Final
Remedial Design Report

for

Jones Sanitation Site
Hyde Park, New York

July 2000

Prepared by

LMS **LAWLER, MATUSKY & SKELLY ENGINEERS LLP**
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JONES SANITATION – WETLANDS DELINEATION, FUNCTIONAL ASSESSMENT, AND ECOLOGICAL RISK COMPARISON

1.0 INTRODUCTION

As part of the RI/FS for the Jones Sanitation site, the wetlands on the property were delineated, ecological communities defined, and on-site fish and wildlife resources identified. The wetlands were delineated using the 1987 U. S. Army Corps of Engineers (Technical Report Y-87-1) three-parameter methodology for identifying wetlands. These studies were conducted to update previous site assessments, identify any existing site-related risks to the environment, and to provide a basis for any habitat restoration required as a result of proposed site closure activities. This report describes the study methods, site observations, results of the functional analysis, and a comparison of the ecological risk findings in the 1994 study prepared by CDR Environmental Specialists, Inc. (CDR) and those identified by Lawler, Matusky & Skelly Engineers LLP (LMS) in 1999. Copies of agency correspondence, wetland delineation data sheets, the site wetland boundary map, work sheets for the Wetland Evaluation Technique (WET) analysis, and literature consulted for this study are presented in Appendix A.

2.0 LITERATURE REVIEW AND FIELD STUDIES

2.1 Literature Review

The New York State Department of Environmental Conservation (NYSDEC) Freshwater Wetlands, National Wetlands Inventory (NWI), and United States Geological Survey (USGS) topographic maps were consulted as part of the literature review for the delineation effort. A general location map for the Jones Sanitation site is attached (Figure 1). The NYSDEC Freshwater Wetland Map is Figure 1 of the prior Ecological Risk Assessment (CDR, 1994) and the NWI map is Figure 2 of the same report. The Dutchess County Soils Atlas (USDA, 1978) was consulted for the soil types present within and adjacent to the wetlands. NWI lists the all wetlands on the Jones Sanitation site as being in the palustrine forested, broad-leaved deciduous vegetation system (PFO1). The unnamed stream entering the site and the Maritje Kill exiting the site are listed as being "temporarily flooded" (PFO1A) and the Maritje Kill entering on east side of the site is listed as being "seasonally flooded" (PFO1C). All the contiguous forest wetlands on the site are listed by NWI as being "seasonally flooded/saturated' (PFO1E). The NWI map identifies two isolated pockets on the eastern edge of the site as being palustrine scrub-shrub, broad-leaved deciduous vegetation, seasonally flooded/saturated systems (PSS1E). The wetlands on the Maritje Kill immediately downstream of the site are identified by NYSDEC as Wetland HP-23, a Class 2 wetland. Class 2 wetlands are defined by NYSDEC (in Part 664.5 of Title 6 [Environmental Conservation Law]) as containing any of 17 listed wetland characteristics. The

FINAL REMEDIAL DESIGN REPORT

FOR

JONES SANITATION SITE

Hyde Park, New York

July 2000

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Environmental Science & Engineering Consultants
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Project No. 442-221

ALFA LAVAL/JONES SANITATION

REMEDIAL DESIGN

TABLE OF CONTENTS

FINAL DESIGN REPORT

Page No.

LIST OF FIGURES iii

LIST OF TABLES iv

1 INTRODUCTION 1-1

- 1.1 Site Description 1-1
- 1.2 Site History 1-2

2 DESIGN CRITERIA 2-1

- 2.1 Performance Standards 2-1
- 2.2 Performance Monitoring 2-3
- 2.3 Compliance with ARARs, Pertinent Codes, Standards, and Public Health Requirements. 2-3
  - 2.3.1 ARARS 2-3
- 2.4 Important Technical Factors 2-5
  - 2.4.1 Current Environmental Control 2-5
  - 2.4.2 Constructability and Currently Acceptable Construction Techniques 2-5

3 REMEDIAL ACTION SCHEDULE 3-1

4 SPECIFICATIONS 4-1

5 DRAWINGS 5-1

6 BASIS OF DESIGN 6-1

- 6.1 Description of Evaluations 6-1
  - 6.1.1 Evaluation of Cap Cross Section 6-1
  - 6.1.2 Evaluation of Placing Construction and Demolition Debris (C&D) Under the Cap Rather Than Off-Site Disposal 6-3
  - 6.1.3 Evaluation of Limits of Cap Footprint 6-5
  - 6.1.4 Evaluation of Need for Gas Venting Layer 6-6

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REMEDIAL DESIGN

TABLE OF CONTENTS
(Continued)

FINAL DESIGN REPORT

Page No.

6.1.5 Excavation Plan for Outlying Areas 6-8
6.1.6 Cap Drainage Design 6-11

6.1.6.1 Adequacy of Drainage Layer 6-12
6.1.6.2 Evaluation of Soil Migration 6-13
6.1.6.3 Capacity of Drainage Pipe 6-14

6.2 Summary and Detailed Justification of Assumptions 6-14

6.2.1 Calculations Supporting all Assumptions 6-14
6.2.2 How Performance Standards and ARARs Will Be Met 6-14
6.2.3 Plan for Minimizing Environmental and Public Impacts 6-16
6.2.4 Permits Plan 6-18

7 LONG TERM GROUNDWATER MONITORING PROGRAM 7-1

7.1 On-Site Monitoring Wells 7-1
7.2 Off-Site Residential Drinking Water Supply Wells 7-2
7.3 Sampling and Analytical Procedures 7-3
7.4 Schedule of Well Installation and Sampling 7-4
7.5 Annual Reports 7-4

8 SURVEY WORK 8-1

9 EASEMENT AND ACCESS REQUIREMENTS 9-1

10 RESULTS OF FIELD SAMPLING 10-1

References R-1

APPENDICES

A – Excerpts from Part 360 Regulations Solid Waste Landfill Cap Construction
B – Methane Soil Gas Survey Results
C – VOC Soil Gas Survey Results
D – Design Calculations
E – Consent Decree Between Losee and Alfa-Laval, and Proposed Grant of Easement and Declaration of Restrictive Covenants
F – Excerpt from Ecological Risk Assessment (ERA)

LIST OF FIGURES

Figure No.	Title	Following Page
1-1	Location Map Jones Sanitation – Hyde Park, New York	1-1
1-2	Site Plan Jones Sanitation – Hyde Park, New York	1-1
2-1	Typical Cap Cross-Section Jones Sanitation – Hyde Park, New York	2-1
2-2	Frost Penetration Map	2-2
3-1	Project Schedule Alpha-Laval/Jones Sanitation Site	3-1
6-1	Final Grading Plan With Limits of Cap Footprint	6-6
6-2	Typical Trench Cross-Section Jones Sanitation – Hyde Park, New York	6-8
6-3	Trench 1A Cross-Section Jones Sanitation – Hyde Park, New York	6-8
6-4	Transportation Routes for Excavation Jones Sanitation - Hyde Park, New York	6-9
7-1	Monitoring Well Sampling Location Map Jones Sanitation – Hyde Park, New York	7-1
7-2	Proposed Residential Well Sampling Location Map Jones Sanitation – Hyde Park, New York	7-1
7-3	Typical Overburden Monitoring Well Construction	7-2
7-4	Typical Bedrock Monitoring Well Construction	7-2

LIST OF TABLES

Table No.	Title	Following Page
2-1	Site Remedial Action Objectives Jones Sanitation Site	2-4
2-2	Site Remedial Action Objectives Jones Sanitation Site	2-4
4-1	Outline of Typical Specifications	4-1
4-2	Preliminary Table of Contents for Specifications (Jones Sanitation)	4-1
6-1	Summary of Soil Gas Survey Data Jones Sanitation Site	6-7
7-1	Jones Sanitation Site Groundwater Monitoring Well Sampling and Monitoring Program On-Site Groundwater Monitoring Wells	7-2
7-2	On-site Groundwater/Monitoring Well Data	7-3

CHAPTER 1

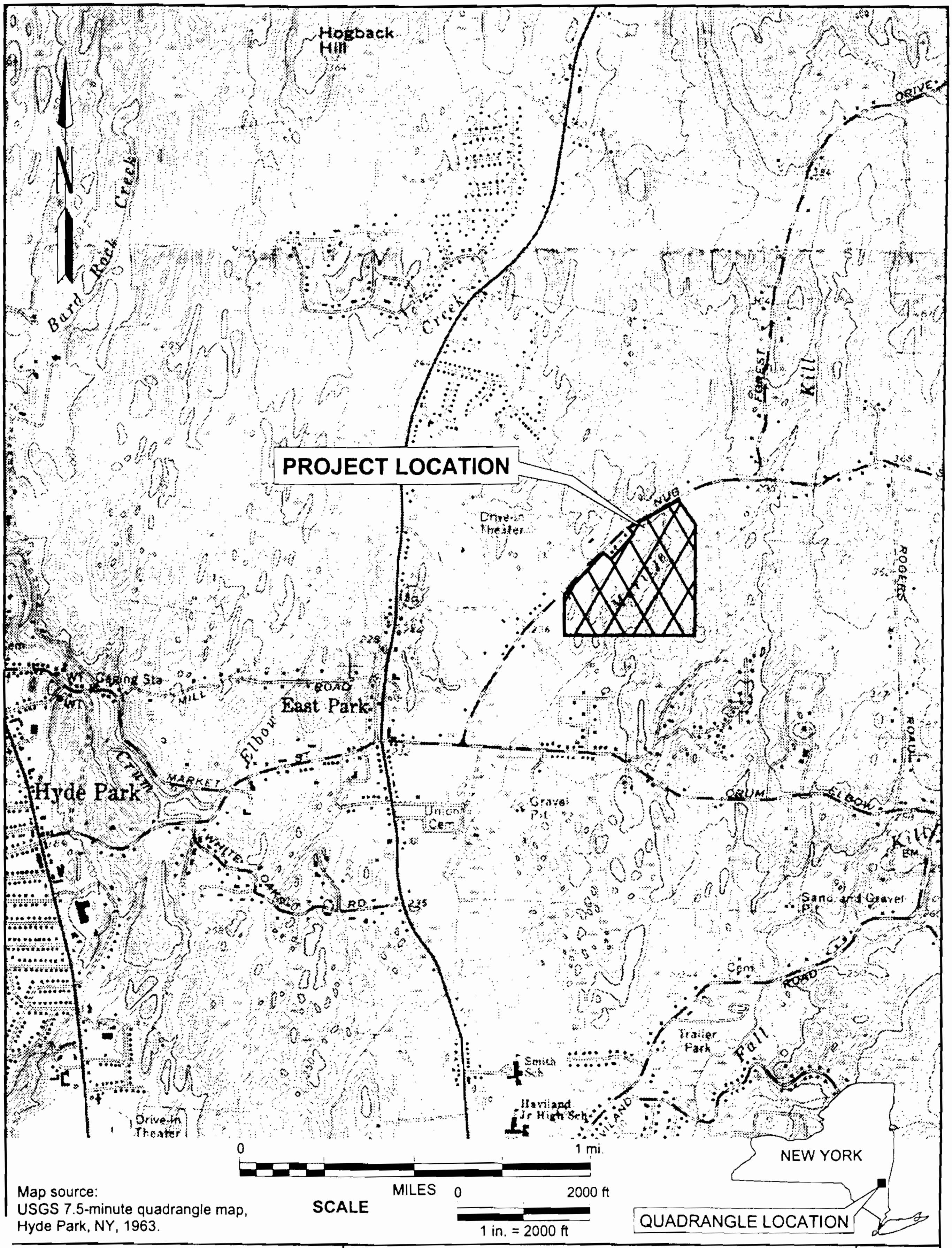
INTRODUCTION AND BACKGROUND

1.1 SITE DESCRIPTION

The Jones Sanitation (Jones) site is located on Cardinal Road, approximately 0.5 mile northeast of its intersection with Crum Elbow Road in Hyde Park, Dutchess County, New York (Figure 1-1). The site consists of a 57-acre parcel of land covered primarily with heavy vegetation. Site access is via a gravel driveway from Cardinal Road on the west side of the property. Two residences, a two-story house and a trailer home, are located south of the gravel driveway. Also in this area are a second trailer, a cinder-block building, and a garage, all reportedly used for equipment storage.

A large cleared area in the west-central portion of the site extends to the northeast (Figure 1-2). A two-story concrete block building located in the clearing houses a filter press on the first floor and office space on the second floor. Several holding tanks and associated piping are also present in the cleared area of the site. A concrete pad and a bituminous-paved pad (formerly used for composting activities) are located directly to the east of the filter press building. The remainder of the central cleared area consists of the gravel access road, several depressions with bermed sides (indicating the former locations of sand filter beds), and indications of grading and reworking of this area (i.e., flat and regularly sloped areas). In addition, in and near the disposal area are a frame building, several settling tanks (assumed to be metal), and a small work shed (see Figure 1-2), all presumed to be related to previous septage treatment and disposal operations.

The site and surrounding area exhibit gently rolling topography. From Cardinal Road on the west side of the property, the ground surface rises gently up a northeast-southwest trending slope and then drops down to the east toward a wide, flat-lying area (the central cleared area) where the majority of the waste disposal activities occurred. The topography then rises up a second slope to the east and northeast before sloping downward toward Maritje Kill, which flows from northeast to southwest across the east side of the site. Another unnamed stream enters the north side of the site, flows into



Map source:
USGS 7.5-minute quadrangle map,
Hyde Park, NY, 1963.

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Location Map

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Figure 1-1

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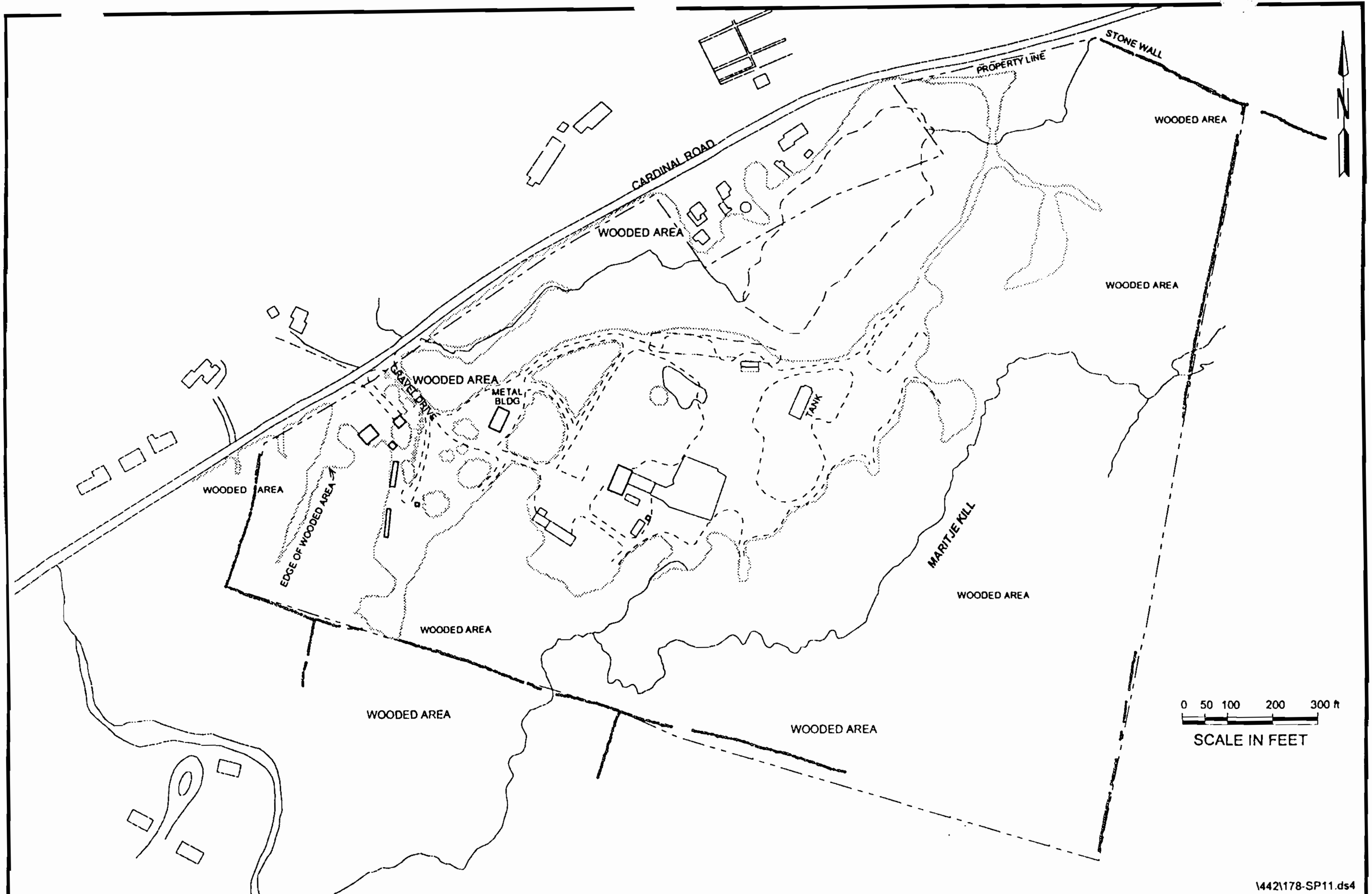

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Site Plan

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Figure 1-2

wetlands on the northwest side of the property, and flows off-site to the west. To the east of these streams, topography rises steeply in the heavily wooded areas.

Adjacent land use consists primarily of residential and undeveloped land. Single-family homes are located along Matuk Drive and Thurston Lane to the south and along Cardinal Road to the west. Val-Kill trailer park, containing approximately 80 residences, is located to the southwest. The Hudson River is located approximately 2 miles west of the site.

1.2 SITE HISTORY

The wastes that were treated and disposed of at the Jones site during its approximately 35 years of operation include septage wastes, primarily liquid, from residential, commercial, institutional, and industrial facilities. During a 17-year period, industrial wastewaters were also disposed of at the site. In the early years of operation, solids were separated out as liquid wastes filtered through the soil media. In later years (after 1980), solids were separated in lined sand filtration pits or with a mechanical separator (i.e., filter press), then composted with wood chips. The compost was used for cover and regrading in some areas of the site.

Septage disposal operations were begun at the site in approximately 1956 by Mr. William Jones, Sr., under the name of William Jones Sanitation Service (Jones Sanitation). Mr. Jones collected domestic septage from residential properties and disposed of it in trenches on the property. Little information is available concerning operations at the site during the 1960s. In 1972, the Dutchess County Health Department (DCHD) issued a permit to Jones Sanitation to collect and transport sanitary wastes to the Jones site.

The DeLaval Separator Company (DeLaval) operated a facility on Route 44 in Poughkeepsie, New York, from approximately 1963 to 1990. DeLaval, which changed its name to Alfa-Laval in 1980, manufactured mechanical separators; the Poughkeepsie plant was primarily a manufacturing and research and development facility. Untreated industrial wastewaters from DeLaval's operations were disposed of at the Jones site until approximately 1975; these wastewaters were described as milk and oil wastes from the testing laboratory and batch-neutralized machining and plating wastes. The sources of

DeLaval's industrial wastewater are described as being the Tin Room, which generated acids, alkali, and metals from plating; the Tumbling Area, which generated metal and grit in the form of sludge; Customer Service, which generated "Zyglo" chemicals and alkali; the Pilot Plant, which produced oil, solvents, organic waste chemicals, and heavy metals; the Rubber Area, which generated hydraulic oil, lube oil, and steam condensate; and Salvage, which generated water-soluble oils, lube oil, solvents, and pigments (ChemCycle 1995). In 1975 DeLaval began treating the industrial wastewaters using a centrifugal separator and sent the treated wastewater to the Jones site. DeLaval ceased sending treated wastewaters to the site in May 1979.

In the available documentation describing DeLaval's wastewater generating operations, no mention is made of the specific chemicals used in on-site processes that may have contributed to the wastewater stream. Based on DCHD inspection reports (of the Jones Sanitation Operation) from the 1970s, septage and industrial wastewater were disposed of together by burial in approximately 30 to 40 shallow, randomly oriented trenches located haphazardly across the site. Trenches were reportedly 3 to 5 ft deep, with lime applied to septage disposed of in the trenches to reduce odors. After the trenches were full and the liquids had leached out into the ground, they were covered with sand and gravel. Between approximately 1970 and 1974, only industrial wastewaters were discharged at the site; septic wastes collected by Jones were sent to the Poughkeepsie Sewage Treatment Plant during this period.

Mr. Jones operated the site until 1977, when Mr. Theodore Losee took over operations and reportedly ended haphazard disposal at the site by installing orderly, parallel trenches. Approximately eight to 12 trenches were laid out in the central site area. Any old trenches encountered during the installation of new trenches or other facilities were excavated and the sludge composted. Much of the central disposal area was regraded and the grade was elevated with clean gravel and compost. No compost was reportedly disposed of off site; it was all used as on-site fill. Under Mr. Losee, the facility was operated under the name of Jones Septic Services.

Beginning around 1980, septage solidification ponds (SSPS) were constructed in the central disposal area and used to separate solids and liquids. Sand filter beds were used to filter the pond effluent before it was discharged to the subsurface through an unlined filter bed. The SSPs and most of the filter beds were reportedly constructed with 18-in. clay bottoms. Solids removed from the SSPs were composted using the Beltsville static aeration method. In approximately 1983, a tile drain was installed to the north of the SSPS. Effluent from the sand filter beds was then discharged to the subsurface via the tile drain rather than through the unlined filter bed. In 1987 a filter press was constructed and the use of the SSPs was discontinued. Remaining sludge from the SSPs and filter beds was reportedly excavated and composted. Effluent from the filter press was discharged to the tile drain and the solids were composted on site.

Volumes of waste disposed of at the site prior to 1974 are unknown. Available information indicates that septage volumes increased dramatically in the 1980s after DeLaval wastewaters were no longer discharged at the site, from approximately 4 million gal in 1980 to 26 million gal in 1988. The remedial investigation (RI) conducted by ChemCycle Corporation of Boston, Massachusetts, in 1995 indicated that other industrial septage was received at the Jones site in addition to the DeLaval wastewaters; however, little information was available regarding volumes or wastewater characteristics. Site operations were discontinued in February 1990 at the order of the New York State Department of Environmental Conservation (NYSDEC). A more detailed description of the site history, waste disposal characteristics, and previous investigations of the site is included in Sections 1.2.2 and 1.2.3 of the RI report (ChemCycle 1995).

In 1994 a feasibility study (FS) of potential remedial alternatives was undertaken by Lawler, Matusky & Skelly Engineers LLP (LMS) on behalf of Alfa Laval Inc. A report (LMS, 1996) on the final FS was completed in June 1996. A public meeting on the selected remedial alternative was conducted by Region II of the U.S. Environmental Protection Agency (EPA) in March 1997, at which time the Record of Decision (ROD) document (EPA, 1997) was also prepared by EPA.

A Consent Decree addressing the preparation of remedial design (RD) documents and the performance of the selected remedial actions (RAs) was lodged in November 1997. In January 1998, after authorization to proceed was given by EPA, LMS began the performance of the RD on behalf of Alfa Laval Inc. As part of the RD, LMS prepared and submitted a Remedial Design Work Plan (RDWD) including the following major components:

- Plan for obtaining access approvals and other approvals
- Description of other remedial design tasks
- Remedial design schedule and preliminary schedule for remedial action
- Performance standards
- Site Management plan
- Project Organization and Responsibilities
- Wetlands Assessment Plan
- Ecological Risk Assessment Plan
- Stage IA Cultural Resources Survey
- Sampling, Analysis and Monitoring Plan
- Quality Assurance Project Plan
- Health and Safety/Contingency Plan (HASP)

The RDWD was approved by EPA in December 1998.

A Preliminary Design Report (30% completion) was submitted in May 1999 in compliance with the Statement of Work requirement, that following approval of the RDWP, and 60 days after completion of the field work, this be submitted to the EPA and NYSDEC for review and approval. This report and the preliminary design drawings submitted under separate cover presented the preliminary design criteria and design basis for the Jones Sanitation Landfill cap. The report also included an updated schedule and a long-term groundwater monitoring plan.

Based on the review of that report by EPA and NYSDEC, appropriate comments were incorporated into the Pre-Final (95% complete) design report and the accompanying plans and specifications, submitted in February 2000.

The current Final Design Report incorporates all appropriate comments received on the Pre-final Design Report, and as discussed among EPA, NYSDEC, and LMS in June 2000.

CHAPTER 2

DESIGN CRITERIA

As stated in the Scope of Work, the design report shall contain a discussion of design criteria: design assumptions and parameters regarding: performance standards; performance monitoring; compliance with all ARAR's, pertinent codes, standards, and public health requirements; and technical factors of importance.

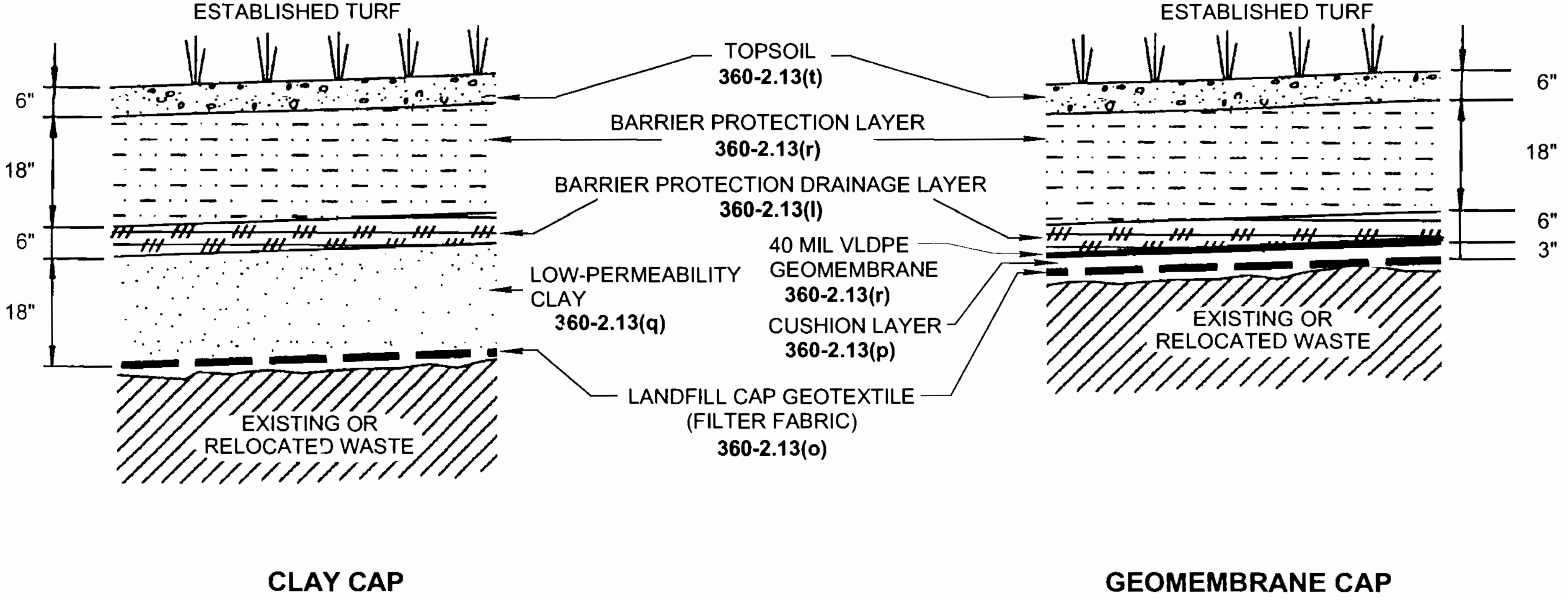
2.1 PERFORMANCE STANDARDS

The Record of Decision (ROD) for the Jones Sanitation site states that the selected remedy is to construct a cap "over the central disposal area in conformance with the major elements described in 6 NYCRR Part 360 for solid waste landfill caps." Accordingly, the performance standards used for design of the Jones Sanitation cap are the appropriate sections of Part 360 that define construction of a final cover system for solid waste landfills.

Part 360 – 2.15(d) Final Cover System stipulates that as a minimum, the final cover must consist of a layered system meeting specified requirements.

Although the ROD specified that conceptually the cap will comprise 18-in. of clay or suitable material, 6 in. of porous material serving as a drainage layer, 18 in. of protective backfill and 6 in. of topsoil and grass cover, it did not preclude the use of a polyethylene geomembrane. As will be shown in Section 6.1, the use of a 40 mil very low density polyethylene geomembrane in lieu of 18 in. clay will be less costly. Since the use of such a geomembrane is in conformance with Part 360, the performance standards for the geomembrane will be addressed.

A typical cross section through the cap is show in Figure 2-1. The figure also provides references to the appropriate subdivision of Part 360 where the performance standard can be found. Applicable sections of the Part 360 regulations are provided for reference in Appendix A.



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Typical Cap Cross-Sections

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Figure 2-1

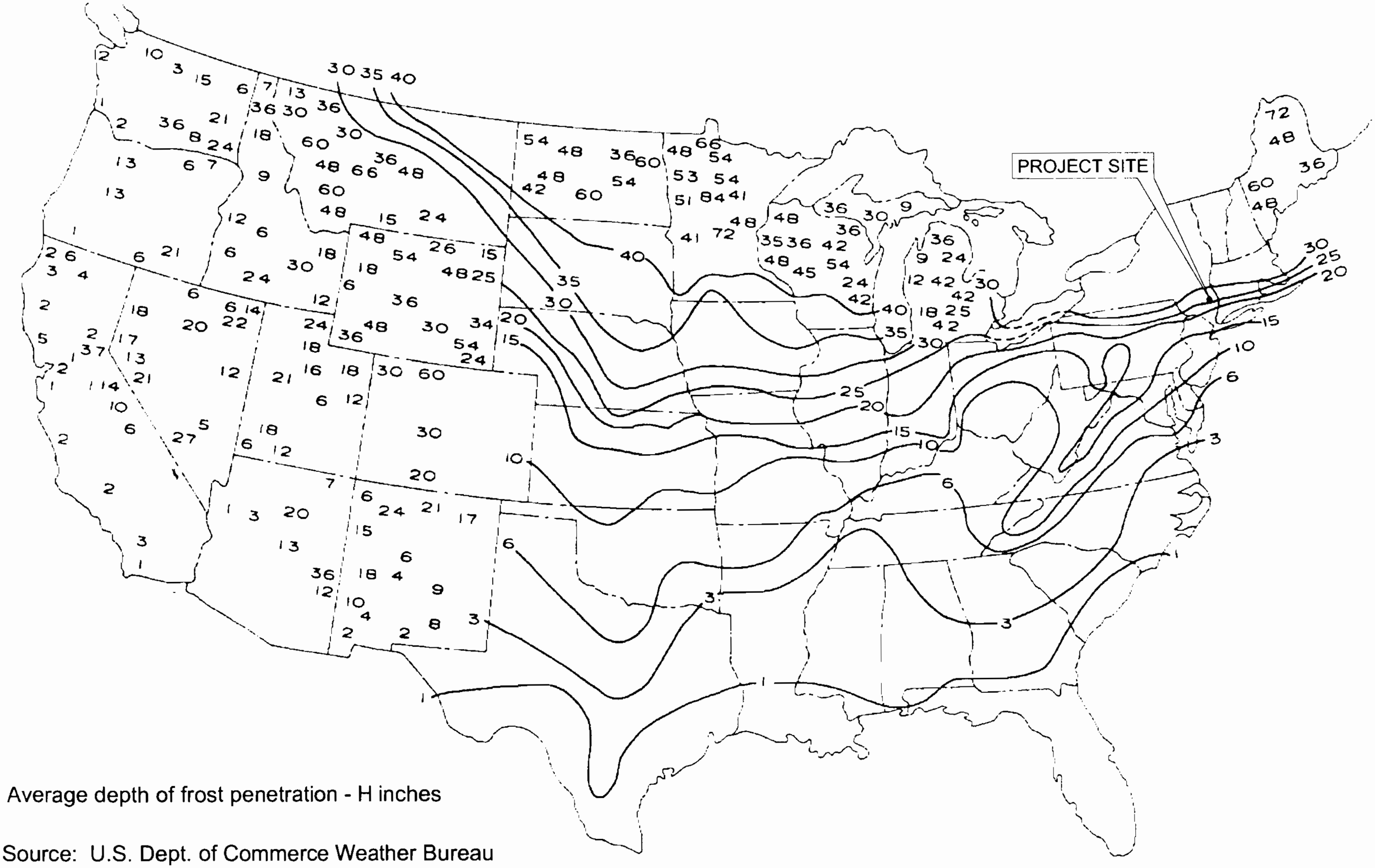
The functions of the cap layers are as follows:

> The 6" topsoil layer is the uppermost component of the landfill cap system. Its functions are to protect the underlying layers from mechanical and frost damage, and (in conjunction with a vegetative cover) to protect against erosion.
>
> The 18" barrier protection layer provides frost protection to the underlying layers, and conducts infiltrating precipitation and drain water that is percolating down from the vegetative cover to the drainage layer.
>
> The drainage layer is composed of six inches of permeable sand. It is used to convey infiltrating water to the 6-in. slotted perimeter collection header. The water is then directed to the perimeter drainage swales through a series of 6-in. solid pipes ft each draining a maximum of one acre of cap. (See also Chapter 6.)
>
> The geomembrane liner prevents infiltration of water through the cap into the waste material.
>
> The soil cushion layer provides a base for the flexible geomembrane liner.

The total frost protection layer above the geomembrane liner is 30" (6" topsoil, 18" barrier protection layer, and 6" drainage layer). Figure 2-2 shows that average frost penetration at the project site is less than the 30" provided.

A concern has been expressed that, were gypsum board from the existing building to be disposed of within the fill, objectionable odors from its decomposition might develop. Therefore, the specifications now require that such material be segregated from the general building demolition debris and disposed of off-site in accordance with State and Federal Regulations.

Furthermore, because the building potentially includes asbestos containing materials, the Contractor will be required to inspect the building for such materials, develop a disposal plan should any such be present, and dispose of the material according to that plan, upon approval of same by the Engineer.



Average depth of frost penetration - H inches

Source: U.S. Dept. of Commerce Weather Bureau

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Frost Penetration Map
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Figure 2-2

2.2 PERFORMANCE MONITORING

During the construction phase of the work, performance monitoring will be conducted by the Resident Engineer. The Engineer may use the services of one or more testing firms to assist him with the monitoring.

The Engineer will also review the contractor's submittals (i.e., shop drawings, samples, material analysis, etc.) for conformance with the approved plans and specifications.

Survey bench marks have already been installed on-site; the Construction Contractor will be required to establish additional benchmarks to be used in the monitoring of the cap construction. The bench marks will be of known USC&GS elevation for vertical control, and known New York Transverse Mercator (NYTM) coordinates for horizontal control.

Responsibilities of the Resident Engineer during construction, will include but not be limited to visual observations and the overseeing of various tests to ensure that the construction and installation of the landfill cover meets or exceeds all design criteria as indicated on the plans and specifications.

The detailed specifications provide the requirements for the type and frequency of all sampling, testing and analysis required during construction activities. The Construction Quality Assurance Project Plan (CQAPP) being submitted in conjunction with this Pre-Final Design Report covers the QA needs of the construction phase.

2.3 COMPLIANCE WITH ARARS, PERTINENT CODES, STANDARDS, AND PUBLIC HEALTH REQUIREMENTS

2.3.1 ARARS

We reviewed the Feasibility Study to identify those ARARs that apply to the design and construction of the cap, and determined that the following are listed in Section 2.4.1.2 of the FS as "TBCs" (to be considered) as possible ARARs.

- New York State recommended soil cleanup objectives (TAGM HWR-94-4046)
- OSHA exposure standards

- NIOSH exposure standards

Each of these is discussed in turn.

2.3.1.1 ***New York State Recommended Cleanup Objectives.*** TAGM HWR-94-4046 contains the promulgated cleanup objectives for inactive hazardous waste site remediation in New York State: the concentrations of chemicals in soil given in this TAGM are the maxima that may be left in uncapped soil. For the Jones site, such uncapped soil will be that that remains after excavation of the outlying trench units. The levels given in the TAGM were incorporated into the Feasibility Study (FS) as the Site Remedial Action Objectives, Table 2-1 in the FS and repeated herein as Table 2-1. These are the Remedial Action Objectives that will be used at the Jones site; the method for assuring compliance with these objectives is given in Chapter 6.

2.3.1.2 ***OSHA Exposure Standards***. The construction specifications will require the contractor to conform with the OSHA 8-hr dust exposure limit of 15 mg/m^3 total dust; the contractor's QA/QC plan will assure that this limit is met.

OSHA also has standards to limit worker exposure to airborne chemicals, including all chemicals given on Table 2-2, the Remedial Action Objectives. LMS performed calculations to determine whether the overall dust standard or the individual chemical exposure standards would control at the Jones site, i.e., given the concentrations of chemicals found at the site, whether the dust exposure standard is sufficient to protect against the individual chemicals. The right hand column on Table 2-2 shows the limiting concentrations of chemical in soil, below which the OSHA dust standard controls; as can be seen, these concentrations are very high, in fact far higher than the highest concentrations in soil reported in the RI. We conclude, therefore, that the OSHA dust standard controls, and the chemical-specific standards need not be addressed in the construction specifications.

2.3.1.3 ***NIOSH Exposure Standards***. The NIOSH exposure standards are not legally required to be adhered to in this project, whereas the OSHA standards are. Because the OSHA standards are legally binding, and because Table 2-2 and the RI data demonstrate that there is no chance of exposure to dangerous levels of chemicals during the remedial action, the NIOSH standards will not be made part of the construction specifications.

TABLE 2-1

SITE REMEDIAL ACTION OBJECTIVES[a]
Jones Sanitation Site

REMEDIAL ACTION OBJECTIVES	
Organics:	
Tetrachloroethylene	< 1,400 µg/kg[a]
4-Methylphenol	< 900 µg/kg[a]
Fluoranthene	< 50,000 µg/kg
Pyrene	< 50,000 µg/kg
Benzo(a)anthracene	< 220 µg/kg
Benzo(b)fluoranthene	< 1,100 µg/kg
Benzo(a)pyrene	< 61 µg/kg[a]
Indeno(1,2,3-cd)pyrene	< 3,200 µg/kg
Dibenzo(a,h)anthracene	< 14 µg/kg[a]
PCBs	< 10 mg/kg[a]
Inorganics:	
Antimony	< 9.6 mg/kg[b]
Arsenic	< 7.5 mg/kg[a]
Barium	< 300 mg/kg
Beryllium	< 1.3 mg/kg[b]
Cadmium	< 1 mg/kg[a]
Chromium	< 25.9 mg/kg
Copper	< 35.1 mg/kg[a]
Manganese	< 2,240 mg/kg[a]
Mercury	< 0.1 mg/kg
Nickel	< 41.1 mg/kg
Silver	< 1.9 mg/kg
Vanadium	< 150 mg/kg[b]
Zinc	< 141 mg/kg
Cyanide	< 0.06 mg/kg[c]

a - All COCs identified in baseline risk assessment included; however, a smaller subset of these identified with "a" accounted for 90% or more of the calculated risk.

b - These COCs as identified in baseline risk assessment did not exceed PSALs.

c - The remedial action objective for cyanide is based on the method detection limit.

TABLE 2-2

SITE REMEDIAL ACTION OBJECTIVES[a]

Jones Sanitation Site

REMEDIAL ACTION OBJECTIVES		ENVIRONMENTAL MEDIA		
		OSHA Standard mg/m3	ACGIH Standard mg/m3	Limiting Soil Concen. mg/kg
Organics:				
Tetrachloroethylene	< 1,400 µg/kg[a]	678	25 ppm or 170mg/m^3	∞
4-Methylphenol	< 900 µg/kg[a]	NS	0	NS
Fluoranthene	< 50,000 µg/kg	0.2	0.2	13,000
Pyrene	< 50,000 µg/kg	0.2	0.2	13,000
Benzo(a)anthracene	< 220 µg/kg	0.2	0.2	13,000
Benzo(b)fluoranthene	< 1,100 µg/kg	0.2	0.2	13,000
Benzo(a)pyrene	< 61 µg/kg[a]	0.2	0.2	13,000
Indeno(1,2,3-cd)pyrene	< 3,200 µg/kg	0.2	0.2	13,000
Dibenzo(a,h)anthracene	< 14 µg/kg[a]	0.2	0.2	13,000
PCBs	< 10 mg/kg[a]	1242-1 1254-0.5	1242-1 1254-0.5	33,000
Inorganics:				
Antimony	< 9.6 mg/kg[b]	0.5	0.5	33,000
Arsenic	< 7.5 mg/kg[a]	0.01	0.01	660
Barium	< 300 mg/kg	0.5	0.5	33,000
Beryllium	< 1.3 mg/kg[b]	0.002	0.002	130
Cadmium	< 1 mg/kg[a]	0.005	Total - 0.01 Resp - 0.002	330
Chromium	< 25.9 mg/kg	1.0	0.5	66,000
Copper	< 35.1 mg/kg[a]	1.0	1	66,000
Manganese	< 2,240 mg/kg[a]	5.0	0.2	330,000
Mercury	< 0.1 mg/kg	0.1	0.025	6,600
Nickel	< 41.1 mg/kg	1.0	1.5	66,000
Silver	< 1.9 mg/kg	0.01	0.1	660
Vanadium	< 150 mg/kg[b]	0.5[d]	0.05[d]	33,000
Zinc	< 141 mg/kg	Total -15, Resp - 5.0[e]	10[e]	1,000,000
Cyanide	< 0.06 mg/kg[c]	11[f]	4.7 ppm or 5 mg/m^3[f]	733,000

a - All COCs identified in baseline risk assessment included; however, a smaller subset of these identified with "a" accounted for 90% or more of the calculated risk.

b - These COCs as identified in baseline risk assessment did not exceed PSALs.

c - The remedial action objective for cyanide is based on the method detection limit.

d - Respirable dust as V_2O_5.

e - Zinc oxide dust.

f - Ceiling limit for hydrogen cyanide

NS - No standard

ACGIH = American Conference of Govermental Industrial Hygienists

2.4 IMPORTANT TECHNICAL FACTORS

2.4.1 Current Environmental Control

At the present time, there are no specifically constructed environmental controls in place at the Jones site. The RI/FS process has demonstrated that there is no immediate or significant or extensive threat to the environment that would require action other than that to be taken as a result of the current remedial design.

2.4.2 Constructability and Currently Acceptable Construction Technique

The use of a cap as a final cover for a landfill is a standard method for landfill closure. Standards for construction of caps for solid waste landfills in New York State are contained in 6NYCRR Part 360, and provide the design standards for the Jones Sanitation cap.

The main objective of the final cover system is to prevent the percolation of rainwater into the waste materials and to provide a physical barrier that prevents direct exposure to the waste. This objective is met with the construction of a cap consisting of several separate layers each with an individual function. The construction of each soil layer (topsoil, protective barrier, drainage) is relatively simple, and consists of placing and compacting a specific type of soil in layers of specified thickness and density. Construction of the low permeability geomembrane layer uses rolls of very low density polyethylene fabricated into one single cover over the entire landfill. The large number of landfill caps constructed throughout the United States in recent years has resulted in improved means and methods for constructing final landfill covers with geomembrane. The constructibility of the Jones Sanitation Landfill cap is therefore a standard, common landfill project that should not pose unique construction problems.

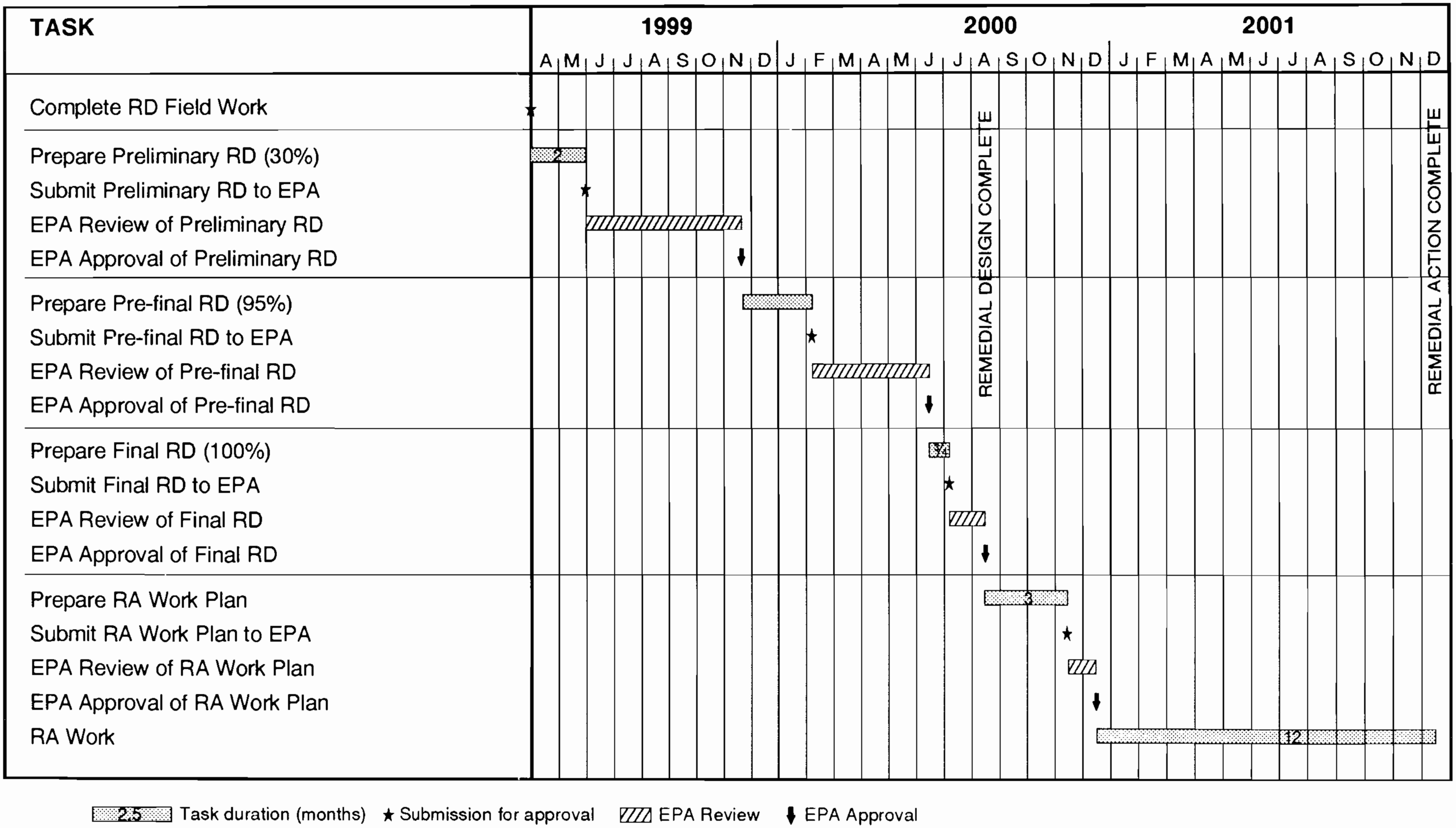
CHAPTER 3

REMEDIAL ACTION SCHEDULE

Figure 3-1 presents a schedule for the project's completion through construction. The updated schedule is based on the time frames established in the Consent Decree and assumptions of time for agency review of final design phase deliverables.

The Remedial Action (RA) Work Plan will be completed and submitted for review within 90 days of EPA's approval of the Final Design Report. Another 30 days is assumed to be required for approval of the RA Work Plan, followed by 60 days to bid the project and issue a Notice to Proceed to the Contractor. This leaves a 10-month period for construction to still meet the total RA period of 12 months specified in the SOW (Consent Decree). Construction work will mainly be done in the year 2001 late spring to early fall, which should help Alfa Laval to obtain good bids and the best weather conditions for construction. The remainder of the RA work identified in the SOW will be scheduled and described in the RA Work Plan.

Figure 3-1
Project Schedule
Alpha-Laval/Jones Sanitation Site



CHAPTER 4

SPECIFICATIONS

Specifications have been prepared for construction of the work items indicated on the Contract Drawings. The specifications complement the Drawings and provide the Contractor with instructions and requirements for the construction and installation of materials and equipment used in the work.

The specifications follow the Construction Specifications Institute (CSI) master format, which divides each specification into three parts: Table 4-1 shows a generic breakdown of the three major parts and sub-parts of a typical specification. It should be noted that this listing is general and must be customized as appropriate for each specification. Table 4-2 presents the Table of Contents for the specifications for the Jones Sanitation project.

OUTLINE OF TYPICAL SPECIFICATION

(Jones Sanitation)

PART 1 GENERAL

1.1 Summary
1.2 References
1.3 Definitions
1.4 System Description
1.5 Submittals
1.6 Quality Assurance
1.7 Delivery, Storage, and Handling
1.8 Project/Site Conditions
1.9 Sequencing
1.10 Scheduling
1.11 Warranty
1.12 System Startup
1.13 Owner's Instructions
1.14 Commissioning
1.15 Maintenance

PART 2 PRODUCTS

2.1 Manufacturers
2.2 Existing Products
2.3 Materials
2.4 Manufactured Units
2.5 Equipment
2.6 Components
2.7 Accessories
2.8 Mixes
2.9 Fabrication
2.10 Finishes
2.11 Source Quality Control

PART 3 EXECUTION

3.1 Acceptable Installers
3.2 Examination
3.3 Preparation
3.4 Erection
3.5 Installation
3.6 Application

TABLE 4-1 (Page 2 of 2)

OUTLINE OF TYPICAL SPECIFICATION

(Jones Sanitation)

3.7 Construction
3.8 Repair/Restoration
3.9 Re-installation
3.10 Field Quality Control
3.11 Adjusting
3.12 Cleaning
3.13 Demonstration
3.14 Protection
3.15 Schedules

TABLE 4-2 (Page 1 of 2

TABLE OF CONTENTS

BIDDING REQUIREMENTS AND CONDITIONS OF THE CONTRACT

NOTICE TO BIDDERS

INSTRUCTIONS TO BIDDERS

BID FORM (with three attachments)

1. Bidder Proposed Substitution Sheet
2. Non-Collusive Bidding Certification
3. Certified Corporate Resolution

EQUIVALENT LISTING

CONTRACTORS COST BREAKDOWN

STATEMENT OF BIDDER'S QUALIFICATIONS

CONTRACTOR'S SUBCONTRACTOR LIST

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

SUPPLEMENTARY CONDITIONS

STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

TECHNICAL SPECIFICATIONS

DIVISION 1 – GENERAL REQUIREMENTS

SECTION	**TITLE**
01095	Reference Standards and Abbreviations
01100	Summary of Work
01110	Work Sequence
01200	Price and Payment Procedures
01300	Administrative Requirements
01310	Health and Safety
01315	Decontamination Protocol
01320	Construction Schedule

TABLE 4-2 (Page 2 of 2)

01330	Submittal Procedures
01350	Environmental Protection and Erosion Control
01500	Temporary Facilities and Services
01600	Product Requirements
01700	Closeout and Record Documents

DIVISION 2 – SITE CONSTRUCTION

SECTION	**TITLE**
02081	Sampling and Testing
02103	Contaminated Soil Handling, Storage and Disposal
02110	Clearing and Grubbing
02115	Underground Storage Tank Removal
02118	Well Decommissioning
02175	Buried Drum Handling, Storage and Disposal
02200	Demolition
02215	Earthwork
02220	Barrier Protection Layer
02225	Geomembrane
02230	Toe Drain
02619	Landfill Gas Venting System
02800	Chain Link Fence
02921	Topsoil
02931	Seeding

CHAPTER 5

DRAWINGS

As a part of this project, LMS has prepared Design Drawings (24-in. x 36-in.) for construction of the remedial facilities required under the Consent Decree, Record of Decision and Scope of Work. A set of Pre-Final Design Drawings, (95% complete), is attached to this report. A brief description of each drawing follows:

1. **General Site Plan (1-in. = 100 ft)**

   This drawing shows existing site features including NGVD1929 datum, property lines, property owners of record, easements, right-of-ways, reservations, staging areas, roadways, structures, buildings, wells, topography, existing utilities, natural features, such as wooded areas, water bodies, wetlands, 100 year flood hazard boundaries, and legends.

2. **Landfill Cap Plans (1 in. = 50 ft)**

   This drawing shows the existing contours, demolition work, site security fencing, decontamination area(s), excavation area(s), and the location of erosion and sedimentation controls. This drawings also shows the final cap grading and other facilities such as gas vents, final site drainage, access roads, fencing, gates, and the extent of the final cap. The excavation and final regrading and restorations of Trench 20 are also shown on this sheet.

3. **Landfill Cap Sections**

   Typical longitudinal and transverse cross-sections of the cap, including existing and finished grades, are shown.

4. **Landfill Cap Details**

   This drawing contains the miscellaneous construction details required to illustrate the proposed work including gas vents and cap construction details.

5. **Excavation Areas**

   This drawing shows the existing grades of excavation areas 1A, 1B, 6, 7, 8 and 20, including the limits of excavation, clearing and grubbing, and erosion/sedimentation controls. This drawing also shows the final grades of these excavation areas and the limits of resotration.

6. **Erosion/Sedimentation Control and Miscellaneous Details**

This drawing shows the standard details for controlling erosion and sedimentation resulting from construction activities. Standard NYS details areused wherever appropriate.

CHAPTER 6

BASIS OF DESIGN

6.1 DESCRIPTION OF EVALUATIONS

6.1.1 Evaluation of Cap Cross Section

The cost estimate in the FS was based on use of clay (off-site borrow) as the impermeable layer for the Part 360 cap. The FS also recognized that a geomembrane may be more suitable than clay, and its use would be reevaluated as part of the predesign activities.

The Consent Decree and Record of Decision (ROD) both state that the scope of the selected remedy is construction of a cap over the central disposal area in conformance with 6NYCRR Part 360 for Solid Waste Landfills. The ROD further states that: "Conceptually, the cap will be comprised of: 18 in. of clay or a suitable material to ensure a permeability of 1 x 10^{-7} cm/sec."

The Part 360 regulations state that the final cover system must comply with 360-2.15(d)(2)(i), which allows either a low-permeability soil cover barrier layer (clay) meeting 360-2.13(q), a geomembrane cover meeting 360-2.13(r), or a composite cover (combination of clay and geomembrane) meeting 360-2.13(s). Therefore, the use of a geomembrane layer instead of clay is a valid option for the Jones Sanitation site.

The following evaluation compares the costs of constructing a 4.4-acre clay or geomembrane lined cap meeting the requirements of part 360-2.13. Cap items that are required for both cases have been eliminated as being equal in cost and would only serve to dilute the evaluation of clay vs. geomembrane. These common components include a vegetated, 6-in. thick topsoil layer, a 24-in. thick barrier protection layer above the impervious layer (clay or geomembrane) and a filter fabric layer beneath the clay or sand cushion layer (see Figure 2.1).

Our evaluation therefore compares only the cost of an 18-in. thick clay layer with that of a geomembrane layer, with a 3-in. layer of sand as a cushion layer immediately beneath the geomembrane to ensure the integrity of the geomembrane.

In comparing the economics of clay vs geomembranes, LMS found that clay with a permeability of less than 1 x 10^{-7} cm/sec is very difficult to obtain in Dutchess County. LMS contacted a number of local borrow pits and found that only one (in Dover Plains) had a clay layer from which to supply clay material. The supplier acknowledged that his material had a permeability on the order of 1 x 10^{-5} to 1 x 10^{-6} cm/sec and would have to be mixed with bentonite and tested to meet the 1 x 10^{-7} cm/sec permeability requirement.

Our cost comparison uses cost data taken from R.S. Means Environmental Remediation Cost Data Assemblies for 1999 (Means). These costs have been increased by 10% due to the location factor for Hyde Park.

The costs for the geomembrane cap are based on a 40 mil very low density polyethylene (VLDPE) geomembrane since Means indicates that a 60 mil high density polyethylene (HDPE) geomembrane is more expensive ($1.19/sf vs $1.73/sf plus 10% location factor). The cost for a 40 mil VLDPE geomembrane over 4.4 acres would be $250,888 ($1.19/sf x 1.10 x 4.4 ac x 43,560 sf/ac). The actual bid price for a 60 mil VLDPE geomembrane installed in a LMS designed landfill cap constructed in Westchester County, New York in 1998 was $0.70/sf. A recent installers quotation for a 40 mil VLDPE geomembrane is $0.40/sf. However, this price should be increased to $0.45/sf for profit and overhead. Using this price, the cost for a 4.4 acre geomembrane is $86,248.

The cost for a 3-in. thick sand cushion layer under the geomembrane is estimated at $20,458 ($10.48/cy x 1.10 x 4.4 ac x 43,560 sf/ac x 3-in. ÷ 12-in./ft ÷ 27 cf/cy).

The total cost for the geomembrane and sand components of the cap is $271,346, or $61,670 per acre, using Means; or $106,706, or $24,251 per acre using the quotation.

Our evaluation of the costs of an 18 in. clay layer included information in the Means Estimating book and actual quotes from a local supplier.

Inspection of the Means cost data book for the unit cost of a 6-in. thick clay layer with a 1 x 10^{-7} cm/sec coefficient of permeability indicated two unit prices; one using on-site and the other off-site clay. Our evaluation assumes that the difference between these two prices is the cost for purchasing the clay material and hauling it to the site. The location adjusted price for constructing the clay layer in 6-in. lifts with on-site clay is $15.25/cy.

The price with off-site clay is \$19.01/cy or \$3.76/cy more for purchasing and hauling the clay to the site.

LMS believes this cost increment is unrealistically low in light of our discussions with the Dover Plains borrow pit. LMS was quoted \$5.20/cy for clay with a coefficient of permeability of 1×10^{-5} to 1×10^{-6} cm/sec. The supplier estimated an additional \$1.00/cy to amend their clay with bentonite to obtain the required 1×10^{-7} cm/sec permeability. Since Dover Plans is approximately 22 miles from the Hyde Park site, the cost for hauling the clay will be significant. The supplier estimated a three-hour round trip cycle time at a cost of \$90/hr for a 30 cy truck and driver (not prevailing wage). The cost per cy for hauling would be \$9.00/cy (\$90/hr x 3 hr/cycle ÷ 30 cy/cycle). The total cost for purchasing, amending and hauling the clay is therefore \$15.20/cy (\$5.20/cy + \$1.00/cy + \$9.00/cy), and not the \$3.76/cy from Means. To this must be added the \$15.20/cy for constructing the cap in 6-in. lifts. The total unit price cost of a clay liner is therefore \$30.45/cy (\$15.20/cy + \$15.25/cy) or \$1.69/sf for a 18-in. thick layer.

The total cost for an 18-in. thick clay liner is \$323,912 (\$1.69/sf x 4.4 ac x 43,560 sf/ac). This is \$73,616 per acre.

Thus, our evaluation indicates that the cost of a clay liner will exceed the cost of a geomembrane liner by between \$11,946 and \$49,365 per acre, depending on the method used for estimating. The total difference for 4.4 acres would be between \$52,562 and \$217,206: in either case a substantial savings. It is therefore recommended that the required impervious layer be constructed with a 40 mil VLDPE geomembrane underlain by a 3-in. cushion layer of sand instead of 18-in. of clay.

6.1.2 **Evaluation of Placing Construction and Demolition Debris (C&D) Under The Cap Rather Than Off-Site Disposal**

The ROD states that "To facilitate the construction of the cap, the existing asphalt and concrete pads, frame building, and shed will be removed and disposed of off site." LMS has reviewed the NYCRR Title 6, Chapter IV, Subchapter B, Part 360 regulation governing solid waste landfills and could not find any prohibitions against placing C&D debris in a solid waste landfill. Since C&D is a type of solid waste and is not specifically prohibited for disposal, it follows that it should be allowed for disposal at an authorized solid waste landfill.

If the ROD is taken literally, the only reason for removing this C&D waste from the site is to facilitate construction of the cap. The additional cost in undertaking this off-site disposal, however does not provide a commensurate return in facilitating construction. Regardless of the final disposition of the C&D waste (off-site or under the cap) the existing facilities will still have to be demolished. The question then is whether the debris will be loaded on to trucks and hauled to a permitted off-site disposal facility, or buried on-site under the cap.

LMS has prepared preliminary estimates of quantities of materials that will result from demolition of the existing pavements, slabs, buildings and tanks.

ITEM	ESTIMATED QUANTITY
Asphalt	170 cy
Concrete	186 cy
Wood Frame Building Debris	185 cy
Steel Reinforcing and Tanks	3720 lbs

With the possible exception of reinforcing steel and the steel tanks, we believe that all of the remaining C&D waste can be disposed of under the cap. The primary concerns with placing C&D waste under the cap are that it does not interfere with the integrity of the cap or with compaction of the waste. It is LMS' intention to prepare demolition specifications that will require the Contractor to reduce the size of all C&D debris to a specified maximum size and to permit its burial under the cap. LMS will also provide detailed specifications requiring a minimum burial depth for C&D waste of three feet below the bottom most component of the cap (i.e., the sand cushion layer). Placement of the C&D materials will be spread in layers not to exceed 12-in. and compacted so that the creation of voids is prevented. Excavated soil from the outlying trench areas will be mixed with the C&D material to aid in compaction, and will be used (unmixed) to help provide the 3 ft minimum cover between the bottom of the cap and the top of the C&D materials.

Loose reinforcing steel and the two burial steel tanks (one 550 gal fuel oil tank and one 2000 gal water tank) will be required to be salvaged or disposed of off-site. Reinforcing steel that remains embedded in concrete debris that meets the size requirements may be buried under the cap, if adequately spread and compacted. Note also that any gypsum board and/or asbestos-containing material from the building will be disposed of off-site.

6.1.3 **Evaluation of Limits of Cap Footprint**

The design concept included in the FS was to place a cap over the entire contaminated central portion of the site. Contaminated materials from the outlying trench areas were to be moved into the central area and placed under the cap. The FS set the upper bound of the cap area at approximately 5 acres, which was developed as a conservative estimate for the purpose of estimating the capital cost of the remedy. The preliminary footprint of the area to be capped was established in the FS based on an examination of the RI data from the trench units (TUs), septage solidification ponds (SSPs) and sand filter (SF) beds. Areas where contaminant concentrations exceeded remedial action objectives were identified. If one or more soil samples from a particular TU/SSP/SF exceeded the remedial action objective for a COC , that unit was included in the calculation of contaminated soil volumes. Review of this information revealed the areal extent of contaminated waste material was generally confined to a centralized group of TUs with some additional TUs at greater distance from the centralized group. Based on the approximate location of the units and their dimensions as specified in the RI, a footprint of the centrally located contamination was drawn. This footprint included the SSP/SF area and TU-2,-3,-4,-5,-9, and –10. This centrally located area of contamination then became the footprint used to evaluate capping as remedial alternative.

Preliminary evaluation of the extent of the cap footprint and depth to bedrock suggested that the area of the cap (and therefore its cost) could be reduced by moving some of the soil from the perimeter of the proposed cap into the center portion of the cap. A requirement of this concept, however, is that when moving the contaminated soil, all the soil down to bedrock must be moved. This is based on the conservative assumption that, where soil is contaminated, it is contaminated down to bedrock. Where bedrock is only 5-6 ft below grade, moving the soil would appear to be cost-effective. However, LMS' evaluation indicates that depth to bedrock in most places is greater than 10 ft deep, and the savings derived by reducing the cap area will be expended in excavation and replacement costs for clean soil.

LMS' evaluation of the final cap footprint considered the initial cap layout based on the estimated extent of the contaminated soil as indicated in the FS. In fine tuning this layout, LMS considered the upper bound of the FS cap, site surveys, site inspections, and design improvements such as smoothing out the edge geometry of the cap to simplify construction.

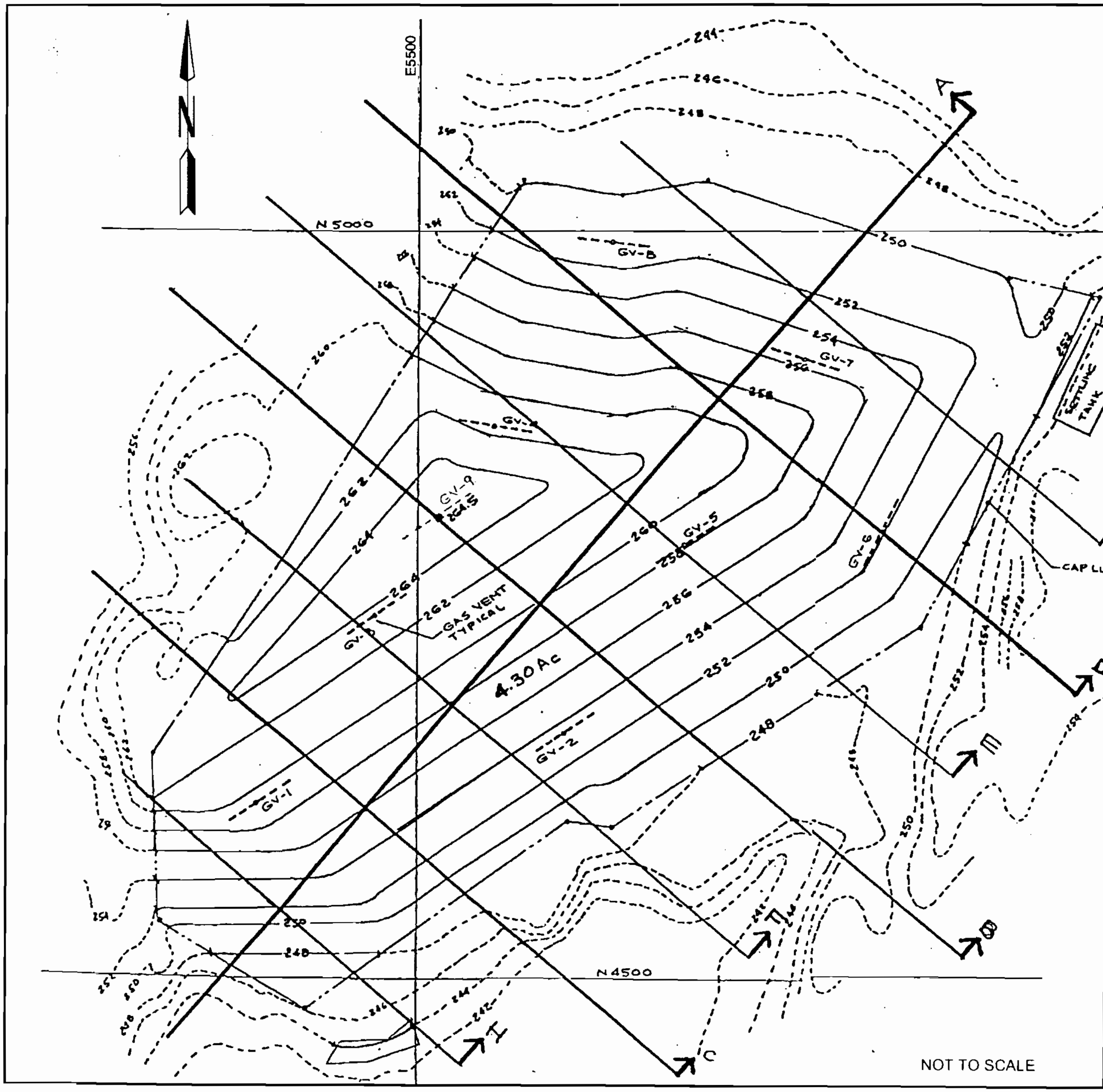
The resulting cap footprint, as shown on the preliminary drawings, generally runs parallel to the existing road on the northwesterly side of the central area. This road has always been used for access to the site and it is not realistic to believe that waste material was placed under the road. On the southerly end of the central area, the cap will generally follow parallel and close to the existing tree line, adjusted slightly to simplify edge geometry. On the southeasterly side of the cap, the edge of the cap continues to follow the tree line to a point where it coincides with the cap boundary set in the FS. The proposed cap perimeter follows the FS cap limit in a northeasterly direction to a point, just to the west of the existing settling tank at the northeast corner of the cap. At this point, the northerly limit of the cap will again follow parallel to the existing tree line to the northwest corner along the access road. The limits of the cap are shown on Figure 6-1 and on the Drawings. The approximate area of the cap is 4.42 acres.

6.1.4 **Evaluation of Need for Gas Venting Layer**

A gas venting layer within the solid waste landfill cap was determined not to be necessary based on historical information and previous environmental assessments that were performed at the site, particularly during the remedial investigation (RI) conducted by ChemCycle Corporation. The bases of this conclusion are as follows:

- Although the results of a soil gas survey conducted at the site in 1991 as part of the RI indicated the potential emission of methane in several areas on-site (Appendix B), the current potential methane emission is believed to be lower, due to the natural degradation of the septage wastes over time. All septage disposal operations at the site were terminated in 1990, and the septage ended in 1980 (ChemCycle RI Report, 1994). The septage wastes that were historically disposed of at the site were primarily sludges and liquids from sanitary wastewater disposal systems. By design, some amount of biological treatment typically occurs within such units so that the resulting septage has undergone considerable biological degradation before being disposed. In addition, lime was typically applied to septage waste that was disposed of in trenches at the site. Aside from reducing odors, lime typically stabilizes septage and destroys microbial organisms.

- Although it is likely that some biological decay probably still occurs in the subsurface at the site, the potential of subsurface migration of any methane that may be formed is relatively low due to the configuration of bedrock and the physical characteristics of the overburden material. As noted by ChemCycle in the 1992 Soil Gas Survey Report (p. 16):



\442\cap grading plan.dsf

Figure 6-1

Final Grading Plan With Limits of Cap Footprint

Jones Sanitation • Hyde Park, New York

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Environmental Science & Engineering Consultants

> "The presence of methane is not surprising given the organic rich nature of material (septage) disposed of at the site, which would be a nutrient source for methane producing bacteria. The methane may influence the migration of soil gas vapors on the site, however, since it was not observed at points near the perimeter of the site, it is not expected to be widespread enough to cause off-site migration of soil vapors. In addition, the levels observed do not appear to present a significant explosion risk."

- Potential volatile organic compound (VOC) emissions are also not expected to be a concern, as noted in the VOC soil gas survey (Appendix C) where generally only minor amounts of VOCs were detected in 1991. During this VOC emission survey the range of concentrations for perchloroethene (PCE, also known as tetrachloroethene), trichloroethene (TCE), trans-1,2-dichloroethene (trans-1,2-DCE), and toluene were: not detected (ND) – 47 ppb; ND – 100 ppb; ND – 194 ppb; and ND – 2130 ppb, respectively (Table 6-1 and Appendix C). The approximate mean concentrations of these same four VOCs were: 3 ppb, 2 ppb, 5 ppb, and 33 ppb, respectively.

- As noted in the RI Report (ChemCycle 1994, p. 4-60):

"No evidence of volatile organic emissions was noted at any time during site activities or during the ambient air monitoring traverse of the site. Given the contaminant levels observed in soil and groundwater, gaseous air emissions are not considered and have not been found to be significant at this site."

- While gas venting layers are commonly employed at municipal solid waste landfills, to control the large amount of anaerobic biological decay and methane formation that occurs from the degradation of municipal and household solid wastes (i.e., putrescible food wastes, yard wastes, paper, cardboard, plastics, rubber, textiles, etc.), these kinds of wastes were not disposed of at the Jones Sanitation Site. In fact it is likely that the residual wastes from the treated and untreated septic wastes that were historically disposed on the site have already experienced most of the biological degradation that they will likely encounter.

- According to 6 NYCRR Part 360 subpart 4 (Land Application Facilities), the land application of septage does not require the installation of a gas venting layer. The Jones Sanitation Site and its disposal history closely resembles a land application site.

TABLE 6-1

SUMMARY OF SOIL GAS SURVEY DATA

Jones Sanitation Site

COMPOUND	RANGE[1,2,3]	MEAN[1,2,3,4]
Tetrachloroethene (PCE)	ND - 47	3
Trichloroethene (TCE)	ND - 100	2
trans-1,2-Dichloroethene (t-1,2-DCE)	ND - 194	5
Toluene	ND - 38[4]	33

SOURCE: - *Soil Gas Survey: Jones Sanitation Site, Hyde Park, New York* (ChemCycle Corporation, June 1992).

1 - Concentrations shown in parts per billion (ppb).

2 - For purposes of this analysis, soil gas samples with analytical results of "ND" are assumed to have concentrations of zero ppb.

3 - Compounds detected at "trace" levels were assigned a value of 5 ppb, as no instrument detection limits were cited in the ChemCycle report and the lowest reported concentration for the soil gas sampling program was 7 ppb.

4 - Calculations based on data from 176 samples.

5 - The highest detectable toluene concentration was 10,800 ppb. However, a duplicate sample at the same location was found to have a toluene concentration of 38 ppb, and a laboratory QC analysis of the duplicate sample did not detect toluene. As per the ChemCycle report, it is suspected that the elevated toluene concentration observed (10,800 ppb) may have been related to minor gasoline drippage from automobiles that were driven across the site on the day of sampling. Thus, a maximum concentration of 38 ppb was used for this analysis.

ND - Indicates compound was not detected.

For these reasons the design and construction of a gas venting layer was determined to not be necessary as part of the capping remedial alternative selected for the site. However, to control the minor amount of methane and trace VOCs that may be emitted from the capped area, passive gas venting risers will be installed. According to 6 NYCRR Part 360, gas venting risers should be spaced at a maximum separation of one vent per acre of final cover and installed to a depth of at least five feet into the waste layer. Under these regulations, a minimum of five (5) passive gas vents, would be required for venting methane and minor concentrations of VOCs at the Jones Sanitation Site. LMS has used engineering judgement to locate nine passive gas vents in the Jones Sanitation cap. These nine vents exceed the minimum five vents required by Part 360 and will provide a more conservative design. The vents will be backfilled with rounded stone or other porous media, and will be exposed at least three feet above final elevation of the cover system. In addition, each passive vent will be fitted with a cap to allow effective passive venting and designed and constructed to operate without clogging. A typical gas vent installation is shown on the drawings.

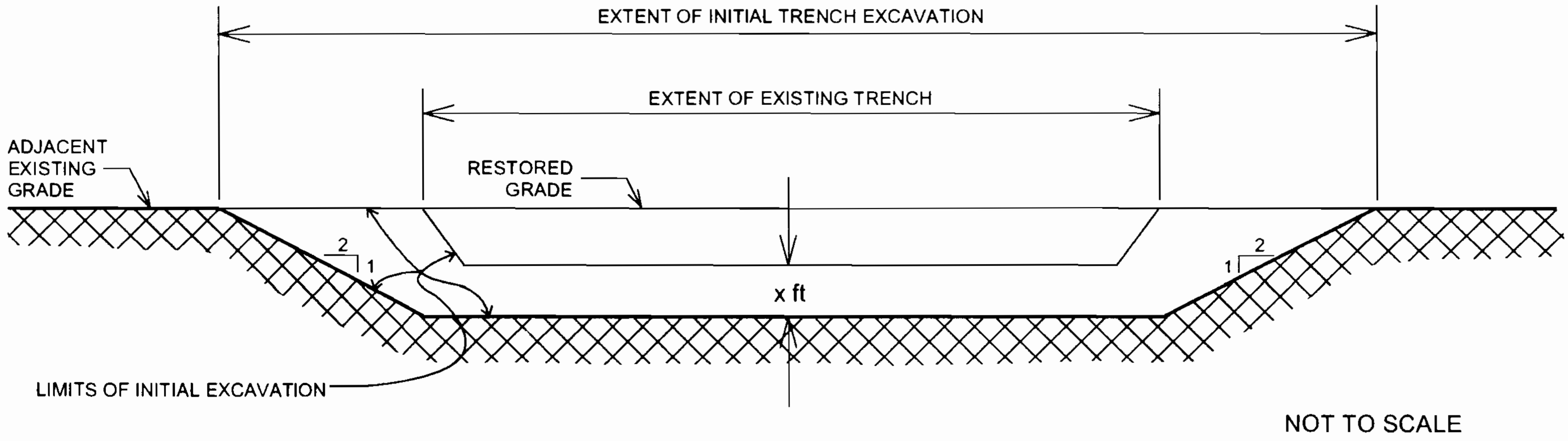
6.1.5 **Excavation Plan for Outlying Areas**

The ROD calls for contaminated soils above the RAOs in the outlying trench areas (trenches 1, 6, 7, and 8) to be excavated and moved to the central disposal area where they will be graded with the material there in preparation for placement of the cap. Subsequent to the ROD, another outlying trench was included for excavation (i.e., trench 20).

During a site visit, LMS visually identified and flagged the areal extent of these outlying trenches and then retained the services of a Land Surveyor to record this information on a survey map. The information so obtained has been added to the design drawings.

The excavation work includes the removal and relocation of waste material and soil from the following six trench areas (see the general plan in the design drawings and Figures 6-2 and 6-3):

- Trench area 1A, located on the northeast, appears to have been regraded and contains a mound about 10 ft high of what is probably waste material. The mound of waste material plus all soil to a minimum depth of 2 ft below the adjacent existing grade will be excavated and placed under the landfill cap. The estimated quantity of excavated material is 2100 cy.



SCHEDULE	
Trench No.	Depth x
1-B	2 ft
6	4 ft
7	2 ft
8	4 ft
20	2 ft

\442\222 trench detail.dsf

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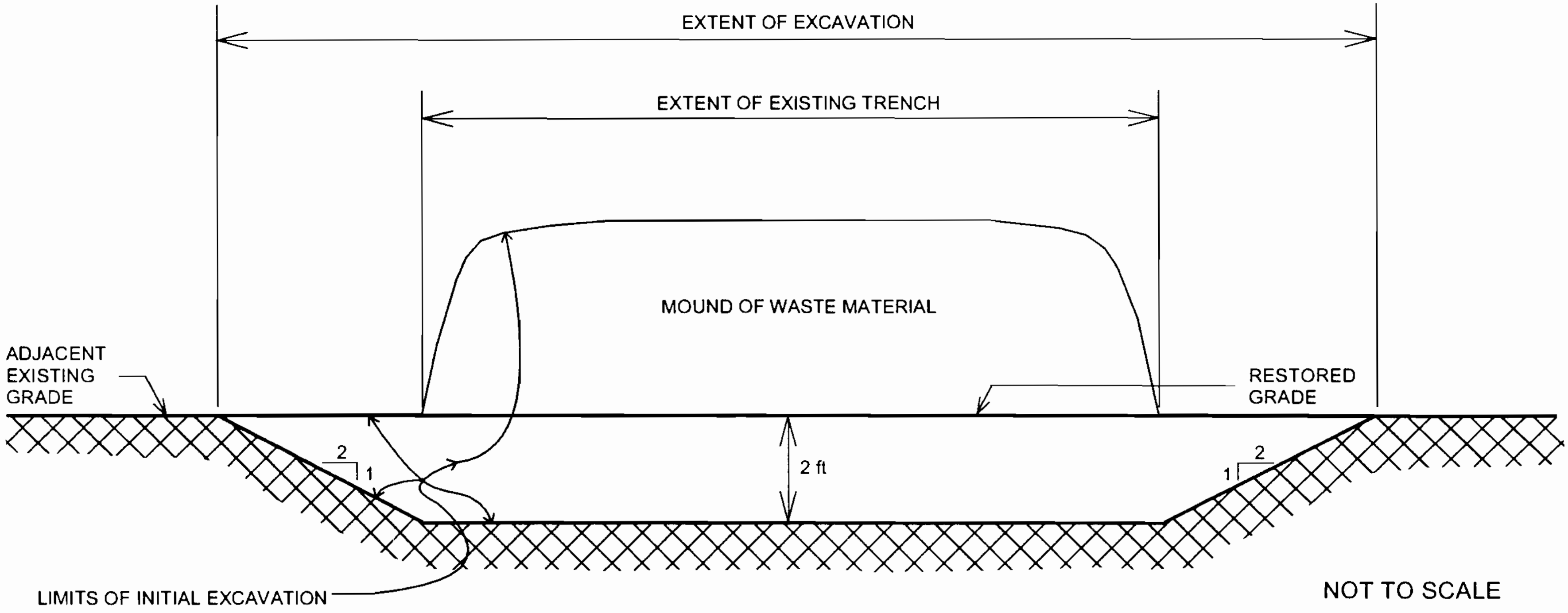
One Blue Hill Plaza • Pearl River, New York 10965
ENVIRONMENTAL SCIENCE & ENGINEERING CONSULTANTS

Typical Trench Cross-Section
JONES SANITATION • HYDE PARK, NEW YORK

Figure 6-2



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Trench 1A Cross-Section

JONES SANITATION • HYDE PARK, NEW YORK

Figure 6-3

- Trench area 1B is located immediately to the northeast of trench area 1A. This trench area will be excavated to a minimum depth of 2 ft below the bottom of the existing trench. The estimated quantity of excavated material is 2700 cy.

- Trench area 6 is located in the southwestern corner of the site. This trench area will be excavated to a minimum depth of 4 ft below the bottom of the existing trench. The estimated quantity of excavated material is 500 cy.

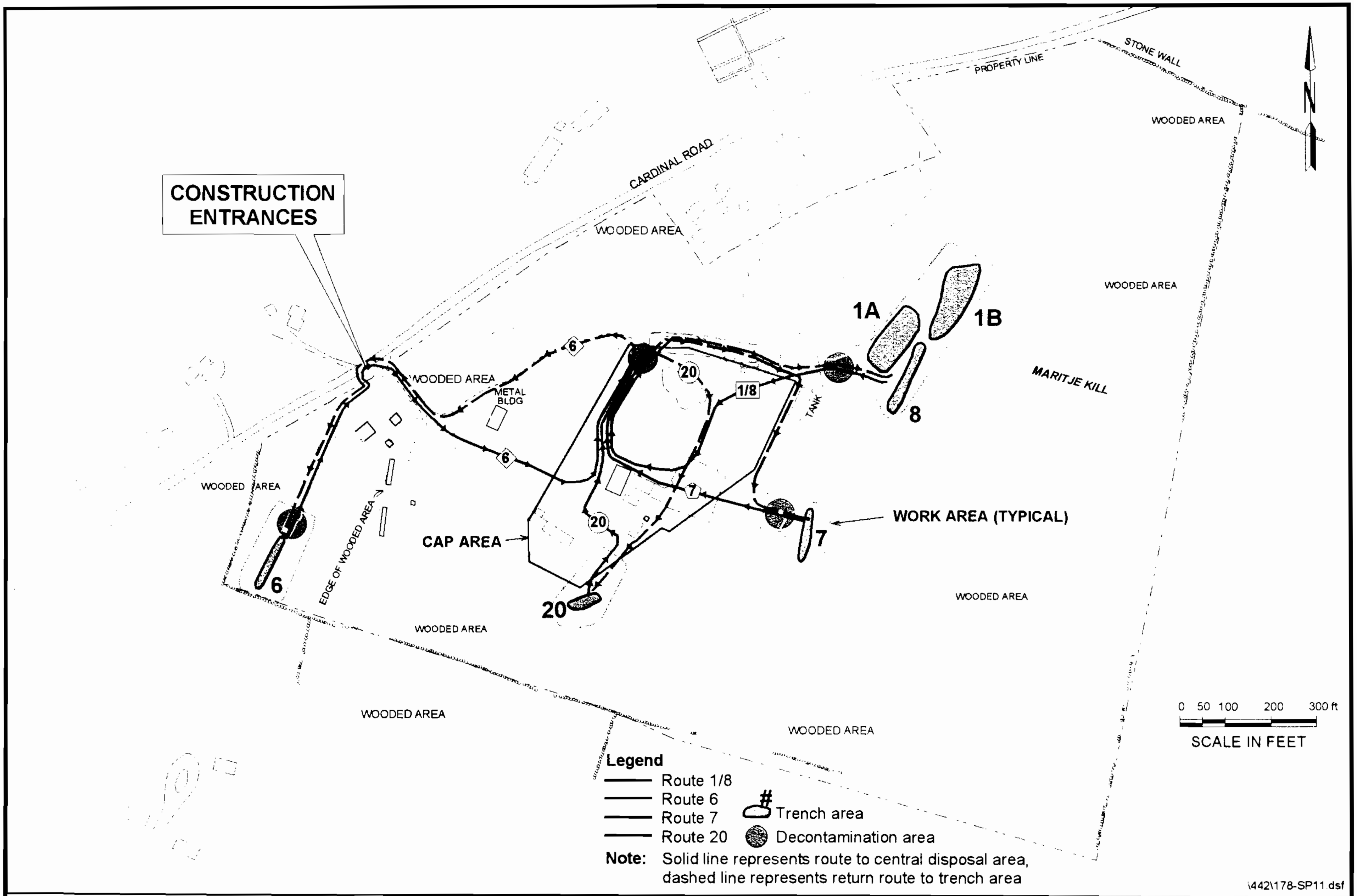
- Trench area 7 is located at the edge of the wooded area to the east of the central area. This trench area will be excavated to a minimum depth of 2 ft below the bottom of the existing trench. The estimated quantity of excavated material is 250 cy.

- Trench area 8 is located on the northeast side of the site to each of trench 1A and to the south of trench 1B. This trench will be excavated to a minimum depth of 4 ft below the bottom of the existing trench. The estimated quantity of excavated material is 900 cy.

- Trench area 20 is located at the southeast corner of the central area. This trench will be excavated to a minimum depth of 2 ft below the bottom of the existing trench. The estimated quantity of excavated material is 100 cy.

The varying depths of initial excavation are based on our judgement of how deep any contaminated material is likely to be found. In general, if the "trench" is actually a mound (1A) or is broad and shallow, we judge that it is not likely that contaminated materiai is more than two feet below the mound or trench bottom; where the trench walls are steeper, we judge that the contamination may have been placed to greater depths. Note also that this design judgement may be modified during the excavation itself; the specifications require the excavation to be made to the given minimum depth and extent, then to continue excavation until no visible evidence of contamination remains. Then, the first set of confirmatory samples will be taken.

Transportation routes to be used during excavation of the outlying areas are shown on Figure 6-4. Transportation routes have been numbered with the same identification number as the trench area to be excavated (i.e., Route 7 is the route to be followed by haul trucks during excavation of trench 7). Transportation routes 1/8, 7, and 20 are located entirely on the Jones site. Route 6 to be used during excavation of outlying trench 6 will make use of a short section of Cardinal Road. As an alternative, the possibility of remaining entirely on the Jones Site was investigated. However, that



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Transportation Routes for Excavation

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Figure 6-4

alternative will require the removal of existing trees that separate the two driveways. In consideration of the relatively small quantity of material that is expected to be excavated from trench 6 (500 cy), and the light traffic on Cardinal Road, it was decided to use the Cardinal Road route so as not disturb the existing trees.

Excavation of the existing outlying areas will require vehicle decontamination pads at each trench area and at the central disposal area. This will prevent the spread of contaminated material on the site.

Excavated waste material will be placed only within the limits of the final cap. The total volume of excavated material is estimated at approximately 6550 cy. If intermediate stockpile areas are required it would require handling this quantity of material twice. Additionally, intermediate stockpile areas would require placing temporary liners beneath the stockpile to prevent contamination of the underlying soil as well as construction of an additional vehicle decontamination pad at the stockpile area.

A suggested sequence of construction will be provided with the plans and specifications as well as the required construction completion time which may be about eight to 10 months. The specifications are written to require the contractor to prepare the site and schedule his excavation and filling operations to suit his intended means and methods of construction, within the guidelines set forth by the contract documents.

Once the outlying trenches have been excavated to the extent and depth shown on the plans, plus further excavation to remove visibly contaminated materials, confirmatory samples will be collected from the bottom and sidewalls of the excavations. The minimum number of samples and the analyses to be conducted are shown in the following table.

	No. OF SAMPLES		
TRENCH	Bottom	Side Walls	ANALYSES
1A	6	4	TCL, SVOCs, PCBs, TAL
1B	9	4	TCL, SVOCs, PCBs, TAL
6	5	4	TAL
7	3	4	TCL, SVOCs, TAL
8	1	4	TAL
20	3	4	TAL

alternative will require the removal of existing trees that separate the two driveways. In consideration of the relatively small quantity of material that is expected to be excavated from trench 6 (500 cy), and the light traffic on Cardinal Road, it was decided to use the Cardinal Road route so as not disturb the existing trees.

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	No. OF SAMPLES		
TRENCH	Bottom	Side Walls	ANALYSES
1A	6	4	TCL, SVOCs, PCBs, TAL
1A/1B	9	4	TCL, SVOCs, PCBs, TAL
6	5	4	TAL
7	3	4	TCL, SVOCs, TAL
8	1	4	TAL
20	3	4	TAL

The proposed analyses are based on the contaminants present above the remedial action objectives for each trench. The number of samples to be taken for each trench area is based on technical judgement that a minimum threshold of five samples per trench area should be taken. If any side wall or trench bottom exceeds 1,000 sf, one sample per 1,000 sf will be taken; the estimated number of bottom samples is based on the trench areas in Appendix B. The analyses will be conducted with a 48-hr turnaround time so that the need for additional excavation in any of the trench areas can be determined while excavation equipment is still mobilized at the trench site.

Following excavation and confirmatory sampling, the trench units will be backfilled with clean fill and a 6-in. layer of clean topsoil. This material is specified to be off-site borrow only, and is to be tested for contamination or certified 'clean' by the borrow pit.

If groundwater is encountered during trench excavation, it will be treated by Granular Activated Carbon (GAC) and discharged into another trench already excavated or some other depression in the ground surface, but not into the wetlands. A review of the RI sampling and analysis shows that four overburden wells on the trench side of the site were sampled: OB-4, OB-6, OB-8 and OB-9S. The only VOCs found above the NYS Groundwater standard in any of these borings were 5 µg/L Benzene and 14 µg/L Chlorobenzene in OB-6; the groundwater standards for these chemicals are 0.7 µg/L and 5 µg/L, respectively.

At these low concentrations, GAC has a usage rate of about 0.1 lb GAC per gallon; a 165 lb drum of GAC would treat up to 1.6 x 10^6 gal of water at these concentrations. The specifications require the use of a 165 lb GAC drum, and limit total throughput to 1 x 10^6 gal; the specifications also require the drum to be disposed in accordance with applicable rules and regulations at the end of the job.

The soil pile in trench 1B, which extends substantially above surrounding ground surface will be backfilled only to adjacent grade level. All backfilled areas will be reseeded.

6.1.6 Cap Drainage Design

The overall approach to cap drainage design includes two major features:

- A six inch drainage layer above the impermeable membrane, to convey water that percolates through the barrier protection layer out to the perimeter of the cap more efficiently than the barrier protection layer itself can. Although not required by Part 360 Regulations, and, in fact, often eliminated in landfill closures, it is proposed in the ROD and we have incorporated it as a conservative design element.

- A cap toe drain system that will convey both surface runoff and cap drainage layer flow away from the cap itself, to provide insurance against water percolating through the material protected by the cap.

6.1.6.1 **Adequacy of Drainage Layer**

Since many Part 360 caps are designed, and function well, without any drainage layer, it is intuitive that a layer that has a permeability significantly higher than the barrier protection layer will improve drainability beyond that achievable with no drainage layer. Calculations are presented to show that the drainage layer will function adequately.

The sand is specified as follows:

Minimum permeability: 1 x 10^{-2} cm/sec
% passing No. 8 (2.38 mm) sieve: 100%
% passing No. 200 (0.074 mm) sieve: $\leq$ 5%

The capacity of the drainage layer to convey percolated flow to the perimeter drain is calculated, then compared to the expected rate of percolated flow. The critical location for the drainage layer capacity will be where the pathway from the upper end of a section of the drainage layer to the perimeter drain is the longest, given equal slopes of the drainage layer. The longest pathway, from a point on the cap to the perimeter drainage trench has a length of 230 ft and slope of 0.07.

By D'Arcy's law:

$$Q = K.S.A$$

For a 1 ft wide strip:

Capacity: Q = -28 ft/day x .07 x 0.5 SF
= 0.98 CF/day
= 7.3 gpd

To compare this carrying capacity to the expected flow, we used an annual average net recharge (precipitation minus evapo-transpiration) of 24 in. per year. Over the 230' x 1' strip, drainage is: Q = 2'/yr x 230 sf x 1/365 = 126 cf/day

This flow is similar to the capacity of the drainage layer. Because we chose the critical point in the cap for this analysis, we believe that any tendency to back up percolated water will be relieved laterally.

6.1.6.2 **Evaluation of Soil Migration**

The prevention of migration of a finer into a coarser soil can be achieved by following established rules that relate the gradation of the two adjacent materials:

$$\frac{D_{15}\text{of filter material}}{d_{85}\text{ of natural soil}} \quad \text{Is less than 5.}$$

$$\frac{D_{50}\text{of filter material}}{d_{50}\text{ of natural soil}} \quad \text{Is less than 25.}$$

$$\frac{D_{15}\text{of filter material}}{d_{15}\text{ of natural soil}} \quad \text{Is less than 20.}$$

In these equations, the filter material is the sand and the natural material is the barrier protection layer. For the gradation of the barrier protection layer, we used a contractor submittal of a soil that met the LMS specification we used for the Harrison, NY, C&D Landfill closure project. For this soil, the three key sizes are:

D_{85} = 0.5"
D_{50} = 0.18"
D_{15} = 0.007"

Applying the above three equations to this material, the sand layer must meet the following:

$D_{15} < 5 \times 0.5 < 2.5" < 63$ mm
$D_{50} < 25 \times 0.18 < 4.5" < 114$ mm
$D_{15} < 20 \times 0.007 < 0.14" < 3.6$ mm

These criteria thus allow the sand to be a very coarse material, much coarser than that specified to achieve the permeability of 1×10^{-2} cm/sec.

We have therefore used the same specification for the barrier layer that we used at the Harrison project.

6.1.6.3 **Capacity of Drainage Pipe**

The drainage pipe design flow will be that that occurs during a storm event. For this design, we have chosen a 3.5 in. per hour rainfall rate (i) and a runoff coefficient (c) of 0.3. For a one acre area, using the rational formula:

Q (cfs) = c i A (acres
Q = 0.3 x 3.5 x 1
= 1.05 cfs

At a pipe slope of 0.25 in per ft, and a Manning's "n" of 0.010 (PVC pipe), a 6 in. diam. pipe can carry this flow rate.

Therefore, the system has been designed with a 6 in. diam. perimeter drain, with outlets spaced so that no pipe carries the runoff from more than one acre; the outlets are sloped at a minimum of ¼ in. per ft.

6.2 SUMMARY AND DETAILED JUSTIFICATION OF ASSUMPTIONS

6.2.1 **Calculations Supporting all Assumptions**

Calculations supporting the design of the final cover are included in Appendix D. These calculations include those for determining the stability of the cover soil above the geomembrane as well as calculations to determine the geomembrane tension stresses due to subsidence of the waste material below the cap. Other calculations included in this appendix are cut and fill quantities for the central area and the outlying trench areas.

6.2.2 How Performance Standards and ARARs will be Met

Performance standards, as described in Section 2.1, have mainly to do with assuring that the cap and its components meet the relevant portions of Part 360. The CSI specifications will require material and in-place testing by the Contractor and /or his suppliers to demonstrate compliance with Part 360 requirements. In addition, LMS, as Resident Engineer for the project, will review all subconsultant work for conformance to the specifications, and will inspect field installations to provide further assurance that the Contract Documents are being complied with. The Construction Quality Assurance Project Plan (CQAPP), prepared in parallel with this Final Design Report, requires inspections and testing to see that the construction conforms to the relevant requirements of Part 360.

With respect to ARARs, review of the FS and other project documents reveals that the project must meet the Remedial Action Objectives (RAOs) for concentrations of specific chemical constituents in uncapped soils, and the OSHA dust standard must be met. The dust standard of 15 mg/m^3 will be written into the Contract Specifications and the Contractor's Health and Safety Plan and Plan of Operations will include the details of how compliance will be achieved by the Contractor.

Compliance with the RAOs will be determined by sampling the walls of the trench unit excavations. The initial (minimum) excavation will be as described elsewhere in this report, and that excavation will be part of the Contractor's base lump bid for cap construction. Following excavation to the depths specified, soil samples will be collected from the bottom and sidewalls of the excavation at the rate of one sample per 1000 ft^2 of excavation. The samples will be analyzed in accordance with the Table in Section 6.1 (page 6-10). The samples will be analyzed with a 48-hr turnaround time to provide rapid information on the need for additional excavation at the site.

Samples will be take over a 12 in. depth, and the specifications, will require that if any sample exhibits concentration(s) exceeding the RAO, the trench area represented by that sample be excavated an additional 1 ft, after which confirmatory sampling, again at 12 in.

depth, be repeated. This procedure will be continued until all trench areas are in compliance with the RAOs.

All additional excavation, sampling, and analyses beyond that initially specified will be bid and paid for on a unit price basis.

6.2.3 Plan for Minimizing Environmental and Public Impacts

Environmental and public impacts related to construction of the selected remedy will be minimized by issuing construction specifications that will contain appropriate requirements and guidelines to be met by the Contractor.

Environmental issues that will be addressed include:

- **Construction Entrance**. The plans and specifications will contain details for the installation of a construction entrance at the entrance to the site. A construction entrance is typically a pad of large stones that will dislodge soil from the tires of construction vehicles and thus prevent tracking of soil onto public roads.

- **Decontamination of Vehicles and Equipment**. The plans and specifications will contain details for construction of one or more decontamination pads where vehicles and/or equipment will be decontaminated. Any vehicle and/or piece of equipment that enters a designated work area will be required to exit via a decontamination pad.

- **Erosion and Sedimentation Control**. A section on erosion and sedimentation control will be included in the specifications. Details of the controls required for the Jones Sanitation site will be included on the drawings. Erosion and sedimentation controls will include silt fences as a minimum. Other controls will be provided if appropriate, from the New Your State Guidelines for Urban Erosion and Sediment Control handbook.

- **Dust Control**. The Specifications will include a section on dust control. The Contractor will be required to comply with the appropriate sections of NYSDEC's guidance memorandum (TAGM #4031) on dust suppression and particulate monitoring at Inactive Hazardous Waste Sites. Under this guidance the Contractor will be required to use one or more of the following dust control techniques to control the generation and migration of dust during construction activities: applying water on haul roads, wetting equipment and excavation faces, spraying water or buckets during excavation and dumping, hauling material in tarped containers, restricting vehicle speeds on site to 10 mph, and covering excavated areas and material after excavation activity ceases.

Public impacts will be minimized by the following controls:

- **Fencing**. Fencing of the work site (temporary) and the landfill cap (permanent) will prevent the public from entering the work site or landfill cap area. By restricting the public from the site, the potential for injuries or vandalism will be reduced.

  In addition to the wetland boundaries, all construction limits will be marked with bright orange fencing. The specifications require the following:

  - Silt fencing be placed along the line of the permanent chain link fence, and remain in place until construction of the cap is complete.

  - Bright orange fencing be placed just outside the silt fencing, marking the outside limit of construction activity.

  - When the construction of the cap has been completed, and silt fencing is no longer needed, the silt fence will be removed and the permanent chain link fence installed.

  - When the chain link fence has been completed, the bright orange fence will be removed.

- **Long Term Cap Maintenance**. The public will be protected by implementing a long term cap maintenance program to ensure the integrity of the cap. Cap integrity is essential to prevent the passage of rain water into the landfill and becoming contaminated leachate with the potential for contaminating the groundwater.

- **Groundwater Monitoring**. A plan for the long term monitoring of groundwater on-site and off-site will be implemented. Details of this plan are contained in Chapter 7.

- **Dust Control**. New York State Department of Health's Community Air Monitoring Plan will be implemented as appropriate during site construction activities. The specifications will require conformance to this plan.

6.2.4 **Permits Plan**

In preparing this permits plan, LMS has contacted the building inspector for the Town of Hyde Park and various Dutchess County departments and agencies regarding permits required for construction of the remedy.

The Town of Hyde Park will require a permit for demolition of the existing building. NYSDEC approval to place the C&D debris on site under the cap would have to be provided before the Town would issue this permit.

LMS contacted the Dutchess County Planning Department who referred us to the Department of Public works. The Engineering Division of DPW informed LMS that since Cardinal Road is a Town road no county permits would be necessary.

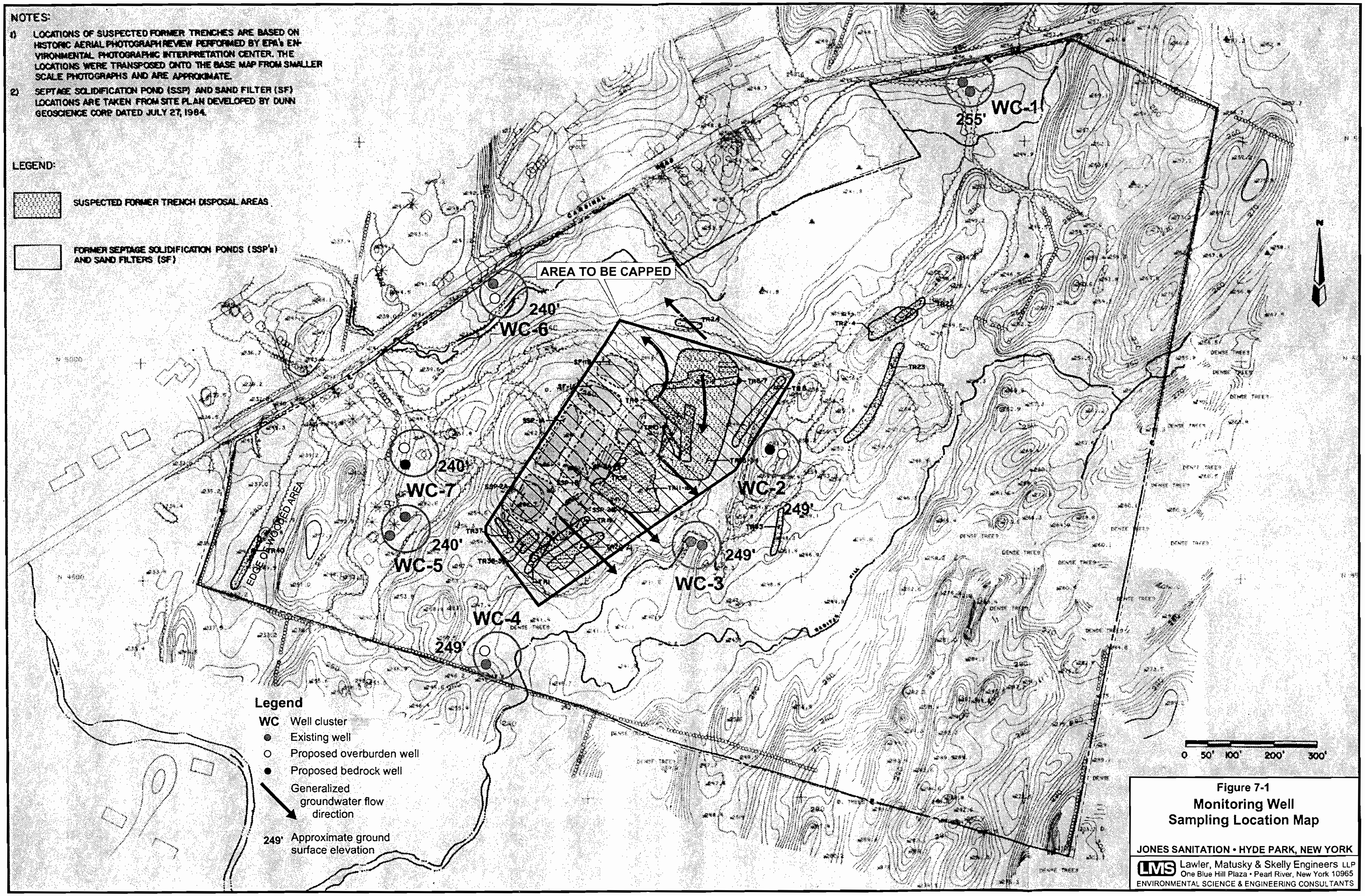
The Dutchess County Soil and Water Conservation District was also contacted by LMS. This agency generally receives construction plans from town planning boards for review and comment. There is no permit issued by this agency.

CHAPTER 7

LONG TERM GROUNDWATER MONITORING PROGRAM

On and off-site groundwater monitoring will be conducted to assess the migration and rate of natural attenuation of contaminant levels and determine if any contaminants at unacceptable concentrations are moving off-site. Prior to commencing this groundwater monitoring program, a sampling plan will be prepared and submitted for review to the USEPA and NYSDEC. The groundwater monitoring program will include sampling of fourteen on-site monitoring wells (seven well clusters) that encompass seven overburden and seven bedrock wells (Figure 7-1), and ten off-site residential drinking water supply wells (Figure 7-2). The New York State Department of Health (NYSDOH) will provide oversight of the off-site residential well monitoring program to be conducted by the Settling Defendants. Initial post-construction sampling will consist of quarterly (i.e., each season) sampling of the on-site monitoring wells, for target analyte list (TAL) metals and volatile organic compounds (VOCs), to establish a baseline profile of groundwater quality information. As part of this quarterly monitoring program, static water level measurements will be taken in the on-site wells being sampled. This baseline data will be reviewed, and assuming that the results of these analyses show seasonally appropriate stability in chemical concentrations, annual sampling of both on- and off-site wells will commence thereafter. If groundwater quality stability is not demonstrated, then the need for further baseline data will be discussed with the USEPA and NYSDEC.

Annual groundwater sampling and analyses will be conducted for five years of the thirty-year monitoring program for the same TAL metals and VOCs as sampled and analyzed for in the baseline program. Static water level measurements will continue to be taken on a quarterly basis of the on-site monitoring wells during this first five year sampling period to establish groundwater elevation patterns. In the event that contaminant levels remain below groundwater standards in the residential drinking water supply wells during the five-year monitoring period, the monitoring program will be reevaluated and the frequency of sampling, or a change in scope, may be initiated. If the data indicates that groundwater contamination is not attenuating and is migrating to off-site wells, additional groundwater remedial measures may be considered.



NOTES:

1) LOCATIONS OF SUSPECTED FORMER TRENCHES ARE BASED ON HISTORIC AERIAL PHOTOGRAPH REVIEW PERFORMED BY EPA's ENVIRONMENTAL PHOTOGRAPHIC INTERPRETATION CENTER. THE LOCATIONS WERE TRANSPOSED ONTO THE BASE MAP FROM SMALLER SCALE PHOTOGRAPHS AND ARE APPROXIMATE.

2) SEPTAGE SOLIDIFICATION POND (SSP) AND SAND FILTER (SF) LOCATIONS ARE TAKEN FROM SITE PLAN DEVELOPED BY DUNN GEOSCIENCE CORP DATED JULY 27, 1984.

LEGEND:

▨ SUSPECTED FORMER TRENCH DISPOSAL AREAS

☐ FORMER SEPTAGE SOLIDIFICATION PONDS (SSP's) AND SAND FILTERS (SF)

Legend

WC Well cluster
● Existing well
○ Proposed overburden well
● Proposed bedrock well
→ Generalized groundwater flow direction
249' Approximate ground surface elevation

Figure 7-1
Monitoring Well
Sampling Location Map

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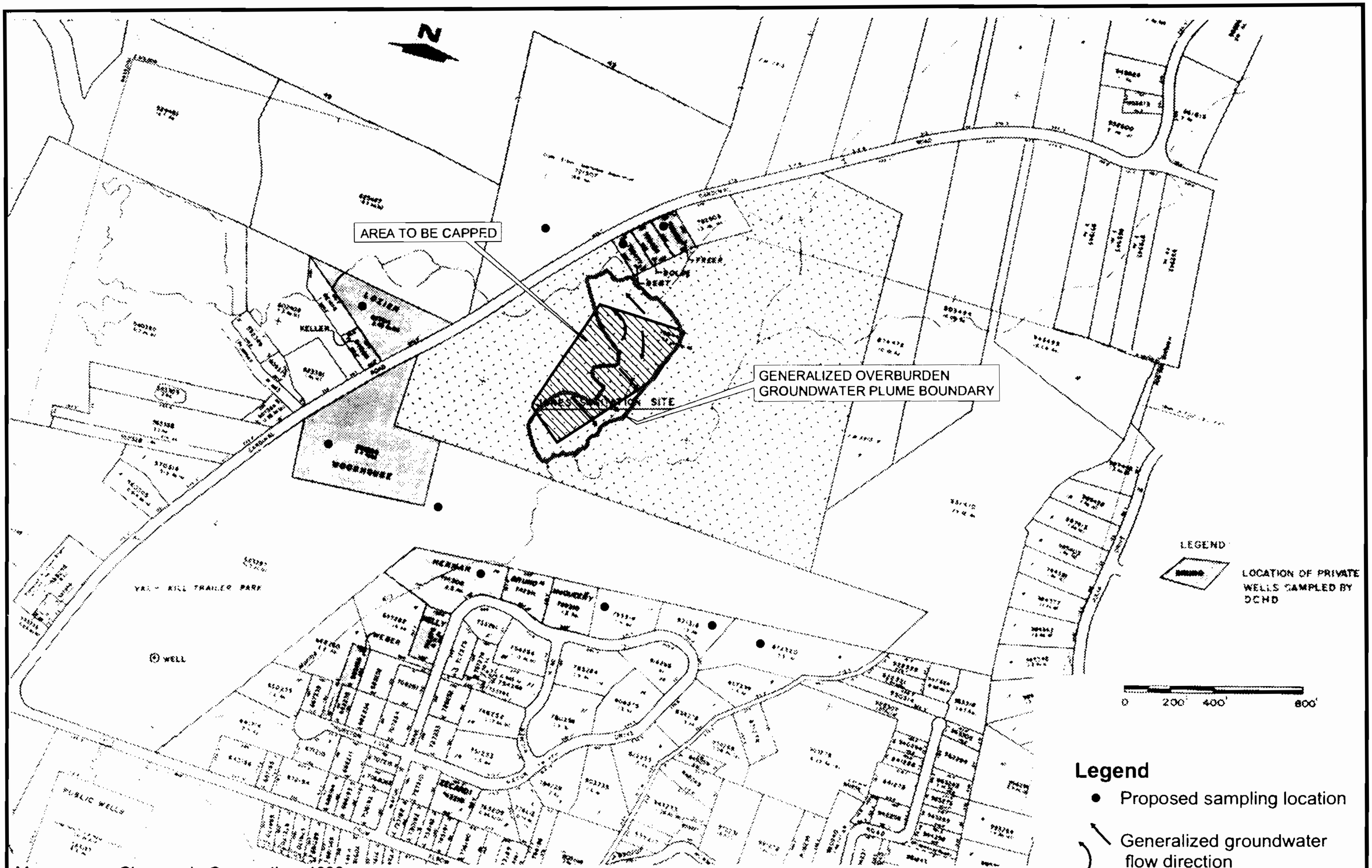

Map source: Chemcycle Corporation, 1998.

\442\222 offsite.dsf

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Proposed Residential Well Sampling Location Map

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Figure 7-2

7. 1 ON-SITE MONITORING WELLS

A total of seven on-site monitoring well clusters (Figure 7-1), each consisting of an overburden and bedrock well (Table 7-1), were chosen for the long-term monitoring program. These wells will provide circumferential coverage at and beyond the waste management area. Of the seven well clusters, WC-1 was chosen to provide background data as both the bedrock and overburden wells in this cluster are upgradient of the contamination. As shown in Figure 7-1, overburden groundwater flow directions are generally to the north-northwest and southeast; more detailed groundwater contours can be found in Exhibit 6 of the RI Report (Chemcycle, 1995). The six downgradient/side gradient well clusters will also serve to ensure that contamination from the site will be detected before it could impact down- or sidegradient residential drinking water supply wells.

The seven proposed well clusters will require the installation of four overburden and two bedrock monitoring wells (Figure 7-1). An overburden monitoring well will be installed at WC-4 and WC-6. Both an overburden and bedrock monitoring well will be installed at WC-2 and WC-7. Installation of monitoring wells may be required if the wells at WC-3 are destroyed during remedial activities (i.e. excavations during cap construction, etc.). There are several existing wells in this area that may be used as alternates in the event that the initially selected wells are destroyed.

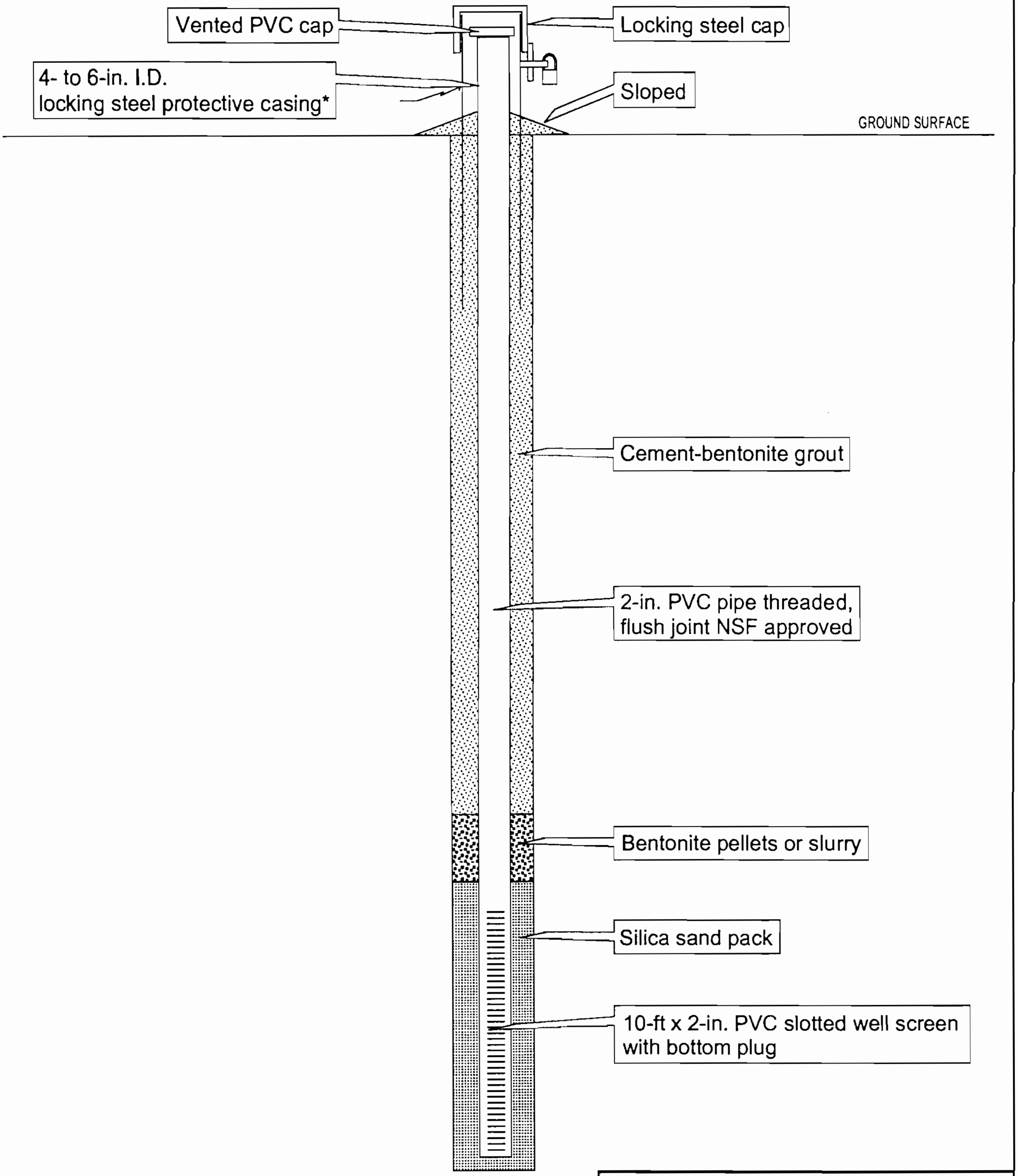
A field reconnaissance will be conducted prior to the installation of the on-site monitoring wells to screen and select areas for new well placement. During this reconaissance the existing wells located within the chosen well clusters will be inspected and provisions will be made to re-develop these wells during the installation/development of the additional on-site monitoring wells. If, during the field reconnaissance, it is determined that any of the existing on-site monitoring wells are unsuitable for sampling (i.e. damaged), an alternate well(s) in the area of that cluster will be chosen. If no suitable well(s) is available near the existing well cluster, a new well(s) will be installed. Wells requiring replacement during the life of the monitoring program will be installed within the existing well cluster area as required.

All wells will be installed in accordance with the most current New York State Department of Environmental Conservation (NYSDEC) protocol. Figures 7-3 and 7-4 represent the construction of a typical overburden and bedrock well. Overburden monitoring wells will be installed to a depth consistent with the average maximum depth

TABLE 7-1

JONES SANITATION SITE
GROUNDWATER MONITORING WELL SAMPLING AND MONITORING PROGRAM
ON-SITE GROUNDWATER MONITORING WELLS

Well Cluster Designation	Overburden Well Designation	Bedrock Well Designation	Comments
WC-1	OB-1	MW-101 SR	Upgradient Wells
WC-2	OB-18*	MW-107*	* New Well Designation
WC-3	OB-9D	W-8	
WC-4	OB-15*	MW-104 S	* New Well Designation
WC-5	OB-10	MW-3	
WC-6	OB-16*	MW-103 S	* New Well Designation
WC-7	OB-17*	MW-106*	*New Well Designation



*In traffic areas the well will be fitted with a flush-mounted protective case.

NOT TO SCALE

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Figure 7-3

Typical
Overburden Monitoring Well
Construction

Jones Sanitation Site

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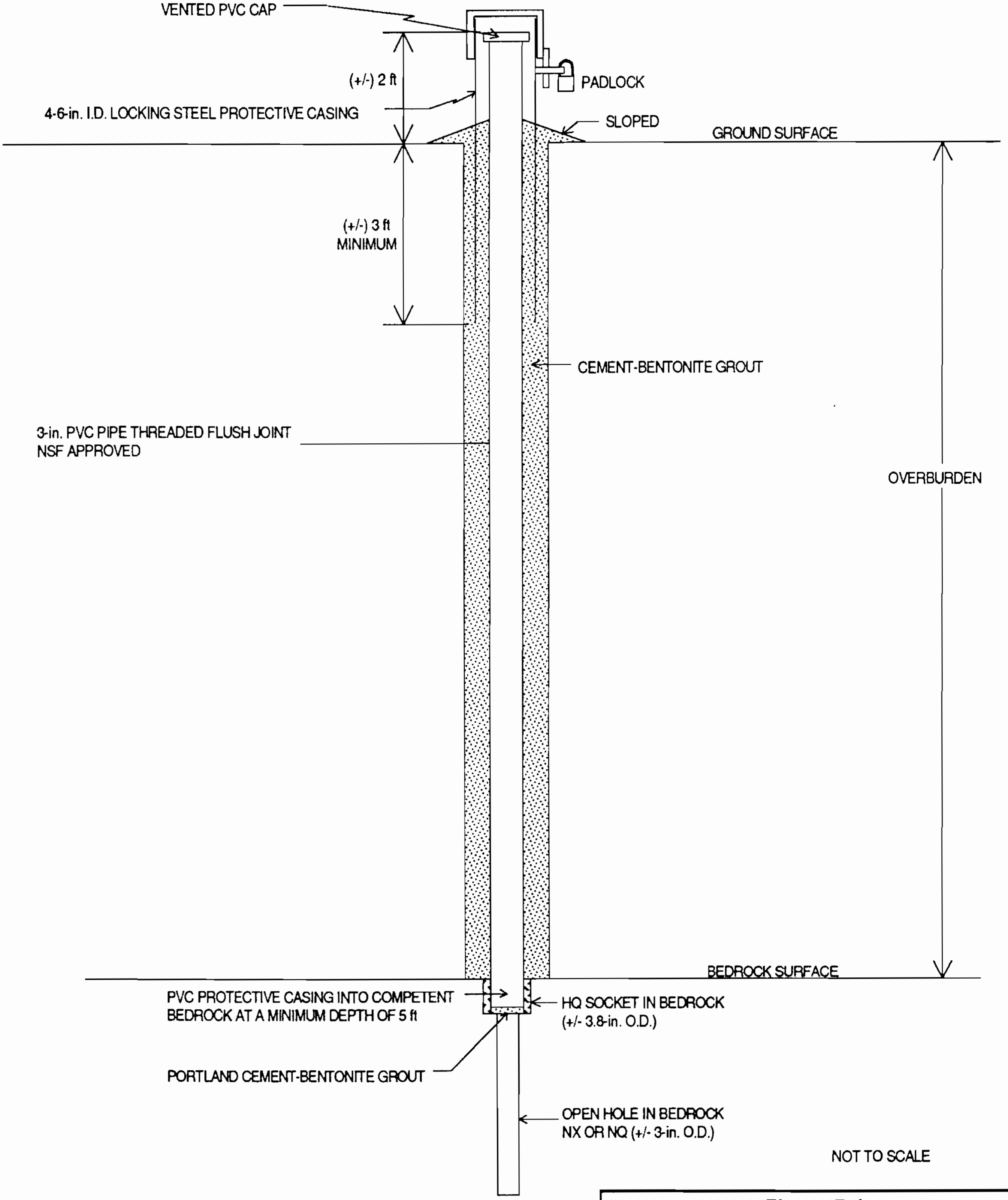
Pearl River, New York



NOT TO SCALE

NOTE: Flush-mount curb box will be even with grade.

Figure 7-4
Typical
Bedrock Monitoring Well
Construction

Jones Sanitation Site

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Pearl River, New York

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of contamination in the overburden aquifer and will be screened in the contaminated zone of the aquifer. The screen of any newly constructed overburden well should be long enough to straddle the water table to accommodate seasonal water table fluctuations. Bedrock monitoring wells will be screened in the bedrock aquifer and installed to a depth consistent with average range of depths of the existing bedrock wells in the area. Table 7-2 includes depths of both the existing and proposed overburden and bedrock monitoring wells for each well cluster. The depths of the proposed wells were estimated based on groundwater data summarized in the RI. The final determination regarding well depth will be made in the field prior to or during well construction activities. Sheet 1 enclosed provides additional detail on the location and elevations of proposed monitoring wells. All existing on-site wells that will not be used as part of the long-term monitoring program will be decommissioned in accordance with relevant NYSDEC protocols.

With the exception of WC-2 and WC-7, each well monitoring well cluster includes either an overburden and/or bedrock well that has been previously sampled. WC-2 and WC-7 are entirely new well clusters with wells that will still need to be installed. Therefore, to insure continuity, the original well designation will be kept for each existing overburden and bedrock monitoring well. The designations for the newly installed overburden and bedrock monitoring wells will follow the same nomenclature used to designate the existing monitoring wells (Table 7-1).

7.2 OFF-SITE RESIDENTIAL DRINKING WATER SUPPLY WELLS

The on-site monitoring wells and ten residential drinking water supply wells (Figure 7-2) will be sampled concurrently (i.e. within approximately one week) to provide data to insure that no contaminants are migrating off-site. The ten residential drinking water wells were selected for inclusion in the sampling program based on the following:

- Proximity to the site
- Groundwater flow direction
- Aquifer of concern

The following wells were selected for inclusion in the residential drinking water supply well sampling program:

TABLE 7-2

JONES SANITATION SITE
GROUNDWATER MONITORING WELL SAMPLING AND MONITORING PROGRAM
ON-SITE GROUNDWATER / MONITORING WELL DATA

Well Cluster	Overburden Well	Well Depth (ft. bgs)[1]	Bedrock Well	Well Depth (ft. bgs)[1]	Approximate Depth to Groundwater (ft. bgs)[1]
WC-1	OB-1	17.0	MW-101 SR	34.5	4.0
WC-2	OB-18*	20.0**	MW-107*	30.0**	8.0
WC-3	OB-9D	31.0	W-8	N.A.	8.0
WC-4	OB-15*	20.0**	MW-104 S	29.0	6.0
WC-5	OB-10	17.0	MW-3	N.A.	9.0
WC-6	OB-16*	20.0**	MW-103 S	27.0	7.0
WC-7	OB-17*	20.0**	MW-106*	30.0**	6.0

[1] Feet Below Ground Surface

* New Well Designation

N.A. Information Not Available

** Estimated Well Depth

TAX LOT NUMBER	DEPTH OF WELL (FT.BGS)/AQUIFER
766492	220/ Bedrock
707215	30-35 /Overburden
721507	130/ Bedrock
647414	60/ Overburden
658354	210/Bedrock
623287	20-22/ Overburden (Val-Kill Mobile Homes)
714308	109/ Bedrock
795314	160/ Bedrock
821318	208/ Bedrock
872320	120/ Bedrock

The residential well samples will be collected from a tap, located before any in-home treatment systems, after flushing the tap for five minutes. The samples will be designated by the last name of the resident and a number that will correspond to the date of the sampling event (i.e. Smith-1/4/2002, Jones-1/4/2002 etc.).

7.3 SAMPLING AND ANALYTICAL PROCEDURES

All sampling and monitoring will be performed in accordance with the USEPA Region 2 CERCLA Quality Assurance Manual dated October 1989 which will be incorporated in the Quality Assurance Project Plan (QAPP). The QAPP will include sampling and analytical procedures, sample chain-of-custody form, instrument calibration procedures and frequency, data validation and reporting procedures, internal quality control measures, etc. The samples will be sent, under chain of custody, to an EPA-approved (CLP) laboratory. Samples will be analyzed in accordance with EPA methods as described in the CLP Statement of Work for Organic Analysis (revision No. 9, 1994) and the EPA CLP Statement of Work for Inorganic Analysis (revision No. 11, 1992). All data to be validated in accordance to the procedures stated in the EPA Region II Contract Lab Program Organics Data Review and Preliminary Review (SOP #HW-6, Revision 8 - 1/92) and the Evaluation of Metals Data for the CLP (SOP #HW-2, Revision 11- 1/92). All analytical data will be submitted to the EPA in CLP-deliverable format, or similar EPA-approved format. All laboratory contracts will provide for access of United States Government personnel and authorized representatives of the United States for the purpose of ensuring the accuracy of laboratory results related to the site.

All analytical results will be compared to the most current National Primary Drinking Water Regulations - Maximum Contaminant Levels (MCLs) as stated in 40 CFR Part 141 and NYSDEC Ambient Water Quality Standards and Guidance Values [6 NYCRR, Chapter X -Part 703, (March 12, 1998 or most current)].

7.4 **SCHEDULE OF WELL INSTALLATION AND SAMPLING**

A written schedule will be submitted to the USEPA and NYSDEC prior to commencement of the long-term groundwater monitoring program. The schedule will include specific dates for the start and completion of each task, submission of each deliverable and the expected review and revision time required for the annual report. The schedule will be submitted to allow enough time for the agency(s) to co-ordinate a confirmatory sampling program if required.

The monitoring wells will not be installed/redeveloped until after the completion of the remedial construction at the site. Upon completion of the installation of the additional long-term groundwater monitoring wells and the redevelopment of the existing monitoring wells, the long-term groundwater monitoring program will commence. The on-site monitoring wells and the residential wells will be sampled concurrently (i.e. within one week of each other). Each resident will be notified in writing at least two weeks prior to the residential drinking water well sampling event and a schedule for sampling will be arranged with the resident. A draft report of findings will be submitted to the USEPA within a reasonable time frame after the receipt of the validated laboratory data. Subsequent to finalization and approval of the report all residents will be given the results of the tests on their wells.

7.5 **ANNUAL REPORTS**

The annual report shall include, at a minimum the following:

- Comprehensive groundwater monitoring data from all previous groundwater monitoring data and sampling events relevant to the groundwater monitoring plan implemented.

- An analysis of the level of the contaminants in the groundwater e.g., whether contaminant migration has been effectively prevented or stabilized and whether there have been any reductions or changes in the concentration of contaminants in the groundwater.

- Time versus concentration plots for contaminants and wells.

- An evaluation of whether the concentration trends in the groundwater plume are consistent with the predictions of the groundwater movement in the RI/FS.

CHAPTER 8

SURVEY WORK

LMS retained the services of a licensed Land Surveyor, Joseph Haller, Land Survey Consultant (Haller), to prepare the surveys required for the Remedial Design. The services provided by Haller are indicated below:

SURVEY OF WETLANDS, TRENCHS, AND WASTE PILES

- Survey of the horizontal location of the 375(±) red and/or orange wetland flags, in areas A, B, C, and D, by number.

- Survey of the horizontal location of approximately 30 to 40 blue/yellow flags to define waste piles and/or trenches.

- Topography at 1-ft contour interval of blue/yellow flag areas (+20-ft all around).

- Provide monuments at approximate locations to be specified by LMS, in the open area to be capped, to act as semi-permanent baseline (two 30-in. steel pipes, approximately 300-ft apart).

- Use of previous survey to the maximum extent possible is included; survey to be tied into previous survey.

- Locations of the wetland and pile/trench flags will be accurate within 6-in.

- Access to all points to be surveyed is available. The surveyor will coordinate all field activities with LMS as directed.

- The survey work will be accomplished by 24-hr OSHA-trained personnel with current medical monitoring (documentation to be available upon request).

- All field activities, calculations and analysis of results will be under the direct guidance of a professional land surveyor licensed in the State of New York.

- Survey data collected will be added to the existing facility site plan. One signed and sealed plottings, together with an AutoCAD Version 12 drawing on diskette will be delivered.

- Topographical survey of open area of site, approximately 6 to 7-acres, to 1-ft accuracy.

The information provided by Haller has been used in various parts of the design, including: grading of the cap; wetlands mapping; excavation plan for outlying trenches; and horizontal and vertical control. The Haller information, which was for the central cleared area, outlying trenches, and wetland boundaries only, was tied into the previous site survey to provide overall mapping of the site.

CHAPTER 9

EASEMENT AND ACCESS REQUIREMENTS

The Consent Decree identifies the Owner of the Jones Sanitation site, Mr. Theodore C. Losee, Sr. as the Owner Settling Defendant, and Alfa-Laval, Inc. as the Performing Settling Defendant. Since the site is private property owned by Mr. Losee, it is necessary for Alfa-Laval to secure access to the site for the purpose of performing the Remedial Actions required.

Mr. Losee and Alfa-Laval have entered into an agreement that grants access to the site to Alfa-Laval for the purpose of constructing the approved remedy i.e., capping the landfill. Mr. Losee has also agreed to provide institutional controls at the site, including deed and use restrictions as required in the EPA's Record of Decision. A copy of the Consent Decree between Mr. Losee and Alfa-Laval is included in Appendix -E. Also included in Appendix E is a proposed Grant of Easement and Declaration of Restrictive Covenants to be signed by Mr. Losee.

CHAPTER 10

RESULTS OF FIELD SAMPLING

LMS collected surface water and sediment samples at six locations at the Jones Sanitation Site on March 24, 1999. The results of that sampling effort are summarized in the Ecological Risk Assessment (ERA) report that has been submitted under separate cover. Excerpts from that report relating to field sampling results are included in Appendix F.

Based on the site observations and the results of the sampling effort, the ERA states that "no further ecological risk assessment work is recommended at the Jones Sanitation site."

REFERENCES

Lawler, Matusky & Skelly Engineers LLP (LMS). 1998. Remedial Design Work Plan for Jones Sanitation Site: Hyde Park, New York. September 1998.

Lawler, Matusky & Skelly Engineers LLP (LMS). 1996. Feasibility Study Jones Sanitation Site: Hyde Park, New York. June 1996.

ChemCycle Corporation. 1995. Remedial Investigation Jones Sanitation Site: Hyde Park, New York, Volume II - Appendices. April 1995.

ChemCycle Corporation. 1994. Remedial Investigation Jones Sanitation Site: Hyde Park, New York. August 1994.

U.S. Environmental Protection Agency (USEPA). 1977. Record of Decision Jones Sanitation Site: Town of Hyde Park Dutchess County, New York.

APPENDIX A

EXCERPTS FROM PART 360 REGULATIONS SOLID WASTE LANDFILL CAP CONSTRUCTION

every 5,000 cubic yards of material placed, and one for each time soil material changes are noted.

(ii) Quality assurance testing included in this subparagraph must be compared to and evaluated against the quality control testing of subparagraph (i) of this paragraph where applicable. Quality assurance testing locations must be proportionally distributed to reflect the areal extent of side slope verses bottom area of the landfill under construction and must include density and moisture content tests to be performed at a minimum of nine locations per acre per lift of soil material placed. For each location the density and moisture content must be compared to the appropriate moisture-density-permeability relation to determine the permeability at that location; and one shelby tube sample for laboratory permeability testing must be taken per acre per lift. Any tests resulting in penetration of the soil liner must be repaired using bentonite or other means acceptable to the department.

(k) *Geomembrane liners.* Geomembrane liners are low permeability geosynthetics used to control fluid migration from landfills.

(1) Materials required. The geomembrane liner material must have a demonstrated maximum water vapor transmission rate of 0.03 gram per meter squared per day and chemical and physical resistance not adversely affected by waste placement or leachate generated. Documentation must be submitted to ensure chemical compatibility of the geomembrane liner material chosen, or in absence of the appropriate documentation, chemical compatibility testing must be performed using a method acceptable to the department.

(2) Construction requirements. Geomembranes must be installed in accordance with the requirements of the approved engineering plans, report, and specifications and manufacturer's recommendations. The project engineer must ensure that the geomembrane installation, at a minimum, must conform with the following:

(i) the geomembrane in both the primary and secondary composite liner must have a minimum thickness of 60 mils;

(ii) all geosynthetic materials must be installed on a subgrade that has a minimum two percent slope to promote positive drainage;

(iii) any geosynthetic materials installed on landfill side slopes must be designed to withstand the calculated tensile forces acting upon the geosynthetic materials. At a minimum, the design must consider the maximum friction angle of the geosynthetic with regard to any soil-geosynthetic or geosynthetic-geosynthetic interface, along with seepage forces expected in the side slope soil drainage layer in the primary leachate collection and removal system, to ensure that overall slope stability is maintained;

(iv) the surface of the supporting soil upon which the geosynthetic material will be installed must be reasonably free of stones, organic matter, irregularities, protrusions, loose soil, and any abrupt changes in grade that could damage the geosynthetic. The supporting soil must conform to the requirements of subdivision (i) of this section (except for landfill closure);

(v) the anchor trench must be excavated to the length and width prescribed on the approved design drawings;

(vi) field seams should be oriented parallel to the line of maximum slope, *i.e.*, oriented along, not across the slope. In corners and irregularly shaped locations, the number of field seams should be minimized. No horizontal seam should be less than five feet from the toe of slope toward the inside of the cell;

(vii) the materials must be seamed using an appropriate method acceptable to the department. Seam testing must be in accordance with the requirements of paragraph (3) of this subdivision;

(viii) the seam area must be free of moisture, dust, dirt, debris, and foreign material of any kind before seaming;

(ix) field seaming is prohibited when either air or sheet temperature is below 32°F, when the sheet temperature exceeds 158°F, when the air temperature is above 120°F, during periods of precipitation, or when winds are in excess of 20 miles per hour; and

(x) the field crew foreman of the liner installer must have a documented minimum qualification of successful installation experience of at least 50 acres of previous landfill or comparable geosynthetic systems, on a minimum of five different projects.

(3) Certification requirements. The project engineer must include in the construction certification report a discussion of the approved data resulting from the quality assurance and quality control testing as required in this paragraph. The results of all testing must be included in the construction certification report including documentation of any failed test results, and descriptions of the procedures used to correct the failed material, and statements of all retesting performed.

(i) The project engineer must certify the quality control testing of any manufactured geosynthetic materials ensuring that the material and the finished product meet the requirements of the approved engineering plans, reports, and specifications. Before installing any geosynthetic material, the following information must be available to the project engineer for approval:

(*a*) origin and identification of the raw materials used to manufacture the geosynthetic material;,

(*b*) copies of quality control certificates issued by the producer of the raw materials used to manufacture the geosynthetic material, which at a minimum must include reports of tests conducted to verify material quality, including specific gravity, melt flow index, percent carbon black, and carbon dispersion using methods acceptable to the department; and

(*c*) reports of tests conducted to verify the quality of the raw materials used to manufacture the geosynthetic material. At a minimum, the project engineer must review the following tests: for single-point stress rupture, tensile strength, tear and puncture resistance, and for the complete stress rupture curve for the geomembrane, using test methods acceptable to the department, to ensure proper geomembrane specification.

(ii) The project engineer must certify through appropriate documentation that the quality control testing of any geosynthetic rolls fabricated into geomembrane sheets at the factory took place in accordance with the following requirements:

(*a*) The geomembrane was continuously inspected for uniformity, damage, imperfections, holes, cracks, thin spots, and foreign materials. Additionally, the geomembrane liner must be inspected for tears, punctures, and blisters. Any imperfections must be immediately repaired and reinspected.

(*b*) Nondestructive seam testing was performed on all fabricated seams over their full length using a test method acceptable to the department.

(*c*) Destructive seam testing was performed on a minimum of two samples per geomembrane sheet. The samples must be taken from extra material at the beginning or end of sheet seams, such that the geomembrane sheet is not damaged and the sheet geometry is not altered. The size of the sample taken must be large enough to perform the required testing. A laboratory acceptable to the department must have performed the required testing on the samples taken. If a sample fails a destructive test, the entire seam length must be reconstructed or repaired using a method acceptable to the department, and retested using nondestructive seam testing over the full length of the seams using a test method acceptable to the department.

(iii) Quality assurance testing performed in the field under the supervision of the project engineer must assure conformity of the geosynthetic installation with the engineering plans, reports, and specifications submitted in accordance with the following requirements:

(*a*) During the construction phase, for each lot number of geomembrane material that arrives at the site, a sample should be taken for fingerprinting of the material. This sample should be archived at room temperature and in a light free environment for possible future testing and analysis. The geosynthetic material must be visually inspected for uniformity, damage, and imperfections. The geomembrane must be inspected for tears, punctures, or blisters. Any imperfections must be immediately repaired and reinspected.

(*b*) The project engineer must certify that test seams are made at each start of work for each seaming crew, after every four hours of continuous seaming, every time seaming equipment is changed, when significant changes in geomembrane temperature are observed, or as additionally required in the approved specifications.

(*c*) All field seams must be nondestructively tested in accordance with the procedures listed in this clause using a test method acceptable to the department. The project engineer or his/her designated representative must:

(*1*) monitor all nondestructive testing;

(*2*) record the location, date, test unit number, name of tester, and results of all testing;

(*3*) inform the installer of any required repairs; and

(*4*) overlay all seams which cannot be nondestructively tested with the same geomembrane. The seaming and patching operation must be inspected by the project engineer for uniformity and completeness.

(*d*) Destructive testing must be performed on the geomembrane liner seam sections in accordance with the requirements listed in this clause, and using test methods acceptable to the department.

(*1*) Seam samples for testing must be taken as follows: a minimum of one test per every 500 feet of seam length unless a more frequent testing protocol is agreed upon by the installer and project engineer; a minimum of one test for each seaming machine operating on a given day; additional test locations may be determined during seaming at the project engineer's discretion; all test locations must be appropriately documented.

(*2*) The project engineer must approve the sample size to be taken. The sample size must be large enough to perform the required testing.

(*3*) An independent laboratory acceptable to the department must perform the required testing, which must include testing for seam strength and adjacent geomembrane elongation, and peel adhesion (and separation if high density polyethylene [HDPE]) using testing procedures acceptable to the department.

(*4*) If a sample fails destructive testing, the project engineer must ensure that: the seam is reconstructed in each direction between the location of the sample that failed and the location of the next acceptable sample; or the welding path is retraced to intermediate locations at least 10 feet in each direction from the location of the sample which failed the test, and a second sample is taken for an additional field test. If this second sample passes, the seam must be reconstructed between the location of the second test and the original sampled location. If the second sample fails, this process must be repeated.

(*5*) All acceptable seams must lie between two locations where samples passed the test procedures found in subclause (*4*) of this clause and include one test location along the reconstructed seam.

(*6*) Nondestructive testing of the geomembrane liner must be performed in accordance with clause (*b*) of this subparagraph.

(*e*) Upon completion of geomembrane seaming, post-construction care of the installed geomembrane should commence and, at a minimum, include timely covering or temporary weighting using sandbags to prevent damage from wind uplift, construction, or other weather related damage.

(l) *Soil drainage layers.* All soil material used in the primary and secondary leachate collection and removal systems of the landfill must conform to the following requirements:

(1) Materials required. Soil materials used to construct a drainage layer must be designed to ensure proper hydraulic operation of the leachate collection and removal system pursuant to the provisions of subdivision (g) of this section. The soil drainage layer must be free of any organic material and have less than five percent of the material by weight pass the No. 200 sieve after placement. Soil material testing must be performed in accordance with paragraph (3) of this subdivision.

(2) Construction requirements. The soil drainage layer must be constructed and graded in accordance with the requirements of the approved engineering plans, report, and specifications along with the following requirements:

(i) The minimum thickness of the soil drainage layer in the primary leachate collection and removal system must be 24 inches and provide adequate physical protection to the underlying liner materials and leachate collection pipe network placed within the primary leachate collection and removal system, and have a minimum coefficient of permeability of 1×10^{-2} centimeters per second.

(ii) The minimum thickness of the secondary leachate collection and removal system layer must be 12 inches, and provide adequate physical protection to the underlying liner materials and leachate collection pipe network placed within the secondary leachate collection and removal system, and have a minimum coefficient of permeability of 1×10^{-2} centimeters per second.

(iii) The soil drainage layer must be designed and placed on a minimum slope of two percent to promote efficient positive drainage to the nearest leachate collection pipe and to prevent ponding above the liner.

(3) Certification requirements. The project engineer must include in the construction certification report a discussion of the approved data resulting from quality assurance and quality control testing required in this paragraph. The results of all testing must be included in the construction certification report including any failed test results, descriptions of the procedures used to correct the failed material, and any retesting performed.

(i) The project engineer must certify the quality control testing of any soil drainage materials and ensure that the material meets the requirements of paragraph (1) and subparagraphs (2)(i) and (ii) of this subdivision and the approved engineering plans, reports, and specifications. A particle size analysis of the soil drainage layer material must be submitted to the project engineer for approval before installation of the soil drainage layer, and during installation at a frequency of at least one test for every 1,000 cubic yards of material delivered and placed. A laboratory constant head permeability test for a soil drainage layer sample shall be submitted to the project engineer for approval before placement and during construction at a frequency of at least one test for every 2,500 cubic yards of material delivered and placed.

(ii) The project engineer must certify that post-construction care procedures were carried out which, at a minimum, protected the soil drainage layers from fines related to water and wind borne sedimentation.

(iii) Quality assurance testing performed by the project engineer must ensure that the material is placed in accordance with the requirements of the engineering plans, reports, and specifications.

(m) *Leachate collection pipes.* Leachate collection pipes that are located in any soil or geosynthetic drainage layer of the primary and secondary leachate collection and removal systems must be hydraulically designed to remove leachate from the landfill and provide conveyance to an appropriately designed and sized storage or treatment facility, and must comply with the following:

(1) Materials required. The primary leachate collection pipe must have a minimum diameter of six inches, the secondary leachate collection pipe must have a minimum diameter of four inches and meet the following:

(i) The physical and chemical properties must not be adversely affected by waste placement or leachate generated by the landfill. The project engineer must certify that the leachate collection pipe is chemically compatible with leachate or waste which it will come in contact with, as verified by appropriate documentation of chemical compatibility testing, using a method acceptable to the department.

(ii) Piping must have adequate structural strength to support the maximum static and dynamic loads and stresses that will be imposed by the overlying material, including the drainage layer, liners, waste material, and any equipment used in the construction and operation of the landfill. Specifications for the proposed leachate collection pipe network must be submitted in the engineering report.

(2) Construction requirement. Leachate collection pipes must be installed in accordance with the requirements of the approved engineering plans, reports, and specifications. The leachate collection pipe size, spacing and slope of at least one percent must be designed, in accordance with the provisions of section 360-2.7(b)(9) of this Subpart, to ensure that the

leachate head on the primary liner does not exceed one foot at the expected flows from the drainage area except during storm events.

(3) Certification requirements. The project engineer must include in the construction certification report a discussion of all quality assurance and quality control testing to ensure that the material is placed in accordance with requirements of the approved engineering plans, reports, and specifications. The testing procedures and protocols must be acceptable to the department and submitted in accordance with section 360-2.8 of this Subpart. The results of all testing must be included in the construction certification report, including documentation of any failed test results, a description of the procedures used to correct the failed material and any retesting performed.

(n) *Geosynthetic drainage layers.* Any geosynthetic drainage layers used in the leachate collection and removal system of a landfill must be designed and constructed to have an equivalent hydraulic transmissivity to that of a one-foot sand layer with a minimum coefficient of permeability of 1×10^{-2} centimeters per second, and must comply with the following:

(1) Materials required. The hydraulic conductivity, transmissivity, and chemical and physical resistance of the geosynthetic material must not be adversely affected by waste placement or leachate generated by the landfill. Documentation must be submitted which demonstrates the chemical compatibility of the geosynthetic drainage layer material and the waste to be deposited, or chemical compatibility testing must be performed using a method acceptable to the department. Documentation must also be submitted to ensure effective liquid removal throughout the active life of the facility and that the maximum compressive load of the materials to be placed above the geosynthetic drainage layer does not impede transmissivity during the post-closure period.

(2) Construction requirements. The project engineer must ensure that the geosynthetic drainage layers are installed in accordance with the requirements of the approved engineering plans, reports, and specifications and conform with the following requirements:

(i) The geosynthetic drainage layer must be designed and constructed to effectively remove leachate from the landfill's primary and secondary leachate collection and removal systems and must be configured to allow for installation of a leachate collection pipe network as set forth in subdivision (m) of this section. If a geosynthetic drainage layer is specified in the primary leachate collection and removal system, a 24 inch protective soil layer shall be required and must have a minimum coefficient of permeability of 1×10^{-3} centimeters per second and must be free of any organic material and have less than five percent of the material by weight pass the No. 200 sieve at placement. Soil testing must be performed in accordance with paragraph (1)(3) of this section.

(ii) The geosynthetic drainage layer must be installed in accordance with the procedures set forth in subparagraphs (k)(2) (ii)-(vi) and (x) of this section.

(3) Certification requirements. The project engineer must include in the construction certification report a discussion of all quality assurance and quality control testing required in this paragraph. The testing procedures and protocols must be acceptable to the department and submitted in accordance with section 360-2.8 of this Subpart. The results of all testing must be included in the construction certification report including documentation of any failed test results, and a description of the procedures used to correct the failed material and any retesting performed.

(i) The project engineer must certify the quality control testing according to the requirements of subparagraph (k)(3)(i) of this section for any geosynthetic drainage materials. The project engineer must also certify that a hydraulic transmissivity test was performed on the geosynthetic drainage material at the maximum design compressive load on the materials to be used in the geosynthetic drainage layers. This test method must consider the physical properties of all the materials above and below the geosynthetic drainage material being tested.

(ii) Quality assurance testing as performed by the project engineer must adequately demonstrate that the material is placed in accordance with the requirements of the engineering plans, reports, and specifications.

(iii) The project engineer must certify that post-construction care procedures were carried out which, at a minimum, protected the geosynthetic drainage layer from the intrusion of fines related to waterborne and wind-borne sedimentation.

(o) *Filter layer criteria.* The filter layer must be designed to prevent the migration of fine soil particles into a coarser grained material, and to allow water or gases to freely enter a drainage medium (pipe or drainage blanket) without clogging.

(1) For graded cohesionless soil filters. The granular soil material used as a filter must have no more than five percent by weight passing the No. 200 sieve and no soil particles larger than three inches in any dimension.

(2) Geosynthetic filters. Geotextile filter material must demonstrate adequate permeability, soil particle retention, resistance to clogging and construction survivability along with demonstration of adequate chemical and physical resistance such that it is not adversely affected by waste placement, or any overlying material or leachate generated at the landfill. Geotextile filter openings must be sized in accordance with the following criteria, which takes into consideration the soil found in layers located adjacent to the geotextile filter as follows:

(i) $k_f > 10k_s$ (permeability criteria) where:

k_f is the geotextile permeability
k_s is the overlying soil permeability

(ii) O_{95} of the geotextile < (2-3) $\mathbf{d_{85}}$ (retention criteria) where:

O_{95} is the apparent opening size of the geotextile at which 95% of the soil particles will be retained.
d_{85} is the soil particle size at which 85% of the particles are finer.

(iii) clogging potential must be assessed using a long-term permeameter test of the soil/geotextile system with a test method acceptable to the department.

(iv) construction survivability of the geotextile must be assessed, whereby, the severity of the installation is defined by the type of material placed adjacent to the geotextile and the construction installation technique used and specification should be written to ensure that the minimum strength properties as prescribed by applicable industry guidelines are met based on the severity of the installation, using a test method acceptable to the department.

(3) Construction requirements. Both the soil filters and geotextile filters must be installed in accordance with the approved engineering plans, reports, and specifications.

(4) Certification requirements. The project engineer must include in the construction certification report the results of all the required quality assurance and quality control testing performed necessary to demonstrate compliance with the project specifications. For the geotextile filters the project engineer must assess the geotextile's polymer properties density, polymer type and ultraviolet stability, mechanical properties weight, tensile strength, permittivity, apparent opening size, and puncture strength. The testing procedures and protocols must be acceptable to the department and submitted in accordance with section 360-2.8 of this Subpart.

(5) The project engineer must certify that post-construction care procedures were implemented which will protect the soil or geotextile filter from the intrusion of fines related to waterborne and windborne sediments.

(p) *Gas venting layer.* A gas venting layer must be located directly below the barrier layer of the final cover system and above the compacted waste layer. Such layer must be designed and constructed in accordance with the requirements of this subdivision for a soil venting layer or as a geosynthetic venting layer designed and constructed to effectively perform the equivalent functions of the soil venting layer and found acceptable to the department.

(1) Materials required. Gas venting layers must consist of venting pipes with risers installed within the gas venting layer. The material used to construct the gas venting riser pipes

must be a minimum of six-inch diameter. The gas venting layer must have a minimum coefficient of permeability of 1 × 10^{-3} centimeters per second and a maximum of 10 percent by weight passing the No. 200 sieve after placement. The gas venting soil layer must be bounded on its upper and lower surfaces with a filter layer designed in accordance with subdivision (o) of this section (except where its upper surface is directly overlain by a geomembrane, then an upper filter is not required), to ensure that the effective integrity of the gas venting layer is maintained.

(2) Construction requirements. The gas venting soil layer and venting pipes must be constructed and graded in accordance with the requirements of the approved engineering plans, reports, and specifications which must be prepared as follows:

(i) the minimum thickness of the soil layer must be 12 inches;

(ii) gas venting risers must be spaced at a maximum separation of one vent per acre of final cover and be installed at a depth of at least five feet into the refuse, unless otherwise approved by the department. The riser pipe must be perforated only where it extends into the gas venting layer. Risers must be backfilled with rounded stone or other porous media or other material acceptable to the department;

(iii) gas venting risers must be exposed at least three feet above final elevation of the cover system and be fitted with a gooseneck cap or other equivalent cap to allow effective venting; and

(iv) the gas venting system must be designed and constructed to operate without clogging.

(3) Certification requirements. The project engineer must include, in a construction certification report, a discussion of all the quality assurance and quality control testing required in this paragraph. The testing procedures and protocols must be acceptable to the department and be submitted in accordance with section 360-2.8 of this Subpart. The results of all testing must be included in the construction certification report, including documentation of any failed test results and description of the procedures used to correct the failed material, as well as the results of any retesting performed.

(i) Quality control testing of the particle sizes of the soil material selected for the gas venting soil layer must be performed before installation at a frequency of one test for every 1,000 cubic yards of gas venting material being installed. Laboratory hydraulic conductivity testing shall be performed at a frequency of one test for every 5,000 cubic yards of gas venting material being installed.

(ii) Quality assurance testing, as performed by the project engineer must ensure that the material is placed in accordance with the approved engineering drawings, reports and specifications.

(q) *Low permeability barrier soil covers.* The provisions of this subdivision apply to landfills which meet the requirements of section 360-2.15(d)(2)(i) of this Subpart. A low permeability barrier soil cover is a layer of low permeability soil constructed to minimize precipitation migration into an inactive area of the landfill. In accordance with the provisions of section 360-2.7 of this Subpart the project engineer must consider settlement, erosion, and seepage forces in the overall stability of the final cover system design.

(1) Materials required. A low permeability barrier soil cover must consist of materials which have a maximum remolded coefficient of permeability of 1 × 10^{-7} centimeters per second throughout its thickness as set forth in paragraph (2) of this subdivision. The soil material must be able to pass a one-inch screen.

(2) Construction requirements. Low permeability barrier soil covers must be constructed in accordance with the requirements of paragraph (j)(2) of this section with the following exceptions:

(i) The low permeability barrier soil cover must have a minimum compacted thickness of 18 inches.

(ii) The low permeability barrier soil cover must be placed on a slope of no less than four percent to promote positive drainage and at a maximum slope of 33 percent to minimize erosion.

(iii) A barrier protection layer of soil not less than 24 inches thick must be installed on top of the low permeability barrier soil cover. The material thickness, specifications, installation methods, and compaction specifications must be adequate to protect the low permeability soil barrier cover from anticipated desiccation cracking, frost action and root penetration, as well as to resist erosion and anticipated seepage forces to allow for a stable condition on the final slopes of the landfill cover.

(3) Certification requirements. Certification for the installation of barrier soil covers must be conducted in accordance with the requirements in paragraph (j)(3) of this section.

(r) *Geomembrane covers.* A geomembrane may be substituted for the low permeability barrier soil cover in final cover systems for those landfills which meet the requirements of section 360-2.15(d)(2)(i) of this Subpart. The geomembrane cover must be constructed to preclude precipitation migration into the landfill. The project engineer must consider settlement, erosion and seepage forces in the overall stability of the final cover system designed in accordance with section 360-2.7 of the Subpart.

(1) Materials required. The geomembrane material used in a final cover system must be chemically and physically resistant to materials it may come in contact with, and accommodate the expected forces and stresses caused by settlement of waste.

(2) Construction requirements. Geomembrane covers must be constructed in accordance with the same requirements as those found in paragraph (k)(2) of this section with the following exceptions:

(i) the geomembrane must have a minimum thickness of 40 mils; or 60 mils in the case of geomembranes comprised of a high density polyethylene polymer;

(ii) the geomembrane must be placed on a four percent minimum slope to promote gravity drainage and a 33 percent maximum slope to ensure stability of the capping system; and

(iii) a barrier protection layer of soil not less than 24 inches thick must be installed on top of the geomembrane cover. Material specifications, installation methods and compaction specifications must be adequate to protect the geomembrane barrier layer from frost action and root penetration, and to resist erosion and be stable on the final design slopes of the landfill cover. The lower six inches of this layer must be reasonably free of stones.

(3) Certification requirements. Certification for the installation of a geomembrane cover must be conducted in accordance with the same conditions found in paragraph (k)(3) of this section.

(s) *Composite covers.* The provisions of this subdivision apply to all landfills which meet the requirements of section 360-2.15(d)(2)(ii) of this Subpart. The composite cover component of the final cover system must be constructed to preclude precipitation migration into the landfill. The project engineer must consider settlement, erosion, and seepage forces in the overall stability of the final cover system designed in accordance with section 360-2.7 of this Subpart. The composite cover component of the landfill's final cover system must include a 40 mil geomembrane (or 60 mils in the case of geomembranes comprised of a high density polyethylene polymer) that directly overlays an 18 inch thick low permeability soil layer. The composite cover need only be installed on areas which have final cover slopes of less than 25 percent (except for side slope terraces with slopes of 4 percent or greater). On slopes equal to or greater than 25 percent, either a single low permeability barrier soil cover comprised of 24 inches of soil with a maximum remolded coefficient of permeability of 1×10^{-6} cm/sec or a single geomembrane cover is an acceptable substitution for the composite cover layer of the final cover system.

(1) Low permeability soil material requirements. A low permeability soil cover must consist of materials having a maximum remolded coefficient of permeability of 1×10^{-6} cm/sec throughout its thickness.

(i) Construction requirements. Low permeability soil covers must be constructed in accordance with the requirements of paragraph (j)(2) of this section with the following exceptions:

(*a*) The low permeability soil cover must have a minimum compacted thickness of either 18 inches on all landfilled areas where the cover slope is 25 percent or less, or 24 inches on all landfill areas where the cover slope is equal to or greater than 25 percent.

(*b*) The low permeability soil cover must be placed on a slope of no less than four percent to promote positive drainage and at a maximum slope of 33 percent to minimize erosion.

(ii) Certification requirements. Certification for the installation of low permeability barrier soil covers must be conducted in accordance with the requirements in paragraph (j)(3) of this section.

(2) Geomembrane cover material requirements. The geomembrane material used in a final cover system must be chemically and physically resistant to materials it may come in contact with, and accommodate the expected forces and stresses caused by settlement of waste.

(i) Construction requirements. Geomembrane covers must be constructed in accordance with the same requirements as those found in paragraph (k)(2) of this section with the following exceptions:

(*a*) the geomembrane must have a minimum thickness of 40 mils; or 60 mils in the case of geomembranes comprised of a high density polyethylene polymer;

(*b*) the geomembrane must be placed on a 4 percent minimum slope to promote gravity drainage and a 33 percent maximum slope to ensure stability of the capping system; and

(ii) Certification requirements. Certification for the installation of a geomembrane cover must be conducted in accordance with the same conditions found in paragraph (k)(3) of this section.

(3) a barrier protection layer of soil not less than 24 inches thick must be installed on top of the low permeability soil cover, geomembrane cover and composite cover. Material specifications, installation methods and compaction specifications must be adequate to protect the geomembrane barrier layer from frost action and root penetration, and to resist erosion and be stable on the final design slopes of the landfill cover. The lower six inches of this layer must be reasonably free of stones when placed above a geomembrane.

(t) *Topsoil.* A topsoil layer, or alternative soil material, must be designed and constructed to maintain vegetative growth over the landfill.

(1) Materials required. The topsoil or alternative soil material layer must be suitable to maintain vegetative growth.

(2) Construction requirements. The soil must be at least six inches thick. A thicker layer of soil may be required, as determined by the department, if either of the following conditions exist:

(i) sufficient moisture retention cannot be maintained to sustain vegetative growth; or

(ii) the proposed post-closure uses of the site warrant a thicker soil layer.

(u) *Construction certification report.* A construction certification report must be submitted to the department within 45 days after the completion of landfill construction. This report must include, at a minimum, the information prepared in accordance with the application requirements of section 360-2.8 of this Subpart containing results of all construction quality assurance and construction quality control testing required in this section, including documentation of any failed test results, descriptions of procedures used to correct the improperly installed material, and results of all retesting performed. In addition, the construction certification report must contain as-built drawings noting any deviation from the approved engineering plans, and must also contain a comprehensive narrative including, but not limited to, daily reports from the project engineer and a series of color photographs of major project features. Construction activities must be staged to allow for effective collection and tabulation of a minimum of 30 consecutive days of

APPENDIX B

METHANE SOIL GAS SURVEY RESULTS

Table 2
Methane Screening Results

Location	Date Collected	Concentration (ppm)
SG062	10/31/91	ND
SG068	10/31/91	250
SG074	10/31/91	>1000
SG75SE	10/29/91	>1000
SG081	10/31/91	>1000
SG081SE	10/29/91	ND
SG082	10/29/91	ND
SG094	10/31/91	>1000
SG097	10/31/91	>1000
SG099	10/29/91	ND
SG104	10/29/91	ND
SG105	10/29/91	ND
SG110	10/29/91	ND
SG116	10/31/91	ND
SG117	10/31/91	>1000
SG118	10/31/91	>1000
SG120	10/31/91	ND
SG121	10/31/91	200-300
SG122	10/31/91	ND
SG123	10/31/91	90
SG124	10/31/91	>1000
SG125	10/31/91	>1000
SG128	10/31/91	>1000
SG129	10/31/91	70
SG130	10/31/91	>1000
SG131	10/31/91	650
SG133	10/31/91	ND
SG134	10/31/91	>1000
SG135	10/31/91	>1000
SG136	10/31/91	ND
SG137	10/31/91	>1000
SG140	10/31/91	ND
SG141	10/31/91	>1000
SG142	10/31/91	400
SG158	10/30/91	ND
SG159	10/30/91	ND
SG163	10/30/91	ND
SG164	10/30/91	ND
SG165	10/30/91	ND
SG166	10/30/91	ND
SG168	10/30/91	ND
SG169	10/30/91	ND
SG170	10/30/91	ND
SG171	10/30/91	ND

Notes:

Screening performed using a Foxboro Analytical Century Systems OVA-128 calibrated to methane.

Readings represent total volatile organic compounds, and are interpreted to represent methane since no volatiles above low part per billion levels were detected by HNu photoioniser or Photovac gas chromatograph screening.

ND = Not Detected

Refer to Exhibit 1 for site probe locations.

APPENDIX C

VOC SOIL GAS SURVEY RESULTS

Soil Probe Location	Date Collected	Trans-1,2-DCE (ppb)	TCE (ppb)	Toluene (ppb)	PCE (ppb)	Number of Unknowns	Comments
SG001	Not Sampled						Shallow groundwater
SG002	Not Sampled						Shallow groundwater
SG003	Not Sampled						Shallow groundwater
SG004	Not Sampled						Shallow groundwater
SG005	11/5/91	ND	ND	ND	ND	ND	No significant unknowns.
SG006	Not Sampled						Shallow groundwater
SG007	Not Sampled						Shallow groundwater
SG008	11/5/91	ND	ND	ND	ND	2	No significant unknowns.
SG009	11/5/91	ND	ND	Trace (#4)	Trace (#5)	2	No significant unknowns.
SG010	11/5/91	26	Trace (#5)	Trace (#6)	Trace (#7)	3	No significant unknowns.
SG011	Not Sampled						Shallow groundwater
SG012	11/5/91	ND	ND	Trace (#4)	ND	1	No significant unknowns.
SG013	11/5/91	ND	ND	Trace (#4)	ND	ND	Shallow groundwater
SG014	11/5/91	ND	ND	Trace (#4)	Trace (#6)	4	No significant unknowns.
SG015	Not Sampled						Shallow groundwater
SG016	Not Sampled						Shallow groundwater
SG017	11/5/91	ND	ND	Trace (#4)	Trace (#5)	3	No significant unknowns.
SG018	11/5/91	ND	ND	Trace (#4)	ND	1	No significant unknowns.
SG019	11/5/91	Trace (#3)	ND	Trace (#6)	Trace (#7)	5	No significant unknowns.
SG020	Not Sampled						Shallow groundwater
SG021	11/5/91	ND	ND	Trace (#5)	ND	5	No significant unknowns.
SG021(Dup)	11/5/91	ND	ND	ND	ND	1	No significant unknowns.
SG022	11/5/91	ND	ND	ND	ND	6	Large early peak at 14 sec; other unknowns (#3,#5,#7,#8,#10 and #11) between 30 sec and 460 sec.
SG022SE	11/5/91	ND	ND	ND	Trace (#4)	2	No significant unknowns.
SG023	11/5/91	ND	ND	ND	ND	3	Unknowns (#4 and #5) at 264 aned 409 sec, respectively.
SG024	Not Sampled						Shallow groundwater
SG025	Not Sampled						Shallow groundwater
SG026	Not Sampled						Shallow groundwater
SG027	11/5/91	ND	ND	ND	ND	1	No significant unknowns.
SG028	11/5/91	154	29	97	32	10	No significant unknowns.
SG028SW	11/6/91	Trace (#4)	ND	45	ND	3	No significant unknowns.
SG029	11/5/91	ND	ND	ND	ND	ND	No significant unknowns.
SG030	11/5/91	ND	ND	ND	Trace (#4)	3	No significant unknowns.
SG031	Not Sampled						Shallow groundwater
SG032	11/5/91	ND	ND	302	ND	3	No significant unknowns.
SG032(Dup)	11/8/91	ND	ND	51	ND	2	Large early peak at 15 sec; unknown (#4) at 377 sec(possibly chlorobenzene Duplicate collected in air bag
SG033	11/5/91	ND	ND	ND	ND	1	No significant unknowns.
SG034	Not Sampled						Shallow groundwater
SG035	11/6/91	ND	ND	ND	ND	2	No significant unknowns.
SG036	11/6/91	Trace (#2)	9	ND	ND	3	Large early peak at 16 sec.
SG037	11/6/91	Trace (#2)	ND	200	ND	2	Large early peak at 19 sec.
SG038	11/5/91	Trace (#3)	ND	227	ND	3	No significant unknowns.
SG038(Dup)	11/6/91	22	ND	124	ND	3	No significant unknowns.
SG038SW	11/6/91	ND	17	31	ND	4	No significant unknowns.
SG039	11/5/91	ND	ND	ND	Trace (#5)	4	No significant unknowns.
SG040	11/5/91	ND	ND	ND	ND	3	No significant unknowns.
SG041	11/5/91	ND	ND	Trace (#5)	ND	4	No significant unknowns.
SG042	11/6/91	ND	ND	114	ND	2	No significant unknowns.
SG043	11/6/91	ND	ND	ND	ND	2	No significant unknowns.
SG044	11/6/91	ND	ND	Trace (#5)	ND	3	No significant unknowns.
SG045	11/6/91	ND	ND	Trace (#5)	ND	1	No significant unknowns.
SG046	11/6/91	ND	ND	ND	ND	1	No significant unknowns.
SG047	11/6/91	Trace (#2)	Trace (#6)	29	ND	2	Large early peak at 17 sec.
SG048	11/6/91	ND	ND	ND	ND	3	No significant unknowns.
SG049	11/6/91	ND	ND	ND	ND	3	Small unknown (#4) at 344 sec., possibly chlorobenzene.
SG050	11/6/91	Trace (#4)	ND	ND	ND	2	No significant unknowns.
SG051	11/6/91	Trace (#2)	ND	Trace (#6)	ND	3	No significant unknowns.
SG052	11/6/91	Trace (#3 or #4)	ND	ND	ND	4	No significant unknowns.
SG053	11/6/91	ND	ND	ND	ND	2	No significant unknowns.
SG054	11/6/91	ND	ND	ND	ND	1	No significant unknowns.
SG055	11/6/91	ND	ND	ND	ND	3	No significant unknowns.
SG056	11/6/91	ND	ND	Trace (#5)	ND	2	No significant unknowns.
SG057	11/6/91	ND	ND	ND	Trace (#4)	2	No significant unknowns.
SG058	11/6/91	Trace (#2 or #3)	15	20	ND	6	Unknown (#7) at 114 sec.
SG059	11/6/91	22	8	27	Trace (#10)	6	Large early peak at 17 sec; large unknowns (#3 and #11) at 62 sec and 345 sec, respectively.
SG060	11/6/91	Trace (#3)	ND	Trace (#5)	ND	3	Small unknown (#6) at 344 sec, possibly chlorobenzene.
SG061	11/6/91	ND	ND	ND	ND	1	No significant unknowns.
SG062	11/6/91	ND	ND	ND	ND	ND	No significant unknowns.
SG063	11/6/91	Traca (#3 or #4)	ND	202	11	5	Large unknown at 343 sec, possibly chlorobenzene.
SG064	11/6/91	Trace (#3)	ND	12	ND	4	Large early peak at 16 sec; large unknown (#9) at 343 sec, possibly chlorobenzene.
SG065	11/6/91	Trace (#2)	ND	15	Trace (#9)	6	Large early peak at 17 sec; unknowns (#6 and #10) at 113 sec and 343 sec (possibly chlorobenzene), respectively.
SG066	11/6/91	Trace (#3 or #4)	ND	ND	ND	3	Large early peaks at 13 sec and 20 sec; unknown (#6) at 343 sec, possibly chlorobenzene.
SG067	11/8/91	ND	9	31	Trace (#9)	5	Large early peaks at 17 sec and 24 sec; large unknown (#10) at 391 sec.
SG067S	11/8/91	ND	ND	ND	ND	4	Large early peaks at 14 sec and 21 sec; unknown (#3) at 378 sec, possibly chlorobenzene.
SG068	11/6/91	18	17	23	10	6	Large unknown (#11) at 342 sec, possibly chlorobenzene.
SG068SW	11/6/91	ND	ND	ND	ND	3	No significant unknowns.
SG068NE	11/6/91	ND	ND	ND	ND	ND	No significant unknowns.

Footnotes:

ND	-	Compound was not detected.
Dup	-	Duplicate Sample
Trace(#5)	-	Trace levels identified based on GC operator review of chromatograph. (#5) is the peak number of the compound on the specific chromatograph.

Refer to Exhibit 1 for soil probe locations.

Soil gas survey conducted using a Photovac 10S70 Gas Chromatograph (GC) equipped with a photoionization detector, a fused capillary column, and a isothermal oven. The GC will be calibrated at the site daily with standards for tetrachloroethylene, trichloroethylene, trans-1,2-dichloroethylene, and toluene.

Soil Probe Location	Date Collected	Trans-1,2-DCE (ppb)	TCE (ppb)	Toluene (ppb)	PCE (ppb)	Number of Unknowns	Comments
SG069	11/6/91	ND	ND	ND	ND	1	No significant unknowns.
SG069SW	11/6/91	Trace (#3 or #4)	ND	ND	ND	2	No significant unknowns.
SG070	11/6/91	ND	ND	ND	ND	1	No significant unknowns.
SG071	11/6/91	ND	Trace (#4)	23	10	5	Large early peak at 16 sec; large unknown (#10) at 344 sec, possibly chlorobenzene.
SG071(Dup)	11/7/91	83	12	122	12	7	Large early peak at 17 sec; large unknown (#12) at 332 sec, possibly chlorobenzene.
SG072	11/6/91	Trace (#2 or #3)	31	164	14	10	Large early peak at 17 sec; large unknowns (#9, #12 and #15) at 113 sec, 213 sec and 343 sec (possibly chlorobenzene), respectively.
SG072(Dup)	11/8/91	40	100	930	12	13	Large early peak at 17 sec; large unknowns (#9, #11 and #17) at 83 sec, 125 sec and 376 sec (possibly chlorobenzene), respectively.
SG073	11/6/91	ND	ND	Trace (#5)	ND	4	Large early peak at 16 sec; small unknown (#7) at 342 sec, possibly chlorobenzene.
SG074	11/6/91	ND	ND	ND	ND	3	Large early peaks at 13 sec and 20 sec.
SG075	11/8/91	ND	ND	35	ND	3	Large early peak at 18 sec.
SG075SE	11/8/91	Trace (#3)	21	10,800	ND	2	Large early peak at 20 sec; large unknown (#7) at 386 sec, possibly chlorobenzene.
SG075SE(Dup)	11/8/91	ND	ND	38	ND	2	Unknown (#5) at 378 sec, possibly chlorobenzene. Duplicate collected in an air bag.
SG076	11/7/91	ND	ND	ND	ND	ND	No significant unknowns.
SG077	11/7/91	ND	ND	ND	ND	ND	No significant unknowns.
SG078	11/7/91	Trace (#4)	ND	ND	ND	3	No significant unknowns.
SG079	11/8/91	ND	ND	13	ND	3	Large early peaks at 15 sec and 24 sec.
SG080	11/8/91	20	7	14	9	5	Large early peak at 20 sec; unknowns (#8 and #10) at 145 sec and 275 sec, respectively.
SG081	11/8/91	Trace (#3 or #4)	12	101	Trace (#12	5	Large early peak at 19 sec; unknowns (#9,#11 and #13) at 137 sec, 248 sec and 396 sec, respectively.
SG081SE	11/8/91	ND	ND	ND	ND	4	Large early peaks at 16 sec and 23 sec; large unknown (#6) at 382 sec, possibly chlorobenzene.
SG082	11/6/91	ND	ND	ND	ND	1	No significant unknowns.
SG083	11/6/91	ND	ND	ND	ND	4	Trace unknown (#5) at 344 sec, possibly chlorobenzene.
SG084	11/6/91	ND	ND	ND	ND	2	No significant unknowns.
SG085	11/6/91	ND	ND	ND	ND	5	No significant unknowns.
SG086	11/7/91	ND	ND	ND	ND	3	Unknown (#3) at 328 sec.
SG087	11/8/91	ND	ND	ND	ND	4	No significant unknowns.
SG088	11/8/91	12	Trace (#8)	Trace (#12	11	8	Large early peak at 20 sec; large unknown (#15) at 449 sec; unknowns (#10,#11,#13) at 147 sec, 158 sec and 277 sec, respectively.
SG089	11/8/91	ND	Trace (#6)	38	ND	3	Large early peak at 20 sec.
SG090	11/6/91	ND	ND	ND	ND	1	No significant unknowns.
SG091	11/6/91	Trace (#3 or #4)	ND	20	13	3	No significant unknowns.
SG092	11/6/91	ND	ND	ND	ND	3	No significant unknowns.
SG093	11/7/91	ND	ND	ND	ND	3	No significant unknowns.
SG094	11/7/91	ND	ND	ND	ND	3	No significant unknowns.
SG094NE	11/7/91	Trace (#3)	ND	ND	ND	2	Large early peaks at 15 sec and 22 sec.
SG095	11/7/91	ND	ND	ND	ND	3	Large early peak at 18 sec; large unknown (#5) at 333 sec, possibly chlorobenzene.
SG096	11/8/91	Trace (#3)	ND	ND	ND	3	Large early peaks at 15 sec and 21 sec.
SG097	11/8/91	55	11	53	14	10	Large early peak at 20 sec; large unknown at 470 sec; unknowns (#7,#10 and #14) at 78 sec, 148 sec and 279 sec, respectively.
SG097(Dup)	11/8/91	ND	ND	ND	ND	3	Unknown (#6) at 377 sec. Duplicate collected in air bag.
SG098	11/8/91	Trace (#3)	8	225	ND	4	Large early peak at 21 sec.
SG098SE	11/8/91	ND	Trace (#4)	ND	ND	3	Large early peaks at 15 sec and 21 sec.
SG099	11/6/91	ND	ND	ND	ND	2	No significant unknowns.
SG100	11/6/91	ND	ND	ND	ND	1	No significant unknowns.
SG101	11/6/91	ND	ND	ND	ND	4	No significant unknowns.
SG102	11/6/91	Trace (#3)	Trace (#5)	ND	ND	4	No significant unknowns.
SG103	11/7/91	ND	ND	ND	ND	ND	No significant unknowns.
SG104	11/8/91	ND	ND	ND	ND	3	No significant unknowns.
SG105	11/8/91	42	14	169	47	7	Large early peak at 21 sec; large unknowns (#10 and #13) at 149 sec and 282 sec, respectively.
SG106	11/8/91	34	ND	ND	13	6	Large early peak at 21 sec; unknowns (#9 and #10) at 147 sec and 266 sec, respectively.
SG106SE	11/8/91	ND	ND	ND	ND	3	Large early peaks at 14 sec and 22 sec.
SG107	11/7/91	ND	ND	ND	ND	ND	No significant unknowns.
SG108	11/7/91	ND	ND	230	ND	3	Large early peaks at 15 sec and 22 sec; large unknown (#5) at 329 sec, possibly chlorobenzene.
SG108SW	11/7/91	ND	ND	13	45	6	Large early peaks at 17 sec and 27 sec; large unknown (#8) at 321 sec, possibly chlorobenzene.
SG108SW(Dup)	11/8/91	ND	ND	Trace (#6)	Trace (#8)	6	Large early peaks at 16 sec, 24 sec and 27 sec; large unknown (#10) at 375 sec, possibly chlorobenzene.
SG108NE	11/7/91	ND	ND	ND	ND	3	No significant unknowns.
SG108SE	11/7/91	12	ND	14	ND	3	Large unknown (#6) at 319 sec, possibly chlorobenzene.
SG108NW	11/7/91	ND	ND	ND	ND	3	Large early peaks at 15 sec and 21 sec.
SG108SWW	11/7/91	ND	ND	ND	ND	3	Large early peaks at 16 sec and 22 sec.
SG108SWE	11/7/91	ND	ND	ND	ND	2	No significant unknowns.
SG109	11/7/91	ND	ND	ND	ND	3	No significant unknowns.
SG110	11/7/91	ND	ND	Trace (#4)	ND	3	Large early peaks at 16 sec and 24 sec.
SG111	11/7/91	ND	ND	86	ND	6	Large early peak at 20 sec; large unknowns (#6 and #11) at 119 sec and 332 sec (possibly chlorobenzene), respectively.
SG112	11/8/91	ND	ND	ND	ND	ND	No significant unknowns.
SG113	11/6/91	Trace (#3 or #4)	ND	ND	ND	4	No significant unknowns.
SG114	11/6/91	ND	ND	ND	ND	3	No significant unknowns.
SG115	Not Sampled						Shallow groundwater
SG116	11/7/91	ND	ND	ND	ND	1	No significant unknowns.
SG117	11/7/91	ND	ND	ND	ND	3	No significant unknowns.
SG118	11/7/91	Trace (#4 or #5)	ND	2,130	ND	3	Large early peaks at 16 sec and 23 sec.

Footnotes:

ND - Compound was not detected.
Dup - Duplicate Sample
Trace(#5) - Trace levels identified based on GC operator review of chromatograph.
(#5) is the peak number of the compound on the specific chromatograph.

Refer to Exhibit 1 for soil probe locations.

Soil gas survey conducted using a Photovac 10S70 Gas Chromatograph (GC) equipped with a photoionization detector, a fused capillary column, and a isothermal oven. The GC will be calibrated at the site daily with standards for tetrachloroethylene, trichloroethylene, trans-1,2-dichloroethylene, and toluene.

Table 1. Soil Gas Survey Results (continued)

Soil Probe Location	Date Collected	Trans-1,2-DCE (ppb)	TCE (ppb)	Toluene (ppb)	PCE (ppb)	Number of Unknowns	Comments
SG119	11/7/91	Trace (#3)	ND	ND	Trace (#10)	6	Large early peak at 20 sec; unknowns (#7,#8,#9,#11 and #12) at 128 sec, 212 sec, 247 sec, 338 sec (possibly chlorobenzene) and 408 sec, respectively.
SG119(Dup)	11/8/91	Trace (#3)	ND	ND	22	4	Large early peak at 19 sec; unknown (#9)at 268 sec.
SG119SE	11/8/91	ND	ND	ND	ND	ND	No significant unknowns.
SG120	11/7/91	ND	ND	ND	ND	2	No significant unknowns.
SG121	11/7/91	ND	ND	66	ND	3	Large early peaks at 15 sec and 21 sec; large unknown (#6) at 311 sec, possibly chlorobenzene.
SG122	11/7/91	ND	ND	Trace (#5)	ND	3	No significant unknowns.
SG123	11/7/91	ND	ND	ND	ND	3	Large early peaks at 17 sec and 26 sec.
SG124	11/7/91	ND	ND	ND	ND	2	No significant unknowns.
SG125	11/7/91	ND	ND	ND	Trace (#9)	6	Large early peak at 20 sec; unknowns (#6, #7 and #10) at 130 sec, 214 sec and 359 sec (possibly chlorobenzene), respectively.
SG126	Not Sampled						Shallow groundwater
SG127	11/6/91	Trace (#3)	ND	ND	ND	4	No significant unknowns.
SG128	11/7/91	ND	ND	ND	ND	3	No significant unknowns.
SG129	11/7/91	Trace (#3)	ND	33	21	6	Large early peak at 21 sec; large unknown (#10) at 332 sec, possibly chlorobenzene; unknown (#7) at 212 sec.
SG130	11/7/91	ND	ND	Trace (#4)	ND	2	No significant unknowns.
SG131	11/7/91	ND	ND	ND	ND	3	Large early peaks at 15 sec and 24 sec.
SG132	11/7/91	ND	ND	ND	ND	2	No significant unknowns.
SG133	11/7/91	ND	ND	ND	ND	3	No significant unknowns.
SG134	11/7/91	ND	ND	ND	ND	2	No significant unknowns.
SG135	11/7/91	ND	ND	ND	ND	3	Large early peaks at 16 sec and 25 sec; large unknown (#5) at 335 sec, possibly chlorobenzene.
SG136	11/7/91	ND	ND	ND	ND	2	No significant unknowns.
SG137	11/7/91	30	ND	ND	Trace (#10)	8	Large early peak at 20 sec; unknowns (#3,#4,#5 and #6) at 44 sec, 50 sec, 60 sec and 72 sec, respectively.
SG138	Not Sampled						Shallow groundwater
SG139	11/7/91	ND	ND	Trace (#5)	ND	2	Large early peaks at 16 sec and 23 sec.
SG140	11/7/91	ND	ND	Trace (#5)	ND	2	Large early peaks at 16 sec and 22 sec.
SG141	11/7/91	ND	ND	ND	Trace (#7)	6	Large early peaks at 16 sec and 23 sec.
SG142	11/7/91	See Notes --					Chromatograph went off scale at a gain of 50; two duplicates (Dup#1 and Dup#2) were run on 11/8/91 at gains of 20 and 50, respectively.
SG142(Dup#1)	11/8/91	ND	ND	ND	ND	ND	
SG142(Dup#2)	11/8/91	ND	ND	ND	ND	2	No significant unknowns.
SG142SW	11/8/91	ND	ND	ND	ND	1	No significant unknowns.
SG142SE	11/8/91	ND	ND	ND	ND	ND	No significant unknowns.
SG143	11/7/91	ND	ND	ND	ND	2	No significant unknowns.
SG144	11/7/91	ND	ND	ND	ND	2	No significant unknowns.
SG145	11/7/91	ND	ND	ND	ND	4	No significant unknowns.
SG146	11/7/91	ND	ND	ND	ND	3	No significant unknowns.
SG147	11/7/91	ND	ND	ND	ND	2	No significant unknowns.
SG148	11/7/91	ND	ND	ND	ND	2	No significant unknowns.
SG149	Not Sampled						Shallow groundwater
SG150	Not Sampled						Shallow groundwater
SG151	11/7/91	ND	ND	ND	ND	3	No significant unknowns.
SG152	Not Sampled						Shallow groundwater
SG153	Not Sampled						Shallow groundwater
SG154	11/7/91	ND	ND	ND	ND	3	No significant unknowns.
SG155	11/7/91	ND	ND	ND	9	3	Large unknown (#6) at 298 sec, possibly chlorobenzene.
SG155NE	11/8/91	ND	ND	ND	ND	3	No significant unknowns.
SG155W	11/8/91	ND	ND	ND	ND	3	No significant unknowns.
SG156	11/7/91	ND	ND	ND	ND	2	No significant unknowns.
SG157	Not Sampled						Shallow groundwater
SG158	11/7/91	ND	ND	ND	ND	2	No significant unknowns.
SG159	11/7/91	ND	ND	ND	ND	2	No significant unknowns.
SG160	11/7/91	ND	ND	ND	22	3	Large unknown (#6) at 304 sec, possibly chlorobenzene.
SG160E	11/8/91	ND	ND	ND	Trace (#3)	3	Unknown (#4) at 368 sec.
SG160W	11/8/91	ND	ND	ND	Trace (#4)	3	No significant unknowns.
SG161	11/7/91	ND	ND	ND	ND	3	No significant unknowns.
SG162	11/7/91	194	ND	ND	ND	2	No significant unknowns.
SG163	11/7/91	ND	ND	ND	19	3	Unknown (#5) at 317 sec, possibly chlorobenzene.
SG163NW	11/8/91	ND	ND	ND	ND	ND	No significant unknowns.
SG163NE	11/8/91	ND	ND	ND	ND	3	No significant unknowns.
SG164	11/7/91	ND	ND	ND	ND	3	No significant unknowns.
SG165	11/7/91	ND	ND	ND	ND	2	No significant unknowns.
SG166	11/7/91	ND	ND	ND	43	3	Unknown (#5) at 307 sec, possibly chlorobenzene.
SG166E	11/8/91	ND	ND	ND	ND	2	No significant unknowns.
SG166SW	11/8/91	ND	ND	ND	ND	3	No significant unknowns.
SG167	11/7/91	ND	ND	ND	45	3	Large unknown (#5) at 311 sec.
SG168	11/7/91	ND	ND	ND	ND	3	No significant unknowns.
SG169	11/7/91	ND	ND	ND	ND	3	No significant unknowns.
SG170	11/7/91	ND	ND	ND	ND	3	Large early peaks at 16 sec and 24 sec.
SG171	11/7/91	ND	ND	ND	ND	2	No significant unknowns.

Footnotes:

ND - Compound was not detected.
Dup - Duplicate Sample
Trace(#5) - Trace levels identified based on GC operator review of chromatograph.
(#5) is the peak number of the compound on the specific chromatograph.

Refer to Exhibit 1 for soil probe locations.

Soil gas survey conducted using a Photovac 10S70 Gas Chromatograph (GC) equipped with a photoionization detector, a fused capillary column, and a isothermal oven. The GC will be calibrated at the site daily with standards for tetrachloroethylene, trichloroethylene, trans-1,2-dichloroethylene, and toluene.

APPENDIX D

DESIGN CALCULATIONS

BY HMG DATE 11/2/99
CHKD. BY PSL DATE 11·2·99

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SHEET NO. 1 OF 1
JOB NO. 442-221

SUBJECT Calculations to show variation of ∇allowable with varying assumed values of D and R.

$$\underline{\nabla_{ALLOW} = 4000 \text{ PSI}}$$

$$\nabla_{REQ'D} = \frac{2DR^2 \gamma H}{3t(D^2+R^2)}$$

$$= \frac{2DR^2\, 120(2.5)}{3(.00333)[D^2+R^2]} = \frac{600\, DR^2}{.01\,(D^2+R^2)}$$

$$\boxed{\nabla_{REQ'D} = 60{,}000\ \frac{DR^2}{D^2+R^2}}$$

SAMPLE CALC

D = 1.0'
R = 3.0'

$\nabla_{REQ'D}$ = 54,000 LBS/SF = 375 PSI

TRY

D = 2.0
R = 6.0

$\nabla_{REQ'D}$ = 108,000 LBS/SF = 750 PSI

D = 1' FIXED

	$\nabla_{REQ'D}$ PSI
R = 3.0	375
R = 6.0	405
R = 9.0	412
R = 12.0	414

R = 3.0' FIXED

	$\nabla_{REQ'D}$	
D = 1.0	375 PSI	
D = 2.0	577 PSI	
D = 3.0	625 PSI	MAX ←
D = 4.0	600 PSI	
D = 8.0	411 PSI	

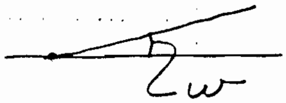
AS R INCREASES
$\nabla_{REQ'D}$ APPROACHES 416.67 PSI
MAX

SUBJECT JONES SANITATION
STABILITY OF COVER SOIL ABOVE GEOMEMBR

REF: DESIGN & CONSTRUCTION OF
RCRA / CERCLA FINAL COVERS
EPA/625/4-91/025, MAY 1991

ASSUMPTIONS

ω • MAX SOIL COVER SLOPE IS 8%



SAY 10% (1V:10H) CONSERVATIVE

$TAN\,\omega = \frac{1}{10} = .10,\ \underline{\underline{\omega = 5.71^\circ}}$

L • MAX SLOPE LENGTH = 240'±

SAY $\underline{\underline{L = 300'}}$ CONSERVATIVE

H • THICKNESS OF COVER SOIL

6" TOPSOIL + 18" BARRIER + 6" DRAINAGE

$H = 30'' = \underline{\underline{2.5^{FT}}}$

γ • DENSITY OF SOIL

ASSUME $\underline{\underline{\gamma = 120\ ^{LBS}/CF}}$

C • COHESION (SOIL TO SOIL)

ASSUME $\underline{\underline{C = 0}}$ CONSERVATIVE

Ca • ADHESION (SOIL TO GEOMEMBRANE)

ASSUME $\underline{\underline{Ca = 0}}$ CONSERVATIVE

ϕ • FRICTION ANGLE SOIL TO SOIL

ASSUME $\phi = 30^\circ$

δ • FRICTION ANGLE SOIL TO GEOMEMBRANE

ASSUME $\delta = 20^\circ$

BY HMG DATE 5/18/99
CHKD. BY ____ DATE ____
SHEET NO. 2 OF ____
JOB NO. 442-221

SUBJECT JONES SANITATION
STABILITY OF COVER SOIL ABOVE GEOMEMBRANE

$$(FS)^2\,[0.5\,\gamma\,LH\sin^2(2\,\omega)] - (FS)\,[\gamma\,LH\cos^2\omega\tan\delta\sin(2\,\omega) + c_a L\cos\omega\sin(2\,\omega)$$

$$+\gamma\,LH\sin^2\omega\tan\phi\sin(2\,\omega) + 2\,c\,H\cos\omega + \gamma H^{\,2}\tan\phi]$$

$$+\,[(\gamma LH\cos\omega\ \tan\delta + c_a L)\,(\tan\phi\sin\omega\sin(2\,\omega)] = 0$$

Using $ax^2 + bx + c = 0$, where

$$a = 0.5\,\gamma\,LH\sin^2 2\omega$$

$$b = -[\,\gamma\,LH\cos^2\omega\tan\delta\sin(2\omega) + c_a L\cos\omega\sin(2\,\omega)$$

$$+\,\gamma\,LH\sin^2\omega\tan\phi\sin(2\omega) + 2cH\cos\omega + \gamma\,H^2\tan\phi]$$

$$c = (\gamma\,LH\cos\omega\tan\delta + c_a L)\,(\tan\phi\ \sin\omega\sin(2\omega))$$

the resulting factor-of-safety is as follows:

$$FS = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

BY HMG DATE 5/18/99

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SHEET NO. 3 OF ____

JOB NO. 442-221

SUBJECT JONES SANITATION

STABILITY OF COVER SOIL ABOVE GEOMEMBRANE

$$a = 0.5 \gamma L H \text{SIN}^2 2\omega$$

$$= 0.5 (120^{LB}/_{CF})(300')(2.5')(\text{SIN } 2 \cdot 5.71)^2$$

$$= (45,000)(0.0392)$$

$$\underline{\underline{a = 1764 \ ^{LB}/_{FT}}}$$

$$b = -[\gamma L H \text{COS}^2\omega \text{ TAN } \delta \text{ SIN }(2\omega) + \overset{0}{\cancel{c}}_a L \text{ COS}\omega \text{ SIN}(2\omega$$

$$+ \gamma L H \text{ SIN}^2\omega \text{ TAN } \phi \text{ SIN }(2\omega) + 2 \overset{0}{\cancel{c}} H \text{ COS}\omega + \gamma H^2 \text{TAN}$$

$$b = -[(120^{LB}/_{CF})(300')(2.5')(\text{COS } 5.71)^2(\text{TAN } 20)(\text{SIN } 2 \cdot 5.71)$$

$$+ (120^{LB}/_{CF})(300')(2.5')(\text{SIN } 5.71)^2(\text{TAN } 30)(\text{SIN } 2 \cdot 5.71)$$

$$+ (120^{LB}/_{CF})(2.5')^2(\text{TAN } 30)]$$

$$b = -[(90,000)(0.9901)(0.3640)(0.1980)$$

$$+ (90,000)(0.009899)(0.5774)(0.1980)$$

$$+ (750)(0.5774)]$$

$$b = -[6422 + 102 + 433]$$

$$\underline{\underline{b = -6957 \ ^{LB}/_{FT}}}$$

BY HMG DATE 5/18/99

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SHEET NO. 4 OF

CHKD. BY DATE

JOB NO. 442-221

SUBJECT JONES SANITATION
STABILITY OF COVER SOIL ABOVE GEOMEMBRA

$$C = \left[\gamma L H \cos w \tan \delta + \cancelto{0}{c_a} L\right]\left[\tan \phi \sin w \sin(2w)\right]$$

$$C = \left[(120\ ^{LB}/_{CF})(300')(2.5')(\cos 5.71)(\tan 20)\right] \times$$

$$\left[(\tan 30)(\sin 5.71)(\sin 2 \cdot 5.71)\right]$$

$$C = \left[(90{,}000)(0.9950)(0.3640)\right]\left[(0.5774)(0.09949)(0.198\right.$$

$$= \left[32{,}595\right]\left[0.01137\right]$$

$$\underline{\underline{C = 371\ ^{LB}/_{FT}}}$$

$$FS = \frac{-b \pm \sqrt{b^2 - 4(a)(c)}}{2a}$$

$$= \frac{-(-6957) \pm \sqrt{(-6957)^2 - 4(1764)(371)}}{2\,(1764)}$$

$$= \frac{6957 \pm \sqrt{45{,}782{,}073}}{3528}$$

$$= \frac{6957 \pm 6766}{3528}$$

$$\boxed{F.S. = 3.89}$$

THIS GREATLY EXCEEDS
THE REQ'D FS = 1.5 IN
PART 360-2.7(b)(6)iii

SUBJECT JONES SANITATION
GEOMEMBRANE TENSION STRESSES
DUE TO SUBSIDENCE

$$\sigma_{reqd} = \frac{2\,DL^2\,\gamma_{cs}\,H_{cs}}{3\,t\,(D^2+L^2)}$$

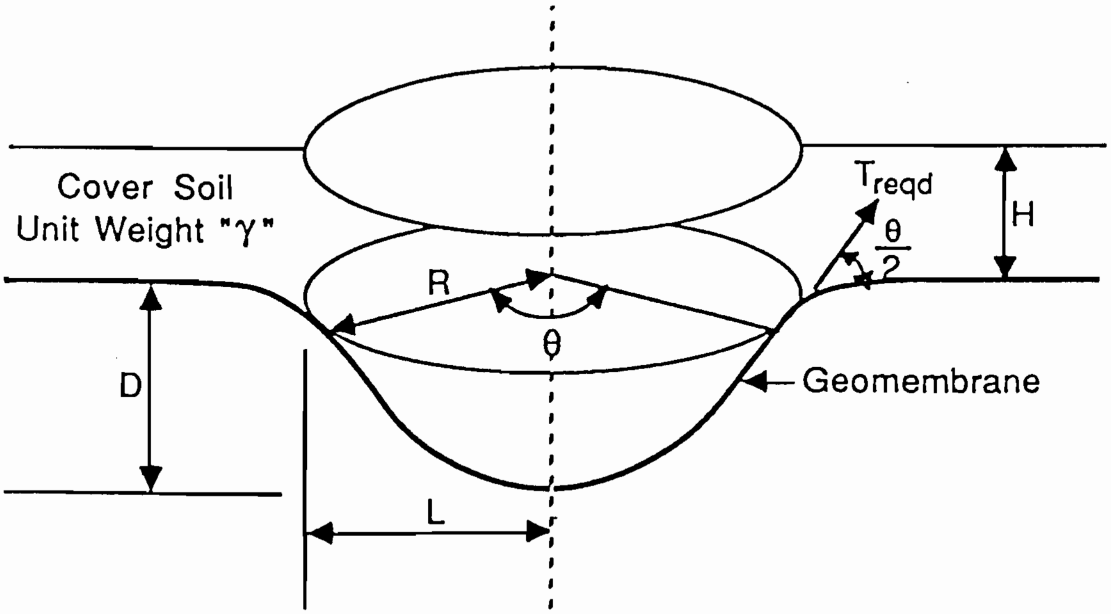

Figure 7 - Tensile Stresses in a Geomembrane Mobilized by Cover Soil and Caused by Subsidence

ASSUMPTIONS

D • DEPTH OF SUBSIDENCE
SAY $D = 1.0'$

R • RADIUS OF SUBSIDENCE
SAY $R = 3.0'$

} SUBSTITUTE R FOR L IN ABOVE EQ.

t • THICKNESS OF GEOMEMBRANE
$t = 0.040^{IN} = 40$ MILS
$t = 0.003333^{FT}$

BY HMG DATE 5/18/99

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SHEET NO. 6 OF

CHKD. BY____ DATE ____

JOB NO. 442-221

SUBJECT JONES SANITATION
GEOMEMBRANE

$\nabla_{REQ'D}$ = STRESS IN GEOMEMBRANE REQ'D TO SPAN SUBIDENCE (LB/SQIN)

∇_{ALLOW} = ALLOWABLE STRESS IN GEOMEMBRAN (LB/SQIN)
SEE CUT SHEET
160 LBS/IN OF WIDTH FOR 40 MIL THICK

$$\nabla_{ALLOW} = \frac{160\text{ LBS}}{1{,}0^{IN} \times {,}040^{IN}} = 4000\text{ PSI}$$

FS = $\nabla_{ALLOW} / \nabla_{REQ'D}$ = FACTOR OF SAFETY

$$\nabla_{REQ'D} = \frac{2DR^2\gamma H}{3t(D^2+R^2)}$$

$$= \frac{2(1{,}0)(3{,}0)^2(120)(2{,}5)}{3(0{,}00333)[(1{,}0)^2+(3{,}0)^2]}$$

$$= \frac{(5400)}{(0.10)}$$

$$\nabla_{REQ'D} = 54{,}000\text{ LB/SF}$$

$$= \frac{54000\text{ LB/SF}}{144\text{ SQIN/SF}} = 375\text{ PSI}$$

$$FS = \frac{\nabla_{ALLOW}}{\nabla_{REQ'D}} = \frac{4000}{375}$$

$$\underline{FS = 10.67} \quad \underline{OK}$$

446-661
5/18/99
HMG

GSE

GSE UltraFlex*

Premium Grade
VFPE Geomembrane

GSE UltraFlex is a premium grade, very flexible polyethylene (VFPE) geomembrane produced from a specially formulated, virgin polyethylene with outstanding flexibility. This polyethylene resin is designed specifically for flexible geomembrane applications. Its high uniaxial and multiaxial elongation characteristics make it very suitable for applications where differential or localized subgrade settlements are expected such as leach pads, landfill closure caps, or any application where elongation or puncture resistance is critical. UltraFlex contains approximately 97.5% polyethylene, 2.5% carbon black and trace amounts of antioxidants and heat stabilizers; no fillers or extenders are used. GSE UltraFlex is the only VFPE on the market with many years of proven performance in applications throughout the world.

TESTED PROPERTY	TEST METHOD	40 mil MINIMUM VALUES				
Thickness, mils (mm)	ASTM D 751/1593/5199	27 (0.68)	36 (0.90)	54 (1.35)	72 (1.80)	90 (2.25)
Density, g/cm^3	ASTM D 792/1505	0.92	0.92	0.92	0.92	0.92
Tensile Properties (each direction)	ASTM D 638, Type IV		= 4000 psi			
Strength at Break, lb/in-width (N/mm)	Dumbell, 2 ipm	122 (21)	160 (27)	243 (43)	324 (57)	405 (71)
Elongation at Break, %	G.L. = 2.5 in (64 mm)	780	800	800	800	800
Tear Resistance, lb (N)	ASTM D 1004	18 (80)	24 (107)	36 (160)	48 (214)	60 (267)
Puncture Resistance, lb (N)	FTMS 101, Method 2065	40 (178)	55 (245)	80 (356)	110 (490)	135 (601)
Carbon Black Content, %	ASTM D 1603	2.0	2.0	2.0	2.0	2.0
Environmental Stress Crack Resistance, hr	ASTM D 1693, Cond. B	1500	1500	1500	1500	1500

REFERENCE PROPERTY	TEST METHOD	NOMINAL VALUES				
Thickness, mils (mm)	ASTM D 751/1593/5199	30 (0.75)	40 (1.0)	60 (1.5)	80 (2.0)	100 (2.5)
Roll Length** (approximate), ft (m)		952 (290)	650 (198)	475 (145)	355 (110)	285 (87)
Low Temperature Brittleness, °F (°C)	ASTM D 746, Cond. B	<-107 (<-77)	<-107 (<-77)	<-107 (<-77)	<-107 (<-77)	<-107 (<-77)
Oxidative Induction Time, minutes	ASTM D 3895, 200 °C Pure O_2, 1 atm	100	100	100	100	100
Carbon Black Dispersion	ASTM D 3015	A1,A2,B1	A1,A2,B1	A1,A2,B1	A1,A2,B1	A1,A2,B1
Dimensional Stability (each direction), %	ASTM D 1204, 100 °C, 1 hr	±2	±2	±2	±2	±2
Melt Flow Index, g/10 minutes	ASTM D 1238, Cond.190/2.16	≤1.0	≤1.0	≤1.0	≤1.0	≤1.0

GSE UltraFlex is available in rolls approximately 22.5 (6.9 m) and 24 ft (7.3 m) wide and weighing about 2,800 lb (1,270 kg) and 3,300 lb (1,500 kg) respectively. Other material thicknesses are available upon request.

** Roll lengths for 30 and 40 mil products correspond to the 22.5 ft (6.9 m) wide roll goods.

This information is provided for reference purposes only and is not intended as a warranty or guarantee. GSE assumes no liability in connection with the use of this information. Check with GSE for current, standard minimum quality assurance procedures.

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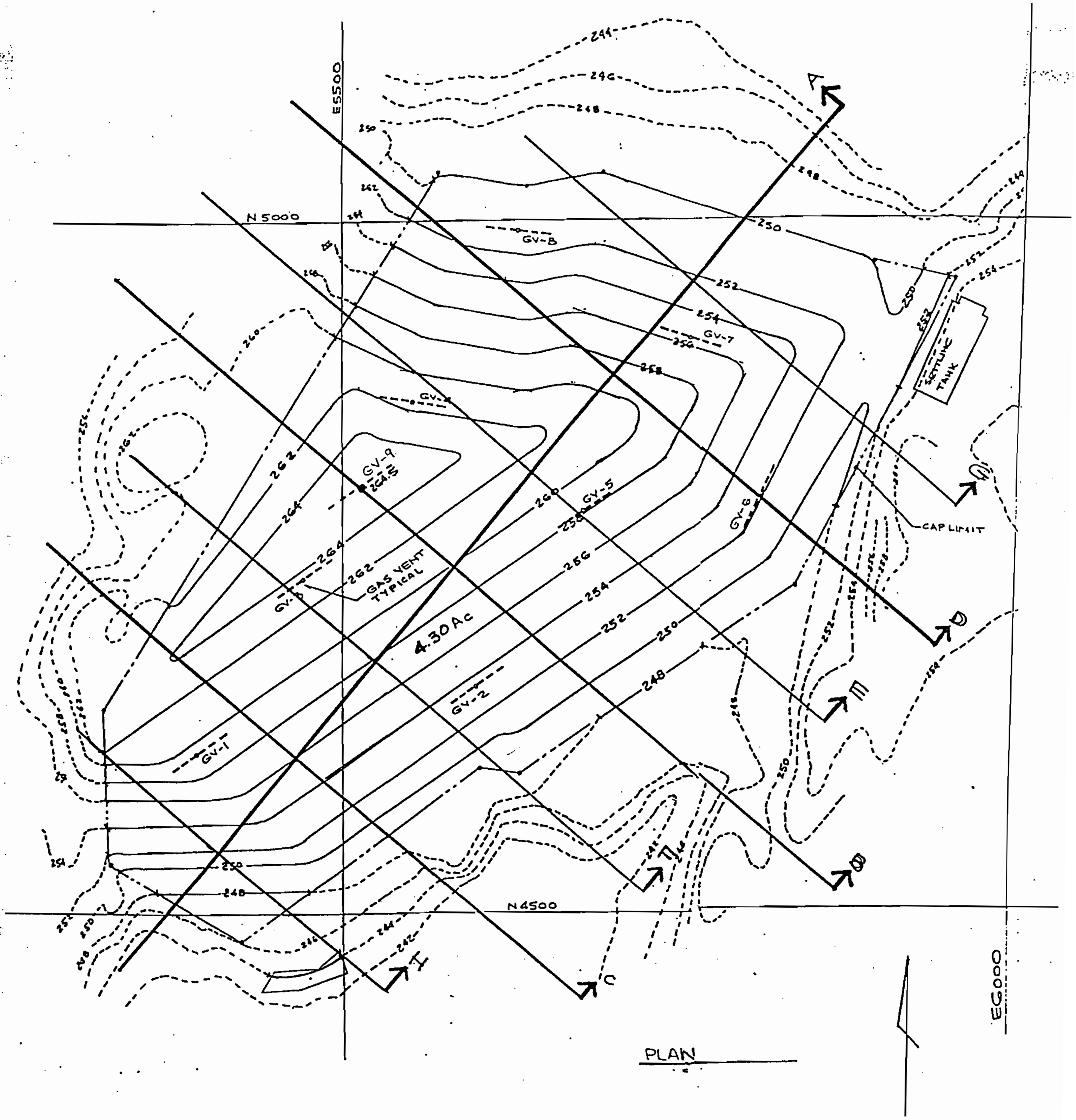
Sales/Installation Offices
Australia
Egypt
Singapore
United Kingdom

Represented by:

*For environmental lining solutions...the world comes to GSE.**
A Gundle/SLT Environmental, Inc. Company


244
246
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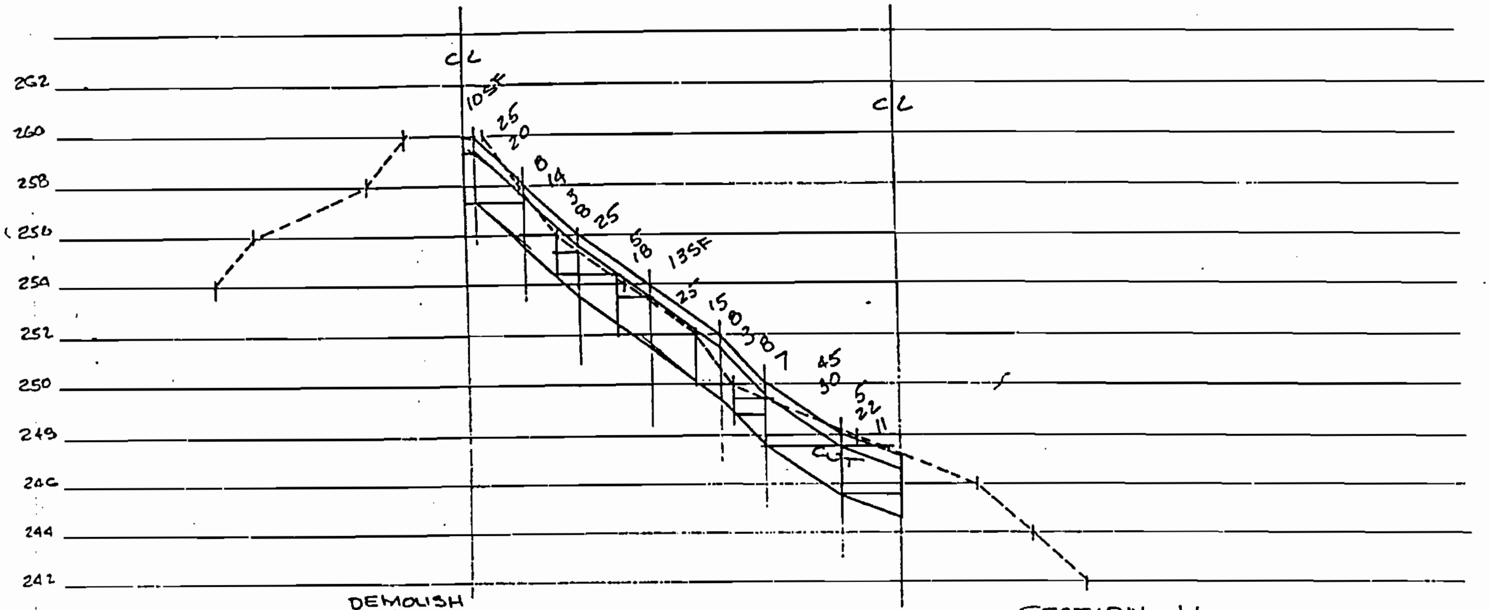
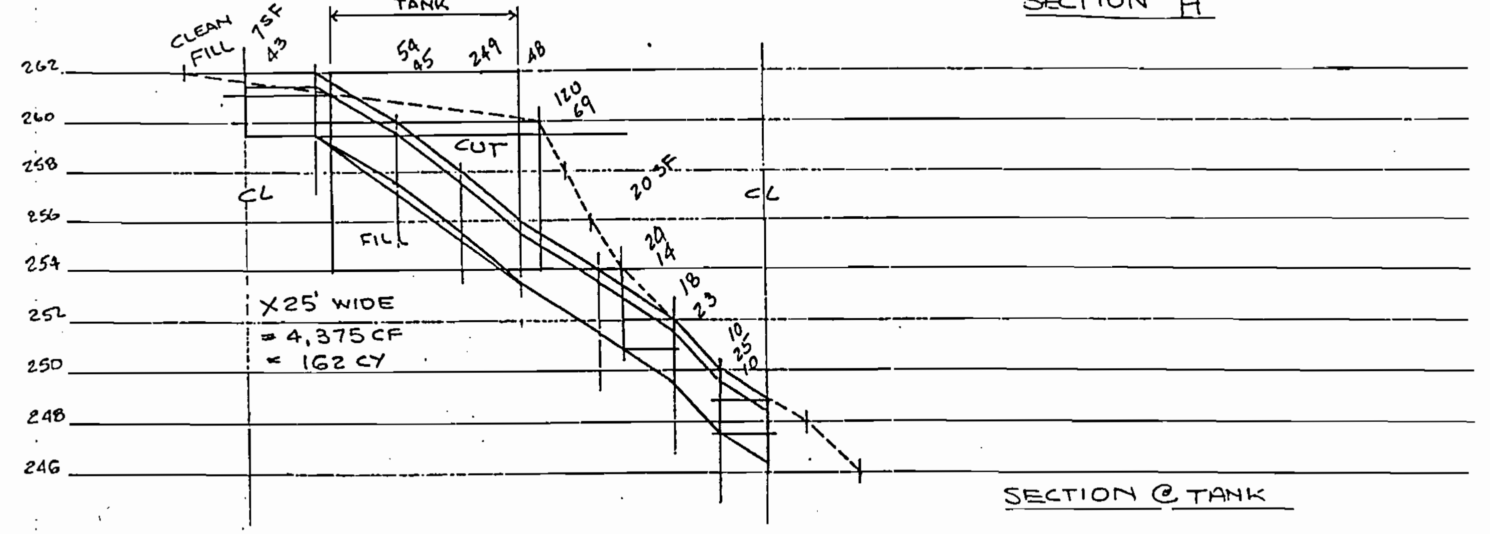
254
256
258
260
262
264
264.5
A
N5000
N4500
E5500
E6000
GV-1
GV-2
GV-3
GV-4
GV-5
GV-6
GV-7
GV-8
GV-9
GAS VENT TYPICAL
4.30 Ac
SEPTIC TANK
CAP LIMIT
I
C
II
B
III
D
E

PLAN



SECTION H



X25' WIDE
= 4,375 CF
= 162 CY

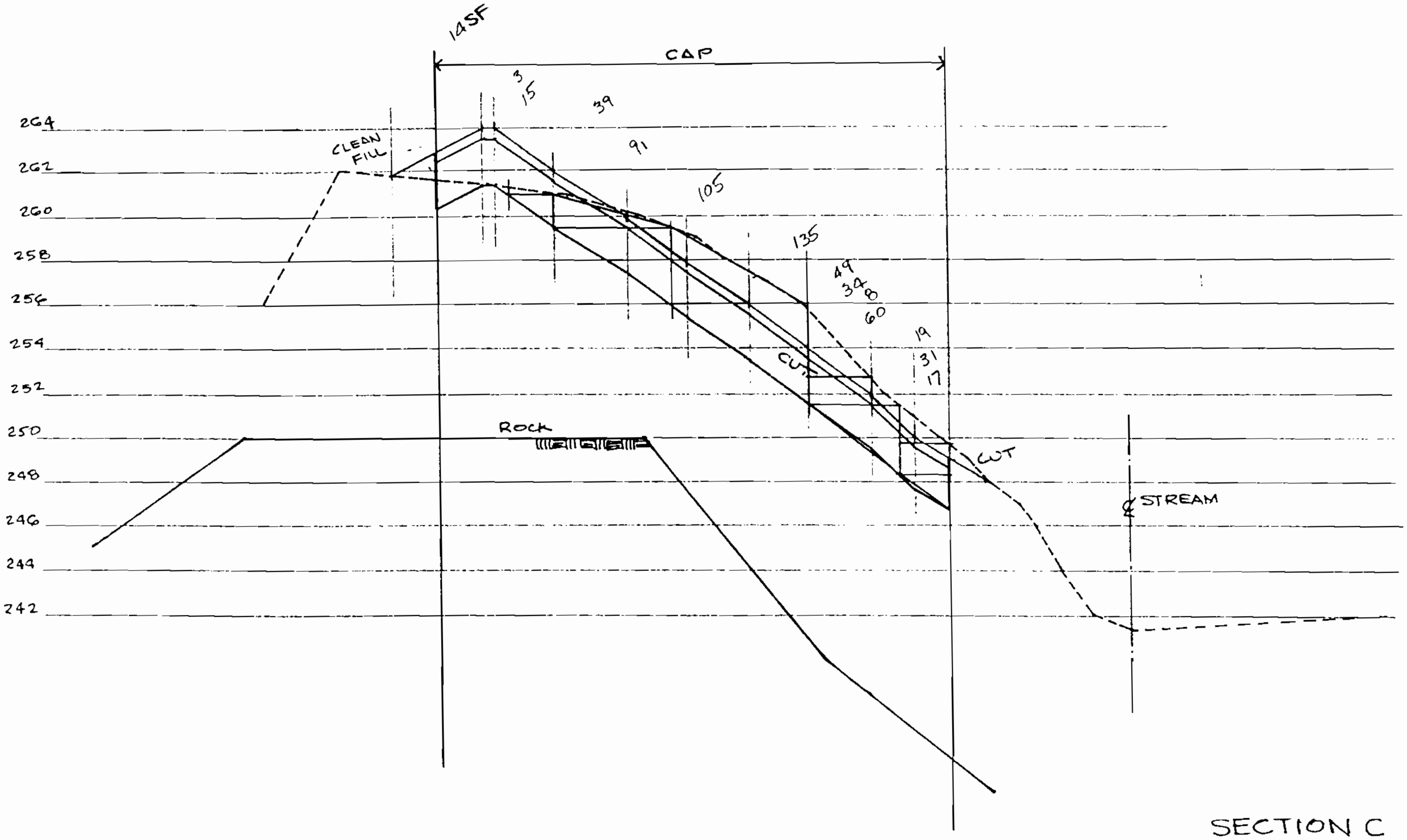
SECTION @ TANK

TRENCHES	
# 1 A	2,100
1 B	2700
8	900
7	250
6	500
(2-4) 20	100
	6,550 CY

90' BETWEEN SECTIONS

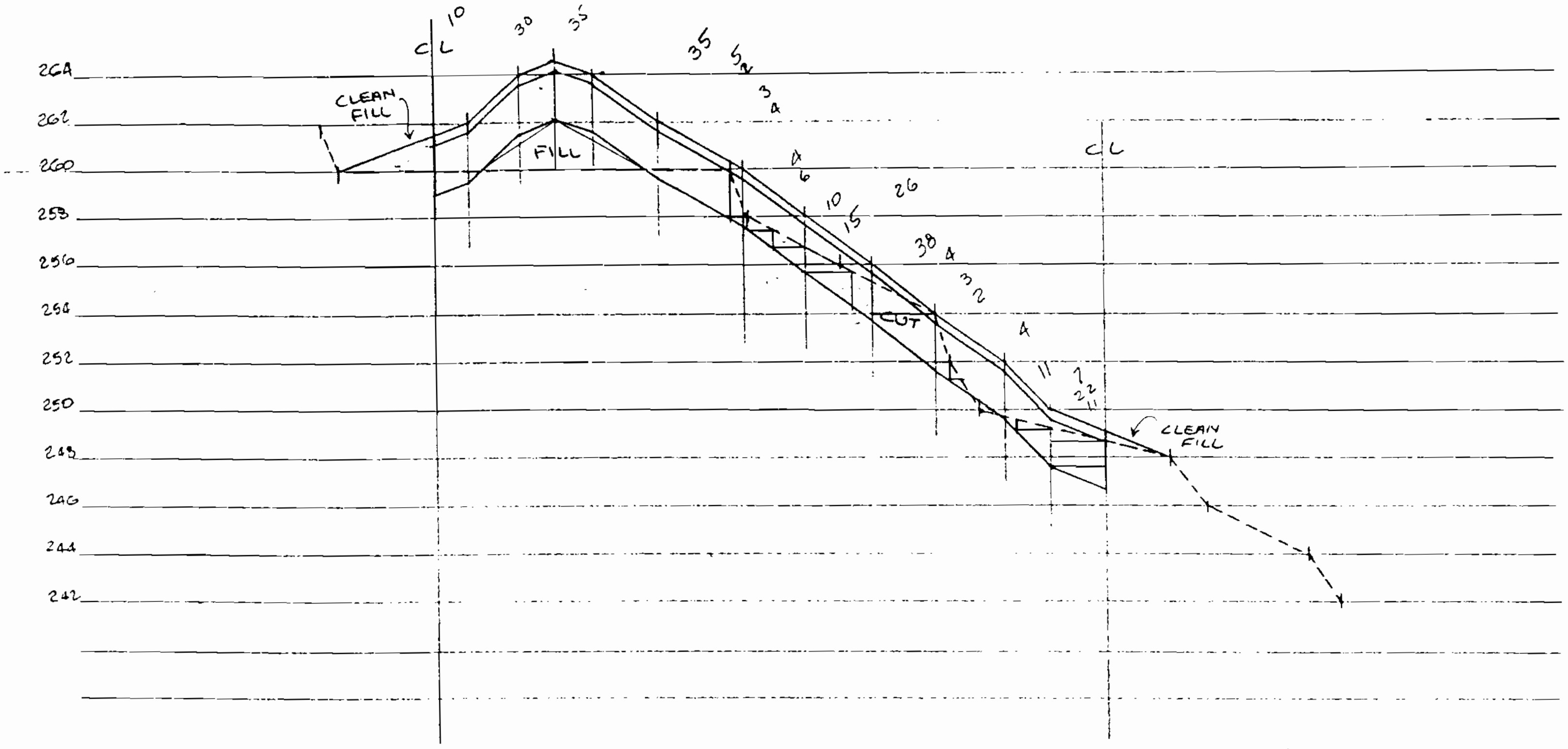
	CUT	FILL
H =	328 SF	—
C =	620	—
F =	222	65 SF
B =	58	863
E =	100	600
D =	265	1098
G =	136	172

JONES
HORIZ 1" = 50'
VERT 1" = 5'



SECTION C

SCALE: 1"=50' HORIZ.
1"= 5' VERT.


264
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242
CL
CL
CLEAN FILL
CLEAN FILL
FILL
CUT
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5 2
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4 6
10 15
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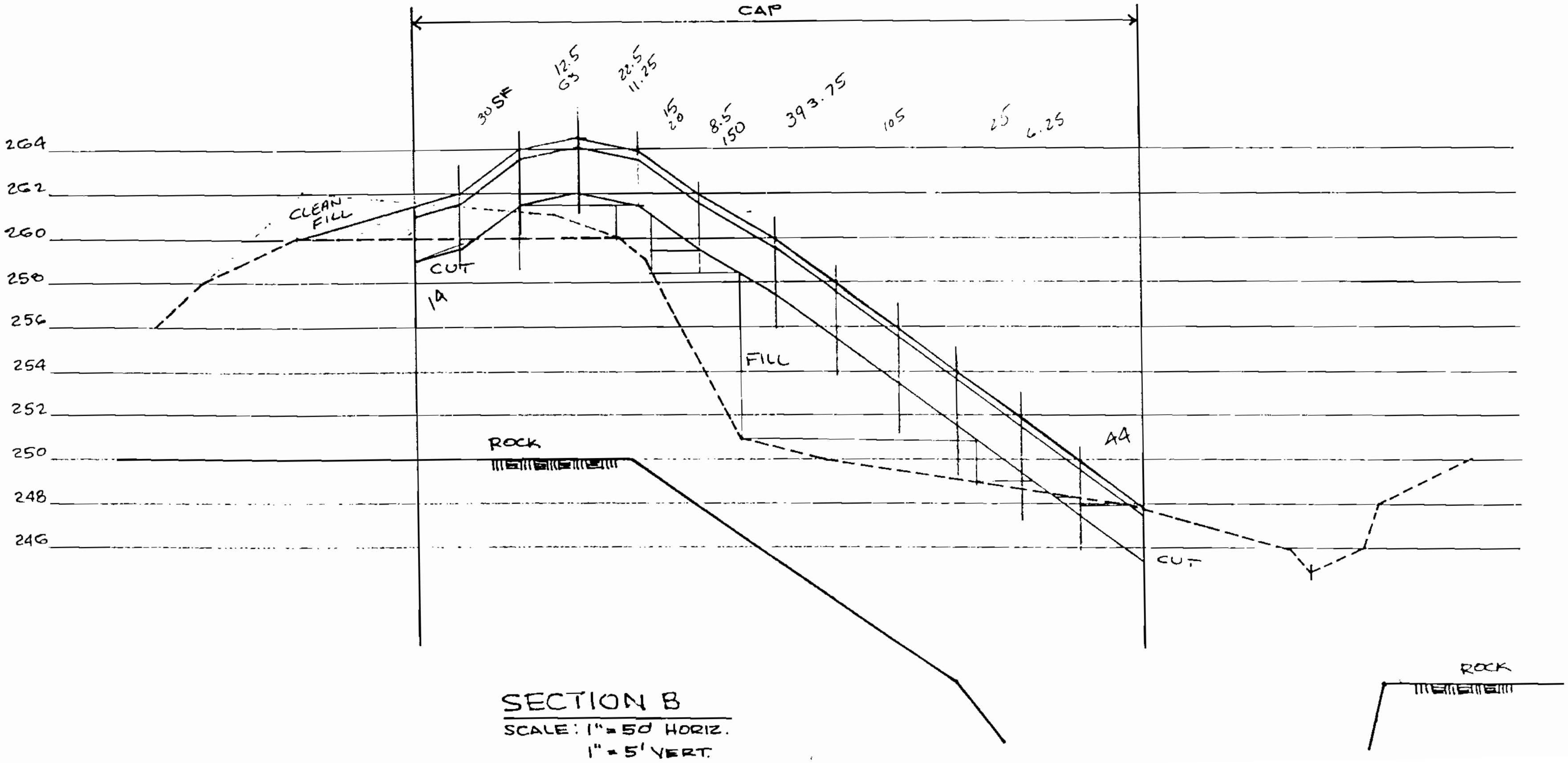
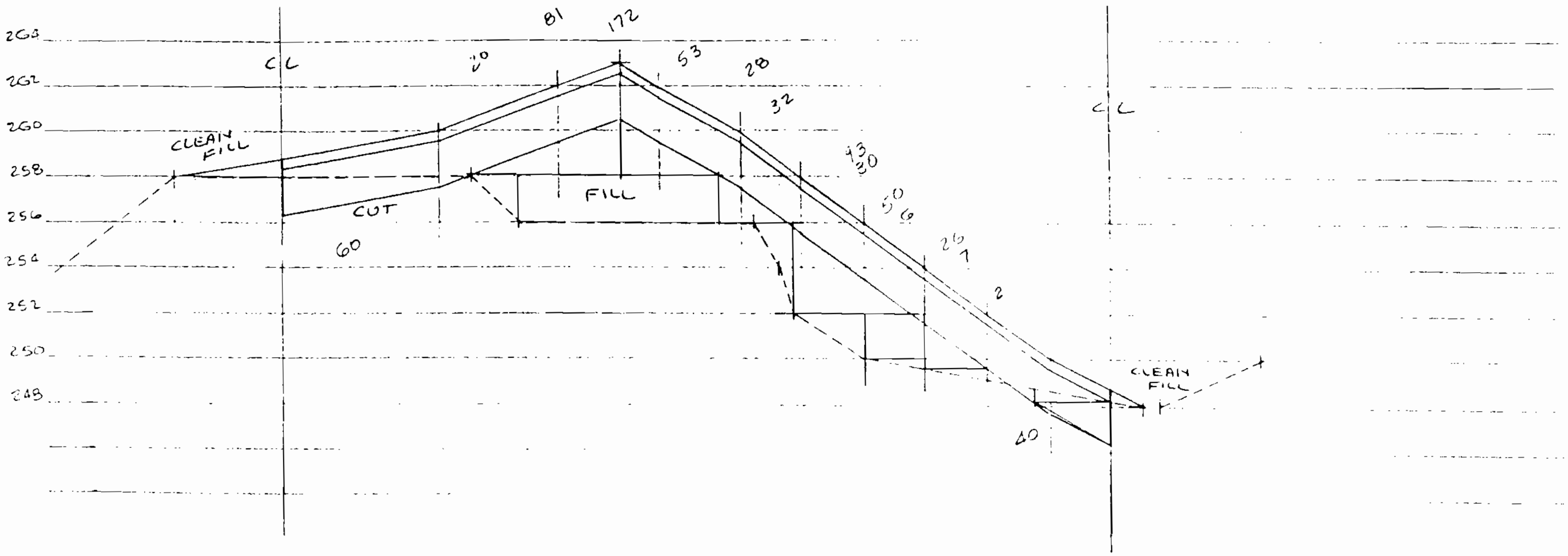
38 4
3 2
4
11
7 22 11

SECTION F



SECTION B
SCALE: 1" = 50' HORIZ.
1" = 5' VERT.


264
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258
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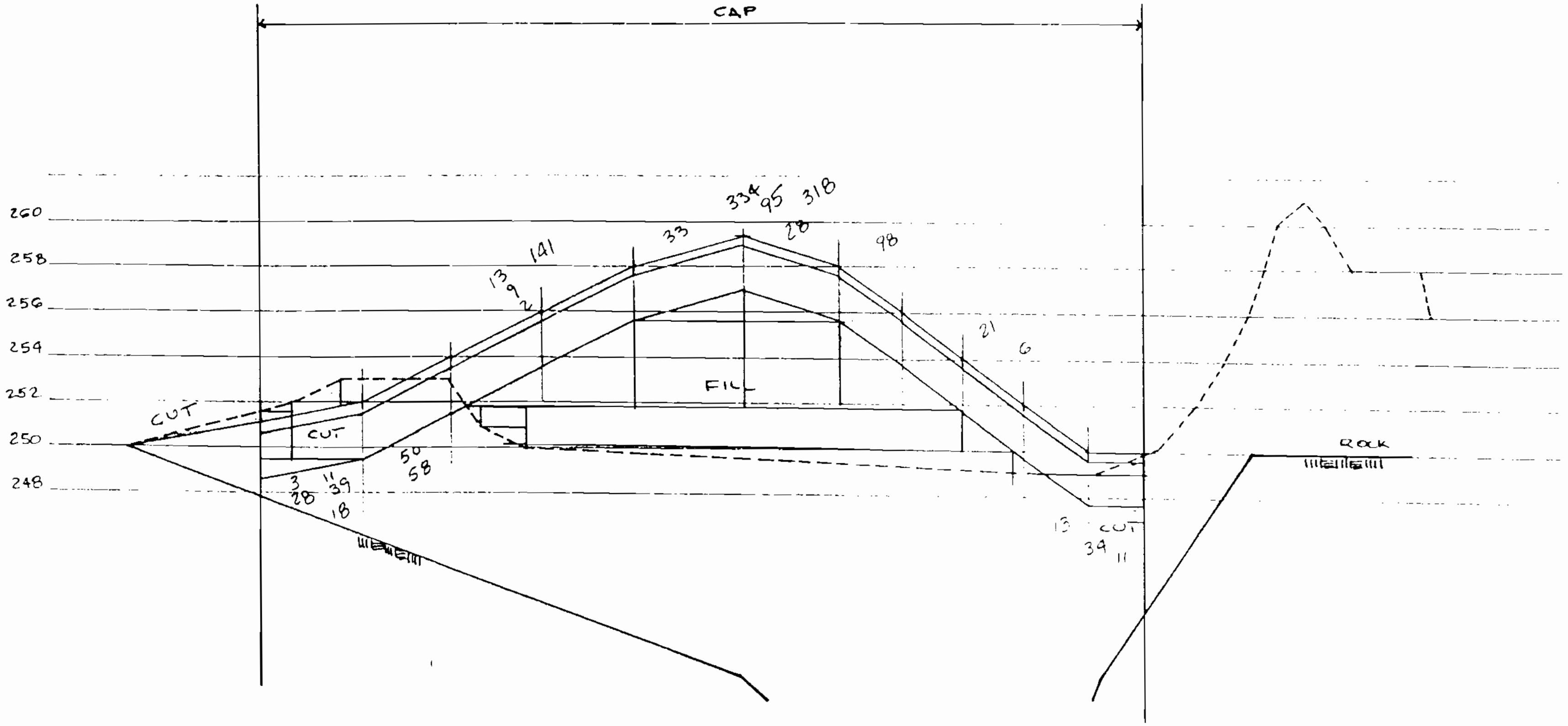
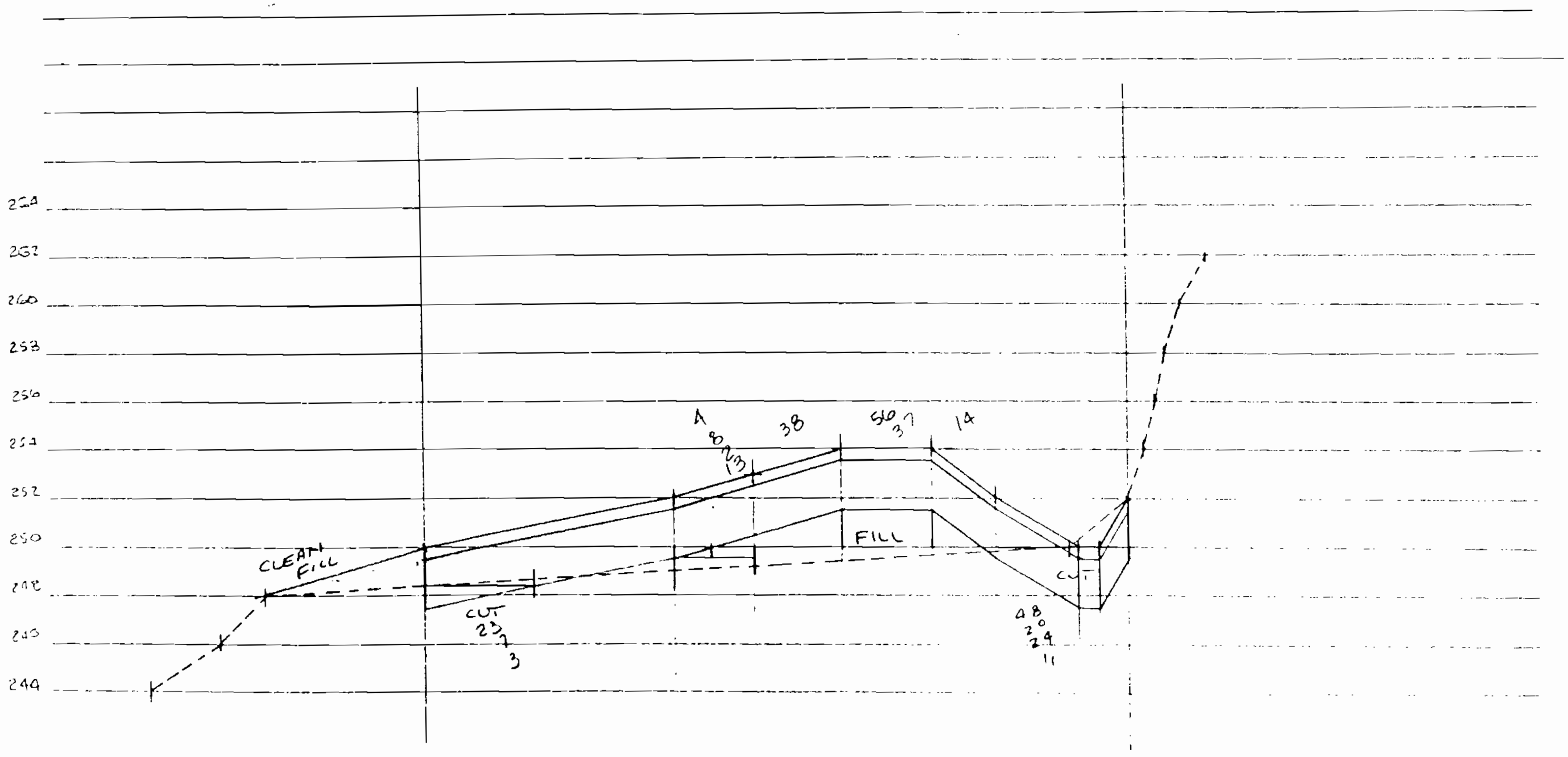
254
252
250
248
C L
C L
CLEAN FILL
CLEAN FILL
CUT
60
FILL
81
172
20
53
28
32
43
30
50
6
26
7
2
40

SECTION E



SECTION D

SCALE: 1" = 50' HORIZ.
1" = 5' VERT.


264
262
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258
256
254
252
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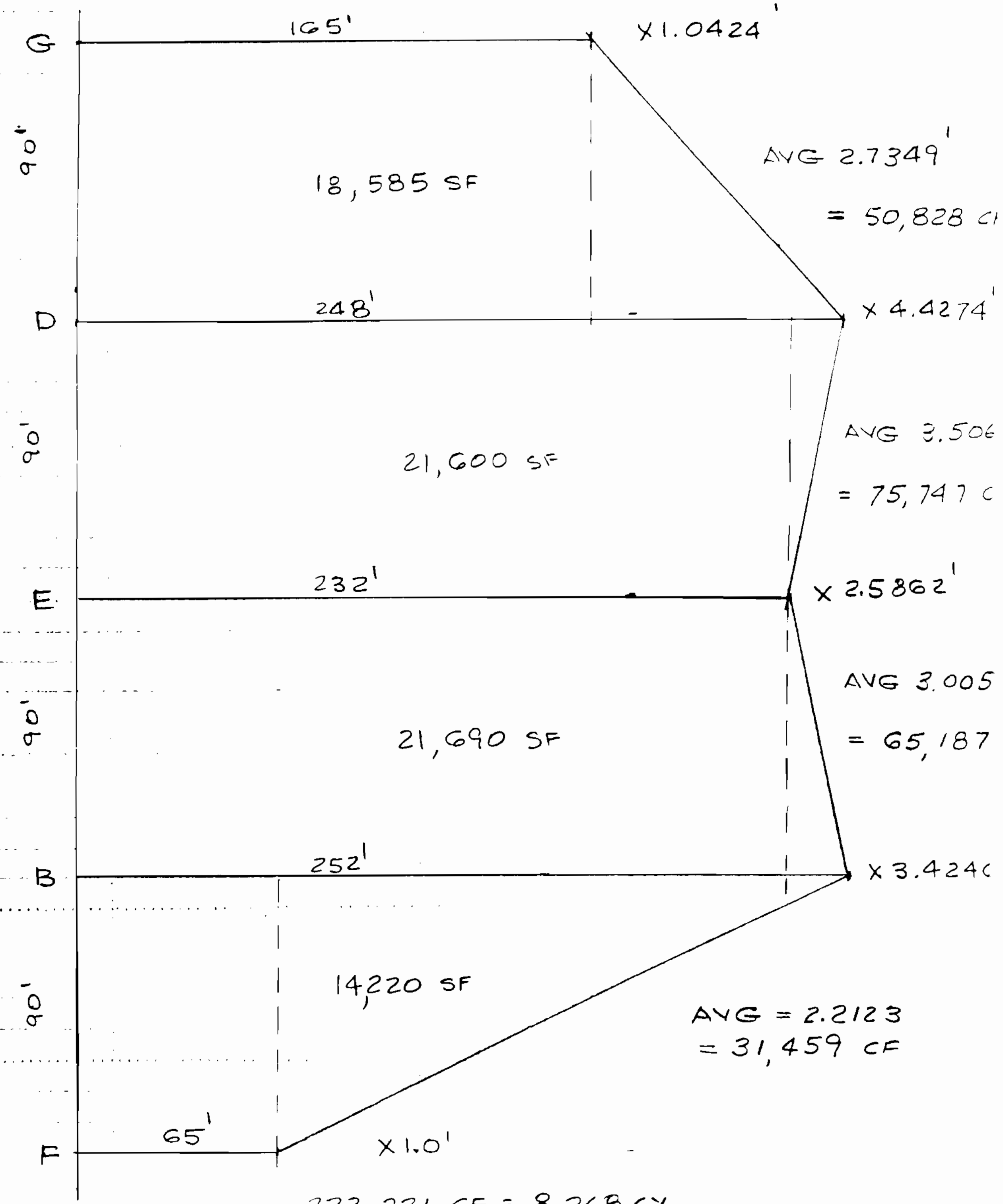
248
246
244
CLEAN FILL
CUT
23
7
3
A
8
2
13
38
56
37
14
FILL
CUT
48
20
24
11

SECTION G

SUBJECT JONES
FILL



223,221 CF = 8,268 CY

LESS FILL FROM TRENCH 6,550 CY = 1,718 CY

BY ______ DATE ______ SHEET NO. 7 OF ______

CHKD. BY ______ DATE ______ JOB NO. ______

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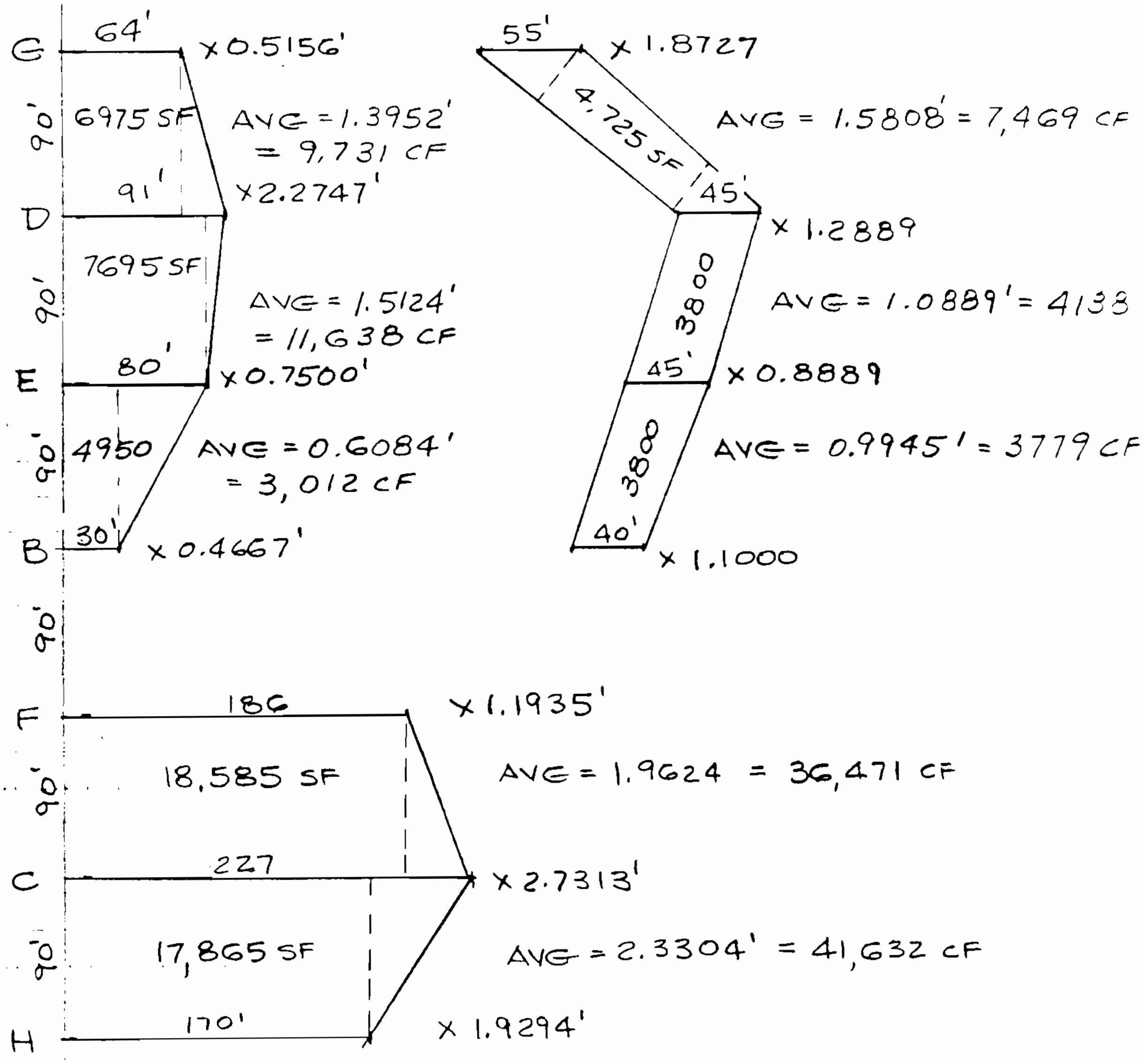
SUBJECT JONES
CUT

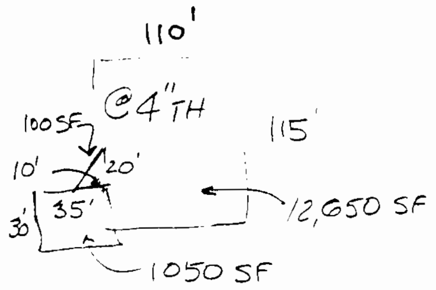


TOTAL 117,870 CF = 4,366 CY

LESS 1,718 = 2,648 CY ADDITIONAL SPACE REQ'D.

SUBJECT JONES
DEMOLITION DEBRIS

BITUMINOUS PVMT

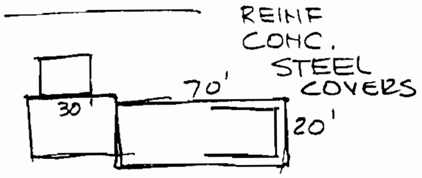


4,600 CF
X.03704 = 170 CY

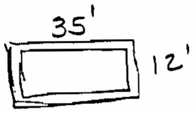
SINGLE STORY FRAME BLDG.

35' x 60' = 2100 SF
PER RICHARDSON 2-100 PG 4
88 CY / 1000 SF FLOOR
@ 2.1 = 185 CY

TANKS



2×100'×8'×.67' = 1,067 CF
2× 20'×8'×.67' = 214 CF
FLOOR 100×20×.67 = 1340 CF
2621 CF = 97 CY



2 × 35' × 8' × .67' = 375 CF
2 × 12' × 8' × .67' = 129
FLOOR 35'×12' = 420
924 CF = 34 CY × 2 = 68 CY

CONC DRIVE

60' × 25' = 1500 SF
@ 4" = 495 CF
= 18 CY

CONC. WALK

45'×4'×.33' = 59 CF.
25'×4'×.33' = 33 CF
= 92 CF = 3 CY

TOTAL 541 CY

SUBJECT JONES
SUMMARY

FROM SHEET 9 2,648 CY ADDITIONAL SPACE REQ'D.

PLUS 541 CY DEMOLITION DEBRIS = 3,189 CY

DEDUCT 2,550 GAL STORAGE TANKS = 341 CY

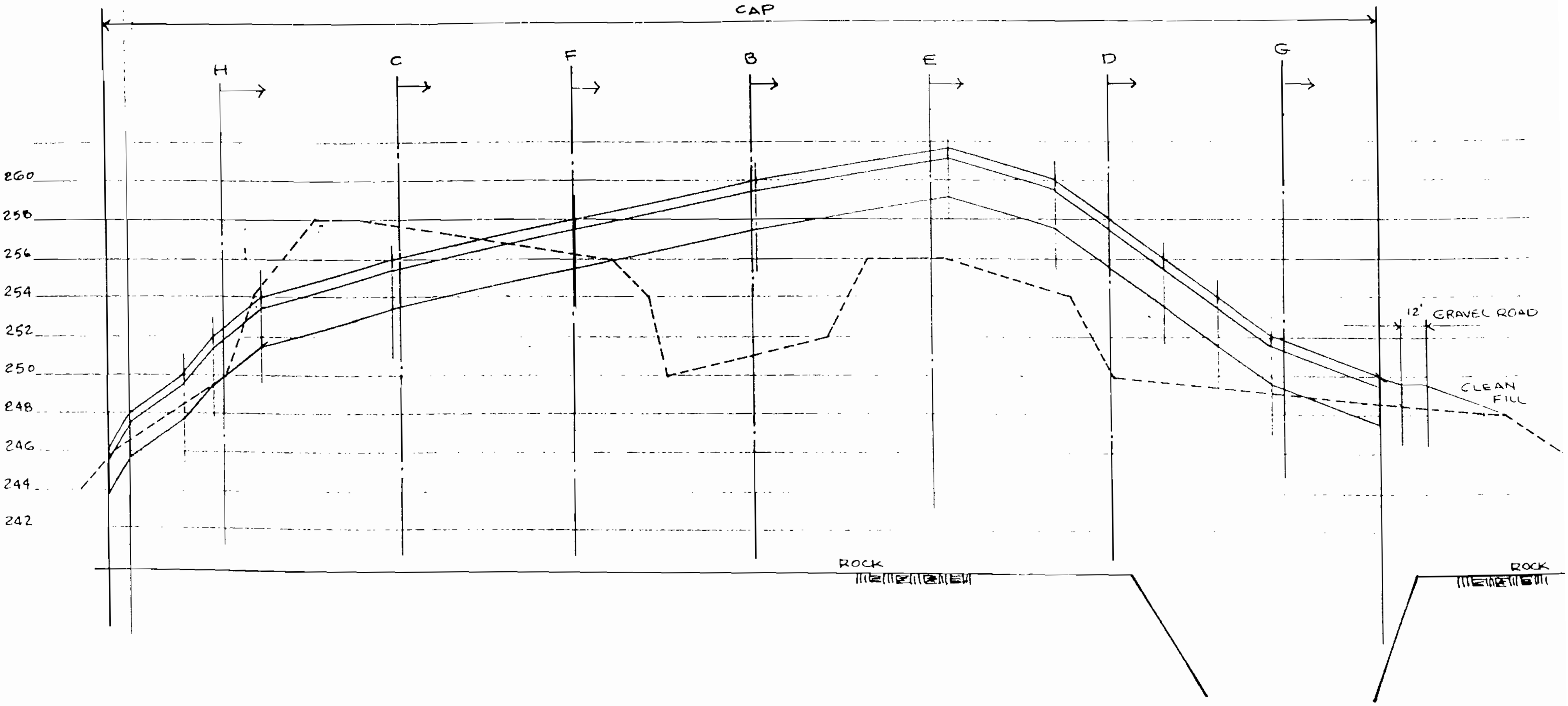
ASSUME NO FILL FOR BLD'G.

2,848 CY REMAINING

4.30 Ac CAP AREA 187,252 SF

2,848 CY × 27 = 76,896 CF
76,896 ÷ 187,252 SF = .41' (5")

THE ADDITIONAL 5" CAN BE SPREAD EVENLY OVER THE ENTIRE AREA OF THE LANDFILL WHICH WILL HAVE A MINOR IMPACT ON THE FINAL GRADING AS SHOWN.



SECTION A

SCALE: 1"=50' HORIZ.
1"=5' VERT.

BY RJL DATE 5.9.99

CHKD. BY ____ DATE ____

LAWLER, MATUSKY & SKELLY ENGINEERS LLP

ENVIRONMENTAL SCIENCE & ENGINEERING CONSULTANTS

ONE BLUE HILL PLAZA
POST OFFICE BOX 1509
PEARL RIVER, NEW YORK 10965

SHEET NO. ① OF ____

JOB NO. 442-221

SUBJECT Initial Excavation Volumes - Trench Units -

1- The FS, Fig 5-1 shows the outlying trench units and their expected initial excavation depths;

No. 1 - 10' (mound)
1' (trenches)
No. 8 - 4'
No. 7 1'
No. 6 4'

Trench 2-4 is not in FS - new trench id'd in discussion w/ Losee, 12.98

2- For design, since total trench volume is expected to be small in comparison to overall earth volumes, and the shallow depth (1') given for some will be hard to control, and, since it is best to be conservative with 1st cut, to reduce analytical time + expense -

- use minimum 2' cut
- combine trench pieces of No 1 into single

BY ______ DATE ______
CHKD. BY ______ DATE ______
SHEET NO. ②-A OF ______
JOB NO. ______

SUBJECT ______

1-B Vol = $\frac{8900}{27} \times 2'$ = 660 cy.

Σ #1 = 2714 say 2700 cy

#8 Perimeter = 400'

NB – FS says 4'

Vol = $\frac{5000 \times 4}{27} + \frac{400 \times 16}{2 \times 27}$ = 860 cy.

#7 - Perimeter = 300'

Vol. = $\frac{2300 \times 2}{27} + \frac{300 \times 8}{2 \times 27}$ = 220 cy

#2-4 Perimeter = 130'

Vol = $\frac{800 \times 2}{27} + \frac{130 \times 8}{2 \times 27}$ = 80 cy

#6 Perimeter = 330'

Vol = $\frac{2500 \times 4}{27} + \frac{330 \times 16}{2 \times 27}$ = 470 cy.

Σ = 6,385 cy.

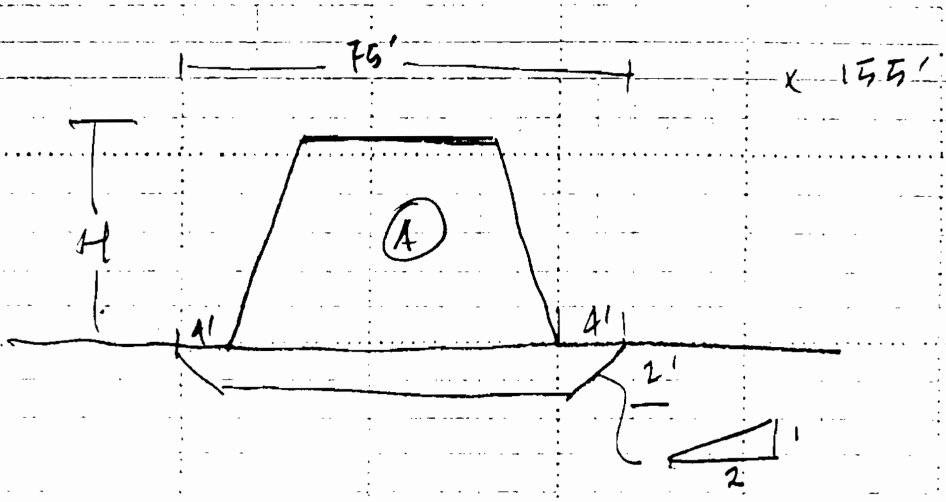
BY ______ DATE ______ SHEET NO. 2 OF ______
CHKD. BY ______ DATE ______ JOB NO. ______

SUBJECT Flagged areas – by planimeter, M 1" = 50'

		SF		
#1-A	Flagged area =	6,000	top area = (El 259)	35 x 75' = 2,600 SF
B		8,900		
# 8		5,000		
# 7		2,300		
# 2-4		800		
# 6		2,500		

Volume to be excavated

1-A



Avg. H = 260 − $\left(\frac{254 + 251}{2}\right)$ = 7.5'

Vol. A (above grade) = $\left(\frac{6,000 + 2600}{2}\right) \cdot \frac{7.5}{27}$ = 1,194 CY.

\+ below grade = 155 x $\frac{75}{27}$ x 2 = 861

2,055

LAWLER, MATUSKY & SKELLY ENGINEERS LLP

ENVIRONMENTAL SCIENCE & ENGINEERING CONSULTANTS

ONE BLUE HILL PLAZA
POST OFFICE BOX 1509
PEARL RIVER, NEW YORK 10965

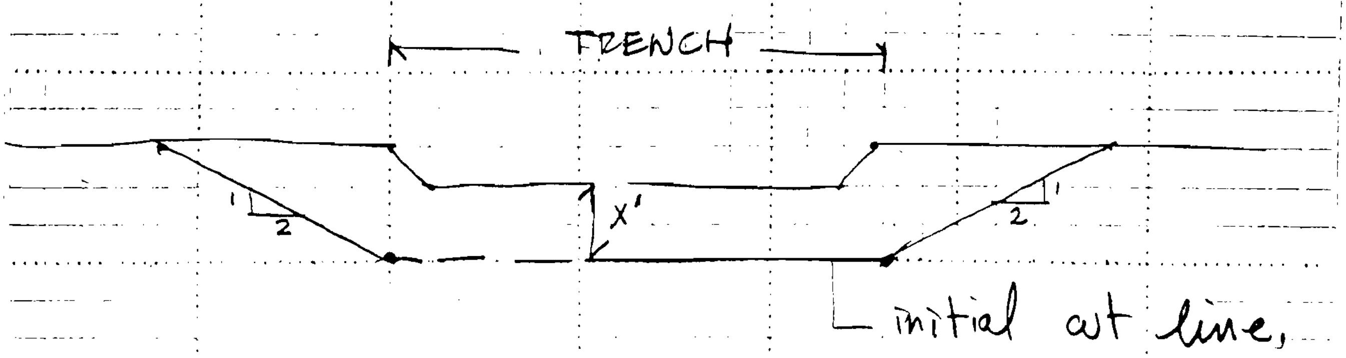
BY ________ DATE ________

CHKD. BY ________ DATE ________

SHEET NO. ③ OF ________

JOB NO. ________

SUBJECT ________



TYPICAL TRENCH INITIAL EXCAVATION

cross-section

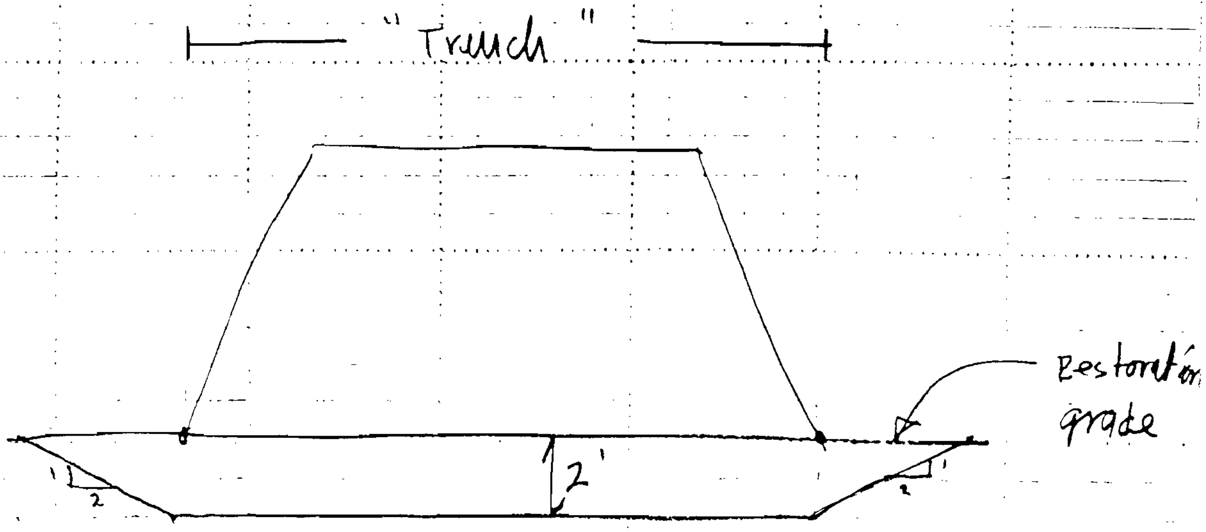
N.T.S.

schedule of Depth "X"

Trench No.	X
1-B	2'
8	4'
7	2'
7-4	2'
6	4'

Notes: 1) Restore to existing grade with off-site common borrow,

2) Clear and grub to overall excavation lines. Place all material in fill area, under membrane.



Trench 1-A Initial Excavation

CROSS-SECTION

N.T.S.

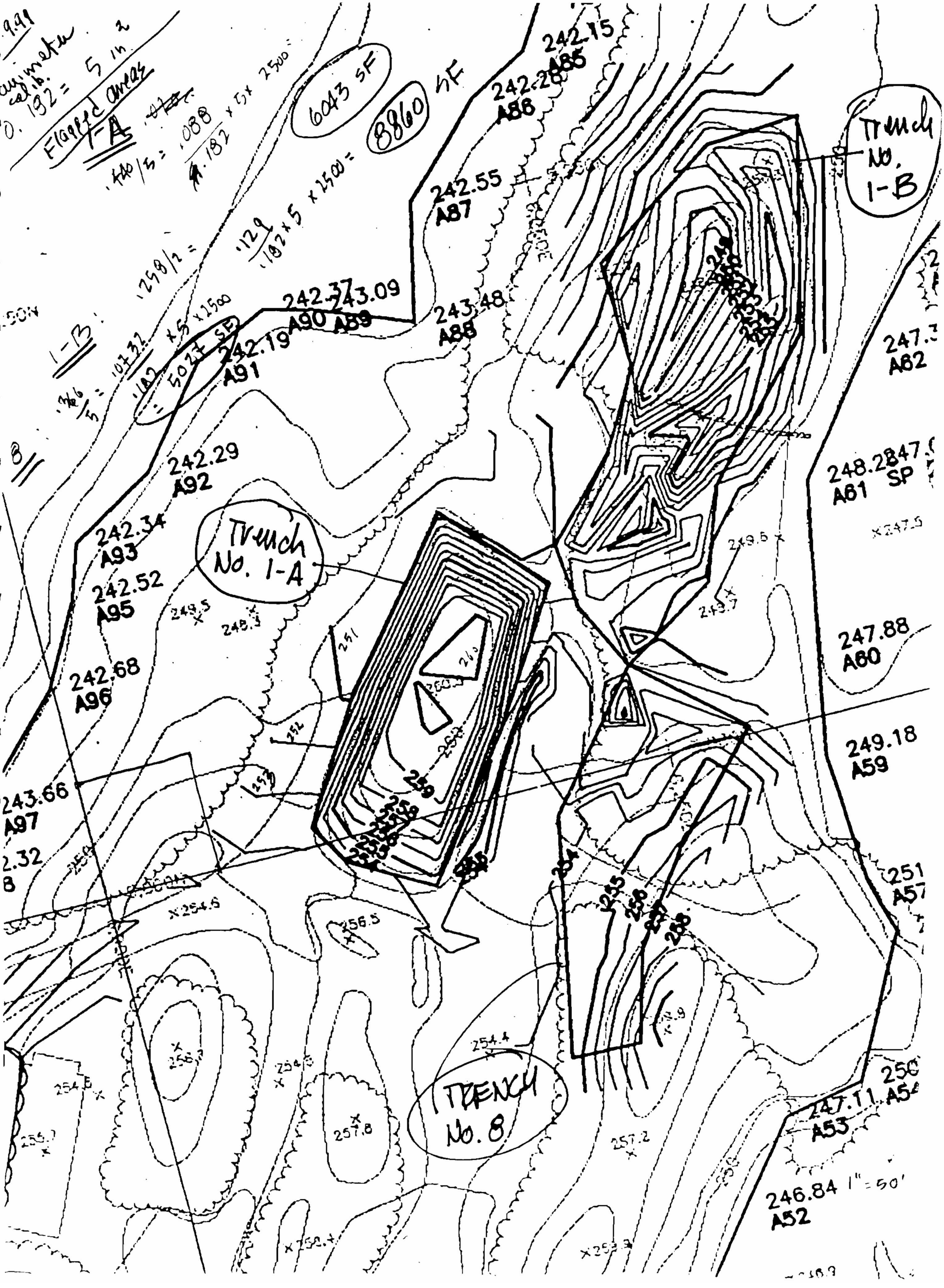
BY ______ DATE ______ SHEET NO. 5 OF ______

CHKD. BY ______ DATE ______ JOB NO. ______

SUBJECT ______

summarize initial excavation volumes

Trench Unit		vol, cy
1-A		2,100
1-B		2,700
8		900
7		250
2-4		100
6		500
	TOTAL:	6,550



9.91

planimeter calib. 0.192 = 5 in 2

Flagged areas

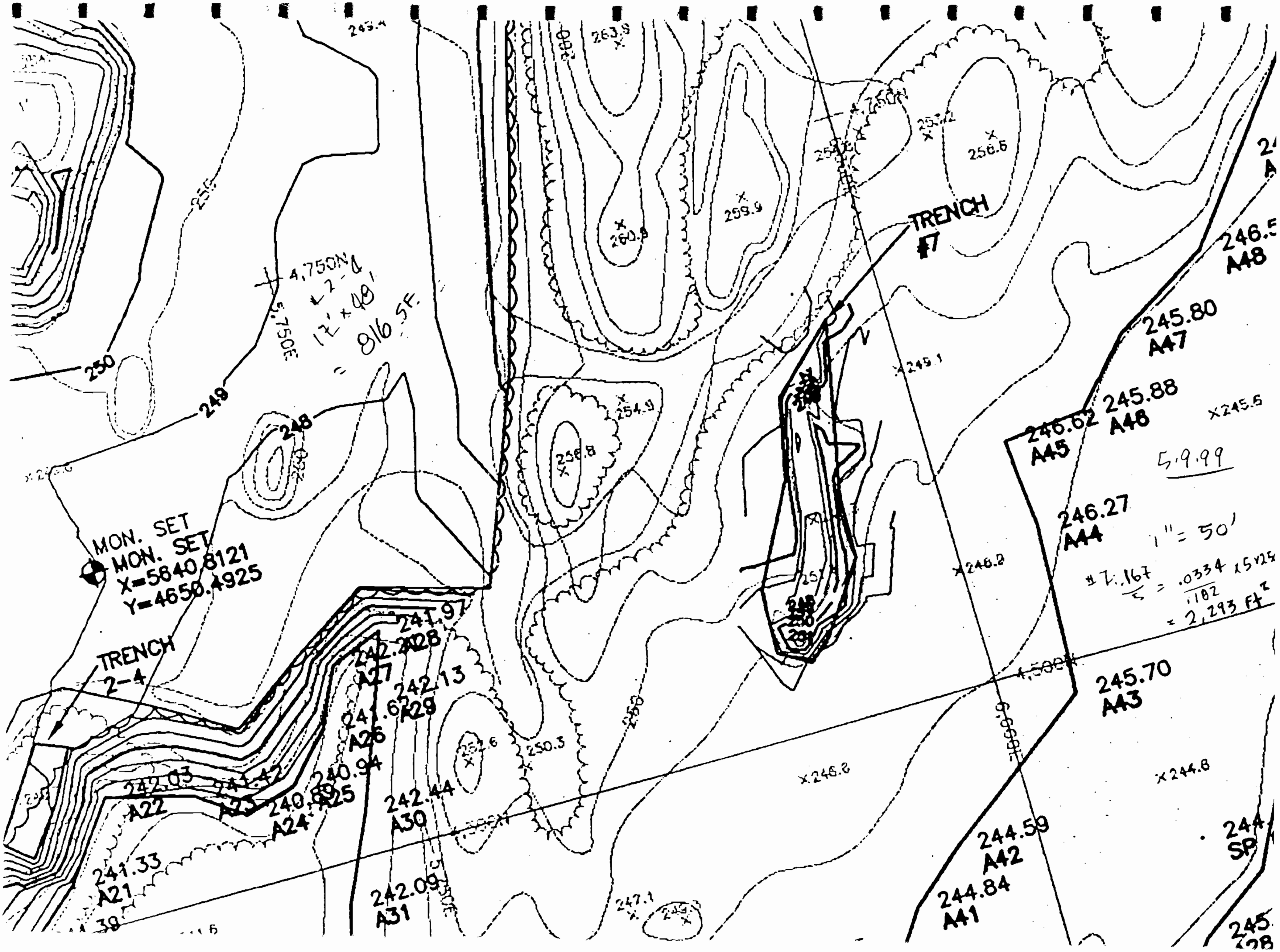
1-A

.440/5 = ~~.07~~ .088 / .182 x 5 x 2500 = 6043 SF

.1258/2 = .129 / .182 x 5 x 2500 = 8860 SF

1-B: .366/5 = .0732 / .182 x 5 x 2500 = 5027 SF

8

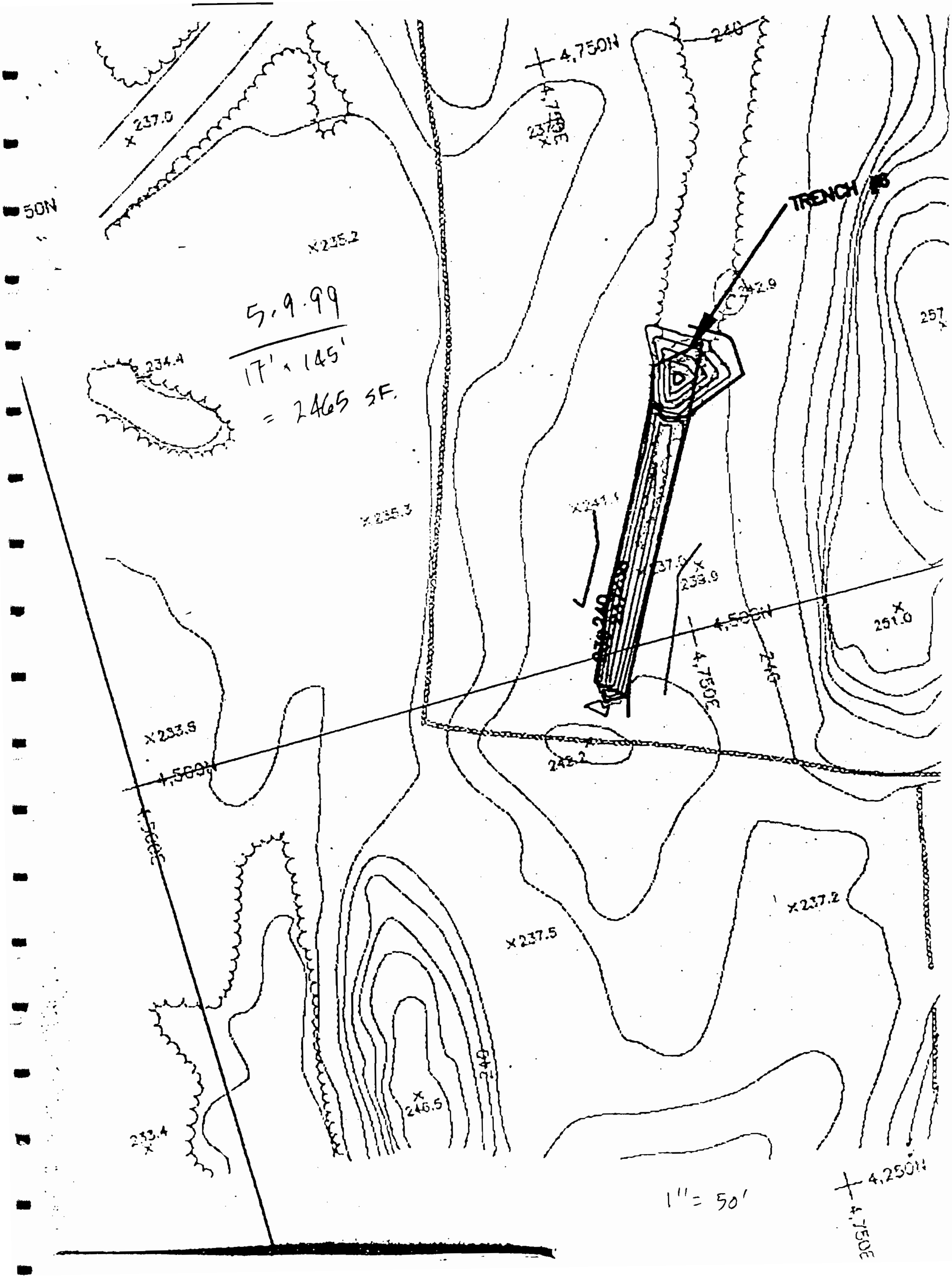


4,750N 2-4
12' x 68'
= 816 SF.

5.9.99

1" = 50'

#7 .167/5 = .0334 x 5 x 25 / .182
= 2,293 Ft²



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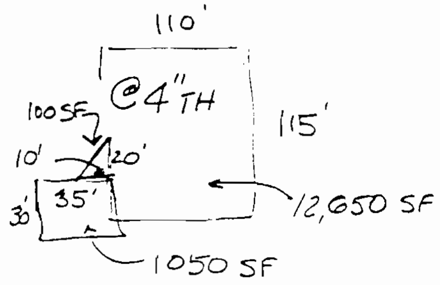
17' x 145'

= 2465 SF.

1'' = 50'

DEMOLITION DEBRIS

BITUMINOUS PVMT

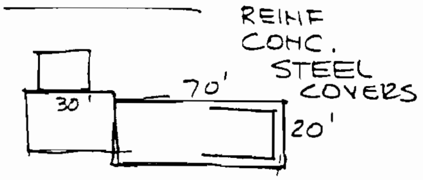


4,600 CF
X.03704 = 170 CY

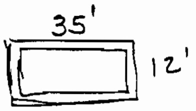
SINGLE STORY FRAME BLDG,

35' x 60' = 2100 SF
PER RICHARDSON 2-100 PE4
88 CY / 1000 SF FLOOR
@ 2.1 = 185 CY

TANKS



2x100'x 8' x .67' = 1,067 CF
2x 20'x8' x .67' = 214 CF
FLOOR 100 x 20 x .67 = 1340 CF
2621 CF = 97 CY



2 x 35' x 8' x .67' = 375 CF
2 x 12' x 8' x .67' = 129
FLOOR 35' x 12' = 420
924 CF = 34 CY x 2 = 68 CY

CONC DRIVE

60' x 25' = 1500 SF
@ 4" = 495 CF
= 18 CY

CONC. WALK

45' x 4' x .33' = 59CF
25' x 4' x .33' = 33CF
= 92CF = 3 CY

TOTAL 541 CY

APPENDIX E

CONSENT DECREE BETWEEN LOSEE AND ALFA-LAVAL
AND
PROPOSED GRANT OF EASEMENT AND DECLARATION OF RESTRICTIVE COVENANTS

responding to the alleged release or threat of releases of hazardous substances at or in connection with a facility known as the Jones Sanitation Site~~, located at Cardinal Road, Hyde Park,~~ Dutchess County, New York (hereinafter the "Site");

WHEREAS, Alfa Laval is also a respondent to an EPA Administrative Order (the "Order") requiring remedial investigation, design and remediation of the Site and has taken and will continue to take actions pursuant to said Order (the "Cleanup");

WHEREAS, Alfa Laval has asserted claims against Losee and Jones and others in the Action under State Law and the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), 42 U.S.C. § 9601 *et. seq.*, for recovery of the alleged past and future expenses and costs that Alfa Laval allegedly incurred and will allegedly incur with respect to the Cleanup;

WHEREAS, Losee and Jones filed answers denying liability under CERCLA, and asserting counterclaims against Alfa Laval and cross-claims against each other defendant;

WHEREAS, the United States Environmental Protection Agency ("EPA") has issued a Record of Decision, dated March 31, 1997, which provides for the soil and groundwater remedy to be instituted at the Site, including the implementation of institutional controls, such as deed and use restrictions;

WHEREAS, Losee is owner of the Site on which said institutional controls are sought and, as owner, has the sole authority to agree to and permit the implementation of said institutional controls;

WHEREAS, said institutional controls have significant value to Alfa Laval and Losee and Jones;

WHEREAS, Alfa Laval and Losee and Jones desire to resolve their claims and the matters addressed in the pleadings in a fair and equitable manner, without the necessity of protracted litigation, in accordance with the terms of this Consent Decree;

NOW, THEREFORE, IT IS ORDERED, ADJUDGED AND DECREED:

1. Jurisdiction: This Court has jurisdiction over the subject matter of this Action pursuant to 28 U.S.C. § 1331 and 74 U.S.C. § 9613(b).

2. Payment: In consideration of the release, and covenant not to sue given them herein by Alfa Laval, Losee and Jones agree to provide to Alfa Laval, as part of the remedy at the Site:

   a. institutional controls at the Site, including deed and use restrictions as required in the EPA's Record of Decision, except as provided below in paragraph 3;

   b. permission to remove and/or demolish the building and shed and the existing asphalt and concrete pads without reimbursement provided to Losee in order to facilitate the construction of the 4.8 acre "cap" over the central disposal area as required in the EPA's Record of Decision;

   c. permission for the installation of fencing for the capped portion of the Site as necessary to secure the cap;

   d. permission for the removal, cleaning and recycling of the tanks located on the Site; and

e. permission for access to and on the property to Alfa Laval's consultant for the purpose of maintaining the portion of the property subject to the ROD and monitoring of the groundwater.

3. Exceptions: The institutional controls at the Site, including deed and use restrictions, which Losee and Jones agree to provide to Alfa Laval as set forth above in paragraph 2, shall not include the following:

a. any restrictions on the continued use by Losee and Jones, and their successors and assigns, of the non-capped portion of the property for continued activities such as the storage and maintenance of vehicles and construction materials, and for the construction of a new building on the non-capped portion of the property for such activities;

b. any restrictions on the continued access to the property by Losee and Jones, and their successors and assigns, through the main gate from the west, the "loggers road" from the northeast, or any other road constructed for access to and on the property; however, Losee and Jones agree that no vehicles or pedestrian traffic or parking will occur on or impact the capped portion of the property or any portion of the property covered by the ROD which would be inconsistent with maintenance of the cap;

c. any restrictions on the continued use by Losee and Jones, and their successors and assigns, of the house and mobile homes presently located on the property;

d. any restrictions on the continued use by Losee and Jones, and their successors and assigns, of the present septic systems which currently service the house and mobile homes located on the property, which septic systems shall be used only to handle and shall only accept sanitary effluent;

e. any restrictions on the continued use for potable purposes by Losee and Jones, and their successors and assigns, of the common well which currently services the house and mobile homes located on the property and the ~~future~~ use of the common well to service water needs for any new building constructed on the property; however, Losee and Jones agree that water will not be drawn from the well in an amount which would hasten the migration of any contamination nor will the use of such water for potable purposes be permitted if contamination is present in the water. Alfa Laval shall not be responsible for contamination caused by the use of these wells;

f. any restrictions on the installation by Losee and Jones, and their successors and assigns, of new wells for nonpotable purposes to service any new building constructed on the property; again subject to limitation if the use of the wells hastens the migration of groundwater contamination. Alfa Laval shall not be responsible for contamination caused by the use of these wells;

g. any restrictions on Losee and Jones, and their successors and assigns, from relocating utility lines that currently service the building on the property from underground to aboveground to service any new building constructed on the property; and

h. any restrictions on Losee and Jones, and their successors and assigns, on the installation and use of a septic system for any new building constructed on the property. However, use of the septic systems shall be limited to sanitary effluent and shall not include any other material, including septic tank cleaners.

Alfa Laval agrees that the uses of the property as set forth above in subsections "a." through "h." of this paragraph "3" will be permissible uses of the property, to the extent that (i) such uses are authorized in writing by the EPA or other appropriate governmental regulatory agencies; (ii) Alfa Laval receives a copy of such authorization before the activity for which authorization has been granted is started; and (iii) any such use does not involve the release of chemical material, petroleum products or hazardous substances to the environment. To the extent that subsections (i), (ii) and (iii) are satisfied, Alfa Laval will not object to said uses of the property by Losee and Jones, and their successors and assigns.

4. Response Costs: Losee's and Jones' contribution to the Site Cleanup shall be limited to the "Payment" in the form of institutional controls and permission for site access and to remove and/or demolish buildings and/or structures, described in paragraph 2, as limited by the exceptions on

institutional controls in paragraph 3. Losee and Jones shall not be responsible for the past or future response costs and expenses of the Cleanup, to the extent that the Site Cleanup does not exceed the scope of the work set forth in the Record of Decision. Alfa Laval shall bear the past and future response costs and expenses of the Cleanup, to the extent of the Site Cleanup set forth in the Record of Decision. In the event that the Record of Decision is reopened and modified to provide for Additional Remediation Measures beyond those presently set forth in the Record of Decision, all parties reserve their respective rights, remedies, and defenses, as against each other with respect to any such Additional Remediation Measures. In the event that Alfa Laval seeks to recover any costs from Losee and/or Jones relating to any such Additional Remediation Measures, Alfa Laval may only seek recovery from Losee and/or Jones to the extent that Losee's and/or Jones' then net worth exceeds Losee's and/or Jones' net worth reflected in Attachment A (which excludes certain rental properties). To the extent that Losee's and/or Jones' then net worth exceeds Losee's and/or Jones' net worth reflected in Attachment A, Losee's and/or Jones' liability, if any, to Alfa Laval shall be limited to the amount by which Losee's then net worth exceeds Losee's and/or Jones' net worth reflected in Attachment A.

5. Release by Plaintiff: In consideration of the deed and use restrictions and other consideration provided by Losee and Jones in paragraph 2, Alfa Laval hereby releases Losee and Jones, their predecessors, successors, assigns, heirs, administrators and executors, and to the extent applicable, Losee's and Jones' former, present, or future shareholders, directors general partners and limited partners, officers, and employees, from liability to Alfa Laval arising from:

a. The liability, if any, of Losee and Jones, their predecessors, successors, assigns, heirs, administrators, and executors or to the extent applicable, Losee's and Jones' former, present, or future shareholders, directors, officers, general partners and limited partners and employees, to Alfa Laval, its successors, shareholders, transferees, and assigns, under CERCLA, the Order or Record of Decision or any other existing federal, state, municipal, or local law, rule, regulation, directive, or ordinance, administrative or judicial decision, in law or equity, imposing any liability or requirement whatsoever upon Alfa Laval for existing response costs and implement of the Site Cleanup set forth in the Record of Decision. .

b. These releases shall take effect with respect to Losee and Jones upon the date that the Court approves and enters this Consent Decree.

6. Release by Losee and Jones: In consideration of Alfa Laval's release, covenant not to sue and the indemnification given herein, Losee and Jones hereby release Alfa Laval, its predecessors, successors, and assigns, and Alfa Laval's former, present, or future shareholders, directors, officers, and employees, from liability to Losee and Jones arising from:

a. The liability, if any, of Alfa Laval, its predecessors, successors, and assigns, of Alfa Laval's former, present or future shareholders, directors, officers, and employees, to Losee and Jones, their successors, shareholders, transferees, and assigns, under CERCLA, the Order or Record of Decision or any other existing or future federal, state, municipal or local law, rule, regulation, directive, or ordinance, administrative or judicial decision, in law or equity, imposing any liability or requirement whatsoever upon Losee and Jones for existing response costs and implementation of the Site Cleanup set forth in the Record of Decision. However, these releases shall be of no force and effect should Alfa Laval fail to pay the existing response costs and implement the Site Cleanup set forth in the Record of Decision.

b. These releases shall take effect with respect to Alfa Laval upon the date that the Court approves and enters this Consent Decree.

7. Parties Bound: This Consent Decree shall apply to and be binding upon Plaintiff, and Losee and Jones only. The signatory parties to this Consent Decree reserve all rights against all other potentially responsible parties, including those rights to cost recovery, contribution, and indemnification

which arise under statute or common law, at law or in equity, or under contract, and nothing herein shall be deemed a waiver or release of any claims, demands, suits, or causes of action which any of the parties hereto may now or shall ever have against all other potentially responsible parties, except as is expressly set forth herein.

8. No Admissions: By entering into this Consent Decree, Plaintiff and Losee and Jones are not admitting to any facts, or to any liability under statute, regulation, ordinance, or common law for any alleged response costs or damages caused by the storage, treatment, handling, disposal, or presence, or the alleged actual or threatened release, of materials at the Site. Nothing in this Consent Decree shall be deemed an admission by any of the parties hereto as to the presence of hazardous substances at the Site or the risks to human health or the environment presented by the Site. This Consent Decree may not be offered in evidence against the parties to this or any other action except in an action by the parties to enforce this Consent Decree.

9. Bind and Inure: This Consent Decree shall be binding upon and shall inure to the benefit of each of the parties hereto and, with respect to the corporate parties, their respective predecessors, successors, and assigns, and with respect to the individual parties, their respective heirs, administrators, executors, and assigns.

10. Effective Date: This Consent Decree shall be effective upon the date that the Court approves and enters this Consent Decree. All times for performance of activities under this Consent Decree shall be calculated from that date.

11. Miscellaneous Provision: The Court shall retain jurisdiction over the settling parties only to the extent necessary to enforce the terms and conditions of this Consent Decree.

12. Authority of Signatory: Each of the persons signing this Consent Decree in a representative capacity represents and warrants that he or she is counsel of record for the entity for which he or she has signed and that the execution of this Consent Decree by him or her on behalf of such entity has been duly authorized. This Consent Decree may be signed in counterpart originals.

13. Dismissal: Upon the date that the Court approves and enters this Consent Decree, all claims against Losee and Jones are dismissed with prejudice, with each party to bear its own litigation costs and attorneys' fees.

CLB/USDJ ~~The Court finds there is no just cause for delay. Rule 54(b) F.R.Civ.P.~~

SO ORDERED:

White Plains, New York
May 5, 1997

Charles Brieant
U.S.D.J.

DEFENDANTS:

THEODORE C. LOSEE, SR.
JONES SEPTIC, INC.

By: Theodore C. Losee, Sr.
Theodore C. Losee, Sr.

By: Michael W. Peters
Michael W. Peters, Esq. (MP-6012)
LeBoeuf, Lamb, Greene & MacRae, L.L.P.
99 Washington Avenue, Suite 2020
Albany, NY 12210-2820

STATE OF NEW YORK)
SS.:
COUNTY OF DUTCHESS)

On the 1st day of May, 1997, before me personally came Theodore C. Losee, Sr., to me known, who, being by me duly sworn, did depose and say that he resides in Hyde Park, New York; that he is the owner of Jones Septic, Inc., the company described in and which executed the above instrument.

Denise A. Morse
Notary Public

DENISE A. MORSE 4861262
Notary Public, State of New York
Qualified in Dutchess County
Commission Expires 3/23/99

WHITEMAN OSTERMAN & HANNA

ATTORNEYS AT LAW
ONE COMMERCE PLAZA
ALBANY, NEW YORK 12260

(518) 487-7600
FAX (518) 487-7777

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DATE: 3/24/99

TO: RUTH FRITSCH 914-735-7466

FROM: MARIA VILLA

MESSAGE: Thanks

Type Machine: FUJITSU DEX 730

TOTAL PAGES SENT (including cover sheet):

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Original will follow: ____ ***No*** ____ ***by U.S. Mail*** ____ ***by Federal Express***

ATTACHMENT A

GRANT OF EASEMENT AND DECLARATION OF RESTRICTIVE COVENANTS

This GRANT OF EASEMENT (the "Grant") and DECLARATION OF RESTRICTIVE COVENANTS (the "Declaration"), dated _____________, 1999 is made by THEODORE LOSEE (the "Grantor"), to ALFA LAVAL INC., ("Alfa Laval"), a corporation performing remediation of property described below.

WITNESSETH

WHEREAS, the Grantor is the owner of certain real property located at Cardinal Road, Town of Hyde Park, Dutchess County, New York (the "Property"), as more particularly described in the legal description of the Property contained in the attached Exhibit 1; and

WHEREAS, the Property is the location of the Jones Sanitation Superfund Site, which was listed on the United States Environmental Protection Agency's National Priorities List ("NPL") of Inactive Hazardous Waste Disposal Sites, in _____ (See, ___ Fed. Reg. ______, ___________); and

WHEREAS, Alfa Laval has entered into Administrative Orders on Consent with the EPA under which Alfa Laval has agreed to perform a remedial investigation/feasibility study ("RI/FS") (Index #________________) and a removal action (Index #________________) (collectively, the "Remediation Efforts") at the Site; and

WHEREAS, Grantor desires to facilitate Alfa Laval's Remediation Efforts on the Site and to eliminate or minimize any potential risks that could occur as the result of the inappropriate use of the Property or of the groundwater beneath the Property.

NOW, THEREFORE, Grantor hereby provides for the following:

1. NOTICE

EPA has determined that hazardous substances are present at the Property. Certain uses or development of the Property may present a risk to the health and safety of individuals exposed to or involved in such development or use. Pursuant to Federal law, EPA has placed the Property on the National Priorities List, and is seeking to minimize the potential risks to health and safety that may be posed by the Property. The development and use restrictions established herein are so established in an effort to prevent potential adverse environmental and human health consequences which could result from exposure to hazardous substances which may continue to exist at or beneath the Property. Use of the Property in a manner contrary to the use and development restrictions set forth herein could result in adverse effects to human health and the environment. All rights in and to the Property are subject to the terms and conditions of this Declaration, as well as other unrecorded declarations. Use and development of the Property also is subject to applicable Federal, State and Local governmental laws relating to inactive hazardous waste disposal sites. All persons acquiring rights in or to the Property are advised to make appropriate inquiries of appropriate environmental and health government agencies.

2. GRANTS AND RESTRICTIVE COVENANTS

Grantor acknowledges that for good and valuable consideration of $1.00 paid by Alfa Laval, the receipt and sufficiency of which are hereby acknowledged, the Grantor hereby grants to Alfa Laval, its agents, contractors, subcontractors, employees, and designees, the easements, rights, obligations, covenants and restrictions set forth below in, over, under, across, upon and through the Property, the terms and conditions of which easements, rights, obligations, covenants and restrictions are also set forth below. This Grant is being accepted by Alfa Laval pursuant to CERCLA Section 104(j), 42 U.S.C. Section 9604(j).

(a) Remediation Easement. The easement granted hereunder (the "Remediation Easement") is the right and easement to perform in, over, under, across, upon and through the Property any and all necessary Remediation Efforts. Such activities shall include, but are not limited to, the construction, reconstruction, installation, use, alteration, maintenance, repair or replacement of material to form a permanent, impermeable cap (the "Permanent Cap Area") covering that portion of the Property necessary to carry out the Remediation Efforts, and of all structures necessary to protect the integrity of the permanent cap, including, without limitation, a permanent fence around the permanent cap.

The Remediation Easement shall also include the right of access to the Property and over the Property as needed in the exercise of the rights of Alfa Laval under this Grant and for purposes of inspecting the Property to ensure compliance with and fulfillment of this Grant. The right of access shall include, without limitation, the right to use existing ways, drives and curb cuts within the Property, as they may be relocated by the Grantor for reasons unrelated to the exercise of rights under this Grant from time to time.

(b) Retained Rights of Grantor. The Grantor shall retain all rights in the Property that are not inconsistent with the exercise of Alfa Laval's rights under the Remediation Easement or the restrictions provided for by Sections 2(d) and 2(e) below (the "Restrictions"). Where remediation areas overlap, the retained rights shall be limited to those not inconsistent with all of the remediation activities taking place within the overlapping area.

(c) Permanent Cap Area. With respect to the Permanent Cap Area, the Grantor shall retain any rights not inconsistent with (1) the construction, reconstruction, installation, use, maintenance, alteration, repair or replacement of material to form a permanent impermeable cap covering the Permanent Cap Area and of all structures constructed to protect the integrity of the permanent cap, including, without limitation, a permanent fence around the Permanent Cap Area, or (2) the Restrictions. Without limiting the generality of the foregoing, the Grantor shall not have access to the surface or subsurface of the Permanent Cap Area.

(d) Permanent Cap Area Restrictions/Institutional Controls. The Grantor shall not perform, suffer, allow or cause any person to perform any of the following activities in, over, under, across, upon or through the Permanent Cap Area:

(i) The Permanent Cap Area shall not be developed for residential use;

(ii) The Permanent Cap Area shall not be developed for non-residential use without prior approval as required by this Section 2. All plans for development of Permanent Cap Area for non-residential use shall be submitted to Alfa Laval for approval;

(iii) Groundwater underlying the Permanent Cap Area shall not be withdrawn for any purpose unless otherwise provided for by the Remediation Efforts. Groundwater supply wells shall not be installed on any part of the Permanent Cap Area;

(iv) Contaminated soil shall not be disturbed, except pursuant to a plan approved by Alfa Laval;

(v) The cap to be constructed over the Permanent Cap Area and other ground covering features of the Remediation Efforts shall not be disturbed or modified in any manner, and no action shall be taken which shall disturb in any manner the integrity of effectiveness of the permanent cap; and

(vi) No use or activity shall be permitted in, over, under, across, upon or through the Permanent Cap Area which will disturb any portion of the Remediation Efforts or which will prevent, disrupt or otherwise interfere with the construction, operation, alteration, reconstruction, use, maintenance, repair, replacement, monitoring or inspection of any portion of the Remediation Efforts implemented in, over, under, across, upon or through the Property, including, without limitation: the collection, containment, treatment and discharge of groundwater; the excavation, dewatering, storage, treatment and disposal of soils and sediment; the long-term monitoring of groundwater, surface water, soils and sediments; and the long-term monitoring of groundwater, surface water, soils and sediments; and the long-term operation, maintenance, monitoring and inspection of any portion of the Remediation Efforts.

The restrictions provided for by this Section 2(d) are collectively referred to herein as the "Permanent Cap Area Restrictions."

(e) Restrictions/Institutional Controls Outside Permanent Cap Area. The Grantor shall not perform, suffer, allow or cause any person to perform any of the following activities in, over, under, across, upon or through the property:

(i) Groundwater underlying the Property shall not be withdrawn for drinking water purposes, and drinking water wells shall not be installed on any part of the Property; and

(ii) Prior to any construction activity or other activity that would withdraw groundwater underlying the Property, the Grantor shall notify Alfa Laval and request the opportunity to consult with Alfa Laval with respect to conditions at the Site addressed by the Remediation Efforts.

The restrictions provided for by this Section 2(e) are collectively referred to herein as the "Remediation Area Restrictions."

(f) Certain Obligations of Grantee

(i) All activities implementing the Remediation Efforts shall be managed and supervised by government personnel and shall be performed in accordance with all applicable or relevant and appropriate standards, requirements, criteria or limitations under federal and state law ("ARARS").

(ii) The Grantee shall install a permanent fence around the perimeter of the permanent cap prior to or concurrently with the construction and installation of the permanent cap within the Permanent Cap Area. The Grantee will maintain the permanent cap and the fence.

(g) Assignment of Grant to the Department. The Grantor expressly acknowledges and agrees that Alfa Laval shall be entitled at any time or from time to time to assign all or any portion of the easements, rights, covenants, obligations and restrictions granted hereunder to EPA.

(h) Exercise of Rights. The Grantor acknowledges that any of Alfa Laval's rights hereunder may be exercised by Alfa Laval or by any one or more of Alfa Laval's agents, contractors, employees or other designees, which may include, without limitation, EPA and/or the United States Army Corps of Engineers. Alfa Laval also acknowledges that, in the event of assignment of this

Grant to EPA, any of Alfa Laval's rights hereunder may be exercised by EPA as assignee of Alfa Laval or by any one or more of EPA's agents, contractors, employees or other designees, which may include, without limitation, the United States Army Corps of Engineers and any of their agents, contractors or employees.

3. SEVERABILITY

If any court or other tribunal determines that any provision of this instrument is invalid or unenforceable, such provision shall be deemed to have been modified automatically to conform to the requirements for validity and enforceability as determined by such court or tribunal. In the event the provision invalidated is of such a nature that it cannot be so modified, the provision shall be deemed deleted from this instrument as though it had never been included herein. In either case, the remaining provisions of this instrument shall remain in full force and effect.

If a question arises under State or local law relating to the enforceability of the restrictive covenants contained herein, Alfa Laval may require Grantor, its successors and assigns, to enter into and record a Declaration of Restrictions which amends the language so that it is enforceable under State and local law.

4. RIGHTS AND REMEDIES

Each party shall have any and all remedies available at law or in equity for any violation or breach of the terms and conditions of this Grant and/or Declaration by any other party. All of such remedies shall be deemed cumulative and not exclusive. Nothing in this Grant and/or Declaration shall waive or limit any rights or powers of Alfa Laval under any constitution, statute, ordinance, regulation, order or other source of governmental authority existing from time to time.

5. PROVISIONS TO RUN WITH THE LAND; SUCCESSORS AND ASSIGNS

This Grant and Declaration set forth easements, rights, obligations, agreements, liabilities and restrictions upon and subject to which the Property shall be improved, held, used, occupied, leased, sold, hypothecated, encumbered or conveyed. The easements, rights, obligations, agreements, liabilities and restrictions herein set forth shall run with the Property, as applicable thereto, and any portion thereof and shall inure to the benefit of and be binding upon the Grantor and Alfa Laval and all parties claiming by, through or under the grantor or the Grantee, respectively. It is acknowledged and intended that these rights shall be rights in gross and not appurtenant to any land of Alfa Laval, and shall be binding upon the Grantor and all parties claiming by, through or under the Grantor. The rights hereby granted to Alfa Laval, its successors and assigns, constitute the perpetual (subject to release as provided in Section 2 above) right to Alfa Laval, its successors and assigns to enforce this Grant and Declaration, and the Grantor hereby covenants for the Grantor and the Grantor's executors, administrators, heirs, successors and assigns to stand seized and hold title to the Property, or any portion thereof, subject to this Grant and Declaration, provided, however, that a violation of this Grant and/or Declaration shall not result in a forfeiture or reversion of the grantor's title to the Property or any portion thereof. Without limiting the generality of the foregoing, Alfa Laval may assign Alfa Laval's rights hereunder in whole or in part from time to time.

Grantor shall ensure that assignees, successors in interest, lessees, and sublessees of the Property shall provide the same access and cooperation during the term of this Grant and Declaration. Grantor shall cause any lease, grant or other transfer of an interest in the Property to include a provision requiring the lessee, grantee, or transferee to comply with this requirement.

Grantor shall ensure that a copy of this Grant and Declaration is provided to any current lessee or sublessee on the Property as of the effective date of this Grant and Declaration and shall ensure that any subsequent leases, subleases, assignments or transfers of the Property or an interest in the Property are consistent with this Grant and Declaration. In the event of any subsequent leases, subleases, assignments or transfers of the Property or an interest in the Property, notice shall be sent to Alfa Laval ninety (90) days prior to the event.

6. CONCURRENCE PRESUMED

It being agreed that the Grantor and all parties claiming by, through or under the Grantor shall be deemed to be in accord with the provisions herein set forth and to agree for and among themselves and any party claiming by, through or under them, and their respective agents, contractors, subcontractors and employees, that the terms and conditions of this Grant and Declaration herein established shall be adhered to and not violated and that their respective interests in the Property shall be subject to the provisions herein set forth .

7. JOINT AND SEVERAL OBLIGATIONS; MISCELLANEOUS

If the Grantor consists of more than one person or entity, the obligations of those person(s) and entity(ies) as the Grantor hereunder shall be joint and several, and if Alfa Laval consists of more than one person or entity, the rights of those person(s) and entity(ies) as Alfa Laval hereunder shall also be joint and several. This instrument may be executed in any number of counterparts, which together shall constitute one and the same instrument, and in the event this instrument is so signed in counterparts, it shall be deemed executed by all parties when each party hereto has executed at least one of such counterparts.

8. AMENDMENT

This Grant may be amended by written agreement of the parties, and any such amendment shall be recorded and/or registered with the Dutchess County Clerk's Office within 30 days of the date of having received from Alfa Laval said amendment as approved by Alfa Laval and mailed to the Grantor by certified mail, return receipt requested.

9. TERM

The easements, rights, obligations, covenants and restrictions established by this Grant and Declaration shall run in perpetuity, except as otherwise expressly provided herein, and unless and until released by Alfa Laval.

IN WITNESS WHEREOF, Grantor hereto has executed this Grant and Declaration on the day and date first above written.

THEODORE LOSEE

By: __________________________ Date:________________
Theodore Losee

APPENDIX F

EXCERPT FROM ECOLOGICAL RISK ASSESSMENT (ERA)

Recreation – The wetlands were ranked "low" for social significance because the site is posted by the Crum Elbow Sportsmen's Association. Utilization of the site for the one identified recreational use (hunting) appears to be minimal.

In summary, the results of the WET analysis shows that the wetlands on the Jones Sanitation site possess no unique characteristics of social significance though they provide floodflow alteration and wildlife habitat. The Jones Sanitation site is located in an area with fairly extensive forested wetlands all draining to the Hudson River. While it is unlikely that the proposed closure and capping plan will disturb the wetlands and thus require the preparation of a mitigation program, the identified values, if compromised, could be addressed in a mitigation and monitoring program and successfully restored. The lack of a fishery resource, endangered or threatened plant or wildlife species, or of a significant recreational resources on the site would all facilitate the preparation and execution of a mitigation program, if required.

5.0 ECOLOGICAL RISK ASSESSMENT (ERA) UPDATE

5.1 Comparison of 1999 Sampling Results to the 1994 ERA

LMS collected surface water and sediment samples at six locations on 24 March 1999 as illustrated in Figure 3. This section provides a summary of the findings in the previous ERA, the results of the 1999 sampling, an assessment of the ecological risk based on the 1999 data and the applicable regulatory criteria, and comparisons to the previous findings. The field sampling data sheets, chain of custody forms, and the analytical results are presented in Appendix B.

The 1994 ERA concluded that while 59 contaminants of concern were identified at the Jones Sanitation site, only eight metals represented a potential ecological risk to receptors indigenous to the site. Three metals (cadmium, iron, and manganese) were believed to represent a low risk to benthic receptors in one or both of the streams. All three were within the established background concentrations. Six metals were judged to represent either a moderate (cadmium, lead, and mercury) or high (copper, silver, and zinc) ecological risk to terrestrial plants in the immediate vicinity of the waste disposal area. The ecological risk of on-site contaminants of concern to water column receptors and terrestrial wildlife indigenous to the site was judged to be negligible.

5.2 Field Sampling Locations and Observations

The six locations sampled by LMS in 1999 correspond to sites previously sampled by ChemCycle in 1995. LMS sample SW-1, located at the south property boundary on the Maritje Kill, corresponds to ChemCycle sample S-5. LMS sample SW-2, located at the confluence of the Maritje Kill with a drainage course from the site storm drain, corresponds to ChemCycle sample S-4. LMS sample SW-3, located near the discharge of a storm drain from the site, corresponds to ChemCycle sample SG-1. LMS sample SW-4, located near the east property boundary, corresponds to ChemCycle sample S-1. LMS sample SW-5, located on the upstream side of Cardinal Road where the unnamed tributary exits the site, corresponds to ChemCycle sample S-9. LMS sample SW-6, located on Cardinal Road where the unnamed tributary enters the site, corresponds to ChemCycle sample S-6. A blind duplicate sample (labeled SW-7) was collected at sampling site SW-3; and the matrix spike and matrix spike duplicate samples were collected at sampling site SW-5 by Cardinal Road. LMS Samples SW-4 and SW-6 were intended to represent background or ambient condition upgradient of the waste disposal area. Sampling site SW-5 was downstream of the only location where a fish (redfin pickerel, a predator) was observed. Results from this site were critical to the ERA update to document any contaminants potentially capable of food chain transfer.

Both streams were flowing at the time of sampling; the water was clear at all the sampling points with the exception of site SW-3. The surface water sample here had a brownish tinge. The sediments at Sampling sites SS - 2, 4, and 6 were comprised of sands, clay and/or gravel with little organic matter discernable. The sediments at SS-3 (and blind duplicate SS-7) were comprised of a greater amount of organic matter than the abovementioned stations. Organic material (pieces of wood) were visible in the sediments at site SS-1. The sediments at SS-5 were comprised entirely of a black silty organic muck. Numerous cans, bottles, and a rusted automobile muffler were present in the pool upstream of Cardinal Road where sample SS-5, the matrix spike, and the matrix spike duplicate were collected.

5.3 Analytical Results

The 1999 sediment and surface water analytical results are presented in Tables 1 through 7. Consistent with the 1994 CDR ERA, an average sitewide hardness of 150 mg/l was used to calculate the appropriate surface water standards for the site. NYSDEC Class B water quality standards (NYSDEC Ambient Water Quality Standards and Guidance Values, June 1998), where available, were used to determine contraventions of applicable water quality criteria. The 1993 NYSDEC document "Technical Guidance for Screening Contaminated Sediments" was used to identify, where available, the Lowest Effect Level (LEL) and Severe Effect Level (SEL) for the metals analyzed (Table 7) at the site.

No volatile organic compounds (Table 2) were detected in any of the surface water samples. The one semivolatile organic compound detected (Table 3) in the surface water, bis[2-Ethylhexyl] phthalate, is a common laboratory contaminant. The metals analysis for surface water (Table 4) indicated no contraventions of applicable water quality criteria. Consistent with the findings in the 1994 ERA, the site surface waters do display elevated levels of calcium and sodium. Compared to the observed background levels (Samples SW-4 and 6), the levels of barium, calcium, magnesium, manganese, and potassium were higher at Sampling site SW-3 (and blind duplicate SW-7) collected at the base of the fill pile where the iron bacteria and small algae bloom were noted. With the exception of potassium at Sampling site SW-2, all of the abovementioned metals had dropped to levels comparable with or below the background levels where the tributary ditch joined the Maritje Kill (SW-2) or on the Maritje Kill at the downstream boundary of the site (SW-1).

The total organic carbon levels (Table 1) ranged from 5,000 mg/kg at upgradient site SS-6 to 357,000 mg/kg at downgradient site SS-1. The highest total solids level (74.2%) was reported at upgradient site SS-6; the lowest level (17.4%) was reported at downgradient site SS-5 where the substrate was predominantly an organic muck. The three volatile organic compounds reported (Table 5; chloromethane, acetone, and 2-Butanone) are common laboratory contaminants; though acetone was detected in the Maritje Kill during the 1994 site studies. No semivolatile organic compounds (Table 6) were reported in the sediments at levels above the quantitation limit or above the applicable sediment criteria. No semivolatiles were detected at the upgradient site (SS-4) or the two downgradient sites on the Maritje Kill (SS-1 and 2). The highest levels of semivolatiles were found in the upgradient sample (SS-7) on the unnamed tributary.

The reported levels of metals (Table 7) were comparable to the findings in the 1994 ERA. Two metals, iron (at upgradient site SS-6) and manganese (also at upgradient site SS-6 and downgradient site SS-5) were reported at levels above the threshold for severe effects (SEL). In both cases the levels are believed to be reflective of ambient or background conditions and not due to site-generated contaminants. The 1994 ERA reached the same conclusion for these two metals. The following metals were reported above the lowest effects level (LEL): arsenic (SS-5 and 6), cadmium (SS-5), copper (SS-2, 3, 5, 6, and 7), iron (all but SS-6), lead (SS-3, 5, and 7), manganese (all but SS-5 and 6), nickel (all sampling sites) and zinc (all sites but SS-1 and 4). Only cadmium and lead were reported above the LEL at downgradient locations and not at one or both upgradient sites. These two metals are the only ones, based on the 1999 data, that are believed to be attributable to the Jones Sanitation site and to have a minimal potential for impacts on aquatic life. The 1994 ERA reached the same conclusion regarding cadmium. The lead level observed at SS-5 was significantly higher than the mean concentrations (41 and 28 mg/kg in the Maritje Kill and the unnamed tributary, respectively) reported in the 1994 CDR study. It is probable that the lead levels observed at SW-5 were partially due to road runoff and the presence of metal debris, particularly the automobile muffler, found in the pool where the sample was collected. Lead was not detected in the surface water sample collected at this location.

5.4 Discussion and Further Recommendations

Based on the site observations and the results of the sampling effort, no further ecological risk assessment work is recommended at the Jones Sanitation site. No site-related stress on vegetation, fish, or wildlife was observed or previously documented. Ecological risk to potential aquatic and terrestrial wildlife from the identified contaminants of concern on the site is judged to be negligible. The risk of contaminant transfer to fish or to wildlife via fish is minimal due to the lack of fish in the Maritje Kill and the very low fish biomass in the unnamed tributary. The near-absence of fish resources on the site, lack of critical habitats for endangered or threatened species, or evidence of off-site transport of site-generated chemicals in excess of applicable criteria preclude the need for further assessment.

The anticipated closure program at the Jones Sanitation site is not expected to cause a loss or impairment of existing wetland functions to the point where a mitigation program is warranted This assumption will be verified when the capping and closure program plan is completed. The apparent absence of widespread disposal within the wetlands or evidence of continuing widespread discharge of leachate into the wetlands precludes the need to extend the capping effort into the wetlands. The only identified potential impact of the proposed closure plan upon the wetlands is a slight increase in the extent and duration of inundation/saturation due to the increased rate and volume of surface runoff from the capped area to the wetlands.

TABLE 1

SURFACE WATER AND SEDIMENT DATA SUMMARY (24 MARCH 1999)
JONES SANITATION
Hyde Park, New York

19-May-99

	JS-SW-1	JS-SW-2	JS-SW-3	JS-SW-4*	JS-SW-5	JS-SW-6*	JS-SW-7^{x}	FB-SW
CONVENTIONALS:								
Alkalinity (mg/l)	50	68	180	48	88	82	174	<1

	JS-SS-1	JS-SS-2	JS-SS-3	JS-SS-4*	JS-SS-5	JS-SS-6*	JS-SS-7^{x}
CONVENTIONALS:							
Total Organic Carbon (TOC) (mg/kg)	357,000	51,700	89,100	27,000	184,000	5,000	91,000
Total Solids (%)	53.5	38.7	32.0	56.1	17.4	74.2	32.8

x - Sample JS-SW-7 is a blind duplicate of sample JS-SW-3, and sample JS-SS-7 is a blind duplicate of sample JS-SS-3.
* - Background (upstream) site.

DRAFT, Not Validated

19-May-99

TABLE 2

SURFACE WATER DATA SUMMARY (24 MARCH 1999)

JONES SANITATION
Hyde Park, New York

PARAMETER	JS-SW-1	JS-SW-2	JS-SW-3	JS-SW-4*	JS-SW-5	JS-SW-6*	JS-SW-7x	FBSS	FBSW	CLASS B [1] STANDARD (µg/l)
VOLATILE ORGANICS (µg/l)	ND	ND	ND	ND	ND	ND	ND	ND	ND	N/A

x - Sample JS-SW-7 is a blind duplicate of sample JS-SW-3.
* - Background (upstream) site.
1 - NYSDEC Ambient Water Quality Standards and Guidance Values Document, June 1998.
N/A - Not available or applicable.
ND - Not detected at analytical detection limit.

TABLE 3

19-May-99

SURFACE WATER DATA SUMMARY (24 MARCH 1999)
JONES SANITATION
Hyde Park, New York

PARAMETER	JS-SW-1	JS-SW-2	JS-SW-3	JS-SW-4*	JS-SW-5	JS-SW-6*	JS-SW-7^{x}	FB-SW	FB-SS	CLASS B[1] STANDARD (µg/l)
SEMIVOLATILE ORGANICS (µg/l)										
bis(2-Ethylhexyl)phthalate	ND	1 j b	0.6 j b	ND	ND	ND	0.6 j b	ND	ND	0.6

x - Sample JS-SW-7 is a blind duplicate of sample JW-SW-3.
* - Background (upstream) site.
j - Estimated concentration; compound present below quantitation limit.
b - Value is less than the contract-required detection limit but greater than the instrument detection limit.
ND - Not detected at analytical detection limit.
1 - NYSDEC Ambient Water Quality Standards and Guidance Values Document, June 1998.

TABLE 4

SURFACE WATER DATA SUMMARY (24 MARCH 1999)

JONES SANITATION
Hyde Park, New York

19-May-99

PARAMETER	JS-SW-1	JS-SW-2	JS-SW-3	JS-SW-4*	JS-SW-5	JS-SW-6*	JS-SW-7^{x}	FBSS	FBSW	CLASS B $^{(1)}$ STANDARD (µg/l)
METALS (µg/l)										
Aluminum	28.8 B	ND	18.6 B	ND	21.4 B	41.1 B	27.2	ND	ND	100
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	3 $^{(4)}$
Arsenic	ND	3.7 B	ND	4.4 B	ND	ND	ND	ND	ND	150
Barium	6.8 B	9.4 B	26.6 B	6.8 B	10.7 B	9.7 B	27.9 B	ND	ND	1000 $^{(4)}$
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	3 $^{(4)}$
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.88 $^{(3)}$
Calcium	27,000	33,300	72,600	27,100	43,800	42,800	73,700	ND	ND	150,000 $^{(2)}$
Chromium	ND	ND	ND	ND	ND	ND	ND	ND	ND	11
Cobalt	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
Copper	ND	ND	ND	4.2 B	ND	ND	1.0 B	ND	ND	12.66 $^{(3)}$
Iron	32.9 B	18.5 B	118	24.9 B	71.8 B	117	102	ND	23.5 B	300
Lead	1.0 B	ND	ND	ND	ND	ND	ND	ND	ND	5.87 $^{(3)}$
Magnesium	2,560 B	3,430 B	7,860	2,630 B	3,400 B	3,170 B	7,920	ND	ND	150,000 $^{(2)}$
Manganese	5.2 B	14.4 B	94.5	2.7 B	20.3	39.3	94.1	ND	ND	300 $^{(4)}$
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.77 $^{(4)}$
Nickel	2.5 B	1.6 B	2.1 B	2.2 B	ND	ND	1.7 B	ND	ND	73.29 $^{(3)}$
Potassium	391 B	669 B	1,710 B	478 B	666 B	594 B	1,740 B	ND	ND	N/A
Selenium	2.3 B	ND	ND	ND	ND	ND	ND	ND	ND	4.6
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1
Sodium	13,900	13,600	9,970	15,200	12,700	11,500	10,000	ND	ND	20,000 $^{(4)}$
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND	8
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND	ND	14
Zinc	3.6 B	3.0 B	4.7 B	3.7 B	3.2 B	2.5 B	3.2 B	2.1 B	3.3 B	116.63 $^{(3)}$
Cyanide	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.2

x - Sample JS-SW-7 is a blind duplicate of sample JS-SW-3.
* - Background (upstream) site.
B - Value is less than the contract-required detection limit but greater than the instrument detection limit.
ND - Not detected at analytical detection limit.
N/A - Not available.
1 - NYSDEC Ambient Water Quality Standards and Guidance Values Document, June 1998.
2 - Report, CDR, March 1994: Hardness = 150 ppm.
3 - Calculated Standard based on equation for Type A (C) waters.
4 - Class GA standard applied.

DRAFT, Not Validated

19-May-99

TABLE 5

SEDIMENT DATA SUMMARY (24 MARCH 1999)

JONES SANITATION
Hyde Park, New York

PARAMETER	JS-SS-1	JS-SS-2	JS-SS-3	JS-SS-3RE	JS-SS-4*	JS-SS-5	JS-SS-6*	JS-SS-7^x	JS-SS-7RE	SEDIMENT CRITERIA[1]
VOLATILE ORGANICS (mg/kg)										
Chloromethane	ND	ND	ND	ND	ND	0.008 j	ND	ND	ND	N/A
Acetone	ND	0.016 j	ND	ND	ND	0.420	ND	ND	ND	N/A
2-Butanone	ND	ND	ND	ND	ND	0.160	ND	ND	ND	N/A

x - Sample JS-SS-7 is a blind duplicate of sample JS-SS-3.
* - Background (upstream) site.
1 - NYSDEC Technical Guidance for Screening Contaminated Sediments, November 1993.
b - Value is less than the contract-required detection limit but greater than the instrument detection limit.
N/A - Not available or applicable.
ND - Not detected at analytical detection limit.
RE - Reanalysis.

DRAFT, Not Validated

19-May-99

TABLE 6

SEDIMENT DATA SUMMARY (24 MARCH 1999)

JONES SANITATION
Hyde Park, New York

PARAMETER	JS-SS-1	JS-SS-2	JS-SS-3		JS-SS-4*	JS-SS-5		JS-SS-6*		JS-SS-7*		SEDIMENT CRITERIA [1] (µg/g OC)
	mg/kg	mg/kg	mg/kg	µg/g OC	mg/kg	mg/kg	µg/g OC	mg/kg	µg/g OC	mg/kg	µg/g OC	
SEMIVOLATILE ORGANICS												
Acenaphthylene	ND	ND	ND	ND	ND	ND	ND	0.024 j	4.800	ND	ND	140 (E)
Fluorene	ND	ND	ND	ND	ND	ND	ND	0.034 j	6.800	ND	ND	N/A
Phenanthrene	ND	ND	ND	ND	ND	0.100 j	0.5435	0.340 j	68.000	ND	ND	120 (E)
Anthracene	ND	ND	ND	ND	ND	ND	ND	0.030 j	6.000	ND	ND	N/A
Fluoranthene	ND	ND	0.080 j	0.898	ND	0.230 j	1.250	0.320 j	64.000	0.076 j	0.835	1020 (E)
Pyrene	ND	ND	0.083 j	0.932	ND	0.190 j	1.033	0.360 j	72.000	0.081 j	0.890	N/A
Benzo(a)anthracene	ND	ND	ND	ND	ND	0.100 j	0.543	0.170 j	34.000	ND	ND	N/A
Chrysene	ND	ND	0.066 j	0.741	ND	0.130 j	0.707	0.200 j	40.000	0.059 j	0.648	N/A
bis(2-Ethylhexyl)phthalate	ND	ND	0.057 j	0.640	ND	0.150 j	0.815	0.026 j	5.200	0.068 j	0.747	199.5
Benzo(b)fluoranthene	ND	ND	0.056 j	0.629	ND	0.160 j	0.870	0.098 j	19.600	0.063 j	0.692	N/A
Benzo(k)fluoranthene	ND	ND	0.071 j	0.797	ND	0.180 j	0.978	0.140 j	28.000	0.060 j	0.659	N/A
Indeno (1,2,3-cd) anthracene	ND	ND	ND	ND	ND	ND	ND	0.038 j	7.600	ND	ND	N/A
Benzo(a)pyrene	ND	ND	0.052 j	0.584	ND	0.120 j	0.652	0.150 j	30.000	0.052 j	0.571	N/A
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	ND	ND	0.056 j	11.200	ND	ND	N/A

x - Sample JS-SS-7 is a blind duplicate of sample JS-SS-3.
* - Background (upstream) site.
j - Estimated concentration; compound present below quantitation limit.
1 - Technical Guidance for Screening Contaminated Sediments, NYSDEC, November 1993.
E - EPA proposed sediment quality criterion for the protection of benthic organisms.
N/A - Not available.
ND - Not detected at analytical detection limit.

19-May-99

TABLE 7

SEDIMENT DATA SUMMARY (24 MARCH 1999)

JONES SANITATION

Hyde Park, New York

PARAMETER	JS-SS-1	JS-SS-2	JS-SS-3	JS-SS-4*	JS-SS-5	JS-SS-6*	JS-SS-7[x]	SEDIMENT CRITERIA[1] LEL (mg/kg)	SEL (mg/kg)
METALS (mg/kg)									
Aluminum	15,000	18,700	18,600	15,200	9,080	14,200	19,800	N/A	N/A
Antimony	ND	ND	ND	ND	ND	ND	ND	2.0	25.0
Arsenic	5.1	0.97 B	ND	3.4 B	7.4 B	9.4	1.4 B	6.0	33.0
Barium	111	134	122	75.8	171	276	126	N/A	N/A
Beryllium	0.62 B	0.81 B	0.78 B	0.52 B	ND	ND	0.79 B	N/A	N/A
Cadmium	ND	ND	0.39 B	ND	1.2 B	ND	0.27 B	0.6	9.0
Calcium	4,450	7,310	9,000	3,850	13,500	2,670	8,540	N/A	N/A
Chromium	16.0	19.0	19.2	16.0	12.2	18.4	20.0	26.0	110.0
Cobalt	9.7 B	8.5 B	6.9 B	9.2 B	11.8 B	15.0	6.8 B	N/A	N/A
Copper	15.3	19.6	42.1	13.6	43.9	45.1	40.6	16.0	110.0
Iron	34,100 (3.4%)	26,500 (2.7%)	23,000 (2.3%)	26,200 (2.6%)	34,300 (3.4%)	41,900 (4.2%)	23,300 (2.3%)	2.0%	4.0%
Lead	23.4	26.3	48.5	22.6	87.4	19.9	46.2	31.0	110.0
Magnesium	4,340	5,250	4,950	4,790	2,930 B	7,130	5,060	N/A	N/A
Manganese	773	520	521	668	2,090	5,580	483	460.0	1100.0
Mercury	ND	ND	ND	ND	ND	ND	ND	0.15	1.3
Nickel	18.9	22.0	22.2	20.7	19.1 B	29.5	22.4	16.0	50.0
Potassium	715 B	859 B	982 B	765 B	670 B	617 B	991 B	N/A	N/A
Selenium	1.4 B	2.8	3.0	1.6 B	5.8	1.8	2.3	N/A	N/A
Silver	0.75 B	ND	0.77 B	ND	ND	ND	0.99 B	1.0	2.2
Sodium	145 B	171 B	120 B	133 B	411 B	76.2 B	183 B	N/A	N/A
Thallium	1.9 B	1.5 B	ND	1.1 B	4.9 B	8.1	1.8 B	N/A	N/A
Vanadium	18.9	19.1 B	20.9 B	17.7	32.7 B	19.3	22.0	N/A	N/A
Zinc	106	129	153	95.8	248	160	154	120.0	270.0
Cyanide	ND	ND	ND	ND	ND	ND	ND	N/A	N/A

x - Sample JS-SS-7 is a blind duplicate of sample JS-SS-3.
* - Background (upstream) site.
1 - NYSDEC Technical Guidance for Screening Contaminated Sediments, November 1993.
LEL: Lowest Effect Level
SEL: Severe Effect Level
B - Value is less than the contract-required detection limit but greater than the instrument detection limit.
N/A - Not available or applicable.
ND - Not detected at analytical detection limit.