

GPM = flow rate, U.S. gpm
hd = head of fluid, feet
SG = specific gravity relative to water @ 60°F, 29.92 inches mercury
H,n - same as above

- Precipitator power

  Use an average of 1.5 watts per square foot of collection area based on a range of 0.3 to 3 watts per square foot.

- Baghouse power (auxiliaries, motors, etc.)

  Use 0.25 kwh per 1000 square feet of cloth area to estimate the power requirements for baghouse shaker motors, reverse air fan motors, etc.

- Incinerator fuel

  The exhaust rate and the inlet, outlet and combustion temperatures determine the fuel requirements for incinerators. EPA publication 450/3-76-031, "Report of Fuel Requirements, Capital Cost and Operating Expense for Catalytic and Thermal Afterburners," September 1976 can be used in deriving utility costs for incinerators.

Waste disposal cost as listed in Table 5-1 is based on the removal, handling and disposal of a dry, inert and non-toxic contaminant. The factor assumes disposal is done by an independent contractor at a nearby landfill. Compared to this "base"

g unusual handling, pre-disposal
ty and other special measures would
se and conversely the cost for
sal could be less. In general the
es only when the collected material
and discarded. Disposal within the
bustion of hydrocarbons in an incin-
little or no operating cost and
refit (operating credit) in the form

costs for other disposal techniques
Annual waste disposal costs can,
llowing the Table 5-1 format, iden-
vidual items (O/M labor, materials,
c.) associated with waste treatment/
incorporating) these costs into those

s

ance and administrative portions of
collectively be estimated as four
pital cost. For pollution control
taxing authority as tax exempt the
deleted and a value of three percent
d administration.

has value and can be used or sold. The value on a unit basis (pound, gallon, Btu, etc.) must first be determined. Purity, concentration and other marketability/useability factors must be considered when establishing a fair unit value for the captured material. If the collected pollutant is recycled the unit (actual) value can be assumed to be the final product price less processing costs. The annual amount of captured material actually re-used is multiplied by the net unit value to determine product recovery credit. Where captured materials are sold the unit value of salable materials should be adjusted for handling, packaging, transportation and other expenses associated with the marketing effort or with meeting customer use specifications. Credits for heat recovery, such as from high temperature incinerator exhausts, should be estimated when applicable.

A common error in estimating annualized costs is the erroneous assessment of marketability or use of the captured materials. For example, in some areas a sulfuric acid byproduct is either not a marketable commodity or sale would result in a loss because of handling and transportation costs. The relative purity of a captured material such as recovered solvents may preclude or limit marketability. Heat recovery credits pertain only to that portion of the heat recovered from, and attributable to, the combusted pollutant; heat recovery associated with the auxiliary fuel is excluded.

SECTION 6

COST EFFECTIVENESS

Several feasible techniques usually are available for the control of an emission source. The control efficiencies and costs of the several candidate systems may differ and in general the more efficient the control device, the greater the cost. Cost-effectiveness relationships are useful in comparing the emission reduction costs of alternate control methods and in selecting a control option based on costs and affordability.

Cost-effectiveness is computed by dividing the total annualized cost (dollars) of the control system by the annual amount (pounds) of emission reduction achieved by the system and is expressed in dollars per unit weight of pollutant removed (dollars per pound, $/lb).

Example: Assume that the annualized cost of an air pollution control system is estimated at $172,000, the overall control efficiency of the system is 99 percent, the uncontrolled emission rate is 112 pounds per hour (lb/h), and annual operating time is 8000 hours. Cost-effectiveness is determined as follows:

$$\text{Amount of pollutant controlled} = 0.99 \times (112\ \text{lb/h}) \times (8000\ \text{h/yr})$$
$$= 887{,}040\ \text{lb/yr}$$

$$\text{Cost-effectiveness} = \frac{\$172{,}000\ /\text{yr}}{887{,}040\ \text{lb/yr}}$$

$$= \$0.194/\text{lb pollutant collected}$$

The "incremental (marginal or differential) cost-effectiveness" is useful in comparing the costs of a "base case" control with alternate controls that could provide greater emission reduction, i.e., reduction of residual emissions exiting the base case control device. Incremental cost-effectiveness values provide a means of comparing the economics of alternate control options for a given source and are comparative values calculated by dividing the difference in annualized cost (AC) of two systems (a and b) by the difference in emission reduction (ER) of the two systems. In terms of dollars per weight unit of pollutant collected,

$$\text{Incremental cost effectiveness} = \frac{(AC_a - AC_b)}{(ER_a - ER_b)}$$

The following example illustrates the calculation and use of incremental cost-effectiveness values.

> Example: Assume that an engineering study shows that an uncontrolled source of 4200 tons per year can be brought into compliance by either of three control systems - a venturi scrubber, a low efficiency electrostatic precipitator (ESP), or a high efficiency ESP. The respective collection efficiencies for the three systems are 90 percent, 95 percent and 99 percent. Further assume that the annualized costs and emission reduction quantities are as shown in Table 6-1. (In constructing tables of incremental cost-effectiveness the control system options should be ranked in order of increasing emission reduction as shown in Table 6-1.)
>
> The cost-effectiveness values (column C of Table 6-1) are calculated as shown in the previous example, i.e., by dividing the annualized cost (column B) by the annual emission reduction (column A). In this example the range of

TABLE 6-1. EXAMPLE COST-EFFECTIVENESS DATA FOR CONTROL SYSTEM OPTIONS[a]

Control system	A Emission reduction, 1000 lb/yr	B Annualized control costs, $/yr	C Cost-effectiveness, annualized control cost per pound collected (B÷A), $/1000 lb	D Incremental emission reduction, 1000 lb/yr	E Incremental annualized control costs, $/yr	F Incremental cost-effectiveness, incremental annualized control cost per pound collected (E÷D), $/1000 lb
Venturi scrubber (base case)	7,560	450,000	59.5	-	-	-
Low efficiency ESP	7,980	348,400	43.7	420	(-101,600)	(-242)
High efficiency ESP	8,320	442,300	53.2	340	93,900	276

[a] Example of a tabular display of cost-effectiveness and incremental cost-effectiveness.

cost-effectiveness values (column C) for the three control options is relatively small.

For calculating the incremental cost-effectiveness the values in columns A and B are used to determine the increments (differences) between the emission reductions and annualized costs of two systems. For instance in comparing the venturi scrubber and the low efficiency ESP systems the respective values for the two systems are subtracted to obtain the increment in emission reduction (7980 - 7560 = 420) and in annualized cost (348,000 - 450,000 = -101,600). The differential comparison of the low and high efficiency ESP systems is made in the same manner. The incremental cost-effectiveness values (column F) are obtained by dividing incremental annualized control costs (column E) by the incremental emission reduction (column D). For the venturi scrubber vs. low efficiency ESP,

$$\text{Incremental cost effectiveness} = \frac{(-101{,}600)}{420} = -\$242 \text{ per 1000 lb of emissions collected}$$

For this example case the values in Table 6-1 indicate that:

- The cost effectiveness of the three options is approximately the same, i.e., about 50 dollars per pound of emission collected.

- The incremental cost-effectiveness of the high-efficiency ESP versus the low efficiency ESP is 276 dollars per thousand pound collected. The cost of additional emission reduction (340,000 lb/yr) using a high efficiency vs. a low efficiency ESP at 276 dollars per thousand pound would cost more than six times the cost (43.7 dollars per thousand pound) of the initial poundage collected by the low efficiency ESP - a significant economic penalty.

- The low efficiency ESP will reduce emissions at a lower cost than the venturi scrubber. The incremental cost-effectiveness is negative or "favorable" because the low efficiency ESP will collect more emissions (420,000 lb/yr) and at a lesser annualized cost (-$101,600) than the venturi scrubber.

APPENDIX A

CHEMICAL ENGINEERING COST INDEXES - 1957 THROUGH 1982

TABLE A-1. CHEMICAL ENGINEERING PLANT AND EQUIPMENT COST INDEXES[a]

Index	1982 Annual[b]	1981 Annual	1980 Annual	1979 Annual	1978 Annual	1977 Annual	1976 Annual	1975 Annual	1974 Annual	1973 Annual	1972 Annual	1971 Annual	1970 Annual
CE plant index	314.3	297	261.1	238.7	218.8	204.1	192.1	182.4	165.4	144.1	137.2	132.3	125.7
Engineering and supervision	314.0	268.5	214.0	185.9	161.9	162.1	150.8	141.8	134.4	122.8	111.9	111.4	110.6
Building	290.4	274.9	238.3	228.4	213.7	199.1	187.3	177.0	165.8	150.9	142.0	135.5	127.2
Construction labor	263.8	242.4	204.3	194.9	185.9	178.2	174.2	168.6	163.3	157.9	152.2	146.2	137.3
Equipment, machinery supports	335.4	323.9	292.2	264.7	240.3	220.9	205.8	194.7	171.2	141.8	135.4	130.4	123.8
Fabricated equipment	325.1	321.8	291.6	261.7	238.6	216.6	200.8	192.2	170.1	142.5	136.3	130.3	122.7
Process machinery	315.0	301.5	271.8	250.0	228.3	211.6	197.5	184.7	160.0	137.8	132.1	127.9	122.9
Pipe, valves, and fittings	379.6	360.1	330.0	301.2	269.4	247.7	232.5	217.0	192.3	151.5	142.9	137.3	132.0
Process instruments and controls	298.3	287.9	249.5	231.5	216.0	203.3	193.1	181.4	164.7	147.1	143.9	139.9	132.1
Pumps and compressors	414.3	388.5	330.3	280.4	257.5	240.2	220.9	208.3	175.7	139.8	135.9	133.2	125.6
Electric equipment and materials	238.7	222.4	206.1	183.2	167.8	159.0	148.9	142.1	126.4	104.2	99.1	98.7	99.8
Structural supports, insulation, and paint	332.2	322.0	297.7	273.6	248.9	226.0	209.7	198.6	171.6	140.8	133.6	126.5	117.9

(continued)

Table A-1 (continued)

Index	1969 Annual	1968 Annual	1967 Annual	1966 Annual	1965 Annual	1964 Annual	1963 Annual	1962 Annual	1961 Annual	1960 Annual	1959 Annual	1958 Annual	1957 Annual
CE plant index	119.0	113.6	109.7	107.2	104.2	103.3	102.0	101.5	102.0	101.8	101.8	99.7	98.5
Engineering and supervision	110.9	108.6	107.9	106.9	105.6	104.2	103.4	103.6	101.7	101.3	102.5	99.3	98.2
Building	122.5	115.7	110.3	107.9	104.5	103.3	102.1	101.4	100.8	101.5	101.4	99.5	99.1
Construction labor	128.3	120.9	115.8	113.5	109.5	108.5	107.2	105.6	105.1	103.7	101.4	100.0	98.6
Equipment, machinery supports	116.6	111.5	107.7	105.3	102.1	101.2	100.5	100.6	100.2	101.7	101.9	99.6	98.5
Fabricated equipment	115.1	109.9	106.2	104.8	103.4	102.7	101.7	101.0	100.1	101.2	100.9	99.6	99.5
Process machinery	116.8	113.1	108.7	106.1	103.6	102.5	102.0	101.9	101.1	108.1	101.8	100.1	98.1
Pipe, valves, and fittings	123.1	117.4	113.0	109.6	103.0	101.6	100.7	100.6	101.1	104.1	103.3	98.8	97.9
Process instruments and controls	126.1	120.9	115.2	110.0	106.5	105.8	105.7	105.9	105.9	105.4	102.9	100.4	96.7
Pumps and compressors	119.6	115.2	111.3	107.7	103.4	101.0	100.1	101.1	100.8	101.7	102.5	100.8	97.5
Electric equipment and materials	92.8	91.4	90.1	86.4	84.1	85.5	87.6	89.4	92.3	95.7	101.0	100.6	98.4
Structural supports, insulation, and paint	111.6	105.7	103.1	101.0	98.8	98.3	97.3	99.2	99.8	101.9	101.6	100.4	98.8

[a] The indexes for the years 1970 through 1981 are from the April 19, 1982 issue of Chemical Engineering. The index for the year 1981 is based on revised figures for December 1981 in the April 19, 1982 issue of Chemical Engineering. Indexes for the years 1957 through 1969 are from Reference 1.

[b] The index for the year 1982 is based on the preliminary figures for December 1982 in the February 7, 1983 issue of Chemical Engineering.

TABLE B-1. CAPITAL RECOVERY FACTORS

uipment fe, yr	Annual compounded interest, %							
	5	6	7	8	10	12	15	20
1	1.05000	1.06000	1.07000	1.08000	1.10000	1.12000	1.15000	1.20000
2	0.53780	0.54544	0.55309	0.56077	0.57619	0.59170	0.61512	0.65455
3	0.36721	0.37311	0.38105	0.38803	0.40211	0.41635	0.43798	0.47473
4	0.28201	0.28859	0.29523	0.30192	0.31547	0.32923	0.35027	0.38629
5	0.23097	0.23740	0.24389	0.25046	0.26380	0.27741	0.29832	0.33438
6	0.19702	0.20336	0.20980	0.21632	0.22961	0.24323	0.26424	0.30071
7	0.17282	0.17914	0.18555	0.19207	0.20541	0.21912	0.24036	0.27742
8	0.15472	0.16104	0.16747	0.17401	0.18744	0.20130	0.22285	0.26061
9	0.14069	0.14702	0.15349	0.16008	0.17464	0.18768	0.20957	0.24808
10	0.12950	0.13587	0.14238	0.14903	0.16275	0.17698	0.19925	0.23852
11	0.12039	0.12679	0.13336	0.14008	0.15396	0.16842	0.19107	0.23110
12	0.11283	0.11928	0.12590	0.13270	0.14676	0.16144	0.18448	0.22526
13	0.10646	0.11296	0.11965	0.12652	0.14078	0.15568	0.22526	0.17911
14	0.10102	0.10758	0.11434	0.12130	0.13575	0.15087	0.21689	0.17469
15	0.09634	0.10296	0.10979	0.11683	0.13147	0.14682	0.17102	0.21388
16	0.09227	0.09895	0.10586	0.11298	0.12782	0.14339	0.16795	0.21144
17	0.08870	0.09544	0.10342	0.10963	0.12466	0.14046	0.16537	0.20944
18	0.08555	0.09236	0.09941	0.10670	0.12193	0.13794	0.16319	0.20781
19	0.08275	0.08962	0.09675	0.10413	0.11955	0.13576	0.16134	0.20646
20	0.08024	0.08718	0.09439	0.10185	0.11746	0.13388	0.15976	0.20536
21	0.07800	0.08500	0.09229	0.09983	0.11562	0.13224	0.15842	0.20444
22	0.07597	0.08305	0.09041	0.09803	0.11401	0.13081	0.15727	0.20369
23	0.07414	0.08128	0.08871	0.09642	0.11257	0.12956	0.15628	0.20307
24	0.07247	0.07968	0.08719	0.09498	0.11130	0.12846	0.15543	0.20255
25	0.07095	0.07823	0.08581	0.09368	0.11017	0.12750	0.15470	0.20212
26	0.06956	0.07690	0.08456	0.09251	0.10916	0.12665	0.15407	0.20176
27	0.06829	0.07570	0.08343	0.09145	0.10826	0.12590	0.20176	0.15353
28	0.06712	0.07459	0.08239	0.09049	0.10745	0.12524	0.20122	0.15306
29	0.06605	0.08385	0.08145	0.08962	0.10673	0.12466	0.20102	0.15265
30	0.06505	0.07265	0.08059	0.08883	0.10608	0.12414	0.20085	0.15230
31	0.06413	0.07179	0.07980	0.08811	0.10550	0.12369	0.15200	0.20070
32	0.06328	0.07100	0.07907	0.08745	0.10497	0.12328	0.15173	0.20059
33	0.06249	0.07027	0.07841	0.08685	0.10450	0.12292	0.15150	0.20049
34	0.06176	0.06960	0.07780	0.08630	0.10407	0.12260	0.15131	0.20041
35	0.06107	0.06897	0.07723	0.08580	0.10369	0.12232	0.15113	0.20034
40	0.05828	0.06646	0.07501	0.08386	0.10226	0.12130	0.15056	0.20014
45	0.05626	0.06480	0.07350	0.08259	0.10139	0.12074	0.15028	0.20005
50	0.05478	0.06344	0.08246	0.08174	0.10086	0.12042	0.15014	0.20002

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APPENDIX B

CAPITAL RECOVERY FACTORS

APPENDIX C

COST STATEMENT AND EXAMPLE FORMATS FOR PRESENTING COSTS

APPENDIX C

COST STATEMENT AND EXAMPLE FORMATS FOR PRESENTING COSTS

Definition of the basis for, and limits of, the cost estimate are of paramount importance since without such definition accuracy is compromised and the estimate will be of questionable and limited use. An essential first step is determining what is to be costed, i.e., the equipment, structures, instruments/controls, auxiliaries, etc. that are directly related to the capture, collection and handling of the exhaust stream and of the collected pollutants (including disposal and treatment) and are necessary to its installation and satisfactory operation. The cost analysis is generally preceded by an engineering evaluation of the proposed control system as regards source applicability, adequacy and compliance capability. This review and/or the information and data contained in a complete permit application package should provide an adequate basis for:

- Detecting, defining and quantifying the variables that affect costs. (Section 2.0 lists and discusses the many variables that can affect the costs of air pollution control systems.)

- Establishing the "boundaries" and requirements of the control facility, i.e., define what is - and is not - a functional, operational and/or a necessary part of the facility and is to be included (or excluded) in the cost estimate. (Table 4-1 lists examples of capital cost component items and can serve as an abbreviated checklist or reminder in defining system "boundaries" and cost estimate scope).

Cost Statement

A cost estimate should be accompanied by a cost statement that clearly and concisely sets forth the basis for, and the limits of, the cost estimate. The cost statement should be both positive and negative; it should state both what is - and is not - included in the cost items so that no question remains in the mind of the reader. Additionally and importantly the statement should explain the basis, rationale and reason for including/excluding cost items and for modifying costs. In brief the cost statement should:

- Provide a general description of the function and operation of the control facility as a whole and explain the purpose or role of the subsystems within the facility.
- List the items that are included in each category of capital cost components and specify what is included in the cost of each such item.
- Indicate the cost items, components or categories that are not included in the estimate and give the reasons for exclusion.
- Document the source(s) of cost information and the basis for - and date of - the cited costs.
- Explain the basis, rationale and reason for any adjustments that are made with respect to cited or derived costs and/or the use of cost adjustment factors.

The results of a cost estimate are well suited to tabular display in a ledger type format that lists the major cost categories and the contributing components in each category. In the estimating procedure described herein the basic purchase price of equipment is multiplied by appropriate factors to compute other

costs. It is convenient to combine the cost computations and to display the results on a single form. Tables C-1 and C-2 are example formats that can be used to compute and present capital and annualized costs.

TABLE C-1. EXAMPLE FORMAT FOR COMPUTING AND PRESENTING CAPITAL COSTS

Cost item	Computation method	Cost, dollars
Direct costs		
Purchased equipment:		
Basic equipment (A)	Purchased cost of control device	_____
Auxiliary equipment (B)	Purchased cost of auxiliaries	_____
Total equipment costs (A+B)	Total of above (A+B)	_____
	(Average cost factor) x (Adjustment factor)[a] x (A+B)	
Instruments/controls	(0.10) ( ) ( )	_____
Taxes (unless exempt)	(0.05) ( )	_____
Freight	(0.05) ( ) ( )	_____
Base price (C)	Subtotal of above plus (A+B)	_____ (C)
Installation costs, direct:	(Average cost factor) x (Adjustment factor)[a] x (C)	
Foundations/supports	( ) ( )	_____
Erection/handling	( ) ( ) ( )	_____
Electrical	( ) ( )	_____
Piping	( ) ( )	_____
Insulation	( ) ( )	_____
Painting	( ) ( )	_____
Site preparation[b]	Estimate ( ) x adjustment ( )	_____
Facilities/buildings[b]	Estimate ( ) x adjustment ( )	_____
Total installation costs (D)	Subtotal of above	_____ (D)
TOTAL DIRECT COSTS (E)	Base price (C) + installation cost (D)	_____ (E)
Indirect costs		
Installation costs, indirect:	(Average cost factor) x (Adjustment factor)[a] x (C)	
Engineering/supervision	( ) ( ) ( )	_____
Construction/field expenses	( ) ( ) ( )	_____
Construction fee	(0.10) ( ) ( )	_____
Start-up	( ) ( )	_____
Performance test	(0.10) ( )	_____
Model study	( ) ( ) ( )	_____
Contingencies	(0.30) ( ) ( )	_____
TOTAL INDIRECT COSTS (F)	Total of above indirect costs	_____ (F)
TOTAL CAPITAL COSTS (G)	Direct costs (E) + indirect costs (F)	_____ (G)

[a] Absence of parenthesis in the adjustment factor column means no such factor is available.

[b] Costs for these items are unrelated to equipment costs (C) and are developed independently on an individual item basis. General estimates for these items can be modified with cost adjustment factors. Case specific estimates are entered directly in the cost column.

E C-2. EXAMPLE FORMAT FOR COMPUTING AND PRESENTING ANNUALIZED COSTS

ost item	Computation method	Cost, dollars
t operating costs		
ting labor rator ervision	____, $/h x ____ h/yr 15% of operator labor cost	____ (a) ____
iting materials	As required	
tenance (general) bor terials	____, $/h x ____ h/yr 100% of maintenance labor	____ (b) ____
acement parts bor	As required 100% of replacement parts cost	____ ____
lities lectricity uel oil as ater Steam Other (specify)	 ____, $/kWh x ____ kWh/yr ____, $/gal x ____ gal/yr ____, $/10³ft³ x ____ 10³ft³/yr ____, $/10³ gal x ____ 10³ gal/yr ____, $/10³ lb x ____ 10³ lb/yr As required	 ____ ____ ____ ____ ____ ____
ste disposal	____, $/ton x ____ ton/yr	____
istewater treatment	____, $/10³ gal x ____ 10³ gal/yr	____
OTAL DIRECT OPERATING COSTS (A)	Subtotal of above	____ (A)
ndirect operating (fixed) costs		
verhead	80% of O/M labor costs (a+b)	____
roperty tax	1% of capital costs ($____)*	____
Insurance	1% of capital costs*	____
Administration	2% of capital costs*	____
Capital recovery	CRF ____ (at ___%, ___yrs) x capital costs*	____
TOTAL FIXED COSTS (B)	Subtotal of above	____ (B)
Credits		
Product recovery Heat recovery	____, $/ton x ____ tons/yr ____, $/10⁶ Btu x ____ 10⁶ Btu/yr	(____) (____)
TOTAL CREDITS (minus C)	Subtotal of above	(____) (C)
TOTAL ANNUALIZED COSTS (D)	(A+B) minus (C)	____ (D)

* Total capital costs (G) from Table C-1.

H

APPENDIX H

QUALITY ASSURANCE PROJECT PLAN

SOIL REMOVAL AND TREATMENT

REMEDIAL CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN SOIL REMOVAL AND TREATMENT

Summit National Superfund Site
Deerfield Township of Portage County, Ohio

MAY 1993

REF. NO. 2372 (49)

CONESTOGA-ROVERS & ASSOCIATES

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1.0 INTRODUCTION

1.1 BACKGROUND INFORMATION

The Summit National Superfund Site (Site) is located in Deerfield Township of Portage County, Ohio, at the intersection of Ohio Route 225 and U.S. Route 224, approximately 45 miles southeast of Cleveland, Ohio. The location of the Site is illustrated on Figure 1.1 of the Remedial Construction (RC) Work Plan.

The Site was originally used as a coal strip mine and contained a coal wash pond and coal stockpile, prior to its use by Donald Georgehoff, Summit National Services and/or Summit National Liquid Disposal Services for the operation of a hazardous waste treatment, recycling, storage and disposal facility.

Prior to implementation of remedial work activities, operations at the Site resulted in uncontrolled releases of hazardous materials. Subsequent Site investigations indicated that there was significant contamination in Site soils, and that groundwater contamination existed both on and off Site.

1.2 PURPOSE AND ORGANIZATION OF REPORT

This Remedial Construction Quality Assurance Project Plan (RC QAPP) presents the quality assurance program to be implemented

during implementation of the soil removal and treatment activities at the Site, as detailed in the RC Work Plan, to ensure that the soil removal and treatment activities meet or exceed all design criteria, plans and specifications. This report is organized as follows:

i) Section 1.0 presents the background information, purpose and organization of the report;
ii) Section 2.0 provides a description of the project;
iii) Section 3.0 outlines the project organization and responsibilities;
iv) Section 4.0 presents the personnel qualifications requirements;
v) Section 5.0 presents the project meeting requirements;
vi) Section 6.0 describes the inspection and testing activities required to ensure that construction and materials comply with all design specifications and plans; and
vii) Section 7.0 describes documentation requirements of construction quality assurance (CQA) activities.

Construction specifications for the Soil Removal and Treatment are presented in Appendix H of the RC Work Plan, and also on the "E" Construction Drawings.

2.0 PROJECT DESCRIPTION

The third phase of the Remedial Action (RA) to be implemented at the Site, as required by the Consent Decree, is the removal and on-Site treatment of contaminated soils and sediment at the Site, and associated activities. As detailed on Figure 15.1 of the RC Work Plan, the soil removal and treatment must be completed within 33 1/2 months of United States Environmental Protection Agency (USEPA) and Ohio Environmental Protection Agency (OEPA) formal approval of the Final Design Report and RC Work Plan. Implementation of the soil removal and treatment phase of the RA consists of the activities detailed in Section 8.1 of the RC Work Plan.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

It is anticipated that the remedial construction activities will be initiated by Conestoga-Rovers & Associates (CRA) on behalf of the Summit National Facility Trust (SNFT). The project organization chart is presented on Figure 3.1. A brief description of the duties of the key personnel are presented below.

3.1 PROJECT MANAGER

The duties of the Project Manager are as follows:

i) provides overall project management;

ii) ensures professional services by CRA are cost effective and of highest quality;

iii) ensures all resources of CRA are available on an as-required basis;

iv) participates in key technical negotiations with United States Environmental Protection Agency (USEPA) and Ohio Environmental Protection Agency (OEPA); and

v) provides managerial and technical guidance to CRA's Project Coordinator.

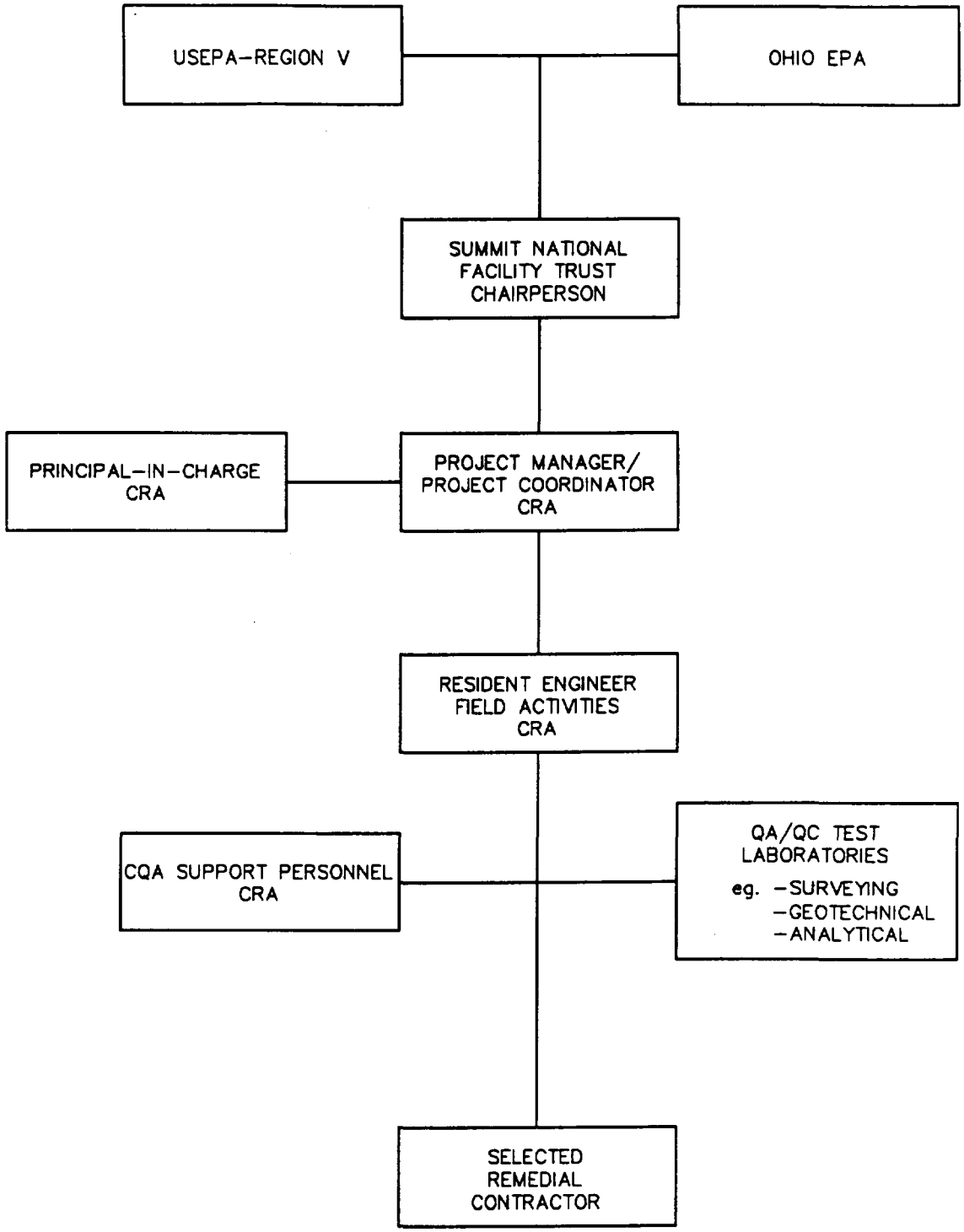

figure 3.1

PROJECT ORGANIZATION
REMEDIAL CONSTRUCTION ACTIVITIES
SUMMIT NATIONAL SUPERFUND SITE
Deerfield Township of Portage County, Ohio

CRA

2372 (49) FEB 15/93 REV.0 (C-13)

3.2 PROJECT COORDINATOR

The duties of the Project Coordinator are as follows:

i) provides day-to-day project management;

ii) provides managerial guidance to CRA's technical group;

iii) provides technical representation at meetings as appropriate;

iv) retains testing firms to perform quality control field/laboratory tests; and

v) prepares and reviews reports.

3.3 RESIDENT ENGINEER

The duties of the Resident Engineer are as follows:

i) reports to CRA Project Coordinator;

ii) provides immediate supervision of all on-site project activities;

iii) provides field management of CQA activities;

iv) reviews design criteria, plans and specifications for clarity and completeness so that the RC QAPP can be implemented;

v) informs CQA Support Personnel on CQA requirements and procedures;

vi) ensures that regular calibration of testing equipment is conducted and recorded;

vii) ensures that all site activities are recorded daily and maintained;

viii) ensures that CQA test results are accurately recorded;

ix) identifies work that should be accepted, rejected, or uncovered for observation, or that may require special testing, inspection, or approval;

x) rejects defective work and verifies that corrective measures are implemented; and

xi) interacts daily with the Contractor to provide assistance in modifying the materials and work to comply with the specified design.

The individual designated to be the Resident Engineer will be specified by CRA prior to commencement of the construction activities.

3.4 CQA SUPPORT PERSONNEL

The duties of the CQA Support Personnel are as follows:

i) reports directly to the Resident Engineer;

ii) conducts CQA tests and inspections as indicated in this RC QAPP;

iii) accurately records test results and inspections;

iv) calibrates testing equipment as required;

v) maintains testing equipment in good working order; and

vi) immediately notifies Resident Engineer whether or not test results comply with design specifications.

3.5 QA/QC TEST LABORATORIES

QA/QC Test Laboratories that will conduct CQA Quality Control tests will be identified by CRA prior to the commencement of the construction activities. The duties of the QA/QC Test Laboratories are to provide QA/QC testing of construction activities, as requested by the Resident Engineer, to confirm construction activities have been implemented according to the construction specifications and drawings.

3.6 CONTRACTOR

The duties of the Contractor, as they relate to QA/QC, are as follows:

i) retains qualified testing firms (for example laboratory, geotechnical), for testing of materials and workmanship to ensure that materials meet specified requirements;

ii) submits samples and/or materials for testing to determine if samples/materials meet specified requirements, and submits results directly to the Resident Engineer;

iii) records daily CQA activities in the Contractors Site log book and submits a "Daily Construction Quality Control Report" (see Section 7.3) to the Resident Engineer; and

iv) carries out construction activities according to design specifications.

4.0 PERSONNEL QUALIFICATIONS

4.1 RESIDENT ENGINEER

The Resident Engineer will have the following qualifications:

i) graduate of a recognized college in a technically related field;

ii) minimum two (2) years experience in the oversight and implementation of hazardous waste remedial construction and CQA activities; and

iii) good management and communication skills.

4.2 CQA SUPPORT PERSONNEL

The CQA Support Personnel will have the following minimum qualifications:

i) degree from a recognized college in engineering technology, or equivalent; or a minimum of two (2) years experience in hazardous waste remedial construction and CQA inspection procedures; and

ii) working knowledge of all relevant codes and regulations concerning material and equipment installation, observation and testing procedures, equipment, documentation procedures, and site safety.

4.3 CONTRACTOR

The selected soil removal and treatment Contractor will assign experienced personnel to supervise the implementation of each of the remedial construction activities specified in the RC Work Plan. In particular, the selected Contractor will assign experienced personnel to the following critical remedial construction activities:

i) preparation of Performance Demonstration, Air Monitoring and Health and Safety Plans;
ii) implementation of Performance Demonstration and soil treatment activities;
iii) excavation, sampling and disposal of underground storage tanks (USTs) and buried drums and the materials contained therein;
iv) excavation and treatment of contaminated soils and sediments;
v) vertical and horizontal control of excavation and backfilling activities;
vi) excavation and backfilling; and
vii) implementation and monitoring of Health and Safety Plan.

Experienced personnel will have a thorough knowledge of testing procedures, equipment and documentation procedures required for implementation of the remedial construction activities.

The selected Contractor will designate an on-Site Project Manager empowered to act on behalf of the Contractor in all matters pertaining to the remedial construction activities.

5.0 PROJECT MEETINGS

Project meetings will be held during the remedial construction period to ensure that all tasks are accomplished according to schedule and that they are completed in accordance with the remedial construction plans and specifications. These progress meetings will be attended by the Project Manager, Project Coordinator, Resident Engineer, Contractor Representative, SNFT, USEPA and/or OEPA as detailed below.

5.1 PRECONSTRUCTION MEETING

Purpose: To resolve any uncertainties in the remedial construction plans and specifications, and to review levels of responsibility, reporting requirements, and health and safety requirements.

Present: Project Coordinator, Resident Engineer, CQA Support Personnel, Contractor Representative, Contractor Site Safety Officer.

Topics:

- Present Contractor's RC QAPP, Contractor's Site-specific Health and Safety Plan, and other relevant documents.
- Review the activities to be conducted during the remedial construction.

- Review roles of each organization relative to the design criteria, plans and specifications within the RC QAPP.
- Determine any need to modify the RC QAPP to ensure that the construction is performed to meet or exceed the specified design criteria.
- Review lines of authority and communication.
- Discuss the established procedures or protocol for observations and tests including sampling strategies.
- Discuss the established procedures or protocols for handling construction deficiencies, repairs and retesting.
- Review methods for documenting and reporting inspection data.
- Review methods for distributing and storing documents and reports.
- Review work area delineation, security and safety protocol.
- Discuss the location for storing construction equipment and materials, and the protection of these items during inclement weather.
- Discuss the protection of uncompleted construction work during off hours and during inclement weather.
- Conduct a Site tour to review construction areas, safety areas, and equipment and stockpile storage locations.

5.2 DAILY PROGRESS MEETINGS

Purpose: To daily review work schedule progress. This meeting is intended to be an informal meeting held at the end of each work day or at the start of each work day.

Present: Resident Engineer, Contractor Representative

Topics:

- Review previous day's activities and progress.
- Review work location and activities for upcoming day.
- Review health and safety deficiencies from the previous work day and review health and safety requirements and potential problems for the next day's activities.
- Review Contractor's personnel and equipment assignments for the upcoming day.
- Discuss any potential construction problems.

5.3 WEEKLY PROGRESS MEETINGS

Purpose: To provide an update of work schedule progress on a weekly basis, and identify schedule slippages and efforts required to get back onto schedule, if required.

Present: Resident Engineer, CQA Support Personnel (optional), Project Coordinator (optional), Project Manager (optional), Contractor Representative, Site Safety Officer (optional).

Topics:

- Health and Safety report for previous week's activities and forthcoming week activities.
- Review work activities for the previous week.
- Comparison of actual progress to scheduled work activities, noting of schedule slippages and actions to be implemented to rectify schedule slippages.
- Review work activities for the next week.
- Review potential construction problems and proposed solutions.

5.4 MONTHLY PROGRESS MEETINGS

Purpose: To provide a remedial construction progress update to SNFT, USEPA and OEPA.

Present: Project Manager, Project Coordinator, Resident Engineer, SNFT, Contractor's Representative, USEPA and OEPA.

Topics:

- Health and Safety report for previous month's activities.
- Review of the work activities for the previous month.

- Comparison of actual progress to scheduled work activities, noting schedule slippages and actions implemented to rectify schedule slippages.
- Summarize work activities scheduled for the next month.
- Review potential remedial construction problems/conflicts for the next month's remedial construction activities and proposed solutions to the potential problems/conflicts.

5.5 PROBLEM OR WORK DEFICIENCY MEETINGS

Purpose: If a problem or deficiency is present or likely to occur.

Present: Resident Engineer and CQA Support Personnel, Contractor Representative (optional if major problem directly related to his work)

Topics:

- Define and discuss problem or deficiency.
- Review alternative solutions.
- Develop and implement a plan to resolve the problem or deficiency.

For all meetings held on Site during the remedial construction, with the exception of the daily progress meetings, minutes will be taken by the Resident Engineer. Copies of the minutes will be forwarded to SNFT and all organizations present at the meetings.

6.0 INSPECTION AND TESTING ACTIVITIES

6.1 SCOPE

Throughout the implementation of the remedial construction activities there will be numerous inspections and testing requirements for specific work tasks. The inspection and testing requirements will ensure compliance with the remedial design as presented in the construction specifications, as well as ensure completion of the work tasks to the highest level of quality.

Inspections and testing will provide a qualitative and quantitative means of monitoring the quality and progress of work performed.

The components of each work task that will require some form of inspection or testing are as follows:

i) Demolition and Removal Activities

- clearing and grubbing
- structure demolition
- existing incinerator lining removal; and

ii) Excavation, Regrading, Backfilling Activities

- horizontal and vertical control
- compaction
- backfill material quality control

Separate quality assurance project plans will be developed by the Contractor to address quality assurance protocol for the following activities:

i) Incinerator or Thermal Desorber

- waste feed monitoring
- stack emissions monitoring

ii) Treated Wastewater, Ash and Drummed/Containerized Waste

- treated water monitoring
- treated ash monitoring
- drummed/containerized waste fingerprint, compatibility and characterization testing

These plans will be reviewed by the Trust, USEPA and OEPA prior to the Contractor's mobilization to the Site.

6.2 INSPECTIONS

Throughout the period of remedial construction the quality of work completed and material used for each of the work tasks will be maintained at its highest practical level through regular inspections of the work. Inspections will be completed throughout the construction by the Resident Engineer, CQA Support Personnel, and representatives of USEPA and OEPA on a periodic basis, if required.

In general, inspections to be conducted by the Resident Engineer and CQA Support Personnel include the following:

i) Reviewing and approving Contractor work plans;

ii) Monitoring work progress;

iii) Monitoring incinerator or thermal desorber operation;

iv) Inspecting material as it is delivered to the Site to check for damage during delivery;

v) Comparing of the material and equipment delivered to the Site to the design specifications;

vi) Inspecting materials after they have been installed or placed to ensure that it has not been damaged during installation or that they have been placed properly;

vii) Performing pre-construction inspection prior to beginning work on any work task. A pre-construction inspection will include the following:

- a review of contract requirements to ensure that all materials and/or equipment have been tested according to applicable standards and specifications,
- ensure that provisions have been made to provide required quality control testing, and
- examination of the work area to ascertain that all applicable preliminary work tasks have been completed;

viii) Performing general inspections periodically as the amount of work completed warrants an inspection. A general inspection will include the following:

- examination of the quality of workmanship,
- testing of materials for compliance with Contract requirements,
- any omissions, and
- general progress of work performed; and

ix) Performing final inspection upon completion of each work task to ensure compliance with the Construction Drawings and Construction Specifications and to ensure that deficiencies identified in the general inspections have been corrected.

These inspections will be performed by the Resident Engineer and the results of the inspections will be provided in the final construction report. USEPA and OEPA representatives will be notified by the Resident Engineer at least 3 days in advance of any final inspections. The results of all inspections will be recorded in the daily Site log book as described in Section 7.0. Copies of the pre-construction, general and final inspection reports will be provided to SNFT and all parties involved in the inspection.

The component of each work task to be inspected, the types of inspections required and the frequency of the inspections are discussed in Section 6.3 and summarized in Table 6.1.

TABLE 6.1

SUMMARY OF CONSTRUCTION QUALITY ASSURANCE INSPECTIONS
SOIL REMOVAL AND TREATMENT
SUMMIT NATIONAL SUPERFUND SITE

Work Task Component to be Inspected	*Items to be Checked During Inspection*	*Type of Inspection*	*Frequency of Inspection*	*Submittals to Resident Engineer*
A. Demolition and Removal	• completion of removal • elevations	• visual • surveying	• daily	• survey results
B. Excavation, Regrading and Backfilling	• drum removal • tank removal • contaminated soil and sediment removal • regrading and backfill	• visually contaminated soil and sediment • depth of excavation • compacted density • elevations • Table 6.6	• continuous as required	• field logs • survey results and final grading plan

6.3 DESCRIPTION OF QUALITY ASSURANCE ACTIVITIES

6.3.1 Quality Review of Plans and Project Summaries

The Contractor will prepare several work plans (listed in Section 7 of the Final Design Report) and submittals (i.e. project summaries, field reports, logs, etc.) during this project. CRA, SNFT, USEPA and OPEA will review all plans submitted by the Contractor to verify that they meet project specifications, the Consent Decree, the Record of Decision, all associated and approved SNFT work plans and acceptable standards of engineering practice.

6.3.2 Demolition and Removal

A number of structures and facilities are to be demolished, reduced and buried under the final cover on Site.

The majority of Site inspection activity will be visual, and will include, ensuring that demolition extends to the base of the cover, that debris placed under the cap will not have voids after backfilling, and that the elevation of the top of the placed debris is below the base of the final cover. The Resident Engineer will produce grading plans prepared by a competent surveyor verifying that the elevations meet specifications. This information will be provided as part of the overall surveying and as-built grading plans developed for the Site.

6.3.3 Excavation, Regrading and Backfilling

Excavation is to be performed for three purposes:

i) to remove drums and tanks;

ii) to remove soils and sediments designated for treatment; and

iii) to meet final grading requirements for the Site.

During the removal of drums and tanks, the Resident Engineer will provide full-time Work Zone monitoring to ensure that they are carefully excavated, to identify soils requiring treatment, and to verify that excavation has extended to the required depth.

Monitoring during excavation for soils and sediments designated for treatment and to meet final grading requirements will include surveying by the Contractor and by the Resident Engineer to maintain horizontal and vertical control. Testing protocols and frequencies are provided in Table 6.2.

Monitoring during backfilling will include compaction testing and surveying for horizontal and vertical control. As well, imported material to be included in the lower six inches of the final cover will be monitored to verify that it meets gradation requirements. In addition, visual monitoring of samples will be conducted in order to identify the obvious presence of contaminants, and selected samples will be analyzed for select

TABLE 6.2

EXCAVATION, REGRADING AND BACKFILLING TESTING PROTOCOLS
SUMMIT NATIONAL SUPERFUND SITE

Type of Test	*Test Standard*	*Frequency*	*Criteria*
• Maximum Dry Density	• ASTM D698 and ASTM D2216	• minimum one test for each change in material	• N.A.
• Dry Density (field)	• ASTM D3017 and ASTM D2922	• minimum one test per 2,500 sq. ft. per layer	• 90 percent of maximum dry density (ASTM D698)
• Gradation	• ASTM D422 or ASTM D1140, as appropriate	• minimum of one test per 1,000 cu. yds. • minimum of one test for any material change	• D 100 ≤50 mm (1)
• Permeability	• ASTM D2434	• minimum of one test per 1,000 cu. yds • minimum of one test for any material change	• 1 x 10E-4 cm/s
• Surveying	• horizontal and vertical control	• as required	• cut and fill to grades ± 2 inches, but not uniformly greater or lesser

Notes:

1. D100 - particle size which 100 percent by mass of soil is less than

chemical parameters as described in the Soil Removal and Treatment Specifications.

7.0 CQA DOCUMENTATION

7.1 GENERAL

This section details the documentation requirements for the RC QAPP. The proper, thorough, and accurate documentation of all CQA site activities is important in ensuring quality installation. CQA testing will be documented daily.

7.2 CONTRACTOR'S DAILY SITE LOG BOOK

The selected remedial Contractor will record daily quality control activities in a Daily Site Log Book to be kept on Site at all times. The log book will include the following information:

i) date, weather conditions;

ii) all Site activities;

iii) decisions made regarding approval of units of material or of work, and/or corrective actions to be taken in cases of substandard quality;

iv) submittals made by suppliers verifying material quality;

v) quality control test and inspection results;

vi) construction delays, and causes;

vii) areas affected by delays;

viii) construction problems and corrective actions;

ix) personnel on Site;

x) present phase of construction;

xi) material and/or equipment delivered to site (including equipment demobilization);

xii) inspections made;

xiii) health and safety considerations;

xiv) quality control tests performed and results of tests taken on previous work day;

xv) instructions given by the Resident Engineer;

xvi) changed conditions/conflicts encountered; and

xvii) remarks.

Each daily entry into the log will be signed by the remedial Contractor as verification to its correctness, and a copy of the signed entry will be provided to the Resident Engineer on a daily basis for verification. An example of this report sheet is presented in Appendix A. The Contractor may use alternate forms providing the same information, subject to the approval of the Resident Engineer.

7.3 CQA INSTRUMENT CALIBRATION

The CQA Support Personnel will record calibrations of test equipment in an Instrument Calibration Log Book, maintained on Site by the Resident Engineer. Actions taken as a result of recalibration will be recorded in the Inspection log book, as described in the next section.

7.4 INSPECTION LOG BOOK

All observations and quality control field tests will be recorded by the CQA Support Personnel into Inspection Log Books. These books will be kept on Site and maintained by the Resident Engineer. The inspection log book will include the following information:

i) date, time, weather conditions;

ii) description or title of the inspection activity;

iii) location of the inspection activity or location from which the sample increment was obtained;

iv) type of inspection activity and procedure used (reference to standard method when appropriate);

v) recorded observation or test data, with all necessary calculations;

vi) results of the inspection activity and comparison with specification requirements;

vii) personnel involved in the inspection activity; and

viii) signature of the appropriate CQA inspection personnel and concurrence by the Resident Engineer.

Items above shall be formulated into checklists so that details are not overlooked.

7.5 PROBLEM/CORRECTIVE ACTION REPORTS

A problem is defined as material or workmanship that does not meet the construction specifications. Problem/Corrective Action Reports should be cross-referenced to specific inspection entries in the Inspection Log Book where the problem was identified. Problem/Corrective Action Reports will include the following information:

i) unique identifying sheet number for cross-referencing and document control;
ii) detailed description of the problem;
iii) location of the problem;
iv) probable cause;
v) how and when the problem was located (reference to Inspection Log Book);
vi) estimation of how long problem has existed;
vii) suggested corrective action;
viii) documentation of correction (reference to Inspection Log Book);
ix) final results;
x) suggested methods to prevent similar problems; and
xi) signature of the appropriate CQA Support Personnel and concurrence by the Resident Engineer.

In some cases, not all of the above information will be available or obtainable. However, when available, such efforts to document problems could help to avoid similar problems in the future.

7.6 WORK TASK REPORTS

Within each work task, there may be several quality characteristics, or parameters, that are specified to be observed or tested, each by a different observation or test, with the observations and/or tests recorded in different Inspection Log Books. At the completion of each task, these log books should be used to write a Work Task Report summarizing all of the construction activities related to that particular work task.

Work Task Reports will be prepared by the Resident Engineer or the Project Coordinator and will include the following information:

i) unique identifying sheet number for cross-referencing and document control;

ii) description of work task (i.e. removal and treatment of old incinerator lining, removal of USTs, etc.);

iii) quality characteristic being evaluated and references to construction specifications and plans;

iv) quality control test locations;

v) inspections made (define procedure by name or other identifier);

vi) summary of inspection results, which will include all data outside acceptable limits, and documentation of corrective action and retest results;

vii) define acceptance criteria (compare task inspection data with design specification requirements; indicate compliance or noncompliance; in

the event of noncompliance, identify documentation that gives reasons for acceptance outside of the specified design); and

viii) signature of the Resident Engineer or Project Coordinator.

7.7 FINAL REPORT

At the completion of the remedial construction, CRA will prepare and submit a final report to USEPA, OEPA and SNFT. This report will include copies of all of the Daily Site Log Books, Inspection Log Books, Problem/Corrective Action reports, deviations from design and material specifications (with justifying documentation), and as-constructed drawings.

The final report will re-emphasize that areas of responsibility and lines of authority were clearly defined, understood, and accepted by all parties involved in the project. Signatures of CRA's Project Coordinator and Resident Engineer should be included as confirmation that each party understood and accepted the areas of responsibility and lines of authority and performed their functions in accordance with the RC QAPP.

7.8 STORAGE OF RECORDS

During remedial construction the Resident Engineer will maintain a copy of the Construction Drawings and the Construction Specifications, RC QAPP and Problem/Corrective Action reports in the Site office. Once the remedial construction is complete, all CQA documents

(originals) will be retained by CRA, and a copy sent to SNFT. This information will be kept until all operating and post closure monitoring periods have expired as specified in the Consent Decree.

APPENDIX A

TYPICAL CONTRACTORS DAILY SITE LOG BOOK

TYPICAL CONTRACTORS DAILY SITE LOG BOOK

Project Name: Soil Removal and Treatment _____ Date: _____

Summit National Superfund Site _____

Weather: _____ Report No._____

1) Personnel On Site

   a) CRA

   b) Contractor

   c) Subcontractor

   d) Other

2) Phases of Construction in Progress (Give briefly only phase or phases of work in progress)

3) Health and Safety

   a) Preparatory

   b) Initial

   c) Follow-up

4) Material and/or Equipment on-Site (Including equipment demobilization)

5) Inspection Made (Include negative inspections, phase of in-progress construction work inspected and all deficiencies noted during inspections)

6) Tests Performed and Results of Tests (including results of tests taken on previous dates).

7) Instructions Received (List any instructions given by Resident Engineer on construction deficiencies, retesting required etc., with action to be taken).

8) Changed Conditions/Conflicts Encountered.

9) Remarks

SIGNATURE_____

TITLE_____

_____

Contractor's Verification: The above report is complete and correct and all material and equipment used and work performed during this reporting period are in compliance with the construction plans and specifications except as noted above.

_____

Contractor's Approved Authorized Representative

APPENDIX I

CONSTRUCTION SPECIFICATIONS

SITE COVER

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SECTION 01010 - SUMMARY OF WORK

1. SCOPE OF WORK

The Works to be performed under this Contract consist of Construction of Site Cover and associated work for construction at the Summit National Superfund Site.

2. LOCATION

The Site is located on the southeastern corner at intersection of Routes 224 and 225 in Deerfield Township of Portage County, Ohio.

3. ACCESS TO SITE

Access to the Site is available from Route 224.

The Contractor shall make all arrangements with the authorities having jurisdiction for the movement of his material and equipment to and from the Site over public roadways

4. DESCRIPTION OF WORK

Work includes, but is not necessarily limited to, the following:

1. mobilization of material, equipment, plant and personnel necessary to satisfactorily perform the Works;
2. supply and installation of 12-inch layer of imported loam;
3. supply and installation of 6-inch layer of imported topsoil;
4. seeding, fertilizing and watering; and
5. demobilization and project closeout.

5. WORK NOT INCLUDED

The following items of work associated with the project do not form part of this Contract:

1. construction of groundwater extraction and treatment system; and
2. well installation and abandonment.

6. CONSTRUCTION SCHEDULE

The Contractor shall perform the Works in accordance with the following construction schedule:

1. the Works shall be commenced at the Site within seven (7) calendar days of the date of the Notice to Proceed; and

2. the Works shall be completed within 90 calendar days of the date of the Notice to Proceed.

7. DRAWINGS

Drawings issued with and forming part of the Contract Documents are listed below. Such Drawings are issued for bid purposes only.

Drawing No.	Rev. No.	Date of Drawing or Latest Revision	Title
F-1	2	February, 1993	Existing Conditions
F-2	2	February, 1993	Final Grading Plan
F-3	2	February, 1993	Typical Details

The Contractor shall perform the Works in accordance with Drawings signed "Approved for Construction" by the Engineer. Such Drawings will be issued to the Contractor during progress of the Works and will consist of bid Drawings revised as required by the Engineer and additional Drawings if required by the Engineer.

Revised "Approved for Construction" Drawings may be issued from time to time by the Engineer and such Drawings shall supersede previous revisions. If revised "Approved for Construction" Drawings are issued which necessitate changes to the Contractor's shop drawings not yet reviewed, no separate payment will be made for the Contractor's expenses involved in revising such shop drawings.

8. MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for work under Section 01010.

END OF SECTION

SECTION 01015 - GENERAL REQUIREMENTS

1. PROJECT STARTUP

Prior to mobilizing to the Site, the Contractor shall provide all bonds and insurance as required by the Contract Documents and to the satisfaction of the Engineer.

Prior to commencing work at the Site, the Contractor shall mobilize all material and equipment required for performance of the Works; erect all temporary fencing; provide all construction facilities and temporary controls including parking areas, all necessary connections to power, water, telephone and sewer and access roads as required.

The Contractor shall site all construction facilities in areas designated by the Engineer. Any changes to the locations of construction facilities shall be approved by the Engineer.

The Contractor shall ensure all utilities and surface features potentially affected by the Works are located in and around all active work areas prior to commencement of the Works.

The Contractor shall ascertain and record the conditions of existing surface features at all work locations under this Contract.

2. CONTRACTOR'S REPRESENTATIVE

During the performance of the Works, the Contractor shall have on the Site during working hours a designated Superintendent empowered to act on behalf of the Contractor in all matters pertaining to the Contract. The Contractor shall within seven days of execution of the Contract, nominate such person or persons, in writing, to the Engineer. Such person or persons shall remain, in the context of this Contract, the Contractor's designated agent(s) until such time as notification to the contrary is received in writing by the Engineer.

3. MEASUREMENT METHODS

Further to Article 7 of the Agreement, measurement clauses in these Project Specifications define methods the Engineer will use to determine quantity of completed work for payment purposes.

The Contractor shall notify the Engineer sufficiently in advance of operations to permit required measurements for payment and shall provide reasonable and necessary opportunities and facilities for making such measurements.

The Contractor shall provide at his own expense a qualified assistant(s) to the Engineer to expedite the taking of these measurements and to facilitate agreement on pay item quantities.

4. DELIVERY OF EQUIPMENT AND MATERIAL

No material or equipment of any kind shall be delivered to the Site until approval in writing has been applied for and obtained by the Contractor from the Engineer that such material or equipment may be delivered.

The Contractor shall ensure that the delivery of material and equipment to the Site is coordinated with the work sequence and stored in areas approved by the Engineer. Delivered equipment and material shall be protected from contamination prior to and during use in the Works.

5. OTHER CONTRACTORS

Other Contractors may be working on the Site. The Contractor shall cooperate with and coordinate his activities with Other Contractors. No additional payment will be made for delays, changes in schedule, or any other work due to the fact that Other Contractors are working on the Site.

6. QUALITY CONTROL

A. INSPECTION

The Engineer shall have access to the Works. If parts of the Works are in preparation at locations other than at the Site, the Contractor shall provide access to such work whenever it is in progress.

The Contractor shall give timely notice requesting inspection if work is designated for special tests, inspections or approvals or by instructions of the Engineer or other authorities having jurisdiction.

If the Contractor covers or permits to be covered any part of the Works that has been designated for special tests, inspections or approvals before such is made, the Contractor shall uncover such work, have the inspections or tests satisfactorily completed and make good such work at no additional cost to the Trust.

The Engineer may order any part of the Works to be examined if such work is suspected to be not in accordance with the Contract Documents. If, upon examination such work is found not in accordance with the Contract Documents, the Contractor shall correct such work and pay the cost of examination and correction. Except as specified above, if such work is found to be in accordance with the Contract Documents, the Trust will pay the cost of examination.

B. INDEPENDENT TESTING AGENCIES

Independent testing agencies may be engaged by the Trust for the purpose of inspecting and/or testing portions of the Works.

The Contractor shall allow inspection/testing agencies access to the Works whenever it is in preparation or progress and shall provide reasonable facilities for such access.

Employment of testing agencies by the Trust does not preclude or relax the responsibility of the Contractor to perform as specified.

If defects or deficiencies are revealed during inspection and/or testing, the appointed agency will request additional inspection and/or testing to ascertain the full degree of the defect or deficiency. The Contractor shall correct defects and deficiencies as directed by the Engineer at no additional cost to the Trust.

The Contractor shall pay costs for retesting and reinspection.

C. PROCEDURES

The Contractor shall notify the appropriate agency and the Engineer in advance of the requirement for tests, inspections or approvals, in order that attendance arrangements can be made.

The Contractor shall submit samples and/or materials required for testing, as specifically requested in the Project Specifications. The Contractor shall submit with reasonable promptness and in an orderly sequence so as not to cause delay in the performance of the Works.

The Contractor shall provide labor and facilities to obtain and handle samples and materials at the Site.

D. REJECTED WORK

The Contractor shall remove defective work, whether the result of poor workmanship, use of defective products or damage and whether incorporated in the Works or not, which has been rejected by the Engineer as failing to conform to the specified requirements.

The Contractor shall make good Other Contractor's work damaged by such removals or replacements promptly.

If in the opinion of the Engineer it is not expedient to correct defective work or work not performed in accordance with the Contract Documents, the Trust may deduct from the Contract Price the difference in value between the work performed and that called for in the Contract Documents, the amount of which shall be determined by the Engineer.

7. EXISTING CONDITIONS

Prior to commencement of work at the Site, the Contractor shall inspect the Site with the Engineer to review and establish the condition of all surface features including existing buildings, trees and other plants, grassed areas, fencing, service poles, wires, paving and survey bench marks or monuments on or adjacent to the Site which may be affected by the Works. This inventory shall be mutually agreed between the Engineer and the Contractor and shall not thereafter be subject to dispute. Such inventory as may be amended, from time to time, will be used by the Engineer to check compliance by the Contractor with the requirements of the Contract Documents.

The Contractor shall provide ongoing review inspection and attendance during performance of the Works to properly document conditions. The Contractor shall inform the Engineer within seven (7) calendar days of any existing conditions at the Site affected by the Works which may require restoration, repair or replacement. The Contractor shall not cover up any of the Works without prior approval from the Engineer.

The Contractor shall protect existing buildings and other surface features from damage which may be affected by the Works while work is in progress and repair any resulting damage from the Works to the Engineer's approval.

8. RESTORATION

A. GENERAL

This Clause describes minimum requirements and not necessarily all the requirements for restoration work.

The Contractor shall supply all labor, materials and equipment and do all work necessary or required to restore the Site as specified and shown on the Drawings.

Restoration shall mean replacement, repairs or reconstruction to a condition at least as good as or better than the condition prior to commencement of the Works.

Except where specifically required by other Sections of the Project Specifications, the Contractor shall restore areas of the Works and areas affected by the performance of the Works to conditions that existed prior to commencement of the Works and to match condition of adjacent, undisturbed areas.

The Contractor shall be responsible to restore the Site, including all areas affected by the performance of the Works, and shall utilize construction methods and procedures during the performance of the Works which keeps disturbance and damage of whatever nature to existing conditions to the practical minimum. Where the works necessitate root or branch cutting, the Contractor shall do so only as approved by the Engineer.

Unless specified otherwise, the Contractor shall ensure that quality, grades, elevations and extent of bedding, backfill and other materials including subgrades, finish grades, thickness of pavements for roadways and parking areas are properly documented during their removal to ensure reconstruction to at least their original and functional condition.

B. MATERIAL

Material required for restoration work shall be provided by the Contractor subject to the approval of the Engineer prior to use.

Restoration material shall be new, except as otherwise specified, not damaged or defective and of the best quality for the purpose intended. If requested by the Engineer or specified in other Sections of the Project Specifications, the Contractor shall furnish evidence as to type, source and quality of materials or products provided.

Should any dispute arise as to the quality or fitness of materials, whether obtained on the Site or off the Site, whether previously inspected by the Engineer prior to use or not, the decision to use any material or product in the finished Works will rest strictly with the Engineer.

Material not approved for reuse shall become the property of the Contractor and shall be removed from the Site.

The Contractor shall handle and store products or materials in a manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

C. PERFORMANCE

The Contractor shall notify the Engineer sufficiently in advance of any required attendance to assess and/or document existing conditions.

Prior to commencement of restoration work, the Contractor shall inform the Engineer of proposed material, methods and procedures to repair, replace or reconstruct any disturbed, damaged or suspected damaged to the Works.

The Contractor shall perform cutting, remedial and coordination work required to make the parts of the Works fit together.

The Contractor shall ensure that restored areas match existing grade and surface drainage characteristics, except as otherwise specified, and ensure a smooth transition from restored surfaces to existing surfaces.

The Contractor shall not alter original conditions without approval from the Engineer.

The Contractor shall dismantle and/or salvage materials for reuse where practicable except as otherwise specified. The Contractor shall exercise due care when removing material for salvage. Materials damaged through improper handling or through loss after removal shall be repaired or replaced by the Contractor at no additional cost to the Trust.

The Contractor shall store and protect removed material approved for reuse in approved locations.

Unless otherwise specified, restoration of pavement shall be made by removing and replacing the entire portions between joints or scores and not merely refinishing or patching localized areas.

In removing pavements, curbs and gutters and similar structures or surfaces, the Contractor shall saw cut surfaces and protect adjacent joints and load transfer devices and underlying granular materials.

9. LAYOUT

The Engineer will establish reference bench marks and baselines adjacent to the Works.

The Contractor shall be responsible for the preservation of all survey reference points as set or established by the Engineer. Any errors entering into the Works through failure of the Contractor to notify the Engineer concerning lack of preservation of such survey reference points shall be made good by the Contractor at no additional cost to the Trust.

The Contractor shall develop and make such additional detailed surveys as are needed for construction, such as slope stakes, line and grade stakes for forcemains, batterboards, stakes for establishing the design elevations of the working points, lines and elevations. All bench marks, base lines, property boundaries, line and grade hubs, and other references and construction points, and such survey points shall thereafter be maintained by the Contractor.

The Engineer may, at any time, check the Contractor's survey and layout work but this shall not relieve the Contractor of any of his responsibilities to carry out the Works to the lines and grades as set out in accordance with the Drawings and Project Specifications.

The Contractor shall provide reasonable and necessary opportunities and facilities for setting points and making measurements during construction. The Contractor shall not proceed until he has made request to and has received from the Engineer, such points as may be necessary as the work progresses. The construction shall be done in conformance with such points.

10. WORK AREAS

The Trust will provide the right of access to certain lands in connection with the Works. The Contractor shall not unreasonably encumber these premises with its plant, equipment or materials. No other areas on the Site shall be used by the Contractor without the Engineer's written approval.

11. LANDS BY CONTRACTOR

The Contractor shall provide, with no liability to the Trust, any additional land and access thereto not shown or described that may be required for temporary construction facilities or storage of materials. The Contractor shall construct and maintain all access roads, detour roads, or other temporary work as required by its operations. All such areas shall be approved by the Engineer prior to construction.

12. INTERFERENCE WITH EXISTING PLANT

The Contractor shall conduct operations to minimize interference with the existing plant, and shall comply with any regulations in force. Where it is necessary to interrupt existing services for purposes of demolition work, connecting work, re-routing systems or changing over to new arrangements, all related and preliminary work shall be scheduled and completed in advance, except for necessary final connecting or removal, as the case may be, to ensure minimum shut down time.

13. COORDINATION WITH ADJACENT OPERATIONS

The Contractor is advised that operations of facilities adjacent to the Site must be maintained (to the maximum extent possible) throughout the execution of the Works. The Contractor shall arrange and perform all work in such a manner as to cause minimum interference to adjacent operations or personnel.

14. DISRUPTION OF SERVICES

Where it is necessary to interrupt existing services, the Contractor shall advise the Engineer a minimum of 72 hours in advance of a proposed shut down or interruption of services, utilities or access to any adjacent facility and shall not proceed with such shutdown or interruption until authorization to proceed has been issued by the Engineer. Where it is necessary to interrupt existing services, all related and preliminary work shall be scheduled and completed in advance, except for necessary final connecting or removal, as the case may be, to ensure minimum shut down time. No additional payment will be made for delays resulting from failure to

authorize the interruption within 72 hours or modifications required to the proposed sequence of work to accommodate adjacent operations.

The Contractor shall identify all potentially required shut down or interruptions of service utilities or access to any adjacent facility and expected duration on the Contractor's detailed construction schedule.

The Contractor shall coordinate the Work to ensure alternate access routes, points of entry, or service connections are not interrupted at the facilities located adjacent to the Site.

15. HAZARDOUS WASTE

No waste that is considered to be hazardous, or is subject to regulation under any applicable law, statute, rule, regulation, or ordinance, shall be treated or disposed on the Site except as approved by the Engineer. No such waste shall be stored in violation of any such applicable requirements. Liability and responsibility for any and all hazardous waste produced during the performance of this Contract shall be the sole liability and responsibility of the Contractor.

16. CLEAN UP

No material of any kind shall be removed from the Site without prior approval from the Engineer.

The Contractor shall not allow any part of the Site to become littered with trash and/or waste material, and shall maintain the same in a neat and orderly condition throughout the performance of the Works.

Daily accumulations of solid waste material which have been in contact with contaminated materials, such as discarded safety equipment, debris and rubbish, shall be collected and properly containerized for disposal.

Non-contaminated solid waste materials from the Site offices, lunch room and security office shall be segregated from contaminated solid wastes removed from the work areas.

Non-contaminated solid waste materials shall be removed from the Site in a timely manner or as directed by the Engineer such that accumulation of waste materials at the Site is minimized. Greasy or oily rags or materials subject to spontaneous combustion shall be deposited and kept in approved receptacles for disposal.

On or before the completion of the Works, the Contractor shall carefully clean out all structures including pits, chambers and conduits and shall tear down and remove all temporary structures and facilities provided by him and shall remove rubbish of all kinds from any of the grounds which have been occupied or used and leave them in first-class condition approved by the Engineer.

17. HEALTH AND SAFETY

The Contractor shall implement a health and safety program for all work to be performed at the Site. The Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29, Code of Federal Regulations, Parts 1910 and 1926

(29 CFR 1910 and 1926) shall provide the basis for the Contractor's health and safety program. The program shall also reflect the position of the USEPA and NIOSH regarding procedures recommended or required to ensure safe operations at sites containing hazardous or toxic materials.

Remedial construction activities have previously been conducted at the Site, and the Site has been covered with a minimum of six (6) inches of clean soil. Contact with contaminated materials during performance of the Works is therefore not anticipated at the Site. A list of known chemicals at the Site as determined by USEPA is provided in the Trust's Health and Safety Plan for the Site which is included in Attachment B.

The Contractor shall develop and implement a Site-specific Health and Safety Plan including an Emergency Contingency Plan prior to commencing any on-Site work. The development, implementation and maintenance of the Site-specific Health and Safety Plan is the Contractor's sole responsibility. The Contractor shall submit the Site-specific Health and Safety Plan to the Engineer for review within seven (7) calendar days of the date of the Notice to Proceed.

18. MEASUREMENT AND PAYMENT

A. BONDS

Payment for bonds will be made at the lump sum price stipulated in the Schedule of Prices for Item A-1, which price and payment shall be full compensation for furnishing all bonds required by the Contract Documents.

B. INSURANCE

Payment for insurance will be made at the lump sum price stipulated in the Schedule of Prices for Item A-2, which price and payment shall be full compensation for furnishing all insurance required by the Contract Documents and as required by Federal, State and local agencies having jurisdiction over the Works.

C. MOBILIZATION AND PROJECT STARTUP

Payment for mobilization and project startup will be made at the lump sum price stipulated in the Schedule of Prices for Item A-3, which price and payment shall be full compensation for movement of all equipment, materials, plant and personnel to the Site and within the Site during performance of the Works; provision of all necessary permits; provision of all Contractor required facilities; provision of all required utilities; construction of access roads to work areas, including detours, where required; and all other miscellaneous items for which separate payment is not provided under other Items.

END OF SECTION

SECTION 01300 - SUBMITTALS

1. GENERAL

Unless otherwise specified, drawings, product data and other technical information specified to be submitted by the Contractor to the Engineer shall be submitted in triplicate, consisting of one original and two copies. Copies shall be legible and shall clearly show all information contained on the original. Where Section 01300 or other requirements of the Project Specifications specify that submittals shall be prepared and sealed by a professional engineer, such professional engineer shall be licensed in the State of Ohio.

Where submittals are to be reviewed and approved by the USEPA and/or OEPA, final approval of such submittals and the schedule of any work upon which such approval is dependent are subject to review times of the USEPA.

2. CONTRACTOR'S CONSTRUCTION SCHEDULE

Within seven (7) calendar days of the date of Notice of Award and prior to commencing the Works at the Site, the Contractor shall submit a detailed construction schedule to the Engineer for review and approval. The Contractor's construction schedule shall show all activities required for construction of the Works in accordance with the construction schedule issued by the Engineer and identified in Section 01010 of the Project Specifications.

The schedule shall clearly show the proposed sequencing of the Works and the coordination of interrelated work activities and items. The proposed progress of the Works shall be shown on a weekly basis. The schedule shall, as a minimum, include each item of work identified in the Schedule of Prices as a work activity and identify the proposed start and completion date for each activity. The schedule shall be of sufficient detail to permit cross-referencing of items identified in other submittals. As a minimum, the schedule shall identify on a weekly basis: the size of the work force, anticipated man hours by trade, the type of equipment, the equipment hours for each type of equipment and demobilization. Actual progress of each activity of the Works shall be compared with progress indicated on the Contractor's Construction Schedule no less than once every month by the Contractor and such comparison shall be submitted to the Engineer for review.

If the Contractor believes it necessary or advantageous to change sequence of activities shown on the approved Contractor's construction schedule, he shall submit proposed revisions to the Engineer for approval. No change shall be made in order in which work activities are being performed until the Engineer's written approval for the revised schedule has been obtained.

3. CONSTRUCTION PROGRESS REPORTS

The Contractor shall submit weekly progress reports in a form acceptable to the Engineer indicating actual progress made the preceding week, showing cumulative progress toward scheduled completion, expressed as a percentage, of all items in the Contractor's construction schedule, number of workers and hours worked on the Site for each trade and the number and type of equipment and hours worked on the Site during the previous week. An updated schedule showing work tasks completed, any projected difficulties which may delay or alter the schedule and any modifications to the original schedule shall be included with the weekly progress report.

4. CONSTRUCTION QUALITY CONTROL LOGS

The Contractor shall record his daily quality control activities on a "Daily Construction Quality Control Report". All Site activities, Site inspections, submittals made by material suppliers and field testing of materials shall be recorded along with any unacceptable Site occurrences on a daily basis. The Daily Construction Quality Control Report shall be signed and reviewed by the Contractor and the Engineer at the completion of each work day. Attachment C presents an example of a typical Daily Construction Quality Control Report. The Contractor may use alternative forms providing the same information subject to the prior approval of the Engineer.

5. CONTRACTOR'S DRAWINGS

If specified, detailed drawings of material and structures to be supplied by the Contractor shall be prepared from typical details shown on "Approved for Construction" drawings and/or from specified requirements. Contractor's drawings shall be submitted to the Engineer for review and will be returned to the Contractor stamped and noted as being "Reviewed" by the Engineer before fabrication or construction commences.

All submittals shall bear the Contractor's approval stamp prior to their initial submission to the Engineer and shall be signed, dated and identified as to the specific project.

Dimensions shown on the Contractor's drawings shall conform with actual measurements of existing and/or completed associated structures and affected adjacent work.

Contractor's drawings shall indicate materials, methods of construction attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of the Works. Where articles or equipment attach or connect to other articles or equipment, the Contractor shall indicate that such work has been coordinated, regardless of the Project Specification Section under which the adjacent items will be supplied and installed. Contractor's drawings shall be cross-referenced to appropriate Project Specifications and Drawings.

The Contractor shall make changes in Contractor's drawings as the Engineer may require, consistent with the Contract Documents. When resubmitting drawings the Contractor shall notify the Engineer in writing of any revisions other than those requested.

Adjustments made on the Contractor's drawings by the Engineer are not intended to change the Contract Price. If adjustments affect the value of the Works, the Contractor shall state such in writing, as specified elsewhere in the Contract, to the Engineer prior to proceeding with the Works.

The Contractor shall submit three legible copies of drawings for each requirement requested in the Project Specifications and as the Engineer may reasonably request.

One print of each drawing will be returned stamped and noted as "Reviewed" by the Engineer, or marked up to show the Engineer's required modifications and noted as "Revise and Re-Submit". The Contractor shall correct and resubmit drawings as often as necessary until the Engineer returns drawings without marked modifications and stamped "Reviewed".

The Contractor shall not be relieved of any part of his responsibilities for correctness of his drawings or adequacy of his design bearing the Engineer's "Reviewed" stamp. The Engineer's

review is for the sole purpose of ascertaining conformance with general design concepts, and in no way constitutes approval of the detail design inherent in the Contractor's drawings, responsibility for which remains with the Contractor.

6. MANUFACTURER'S PRODUCT DATA

Where specified or as requested by the Engineer, the Contractor shall submit to the Engineer duplicate copies of product data sheets or brochures for requirements requested in the Project Specifications and as the Engineer may reasonably request where shop drawings will not be prepared due to standardized manufacture of product.

The Contractor shall also submit to the Engineer prior to a materials arrival on Site, Material Safety Data Sheet for all materials brought to the Site requiring special handling procedures.

7. RECORD DRAWINGS

After award of Contract, the Engineer will provide an extra set of Drawings to the Contractor for the purpose of maintaining record drawings during performance of the Works.

The Contractor shall accurately and neatly record deviations from the Contract Documents caused by Site conditions and changes ordered by the Engineer, on the extra set of Drawings.

Locations of concealed components of mechanical and electrical services also shall be recorded on the extra set of Drawings.

Such drawings shall be identified as "Record Drawings" and shall be maintained in new condition and made available for inspection on the Site, as required by the Engineer.

On completion of the Works and prior to final inspection, the Contractor shall submit record drawings and documents to the Engineer.

8. SUBMITTALS FOR WEEKLY MEETINGS

The following are minimum required submittals to be provided to the Engineer at least 24 hours prior to scheduled weekly meetings:

1. updated job progress schedules detailing all activities. Include review of progress with respect to previously established milestones and schedules, major problems and action taken, injury reports, equipment breakdown and all bulk material removal and all air sampling results conducted by the Contractor;

2. copies of all transport manifests and trip tickets for all materials delivered to the Site during the Works; and

3. weekly copies of work-site entry logbooks with information on worker and visitor access.

10. MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for work under Section 01300.

END OF SECTION

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1. SITE OFFICES

During the performance of the Works, the Contractor shall provide and maintain separate and suitable offices at the Site for the Contractor.

The offices shall be located on the Site as shown on the Drawings or as directed by the Engineer.

2. EMERGENCY FIRST AID FACILITY

The Contractor shall provide, operate and maintain an emergency first aid facility which complies with the requirements of 29 CFR 1910.141. This facility may be housed within or adjacent to the Contractor's Site office. The Emergency First Aid Facility shall have available, as a minimum, the following equipment and supplies:

1. stretcher;
2. one set of crutches;
3. two fire extinguishers meeting the requirements of 29 CFR 1910.307;
4. one cot;
5. blankets and towels as required;
6. first aid kit containing medications appropriate for the initial treatment of burns, abrasions and fractures; and
7. one hand-held area siren/alarm.

3. PORTABLE TOILETS

The Contractor shall provide a minimum of one (1) portable sanitary toilets. The Contractor shall remove and dispose of sanitary wastes off Site on a periodic basis as required and in accordance with applicable laws and regulations.

4. PARKING

Should off-road parking be required, the Contractor shall supply parking areas at its own expense.

The Contractor shall locate parking in a designated on-Site clean zone as shown on the drawings such that parked vehicles do not interfere with Site operations and/or adjacent facilities. The Contractor shall provide two parking spaces for the use of the Engineer.

5. ACCESS ROADS

The Contractor will be permitted reasonable use of all existing access roads at the Site subject to the following conditions:

1. traffic on roads or parking areas shall not be interrupted or interfered with at any time; and

2. all vehicles comply with weight and load size restrictions where applicable.

Maintenance of access roads during performance of the Works shall include provision of all signs, barricades, gatepersons, flagpersons, flares and lights and other measures required. The Contractor shall provide flag persons for all construction traffic crossing or entering local traffic routes or otherwise required on the Site.

The Contractor shall take appropriate measures to prevent contamination of access roads and other clean areas during remedial activities. Debris or material on access roads which is suspected to be contaminated as determined by the Engineer shall be scraped up, transported and placed by the Contractor into a designated area as directed by the Engineer. The Contractor shall repair any wear and tear and damages to access roads arising out of the Contractor's construction operations.

6. TELEPHONE

The Contractor shall provide and pay for telephone service at the Contractor's Site office for use by the Contractor. A radio telephone service will not be acceptable.

7. ELECTRICAL POWER

The Contractor shall provide and pay for all power required for the performance of the Works, including provision of all necessary power distribution system and special connections to existing power system.

8. POTABLE WATER

The Contractor shall provide and pay for all necessary potable water, potable water holding tanks, distribution system and connections to a potable water supply. The Contractor shall maintain an adequate supply of potable water at the Site at all times.

9. TEMPORARY HEATING

The Contractor shall provide temporary heating, covering and enclosures as necessary to protect all work and material against damage by dampness and cold and to facilitate completion of the Works. The Contractor shall supply all fuel, equipment, materials and attendance required for temporary heating.

The Contractor shall be responsible for damage to the Works due to failure in providing adequate heat and protection during construction.

10. GUARDRAILS AND BARRICADES

The Contractor shall provide, erect and remove barricades and guardrails as required by laws and codes for the performance of the Works. Guardrails and barricades shall be erected in a timely manner around all excavations, open trenches and active work areas as shown on the Drawings and as directed by the Engineer. All excavations and work activity adjacent to Municipal, County or State roadways shall be guarded and barricaded to the standards and requirements of the respective Municipal, County or State maintenance authority as a minimum.

The Contractor shall ensure that all open excavations are flagged and barricaded prior to leaving the Site at the end of each work day.

11. SITE SECURITY

The Contractor shall provide Site security which as a minimum, shall include the following:

1. Limit access to the Site to authorized vehicles and personnel only;

2. provide a list of authorized personnel and the name of their employer to the Engineer;

3. maintain a security log in which documentation is provided of all Contractor personnel, deliveries and any security incidents. This log shall include the date, name, address, company, time in and time out for each Contractor personnel. If unauthorized personnel are observed on the Site, the appropriate law enforcement officials shall be called upon for proper legal actions; and

4. check that the perimeter fencing and all warning signs are secure and intact on a daily basis. If deterioration of the Site security fence is observed, or if warning signs are found to be removed, the situation shall be brought to the attention of the Engineer and shall be immediately rectified by the Contractor.

All Site access gates shall be locked at all times when there are no on-Site activities and shall be maintained in a closed position during active construction activities.

12. DUST AND PARTICULATE CONTROL

The Contractor shall supply and maintain dust control measures such as water misting systems as required to prevent generation of dust during performance of the Works. Water used for dust control shall be potable water, or treated water from the Trusts on-Site groundwater treatment facility, if available.

13. SOIL EROSION AND SEDIMENT CONTROL

The Contractor shall implement a soil erosion and sediment control plan as specified and as shown on the Drawings. All collected sediments shall be evenly spread on Site as directed by the Engineer. The Contractor shall maintain soil erosion and sediment control facilities during construction.

The Contractor shall stabilize the disturbed soils as quickly as practical. Stripping of vegetation, regrading or other development shall be done in such a way as to minimize erosion.

The Contractor shall remove accumulated sediment resulting from construction activity from all adjoining surfaces, drainage systems and watercourses and repair any damage caused by soil erosion and/or sedimentation as directed by the Engineer.

14. PROTECTION OF MONITORING WELLS AND PIEZOMETERS

Monitoring wells and piezometers are located in the working area. The Contractor shall protect monitoring wells and piezometers and shall take all necessary precautions to avoid damage to these monitoring wells and piezometers. Any monitoring well or piezometer damaged by the Contractor during performance of the Works shall be repaired or replaced by the Contractor, as directed by the Engineer, at no additional cost to the Trust.

15. MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for work under Section 01500.

END OF SECTION

SECTION 01700 - PROJECT CLOSEOUT

1. DEMOBILIZATION

The Contractor shall remove all equipment and materials from the Site on completion of the Works. All Contractor generated debris shall be removed and disposed of to the satisfaction of the Engineer and the Contractor shall leave the Site in a condition suitable to the Trust and other property owners where applicable and as approved by the Engineer.

Parking and temporary construction areas shall be regraded to prevent ponding of water and restored to their original condition to the satisfaction of the Engineer and all other restoration shall be completed by the Contractor to the Engineer's approval.

2. MEASUREMENT AND PAYMENT

A. DEMOBILIZATION AND PROJECT CLOSEOUT

Payment for demobilization and project closeout will be made at the lump sum price stipulated in the Schedule of Prices for Item B-1, which price and payment shall be full compensation for removal of all temporary fencing; disposal of all debris from the Site; removal of all equipment and materials from the Site; regrading and restoration of disturbed or areas affected by the performance of the Works; final cleaning within all structures constructed by and used by the Contractor for performance of the Works; and all other miscellaneous items for which separate payment is not provided under other Items.

END OF SECTION

SECTION 02264 - LOAM FILL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included

Work of this Section consists of supply and installation of loam fill as specified and as shown on the Drawings.

1.02 QUALITY ASSURANCE

The Contractor shall construct the loam fill layer to the lines and grades shown on the Drawings. A tolerance of plus or minus 0.1 foot shall be allowed on the finished elevations of the loam layer.

If in the opinion of the Engineer , materials from the proposed source do not meet, or cannot reasonably be processed to meet specified requirements, the Contractor shall obtain an alternate source or demonstrate that material from the source in question can be processed to meet specified requirements.

Should a change of material source be proposed during the Works, the Contractor shall advise the Engineer sufficiently in advance of a proposed change to allow sampling and testing to be completed by the Engineer.

Acceptance of a material at source or failing conduct of sampling and testing at source by the Engineer does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.

The Contractor shall bear the cost of sampling and testing of materials which fail to meet specified requirements.

The Contractor shall provide the Engineer access to the source and processed material for the purposes of sampling and testing at least 14 days prior to delivery to the Site.

1.03 SUBMITTALS

A. General

The Contractor shall comply with Section 01300.

B. Source of Materials

The Contractor shall submit to the Engineer the name and location of the proposed source of loam fill to be incorporated into the Works at least 14 days prior to commencing production, including any change in material source during performance of the Works.

C. Geotechnical Data

The Contractor shall submit to the Engineer grain size distribution curves for loam at least 14 days prior to commencing production from any source.

1.04 PRODUCT DELIVERY AND HANDLING

A. Delivery

The Contractor shall handle and transport materials at all times in a manner and with equipment that will avoid segregation and contamination by any deleterious material.

B. Storage and Handling

When necessary, as approved by the Engineer, the Contractor shall stockpile material on the Site in approved locations designated by the Engineer.

The Contractor shall ensure provision of stockpile sites that are level, well drained, free of foreign materials and of adequate bearing capacity to support the weight of the materials to be placed thereon. Stockpiles shall be either far enough apart or separated by substantial dividers to prevent intermingling.

The Contractor shall provide and maintain access to stockpile areas.

Stockpiled material shall be covered with approved polyethylene sheeting of minimum 6 mil thickness to withstand adverse weather, wind and other detrimental forces. Covering shall provide total protection of stockpiled material from rain and other adverse weather effects.

Temporary stockpile slopes shall be maintained not steeper than 1.5 horizontal to 1 vertical.

Stockpiles shall not block natural drainage of surrounding area, and area surrounding stockpiles shall be maintained in neat and tidy condition.

The Contractor shall construct and maintain temporary stockpile areas in a properly drained and graded condition so that natural drainage of surrounding area will not be restricted and the area will be free of depressions that will pond or collect water. All surface water shall be diverted around and away from stockpile areas.

1.05 JOB CONDITIONS

A. Existing Conditions

During all Site activities, the Contractor shall maintain all the existing structures designated to remain in service. Any structure damaged due to the Contractor's operations shall be repaired immediately by the Contractor as specified by the Engineer at no additional cost to the Trust.

B. Environmental Requirements

(1) General

The Contractor shall suspend operations whenever climatic conditions, as determined by the Engineer, are unsatisfactory for placing material to the requirements of this Section.

After occurrence of heavy rains, equipment shall not be operated on previously placed material or on approved excavations until the material has dried sufficiently to prevent rutting.

Loam shall not be placed in a frozen state or against frozen excavations or previously placed frozen material. Loam shall not be placed on snow, ice, water or other objectionable material or on improperly prepared excavations or previously improperly placed material.

Where excavations or previously placed material have been softened or eroded, the Contractor shall remove soft and yielding material or otherwise objectionable or damaged areas and replace with compacted fill as specified.

(2) Dust Control

During all work activities related to construction of loam layer, the Contractor shall keep the Site, adjacent areas and haul routes free from dust and airborne particulate matter as specified in Section 01500.

(3) Dewatering

The Contractor shall keep the Works free of water in accordance with Section 01500.

C. Protection

When placing and compacting loam, the Contractor shall not disturb satisfactorily placed material or structures already in place.

Surfaces of loam shall be crowned or sloped with grades shown on the Drawings so that surface will drain freely.

The Contractor shall not route or permit traffic to travel over in-place loam without approval from the Engineer.

The Contractor shall maintain and protect from damage all utilities, structures, monitoring wells, piezometers, manholes, gravel access roads, and security fences remaining in service. In the event of disturbance or damage of any utility or structure the Contractor shall immediately notify the Engineer.

The Contractor shall protect existing buildings and surface features which may be affected while work is in progress.

The Contractor shall protect existing buildings and structures where temporary unbalanced earth pressures are liable to develop on walls or other structures utilizing bracing, shoring or other approved methods to counteract unbalance.

Placement, haulage or any other construction equipment that may cause damage to loam or other layer, shall at no time operate upon such layers.

Immediately prior to temporary suspension of fill operations, the Contractor shall roll or grade filled surfaces under construction to grades specified so as to leave the surface free of ruts, depressions or areas that will pond or collect water.

D. Sequencing and Scheduling

The Contractor shall sequence delivery of materials to the Site in a manner to minimize stockpiling and in any event the Contractor shall obtain approval from the Engineer to stockpile.

PART 2 - PRODUCTS

2.01 LOAM FILL

Fill to be used for the 12 inches of loam final cover shall be clean, well graded imported sandy loam soil material free of unsuitable material as specified above. The maximum aggregate size shall be 2 inches measured through any axis and D_{10} (particle size which 10 percent of particles by mass are smaller than) shall be less than 0.01 mm. The permeability of the sandy loam shall not exceed 1×10^{-4} cm/s.

Unsuitable materials shall mean materials which are not approved for use as determined by the Engineer and shall include the following:

1. frozen material or material containing snow or ice;
2. clays which are classified as inorganic clays of high plasticity in accordance with ASTM D2487;
3. soft and/or organic clays and silts of low strength;
4. frost susceptible silts or clays;
5. swelling clays;
6. trees, stumps, branches, or any other wood or lumber;
7. wire, steel, cast iron, cans, drums or any other foreign materials; and
8. materials containing hazardous or toxic constituents at hazardous or toxic concentrations.

PART 3 - EXECUTION

3.01 PREPARATION

The Contractor shall advise the Engineer in advance of placement of loam fill operations to enable the Engineer to take original cross-sections.

The Contractor shall ensure that areas to receive loam fill are free from debris, snow, ice, water or frozen ground.

3.02 INSPECTION

The Contractor shall obtain approval from the Engineer for material to be placed in the Works and for surfaces or previously placed material prior to placing loam fill.

3.03 INSTALLATION

A. Placing

The Contractor shall place loam fill continuously and in uniform layers not exceeding twelve (12) inches compacted thickness unless specified otherwise, up to grades shown on the Drawings. The Contractor shall compact each layer before placing succeeding layer as specified. Loam fill shall be placed without segregating material.

B Compaction

The Contractor shall compact each layer of loam fill, placed as specified, to achieve at least 90% of maximum dry density determined in accordance with ASTM D698 up to the elevations at which the requirements for landscaping apply, and the thickness of each layer shall not exceed 12 inches.

The Contractor shall apply water as is necessary during compaction to obtain specified density. If fill is excessively moist, the Contractor shall aerate with suitable equipment and methods until moisture content is corrected. In areas not accessible to rolling equipment, loam fill shall be compacted to specified density with mechanical tampers approved by the Engineer.

The type, size and efficiency of compaction equipment shall be approved by the Engineer and shall be capable of achieving the specified degree of compaction. When operating equipment adjacent to structures, the Contractor shall exercise care so as not to cause damage or displacement to the adjacent structure.

Whenever use of rollers is not practical, the Contractor shall compact the loam fill using hand-operated power tampers or other compaction equipment approved by the Engineer to achieve the specified degree of compaction for rollers.

3.04 FIELD QUALITY CONTROL

A. Quality Control by Engineer

The Engineer will select samples of uncompacted fill intended for the Works and samples of compacted fill in the Works. The Engineer will perform tests in the field and in the laboratory on samples of uncompacted and compacted fill to determine if materials meet the specification and except as otherwise specified, tests will be at the expense of the Trust. Copies of test reports will be supplied to the Contractor on request.

B. Frequency of Testing by Engineer

A minimum of one density test and one moisture content determination will be made for each 2,000 yd^3 placed, or more frequent as determined by the Engineer.

A minimum of one particle size analysis will be made for any change in material being used in the fill.

The method used and the frequency of such tests may be determined by the Engineer. When the Contractor disputes the results of any test, further tests will be taken but the decision to use any test method other than the one chosen will be made only by the Engineer.

C. Methods of Testing by Engineer

Maximum density of loam fill will be determined in accordance with ASTM D698.

Bulk density will be determined in the field in accordance with ASTM D1556 or with ASTM D2167 or with ASTM D2922, whichever is most suitable to obtain representative density of soil tested.

Particle size analysis will be performed in accordance with ASTM D422 or ASTM D1140, whichever is appropriate to material being tested.

Moisture content of loam fill in place will be determined in accordance with ASTM D3017.

D. Failure to Meet Specified Requirements

When tests indicate that the required degree of compaction is not achieved or cannot be obtained with the equipment in use or the procedure being followed, the Contractor shall modify his operations so that the equipment and procedures will produce the required results.

The generality of the foregoing does not preclude the Contractor employing other measures to achieve specified results including but not necessarily limited to additional passes of compaction equipment, additional ballast, removing and replacing material, reduction in lift thickness or wetting or drying material.

3.05 ADJUSTMENT AND CLEANING

The Contractor shall finish surfaces to established grade but not uniformly high or low. Surface irregularities shall be corrected by loosening and adding or removing material until surface is within specified grade.

The Contractor shall clean and reinstate work areas and areas affected by equipment outside areas specified to be excavated, to specified restoration condition.

Upon completion of filling, the Contractor shall remove all excess material and debris from work areas, roads, ditches and shall leave ditches in a properly graded condition sloped as required to permit proper drainage and free of depressions that will pond or collect water or debris that will restrict flow.

All stockpiled material designated to remain at the Site shall be adequately covered and erosion control measures implemented as approved by the Engineer.

PART 4 - MEASUREMENT AND PAYMENT

4.01 LOAM FILL

A. Measurement

Measurement for loam fill will be made at the actual number of cubic yards of loam soil final cover installed as measured in place by the Engineer, calculated using the average end area method from cross-sections taken prior to and following completion of loam fill operations.

B. Payment

Payment for the quantity determined above will be made at the unit price per cubic yard stipulated in the Schedule of Prices for Item C-1 which price and payment shall be full compensation for the supply of all labor, plant, materials and equipment required to construct loam fill; supply and installation of 12-inch soil layer; provision and maintenance of soil erosion and sediment control facilities; dust control; and all other miscellaneous items for which separate payment is not provided under other Items.

END OF SECTION

SECTION 02900 - LANDSCAPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included

Work of this Section consists of supply and installation of landscaping as specified and as shown on the Drawings.

The work includes, but is not necessarily limited to, the following:

1. supply and installation of topsoil;
2. supply and installation of fertilizer, seed and mulch;
3. restoration of existing grassed areas which have been damaged during the prosecution of the Works; and
4. maintenance of vegetative cover.

1.02 QUALITY ASSURANCE

A. General

Packaged standard products shall be supplied with manufacturer's certified analysis. For other materials, the Contractor shall provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Analytical Chemists, wherever applicable or as further specified.

B. Supplier-Installer Qualifications

The Contractor shall employ only experienced personnel who are familiar with the required work.

C. Tolerances

The Contractor shall construct the topsoil layer to the lines and grades shown on the Drawings.

1.03 SUBMITTALS

A. General

The Contractor shall comply with Section 01300.

B. Source of Materials

The Contractor shall submit to the Engineer the name and location of the proposed source of topsoil to be incorporated into the Works at least 14 days prior to commencing production including any change in material source during performance of the Works.

C. Seed Certification

The Contractor shall submit certificates from seed vendors stating botanical and common name, percentage by weight and percentage of purity, germination, and weed seed for each species.

1.04 PRODUCT DELIVERY AND HANDLING

A. Delivery

Grass seed shall be delivered in original containers showing:

1. analysis of seed mixture;
2. percentage of pure seed;
3. year of production;
4. net weight;
5. date when tagged and location;
6. percentage germination; and
7. name and address of distributor.

Mulch shall be delivered in moisture-proof containers showing manufacturer, content and net weight.

Fertilizer and lime shall be delivered in waterproof bags showing weight, analysis and name of manufacturer.

Topsoil shall be delivered in vehicles free of deleterious materials.

B. Storage and Handling

Materials shall be stored in accordance with manufacturer's instructions and in a manner to prevent damage or deterioration.

Seed which has become wet, mouldy or otherwise damaged in transit or storage shall be removed from the Site.

Seed, fertilizer and lime shall be stored in weatherproof containers.

Equipment and methods of handling material shall be such as to prevent contamination by foreign material, intermixing, segregation and breakage.

Stockpiles of topsoil shall be situated so as not to obstruct natural drainage or cause off-Site environmental damage.

The Contractor shall provide and maintain access to stockpile areas, shall stockpile materials in a manner to prevent segregation and upon completion of the Work shall

leave stockpile sites in a tidy, well drained condition, free of standing surface water and stockpiled material.

All stockpiles on the Site shall be in approved locations designated by the Engineer.

1.05 JOB CONDITIONS

A. Environmental Requirements

Materials shall not be placed over snow, ice or standing water.

The Contractor shall not apply seed slurry when wind conditions are such that material would be carried beyond designated area or that materials would not be uniformly applied.

B. Protection

The Contractor shall protect all structures, fences, monitoring wells, piezometers, manholes, access roads, and landscaped areas from damage during performance of the Works.

C. Sequencing and Scheduling

The Contractor shall sequence and schedule his activities to ensure permanent vegetative cover shall be accomplished within 10 days after loam fill has been completed.

Fertilizer shall be applied at least one week after application of lime.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil

Topsoil shall be imported, friable and loamy, non-swelling compatible material with permeability of 1×10^{-4} cm/sec or less, and capable of supporting vegetative growth.

Topsoil shall be free of objectionable weeds and other unsuitable materials, contain no toxic substances that may be harmful to plant growth, pH in range 6.0 to 7.0, and conductivity less than 0.5 millimhos per centimeter, and a minimum organic matter content of 2.75 percent (organic matter content may be raised by additives as approved by Engineer).

Topsoil shall be obtained from an area free from growth of Quackgrass, Japanese Clover, Horsetail, Morning Glory, and other persistent weed plants. Topsoil shall not be obtained from swampy areas and shall not be infested with seeds of noxious weeds.

Unsuitable materials shall mean materials which are not approved for use as determined by the Engineer, and shall include the following:

1. frozen material or material containing snow or ice;

2. clays which are classified as inorganic clays of high plasticity in accordance with ASTM D2487;

3. soft and/or organic clays and silts of low strength;

4. frost susceptible silts or clays;

5. swelling clays;

6. rock and lumps of material with dimensions greater than 1 inch;

7. trees, stumps, branches, or any other wood or lumber;

8. wire, steel, cast iron, cans, drums or any other foreign materials; and

9. material containing hazardous or toxic constituents at hazardous or toxic concentrations.

B. Fertilizer

Fertilizer for topsoil enhancement shall be Grade 10-20-20.

Fertilizer for hydraulic seeding shall be complete synthetic, slow release fertilizer with maximum 35 percent water soluble nitrogen. Fertilizer ratio and application rate shall be based on soil analysis and shall be determined by the Contractor and approved by the Engineer.

C. Lime

Lime shall be ground agricultural limestone containing minimum 85 percent of total carbonates graded in accordance with the following requirements:

Percent Passing by Weight	*Sieve Size*
90%	No. 18
50%	No. 120

D. Grass Seed

Grass seed shall be obtained from an approved seed house and have germination of 75 percent and minimum purity of 97 percent.

E. Mulch

Mulch materials shall be wheat straw free from weeds and all other foreign matters. Mulch shall be used dry.

F. Water

Water shall be potable and free of impurities that would inhibit germination.

G. Erosion Control Agent

Erosion control agent shall be an approved water dilutable liquid dispersion containing thermoplastic resin containing no components toxic to plant life.

2.02 MIXES

Grass seed mixture and seeding rate shall comply with the following:

1. Kentucky Bluegrass - 80 lb/acre
2. Creeping Red Fescue - 40 lb/acre
3. Perennial Ryegrass - 15 lb/acre
4. Seed Rate - 135 lb/acre

PART 3 - EXECUTION

3.01 PREPARATION

Immediately prior to placing topsoil, the existing surface shall be scarified to provide a good bond with the topsoil.

Unsuitable material and soil contaminated with toxic materials shall be removed and disposed of as directed by the Engineer.

All surfaces shall be graded to eliminate uneven areas and low spots and to ensure positive drainage.

3.02 INSPECTION

The Contractor shall obtain approval of surfaces from the Engineer prior to topsoiling and seeding.

3.03 INSTALLATION

A. Topsoil

Topsoil shall only be applied when it is dry enough to work without damaging the soil structure. A uniform application to the depth required to achieve a 6-inch thick (settled) layer shall be placed. All stones larger than two inches across any axis, other debris and unsuitable material shall be removed.

B. Fertilizer and Lime

Limestone and fertilizer shall be applied according to soil test or as follows:

1. Lime: 2 tons per acre
2. Fertilizer: 300 lbs. per acre, 10-20-20 or equivalent

Lime shall be applied at specified rate determined by the Contractor from soil sample tests to ensure that topsoil is within specified pH range.

The Contractor shall mix lime into full depth of topsoil prior to application of fertilizer.

The Contractor shall spread fertilizer uniformly over entire area of topsoil at the specified rate and shall mix fertilizer thoroughly to full depth of topsoil.

C. Fine Grading

The Contractor shall fine grade the surface free of humps and hollows to eliminate rough spots and low areas and to ensure positive drainage.

The Contractor shall prepare a loose friable bed by means of cultivation and subsequent raking.

The surface shall be rolled to consolidate topsoil for areas to be seeded leaving surface smooth, uniform, firm against deep foot printing and with a fine loose texture.

D. Seeding

The Contractor shall apply seed when winds do not exceed 5 mph using equipment suitable for area involved to the approval of the Engineer.

Quantities of material shall be measured by weight or weight-calibrated volume measurement.

The Contractor shall charge the seeder with water, mulch, seed, fertilizer and mix thoroughly. Fertilizer rate shall be based on soil analysis by the Contractor. Material shall be pulverized where necessary and added slowly into seeder under agitation.

Erosion control agent shall be added into seeder and mixed thoroughly to complete the seeding slurry.

The Contractor shall apply complete seeding slurry at the following rate per acre:

1.	Seed (mixture as specified)	135 lbs
2.	Mulch	900 lbs
3.	Erosion Control Agent	270 lbs
4.	Water, minimum	2600 gallons

Applications shall be blended into existing, adjacent grass areas to bond new growth to existing, adjacent areas or to previous applications to form uniform surfaces.

E. Maintenance

Soil shall be kept moist during germination period and grassed areas shall be adequately watered until accepted by the Engineer.

Water shall be applied to ensure moisture penetration of three to four inches. Sprinkling shall be controlled to prevent washouts.

Grass shall be cut when it reaches height of 2 1/2 inches and shall be cut to height of 1 1/2 inches. Clippings shall be removed.

Grassed areas shall be maintained free of pests and disease.

Herbicide shall be applied when it will not cause damage to new grass.

Seeded areas shall be fertilized one month after seeding.

Fertilizer shall be spread evenly and watered in well. Fertilizing shall be postponed until next spring if application falls within 4-week period prior to expected end of growing season in locality.

3.04 FIELD QUALITY CONTROL

Areas will be accepted by Engineer provided that:

1. seeded areas are properly established,

2. surface soil is free of eroded, bare or dead spots and 98 percent free of weeds,

3. no surface soil is visible when grass has been cut to height of 1 1/2 inches,

4. seeded areas have been cut at least twice, the last cut being carried out 24 hours prior to acceptance.

Areas seeded in the fall will be accepted in the following spring one month after start of growing season, provided acceptance conditions are fulfilled.

3.05 ADJUSTMENT AND CLEANING

The Contractor shall clean up immediately, soil, mulch or other debris spilled onto pavement or gravel access roads and dispose of deleterious materials.

The Contractor shall take precautions and prevent contamination by seeding slurry of gravel access roads, structures, signs, guardrails, fences, utilities or other surfaces not specified to be landscaped.

Where contamination occurs, the Contractor shall remove seeding slurry to satisfaction of, and by means approved by the Engineer.

PART 4 - MEASUREMENT AND PAYMENT

4.01 TOPSOILING

A. Measurement

Measurement for topsoiling will be made at the actual number of cubic yards of topsoil installed as measured in place by the Engineer, calculated using the average end area method from cross-sections taken prior to and following completion of topsoiling operations.

B. Payment

Payment for the quantity determined above will be made at the unit price per cubic yard stipulated in the Schedule of Prices for Item D-1 which price and payment shall be full compensation for the supply of all labor, plant, materials and equipment required for supply and installation of 6-inch topsoil layer, supply and installation of lime and fertilizer; testing of soils; dust control; and all other miscellaneous items for which separate payment is not provided under other Items.

4.02 SEEDING AND MULCHING

A. Measurement

Measurement for seeding and mulching will be made at the actual number of acres seeded and mulched as measured in place by the Engineer.

B. Payment

Payment for the quantity determined above will be made at the unit price per acre stipulated in the Schedule of Prices for Item D-2 which price and payment shall be full compensation for the supply of all labor, plant, materials and equipment required to establish grass growth; supply and installation of grass seed, fertilizer, erosion control agent, mulch and water; maintenance of vegetated areas until acceptance; soil erosion and sediment control; and all other miscellaneous items for which separate payment is not provided under other Items.

END OF SECTION

J

APPENDIX J

QUALITY ASSURANCE PROJECT PLAN

SITE COVER

REMEDIAL CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN SITE COVER

Summit National Superfund Site
Deerfield Township of Portage County, Ohio

MAY 1993

REF. NO. 2372 (48)

CONESTOGA-ROVERS & ASSOCIATES

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1.0 INTRODUCTION

1.1 BACKGROUND INFORMATION

The Summit National Superfund Site (Site) is located in Deerfield Township of Portage County, Ohio, at the intersection of Ohio Route 225 and U.S. Route 224, approximately 45 miles southeast of Cleveland, Ohio. The location of the Site is illustrated in Figure 1.1 of the Remedial Construction (RC) Work Plan.

The Site was originally used as a coal strip mine and contained a coal wash pond and coal stockpile, prior to its use by Donald Georgehoff, Summit National Services and/or Summit National Liquid Disposal Services for the operation of a hazardous waste treatment, recycling, storage and disposal facility.

Prior to implementation of remedial work activities, operations at the Site resulted in uncontrolled releases of hazardous materials. Subsequent Site investigations indicated that there was significant contamination in Site soils, and that groundwater contamination existed both on and off Site.

1.2 PURPOSE AND ORGANIZATION OF REPORT

This Remedial Construction Quality Assurance Project Plan (RC QAPP) presents the quality assurance program to be implemented

during construction of the final Site soil cover at the Site, as detailed in the RC Work Plan, to ensure that the final Site cover is constructed to meet or exceed all design criteria, plans and specifications. This report is organized as follows:

i) Section 1.0 presents the background information, purpose and organization of the report;
ii) Section 2.0 provides a description of the project;
iii) Section 3.0 outlines the project organization and responsibilities;
iv) Section 4.0 presents the personnel qualifications requirements;
v) Section 5.0 presents the project meeting requirements;
vi) Section 6.0 describes the inspection and testing activities required to ensure that construction and materials comply with all design specifications and plans; and
vii) Section 7.0 describes documentation requirements of construction quality assurance (CQA) activities.

Construction specifications for the final Site cover are presented in Appendix I of the RC Work Plan, and also on the "F" Construction Drawings.

2.0 PROJECT DESCRIPTION

The fourth and final phase of the Remedial Action (RA) to be implemented at the Site, as required by the Consent Decree, is the construction of a final permeable Site cover at the Site, and associated activities. As detailed on Figure 15.1 of the RC Work Plan, the final Site cover must be completed within 8 1/2 months of completion of the soil removal and treatment phase of the RA. Installation of the final Site cover phase of the RA consists of the activities detailed in Section 9.1 of the RC Work Plan.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

It is anticipated that the remedial construction activities will be initiated by Conestoga-Rovers & Associates (CRA) on behalf of the Summit National Facility Trust (SNFT). The project organization chart is presented in Figure 3.1. A brief description of the duties of the key personnel are presented below.

3.1 PROJECT MANAGER

The duties of the Project Manager are as follows:

i) provides overall project management;

ii) ensures professional services by CRA are cost effective and of highest quality;

iii) ensures all resources of CRA are available on an as-required basis;

iv) participates in key technical negotiations with United States Environmental Protection Agency (USEPA) and Ohio Environmental Protection Agency (OEPA); and

v) provides managerial and technical guidance to CRA's Project Coordinator.

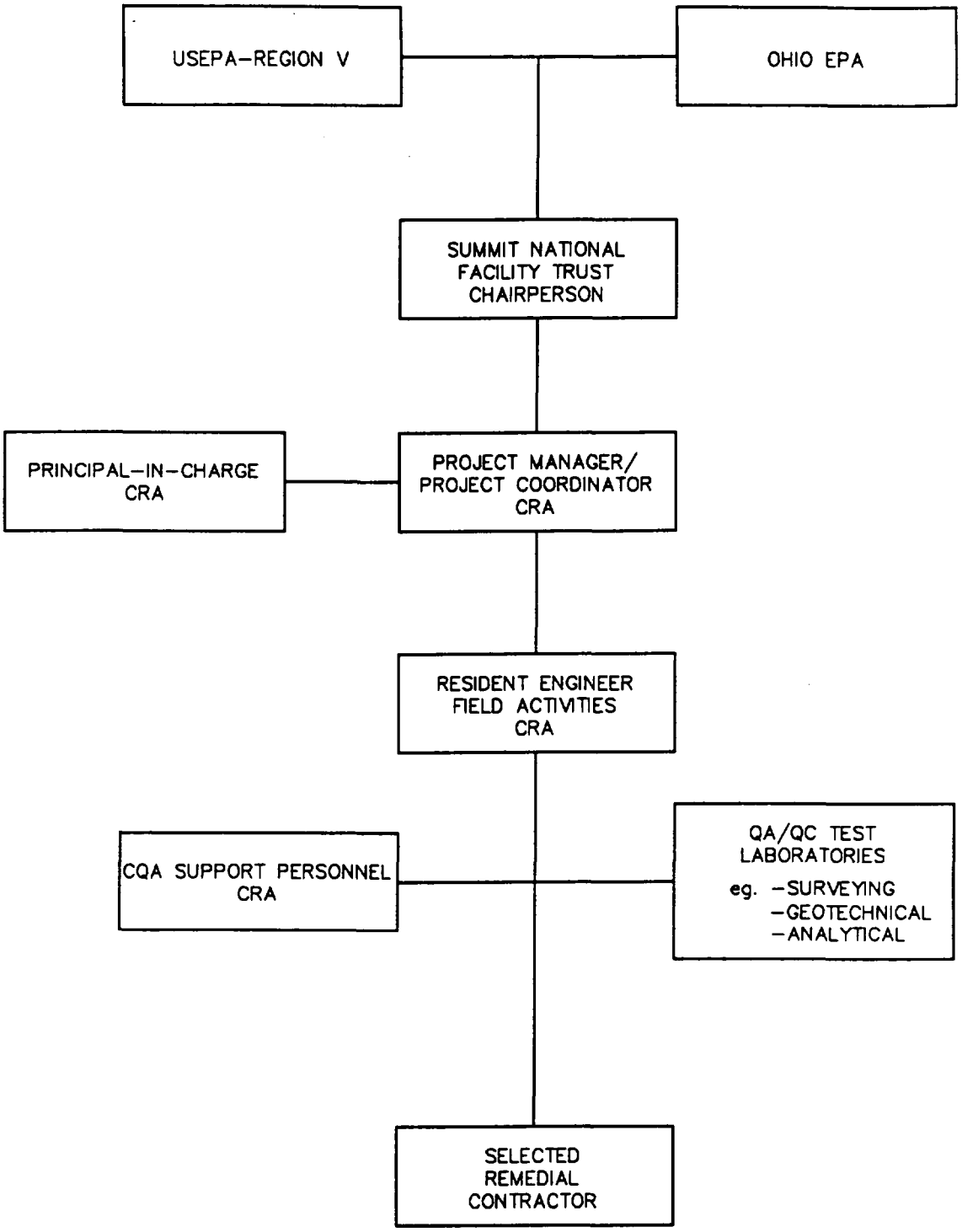

figure 3.1

PROJECT ORGANIZATION
REMEDIAL CONSTRUCTION ACTIVITIES
SUMMIT NATIONAL SUPERFUND SITE
Deerfield Township of Portage County, Ohio

CRA

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3.2 PROJECT COORDINATOR

The duties of the Project Coordinator are as follows:

i) provides day-to-day project management;

ii) provides managerial guidance to CRA's technical group;

iii) provides technical representation at meetings as appropriate;

iv) retains testing firms to perform quality control field/laboratory tests; and

v) prepares and reviews reports.

3.3 RESIDENT ENGINEER

The duties of the Resident Engineer are as follows:

i) reports to CRA Project Coordinator;

ii) provides immediate supervision of all on-site project activities;

iii) provides field management of CQA activities;

iv) reviews design criteria, plans and specifications for clarity and completeness so that the RC QAPP can be implemented;

v) informs CQA support personnel on CQA requirements and procedures;

vi) ensures that regular calibration of testing equipment is conducted and recorded;

vii) ensures that all site activities are recorded daily and maintained;

viii) ensures that CQA test results are accurately recorded;

ix) identifies work that should be accepted, rejected, or uncovered for observation, or that may require special testing, inspection, or approval;

x) rejects defective work and verifies that corrective measures are implemented; and

xi) interacts daily with the contractor to provide assistance in modifying the materials and work to comply with the specified design.

The individual designated to be the Resident Engineer will be specified by CRA prior to commencement of the construction activities.

3.4 CQA SUPPORT PERSONNEL

The duties of the CQA Support Personnel are as follows:

i) reports directly to the Resident Engineer;

ii) conducts CQA tests and inspections as indicated in this RC QAPP;

iii) accurately records test results and inspections;

iv) calibrates testing equipment as required;

v) maintains testing equipment in good working order; and

vi) immediately notifies Resident Engineer whether or not test results comply with design specifications.

3.5 QA/QC TEST LABORATORIES

QA/QC Test Laboratories that will conduct CQA Quality Control tests will be identified by CRA prior to the commencement of the construction activities. The duties of the QA/QC Test Laboratories are to provide QA/QC testing of construction activities, as requested by the Resident Engineer, to confirm construction activities have been implemented according to the construction specifications and drawings.

3.6 CONTRACTOR

The duties of the Contractor, as they relate to QA/QC, are as follows:

i) retains qualified testing firms (for example laboratory, geotechnical), for testing of materials and workmanship to ensure that materials meet specified requirements;

ii) submits samples and/or materials for testing to determine if samples/materials meet specified requirements, and submits results directly to the Resident Engineer;

iii) records daily CQA activities in the Contractors Site log book and submits a "Daily Construction Quality Control Report" (see Section 7.3) to the Resident Engineer; and

iv) carries out construction activities according to design specifications.

4.0 PERSONNEL QUALIFICATIONS

4.1 RESIDENT ENGINEER

The Resident Engineer will have the following qualifications:

i) graduate of a recognized college in a technically related field;

ii) minimum two (2) years experience in the oversight and implementation of hazardous waste remedial construction and CQA activities; and

iii) good management and communication skills.

4.2 CQA SUPPORT PERSONNEL

The CQA support personnel will have the following minimum qualifications:

i) degree from a recognized college in engineering technology, or equivalent; or a minimum of two (2) years experience in hazardous waste remedial construction and CQA inspection procedures; and

ii) working knowledge of all relevant codes and regulations concerning material and equipment installation, observation and testing procedures, equipment, documentation procedures, and site safety.

4.3 CONTRACTOR

The selected contractor will assign experienced personnel to supervise the implementation of each of the remedial construction activities specified in the RC Work Plan.

Experienced personnel will have a thorough knowledge of earthworks and testing procedures and equipment required for implementation of the remedial construction activities.

The selected contractor will designate an on-Site Project Manager empowered to act on behalf of the contractor in all matters pertaining to the remedial construction activities.

5.0 PROJECT MEETINGS

Project meetings as detailed herein will be held during the remedial construction period to ensure that all tasks are accomplished according to schedule and that they are completed in accordance with the remedial construction plans and specifications. These progress meetings will be attended by the Project Manager, Project Coordinator, Resident Engineer, Contractor Representative, SNFT, USEPA and/or OEPA as detailed below.

5.1 PRECONSTRUCTION MEETING

Purpose: To resolve any uncertainties in the remedial construction plans and specifications, and to review levels of responsibility, reporting requirements, and health and safety requirements.

Present: Project Coordinator, Resident Engineer, CQA Support Personnel, Contractor Representative.

Topics:

- Present RC QAPP, Contractors Site-specific Health and Safety Plan, and other relevant documents.
- Review the activities to be conducted during the remedial construction.
- Review roles of each organization relative to the design criteria, plans and specifications within the RC QAPP.

- Determine any need to modify the RC QAPP that may be necessary to ensure that the construction is performed to meet or exceed the specified design criteria.
- Review lines of authority and communication.
- Discuss the established procedures or protocol for observations and tests including sampling strategies.
- Discuss the established procedures or protocols for handling construction deficiencies, repairs and retesting.
- Review methods for documenting and reporting inspection data.
- Review methods for distributing and storing documents and reports.
- Review work area delineation, security and safety protocol.
- Discuss the location for storing construction equipment and materials, and the protection of these items during inclement weather.
- Discuss the protection of uncompleted construction work during off hours and during inclement weather.
- Conduct a Site tour to review construction areas, and equipment and stockpile storage locations.

5.2 DAILY PROGRESS MEETINGS

Purpose: To daily review work schedule progress. This meeting is intended to be an informal meeting held at the end of each work day or at the start of each work day.

Present: Resident Engineer, Contractor Representative

Topics:

- Review previous day's activities and progress.
- Review work location and activities for upcoming day.
- Review health and safety deficiencies from the previous work day and review health and safety requirements and potential problems for the next day's activities.
- Review Contractor's personnel and equipment assignments for the upcoming day.
- Discuss any potential construction problems.

5.3 WEEKLY PROGRESS MEETINGS

Purpose: To provide an update of work schedule progress on a weekly basis, and identify schedule slippages and efforts required to get back onto schedule, if required.

Present: Resident Engineer, CQA Support Personnel (optional), Project Coordinator (optional), Project Manager (optional), Contractor Representative, Site Safety Officer (optional).

Topics:

- Health and Safety report for previous week's activities and forthcoming week activities.
- Review work activities for the previous week.

- Comparison of actual progress to scheduled work activities, noting of schedule slippages and actions to be implemented to rectify schedule slippages.
- Review work activities for the next week.
- Review potential construction problems and proposed solutions.

5.4 MONTHLY PROGRESS MEETINGS

Purpose: To provide a remedial construction progress update to SNFT, USEPA and OEPA.

Present: Project Manager, Project Coordinator, Resident Engineer, SNFT, Contractor's Representative, USEPA and OEPA.

Topics:

- Health and Safety report for previous month's activities.
- Review of the work activities for the previous month.
- Comparison of actual progress to scheduled work activities, noting of schedule slippages and actions implemented to rectify schedule slippages.
- Summarize work activities scheduled for the next month.
- Review potential remedial construction problems/conflicts for the next month's remedial construction activities and proposed solutions to the potential problems/conflicts.

5.5 PROBLEM OR WORK DEFICIENCY MEETINGS

Purpose: If a problem or deficiency is present or likely to occur.

Present: Resident Engineer and CQA Support Personnel, Contractor Representative (optional if major problem directly related to his work)

Topics:

- Define and discuss problem or deficiency.
- Review alternative solutions.
- Develop and implement a plan to resolve the problem or deficiency.

For all meetings held on Site during the remedial construction, with the exception of the daily progress meetings, minutes will be taken by the Resident Engineer. Copies of the minutes will be forwarded to SNFT and all organizations present at the meetings.

6.0 INSPECTION AND TESTING ACTIVITIES

6.1 SCOPE

Throughout the implementation of the remedial construction activities there will be numerous inspections and testing requirements for specific work tasks. The inspection and testing requirements will ensure compliance with the remedial design as presented in the construction specifications, as well as ensure completion of the work tasks to the highest level of quality.

Inspections and testing will provide a qualitative means of monitoring the quality and progress of work performed.

The components of each work task that will require some form of inspection or testing as described by the RC QAPP are as follows:

i) Site Cover

- installation of final Site cover; and

ii) Vegetation

- topsoiling
- seeding
- fertilizing
- watering

6.2 INSPECTIONS

Throughout the period of remedial construction the quality of work completed and material used for each of the work tasks will be maintained at its highest possible level through regular inspections of the work. Inspections will be completed throughout the construction by the Resident Engineer, CQA support personnel, and representatives of USEPA and OEPA on a periodic basis, if required.

In general, inspections to be conducted by the Resident Engineer and CQA support personnel include the following:

i) daily inspections of the work progress;

ii) inspections of material as it is delivered to the Site to check for damage during delivery;

iii) comparison of the material delivered to the Site to the design specifications to ensure that the proper material has been delivered to the Site;

iv) inspection of materials after they have been installed to ensure that it has not been damaged during installation;

v) A pre-construction inspection will be performed prior to beginning work on any work task. A pre-construction inspection will include the following:

- a review of contract requirements to ensure that all materials and/or equipment have been tested according to applicable standards and specifications,
- ensure that provisions have been made to provide required quality control testing, and
- examination of the work area to ascertain that all applicable preliminary work tasks have been completed;

vi) General inspections will be performed periodically as the amount of work completed warrants an inspection. A general inspection will include the following:

- examination of the quality of workmanship,
- testing of materials for compliance with Contract requirements,
- any omissions, and
- general progress of work performed; and

vii) A final inspection will be performed upon completion of each work task to ensure compliance with the Construction Drawings and Construction Specifications and to ensure that deficiencies identified in the general inspections have been corrected.

These inspections will be performed by the Resident Engineer and the results of the inspections will be provided in the final construction report. USEPA and OEPA representatives will be notified by the Resident Engineer at least 3 days in advance of any final inspections. The results of all inspections will be recorded in the daily Site log book as described in Section 7.0. Copies of the

pre-construction, general and final inspection reports will be provided to SNFT and all parties involved in the inspection.

The components of each work task to be inspected, the types of inspections required and the frequency of the inspections are summarized in Table 6.1.

6.3 TESTING

In addition to the daily inspections of the construction progress, material testing will be carried out as required. Material testing will be performed to ensure compliance with material specifications and design criteria as presented in the Construction Specifications.

The testing requirements, methods of testing, testing frequency for each of these work task components and submittals (test reports, certificates verifying material quality/workmanship, etc.) are summarized in Table 6.2 and have been incorporated into the construction specifications for Site cover.

TABLE 6.1

SUMMARY OF CONSTRUCTION QUALITY ASSURANCE INSPECTIONS
SITE COVER
SUMMIT NATIONAL SUPERFUND SITE

Work Task Component to be Inspected	*Items to be Checked During Inspection*	*Type of Inspection*	*Frequency of Inspection*	*Submittals to Resident Engineer*
A. Loam Soil Fill	• has soil cover been constructed to design elevation	• survey	• intermittent during and upon final placement	• elevations before and after placement
	• does imported loam soil meet specifications	• check supplier's specifications	• for each source of material prior to delivery to site	• certification and test results
	• is stockpile being properly stored and handled properly	• visual	• continuous	• none
	• size distribution specification	• check suppliers specification	• 14 days prior to delivery	• grain size distribution curves
	• does backfill contain unsuitable materials i) material containing excess loam, roots or organic matter ii) frozen material or material containing snow or ice iii) clays which are classified as inorganic clays of high plasticity in accordance with ASTM D2487 iv) soft and/or organic clays and silts of low strength v) frost susceptible silts or clays vi) swelling clays vii) rock and lumps of material with dimensions greater than 6 inches for backfill of deep excavation areas or 1 1/2 inches for backfill of the upper 6 inches of any excavation area, measured through any axis before compaction viii) trees, stumps, branches, or any other wood or lumber ix) wire, steel, cast iron, cans, drums or any other foreign materials	• check suppliers specifications	• 14 days prior to delivery	• suppliers specifications
B. Temporary Stockpiles	• height	• measure	• intermittent, as required	• none
	• slope	• measure	• intermittent, as required	• none
	• does stockpile block natural drainage	• visual	• intermittent, as required	• none
	• polyethylene underlay and covering, if required	• visual	• intermittent, as required	• none
	• soil erosion and sediment control	• visual	• intermittent, as required	• none

TABLE 6.1

SUMMARY OF CONSTRUCTION QUALITY ASSURANCE INSPECTIONS
SITE COVER
SUMMIT NATIONAL SUPERFUND SITE

Work Task Component to be Inspected	*Items to be Checked During Inspection*	*Type of Inspection*	*Frequency of Inspection*	*Submittals to Resident Engineer*
C. Topsoil	• does topsoil meet with the following specification a) be friable and loamy, non-swelling compatible material with permeability of 0.0001 cm/sec b) be free of debris, objectionable weeds and stones c) contain no toxic substances that may be harmful to plant growth d) have pH in range 6.0 to 7.0 e) have conductivity less than 0.5 millimhos per centimeter f) have a minimum organic matter content of 2.75 percent (organic matter content may be raised by additives as approved by Engineer)	• check specifications • visual	• prior to delivery to Site	• certification and test results
D. Vegetative Cover	• does fertilizer meet specification • does grass seed meet specification • does mulch meet specification • does water meet specification • mixture rate • mixture rate • grass height	• check specification • check specification • check specification • visual at source • check specification • check specification • visual	• prior to delivery • prior to delivery • prior to delivery • prior to delivery • prior to seeding • continuous • continuous	• suppliers certification • suppliers certification • suppliers certification • none • suppliers certification • contractors certification • none

TABLE 6.2

SUMMARY OF CONSTRUCTION QUALITY ASSURANCE TESTING
SITE COVER
SUMMIT NATIONAL SUPERFUND SITE

Work Task Component to be Tested	*Type of Test*	*Standard*	*Frequency of Test*	*Criteria*
A. Loam Soil Fill	• Final Elevations	• Survey	• upon final placement	• tolerance of plus or minus 0.1 foot from design elevations
	• Maximum Dry Density	• ASTM D698 and ASTM D2216	• minimum of 1 test per 2,000 cu.yd. • minimum of 1 test per 2,000 cu.yd.	• NA • 90% Standard Proctor
	• Moisture Content	• ASTM D3017	• minimum of 1 test per 2,000 cu.yd.	
	• Bulk Density	• ASTM 1556 or ASTM D2167 or ASTM D2922 whichever is appropriate	• minimum of 1 test per 2,000 cu.yd.	• 90% Standard Proctor
	• Gradation	• ASTM D422 or ASTM D1140 whichever is appropriate	• minimum of 1 test per 2,000 cu.yd of material removed at source • minimum of 1 test for any change in material used in fill	• 100% wt. <50 mm Ø particle size; ≥10% wt >0.01 mm Ø particle size
	• Permeability	• ASTM D2434	• minimum of 1 test per 2,000 cu.yd • minimum of 1 test for any material change	• 1 x 10E-4 cm/s

Note:

NA Not Applicable

7.0 CQA DOCUMENTATION

7.1 GENERAL

This section details the documentation requirements for the RC QAPP. The proper, thorough, and accurate documentation of all CQA site activities is important in ensuring quality installation. CQA testing will be documented daily.

7.2 CONTRACTORS DAILY SITE LOG BOOK

The selected remedial contractor will record daily quality control activities in a Daily Site Log Book to be kept on Site at all times. The log book will include the following information:

i) date, weather conditions;

ii) all Site activities;

iii) decisions made regarding approval of units of material or of work, and/or corrective actions to be taken in cases of substandard quality;

iv) submittals made by suppliers verifying material quality;

v) quality control test and inspection results;

vi) construction delays, and causes;

vii) areas affected by delays;

viii) construction problems and corrective actions;

ix) personnel on Site;

x) present phase of construction;

xi) material and/or equipment delivered to site (including equipment demobilization);

xii) inspections made;

xiii) health and safety considerations;

xiv) quality control tests performed and results of tests taken on previous work day;

xv) instructions given by the Resident Engineer;

xvi) changed conditions/conflicts encountered; and

xvii) remarks.

Each daily entry into the log will be signed by the remedial contractor as verification to its correctness, and a copy of the signed entry will be provided to the Resident Engineer on a daily basis for verification. An example of this report sheet is presented in Appendix A. The Contractor may use alternate forms providing the same information, subject to the approval of the Resident Engineer.

7.3 CQA INSTRUMENT CALIBRATION

The CQA support personnel will record calibrations of test equipment in an Instrument Calibration Log Book, maintained on Site by the Resident Engineer. Actions taken as a result of recalibration will be recorded in the Inspection log book, as described in the next section.

7.4 INSPECTION LOG BOOK

All observations and quality control field tests will be recorded by the CQA support personnel into Inspection Log Books. These books will be kept on Site and maintained by the Resident Engineer. The inspection log book will include the following information:

i) date, time, weather conditions;

ii) description or title of the inspection activity;

iii) location of the inspection activity or location from which the sample increment was obtained;

iv) type of inspection activity and procedure used (reference to standard method when appropriate);

v) recorded observation or test data, with all necessary calculations;

vi) results of the inspection activity and comparison with specification requirements;

vii) personnel involved in the inspection activity; and

viii) signature of the appropriate CQA inspection personnel and concurrence by the Resident Engineer.

Items above shall be formulated into checklists so that details are not overlooked.

7.5 PROBLEM/CORRECTIVE ACTION REPORTS

A problem is defined as material or workmanship that does not meet the construction specifications. Problem/Corrective Action Reports should be cross-referenced to specific inspection entries in the Inspection Log Book where the problem was identified. Problem/Corrective Action Reports will include the following information:

i) unique identifying sheet number for cross-referencing and document control;
ii) detailed description of the problem;
iii) location of the problem;
iv) probable cause;
v) how and when the problem was located (reference to Inspection Log Book);
vi) estimation of how long problem has existed;
vii) suggested corrective action;
viii) documentation of correction (reference to Inspection Log Book);
ix) final results;
x) suggested methods to prevent similar problems; and
xi) signature of the appropriate CQA support personnel and concurrence by the Resident Engineer.

In some cases, not all of the above information will be available or obtainable. However, when available, such efforts to document problems could help to avoid similar problems in the future.

7.6 WORK TASK REPORTS

Within each work task, there may be several quality characteristics, or parameters, that are specified to be observed or tested, each by a different observation or test, with the observations and/or tests recorded in different Inspection Log Books. At the completion of each task, these log books should be used to write a Work Task Report summarizing all of the construction activities related to that particular work task.

Work Task Reports will be prepared by the Resident Engineer or the Project Coordinator and will include the following information:

i) unique identifying sheet number for cross-referencing and document control;

ii) description of work task (i.e., fertilizing, Site cover placement; etc.);

iii) quality characteristic being evaluated and references to construction specifications and plans;

iv) quality control test locations;

v) inspections made (define procedure by name or other identifier);

vi) summary of inspection results, which will include all data outside acceptable limits, and documentation of corrective action and retest results;

vii) define acceptance criteria (compare task inspection data with design specification requirements; indicate compliance or noncompliance; in

the event of noncompliance, identify documentation that gives reasons for acceptance outside of the specified design); and

viii) signature of the Resident Engineer or Project Coordinator.

7.7 FINAL REPORT

At the completion of the remedial construction, CRA will prepare and submit a final report to USEPA, OEPA and SNFT. This report will include copies of all of the Daily Site Log Books, Inspection Log Books, Problem/Corrective Action reports, deviations from design and material specifications (with justifying documentation), and as-constructed drawings.

The final report will re-emphasize that areas of responsibility and lines of authority were clearly defined, understood, and accepted by all parties involved in the project. Signatures of CRA's Project Coordinator and Resident Engineer should be included as confirmation that each party understood and accepted the areas of responsibility and lines of authority and performed their functions in accordance with the RC QAPP.

7.8 STORAGE OF RECORDS

During remedial construction the Resident Engineer will maintain a copy of the Construction Drawings and the Construction Specifications, RC QAPP and Problem/Corrective Action reports in the Site office. Once the remedial construction is complete, all CQA documents

(originals) will be retained by CRA, and a copy sent to SNFT. This information will be kept until all operating and post closure monitoring periods have expired as specified in the Consent Decree.

APPENDIX A

TYPICAL CONTRACTORS DAILY SITE LOG BOOK

TYPICAL CONTRACTORS DAILY SITE LOG BOOK

Project Name: Construction of Site Cover _____ Date: _____

Summit National Superfund Site _____

Weather: _____ Report No._____

1) Personnel On Site

   a) CRA

   b) Contractor

   c) Subcontractor

   d) Other

2) Phases of Construction in Progress (Give briefly only phase or phases of work in progress)

3) Health and Safety

   a) Preparatory

   b) Initial

   c) Follow-up

4) Material and/or Equipment on-Site (Including equipment demobilization)

5) Inspection Made (Include negative inspections, phase of in-progress construction work inspected and all deficiencies noted during inspections)

6) Tests Performed and Results of Tests (including results of tests taken on previous dates).

7) Instructions Received (List any instructions given by Resident Engineer on construction deficiencies, retesting required etc., with action to be taken).

8) Changed Conditions/Conflicts Encountered.

9) Remarks

SIGNATURE_____

TITLE_____

_____

Contractor's Verification: The above report is complete and correct and all material and equipment used and work performed during this reporting period are in compliance with the construction plans and specifications except as noted above.

_____

Contractor's Approved Authorized Representative

K

APPENDIX K

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WELL INSTALLATION AND ABANDONMENT

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SECTION 01010 - SUMMARY OF WORK

1. SCOPE OF WORK

The Works to be performed under this Contract consist of construction of monitoring wells, piezometers and extraction wells, abandonment of monitoring wells and piezometers and associated work at the Summit National Superfund Site, in Deerfield Township, Ohio.

2. LOCATION

The Site is located on the southwestern corner of the intersection of Route 224 and 225 in Deerfield Township of Portage County, Ohio.

3. ACCESS TO SITE

Access to the Site is available from Route 224.

The Contractor shall make all arrangements with the authorities having jurisdiction for the movement of his material and equipment to and from the Site over public roadways.

4. DESCRIPTION OF WORK

The Work includes, but is not necessarily limited to, the following activities:

1. development and implementation of a Site-specific health and safety plan;
2. mobilization of plant, labor, material and equipment necessary for the performance of the Works;
3. abandonment of the Tipple well, 27 monitoring wells and 11 piezometers;
4. construction of a water supply well, 33 monitoring wells and 11 piezometers;
5. adjustment of two existing monitoring wells and one piezometer to final grade;
6. demobilization;
7. remobilization, construction of six extraction wells, 6 monitoring wells and 8 piezometers, and adjusting one existing monitoring well to final elevation, after installation of the pipe and media drain by others; and
8. demobilization and project closeout.

5. CONSTRUCTION SCHEDULE

The Contractor shall perform the Works in accordance with the following construction schedule:

1. the Works shall be commenced at the Site within seven (7) calendar days of the date of Notice to Proceed;

2. the Contractor shall complete Phase 1 Well Installation and Abandonment as detailed on Drawing G-2 within fourteen (14) calendar days of the date of the Notice to Proceed;

3. the Contractor shall complete Phase II Well Installation and Abandonment as detailed on Drawing G-2 within ninety (90) calendar days of the date of the Notice to Proceed;

4. the Contractor shall complete Phase II Well Installation and Abandonment as detailed on Drawing G-2 within one hundred and sixty (160) calendar days of the date of the Notice to Proceed; and

5. the Contractor shall complete Phase IV Well Installation and Abandonment as detailed on Drawing G-2 within forty-two (42) calendar days of being notified to remobilize to the Site.

6. DRAWINGS

Drawings issued with and forming part of the Project Specifications are listed below. Such drawings are issued for bid purposes only:

Drawing No.	*Rev. No.*	*Date of Drawing or Latest Revision*	*Title*
G-1	0	May 1993	Existing Conditions
G-2	0	May 1993	Site Work
G-3	0	May 1993	Remedial Construction Work Areas
G-4	0	May 1993	Final Grading Plan
G-5	0	May 1993	Well Details
G-6	0	May 1993	Typical Monitoring Well/ Piezometer Extension Detail

The Contractor shall perform the Works in accordance with Drawings signed "Approved for Construction" by the Engineer. Such Drawings will be issued to the Contractor after award of the Contract and will consist of bid Drawings revised as required by the Engineer and additional Drawings if required by the Engineer.

Revised "Approved for Construction" Drawings may be issued from time to time by the Engineer and such Drawings shall supersede previous revisions. If revised "Approved for Construction" Drawings are issued which necessitate changes to the Contractor's shop drawings not yet reviewed, no separate payment will be made for the Contractor's expenses involved in revising such shop drawings.

7. MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for work under Section 01010.

END OF SECTION

SECTION 01015 - GENERAL REQUIREMENTS

1. PROJECT STARTUP

Prior to mobilizing to the Site, the Contractor shall provide all bonds and insurance as required by the Contract Documents and to the satisfaction of the Engineer.

Prior to commencing work at the Site, the Contractor shall mobilize all material and equipment required for performance of the Works; erect all temporary fencing; provide all construction facilities and temporary controls including parking areas, all necessary connections to power, water, telephone and sewer and access roads as required.

The Contractor shall site all construction facilities in areas designated by the Engineer. Any changes to the locations of construction facilities shall be approved by the Engineer.

The Contractor shall ensure all utilities and surface features potentially affected by the Works are located in and around all active work areas prior to commencement of the Works.

The Contractor shall ascertain and record the conditions of existing surface features at all work locations under this Contract.

2. CONTRACTOR'S REPRESENTATIVE

During the performance of the Works, the Contractor shall have on the Site during working hours a designated Superintendent empowered to act on behalf of the Contractor in all matters pertaining to the Contract. The Contractor shall within seven days of execution of the Contract, nominate such person or persons, in writing, to the Engineer. Such person or persons shall remain, in the context of this Contract, the Contractor's designated agent(s) until such time as notification to the contrary is received in writing by the Engineer.

3. MEASUREMENT METHODS

Further to Article 7 of the Agreement, measurement clauses in these Project Specifications define methods the Engineer will use to determine quantity of completed work for payment purposes.

The Contractor shall notify the Engineer sufficiently in advance of operations to permit required measurements for payment and shall provide reasonable and necessary opportunities and facilities for making such measurements.

The Contractor shall provide at his own expense a qualified assistant(s) to the Engineer to expedite the taking of these measurements and to facilitate agreement on pay item quantities.

4. DELIVERY OF EQUIPMENT AND MATERIAL

No material or equipment of any kind shall be delivered to the Site until approval in writing has been applied for and obtained by the Contractor from the Engineer that such material or equipment may be delivered.

The Contractor shall ensure that the delivery of material and equipment to the Site is coordinated with the work sequence and stored in areas approved by the Engineer. Delivered equipment and material shall be protected from contamination prior to and during use in the Works.

5. OTHER CONTRACTORS

Other Contractors may be working on the Site. The Contractor shall cooperate with and coordinate his activities with Other Contractors. No additional payment will be made for delays, changes in schedule, or any other work due to the fact that Other Contractors are working on the Site.

6. QUALITY CONTROL

A. INSPECTION

The Engineer shall have access to the Works. If parts of the Works are in preparation at locations other than at the Site, the Contractor shall provide access to such work whenever it is in progress.

The Contractor shall give timely notice requesting inspection if work is designated for special tests, inspections or approvals or by instructions of the Engineer or other authorities having jurisdiction.

If the Contractor covers or permits to be covered any part of the Works that has been designated for special tests, inspections or approvals before such is made, the Contractor shall uncover such work, have the inspections or tests satisfactorily completed and make good such work at no additional cost to the Trust.

The Engineer may order any part of the Works to be examined if such work is suspected to be not in accordance with the Contract Documents. If, upon examination such work is found not in accordance with the Contract Documents, the Contractor shall correct such work and pay the cost of examination and correction. Except as specified above, if such work is found to be in accordance with the Contract Documents, the Trust will pay the cost of examination.

B. INDEPENDENT TESTING AGENCIES

Independent testing agencies may be engaged by the Trust for the purpose of inspecting and/or testing portions of the Works.

The Contractor shall allow inspection/testing agencies access to the Works whenever it is in preparation or progress and shall provide reasonable facilities for such access.

Employment of testing agencies by the Trust does not preclude or relax the responsibility of the Contractor to perform as specified.

If defects or deficiencies are revealed during inspection and/or testing, the appointed agency will request additional inspection and/or testing to ascertain the full degree of the defect or deficiency. The Contractor shall correct defects and deficiencies as directed by the Engineer at no additional cost to the Trust.

The Contractor shall pay costs for retesting and reinspection.

C. PROCEDURES

The Contractor shall notify the appropriate agency and the Engineer in advance of the requirement for tests, inspections or approvals, in order that attendance arrangements can be made.

The Contractor shall submit samples and/or materials required for testing, as specifically requested in the Project Specifications. The Contractor shall submit with reasonable promptness and in an orderly sequence so as not to cause delay in the performance of the Works.

The Contractor shall provide labor and facilities to obtain and handle samples and materials at the Site.

D. REJECTED WORK

The Contractor shall remove defective work, whether the result of poor workmanship, use of defective products or damage and whether incorporated in the Works or not, which has been rejected by the Engineer as failing to conform to the specified requirements.

The Contractor shall make good Other Contractor's work damaged by such removals or replacements promptly.

If in the opinion of the Engineer it is not expedient to correct defective work or work not performed in accordance with the Contract Documents, the Trust may deduct from the Contract Price the difference in value between the work performed and that called for in the Contract Documents, the amount of which shall be determined by the Engineer.

7. EXISTING CONDITIONS

Prior to commencement of work at the Site, the Contractor shall inspect the Site with the Engineer to review and establish the condition of all surface features including existing buildings, trees and other plants, grassed areas, fencing, service poles, wires, paving and survey bench marks or monuments on or adjacent to the Site which may be affected by the Works. This inventory shall be mutually agreed between the Engineer and the Contractor and shall not thereafter be subject to dispute. Such inventory as may be amended, from time to time, will be used by the Engineer to check compliance by the Contractor with the requirements of the Contract Documents.

The Contractor shall provide ongoing review inspection and attendance during performance of the Works to properly document conditions. The Contractor shall inform the Engineer within seven (7) calendar days of any existing conditions at the Site affected by the Works which may require restoration, repair or replacement. The Contractor shall not cover up any of the Works without prior approval from the Engineer.

The Contractor shall protect existing buildings and other surface features from damage which may be affected by the Works while work is in progress and repair any resulting damage from the Works to the Engineer's approval.

8. RESTORATION

A. GENERAL

This Clause describes minimum requirements and not necessarily all the requirements for restoration work.

The Contractor shall supply all labor, materials and equipment and do all work necessary or required to restore the Site as specified and shown on the Drawings.

Restoration shall mean replacement, repairs or reconstruction to a condition at least as good as or better than the condition prior to commencement of the Works.

Except where specifically required by other Sections of the Project Specifications, the Contractor shall restore areas of the Works and areas affected by the performance of the Works to conditions that existed prior to commencement of the Works and to match condition of adjacent, undisturbed areas.

The Contractor shall be responsible to restore the Site, including all areas affected by the performance of the Works, and shall utilize construction methods and procedures during the performance of the Works which keeps disturbance and damage of whatever nature to existing conditions to the practical minimum. Where the works necessitate root or branch cutting, the Contractor shall do so only as approved by the Engineer.

Unless specified otherwise, the Contractor shall ensure that quality, grades, elevations and extent of bedding, backfill and other materials including subgrades, finish grades, thickness of pavements for roadways and parking areas are properly documented during their removal to ensure reconstruction to at least their original and functional condition.

B. MATERIAL

Material required for restoration work shall be provided by the Contractor subject to the approval of the Engineer prior to use.

Restoration material shall be new, except as otherwise specified, not damaged or defective and of the best quality for the purpose intended. If requested by the Engineer or specified in other Sections of the Project Specifications, the Contractor shall furnish evidence as to type, source and quality of materials or products provided.

Should any dispute arise as to the quality or fitness of materials, whether obtained on the Site or off the Site, whether previously inspected by the Engineer prior to use or not, the decision to use any material or product in the finished Works will rest strictly with the Engineer.

Material not approved for reuse shall become the property of the Contractor and shall be removed from the Site.

The Contractor shall handle and store products or materials in a manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

C. PERFORMANCE

The Contractor shall notify the Engineer sufficiently in advance of any required attendance to assess and/or document existing conditions.

Prior to commencement of restoration work, the Contractor shall inform the Engineer of proposed material, methods and procedures to repair, replace or reconstruct any disturbed, damaged or suspected damaged to areas of the Works.

The Contractor shall perform cutting, remedial and coordination work required to make the parts of the Works fit together.

The Contractor shall ensure that restored areas match existing grade and surface drainage characteristics, except as otherwise specified, and ensure a smooth transition from restored surfaces to existing surfaces.

The Contractor shall not alter original conditions without approval from the Engineer.

The Contractor shall dismantle and/or salvage materials for reuse where practicable except as otherwise specified. The Contractor shall exercise due care when removing material for salvage. Materials damaged through improper handling or through loss after removal shall be repaired or replaced by the Contractor at no additional cost to the Trust.

The Contractor shall store and protect removed material approved for reuse in approved locations.

Unless otherwise specified, restoration of pavement shall be made by removing and replacing the entire portions between joints or scores and not merely refinishing or patching localized areas.

In removing pavements, curbs and gutters and similar structures or surfaces, the Contractor shall saw cut surfaces and protect adjacent joints and load transfer devices and underlying granular materials.

9. LAYOUT

The Engineer will establish reference bench marks and baselines adjacent to the Works.

The Contractor shall be responsible for the preservation of all survey reference points as set or established by the Engineer. Any errors entering into the Works through failure of the Contractor to notify the Engineer concerning lack of preservation of such survey reference points shall be made good by the Contractor at no additional cost to the Trust.

The Contractor shall develop and make such additional detailed surveys as are needed for construction, such as slope stakes, line and grade stakes for forcemains, batterboards, stakes for establishing the design elevations of the working points, lines and elevations. All bench marks, base lines, property boundaries, line and grade hubs, and other references and construction points, and such survey points shall thereafter be maintained by the Contractor.

The Engineer may, at any time, check the Contractor's survey and layout work but this shall not relieve the Contractor of any of his responsibilities to carry out the Works to the lines and grades as set out in accordance with the Drawings and Project Specifications.

The Contractor shall provide reasonable and necessary opportunities and facilities for setting points and making measurements during construction. The Contractor shall not proceed until he has made request to and has received from the Engineer, such points as may be necessary as the work progresses. The construction shall be done in conformance with such points.

10. WORK AREAS

The Trust will provide the right of access to certain lands in connection with the Works. The Contractor shall not unreasonably encumber these premises with its plant, equipment or materials. No other areas on the Site shall be used by the Contractor without the Engineer's written approval.

11. LANDS BY CONTRACTOR

The Contractor shall provide, with no liability to the Trust, any additional land and access thereto not shown or described that may be required for temporary construction facilities or storage of materials. The Contractor shall construct and maintain all access roads, detour roads, or other temporary work as required by its operations. All such areas shall be approved by the Engineer prior to construction.

12. INTERFERENCE WITH EXISTING PLANT

The Contractor shall conduct operations to minimize interference with the existing plant, and shall comply with any regulations in force. Where it is necessary to interrupt existing services for purposes of demolition work, connecting work, re-routing systems or changing over to new arrangements, all related and preliminary work shall be scheduled and completed in advance, except for necessary final connecting or removal, as the case may be, to ensure minimum shut down time.

13. COORDINATION WITH ADJACENT OPERATIONS

The Contractor is advised that operations of facilities adjacent to the Site must be maintained (to the maximum extent possible) throughout the execution of the Works. The Contractor shall arrange and perform all work in such a manner as to cause minimum interference to adjacent operations or personnel.

14. DISRUPTION OF SERVICES

Where it is necessary to interrupt existing services, the Contractor shall advise the Engineer a minimum of 72 hours in advance of a proposed shut down or interruption of services, utilities or access to any adjacent facility and shall not proceed with such shutdown or interruption until authorization to proceed has been issued by the Engineer. Where it is necessary to interrupt existing services, all related and preliminary work shall be scheduled and completed in advance, except for necessary final connecting or removal, as the case may be, to ensure minimum shut down time. No additional payment will be made for delays resulting from failure to

authorize the interruption within 72 hours or modifications required to the proposed sequence of work to accommodate adjacent operations.

The Contractor shall identify all potentially required shut down or interruptions of service utilities or access to any adjacent facility and expected duration on the Contractor's detailed construction schedule.

The Contractor shall coordinate the Work to ensure alternate access routes, points of entry, or service connections are not interrupted at the facilities located adjacent to the Site.

15. HAZARDOUS WASTE

No waste that is considered to be hazardous, or is subject to regulation under any applicable law, statute, rule, regulation, or ordinance, shall be treated or disposed on the Site except as approved by the Engineer. No such waste shall be stored in violation of any such applicable requirements. Liability and responsibility for any and all hazardous waste produced during the performance of this Contract shall be the sole liability and responsibility of the Contractor.

16. CLEAN UP

No material of any kind shall be removed from the Site without prior approval from the Engineer.

The Contractor shall not allow any part of the Site to become littered with trash and/or waste material, and shall maintain the same in a neat and orderly condition throughout the performance of the Works.

Daily accumulations of solid waste material which have been in contact with contaminated materials, such as discarded safety equipment, debris and rubbish, shall be collected and properly containerized for disposal.

Non-contaminated solid waste materials from the Site offices, lunch room and security office shall be segregated from contaminated solid wastes removed from the work areas.

Non-contaminated solid waste materials shall be removed from the Site in a timely manner or as directed by the Engineer such that accumulation of waste materials at the Site is minimized. Greasy or oily rags or materials subject to spontaneous combustion shall be deposited and kept in approved receptacles for disposal.

On or before the completion of the Works, the Contractor shall carefully clean out all structures including pits, chambers and conduits and shall tear down and remove all temporary structures and facilities provided by him and shall remove rubbish of all kinds from any of the grounds which have been occupied or used and leave them in first-class condition approved by the Engineer.

17. MEASUREMENT AND PAYMENT

A. BONDS

Payment for bonds will be made at the lump sum price stipulated in the Schedule of Prices for Item A-1, which price and payment shall be full compensation for furnishing all bonds required by the Contract Documents.

B. INSURANCE

Payment for insurance will be made at the lump sum price stipulated in the Schedule of Prices for Item A-2, which price and payment shall be full compensation for furnishing all insurance required by the Contract Documents and as required by Federal, State and local agencies having jurisdiction over the Works.

C. MOBILIZATION AND SITE PREPARATION

Payment for mobilization and Site preparation will be made at the lump sum price stipulated in the Schedule of Prices for Item A-3, which price and payment shall be full compensation for movement of all equipment, materials, plant and personnel to the Site and within the Site during performance of the Works; provision of all necessary permits; provision of all Contractor required facilities including temporary decontamination area, potable water holding tank and wastewater tankage; initial decontamination of drill rig and associated equipment; locating and delineating existing underground utilities; provision of all required utilities; and all other miscellaneous items for which separate payment is not provided under other Items.

D. REMOBILIZATION TO IMPLEMENT PHASE IV WELL INSTALLATION AND ABANDONMENT

Payment for remobilization to implement Phase IV well installation and abandonment will be made at the lump sum price stipulated in the Schedule of Prices for Item A-4, which price and payment shall be full compensation for movement of all equipment, materials, plant and personnel to the Site and within the Site during performance of the Works; provision of all necessary permits; provision of all Contractor required facilities including temporary decontamination area, potable water holding tank and wastewater tankage; initial decontamination of drill rig and associated equipment; locating and delineating existing underground utilities; provision of all required utilities; and all other miscellaneous items for which separate payment is not provided under other Items.

END OF SECTION

SECTION 01121 - HEALTH AND SAFETY

1. GENERAL

A. GENERAL REQUIREMENTS

(1) Scope of Work

Work of this Section consists of the development, implementation and maintenance of a written Site-specific Health and Safety Plan.

The Contractor shall develop the Site-specific Health and Safety Plan prior to commencing any on-Site work and shall continue to implement, maintain and enforce the plan until final project closeout. The development, implementation and maintenance of the Site-specific Health and Safety Plan is the Contractor's sole responsibility. The Contractor's Site-specific Health and Safety Plan shall, as a minimum, address the specifications contained herein.

The health and safety guidelines contained herein are intended to provide for a safe and minimal risk working environment for on-Site personnel and to minimize the impact of activities involving contact with any hazardous materials or hazardous wastes on the general public and the surrounding environment.

Should the Contractor seek relief from or substitution for any portion or provision of the minimum health and safety guidelines specified herein or the reviewed Site-specific Health and Safety Plan, such relief or substitution shall be requested of the Engineer in writing, and if accepted by the Engineer, will be authorized in writing.

The Contractor is responsible for the safety of persons and property on the Site and for the protection of persons off the Site and the environment to the extent that they may be affected by the conduct of the Works. The Contractor shall comply with and enforce compliance by its employees and the employees of all of its Subcontractors, agents and invitees, with all safety requirements of the Contract Documents, all applicable federal, state and local statutes, regulations and ordinances, and with its Site-specific Health and Safety Plan. The Contractor acknowledges that safety and environment protection obligations are of paramount importance regarding all of the work performed under the Contract Documents.

(2) Basis

The Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29, Code of Federal Regulations, Parts 1910 and 1926 (29 CFR 1910 and 1926) shall provide the basis for the health and safety program. The program shall also reflect the position of the USEPA and NIOSH regarding procedures recommended or required to ensure safe operations at sites containing hazardous or toxic materials.

(3) Site Characterization

Contact with contaminated materials is anticipated during performance of the Works. A list of known chemicals at the Site as determined by USEPA is provided

in the Trust's Health and Safety Plan for the Site which is included in Attachment C.

(4) Related Work Specified In Other Sections

The following items of work associated with the work of this Section are specified in other Sections as noted:

1. Provision of personnel support and hygiene facilities, Section 01500.

B. SUBMITTALS

(1) Contractor's Site-Specific Health and Safety Plan

Within (7) seven calendar days of the date of Notice to Proceed and prior to mobilization to the Site, the Contractor shall submit to the Engineer a Site-specific Health and Safety Plan for review. The submitted Site-specific Health and Safety Plan shall address, as a minimum, all aspects of worker protection and measures designed to prevent migration of hazardous or contaminated material to the environment, including but not limited to the provisions and guidelines contained herein. Specific topics which must be addressed in the Contractor's Site-specific Health and Safety Plan include:

1. worker medical surveillance;

2. worker training;

3. a detailed description of the planned movement of labor, equipment and materials from and between work areas and/or work zones as work progresses, including measures to be employed to prevent recontamination of previously cleaned areas and contamination of areas that do not now contain hazardous materials;

4. a detailed description of the personnel decontamination facilities to be employed including the planned phasing of decontamination facilities between work areas as work progresses and the methods to be used to collect, store, treat and ultimately dispose of personnel decontamination waters and wastes;

5. a detailed description of the washdown area for decontamination of vehicles and equipment and the methods to be used to collect, store, treat and ultimately dispose of washdown decontamination waters and sediments;

6. confined space entry program and procedures if the Contractor expects confined space work to be performed;

7. drum handling program in accordance with OSHA 29 CFR 1910.120(j) (for sites involving drum characterization activities);

8. personal protective equipment types to be used;

9. personal hygiene and personnel decontamination procedures;

10. respirator protection program and procedures;

11. personnel air monitoring;

12. emergency and first aid equipment and supply;

13. dust and particulate emission control; and

14. monitoring and mitigation of worker heat and cold stress.

The Contractor's Site-specific Health and Safety Plan must be submitted to and reviewed by the Engineer before the Contractor commences Site activities involving the handling or any contact with potentially hazardous waste.

The Engineer will review the Contractor's Site-specific Health and Safety Plan and provide comments to the Contractor within ten (10) days of receipt of the plan. The Contractor shall revise the plan as appropriate and resubmit the plan to the Engineer within seven (7) days of receipt of comments.

Work in the Exclusion Zone or in the Contaminant Reduction Zone (including any areas expected to become an Exclusion Zone or Contaminant Reduction Zone), including work relating to the designation or establishment of an Exclusion Zone or Contaminant Reduction Zone, may not commence until the Contractor's Site-specific Health and Safety Plan is reviewed by the Engineer, USEPA and OEPA. Other on-Site work may be conducted after the submittal of the Site-specific Health and Safety Plan to, and prior to, its review by the Engineer, but any such work shall be conducted only with the prior approval of the Engineer. The Contractor shall be obligated to implement the proposed Site-specific Health and Safety Plan, as submitted to the Engineer, USEPA and OEPA, during the conduct of any work performed prior to the review of the Site-specific Health and Safety Plan. The Trust's Health and Safety Plan for the Site is provided in Attachment B for the Contractor's review.

(2) Proof of OSHA Training

Within seven (7) calendar days of the date of Notice to Proceed and prior to mobilization to the Site, the Contractor shall submit to the Engineer a list of all personnel that will be employed throughout this Contract. For each of the listed personnel the Contractor shall provide proof of training for each employee as required under OSHA 29 CFR 1910.120. The Contractor shall submit to the Engineer proof of training for any additional employees, at least seven (7) calendar days prior to the employee's arrival on the Site.

(3) Medical Surveillance

Within seven (7) calendar days of the date of Notice to Proceed and prior to mobilization to the Site, the Contractor shall submit to the Engineer a report for medical examination conducted within the last twelve (12) months as part of compliance with OSHA medical surveillance requirements for each of the Contractor's personnel designated to be working on this Contract. As a minimum, the following information shall be submitted for each Contractor personnel:

1. name and Social Security Number and date of exam; and

2. physician's statement that the worker is approved to wear and use the types of respiratory protection proposed for the project and is able to work safely in hazardous environments capable of producing heat stress in the worker.

The Contractor shall submit to the Engineer reports on medical examination for any additional employees at least seven (7) calendar days prior to the employee's arrival on the Site.

C. JOB CONDITIONS

(1) Work Stoppage

The safety and health of the public and on-Site personnel and the protection of the environment shall take precedence over cost and schedule considerations for all project work. The Engineer and the Health and Safety Officer shall be responsible for decisions regarding when work shall be stopped or started for health or safety considerations and shall each have the authority to stop the work for health or safety considerations. The Health and Safety Officer shall have the obligation to stop the work when, in his discretion, it is necessary or advisable for reasons of health or safety.

(2) Unforeseen Hazards

Should any unforeseen or Site peculiar safety related factor, hazard, or condition become evident during the performance of the Works at the Site, it shall be the Contractor's responsibility to bring such to the attention of the Engineer verbally and in writing as quickly as possible, for resolution. In the interim, the Contractor shall take prudent action to establish and maintain safe working conditions and to safeguard employees, the public, the Owner, the Engineer and the environment.

2. HEALTH AND SAFETY OFFICER

The Contractor shall provide a Health and Safety Officer on the Site during the execution of all work. The Health and Safety Officer shall report directly to and be under the direction of a Certified Industrial Hygienist provided by the Contractor. The Certified Industrial Hygienist shall oversee operations as necessary to ensure the work is performed in accordance with the Site-specific Health and Safety Plan and shall oversee and be present during the Health and Safety Training Session and, as a minimum, complete qualitative respirator fit testing; and oversee the Health and Safety Officer's activities on a part-time basis and be available on an as-needed basis for emergency situations.

The Health and Safety Officer shall:

1. have a minimum of two years site-related working experience specific to the handling and excavation of contaminated soils;

2. have a sound working knowledge of State and Federal occupational safety and health regulations;

3. have formal educational and/or training in occupational safety and health;

4. be responsible for completing the health and safety training session;

5. be responsible for the implementation and daily enforcement and monitoring of the Site-specific Health and Safety Plan;

6. be responsible for performing air monitoring;

7. ensure that all on-Site personnel have obtained the required medical examinations prior to arrival at the Site and at the termination of their assignment as required;

8. be responsible for the pre-construction indoctrination of all on-Site personnel with regard to the Site-specific Health and Safety Plan and other safety requirements to be observed during construction, including:

    1. potential hazards,
    2. personal hygiene principles,
    3. use of personal protective equipment and respiratory protection, including fit testing, and
    4. emergency procedures for dealing with fire and medical situations;

9. be responsible for incorporating the provisions of both on-Site and off-Site emergency contingency plans in the Site-specific Health and Safety Plan and maintaining a state of readiness to enact the provisions;

10. be responsible for alerting appropriate on-Site and/or off-Site emergency services and the Engineer before starting any particularly hazardous work;

11. assist the Engineer in contacting and advising all local authorities of the Works being performed; and

12. have the authority and obligation to stop all, or any part of the Works if, in his sole discretion, stoppage of the Works is necessary or advisable for considerations of health or safety.

3. PERSONNEL HEALTH, SAFETY AND HYGIENE

A. MEDICAL SURVEILLANCE

The Contractor shall conduct medical surveillance of employees as required by 29 CFR 1910.120 and 29 CFR 1910.134.

The Contractor shall retain the services of a licensed occupational physician or physician's group to provide the medical examinations and surveillance required. All pertinent Site characterization data, a copy of 29 CFR 1910.120, and a description of the intended personal protective equipment shall be provided to the occupational physician prior to completing medical surveillance. The name of the physician and evidence of examination of all on-Site personnel shall be provided to the Engineer prior to assigning personnel on-Site work activities in the Exclusion Zone or Contaminant Reduction Zone. Contractor personnel medical approvals shall be maintained by the Contractor at the Contractor's Site office for the duration of the Contract.

Medical surveillance protocol shall be the occupational physician's responsibility but shall meet the requirements of OSHA standard 29 CFR 1910.120 and 29 CFR 1910.134 for all personnel. This exam may include:

1. medical/occupation questionnaire with work history;

2. full physical examination;

3. screening audiometric test with otoscopic exam for occlusion or perforation;

4. visual acuity measurement, including color perception;

5. pulmonary function test (Spirometry - FVC and FEV-1.0 second);

6. resting EKG;

7. chest x-ray;

8. blood chemistry profile as deemed appropriate by the attending physician for hazardous waste work;

9. complete blood count with differential and platelet evaluation, including WBC, RBC, HGB, hematocrit;

10. urinalysis with microscopic examination; and

11. other Site-specific medical monitoring as required by Site-specific conditions.

All on-Site personnel requiring full medical surveillance shall be provided with medical surveillance within the twelve (12) month period prior to entering the Site, and at any time there is suspected to be excessive exposure to toxic chemicals or physical agents. On-Site personnel who become due for an annual physical examination will be removed from the work force immediately until medical requirements are met in accordance with 29 CFR 1910.120 and 29 CFR 1910.134.

B. TRAINING

The Contractor shall provide and require that all personnel assigned to or entering the Site, complete Site training or refresher sessions. Site-specific training and refresher sessions shall ensure that all personnel are capable of and familiar with the use of safety, health, respiratory and protective equipment and with the safety and security procedures required for this Site. The training session shall be completed by the Health and Safety Officer provided by the Contractor under the supervision of the Contractor's Certified Industrial Hygienist.

The training program shall include, as a minimum, the following items:

1. names and personnel responsible for Site health and safety;

2. Site-specific potential hazards;

3. use of personal protective equipment (PPE), including proper donning and doffing procedures;

4. work practices by which the employee can minimize risks from these potential hazards;

5. confined space entry procedures (if confined space work is to be performed);

6. safe use of engineering controls and on-Site equipment;

7. discussion and completion of medical surveillance requirements and recognition of symptoms associated with exposure to hazards;

8. Site control methods;

9. on and off-Site contingency plans;

10. decontamination procedures;

11. Site-specific standard operating procedures;

12. delineation between work zones;

13. use of the buddy system;

14. scope of the intended work for the Contract;

15. review on-Site communications and appropriate hand signals between personnel working in the Exclusion Zone and/or Contaminant Reduction Zone; and

16. the content of the OSHA standards, including the Appendices.

In accordance with 29 CFR 1910.120, all employees assigned to or entering the Exclusion Zone or Contaminant Reduction Zone (including truck drivers transporting waste material) shall receive training including a minimum of 40 hours instruction off the Site and three (3) days of actual field experience under direct supervision of a trained experience supervisor and an 8-hour annual refresher. The Contractor shall provide documentation stating that all on-Site personnel expected to enter potentially contaminated work areas have complied with this regulation. Each individual's name shall be included on this confirmatory letter.

The Health and Safety Officer shall be responsible for ensuring that personnel not successfully completing the required training are not permitted to enter the Site to perform work in the Exclusion Zone or Contaminant Reduction Zone.

The Contractor shall implement a hazard communication ("Right-to-Know") program in accordance with 29 CFR 1910.1200.

C. LEVELS OF PROTECTION

Levels of protection for each work area shall be established based on planned activity, location of activity and air monitoring results. All potential exposures to hazardous materials shall be monitored with a photoionization device (Oxygen level meter and explosimeter for confined space work).

The level of personal protective equipment (PPE) required in the Exclusion Zone shall be minimum Level C until all wastes have been characterized. Following waste

characterization, the level of PPE may be increased or decreased, but will not be less than Level C for all waste handling activities.

The anticipated levels of personal protection based on work activity are as follows:

Work Activity	*Anticipated Level of Personal Protection*
• Installation of Monitoring Wells	Level D/C*
• Development of Monitoring Wells	Level D/C
• Installation of Piezometers	Level D/C
• Installation of Extraction Wells	Level C
• Development of Extraction Wells	Level C
• Implementation of Pumping Tests	Level D/C
• General Site Work	Level D
• Abandonment of Monitoring Wells and Piezometers	Level D/C
• Potable Water Well	Level D

* Depending on location

D. PERSONAL PROTECTIVE EQUIPMENT

Based on the work activity and the anticipated level of personal protection as specified in Section 01121, Clause 3.C, the Contractor shall provide all on-Site contractor personnel with appropriate personal protective equipment (PPE). The Contractor shall ensure that all safety equipment and protective clothing is kept clean and well maintained. As a minimum, the Contractor shall supply each worker entering or expected to enter the exclusion zone or contaminant reduction zone with protection as specified in Section 01121, Clause 3.C, consisting of the following:

Level C

1. individually assigned half-facepiece or full-facepiece air-purifying respirators (NIOSH approved), with appropriate cartridges for organic vapors and particulates. Respirators should be available at all times and donned when required as indicated by air monitoring;

2. chemical-resistant disposable coveralls (saranex);

3. latex and/or cotton inner gloves;

4. nitrile outer gloves;

5. work boots with steel toe and shank;

6. chemical-resistant overboots or booties, butyl rubber or neoprene;

7. hard hat; and

8. safety glasses and/or chemical-resistant goggles.

Level D

1. hard hats;

2. safety glasses or goggles;

3. long pants and long sleeve shirt;

4. safety boots; and

5. any personal protective equipment necessary for specialized tasks (e.g. welding goggles).

Personal protective equipment usage procedures shall be developed by the Contractor. These requirements shall include, but not be limited to, the following:

1. all prescription eyeglasses in use on the Site shall be safety glasses. Contact lenses shall not be permitted on the Site within the Exclusion Zone or Contaminant Reduction Zone;

2. respirator cartridges/filters shall be changed daily during periods of respirator usage or upon breakthrough, whichever occurs first;

3. footwear used on the Site shall be steel-toed safety shoes or boots and shall be covered by rubber overshoes when entering or working in the Exclusion Zone;

4. all personal protective equipment worn on the Site shall be disposed or decontaminated at the end of the work day;

5. the Health and Safety Officer shall be responsible for ensuring all reusable personal protective equipment is decontaminated before being reissued;

6. on-Site personnel who have not passed a respirator fit test shall not be permitted to enter potentially contaminated work areas and/or the Contaminant Reduction Zone. Personnel shall not be permitted to have facial hair that interferes with a proper fit of the respirator; and

7. all on-Site personnel within active areas shall wear approved PPE including, but not necessarily limited to, hardhats and safety boots.

E. RESPIRATORY PROTECTION

All on-Site personnel shall receive extensive training in the usage and limitations of, and be qualitatively fit tested for, half- and full-facepiece respirators in accordance with 29 CFR 1910.134. This shall include both air purifying and supplied air type respirators.

The respirator program shall be developed and implemented by the Contractor and maintained by the Health and Safety Officer. A copy of the respirator program shall be incorporated or attached to the Contractor's Site-specific Health and Safety Plan.

The Contractor shall monitor, evaluate and provide respiratory protection for all on-Site personnel.

Levels of respiratory protection as listed in Section 01121, Clause 3.C have been chosen to be consistent with Site-specific potential airborne hazards associated with the major contaminants identified at the Site. The selection of appropriate protection is based upon the potential presence of compounds with the lowest recommended threshold limit value.

In the absence of additional air monitoring information or substance identification, the following minimum levels of respiratory protection will be required:

Sustained Total Organic Vapor Concentration Above Background (ppm)	*Level of Respiratory Protection Required*
0 - 1	Half- or full-facepiece respirator available
1 - 5	Full or half facepiece air purifying respirator, Level C
>5	Shut-down activities, evaluate the need for Level B or higher respiratory protection

The Contractor shall be responsible for appropriate respiratory protection during all work activities. As a minimum, the Contractor shall ensure that all persons entering the Exclusion Zone or Contaminant Reduction Zone are supplied with and use appropriate respiratory protection.

Assessing the ability for on-Site personnel to wear respiratory protection shall be the responsibility of the Contractor. Cardiopulmonary system examination and pulmonary function testing are minimum requirements and have previously specified in Section 01121, Clause 3.A.

On-Site personnel unable to pass a respirator fit test shall not enter the Exclusion Zone or Contaminant Reduction Zone. Proof of such fitting shall be provided to the Engineer prior to commencing work.

F. HEAT STRESS/COLD STRESS

The Contractor shall implement a heat stress and/or cold stress monitoring program as applicable. Specific components of the Contractor's program shall address:

1. training of employees to recognize and mitigate heat/cold stress situations and symptoms;

2. target conditions which will initiate monitoring of employees;

3. monitoring methods; and

4. the means and methods by which the Contractor will mitigate such conditions.

The Contractor shall base the heat stress/cold stress program on recommendations by ACGIH, NIOSH, and other recognized authorities.

G. PERSONNEL HYGIENE AND PERSONNEL DECONTAMINATION PROCEDURES

The Health and Safety Officer shall be responsible for, and ensure that all Contractor personnel observe and adhere to the personal hygiene-related provisions of this Section.

On-Site Contractor personnel found to be disregarding the personal hygiene-related provisions of the Site-specific Health and Safety Plan or the Project Specifications (including but not limited to the requirements concerning personal protective equipment specified in Section 01121, Clause 3.D; respiratory protection specified in Section 01121, Clause 3.E; and personnel hygiene and personnel decontamination procedures specified in Section 01121 Clause 3.G shall be issued a written notice of such violation. The notice may be issued by the Engineer, the Health and Safety Officer or any supervisory personnel of the Contractor. A copy of the notice shall be given to the offending worker, to his immediate supervisor, to the Contractor's Superintendent and to the Engineer. Upon issuance of a second written notice of such violation, the worker shall be terminated from employment at the Site.

Failure of the Contractor's supervisory personnel to implement this warning/termination provision shall be deemed a material breach of the Contract.

The Contractor shall provide, as a minimum, the following:

1. suitable containers for storage and disposal of used disposable PPE; and

2. potable water and a suitable sanitation facility.

The Contractor shall enforce the following provisions:

1. on-Site personnel shall wear appropriate PPE at all times when entering or working in the Exclusion Zone or Contaminant Reduction Zone;

2. used disposable PPE shall not be reused, and when removed, shall be placed inside appropriate containers provided for that purpose;

3. smoking, chewing nicotine products, eating and drinking shall be prohibited except in a designated lunch or break area;

4. soiled disposable outerwear shall be removed prior to entering the lunch area, and prior to cleansing hands;

5. on-Site personnel shall thoroughly cleanse their hands and other exposed areas before entering the smoking or lunch area;

6. all personnel working in the potentially contaminated work areas and/or Contaminant Reduction Zone shall shower and change to fresh clothing as soon as possible after each working period or shift;

7. used work clothing shall be laundered daily in a facility provided by the Contractor, at a location specified by the Engineer; and

8. water generated from washing shall be stored in the designated wastewater storage tank in accordance with Section 01500.

Discarded disposable outerwear, gloves, and outer footwear shall be placed in sealable containers.

H. EMERGENCY AND FIRST AID EQUIPMENT AND SUPPLY

First aid equipment emergency first aid facility shall be located and maintained in appropriate locations as directed by the Health and Safety Officer. This equipment shall be stored on a portable pallet in order that it may be easily transported within the active work location. The required equipment shall include, at a minimum:

1. first-aid kit to accommodate on-Site personnel;
2. portable emergency eye wash and shower;
3. two 20-pound ABC type dry chemical fire extinguishers;
4. one self-contained breathing apparatus (SCBA) per drill rig;
5. blankets and towels;
6. stretcher; and
7. one hand-held emergency siren.

As a minimum, the Contractor shall have one certified first aid technician on the Site at all times that work activities are in progress. This person may perform other duties but must be immediately available to render first aid when needed.

I. SITE COMMUNICATIONS

Emergency numbers shall be posted near Site telephones in accordance with the on-Site and off-Site Contingency and Emergency Response Plans.

Additionally, personnel shall work under the use of a "buddy" system and shall develop a hand signal system appropriate for Site activities.

An employee alarm system shall be provided to notify employees of on-Site emergency situations or to stop work activities if necessary.

Selected personnel shall be provided with two-way radios in accordance with Section 01500.

J. SAFETY MEETINGS

The Health and Safety Officer shall routinely conduct safety meetings as required which shall be mandatory for all Site personnel. The meetings shall provide refresher training for existing equipment and protocols, review ongoing safety issues and protocols and shall examine new Site conditions as they are encountered. Additional safety meetings shall be held on an as-needed basis.

K. CUSTODIAN

The Contractor shall employ and provide a custodian who shall be responsible for keeping all safety equipment and project facilities clean, properly equipped and maintained. The custodian may perform other duties for the Contractor but the custodian's first priority will be maintenance of protective equipment and the decontamination area. The custodian shall report directly to the Health and Safety Officer.

4. AIR MONITORING

A. AIR MONITORING PROGRAM

During the progress of work activities, the Contractor shall monitor air quality in and around the Exclusion Zone and Site perimeter. Monitoring shall be conducted on a regular periodic basis, and additionally as required by special or work-related conditions. Any departures from general background shall be reported to the Engineer who will, in conjunction with the Health and Safety Officer, determine when operations should be shut down and restarted.

The Contractor shall provide the required instruments for air monitoring including, as a minimum, an organic vapor photoionizer or organic vapor analyzer and if confined space work is to occur, an oxygen level meter and an explosimeter. Additionally, personnel sampling pumps and dust monitors may be required if Site conditions warrant. The Contractor shall provide sufficient numbers of each instrument to monitor the active work location and to provide backup equipment in cases of equipment malfunction.

Contractor air monitoring equipment shall be operated by Contractor personnel trained in the use of the specific equipment provided and shall be under the control of the Health and Safety Officer. All monitoring equipment used within the potentially contaminated work areas with combustible gases shall be intrinsically safe.

Air monitoring for organic vapors, shall be conducted on a routine basis around all active work locations. Monitoring shall be performed as a minimum on an hourly basis and additionally as dictated by Site activities.

Should the organic vapor level in any active working location exceed 50 ppm for any single reading, or 25 ppm for any two successive readings, or should the explosimeter indicate in excess of 10 percent of the Lower Explosive Limit (LEL) on any single reading, or reduced oxygen concentrations less than 19.5 percent oxygen, or if toxic gases and particulates are present in concentrations which present Immediate Danger to Life and Health (IDLH) or in excess of the protection factor afforded by the air purifying respirator (whichever is lower), then that work location shall be shut down and evacuated upwind. Work shall not resume at that work location until authorized by the Health and Safety Officer.

A wind direction indicator shall be provided and installed by the Contractor at each active work location.

B. AIR MONITORING REPORTING

The results of air monitoring programs shall be reported by the Contractor to the Engineer daily on specific forms and shall include the following information as applicable:

1. Site location/date;
2. work process/operation name;
3. temperature, wind speed and wind direction;
4. area sampling location diagram;
5. field notes including the following:
    1. description of operations and complaints/symptoms,
    2. chemicals/materials/equipment in use,
    3. engineering/administration controls in effect,
    4. personal protective equipment in use, and
    5. sampling observations/comments.

In addition, all daily air monitoring activities shall be recorded in a hard cover log book which shall be maintained on the Site at all times by the Health and Safety Officer.

5. CONTINGENCY AND EMERGENCY RESPONSE PLANS

A. GENERAL

Prior to mobilization to the Site the Contractor shall be required to prepare both on-Site and off-Site Contingency and Emergency Response Plans to ensure the safety of on-Site and off-Site personnel. The Contractor's on-Site and off-Site Contingency and Emergency Response Plans shall be incorporated into the Contractor's Site-specific Health and Safety Plan.

B. ON-SITE CONTINGENCY AND EMERGENCY RESPONSE PLAN

The Contractor's on-Site Contingency and Emergency Response Plan shall address the standard operating procedures to be implemented during emergency situations. Emergency situations and responses to be addressed shall include, as a minimum, the following:

1. In the event of injury to on-Site personnel or contact with hazardous materials requiring immediate medical attention, the following protocol shall be followed:

    1. notify the Engineer and the Health and Safety Officer,

    2. phone the hospital previously identified to be closest to the Site and describe injury,

    3. decontaminate personnel and administer appropriate first aid, and

    4. transport personnel to the specified hospital along the most direct route which will be predefined prior to commencing Site work;

2. In the event that barrels or canisters are encountered during excavation, all work shall immediately cease and the Health and Safety Officer in conjunction with the Engineer shall determine appropriate modifications to the Site-specific Health and Safety Plan.

3. In the event that excessive gases or vapors are detected at an excavation, the following actions shall be taken:

    1. evacuate all workers to an area upwind from the effected area; and

    2. identify the contaminant and monitor contaminant concentrations to determine the type of respiratory protection and/or engineering controls required before workers re-enter the area;

4. In the event of a fire at an excavation, earth moving equipment shall be used to quickly backfill the area and smother the fire if possible and if the presence of noxious gases prohibits this, proper evacuation procedures shall be employed; and

5. In the highly unlikely event of a major leak of toxic gas, such as might occur if a compressed gas cylinder were encountered and ruptured during excavation, all on-Site personnel shall be evacuated to a safe distance, and the Police and Fire Department and local hospital notified if deemed necessary by the Engineer and the Health and Safety Officer. Police and Fire Department Officials will assume responsibility for coordinating with the Engineer and the Health and Safety Officer for the proper emergency response strategy upon arrival.

C. OFF-SITE CONTINGENCY AND EMERGENCY RESPONSE PLAN

Prior to commencing work involving the handling of hazardous materials, the Contractor shall develop an off-Site Contingency and Emergency Response Plan. This plan is intended to provide immediate response to a serious Site occurrence such as explosion, fire or migration of significant quantities of toxic or hazardous material from the Site which could affect or endanger the public or adjacent public or private areas.

The Engineer shall be responsible for coordination of meetings with local officials, issuing minutes of meeting and preparation of the off-Site contingency and emergency response plan for distribution.

The Contractor shall attend a coordination meeting to be held with appropriate authorities which may include the City, Fire, Hospital, State and City Police, State Department of Transportation, the County Health Department and Civil Defense officials. The meeting shall identify the off-Site Emergency Response Coordinator through whom all information and coordination will occur in the event of an incident. Plans and procedures shall be developed, or existing plans and procedures adopted, for:

1. evacuation of Site adjacent areas;
2. fire fighting procedures;
3. transport of injured personnel to medical facilities;
4. priority transportation routes; and
5. coordination and/or modification of highway operations.

Techniques and recommended procedure for immediate first aid emergency response shall be developed by the Health and Safety Officer with local medical facilities.

6. SITE HEALTH AND SAFETY

A. WORK AREAS

The Contractor shall clearly lay out and identify work areas in the field and shall limit equipment, operations and personnel in the areas as defined below. These work areas may be established as temporary or permanent, depending on the work activity and the sequence in which it is performed. These areas are:

1. the Exclusion Zone which includes all areas where hazardous or potentially contaminated (soils, debris and other materials) are being, or may be contacted, disturbed or handled and all areas where contaminated equipment or personnel travel; Temporary Exclusion Zones shall be established around all remote work areas beyond the limits of the Exclusion Zone located within the Site fence and shall be clearly delineated in the field by temporary snow fencing and/or barricades supplied and installed by the Contractor;

2. the Contaminant Reduction Zone which shall occur at the interface of the Exclusion Zone and Clean Zone and shall provide for the prevailing upwind transfer of construction materials from clean to Site-dedicated equipment, the decontamination of equipment and vehicles prior to entering the Clean Zone, the decontamination of personnel and clothing prior to entering the Clean Zone, and for the physical segregation of the Clean and Exclusion Zones;

3. the Clean Zone which is defined as a clearly delineated predominantly upwind area outside the Exclusion Zone(s) and Contaminant Reduction Zone(s), which functions include:

    1. an entry area for personnel, material and equipment to the Contaminant Reduction Zone;

    2. an exit area for decontaminated personnel, materials and equipment from the Contaminant Reduction Zone; and

    3. a storage area for clean safety and work equipment.

B. TEMPORARY FENCING

The Contractor shall erect temporary fencing on the Site to delineate work areas in accordance with the Site-specific Health and Safety Plan.

Temporary fencing shall be constructed of standard snow fence or construction fence supported by posts.

The Contractor shall coordinate the erection of temporary fencing with the work specified under other Sections of the Project Specifications. Prior to or during mobilization, the Contractor shall erect fencing to enclose the Exclusion Zone.

The Contractor may reuse existing temporary fencing. Temporary fencing to be reused or reset at another location shall first be decontaminated to the satisfaction of the Engineer.

C. CONTAMINANT MIGRATION CONTROL

The Contractor shall take appropriate measures to prevent the tracking of contaminants on and off the Site. Vehicles, equipment, and personnel leaving areas of potential contamination shall be decontaminated as determined by the Health and Safety Officer prior to entry into Clean Zones. The Contractor shall locate decontamination facilities and sequence work activities to prevent contaminant tracking.

Personnel engaged in vehicle decontamination shall wear protective equipment including suitable disposable clothing, respiratory protection and face shields.

D. DRUM HANDLING PROGRAM

Drums used during cleanup activities shall meet appropriate DOT, OSHA, USEPA and State regulations for the wastes that they contain. Drums shall be labelled as to content and date filled.

Site operations shall be coordinated so as to minimize the amount of drum or container movement. Drums shall be inspected prior to shipment and shall be staged so as to facilitate inspection.

Appropriate salvage drums shall be kept available and used in areas where spills or leaks may occur. A spill containment program shall be implemented to contain and isolate any and all of the hazardous substances being transferred.

Prior to commencing work involving handling of drums and other containers, the Contractor shall submit to the Engineer procedures for safe handling of drums and other containers in accordance with OSHA 29 CFR 1910.120 (j). During any activities involving drummed waste characterization including but not limited to handling, opening, sampling, staging and consolidating, the Health and Safety Officer shall be responsible for and shall ensure that the drum handling program is implemented and enforced.

7. MEASUREMENT AND PAYMENT

A. DEVELOPMENT, IMPLEMENTATION AND MAINTENANCE OF SITE-SPECIFIC HEALTH AND SAFETY PLAN

Payment for the development, implementation and maintenance of the Site-specific Health and Safety Plan will be made at the lump sum price stipulated in the Schedule of Prices for Item B-1 which price and payment shall be full compensation for the development and preparation of a Site-specific Health and Safety Plan; provision of all required training; provision of emergency first aid facilities; designation and maintenance of work areas; air monitoring for volatile organics, explosive gases and respirable dust; provision of a Personnel Hygiene/Decontamination Facility and Emergency First Aid Facility; providing a qualified Health and Safety Officer/Industrial Hygienist including salary, wages, taxes and benefits; provision of specified services; providing a Custodian including salary, wages, taxes and benefits; maintaining, cleaning and stocking the Personnel Hygiene/Decontamination Facility, the Emergency First Aid Facility, the toilet facilities, the Contractor's Office, provision of Site security; and all other miscellaneous items for which separate payment is not provided under other Items.

As the Contractors selected to bid on this particular job are considered to be involved in hazardous waste activities on a full-time basis, the Contractor shall provide personnel who have already complied with the medical requirements as specified herein. Preliminary medicals for Contractor personnel shall not be included as a pay item. Additional medical surveillance required during the progress of the Works due to excessive exposure to toxic chemicals or physical agents shall be considered as an extra.

B. PROVISION OF HEALTH AND SAFETY AND PERSONAL PROTECTIVE EQUIPMENT - LEVEL C

(1) Measurement

Measurement for provision of health and safety and personal protective equipment - Level C will be made in mandays for the actual number of days worked per man wearing the specified protective equipment as determined by the Engineer from daily time sheets provided by the Contractor and submitted to the Engineer on a daily basis for approval.

(2) Payment

Payment for the quantity determined above will be made at the unit price per manday stipulated in the Schedule of Prices for Item B-2 which price and payment shall be full compensation for providing and maintaining personal protective equipment for Level C for all Contractor personnel required to work in the potentially contaminated work areas; and all other miscellaneous items for which separate payment is not provided under other Items.

C. PROVISION OF HEALTH AND SAFETY OFFICER

1. Measurement

Measurement for provision of a Health and Safety Officer will be made at the actual number of days that the Health and Safety Officer works on Site, as determined by the Engineer from daily time sheets provided by the Contractor and submitted to the Engineer on a daily basis for approval.

2. Payment

Payment for the quantity determined above will be made at the unit price per day stipulated in the Schedule of Prices for Item B-3 which price and payment shall be full compensation for providing a qualified Site Health and Safety Officer including salary, wages, taxes and benefits; and all other miscellaneous items for which separate payment is not provided under other items.

D. PROVISION OF CUSTODIAN

1. Measurement

Measurement for provision of a Custodian will be made at the actual number of days that the Custodian works on Site, as determined by the Engineer from

daily time sheets provided by the Contractor and submitted to the Engineer on a daily basis for approval.

2. Payment

Payment for the quantity determined above will be made at the unit price per day stipulated in the Schedule of Prices for Item B-4 which price and payment shall be full compensation for providing a custodian including salary, wages, taxes and benefits; and all other miscellaneous items for which separate payment is not provided under other items.

END OF SECTION

SECTION 01300 - SUBMITTALS

1. GENERAL

Unless otherwise specified, drawings, product data and other technical information specified to be submitted by the Contractor to the Engineer shall be submitted in triplicate, consisting of one original and two copies. Copies shall be legible and shall clearly show all information contained on the original. Where Section 01300 or other requirements of the Project Specifications specify that submittals shall be prepared and sealed by a professional engineer, such professional engineer shall be licensed in the State of Ohio.

Where submittals are to be reviewed and approved by the USEPA and/or OEPA, final approval of such submittals and the schedule of any work upon which such approval is dependent are subject to review times of the USEPA.

2. CONTRACTOR'S CONSTRUCTION SCHEDULE

Within seven (7) calendar days of the date of Notice of Award and prior to commencing the Works at the Site, the Contractor shall submit a detailed construction schedule to the Engineer for review and approval. The Contractor's construction schedule shall show all activities required for construction of the Works in accordance with the construction schedule issued by the Engineer and identified in Section 01010 of the Project Specifications.

The schedule shall clearly show the proposed sequencing of the Works and the coordination of interrelated work activities and items. The proposed progress of the Works shall be shown on a weekly basis. The schedule shall, as a minimum, include each item of work identified in the Schedule of Prices as a work activity and identify the proposed start and completion date for each activity. The schedule shall be of sufficient detail to permit cross-referencing of items identified in other submittals. As a minimum, the schedule shall identify on a weekly basis: the size of the work force, anticipated man hours by trade, the type of equipment, the equipment hours for each type of equipment and demobilization. Actual progress of each activity of the Works shall be compared with progress indicated on the Contractor's Construction Schedule no less than once every month by the Contractor and such comparison shall be submitted to the Engineer for review.

If the Contractor believes it necessary or advantageous to change sequence of activities shown on the approved Contractor's construction schedule, he shall submit proposed revisions to the Engineer for approval. No change shall be made in order in which work activities are being performed until the Engineer's written approval for the revised schedule has been obtained.

3. CONSTRUCTION PROGRESS REPORTS

The Contractor shall submit weekly progress reports in a form acceptable to the Engineer indicating actual progress made the preceding week, showing cumulative progress toward scheduled completion, expressed as a percentage, of all items in the Contractor's construction schedule, number of workers and hours worked on the Site for each trade and the number and type of equipment and hours worked on the Site during the previous week. An updated schedule showing work tasks completed, any projected difficulties which may delay or alter the schedule and any modifications to the original schedule shall be included with the weekly progress report.

4. CONSTRUCTION QUALITY CONTROL LOGS

The Contractor shall record his daily quality control activities on a "Daily Construction Quality Control Report". All Site activities, Site inspections, submittals made by material suppliers and field testing of materials shall be recorded along with any unacceptable Site occurrences on a daily basis. The Daily Construction Quality Control Report shall be signed and reviewed by the Contractor and the Engineer at the completion of each work day. Attachment D presents an example of a typical Daily Construction Quality Control Report. The Contractor may use alternative forms providing the same information subject to the prior approval of the Engineer.

5. CONTRACTOR'S DRAWINGS

If specified, detailed drawings of material and structures to be supplied by the Contractor shall be prepared from typical details shown on "Approved for Construction" drawings and/or from specified requirements. Contractor's drawings shall be submitted to the Engineer for review and will be returned to the Contractor stamped and noted as being "Reviewed" by the Engineer before fabrication or construction commences.

All submittals shall bear the Contractor's approval stamp prior to their initial submission to the Engineer and shall be signed, dated and identified as to the specific project.

Dimensions shown on the Contractor's drawings shall conform with actual measurements of existing and/or completed associated structures and affected adjacent work.

Contractor's drawings shall indicate materials, methods of construction attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of the Works. Where articles or equipment attach or connect to other articles or equipment, the Contractor shall indicate that such work has been coordinated, regardless of the Project Specification Section under which the adjacent items will be supplied and installed. Contractor's drawings shall be cross-referenced to appropriate Project Specifications and Drawings.

The Contractor shall make changes in Contractor's drawings as the Engineer may require, consistent with the Contract Documents. When resubmitting drawings the Contractor shall notify the Engineer in writing of any revisions other than those requested.

Adjustments made on the Contractor's drawings by the Engineer are not intended to change the Contract Price. If adjustments affect the value of the Works, the Contractor shall state such in writing, as specified elsewhere in the Contract, to the Engineer prior to proceeding with the Works.

The Contractor shall submit three legible copies of drawings for each requirement requested in the Project Specifications and as the Engineer may reasonably request.

One print of each drawing will be returned stamped and noted as "Reviewed" by the Engineer, or marked up to show the Engineer's required modifications and noted as "Revise and Re-Submit". The Contractor shall correct and resubmit drawings as often as necessary until the Engineer returns drawings without marked modifications and stamped "Reviewed".

The Contractor shall not be relieved of any part of his responsibilities for correctness of his drawings or adequacy of his design bearing the Engineer's "Reviewed" stamp. The Engineer's

review is for the sole purpose of ascertaining conformance with general design concepts, and in no way constitutes approval of the detail design inherent in the Contractor's drawings, responsibility for which remains with the Contractor.

6. MANUFACTURER'S PRODUCT DATA

Where specified or as requested by the Engineer, the Contractor shall submit to the Engineer duplicate copies of product data sheets or brochures for requirements requested in the Project Specifications and as the Engineer may reasonably request where shop drawings will not be prepared due to standardized manufacture of product.

The Contractor shall also submit to the Engineer prior to a materials arrival on Site, Material Safety Data Sheet for all materials brought to the Site requiring special handling procedures.

7. RECORD DRAWINGS

After award of Contract, the Engineer will provide an extra set of Drawings to the Contractor for the purpose of maintaining record drawings during performance of the Works.

The Contractor shall accurately and neatly record deviations from the Contract Documents caused by Site conditions and changes ordered by the Engineer, on the extra set of Drawings.

Locations of concealed components of mechanical and electrical services also shall be recorded on the extra set of Drawings.

Such drawings shall be identified as "Record Drawings" and shall be maintained in new condition and made available for inspection on the Site, as required by the Engineer.

On completion of the Works and prior to final inspection, the Contractor shall submit record drawings and documents to the Engineer.

8. SUBMITTALS FOR WEEKLY MEETINGS

The following are minimum required submittals to be provided to the Engineer at least 24 hours prior to scheduled weekly meetings:

1. updated job progress schedules detailing all activities. Include review of progress with respect to previously established milestones and schedules, major problems and action taken, injury reports, equipment breakdown and all bulk material removal and all air sampling results conducted by the Contractor;

2. copies of all transport manifests, trip tickets and disposal receipts for all waste materials removed form the work area during the Works;

3. weekly copies of work-site entry logbooks with information on worker and visitor access; and

4. weekly results of air sampling data collected during the course of the Works, including OSHA compliance air monitoring results.

9. MEASUREMENT AND PAYMENT

No separate measurement and payment will be made for work under Section 01300.

END OF SECTION

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1. SITE OFFICES

During the performance of the Works, the Contractor shall provide and maintain separate and suitable offices at the Site for the Contractor.

The offices shall be located on the Site as shown on the Drawings or as directed by the Engineer.

2. EQUIPMENT DECONTAMINATION FACILITY

The Contractor shall utilize the existing equipment decontamination facility at the Site. The Contractor shall provide pumps and housing as required to remove decontamination wastewater to separate tankage at the existing on-Site groundwater treatment facility.

Equipment decontamination shall take place on the equipment decontamination facility and shall consist of degreasing, if required, followed by high pressure, low-volume, hot water or stream supplemented by detergents as appropriate.

Special attention shall be paid to removal of material on and within the tracks and sprockets of crawler equipment, and the tires and axles of trucks and rubber tire mounted equipment. The Contractor shall take measures to minimize the drift of mist and spray during decontamination. Such measures shall include the use of wind screens.

The decontamination wash unit shall be portable, high pressure with self-contained water storage tankage and pressurizing system. The unit shall be capable of heating and maintaining wash waters to 180°F and providing a nozzle pressure of 150 psi.

All decontamination waters shall be collected and transferred to the appropriate wastewater storage tank. Sediment accumulating in the decontamination sump shall periodically be collected and placed in the existing on-Site soil/sediment stockpile as directed by the Engineer. The Contractor shall supply and operate all equipment required to collect, contain and transfer decontamination wastewaters and sediments.

3. EMERGENCY FIRST AID FACILITY

The Contractor shall provide, operate and maintain an emergency first aid facility which complies with the requirements of 29 CFR 1910.141. This facility may be housed within or adjacent to the Personnel Hygiene/Decontamination Facility. The Emergency First Aid Facility shall have available, as a minimum, the following equipment and supplies:

1. stretcher;
2. one set of crutches;
3. two fire extinguishers meeting the requirements of 29 CFR 1910.307;
4. blankets and towels as required;

5. first aid kit containing medications appropriate for the initial treatment of burns, abrasions, fractures, and ingestion or dermal contact with on-Site hazardous waste;

6. one hand-held area siren/alarm; and

The Contractor shall keep at the Site at all times a sufficient number of fully equipped first aid kits for availability at each work location and shall post emergency and ambulance phone numbers in large letters beside each Site telephone.

4. PORTABLE TOILETS

The Contractor shall provide a minimum of one (1) portable sanitary toilet. The Contractor shall remove and dispose of sanitary wastes off Site on a periodic basis as required and in accordance with applicable laws and regulations.

5. PARKING

Should off-road parking be required, the Contractor shall supply parking areas at its own expense.

The Contractor shall locate parking in a designated on-Site clean zone as shown on the drawings such that parked vehicles do not interfere with Site operations and/or adjacent facilities. The Contractor shall provide two parking spaces for the use of the Engineer.

6. ACCESS ROADS

The Contractor will be permitted reasonable use of all existing access roads at the Site subject to the following conditions:

1. traffic on roads or parking areas shall not be interrupted or interfered with at any time except where open-trench crossings have been specified on the Drawings and proper notice regarding open-trench crossings has been given to the Engineer; and

2. all vehicles comply with weight and load size restrictions where applicable.

Maintenance of access roads during performance of the Works shall include provision of all signs, barricades, gatepersons, flagpersons, flares and lights and other measures required. The Contractor shall provide flag persons for all construction traffic crossing or entering local traffic routes or otherwise required on the Site.

The Contractor shall take appropriate measures to prevent contamination of access roads and other clean areas during performance of the Works. Debris or material on access roads which is suspected to be contaminated as determined by the Engineer shall be scraped up, transported and placed by the Contractor into a designated area as directed by the Engineer. The Contractor shall repair any wear and tear and damage to access roads arising out of the Contractor's construction operations.

7. TELEPHONE

The Contractor shall provide and pay for separate telephone service at the Contractors Site office for use by the Contractor. A radio telephone services will not be acceptable.

8. ELECTRICAL POWER AND SITE LIGHTING

The Contractor shall provide and pay for all power required for the performance of the Works, including provision of all necessary power distribution system and special connections to existing power system.

The Contractor shall supply, erect, operate and maintain adequate Site lighting to facilitate performance of the Works and to maintain a safe working condition. As a minimum, the Contractor shall provide outside area lighting in the office area and the decontamination area.

9. POTABLE WATER

The Contractor shall provide and pay for all necessary potable water, potable water holding tanks, distribution system and connections to a potable water supply. The Contractor shall maintain an adequate supply of potable water at the Site at all times.

10. TEMPORARY HEATING

The Contractor shall provide temporary heating, covering and enclosures as necessary to protect all work and material against damage by dampness, freezing and cold and to facilitate completion of the Works. The Contractor shall supply all fuel, equipment, materials and attendance required for temporary heating.

The Contractor shall be responsible for damage to the Works due to failure in providing adequate heat and protection during construction.

11. GUARDRAILS AND BARRICADES

The Contractor shall provide, erect and remove barricades and guardrails as required by laws and codes for the performance of the Works. Guardrails and barricades shall be erected in a timely manner around all excavations, open trenches and active work areas as shown on the Drawings and as directed by the Engineer. All excavations and work activity adjacent to Municipal, County or State roadways shall be guarded and barricaded to the standards and requirements of the respective Municipal, County or State maintenance authority as a minimum.

The Contractor shall ensure that all open excavations are flagged and barricaded prior to leaving the Site at the end of each work day.

12. DUST AND PARTICULATE CONTROL

The Contractor shall supply and maintain dust control measures such as water misting systems as required to prevent generation of dust during performance of the Works. Water used for dust

control shall be potable water, or treated water from the Trust's on-Site groundwater treatment facility, if available.

13. WASTEWATER STORAGE FACILITIES

A. GENERAL

The Contractor shall provide, operate and maintain separate wastewater storage facilities to collect and store decontamination and well development and testing wastewaters and sanitary wastewaters. Wastewater from toilets, and handbasins, shall be disposed of off Site as approved by the Engineer.

B. INSTALLATION

The Contractor shall install the facilities in the locations shown on the Drawings or as directed by the Engineer.

The Contractor shall connect all pumping, piping, miscellaneous items and necessary utilities as required for operation of the facilities. All tanks, valves, pumping, piping and miscellaneous items shall be protected from freezing.

C. OPERATION

The Contractor shall not operate the facilities until the Engineer has inspected the facility.

The Contractor shall operate the facilities and do all work necessary to collect wastewaters, including general maintenance and repairs when necessary.

The Contractor shall notify the Engineer 72 hours in advance of when a wastewater storage tank is anticipated to be full. The Contractor shall supply transportable tankage to remove stored liquids. The Contractor shall sample the liquids for disposal and have the sample analyzed to determine the final disposition of the wastewaters. Analytical results shall be submitted to the Engineer. The Contractor shall not discharge additional liquids to a filled tank following sampling by the Contractor. The Contractor shall transport and dispose of wastewaters at a facility as identified by the Contractor and approved by the Engineer.

14. PROTECTION OF MONITORING WELLS AND PIEZOMETERS

Monitoring wells and piezometers which are located in the working area and which are to be maintained for the duration of the Contract, or as directed by the Engineer, will be flagged by the Engineer. The Contractor shall protect identified monitoring wells and piezometers and shall take all necessary precautions to avoid damage to these monitoring wells and piezometers. Any monitoring well or piezometer damaged by the Contractor during performance of the Works shall be repaired or replaced by the Contractor, as directed by the Engineer, at no additional cost to the Trust.

15. MEASUREMENT AND PAYMENT

A. SITE OFFICES

Payment for Site offices will be made at the lump sum price stipulated in the Schedule of Prices for Item C-1 which price and payment shall be full compensation for supply of all labor, plant, material and equipment required to supply, install and maintain the Contractor's, Site offices furniture, filing cabinets, plan tables; telephone and facsimile service; and all other miscellaneous items for which separate payment is not provided under other Items.

B. POTABLE AND WASTEWATER HOLDING TANKS

Payment for potable and wastewater holding tanks will be made at the lump sum price stipulated in the Schedule of Prices for Item C-2 which price and payment shall be full compensation for supply of all labor, plant, materials and equipment required to supply, install and maintain potable and wastewater holding tanks including piping and pumping installations; and all other miscellaneous items for which separate payment is not provided under other Items.

C. PROTECTION OF MONITORING WELLS AND PIEZOMETERS

Payment for protection of monitoring wells and piezometers will be made at the lump sum price stipulated in the Schedule of Prices for Item C-3 which price and payment shall be full compensation for supply of all labor, plant, materials and equipment required for protection of monitoring wells and piezometers; and all other miscellaneous items for which separate payment is not provided under other Items.

No separate measurements and payment will be made for other construction facilities and temporary controls required for implementation of the Works.

END OF SECTION

SECTION 01700 - PROJECT CLOSEOUT

1. GENERAL

The Contractor shall coordinate and perform project closeout activities in such a manner that no waste materials scheduled for off-Site disposal, or mobilized facilities remain at the Site upon completion of the Works.

2. FINAL DECONTAMINATION

The Contractor shall perform final decontamination of facilities, equipment, and materials which may have come in contact with potentially contaminated materials prior to removal from the Site. Decontamination shall be completed as described in the Site Specific Health and Safety Plan developed by the Contractor in accordance with Section 01121. Decontamination shall be to the satisfaction of the Engineer. The Engineer shall have sole authority to approve decontamination as complete.

3. STORED WASTEWATER REMOVAL

The stored wastewater shall be sampled and analyzed for disposal purposes by the Contractor prior to disposal. The results of the analyses will determine the appropriate methods of disposal. Upon receipt of the analytical results and as directed by the Engineer, the tank contents shall be transferred by the Contractor to the Trust's on-Site water treatment facility for treatment by the Trust. Following emptying of the wastewater tank, the tank interior shall be decontaminated with a steam or high pressure water wash supplemented by detergent (Alconox). All rinse water generated as part of this cleaning shall be disposed of at the Trust's on-Site water treatment facility.

4. FINAL CEANUP

The Contractor shall clean the Site of general litter and trash generated during the Works and leave the Site in a neat and orderly condition. The Contractor shall pick up any spilled imported fill. The Contractor shall remove and dispose of litter and trash to a sanitary landfill approved by the Engineer.

5. FINAL GRADING

All temporary roads constructed by the Contractor shall be removed and the affected surface restored to final grades and finished as approved by the Engineer.

. DEMOBILIZATION

The Contractor shall schedule and sequence demobilization activities such that all contaminated and potentially contaminated facilities, materials, and equipment to be removed from the Site can be decontaminated prior to removal.

Unless otherwise specified, the Contractor shall remove all waste materials, equipment, temporary structures and materials from the Site at the completion of the Works. The

Contractor shall disconnect and remove from the Site all temporary services and utilities required for the performance of the Works which were provided by the Contractor.

7. MEASUREMENT AND PAYMENT

A. DEMOBILIZATION AFTER COMPLETION OF PHASE III WELL INSTALLATION AND ABANDONMENT

Payment for demobilization after completion of Phase III well installation and abandonment will be made at the lump sum price stipulated in the Schedule of Prices for Item D-1, which price and payment shall be full compensation for removal of all temporary fencing; disposal of all debris from the Site; removal of all equipment and materials from the Site; regrading and restoration of disturbed areas or areas affected by the performance of the Works; final cleaning of all structures constructed by and used by the Contractor for performance of the Works; and all other miscellaneous items for which separate payment is not provided under other Items.

B. DEMOBILIZATION AND PROJECT CLOSEOUT ON COMPLETION OF PHASE IV WELL INSTALLATION AND ABANDONMENT

Payment for demobilization and project closeout will be made at the lump sum price stipulated in the Schedule of Prices for Item D-2, which price and payment shall be full compensation for removal of all temporary fencing; disposal of all debris from the Site; removal of all equipment and materials from the Site; regrading and restoration of disturbed or areas affected by the performance of the Works; final cleaning of all structures constructed by and used by the Contractor for performance of the Works; and all other miscellaneous items for which separate payment is not provided under other Items.

END OF SECTION

SECTION 02018 - MONITORING WELLS AND PIEZOMETERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included

Work of this Section consists of construction and abandonment of monitoring wells and piezometers as specified and as shown on the Drawings.

The work includes, but is not necessarily limited to, the following:

1. construction of 39 monitoring wells and 19 piezometers;
2. monitoring well and piezometer development;
3. monitoring well abandonment; and
4. adjustment of existing monitoring wells.

B. Work Not Included

The following items of work associated with work of this Section do not form part of these Project Specifications:

1. locating and marking of each well and piezometer prior to the commencement of drilling operations; and
2. supply and installation of locks for all wells.

1.02 QUALITY ASSURANCE

Each well will be used to measure water level elevations and/or to collect water samples for chemical analyses. Therefore, strict cleaning protocols will be imposed and enforced to prevent cross-contamination between wells.

Because of the nature of the activities which have taken place at the Site, some wells may penetrate potentially contaminated soil and/or waste material. The Contractor shall take all necessary precautionary measures to prevent contamination near the ground surface from being carried downhole. Particular attention must be provided when drilling through any fine grained overburden into an underlying aquifer to prevent potential overburden contamination from passing into the isolated aquifers.

The Contractor shall clean and decontaminate all drilling equipment and materials prior to mobilization to the Site and between each well.

1.03 SUBMITTALS

The submittals for the monitoring wells and piezometers are as specified in Section 02670.

1.04 JOB CONDITIONS

A. Existing Conditions

The job conditions for the monitoring well construction are the same as specified in Section 02670.

B. Protection

Prior to commencing drilling at each drilling location the Contractor shall protect the surface soil in the immediate area of the drill rig with two layers of 6-mil polyethylene (HDPE) sheeting covered by 5/8-inch plywood. The area to be covered shall be approximately 12 feet by 16 feet. All drill cuttings shall be contained on top of the plywood prior to being transferred to on-Site stockpile areas by the Contractor as directed by the Engineer.

In addition to the HDPE sheeting the work area around the drill rig shall be entirely surrounded with absorbent pads to prevent the release of any surface water during drilling operations. If contacted by drilling liquids or surface water contacting material potentially containing site specific constituents, the absorbent pads shall be transferred to on-Site stockpile areas as directed by the Engineer.

C. Sequencing and Scheduling

The Contractor shall be responsible for sequencing and scheduling the Works as specified and as shown on the Drawings subject to the approval of the Engineer. The Contractor shall complete each phase of well installation/abandonment as shown on Drawing G-2 prior to commencing work on the next phase of well installation/abandonment.

PART 2 - PRODUCTS

2.01 GENERAL

Materials shall be provided by sources approved by the Engineer.

2.02 MATERIALS

A. Monitoring Well Casing

(1) WTU and IU Monitoring Wells

Well casing for all WTU and IU monitoring wells shall comply with ASTM A312 and shall be 2-inch diameter, Type 304 Schedule 10 stainless steel. Pipe fittings shall be threaded and flush joint coupled and of same standard as well casing.

(2) USU Monitoring Wells

Well casing for all USU monitoring wells shall comply with ASTM A312 and shall be 4-inch diameter, Type 304 Schedule 10 stainless steel. Pipe fittings shall be threaded and flush joint coupled and of same standard as well casing.

B. Well Screen

(1) WTU and IU Monitoring Wells

Well screens shall comply with ASTM A312 and shall be 2-inch diameter pipe size, 5 or 10-foot long (as shown on the Drawings), Type 304 stainless steel with 0.010-inch slots.

(2) USU Monitoring Wells

Well screens shall comply with ASTM A312 and shall be 4-inch diameter telescopic Type 304 stainless steel with 0.010-inch slots and 20 feet in length.

C. Surface and Intermediate Casing

Surface and intermediate casings shall be Schedule 40 carbon steel complying with ASTM A53. The diameters shall be as shown on the Drawings. Pipe fittings shall be butt welded or threaded and flush joint coupled and of the same standard as the surface casing.

D. Piezometer Casing

Piezometer casing for all piezometers shall comply with ASTM F480 and shall be 2-inch diameter schedule 40 polyvinyl chloride (PVC). Pipe fittings shall be thread and flush joint coupled and of the same standard as well casing.

E. Piezometer Screens

Piezometer screens shall comply with ASTM F480 and shall be 2-inch diameter, 5-foot or 10-foot long PVC construction with 0.010-inch PVC screen.

F. Silica Sand

Silica sand shall consist of inert uniformly graded silica sand (20-40 mesh) and shall be well rounded and free of fines. The gradation shall be such that no more than 10% of the sand grains are finer than the screen slot size.

G. Cement/Bentonite Grout

Cement/bentonite grout shall be the same as specified in Section 02670.

H. Concrete

Concrete shall consist of ready mix concrete and shall be capable of reaching 3,000 pounds per square inch at 28 days.

I. Water

Water when used in equipment decontamination, drilling, coring and well construction including cleaning, grouting or other activities shall be clean potable water and shall be provided by the Contractor from a source approved by the Engineer.

J. Bentonite Pellet Seal

Bentonite pellets shall be 3/8-inch diameter and of a type approved by the Engineer.

K. Absorbent Pads

Absorbent pads to be placed around the drill rig at each drilling location shall be Type 270 3M Oil Sorbent Boom or equivalent.

L. Drilling Fluid

Drilling fluid shall consist of sterile bentonite, free of organic additives, mixed with potable water.

M. Lockable Protective Casings

Lockable protective casings for WTU wells shall be 6-inch diameter steel complete with a hinged lid with a hasp. For the UIU, LIU and USU monitoring wells, lockable caps shall be welded onto the surface or intermediate casings, as shown on Drawing G-5.

The exposed portion of the protective or surface casing shall be painted fluorescent orange.

N. Other Materials

Other materials shall be selected by the Contractor for the purpose intended and shall be subject to the Engineer's approval prior to use.

PART 3 - EXECUTION

3.01 PREPARATION

The Contractor shall not commence drilling operations until the Engineer has marked the location of each well and has issued an instruction to proceed. Installation of wells shall only proceed upon receipt of instructions from the Engineer.

3.02 PERFORMANCE

A. General

The Contractor shall use drilling equipment and methods approved by the Engineer.

The Contractor shall prevent foreign matter from entering boreholes or from leaving the immediate area of the drill rig and shall take all necessary and proper precautions to prevent contamination within and between borings by introduction of any foreign substances, including contaminated water, contaminated soil, detergents or other decontamination fluids, gasoline, cable lubricant, hammer oil or any other objectionable fluids or substances. Any such substances that must be used shall be precisely described and identified before use and shall be approved by the Engineer prior to use. The Contractor shall lay down two layers of 6-mil polyethylene covered by 5/8-inch plywood to protect surficial soils from contamination at each drilling location.

The Contractor shall maintain a log or record of each borehole on a form approved by the Ohio Department of Natural Resources which form shall include but not necessarily be limited to, the following information:

1. the general character, thickness and type of material encountered;

2. the depth at which the water level stands in the well at the beginning and end of each shift; and

3. the nature and extent of all other work performed, including the exact time spent on each item of work.

The Contractor shall keep the log carefully and accurately at the time the work is being done. A copy of the log shall be maintained at all times at the Site and shall be available for inspection at any time by the Engineer. Upon completion of each well and of the Works, a complete copy of the log and record of forms shall be furnished to the Engineer.

The Contractor shall obtain soil samples of the overburden from each split spoon or from drill cuttings. Samples shall be of at least one-pint size, shall be kept in jars and shall be clearly labeled to show the depth from which collected. Soil samples shall be maintained on Site at the designated on-Site stockpile areas as directed by the Engineer.

Drilling shall be performed in locations and to depths shown on the Drawings or as directed by the Engineer.

The Contractor shall be prepared to shut off and seal a hole should flowing artesian water or gas be encountered.

All cuttings and solid waste generated during well construction shall be collected and secured at the on-Site stockpile areas as directed by the Engineer.

All liquid wastes generated during well construction shall be collected and transferred to Contractor-supplied wastewater storage tanks.

In the event that the Contractor should abandon a well because of loss of tools or equipment, or due to Contractor negligence, the Contractor, if requested and as directed by the Engineer, shall fill the abandoned hole with cement/bentonite grout and, if so directed by the Engineer, salvage and remove such casing as can be salvaged. The cost of abandonment of an incomplete well, including the filling, drilling, casing or other work performed on the abandoned well shall be at no additional cost to the Trust.

Abandonment of a borehole due to auger refusal and not due to Contractor equipment loss, equipment failure or negligence, which is beyond the Contractor's control, shall be reimbursed at the appropriate rates stipulated in the Schedule of Prices.

Each well shall be constructed in accordance with the details shown on the Drawings and as directed by the Engineer.

B. Equipment Cleaning

(1) Cleaning

Upon mobilization to the Site and prior to commencing drilling, the drill rig and all associated equipment shall be thoroughly cleaned with a high pressure, low volume, hot water wash to remove mud and other foreign matter at an on-Site temporary equipment decontamination facility provided by the Contractor. The Contractor shall ensure the drill rig and associated equipment are free of all mud and hydraulic fluid and all seals and gaskets are intact and no fluids are leaking.

All downhole equipment used in the construction of soil borings and installation of wells shall be taken to the equipment decontamination facility and cleaned as specified prior to commencing drilling activities at each borehole to prevent cross-contamination from the previous drilling location. All downhole equipment that has paint or encrustation shall have this material removed to the satisfaction of the Engineer prior to use. This material shall be removed by sandblasting prior to mobilization to the Site.

The drill rig used for such installations shall be cleaned prior to mobilizing to each well location.

All well screens and casings shall be cleaned prior to installation.

(2) Methods of Cleaning

All downhole drilling equipment such as augers, cutting bits, and associated equipment and tools that will contact potentially contaminated soil or groundwater shall receive a complete wash with clean, hot water under high pressure. The wash sequence shall be as follows:

1. clean hot water high-pressure detergent (Alconox) wash and wiping; and

2. clean hot water high-pressure rinse.

All well screens and well casings, shall be thoroughly cleaned using the following wash sequence:

1. sand off all printing inks, if present, on the surface of the well casing or screen;

2. wash equipment thoroughly with a detergent (Alconox) high-pressure wash to remove particulate matter or surface film (if any); and

3. deionized water rinse.

Washwater generated from the cleaning of drilling equipment and well screens and casings shall be transferred to Contractor-supplied wastewater storage tanks.

All drilling equipment and well materials will be inspected and approved by the Engineer prior to their use.

(3) Disposal of Decontamination Wash Waters and Sediments

The Contractor shall collect and transfer all decontamination wash waters to Contractor-supplied wastewater storage tanks and shall collect and transfer all sediments to on-Site stockpile areas as directed by the Engineer. Disposal of decontamination wash waters and sediments will be the responsibility of the Trust.

C. Water Table Unit (WTU) Well Construction

(1) Drilling

At each WTU well location the borehole shall be advanced to the appropriate depth using 4 1/4-inch ID (8-inch OD) hollow-stem augers. Soil samples shall be collected continuously during augering to identify and classify soil materials, using 2-inch diameter split spoon samplers in accordance with the Standard Penetration Test method as described in ASTM D1586, or other method approved by the Engineer.

Boreholes shall be advanced to the top of the confining layer (siltstone).

The Contractor shall exercise extreme caution when augering to ensure the siltstone confining layer is not completely penetrated. The maximum sampling interval within this zone shall not exceed 2 feet.

If the confining layer is encountered, a bentonite pellet plug shall be placed up to the top of the confining layer before installation of the monitoring well.

A 2-inch diameter well screen, 5 feet in length, attached to a 2-inch diameter well casing shall be installed through the augers. A graded silica sandpack shall be placed through the annulus between the casing and inside of the auger as the augers are withdrawn from the borehole. The sandpack shall be placed to a height of 2 feet above the top of the screen.

A 2-foot thick bentonite pellet seal shall be placed above the sandpack and shall be tamped in place using a 3/4-inch rod. The remainder of the borehole shall be backfilled with pure bentonite grout until undiluted grout returns to the ground surface. The uppermost 4 feet of grout shall be removed and replaced with concrete, as shown on the Drawings.

(2) Screens

Well screens shall be cleaned prior to installation as specified in Clause 3.02.B.

Well screens shall be installed by methods approved by the Engineer and in accordance with the manufacturer's recommendations.

(3) Well Casing

Casing pipe and fittings shall be cleaned prior to installation as specified in Clause 3.02.B.

Casing shall be installed to sizes and depths shown on the Drawings and in locations designated by the Engineer. The casing shall be installed to stick up to at least 2 feet above the proposed final Site cover as shown on Drawing G-4.

The Contractor shall maintain accurate records of casing lengths and sizes installed.

(4) Concrete

The Contractor shall only be responsible for installing the concrete apron as shown on Drawing G-5 on all monitoring wells as directed by the Engineer.

The Contractor shall use concrete to backfill the uppermost 4 feet of well installation and form a 2-foot by 2-foot concrete collar around the protective casing at ground surface.

Concrete shall be mixed and placed by hand in one continuous operation with the entire amount poured before initial set occurs.

(5) Protection of Completed Wells

All wells shall be protected by a 6-inch diameter steel protective casing complete with lockable cap or with a flush mounted lockable cap. All protective casings shall be vented by drilling a weep hole in the base. Locking caps shall be furnished by the Contractor and installed immediately upon completion of the well to prevent access by unauthorized persons. A concrete surface pad measuring 2 feet by 2 feet and having a minimum thickness of 1 foot shall be constructed around the surface casing. The Engineer will install locks for securement on the protective caps.

(6) Well Development

Monitoring Wells shall be developed to a silt-free condition, if possible, after completion and following a 24-hour period to allow the cement/bentonite grout to set. Equipment used in well development shall be cleaned prior to use in each monitoring well as specified in Clause 3.02.B. All development waters shall be contained and transferred to Contractor-supplied wastewater storage tanks. The Contractor shall provide to the Engineer the method he proposes to use for well development and shall obtain the Engineer's approval of this method before commencing any well development.

D. Upper Intermediate Unit Monitoring Well Construction

(1) Drilling

At each UIU monitoring well location a 10-inch diameter hole shall be drilled using mud-rotary methods two feet into bedrock.

A continuous length of nominal 6-inch diameter surface casing complete with centralizers (at top and bottom) shall be sealed a minimum of 2 feet into the bedrock using a cement/bentonite grout forced into the annular space through a tremie pipe/packer assembly located in the casing near the bottom of the boring. The pumping of the cement/bentonite grout shall continue until undiluted grout returns through the annulus to the ground surface. The casing then shall be pushed into the confining layer to further seal the annulus. The grout shall be allowed to set for a minimum period of 24 hours before further drilling.

The casing shall be filled with potable water and allowed to sit for five minutes to test the seal. If the water level declines, the borehole shall be redrilled, regrouted with cement/bentonite grout and retested until it passes.

The surface casing shall then be flushed with an additional four casing volumes of potable water prior to proceeding with drilling operations. Water used for drilling shall be potable water and shall be discharged to the Contractor-supplied wastewater storage tanks.

The borehole for each UIU well shall be advanced using wet rotary methods, through the cement/bentonite plug at the bottom of the borehole, using a 6-inch diameter tricone roller bit, to the top of the unnamed limestone. Samples of drill cuttings shall be collected from below the surface casing to the unnamed limestone (marker bed) at 2-foot intervals or other intervals approved by the Engineer.

In several UIU wells (at locations designated by the Engineer) the borehole for the steel surface casing shall be advanced by using a "N" size core barrel (1.88-inch diameter core, 2.98-inch diameter hole). Clean potable water shall be used as the circulating medium. The borehole shall be cored continuously until a minimum of 1 foot of the unnamed limestone is penetrated. Each core run shall be laid in core boxes supplied by the Contractor in accordance with ASTM D2113.

The core hole shall be reamed using a 6-inch diameter tricone roller bit and wet rotary methods to the top of the unnamed limestone or to a depth determined by the Engineer.

Upon reaching the unnamed limestone, a bentonite pellet plug shall be placed to seal off the top of the limestone before installing the monitoring well. A 2-inch diameter 0.010-inch slot stainless steel screen of 10 foot length attached to 2-inch diameter stainless steel well casing (complete with centralizers at maximum 40-foot intervals) shall be installed through the surface casing to its desired depth. No lubricants other than potable water shall be used in the assembly of the well screen and pipe. An inert sandpack shall be placed in the annulus space to a height of approximately 2 feet above the screen. A 2-foot thick bentonite pellet seal shall be placed above the sandpack and shall be tamped in place using a 3/4-inch rod. A tremie pipe shall be lowered into the borehole and pure bentonite grout shall be introduced to the annular space between the well casing and the borehole wall. Pumping of bentonite grout shall continue until undiluted bentonite grout returns to the ground surface. The uppermost 4 feet of cement/bentonite grout shall be removed from the surface casing and replaced with concrete as shown on the Drawings.

(2) Screens

Monitoring well screens shall be cleaned prior to installation as specified in Clause 3.02.B.

Well screens shall be installed by methods approved by the Engineer and in accordance with the manufacturer's recommendations.

(3) Well and Surface Casing

Casing pipe and fittings shall be cleaned prior to installation as specified in Clause 3.02.B.

Casing shall be installed to sizes and depths shown on Drawing G-5 and in locations designated by the Engineer. The casing shall be installed to stick up to at least two feet above the proposed final Site cover as shown on Drawing G-4.

The Contractor shall maintain accurate records of casing lengths and sizes installed.

(4) Concrete

Concrete shall be installed specified in Clause 3.02. C.(4).

(5) Protection of Completed Wells

All monitoring wells shall be protected by a lockable steel protective cap installed over the 6-inch diameter surface casing. All surface casings existing above the ground surface shall be vented by drilling a weep hole in the base. Locking covers shall be furnished by the Contractor and installed immediately upon completion of the well to prevent access by unauthorized persons. A concrete surface pad measuring 2 feet by 2 feet and having a minimum thickness of 1 foot shall be constructed around the surface casing. The Engineer will install locks on the protective caps.

(6) Well Development

UIU monitoring wells shall be developed as specified in Clause 3.02 C.(6).

E. Lower Intermediate Unit (LIU) Monitoring Well Construction

(1) Drilling

At each LIU monitoring well location a 14-inch diameter borehole shall be advanced to the termination depth of the adjacent WTU monitoring well using wet rotary drilling methods.

A continuous length of nominal 10-inch diameter steel surface casing complete with centralizers (at top and bottom) shall be sealed a minimum of 2 feet into the confining layer using a cement/bentonite grout forced into the annular space through a tremie pipe/packer assembly located in the casing near the bottom of the boring. The pumping of the cement/bentonite grout shall continue until undiluted grout returns through the annulus to the ground surface. The casing then shall be pushed into the confining layer to further seal the annulus. The cement/bentonite grout shall be allowed to set for a minimum period of 24 hours before further drilling.

The casing shall be filled with potable water and allowed to sit for five minutes to test the seal. If the water level declines, the borehole shall be redrilled, regrouted with cement/bentonite grout and retested until it passes.

The surface casing shall then be flushed with an additional four casing volumes of potable water prior to proceeding with drilling operations. Water used for rotary drilling shall be potable water and shall be discharged to Contractor-supplied wastewater the storage tanks.

The borehole for each LIU monitoring well shall be advanced using wet rotary methods, through the cement/bentonite plug at the bottom of the casing, using a 10-inch diameter tricone roller bit, to the top of the unnamed limestone bedrock. Drill cutting samples shall be collected from below the surface casing to the limestone bedrock at 2-foot intervals or other intervals approved by the Engineer.

A continuous length of nominal 6-inch diameter steel intermediate casing complete with centralizers (at top and bottom) shall be sealed a minimum of 2 feet into the confining layer using a cement/bentonite grout forced into annular space through a tremie pipe/packer assembly located in the casing near the bottom of the boring. The pumping of the cement/bentonite grout shall continue until undiluted grout returns through the annulus to the ground surface. The casing shall then be pushed into the confirming layer to further seal the annulus. The cement/bentonite grout shall be allowed to set for a minimum period of 24 hours before further drilling.

The casing shall be filled with potable water and allowed to sit for five minutes to test the seal. If the water level declines, the borehole shall be redrilled, regrouted with cement/bentonite grout and retested until it passes.

The intermediate casing shall then be flushed with an additional four casing volumes of potable water prior to proceeding with drilling operations.

The borehole for each of the LIU monitoring wells shall be advanced using wet rotary methods, through the cement/bentonite plug at the bottom of the borehole, using a 6-inch diameter tricone roller bit, to the top of the Upper Sharon Unit. Drill cutting samples shall be collected from below the intermediate casing to the bedrock at 2-foot intervals or other intervals approved by the Engineer.

In several locations (to be designated by the Engineer) it may be necessary to core the lower section of the Intermediate Unit. Coring shall be performed using the procedure outlined in Clause D.(1) using "N" size core barrels. The borehole will be cored continuously to the top of the USU. After coring, the core hole shall be reamed to a diameter of 6 inches using wet rotary methods. Reaming shall continue to the top of the USU or to a depth designated by the engineer. Reaming shall not continue into the USU.

At the top of the USU, a bentonite pellet plug shall be placed to seal off the top of the bedrock before installing the monitoring well. A 2-inch diameter 0.010-inch slot stainless-steel screen of appropriate length attached to 2-inch diameter stainless-steel well casing (complete with centralizers at maximum 40-foot intervals) shall be installed through the surface casing to its desired depth. No lubricants other than potable water shall be used in the assembly of the well screen and pipe. An inert sandpack shall be placed in the annulus space to a height of approximately 2 feet above the screen. A 2-foot thick bentonite pellet seal shall be placed above the sandpack and shall be tamped in place using a 3/4-inch rod. A tremie pipe shall be lowered into the borehole and pure bentonite grout shall be introduced to the annular space between the well casing and the borehole wall. Pumping of bentonite grout shall continue until undiluted bentonite grout returns to the ground surface. The uppermost 2 feet of cement/bentonite grout shall be removed from the surface casing and replaced with concrete as shown on the Drawings.

(2) Screens

Monitoring well screens shall be cleaned prior to installation as specified in Clause 3.02.B.

Well screens shall be installed by methods approved by the Engineer and in accordance with the manufacturer's recommendations.

(3) Well and Surface Casing

Casing pipe and fittings shall be cleaned prior to installation as specified in Clause 3.02.B.

Casing shall be installed to sizes and depths shown on Drawing G-5 and in locations designated by the Engineer. The casing shall be installed to stick up to at least 2 feet above the proposed final Site cover elevations shown on Drawing G-4.

The Contractor shall maintain accurate records of casing lengths and sizes installed.

(4) Concrete

The concrete shall be installed as specified in Clause 3.02.C.(4).

(5) Protection of Completed Wells

Completed wells shall be protected as specified in Clause 3.02.C.(5).

(6) Well Development

LIU monitoring wells shall be developed as specified in Clause 3.02.C.(6).

F. Upper Sharon Unit (USU) Monitoring Well Construction

(1) Drilling

The USU monitoring wells proposed for the well clusters shall be installed in a separate borehole completed in close proximity to the intermediate unit well(s). A 16-inch diameter borehole shall initially be advanced to the termination depth of the adjacent WTU well using wet rotary drilling methods. A 12 3/4-inch outside diameter steel casing shall then be placed into the borehole and grouted into place with cement/bentonite grout as specified for IU wells in Clause 3.02.E.(1). The grout shall be allowed to set for a minimum period of 24 hours before further drilling. The borehole shall then be advanced through the cement/bentonite plug to the base of the UIU using a 12-inch diameter tricone roller bit. The borehole shall be advanced approximately 2 feet into unnamed limestone, and then a 8 5/8-inch outside diameter steel casing shall be grouted in place with cement/bentonite grout as specified in Clause 3.02.E.(1), and the casing pushed into the limestone to further seal the annulus.

After allowing a minimum of 24 hours for the grout to set the borehole shall be advanced through the LIU using a 7 5/8-inch diameter tricone roller bit. The borehole shall be advanced 2 feet into the marker bed sandstone. A 4 1/2-inch diameter steel casing shall be grouted in place with a cement/bentonite grout as

specified in Clause 3.02.E.(1). The casing shall then be pushed into the sandstone to further seal the casing.

The grout shall be pumped into the annular space through a tremie pipe/packer assembly located in the casing near the bottom of the boring. The discharge end of the grout rod shall be fitted with a ball valve to reduce the infiltration of grout into the well casing. The pumping of grout shall continue until undiluted grout returns through the annulus to the ground surface. The casing shall then be pushed into the bedrock to further seal the annulus. The grout shall be allowed to set for a minimum period of 24 hours before drilling into the Upper Sharon Aquifer.

The casing shall be flushed with a minimum of five casing volumes of potable water prior to proceeding with drilling operations. Water used for drilling shall be discharged to Contractor-supplied wastewater storage tanks.

The borehole into the USU shall be advanced using a 4-inch diameter tricone roller bit. Clean potable water shall be used as the circulating medium. The final depth of each borehole will be determined by the Engineer. All fluids generated during drilling shall be contained and transferred to the designated wastewater storage tanks provided by the Contractor.

A 4-inch diameter 0.010-inch slot stainless steel screen of appropriate length shall be installed through the 4-inch diameter protective casing to its final depth as determined by the Engineer. A 1-foot thick lead packer shall be placed above the well screen. The uppermost 4 feet of cement/bentonite grout shall be removed from the surface casings and replaced with concrete.

(2) Screens

Monitoring well screens shall be cleaned prior to installation as specified in Clause 3.02.B.

Well screens shall be installed by methods approved by the Engineer and in accordance with the manufacturer's recommendations.

(3) Well and Surface Casing

Casing pipe and fittings shall be cleaned prior to installation as specified in Clause 3.02.B.

Casing shall be installed to sizes and depths shown on the Drawings and in locations designated by the Engineer. The casing shall be installed to stick up at least 2 feet above the proposed final Site cover elevations shown on Drawing G-4.

The Contractor shall maintain accurate records of casing lengths and sizes installed.

(4) Concrete

Concrete shall be installed as specified in Clause 3.02.C(4).

(5) Protection of Completed Wells

Monitoring wells shall be protected by a lockable steel protective cap installed over the 8 5/8-inch outside diameter (OD) surface casing. All surface casings existing above the ground surface shall be vented by drilling a weep hole. Locking covers shall be furnished by the Contractor and installed immediately upon completion of the well to prevent access by unauthorized persons. A concrete surface pad as detailed on the Drawings shall be constructed around the surface casing. The Engineer will install locks on the protective caps.

(6) Well Development

USU monitoring wells shall be developed as specified in Clause 3.02.C.(6).

G. Extension of Existing Wells

Existing wells to remain shall be adjusted to stick up at least 2 feet above the proposed final Site cover elevations. At each existing well to remain around which final cover shall be placed, existing locking cap and existing riser cap shall be removed. Existing well casing below well cap shall be cut and removed. Existing riser pipe (either stainless steel or PVC) approximately 6 inches above well casing shall be cut and removed. PVC coupling or steel coupling (if required) shall be welded and attached to existing riser pipe and riser pipe extension piece and terminate riser pipe to approximately 2 feet above proposed final grade. Surface well casing extension shall be welded and attached and casing pipe shall be terminated approximately 8 inches above new riser cap. Cement/bentonite grout shall be pumped into the annular space of the extended casing and riser pipe as specified in Clause 3.02.F.(1). A new lockable vented cap shall be installed, as well as a new concrete apron.

H. Monitoring Well Abandonment

The Contractor shall competently abandon 39 existing monitoring wells, in accordance with all applicable regulations governing such activities. In addition, the Contractor shall inject pure bentonite grout into the screened interval until such volume is achieved that will effectively fill the monitoring zone and the 2-inch or 4-inch diameter well casing. The surface installations shall be removed, the well casing shall be severed a minimum depth of 5 feet below ground surface, the top 5 feet of the remaining casing shall be filled with concrete or a cement/bentonite grout and the remaining void backfilled with a mixture of bentonite and native fill material. The Contractor shall then restore the ground surface to existing conditions of adjacent areas.

PART 4 - MEASUREMENT AND PAYMENT

4.01 8-INCH HOLLOW-STEM AUGERING WITH CONTINUOUS SPLIT SPOON SAMPLING

A. Measurement

Measurement for 8-inch hollow-stem augering with continuous split spoon sampling will be made at the actual number of vertical feet of borehole completed as measured in place by the Engineer from existing ground surface to the approved bottom of borehole.

B. Payment

Payment for the quantity determined above will be made at the unit price per vertical foot stipulated in the Schedule of Prices for Item E-1 which price and payment shall be full compensation for all labor, materials and equipment required for augering 8-inch diameter borehole; continuous split spoon sampling; collecting and transferring all drilling cuttings and solid and liquid wastes to on-Site storage areas; equipment cleaning; mobilization between wells; and all other miscellaneous items for which separate payment is not provided under other Items.

4.02 10-INCH MUD-ROTARY DRILLING

A. Measurement

Measurement for 10-inch mud-rotary drilling will be made at the actual number of vertical feet of borehole completed as measured in place by the Engineer from existing ground surface to the approved bottom of borehole.

B. Payment

Payment for the quantity determined above will be made at the unit price per vertical foot stipulated in the Schedule of Prices for Item E-2 which price and payment shall be full compensation for all labor, materials and equipment required for drilling 10-inch diameter borehole to the termination depth of adjacent WTU monitoring well; sample collection of drill cuttings at 2-foot intervals or other intervals approved by the Engineer; installing a 6-inch diameter steel surface casing to a depth approved by the Engineer; supplying and installing cement/bentonite grout around the well casing; collecting and transferring all drill cuttings and solid and liquid wastes to on-Site storage areas; equipment and material cleaning; mobilization between wells; and all other miscellaneous items for which separate payment is not provided under other Items.

4.03 6-INCH WET ROTARY DRILLING AND SAMPLING

A. Measurement

Measurement for 6-inch wet rotary drilling and sampling will be made at the actual number of vertical feet of borehole completed as measured in place by the Engineer from the bottom of the 6-inch diameter casing to the approved bottom of borehole.

B. Payment

Payment for the quantity determined above will be made at the unit price per vertical foot stipulated in the Schedule of Prices for Item E-3 which price and payment shall be full compensation for all labor, materials and equipment required for drilling 6-inch diameter borehole; sample collection of drill cuttings at 2-foot intervals or other intervals approved by the Engineer; equipment and material cleaning; and all other miscellaneous items for which separate payment is not provided under other Items.

4.04 14-INCH WET ROTARY DRILLING

A. Measurement

Measurement for 14-inch wet rotary drilling will be made at the actual number vertical feet of borehole completed as measured in place by the Engineer from existing ground surface to the approved bottom of the borehole.

B. Payment

Payment for the quantity determined above will be made at the unit price per vertical foot stipulated in the Schedule of Prices for Item E-4 which price and payment shall be full compensation for supply of all labor, materials and equipment required for drilling a 14-inch diameter borehole to the termination depth of adjacent WTU monitoring well; installing a 10-inch diameter steel surface casing; supplying and installing cement/bentonite grout around well casing; collecting and transferring all drill cuttings and solid and liquid wastes to on-Site storage areas; equipment and material cleaning; mobilization between wells; and all other miscellaneous items for which separate payment is not provided under other Items.

4.05 16-INCH WET ROTARY DRILLING

A. Measurement

Measurement for 16-inch wet rotary drilling will be made at the actual number of vertical feet of borehole completed as measured in place by the Engineer from existing ground surface to the approved bottom of borehole.

B. Payment

Payment for the quantity determined above will be made at the unit price per vertical foot stipulated in the Schedule of Prices for Item E-5 which price and payment shall be full compensation for supply of all labor, materials and equipment required for drilling 16-inch diameter borehole to the termination depth of adjacent WTU monitoring well; installing a 12 3/4-inch OD surface casing; supplying and installing cement/bentonite grout around the well casing; collecting and transferring all drill cuttings and solid and liquid wastes to on-Site storage areas; equipment and material cleaning; mobilization between wells; and all other miscellaneous items for which separate payment is not provided under other Items.

4.06 12-INCH WET ROTARY DRILLING

A. Measurement

Measurement for 12-inch wet rotary drilling will be made at the actual number vertical feet of borehole completed as measured in place by the Engineer from the bottom of the 16-inch diameter borehole to the approved bottom of the borehole.

B. Payment

Payment for the quantity determined above will be made at the unit price per vertical foot stipulated in the Schedule of Prices for Item E-6 which price and payment shall be

full compensation for supply of all labor, materials and equipment required for drilling a 12-inch diameter borehole using wet rotary method; installing an 8 5/8-inch OD surface casing; supplying and installing cement/bentonite grout around the well casing; equipment and material cleaning; collecting and transferring all solid and liquid wastes to on-Site storage areas; and all other miscellaneous items for which separate payment is not provided under other Items.

4.07 5 7/8-INCH WET ROTARY DRILLING

A. Measurement

Measurement for 5 7/8-inch wet rotary drilling will be made at the actual number of vertical feet of borehole completed as measured in place by the Engineer from the bottom of the 12-inch diameter borehole to the approved bottom of the borehole.

B. Payment

Payment for the quantity determined above will be made at the unit price per vertical foot stipulated in the Schedule of Prices for Item E-7 which price and payment shall be full compensation for supply of all labor, materials and equipment required for drilling a 7 5/8-inch diameter borehole using tricone roller bit and wet rotary method; installing and setting 4 1/2-inch diameter steel well casing; supplying and installing cement/bentonite grout; equipment and material cleaning; collecting and transferring all solid and liquid wastes to the on-Site treatment facility; and all other miscellaneous items for which separate payment is not provided under other Items.

4.08 4-INCH WET ROTARY DRILLING

A. Measurement

Measurement for 4-inch wet rotary drilling will be made at the actual number vertical feet of borehole completed as measured in place by the Engineer from the bottom of the 4 1/2-inch diameter casing to the approved bottom of the borehole.

B. Payment

Payment for the quantity determined above will be made at the unit price per vertical foot stipulated in the Schedule of Prices for Item E-8 which price and payment shall be full compensation for supply of all labor, materials and equipment required for drilling a 4-inch borehole using tricone driller bit and wet rotary methods; equipment and material cleaning; collecting and transferring all solid and liquid wastes to on-Site storage areas; and all other miscellaneous items for which separate payment is not provided under other Items.

4.09 MONITORING WELL SCREEN AND PIEZOMETER SCREEN

A. Measurement

Measurement for monitoring well screen and piezometer screen will be made at the actual number of vertical feet of screen placed as measured by the Engineer prior to being installed in the borehole.

B. Payment

Payment for the quantities determined above will be made at the unit price per vertical foot stipulated in the Schedule of Prices for Items E-9 i) and E-9 ii) which price and payment shall be full compensation for all labor, materials and equipment required for installing 2-inch diameter type 304 stainless steel No. 10 slot well screen for each WTU, UIU and LIU monitoring well for Item E-9 i) and 2-inch diameter Schedule 40 PVC No. 10 slot well screen for each WTU, UIU and LIU piezometer for Item E-9 ii) complete with flush jointed threads and bottom cap; cleaning screen prior to installation in borehole; supplying and installing silica sandpack around the screen; supplying and installing a minimum 2-foot thick bentonite pellet seal above the sandpack; and all other miscellaneous items for which separate payment is not provided under other Items.

4.10 4-INCH TELESCOPIC WELL SCREEN

A. Measurement

Measurement for 4-inch telescopic well screen will be made at the actual number of vertical feet of screen placed as measured by the Engineer prior to being installed in the borehole.

B. Payment

Payment for the quantity determined above will be made at the unit price per vertical foot stipulated in the Schedule of Prices for Item E-10 which price and payment shall be full compensation for supply of all labor, materials and equipment required for installing a 4-inch telescopic stainless steel well screen with flush jointed threads and bottom cap; cleaning screen prior to installation in borehole; supply and installation of a minimum 1-foot thick lead packer above the screen; and all other miscellaneous items for which separate payment is not provided under other Items.

4.11 WELL CASING

A. Measurement

Measurement for well casing will be made at the actual number of vertical feet of well casing installed as measured in place by the Engineer from the top of the well casing to the top of the well screen.

B. Payment

Payment for the quantities determined above will be made at the unit price per vertical foot stipulated in the Schedule of Prices for Item E-11 i), E-11 ii) and E-11 iii) which price and payment shall be full compensation for all labor, materials and equipment required for installing 2-inch diameter type 304 stainless steel well casing for each WTU, UIU and LIU monitoring well for Item E-11 i), 2-inch diameter Schedule 40 PVC for each WTU, UIU and LIU piezometer for Item E-11 ii) and 4-inch diameter Schedule 40 PVC well casing for each USU monitoring well for Item E-11 iii), all complete with flush threaded joints and end caps; and cleaning well casing prior to installation in borehole; supplying and installing cement/bentonite grout around the well casing; and all other miscellaneous items for which separate payment is not provided under other Items.

4.12 WTU WELL PROTECTIVE CASING

A. Measurement

Measurement for WTU well protective casing will be made at the actual number of protective casings installed as counted in place by the Engineer.

B. Payment

Payment for the quantity determined above will be made at the unit price per WTU well protection casing stipulated in the Schedule of Prices for Item E-12 which price and payment shall be full compensation for all labor, material and equipment required for supplying and installing 6-inch diameter protective casing with vented lockable cap mechanism for each WTU monitoring well/piezometer; embedding protective casing in concrete; supplying and installing concrete collar; and all other miscellaneous items for which separate payment is not provided under other Items.

4.13 UIU AND LIU WELL PROTECTIVE CAP

A. Measurement

Measurement for UIU and LIU well protective cap will be made at the actual number of protective caps installed as counted in place by the Engineer.

B. Payment

Payment for the quantity determined above will be made at the unit price per protective cap stipulated in the Schedule of Prices for Item E-13 which price and payment shall be full compensation for all labor, materials and equipment required for supplying and welding 6-inch diameter protective vented lockable cap mechanism to the surface casing for each UIU and LIU monitoring well/piezometer; supplying and installing concrete collar; and all other miscellaneous items for which separate payment is not provided under other Items.

4.14 USU WELL PROTECTIVE CAP

A. Measurement

Measurement for USU well protective cap will be made at the actual number of protective caps installed as counted in place by the Engineer.

B. Payment

Payment for the quantity determined above will be made at the unit price per protective cap stipulated in the Schedule of Prices for Item E-14 which price and payment shall be full compensation for all labor, materials and equipment required for supplying and welding 8 5/8-inch outer diameter protective vented lockable cap mechanism to the surface casing for each USU monitoring well; supplying and installing concrete collar; and all other miscellaneous items for which separate payment is not provided under other Items.

4.15 WELL DEVELOPMENT

A. Measurement

Measurement for well development will be made in hours for the actual number of hours required to develop monitoring wells to a silt-free condition, if possible, as measured in the field by the Engineer.

B. Payment

Payment for the quantity determined above will be made at the unit price per hour stipulated in the Schedule of Prices for Item E-15 which price and payment shall be full compensation for all labor, materials and equipment and doing all work necessary to develop each well to silt-free condition, if possible; collecting and drumming development water; transporting and transferring the drummed liquids from each well location to on-Site storage tanks provided by the Contractor; and all other miscellaneous items for which separate payment is not provided under other Items.

4.16 ADJUSTMENT OF EXISTING MONITORING WELLS

Payment for adjustment of existing monitoring wells will be made at the lump sum price stipulated in the Schedule of Prices for Item E-16 which price and payment shall be full compensation for the supply of all labor, materials and equipment and doing all work necessary to extend well casing and riser pipe for each existing monitoring well; equipment and material cleaning; containing all liquid waste; and all other miscellaneous items for which separate payment is not provided under other Items.

G. WELL ABANDONMENT

A. Measurement

Measurement for well abandonment will be made at the actual number of wells abandoned as counted by the Engineer.

B. Payment

Payment for the quantity determined above shall be made at the unit price per well abandoned stipulated in the Schedule of Prices for Item E-17 which price and payment shall be full compensation for the supply of all labor, material and equipment and doing all work necessary to inject pure bentonite grout into the screened interval so as to fill the monitoring zone and well casing; removing the surface installation; severing the well casing 5 feet below ground surface; backfilling the resulting void with concrete or a cement/bentonite grout; restoring the ground surface to existing conditions of adjacent areas; collecting and transferring all solid and liquid wastes to on-Site storage areas; and all other miscellaneous items for which separate payment is not provided under other Items.

END OF SECTION

SECTION 02019 - EXTRACTION WELLS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included

Work of this Section consists of construction of extraction wells as specified and as shown on the Drawings.

The work includes, but is not necessarily limited to, the following:

1. supply and installation of six intermediate unit (IU) extraction wells;
2. well development; and
3. associated testing.

B. Work Not Included

The following items of work associated with work of this Section do not form part of these Project Specifications:

1. locating and marking the locations of the IU extraction wells.

1.02 QUALITY ASSURANCE

A. General

The Contractor shall ensure the same quality assurance as specified in Section 02670.

1.03 SUBMITTALS

The submittals for the IU extraction wells are as specified in Section 02670.

1.04 JOB CONDITIONS

A. Existing Conditions

The existing conditions for the IU extraction wells are the same as specified in Section 02670.

B. Protection

The Contractor shall control contaminant migration as specified in Section 02018.

C. Sequencing and Scheduling

The Contractor shall be responsible for sequencing and scheduling the Works as specified and as shown on the Drawings subject to the approval of the Engineer. The Contractor shall complete each phase of well installation/abandonment as shown on Drawing G-2 prior to commencing work on the next phase of well installation/abandonment.

PART 2 - PRODUCTS

2.01 SURFACE CASING

The surface casing for IU extraction wells shall be nominal 8-inch diameter Schedule 40 low carbon steel complying with ASTM A53. Pipe fittings shall be butt welded or threaded and flush joint coupled and of same standard as surface casing.

2.02 WELL SCREEN

Well screen shall comply with ASTM F480 and shall be 6-inch diameter, Schedule 40 perforated PVC construction with four columns of 0.020-inch slot screen at 1/2-inch centers.

2.03 CEMENT/BENTONITE GROUT

Cement/bentonite grout shall be as specified in Section 02670.

2.04 CONCRETE

Concrete shall be as specified in Section 02018.

2.05 WATER

Water shall be as specified in Section 02018.

2.06 ABSORBENT PADS

Absorbent pads shall be as specified in Section 02018.

2.07 DRILLING FLUID

Drilling fluid for the IU Extraction Wells shall be as specified in Section 02018.

2.08 OTHER MATERIALS

Other materials shall be selected by the Contractor for the purpose intended and shall be approved by the Engineer prior to use.

PART 3 - EXECUTION

3.01 PREPARATION

The Contractor shall not commence drilling operations until the Engineer has located and marked the position of each extraction well. Installation of extraction wells shall only proceed upon receipt of written instructions from the Engineer.

3.02 PERFORMANCE

A. General

The Contractor shall perform all work activities as specified in Section 02018.

B. Equipment Cleaning

(1) Cleaning

Cleaning shall be as specified in Section 02018.

(2) Methods of Cleaning

All downhole drilling equipment, geologic sampling equipment and tools that will contact potentially contaminated soil or groundwater shall receive a complete wash with clean, hot water under high pressure. The wash sequence shall be as follows:

1. clean hot water and detergent wash; and

2. clean hot water rinse.

Washwater generated from the cleaning of drilling equipment, well screens and casings shall be transferred to the Contractor-supplied wastewater storage tanks.

All drilling equipment and well materials will be inspected and approved by the Engineer prior to their use.

(3) Disposal of Decontamination Wash Waters and Sediments

The Contractor shall dispose of all decontaminated wash waters and sediments as specified in Section 02018.

C. Drilling

At each IU extraction well location, the borehole shall be advanced to 2 feet below the bedrock surface utilizing a 12-inch diameter tricone drill bit in conjunction with mud-rotary method of drilling. A continuous length of nominal 8-inch diameter casing shall be sealed into bedrock using a cement/bentonite grout forced into the annular space through a tremie pipe/packer assembly located in the casing near the bottom of the boring. The pumping of the grout shall continue until undiluted grout returns through the annulus to the ground surface. The casing then shall be pushed into the bedrock to further

seal the annulus. The grout shall be allowed to set for a minimum period of 24 hours before work on the well continues.

The well shall then be advanced using a nominal 8-inch diameter bit and the air-rotary method to the depth shown on the Drawings or as specified by the Engineer.

D. Geophysical Logging

After drilling has been completed, geophysical logging, including resistivity, spontaneous potential, natural gamma and density shall be performed by the Contractor.

E. Well Construction

During drilling, the Contractor shall install a 6-inch diameter Schedule 40 PVC pipe liner over the entire length of the bedrock, and attach it to a 6-inch diameter Schedule 40 PVC pipe.

The PVC liner shall be perforated with four columns of 0.020-inch slots at 1/2 inch centers over the entire length of the bedrock interval to allow groundwater collection from all waterbearing units intercepted. During the course of the drilling, the Contractor shall record the geologic log of the rock cuttings. PVC pipe liners shall be installed by methods approved by the Engineer and in accordance with the manufacturer's recommendations.

F. Protection of Completed Wells

All extraction wells shall be protected by a welded steel protective cap installed over the 8-inch diameter surface casing.

G. Well Development

The Contractor shall not develop extraction wells until authorized to proceed by the Engineer. The Contractor shall provide all labor, equipment and tools to perform well development. All downhole equipment and tools shall be decontaminated in accordance with Section 02018 prior to commencing well development and also after well development of all the wells has been completed.

All development waters shall be contained at the well location in approved drums. Development waters shall be handled in accordance with Section 02018.

Extraction wells shall be developed to a sand-free condition if possible, using stainless steel bailers and/or by pumping. The Contractor shall be equipped to conduct well development using surge blocks or air lift methods if directed by the Engineer. If air-lift methods are used, Norgren type F47 and F18 or equivalent filters shall be used. Well development shall be conducted until determined to be complete by the Engineer.

H. Aquifer Testing

Following well development, a pumping test shall be performed on each extraction well to determine long-term yield, optimum pumping rate, pump setting, and position of the on/off pump control electrodes.

(1) Pumping Test Equipment Setup

The Contractor shall supply all labor, equipment and materials necessary to complete the pumping test at each extraction well. Equipment setup shall include but not be limited to: groundwater storage tanks, connection of all piping, feed and discharge manifolds, submersible electric pump, electrical power supply and floor control valves.

The Contractor shall grade the area where the groundwater storage tanks will be located to the extent necessary to level the tanks and provide an adequate supporting foundation for the tanks. The Contractor shall mobilize the groundwater storage tanks to Site and locate the tanks in the locations approved by the Engineer. The tanks shall be aligned for ease of access to each tank and between tanks.

The Contractor shall construct and install all piping, manifolds, and submersible well pump. The submersible well pump discharge piping shall consist of threaded Schedule 40 PVC for the portion placed down the extraction well. Piping from the wellhead to the feed manifold shall be flexible PVC. The feed and discharge manifolds shall be constructed as integral units.

The discharge piping from the feed manifold to the groundwater storage tanks shall be flexible PVC. The discharge line shall be established by the total length required to reach the bottom of the furthest tank from the feed manifold. An additional length allowance of 15 feet will be added to the total length of the line.

The completed manifold units shall be flushed with potable water prior to making the final connections.

The pump test lines, feed manifold, and discharge lines to the tanks shall be leak-tested to the satisfaction of the Engineer prior to commencing the pumping tests. Testing shall consist of placing a temporary valve at the discharge end of the lines at the tanks and subjecting the lines to the full hydrostatic pressure from the pump under shutoff head conditions. The lines and manifold shall be inspected for leaks. Any leaks shall be corrected and the line retested and approved by the Engineer prior to commencing the pumping tests.

(2) Pumping Test

The Contractor shall conduct pumping tests as specified and as directed by the Engineer.

The pumping tests shall involve a series of three step tests followed by a constant rate long-term pumping test. The Contractor shall be responsible for the operation of the pumping equipment, regulating the pump flow rate and transferring discharge lines between groundwater storage tanks during the pumping tests. Discharge lines shall be transferred sequentially between tanks as they become full. The Contractor shall monitor the water levels in the tanks to ensure that overflow does not occur.

The Contractor shall maintain an accurate log of flow meter readings during the pumping tests. The log shall record the flow meter register reading, data, time and recording personnel. Time shall be referenced to a clock provided by the Contractor and dedicated to the pumping tests.

The step tests shall consist of pumping the extraction well at successive increasing pumping rates of approximately 1, 3 and 5 gallons per minute for a one-hour period at each rate, allowing a 1/2 hour for recovery. The Engineer may use different step drawdown pump rates based on field findings or modify the test duration.

The long-term pumping test for each extraction well shall be performed the day following completion of the step test.

The long-term pumping test shall be for an 8-hour period at a constant pumping rate. The pumping rate will be selected by the Engineer from the results of the step tests. The Contractor shall provide on-Site personnel to operate, regulate, and monitor the pumping test during this period.

During the pumping test, water level measurements in each well will be taken by the Contractor at intervals specified by the Engineer and for one hour following completion of the pumping test.

Upon completion of the long-term pumping test the Contractor shall cease operations and shall leave the extraction well downhole equipment in place until notified by the Engineer to remove the equipment.

Upon completion of the pumping tests, treatment of the tanked groundwater will be conducted by others. The Contractor shall maintain tanks and piping on Site for the period required by others to treat the groundwater to a condition where the treated waters are suitable for discharge.

PART 4 - MEASUREMENT AND PAYMENT

4.01 12-INCH MUD-ROTARY DRILLING

A. Measurement

Measurement for 12-inch mud-rotary drilling will be made at the actual number of vertical feet of borehole completed as measured in place by the Engineer from existing ground surface to the approved bottom of the borehole.

B. Payment

Payment for the quantity determined above will be made at unit price per vertical foot stipulated in the Schedule of Prices for Item F-1 which price and payment shall be full compensation for all labor, materials and equipment required for drilling 12-inch diameter borehole a minimum of 2 feet into bedrock; installing and setting nominal 8-inch diameter steel surface casing into bedrock, mixing grout, installing grout rod/packer assembly, pressure grouting; transferring all solid and liquid wastes to on-Site storage areas; mobilization between wells; and all other miscellaneous items for which separate payment is not provided under other Items.

4.02 AIR-ROTARY DRILLING

A. Measurement

Measurement for air-rotary drilling will be made at the actual number of vertical feet of borehole completed as measured in place by the Engineer from the bottom of installed casing to the approved bottom of the borehole.

B. Payment

Payment for the quantity determined above will be made at the unit price per vertical foot stipulated in the Schedule of Prices for Item F-2 which price and payment shall be full compensation for all labor, materials and equipment required for drilling nominal 8-inch diameter borehole; installing a 6-inch diameter Schedule 40 PVC pipe, 6-inch diameter Schedule 40 PVC pipe liner; recording geologic log of the rock cuttings; equipment cleaning; containing all solid and liquid waste; and all other miscellaneous Items for which separate payment is not provided under other Items.

4.03 WELL DEVELOPMENT

A. Measurement

Measurement for well development will be made in hours for the actual number of hours taken to develop the extraction wells to a sand-free condition, if possible, as measured by the Engineer.

B. Payment

Payment for the quantity determined above will be made at the unit price per hour stipulated in the Schedule of Prices for Item F-3 which price and payment shall be full compensation for the supply of all labor, material and equipment and doing all work necessary to develop each extraction well to a sand-free condition; collecting development water; transporting and transferring liquids to on-Site storage tanks supplied by the Contractor; and all other miscellaneous items for which separate payment is not provided under other Items.

4.04 STEP DRAWDOWN AND CONSTANT-RATE PUMPING TESTS

A. Measurement

Measurement for step drawdown and constant rate pumping tests will be made at the actual number of extraction wells tested as determined from daily records approved by the Engineer.

B. Payment

Payment for the quantity determined above will be made at the unit price per extraction well stipulated in the Schedule of Prices for Item F-4 which price and payment shall be full compensation for the supply of all labor, materials and equipment to perform pumping tests; operate and maintain pumping equipment; regulate and monitor the pump flow rate; supply and install groundwater holding tanks; transfer pumped water to

storage tanks; and all other miscellaneous items for which separate payment is not provided under other Items.

END OF SECTION

SECTION 02670 - WATER SUPPLY WELLS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included

Work of this Section consists of construction of water supply wells as specified and as shown on the Drawings.

The work includes, but is not necessarily limited to, the following:

1. supply and installation of one (1) potable water supply well;
2. supply and installation of well casing and liner;
3. well pumping test;
4. well disinfection; and
5. well development.

B. Work Not Included

The following items of work associated with work of this Section do not form part of these Project Specifications:

1. locating and marking potable water supply well location prior to the commencement of drilling operations; and
2. disposal of sediments, water and fluids generated by the Contractor during the Works.

1.02 QUALITY ASSURANCE

The Contractor shall procure all permits, certificates, and licenses required of him by law for the execution of the Works. Any waivers from the authorities having jurisdiction shall be requested and obtained by the Contractor from the authorities and submitted to the Engineer prior to the commencement of work at the Site. The Contractor shall comply with all Federal, State, and local laws, ordinances, rules and regulations relating to the performance of the Works.

1.03 SUBMITTALS

A. General

The Contractor shall comply with Section 01300.

Submittals shall include, but are not limited to, the following:

1. Prior to Commencement of Work

Should the source of any drilling fluids or other materials to be used downhole change prior to commencement of work, the Contractor shall submit to the Engineer, a sample of new material for analyses.

2. During Work Activities

Any lubricants used during drilling shall also be submitted for chemical analyses. Such submissions shall be in addition to any submission required to be submitted by the Contractor to other authorities having jurisdiction.

3. Completion of Work Activities

Within seven days of completion of work at the Site, the Contractor shall submit, logs, completion reports and other records required by the regulations of Federal, State and local agencies to the Engineer.

1.04 JOB CONDITIONS

A. Existing Conditions

Previous investigations have determined the lithological sequence at the Site as shown on Figure 1 and outlined below:

1. Water Table Unit (WTU), comprising of unconsolidated overburden materials, mine spoil and shallow bedrock. The base of the unit is marked by the upper unnamed coal seam.

2. Intermediate Unit (IU) consists of interbedded shales, sandstones, limestone and coal units. The base of this unit is an unnamed sandstone. The Intermediate Unit is divided into Upper (UIU) and Lower (LIU) subunits by an unnamed limestone.

3. Upper Sharon Unit (USU) begins below a marker bed sandstone which marks the lower extent of the IU. The Upper Sharon Unit consists of sandstone interbedded with siltstone and shale.

B. Protection

The Contractor shall protect the potable water supply well under construction from contamination.

C. Sequencing and Scheduling

The Contractor shall be responsible for sequencing and scheduling the Works as specified or as shown on the Drawings, and subject to the approval of the Engineer.

PART 2 - PRODUCTS

2.01 GENERAL

Materials shall be provided from sources approved by the Engineer.

2.02 MATERIALS

A. Surface Casing

Surface casing shall be Schedule 40, carbon steel 8-inch ID casing complying with ASTM A53. Pipe fittings shall be butt welded or threaded and flush joint coupled and of same standard as surface casing.

B. Well Casing

Well casing shall be 6-inch diameter Schedule 40 PVC pipe with flush joint connections.

C. Well Screen

Well screen shall be perforated 6-inch diameter Schedule 40 PVC pipe, with four rows of 0.020 inch slots.

D. Cement/Bentonite Grout

Cement/bentonite grout shall consist of a mixture of 6.5 gallons of water per 94 pound bag of normal Portland cement and approximately four pounds of bentonite powder per bag of cement. The amount of bentonite will not exceed five percent by weight of the mixed slurry, otherwise excessive shrinkage of the grout may occur.

E. Water

Water when used in drilling, and well construction including cleaning, grouting or other activities potable water shall be provided by the Contractor from a source approved by the Engineer.

F. Other Materials

Other materials shall be selected by the Contractor for the purpose intended and shall be subject to the Engineer's approval prior to use.

PART 3 - EXECUTION

3.01 PREPARATION

The Contractor shall not commence drilling operations until the Engineer has located and marked the location of the potable water supply well. Installation of the potable water supply well shall only proceed upon receipt of written instructions from the Engineer.

3.02 PERFORMANCE

A. General

The Contractor shall use drilling equipment and methods approved by the Engineer.

The Contractor shall prevent foreign matter from entering boreholes and shall take all necessary and proper precautions to prevent contamination within and between borings by introduction of any foreign substances, including contaminated water, contaminated soil, detergents, gasoline, cable lubricant, hammer oil or any other objectionable fluids or substances. Any such substances that must be used shall be precisely described and identified before use and shall be approved by the Engineer prior to use.

The Contractor shall maintain a log or record of each borehole on a form approved by the Engineer including the following information:

1. the general character, thickness and type of material encountered;

2. the depth at which the water level stands in the well at the beginning and end of each shift; and

3. the nature and extent of all other work performed, including the exact time spent on each item of work.

The Contractor shall keep the log carefully and accurately at the time the work is being done. A copy of the log shall be maintained at all times at the Site and shall be available for inspection at any time by the Engineer. Upon completion of the Works a complete copy shall be furnished to the Engineer, and the Contractor shall further file, as required by the potable water well construction permit, the necessary log and record of forms provided by the approving authority.

Drilling shall be performed in the location and to the depth shown on the Drawings or as directed by the Engineer.

The Contractor shall be prepared to shut off and seal a hole should flowing artesian water or gas be encountered.

In the event that the Contractor should fail to complete the well as specified, or should he abandon a well because of loss of tools or equipment, or due to Contractor negligence, the Contractor, if requested and as directed by the Engineer, shall fill the abandoned hole with cement/bentonite grout and salvage and remove such casing as can be salvaged. The cost of abandonment of an incomplete well, including the filling, drilling, casing or other work performed on the abandoned well shall be at the Contractor's expense.

In the event of loss of tools or equipment during any phase of constructing the potable water supply well, the Contractor shall not be entitled to any additional payment for time spent or expense incurred in an attempt to fish out or recover the tools or equipment prior to possible abandonment of a well site.

B. Potable Water Supply Well

(1) Drilling

At the well location, the borehole shall be advanced to 2 feet below the bedrock surface utilizing a 12-inch diameter tricone drill bit in conjunction with air or wet-rotary method of drilling. A continuous length of nominal 8-inch diameter casing shall be sealed into bedrock using a cement/bentonite grout forced into the annular space through a tremie pipe/packer assembly located in the casing near the bottom of the boring. The pumping of the grout shall continue until undiluted grout returns through the annulus to the ground surface. The casing then shall be

pushed into the bedrock to further seal the annulus. The grout shall be allowed to set for a minimum period of 24 hours before work on the well continues.

The well shall then be advanced using a nominal 8-inch diameter bit and the mud rotary or air-rotary method to the depth specified by the Engineer. A Schedule 40 nominal 6-inch diameter slotted PVC perforated liner shall be installed as shown on Drawing G-5.

(2) Casing

Casing shall be installed to size and depth shown on Drawing G-5 and in location designated by the Engineer. A minimum casing stick-up above ground of 30 inches shall be provided.

The Contractor shall maintain accurate records of casing length and size installed.

(3) Development

The potable water well shall be developed to a sand free condition by surging, setting or other methods approved by the Engineer.

(4) Aquifer Testing

The well yield shall be verified through the performance of a 4-hour constant-rate pumping test. The Contractor shall supply all labor and materials necessary to complete the pumping test, including but not limited to: submersible electric pump, drop pipe, wire generator, floor control valves and discharge lines. The pumped groundwater shall be discharged to the ground surface approximately 100 feet from the well.

Water well measurements will be taken by the Contractor at intervals specified by the Engineer during the pumping test and for one (1) hour following completion of the pumping test.

(5) Disinfection

The potable water well shall be disinfected according to the procedures established by local, state or federal regulatory agencies after the permanent pump has been installed and before putting the well in service. A water sample shall be collected by the Engineer following disinfection to verify the potability of the water.

(6) Protection of Completed Wells

The wells shall be protected by temporary lockable steel protective cover installed over the 8-inch diameter surface casing. The above ground cover shall be furnished by the Contractor and installed immediately upon completion of the well to prevent access by unauthorized persons.

PART 4 - MEASUREMENT AND PAYMENT

4.01 12-INCH ROTARY DRILLING

A. Measurement

Measurement for 12-inch rotary drilling, setting will be made in vertical feet for the actual depth of borehole completed as measured in place by the Engineer from ground surface to the approved bottom of the borehole.

B. Payment

Payment for the quantity determined above will be made at the unit price per vertical foot stipulated in the Schedule of Prices for Item G-1 which price and payment shall be full compensation for all labor, materials and equipment required for drilling a 12-inch diameter hole a minimum 2 feet into bedrock; setting nominal 8-inch diameter casing into bedrock, mixing grout, installing grout rod/packer assembly, pressure grouting; and all other miscellaneous items for which separate payment is not provided under other Items.

4.02 8-INCH BEDROCK DRILLING

A. Measurement

Measurement for 8-inch bedrock drilling will be made in vertical feet for the actual length drilled as measured in place by the Engineer from the bottom of casing to the approved bottom of the borehole.

B. Payment

Payment for the quantity determined above will be made at the unit price per vertical foot stipulated in the Schedule of Prices for Item G-2 which price and payment shall be full compensation for all labor, materials and equipment required for set up; drilling nominal 8-inch diameter borehole; equipment cleaning; containing all solid and liquid waste; and all other miscellaneous Items for which separate payment is not provided under other Items.

4.03 WELL CASING

A. Measurement

Measurement for well casing will be made in vertical feet for the actual length installed as measured in place by the Engineer from the top of the casing to the bottom of the casing.

B. Payment

Payment for the quantity determined above will be made at the unit price per vertical foot stipulated in the Schedule of Prices for Item G-3 which price and payment shall be full compensation for the supply of all labor, material and equipment and doing all work necessary to install nominal 6-inch diameter Schedule 40 PVC pipe and nominal 6-inch Schedule 40 PVC perforated liner; equipment cleaning; and all other miscellaneous items for which separate payment is not provided under other Items.

4.04 PUMPING TEST

A. Measurement

Measurement for the pumping test will be made at actual number of crew-hours spent in operating and maintaining pumping operations as determined from time sheets approved by the Engineer.

B. Payment

Payment for the quantity determined above shall be made at the unit price per crew-hour stipulated in the Schedule of Prices for Item G-4 which price and payment shall be full compensation for the supply of all labor, materials and equipment to operate and maintain the pumping equipment; regulate and monitor the pump flow rate; transfer pumped water between storage tanks; and all other miscellaneous items for which separate payment is not provided under other Items.

4.05 DISINFECTION

Payment for disinfection will be made at the lump sum price stipulated in the Schedule of Prices for Item G-5 which price and payment shall be full compensation for the supply of all labor, materials and equipment and doing all work necessary to disinfect the potable water well after the permanent pump has been installed and before putting the well in service; equipment cleaning; containing all liquid waste; and all other miscellaneous items for which separate payment is not provided under other Items.

4.06 WELL DEVELOPMENT

A. Measurement

Measurement for well development will be made in hours for the actual number of hours taken to develop the potable water supply well to a sand-free condition, as measured by the Engineer.

B. Payment

Payment for the quantity determined above will be made at the unit price per hour stipulated in the Schedule of Prices for Item G-6 which price and payment shall be full compensation for the supply of all labor, material and equipment and doing all work necessary to develop potable water supply well to a sand-free condition; collecting and drumming development water; transporting and transferring the drummed liquids to on-Site storage tank supplied by the Contractor; and all other miscellaneous items for which separate payment is not provided under other Items.

END OF SECTION