



US Army Corps of Engineers
New England Division

CLOSE-OUT REPORT

**SHEPLEY'S HILL LANDFILL
FORT DEVENS, MASSACHUSETTS**

Prepared under
CONTRACT NO. DACW33-94-D-0007
Delivery Order 0003

MARCH 1996



Stone & Webster Environmental
Technology & Services

CLOSE-OUT REPORT

SHEPLEY'S HILL LANDFILL FORT DEVENS, MASSACHUSETTS

Prepared for:

Department of the Army
Corps of Engineers, New England Division
Waltham, Massachusetts

Prepared by:

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Project No. 05000.03

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1.0 CERTIFICATION

The information herein represents, to the best of our knowledge, the as-built conditions that currently exist at Shepley's Hill Landfill at Fort Devens. Each phase of the landfill closure was executed through contracts which included detailed technical specifications pertaining to the various activities associated with the closure operations. These specifications contained requirements for contractor Quality Assurance/Quality Control as well as mandatory inspections by both membrane vendor representatives and Fort Devens personnel. The combination of comprehensive technical specifications, reputable membrane vendors and installers, and constant monitoring by Fort Devens personnel lends credence to the assumption that the entire closure was properly accomplished.

Additionally, from a review of this available information it appears that each landfill phase was closed in general conformance with the plans approved by MADEP in 1985 and the Massachusetts state regulations in effect at the time of the individual closures.

2.0 EXECUTIVE SUMMARY

This Close-Out Report (COR) has been prepared to document, based on available information, the closure of Shepley's Hill Landfill (SHL) at Fort Devens, Massachusetts. This COR has been prepared for the U.S. Army Corps of Engineers (USACOE), New England Division (NED), by Stone & Webster Environmental Technology & Services (Stone & Webster), under Contract DACW33-94-D-0007, Delivery Order No. 3.

In an effort to mitigate the potential for off-site contaminant migration, Fort Devens initiated the Fort Devens Sanitary Landfill Closure Plan in 1984, in accordance with Massachusetts regulation 310 CMR 19.00. The plan was approved by the Massachusetts Environmental Protection (MADEP) in 1985. Fort Devens began the process of closing and covering the landfill in 1986 which was completed in 1993. However, acceptance of the administrative closure by MADEP is not documented.

Fort Devens was placed on the National Priorities List (NPL) effective December 21, 1989. A Final Remedial Investigation (RI) and Final Feasibility Study (FS) have been completed for SHL in accordance with CERCLA. The RI was conducted by Ecology and Environment, Inc. (E&E) and an RI Addendum to further characterize the site was prepared by ABB Environmental Services (ABB-ES) under contract to the U.S. Army Environmental Center (AEC). The FS and Proposed Plan were prepared by ABB-ES for the AEC. The Proposed Plan and Record of Decision (ROD) are ongoing at this time.

Stone & Webster has performed a records search on behalf of the Army to gather information necessary to document previous closure efforts. Stone & Webster has reviewed and collected information from the Fort Devens files, MADEP Division of Solid Waste Management files, and MADEP Bureau of Waste Site Cleanup files. Stone & Webster also contacted contractors responsible for the closure phases as well as Army personnel responsible for inspecting the construction activities. The as-built conditions of the landfill were compared with the regulations in place at the time of each of the closure phases. Visual and topographic surveys of SHL were conducted to assess the current conditions and identify areas that currently require improvement.

Based on the review of available documentation and the visual survey of the as-built conditions of SHL, the closure of the landfill was in general conformance with the design plans approved by MADEP in 1985, and that the closure meets the intent of the regulations in effect at the time of the phased closure operations.

A Proposed Plan to address groundwater contamination and landfill maintenance and monitoring at SHL has been drafted. However, prior to the signing of the ROD, the SHL Close Out Report must be formatted in accordance with the MADEP administrative closure requirements.

There are minor deficiencies in the existing condition of the landfill which are not considered significant, but which must be corrected in the near term to restore the cap to its optimum

design. The cap improvement and future landfill monitoring and maintenance activities will be conducted in accordance with the Proposed Plan and forthcoming ROD.

As stated in the final FS, groundwater monitoring is proposed to monitor groundwater quality at SHL, and to assess future environmental impacts. Monitoring locations and analytical parameters have been established, and detailed plans for long-term groundwater monitoring will be developed as part of the CERCLA process.

3.0 INTRODUCTION

This Close-Out Report (COR) has been prepared to document, based on available information, the closure of Shepley's Hill Landfill (SHL) at Fort Devens, Massachusetts. This COR has been prepared for the U.S. Army Corps of Engineers (USACOE), New England Division (NED), by Stone & Webster Environmental Technology & Services (Stone & Webster), under Contract DACW33-94-D-0007, Delivery Order No. 3.

Stone & Webster has performed a records search on behalf of the Army to gather information necessary to document previous closure efforts at SHL. Stone & Webster has reviewed and collected information from the Fort Devens files, Massachusetts Department of Environmental Protection (MADEP) Division of Solid Waste Management files, and MADEP Bureau of Waste Site Cleanup files. Stone & Webster has contacted contractors responsible for the closure projects and attempted to obtain available information from these contractors. This report documents and provides the results of this effort. It identifies the construction requirements of the closure phases and compares them to the appropriate regulatory requirements. It provides the results of a review of the current conditions of the landfill and makes recommendations for improvements. Additionally, items to be included in a long-term maintenance and monitoring program are addressed. A copy of all pertinent information collected is included in Appendices A and B to this report.

4.0 BACKGROUND/HISTORY

4.1 GENERAL LANDFILL HISTORY

SHL encompasses approximately 84 acres in the northeast corner of the Main Post at Fort Devens. It is situated between the bedrock outcrop of Shepley's Hill on the west and Plow Shop Pond on the east (Figure 1). Nonacoicus Brook, which drains Plow Shop Pond, flows through a wooded wetland at the north end of the landfill. The southern end of the landfill borders the DRMO yard and a warehouse area. An area east of the landfill and south of Plow Shop Pond is the site of a former railroad roundhouse.

Review of the surficial geology map of the Ayer Quadrangle shows that in the early 1940s the active portion of the landfill consisted of approximately 5 acres near the end of Cook Street, near where monitoring well SHL-1 is located (see Figure 1). The fill was elongated north-south along a pre-existing small valley marked by at least two swamps (probably kettle holes) and lying between the bedrock outcrop of Shepley's Hill to the west and a flat-topped kame terrace to the east with an elevation of approximately 250 feet, adjacent to Plow Shop Pond (E&E, 1993). During the landfilling operation, the valley was obliterated, as was much of the kame terrace, which may have been used as cover material. Background information indicates the landfill formerly operated as an open burning site.

Landfill operations at Shepley's Hill Landfill began at least as early as 1917 and stopped as of July 1, 1992. During its last few years of use, the landfill received about 6,500 tons per year of household refuse, military refuse, and construction debris, and operated using the modified trench method (Biang, 1992). There is evidence that trenches in the northwest portion cut into previously used areas containing glass and spent shell casings. The glass dated from the mid-nineteenth century to as late as the 1920s. The approximate elevation of the bottom of the waste is estimated at 220 feet ASL at the north end of the landfill, and 225 feet ASL in the central and northeast portions of the landfill, based on pre-landfill surface contours. The maximum depth of the refuse is about 30 feet. The average thickness of waste is not documented; however, if the average thickness were 10 feet, the landfill volume would be over 1,300,000 cubic yards. Reports of flammable fluid disposal in the southeast portion of the landfill have not been substantiated by test pits or other research (Biang, 1992). The Army has no evidence that hazardous materials were disposed of in the landfill after November 19, 1980. No waste hot spots or hazardous waste disposal areas were identified during RI or supplemental RI activities (E&E, 1993, ABB-ES, 1993).

Fort Devens began the process of closing and covering the landfill in 1986. The capping was completed in four phases in accordance with the MADEP approved 1985 closure plan (see Figure 1). In Phase I, 50 acres were capped in 1985 and 1986; in Phase II, 15 acres were capped in 1987 and 1988; and in Phase III, 9 acres were capped in 1989. Phase IV closure of the last 10 acres was accomplished in two steps: Phase IV-A was closed in 1989 and 1990, and Phase IV-B was closed during 1992 and 1993.

4.2 REGULATORY BACKGROUND

Fort Devens initiated the Fort Devens Sanitary Landfill Closure Plan in 1984, in accordance with Massachusetts regulations 310 CMR 19.000. The plan, written by Gale Engineering, was approved by the MADEP in 1985. The closure approval was consistent with 310 CMR 19.00 and contained the following requirements:

1. Grading the landfill surface to a minimum 2 percent slope in nonoperational areas of the landfill and 3 percent in operational areas.
2. Removing waste from selected areas within 100 feet of the 100-year floodplain.
3. Installing an impermeable cap and covering the cap with sand, gravel, and loam, and seeding to provide cover vegetation and prevent erosion.
4. Installing a gas venting system.
5. Implementing a groundwater monitoring program based on sampling five existing monitoring wells every four months.

Because of the large area and shallow surface slope of the existing landfill, early phases of the landfill closure were completed with a 2 or 3 percent slope. Slopes were increased to 5 percent in Phase IV-B. Phases I through IV-A were capped with a 30-mil polyvinyl chloride (PVC) geomembrane overlain with a 12-inch drainage layer and 6-inch topsoil layer. At the request of MADEP, the Phase IV-B cap design was modified to a 40-mil PVC geomembrane, a 6-inch drainage layer, and a 12-inch topsoil layer. A landfill gas collection system consisting of 3-inch perforated gas-collection pipes bedded in a minimum 6-inch layer of 1×10^{-3} pervious material was installed beneath the PVC geomembrane in all closure phases. Gas vents were installed through the PVC geomembrane at 400-foot centers. With the exception of Phase I, a minimum 6-inch cushion/protection layer was maintained beneath the geomembrane. As requested by the U.S. Environmental Protection Agency (USEPA) and MADEP, four additional groundwater monitoring wells were installed in 1986 to supplement the five in the original groundwater monitoring program.

Fort Devens was placed on the National Priorities List (NPL) effective December 21, 1989. A Final Remedial Investigation (RI) and Final Feasibility Study (FS) have been completed for SHL in accordance with CERCLA. The RI was conducted by Ecology and Environment, Inc. (E&E) and an RI Addendum to further characterize the site was prepared by ABB Environmental Services (ABB-ES) under contract to the U.S. Army Environmental Center (AEC). The FS and Proposed Plan were prepared by ABB-ES for the AEC. The Proposed Plan and Record of Decision (ROD) are ongoing at this time.

Acceptance of the SHL administrative closure by MADEP is not documented. A Proposed Plan to address groundwater contamination and landfill maintenance and monitoring at SHL has been

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drafted. However, prior to the signing of the ROD, the SHL close-out report must be formatted in accordance with the MADEP administrative closure requirements.

5.0 AS-BUILT CONDITIONS

The following subsections detail the as-built conditions of each closure phase. Additional information is included in Appendices A and B of this report. This information has been taken from as-built drawings prepared for each of the phases and submitted to the MADEP. Some information has also been taken from the contract specifications written for each phase and documentation generated during the closure activities. Contractor information is contained in Table 1 at the end of this section.

5.1 PHASE I

The Phase I closure was constructed by Barson's Construction Company, Inc. of Schenectady, NY during 1985 and 1986. This phase was the largest of the phases and included approximately 50 acres at the northern end of the site. As part of this phase, refuse located in the northernmost portion of the landfill, within 100 ft of the 100 year floodplain, was removed and relocated elsewhere in the landfill. Surface drainage swales including grade stabilization structures were constructed along the western and eastern perimeters, and the catch basin and associated piping system at the southwest corner of the site was installed. A gas collection system consisting of 3 in. dia perforated piping on a 100 foot grid placed in a 100 foot grid in a pervious layer below the membrane, and eleven vents was also installed. The entire Phase I area, including the portions below the swales, was covered with a 30 mil PVC membrane manufactured by Watersaver Company and installed by the Wright & Kohli Construction Company, Inc. The finished grade elevations, contours, slopes, and vegetative cover for this phase are in general conformance with the MADEP approved plans.

Sheet 17 of 25 of the approved 1985 closure plans shows a leachate collection system which mostly likely would have been constructed as part of Phase II. However, this system was not installed on the advice of the original design Consultant, Gale Engineering, who stated in their closure design report of 1985 that this system was inappropriate for installation in the small operating area remaining.

5.2 PHASE II

The Phase II closure was constructed during 1987 and 1988 by WES Construction Company of Dedham, MA. This area consisted of approximately 15 acres located at the southeastern corner of the site. As part of this work, the rip-rapped drainage swale along the eastern perimeter discharging into Plow Shop Pond, as well as the swale located along the southern perimeter were constructed. Since because of a contract change order this swale was rip-rapped for its entire length, the concrete stabilization structure proposed for the end of the swale was eliminated. The emergency mobilization dump, and associated leachate collection and drainage systems, shown on the original 1985 drawings along the eastern side was never required and was therefore never built. This area was regraded at an approximate 2% slope to drain into the

adjacent swale. A gas collection system consisting of 3 in. dia perforated piping placed in a 100 foot grid in a previous layer below the membrane, and three vents was installed. The entire Phase II area was covered by a 30 mil PVC membrane manufactured by the Watersaver Company. The edges of the existing membrane adjacent to this phase were exposed and the new membrane was sealed to the existing membrane along its entire length. The finished grade elevations, contours, slopes, and vegetative cover are in general conformance with the MADEP approved plans.

5.3 PHASE III

The Phase III closure was constructed by ET&L Construction Co. of Stow, MA during 1989. This area consisted of approximately 9 acres located in the south-central portion of the site. The work consisted primarily of the closure activities since no drainage structures were included. A gas collection system consisting of 3 in. dia perforated piping placed in a 100 foot grid in a pervious layer below the membrane and two vents was installed. The entire Phase III area was covered by a 30 mil PVC membrane manufactured by the Watersaver Company, and installed by the Wright Lining and Construction Company. The edges of the existing membrane adjacent to this phase were exposed, and the new membrane was sealed to the exiting membrane along its entire length. The finished grade elevations, contours, slopes, and vegetative cover are in general conformance with the MADEP approved plans.

5.4 PHASE IVA

The Phase IVA closure was constructed by WES Construction Company of Dedham, MA during 1989 and 1990. This area consisted of approximately 3 acres located in the west-central portion of the site. The work consisted primarily of the closure activities since no drainage structures were included. A gas collection system consisting of 3 in. dia perforated piping placed in a 100 foot grid in a pervious layer below the membrane and one vent was installed. The entire Phase IVA area was covered by a 30 mil PVC membrane manufactured by the Watersaver Company, and installed by the Wright Lining and Construction Company. The edges of the existing membrane adjacent to this phase were exposed, and the new membrane was sealed to the existing membrane along its entire length. The finished grading, contours, slopes, and vegetative cover are in general agreement with the approved plans although the top of the high point is approximately four feet higher than that proposed, and some slopes are slightly steeper.

5.5 PHASE IVB

Phase IVB was the final phase of the landfill closure and was constructed by T.J. Battye Trucking Company during 1992 and 1993. This area consisted of approximately 6 acres located in the southwestern corner of the site. The work consisted primarily of the closure activities since no drainage structures were included. A gas collection system consisting of 3 in. dia perforated piping placed in a 100 foot grid in a pervious layer below the membrane and one vent was installed. The entire Phase IVB area was covered by a 40 mil PVC membrane manufactured and installed by Staff Industries. The edges of the existing membrane adjacent

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to this phase were exposed, and the new membrane was sealed to the existing membrane along its entire length. The finished grading, contours, slopes, and vegetative cover are in general agreement with the approved plans, although some slopes are slightly steeper than those proposed, but are not of concern.

TABLE 1
CONTRACTOR INFORMATION

PHASE I

Construction Contractor:	Barson's Construction Company
Location:	no longer in business
Point of Contact:	
Phone Number:	

Membrane Manufacturer:	Watersaver Company
Location:	Denver, Colorado
Point of Contact:	Jim Bartlett, representative
Phone Number:	(908) 566-2252

Membrane Installation Contractor:	Wright & Kohli Construction Company
Location:	The Waterlands, Texas
Point of Contact:	Steve Wright
Phone Number:	(713) 367-1941

PHASE II

Construction Contractor:	WES Construction Company
Location:	Dedham, Massachusetts
Point of Contact:	Stephen Vogel
Phone Number:	(617) 326-4030

Membrane Manufacturer:	Watersaver Company
Location:	Denver, Colorado
Point of Contact:	Jim Bartlett, representative
Phone Number:	(908) 566-2252

Membrane Installation Contractor:	Wright & Kohli Construction Company
Location:	The Waterlands, Texas
Point of Contact:	Steve Wright
Phone Number:	(713) 367-1941

TABLE 1 (Cont)**PHASE III**

Construction Contractor:	ET&L Construction Company
Location:	Stow, Massachusetts
Point of Contact:	Gary Balboni
Phone Number:	(508) 897-4353
Membrane Manufacturer:	Watersaver Company
Location:	Denver, Colorado
Point of Contact:	Jim Bartlett, representative
Phone Number:	(908) 566-2252
Membrane Installation Contractor:	Wright & Kohli Construction Company
Location:	The Waterlands, Texas
Point of Contact:	Steve Wright
Phone Number:	(713) 367-1941

PHASE IVA

Construction Contractor:	WES Construction Company
Location:	Dedham, Massachusetts
Point of Contact:	Stephen Vogel
Phone Number:	(617) 326-4030
Membrane Manufacturer:	Watersaver Company
Location:	Denver, Colorado
Point of Contact:	Jim Bartlett, representative
Phone Number:	(908) 566-2252
Membrane Installation Contractor:	Wright & Kohli Construction Company
Location:	The Waterlands, Texas
Point of Contact:	Steve Wright
Phone Number:	(713) 367-1941

TABLE 1 (Cont)

PHASE IVB

Construction Contractor:	T.J. Battye Trucking Company
Location:	Methuen, Massachusetts
Point of Contact:	Tom Battye
Phone Number:	(508) 683-4757
Membrane Manufacturer and Installer:	Staff Industries
Location:	Detroit, Michigan
Point of Contact:	Gary Lechner
Phone Number:	(313) 259-1820

6.0 QA/QC PROCEDURES IMPLEMENTED DURING CONSTRUCTION

Documentation regarding the Quality Assurance/Quality Control (QA/QC) procedures implemented during the closure phases is limited. Table 2 included in Section 7.0 details the regulatory requirements of each closure phase. In general the 1971 regulations contain only one QA/QC requirement. This requirement is that the landfill be designed by an engineer "experienced or knowledgeable in matters of solid waste disposal". In contrast the revisions contained in the 1990 regulations are considerably more detailed with respect to the required QA/QC procedures. These procedures include: ensuring the construction is in compliance with a MADEP-approved QA/QC plan; oversight of the construction activities and subsequent certification by an independent professional engineer; and construction of the final cover to be under the direction of a person with extensive experience in the installation of final covers.

The QA/QC practices which were found to be common to nearly all the phases were the use of specifications which explicitly stated the performance and design requirements of the cap, and the inspection of the construction activities by both Army and contractor personnel. These requirements included:

- Membrane warranty shall be submitted.
- Factory made seams to obtain 80 percent of sheet strength.
- Ground surfaces to receive membrane shall be inspected and accepted by installer prior to membrane installation.
- Membrane manufacturer's field engineer shall be present at all times during installation.
- Field seams shall be 100 percent inspected by contractor and membrane manufacturer's technical representative.
- All field seams of new membrane to existing membrane shall be as per manufacturer's instructions.
- All membrane located at perimeter of cap shall be locked into place as shown in liner/membrane anchor trench detail on design drawings.
- A contracting officer's representative and backup, in the persons of designated Fort Devens personnel, were assigned for each phase to monitor the work for the duration of the contract.

Contract information relating to the construction of Phase I is limited as the Army purges its records after approximately 6 years following the closing of the contract. Tom McNaughton of the Department of Public Works at Fort Devens has indicated that Barson's Construction Company is no longer in business. Steven Wright of Wright Lining and Construction Company was contacted for additional QA/QC information for those phases his company was responsible for. He was able to locate results from destructive testing of the field seams in Phase II. The results indicate an average seam strength of 58.0 lbs per inch of seam length. Requests for information on other phases were unsuccessful. Mr. Darren Manees of Staff Industries, Inc., provided both factory and field seam test reports for the membrane they supplied for Phase IVB. Contract information available for Phases II through IVB, state that, in Phases II, IVA and IVB, the membrane seams were air lance tested. Contract information for Phase III also indicate that topsoil tests were conducted as part of the construction.

Army personnel, Norm Black and Glen Hagstrom, have each stated that Phases II through IVB were constructed according to the specifications. N. Black and G. Hagstrom were unable to identify personnel associated with Phase I of the closure as they were not familiar with that phase.

The following subsections present an overview of the QA/QC procedures that were implemented during each phase.

6.1 PHASE I

The contractor, Barsons Construction Co., Inc., submitted a statement and acknowledgement from Wright & Kohli Construction Co., the membrane subcontractor, that the work would be completed per the landfill liner specification. The contract/specifications contained a requirement that the contractor furnish a QA/QC program for the execution of the work. It is presumed that this document was furnished in accordance with the submittal provisions of the contract.

This technical specification section prepared for the PVC membrane installed during Phase I also contains specific requirements for testing of all field splices made during installation. Adherence to this specification, particularly by a reputable liner installation contractor under constant monitoring by Fort Devens personnel, lends credence to the assumption that the field splices were properly made and tested.

6.2 PHASE II

The contractor for Phase II, WES Construction Corp. submitted information on the PVC membrane to be installed and also for the gas piping/vent system. The contract/specifications contained a requirement that the contractor furnish a QA/QC program for the execution of the work. It is presumed that this document was furnished in accordance with the submittal provisions of the contract.

The technical specification section prepared for the PVC membrane installed during Phase II contains specific requirements for testing of all field splices made during installation. Results of these tests are included in Appendix A to this report. Additionally, adherence to this specification, particularly by a reputable liner installation contractor under constant monitoring by Fort Devens personnel, lends credence to the assumption that the field splices were properly made and tested.

6.3 PHASE III

The contractor for Phase III, ET&L Construction Co., submitted a QA/QC program for the execution of his scope of work together with information on the PVC membrane and perforated piping, and results of topsoil tests. Additionally, the combination of comprehensive technical specifications, a reputable membrane liner installer, and constant monitoring by Fort Devens personnel, lends credence to the assumption that the work was completed as specified.

6.4 PHASE IVA

The contractor for Phase IVA, WES Construction Co., submitted a QA/QC program for the execution of his scope of work, together with information on the PVC membrane and perforated piping. Additionally, the combination of comprehensive technical specifications, a reputable membrane liner installer, and constant monitoring by Fort Devens personnel lends credence to the assumption that the work was completed as specified.

6.5 PHASE IVB

The contractor, T.J. Battye Trucking Co., submitted information on the PVC membrane to be installed and also for the gas/vent system. The contract/specifications contained a requirement that the contractor furnish a QA/QC program for the execution of the work. It is presumed that this document was furnished in accordance with the submittal provisions of the contract. The technical specification section prepared for the PVC membrane installed during Phase IVB contains specific requirements for testing of all field splices made during installation. Results of these tests are included in Appendix A of this report. Adherence to this specification, particularly by a reputable liner installation contractor under constant monitoring by Fort Devens personnel, lends credence to the assumption that the field splices were properly made and tested.

7.0 TECHNICAL EVALUATION OF CLOSURE CONSTRUCTION

Table 2 details the regulatory requirements of each closure phase as contained in 310 CMR 19.00, dated April 21, 1971, 310 CMR 19.000, dated October 12, 1990. Each phase appears to satisfy the intent of the regulations. Phases I through IVA are required to comply with the 1971 regulations. These regulations are brief with respect to specific cap design requirements. The 1990 regulations, which Phase IVB must comply with, are far more stringent. There are explicit requirements regarding the design of the cap.

The 1971 requirements contain primarily performance standards, including a requirement that the final cover material support vegetation and that the vegetation be capable of promoting stabilization of the cover. The finished landfill must not interfere with the proper drainage of the adjacent lands and the surface drainage must be consistent with the surrounding area. The few design standards contained in the 1971 regulations include the need for cover material to be a minimum of 2 feet deep and the final slope to be a minimum of 2%. Phases I through IVA generally comply with these requirements, although recommendations for some improvements are noted in Table 1 and later in this report (see Section 10).

In comparison, the 1990 regulations contain numerous component and design standards as well as performance standards and QA/QC requirements. The 1990 regulations detail the layers required as part of the cap, including a subgrade layer, a gas venting layer, a low permeability layer, a drainage layer, and vegetative support and cover layers. Environmental monitoring systems are also required. Other design standards include a minimum top slope of 5% and a maximum side slope of 3 horizontal to 1 vertical. Performance standards contained in the 1990 regulations include the requirement that the cap minimize percolation of water into the landfill, promote the drainage of precipitation, facilitate the venting and control of landfill gas, and ensure the isolation of landfill wastes from the environment. The regulations also detail oversight requirements intended to ensure proper QA/QC procedures. The primary focus of these requirements is that the construction be overseen and certified by an independent professional engineer.

In general, Phase IVB complies with these regulations, however the construction was not overseen or certified by an independent professional engineer. Army and contractor personnel inspected the construction as had been done for the previous phases. Prior to the construction of Phase IVB, the MADEP agreed conceptually to the Phase IVB closure plan. This phase was constructed similarly to the other phases, with the exception of the change in membrane thickness from 30 mil to 40 mil and the change in thicknesses of the drainage and topsoil layers from 12 inches to 6 inches and 6 inches to 12 inches respectively. As the Army was in communication with the MADEP throughout construction, as indicated by the available documentation, the lack of a professional engineer's certification of the construction appears to be a minor nonconformance.

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A comparison was made between the as-built drawings and other available documentation and the MADEP approved plans from 1985. From this comparison, it appears that all major engineering design considerations and details were implemented and installed for each phase of the closure operation. Drainage swales were installed around the perimeter of the landfill in accordance with the approved plans, and in one instance at the eastern perimeter, the swale was improved by the installation of rip-rap.

The catch basins and associated piping system were installed at the southern end, although several of the basins were offset somewhat from their proposed locations to avoid a rock outcropping. As discussed in Section 5.0, the leachate collection system, and emergency mobilization dump were not required, and consequently were not installed.

Finally, the final contours and slopes are in general agreement with those shown on the approved plans, and any deviations that were made are not of any significance and will not affect the integrity of the cover.

TABLE 2A

**COMPARISON OF REGULATORY REQUIREMENTS VS AS-BUILT CONDITIONS
PHASE I - 1971 REGULATIONS**

REGULATORY REQUIREMENTS	AS-BUILT CONDITIONS	REMARKS
All sanitary landfills shall be designed by an engineer experienced or knowledgeable in matters of solid waste disposal.	Closure plan designed by Gale Engineering.	
Cover material shall be free of materials that would attract flies and rodents, free of large objects that would hinder spreading and compaction, and shall not be easily eroded by water or wind	Cover material appears to conform to this requirement.	
Final cover material shall support cover vegetation	Vegetation generally well established.	Additional topsoil and seeding necessary in some areas.
Cover material layer shall be a total minimum depth of 2'	3" sand and gravel layer below membrane, 12" sand above membrane, 6" topsoil installed.	Cover slightly thinner. This will not affect performance.
Final cover shall be graded so that surface water will not accumulate and shall be at a slope of not less than 2%	Generally, slopes are a minimum of 2%.	Existing depressed area requires improvements.
The landfill shall be graded and provided with a drainage system to minimize surface water runoff onto and into the fill, to prevent erosion of the fill, to drain off rain water falling on the fill, and to prevent the collection of standing water	30 mil PVC membrane installed. Final grading generally conforms to this requirement.	Drainage swales require cleaning to be made fully operational.
The finished works shall not in any way cause interference with proper drainage of adjacent lands nor shall the finished fill concentrate run-off waters on adjacent areas	Final grading conforms to this requirement.	
The surface drainage shall be consistent with the surrounding area	Final grading conforms to this requirement.	

TABLE 2A (Cont)

REGULATORY REQUIREMENTS	AS-BUILT CONDITIONS	REMARKS
The completed landfill shall be graded in a suitable manner to facilitate the use of the fill as planned	Final grading conforms to this requirement.	
The finished landfill will be planted with appropriate vegetation to promote stabilization of the cover	Vegetation generally conforms to this requirement.	Additional topsoil and seeding necessary in some areas.
<i>Additional non-regulated items:</i>	4" steel vent pipes installed 3" perforated piping installed in 100 ft grid. QA/QC program required per specs.	

TABLE 2B

**COMPARISON OF REGULATORY REQUIREMENTS VS AS-BUILT CONDITIONS
PHASE II - 1971 REGULATIONS**

REGULATORY REQUIREMENTS	AS-BUILT CONDITIONS	REMARKS
All sanitary landfills shall be designed by an engineer experienced or knowledgeable in matters of solid waste disposal.	Closure plan designed by Gale Engineering.	
Cover material shall be free of materials that would attract flies and rodents, free of large objects that would hinder spreading and compaction, and shall not be easily eroded by water or wind	Cover material appears to conform to this requirement.	
Final cover material shall support cover vegetation	Vegetation generally well established.	Additional topsoil and seeding necessary in some areas.
Cover material layer shall be a total minimum depth of 2'	6" minimum sand buffer layer below membrane, 12" sand layer above membrane, 6" topsoil installed.	
Final cover shall be graded so that surface water will not accumulate and shall be at a slope of not less than 2%	Final slopes are minimum of 2%.	
The landfill shall be graded and provided with a drainage system to minimize surface water runoff onto and into the fill, to prevent erosion of the fill, to drain off rain water falling on the fill, and to prevent the collection of standing water	30 mil PVC membrane (720'x15') and rip rap swale installed. Final grading conforms to this requirement.	Drainage swales require cleaning to be made fully operational.
The finished works shall not in any way cause interference with proper drainage of adjacent lands nor shall the finished fill concentrate run-off waters on adjacent areas	Final grading conforms to this requirement.	

TABLE 2B (Cont)

REGULATORY REQUIREMENTS	AS-BUILT CONDITIONS	REMARKS
The surface drainage shall be consistent with the surrounding area	Final grading conforms to this requirement.	
The completed landfill shall be graded in a suitable manner to facilitate the use of the fill as planned	Final grading conforms to this requirement.	
The finished landfill will be planted with appropriate vegetation to promote stabilization of the cover	Vegetation generally conforms to this requirement.	Additional topsoil and seeding necessary in some areas.
<i>Additional non-regulated items:</i>	4" Vent pipes installed. 3" perforated piping installed in 100 ft grid Membrane seams air lance tested. QA/QC program required per specs.	

TABLE 2C

**COMPARISON OF REGULATORY REQUIREMENTS VS AS-BUILT CONDITIONS
PHASE III - 1971 REGULATIONS**

REGULATORY REQUIREMENTS	AS-BUILT CONDITIONS	REMARKS
All sanitary landfills shall be designed by an engineer experienced or knowledgeable in matters of solid waste disposal.	Closure plan designed by Gale Engineering.	
Cover material shall be free of materials that would attract flies and rodents, free of large objects that would hinder spreading and compaction, and shall not be easily eroded by water or wind	Cover material appears to conform to this requirement.	
Final cover material shall support cover vegetation	Vegetation currently well established.	
Cover material layer shall be a total minimum depth of 2'	6" sand buffer layer below membrane, 12" sand layer above membrane, 6" topsoil installed	
Final cover shall be graded so that surface water will not accumulate and shall be at a slope of not less than 2%	Final slopes are a minimum of 2%.	
The landfill shall be graded and provided with a drainage system to minimize surface water runoff onto and into the fill, to prevent erosion of the fill, to drain off rain water falling on the fill, and to prevent the collection of standing water	30 mil PVC membrane installed. Final grading conforms to this requirement.	Drainage swales require cleaning to be made fully operational.
The finished works shall not in any way cause interference with proper drainage of adjacent lands nor shall the finished fill concentrate run-off waters on adjacent areas	Final grading conforms to this requirement.	
The surface drainage shall be consistent with the surrounding area	Final grading conforms to this requirement.	

TABLE 2C (Cont)

REGULATORY REQUIREMENTS	AS-BUILT CONDITIONS	REMARKS
The completed landfill shall be graded in a suitable manner to facilitate the use of the fill as planned	Final grading conforms to this requirement.	
The finished landfill will be planted with appropriate vegetation to promote stabilization of the cover	Vegetation conforms to this requirement.	
<i>Additional non-regulated items:</i>	6" steel vent pipes installed. 3" perforated piping installed in 100 ft grid. Topsoil tests conducted QA/QC program required per specs.	

TABLE 2D

**COMPARISON OF REGULATORY REQUIREMENTS VS AS-BUILT CONDITIONS
PHASE IVA - 1971 REGULATIONS**

REGULATORY REQUIREMENTS	AS-BUILT CONDITIONS	REMARKS
All sanitary landfills shall be designed by an engineer experienced or knowledgeable in matters of solid waste disposal.	Closure plan designed by Gale Engineering.	
Cover material shall be free of materials that would attract flies and rodents, free of large objects that would hinder spreading and compaction, and shall not be easily eroded by water or wind	Cover material appears to conform to this requirement.	
Final cover material shall support cover vegetation	Vegetation currently well established.	
Cover material layer shall be a total minimum depth of 2'	6" sand buffer layer below membrane, 12" sand layer above membrane, 6" topsoil installed.	
Final cover shall be graded so that surface water will not accumulate and shall be at a slope of not less than 2%	Final slopes are a minimum of 2%.	
The landfill shall be graded and provided with a drainage system to minimize surface water runoff onto and into the fill, to prevent erosion of the fill, to drain off rain water falling on the fill, and to prevent the collection of standing water	30 mil PVC membrane installed. Final grading conforms to this requirement.	
The finished works shall not in any way cause interference with proper drainage of adjacent lands nor shall the finished fill concentrate run-off waters on adjacent areas	Final grading conforms to this requirement.	
The surface drainage shall be consistent with the surrounding area	Final grading conforms to this requirement.	

TABLE 2D (Cont)

REGULATORY REQUIREMENTS	AS-BUILT CONDITIONS	REMARKS
The completed landfill shall be graded in a suitable manner to facilitate the use of the fill as planned	Final grading conforms to this requirement.	
The finished landfill will be planted with appropriate vegetation to promote stabilization of the cover	Vegetation conforms to this requirement.	
<i>Additional non-regulated items:</i>	6" steel vent pipes installed 3" perforated piping installed in 100 ft grid. Membrane seams air lance tested QA/QC program required per specs.	

TABLE 2E

**COMPARISON OF REGULATORY REQUIREMENTS VS AS-BUILT CONDITIONS
PHASE IVB - 1990 REGULATIONS**

REGULATORY REQUIREMENTS	AS-BUILT CONDITIONS	REMARKS
<i>Oversight Requirements</i>		
The construction shall be in compliance with a QA/QC plan approved by the MADEP	Closure of Phase IV conceptually agreed to by DEP in a letter dated May 19, 1989.	
An independent professional engineer, knowledgeable and experienced in matters of landfill construction, shall oversee all construction activities	Construction overseen by Army personnel.	
Final covers shall be constructed under the direction of a person with extensive experience in the installation of final caps	Cap installed by experienced contractors specializing in cap installation.	
Each phase of cap construction shall be carried out and inspected under the direction of the independent professional engineer who shall certify that each phase was completed in accordance with approved plans and specifications	Cap construction inspected by representatives of the membrane manufacturer and the Army.	
The independent engineer shall ensure that the completed phase is graded in a manner that facilitates surface drainage, is consistent with the surrounding topography, and does not interfere with proper drainage of adjacent lands or concentrate run-off waters on adjacent areas	Not inspected by a professional engineer, however, final grading conforms to this requirement.	
The independent professional engineer shall ensure that as-built plans accurately reflect the constructed facility	Final grading plan is stamped by the surveyor.	

TABLE 2E (Cont)

REGULATORY REQUIREMENTS	AS-BUILT CONDITIONS	REMARKS
A copy of the engineer's certification on all construction and QA/QC activities shall be submitted to the DEP	Construction not certified by an engineer.	Entire closure operation overseen by competent contractor and Fort Devens personnel.
<i>Performance Standards</i>		
Minimize percolation of water through the final cover system into the landfill to the greatest extent practicable	40 mil PVC membrane installed.	
Promote proper drainage of precipitation	Final grading conforms to this requirement.	Several catch basins require regrading.
Minimize erosion of the cover	Final grading conforms to this requirement and vegetation is well established.	
Facilitate venting and control of the landfill gas	Vent system installed.	
Ensure isolation of the landfill wastes from the environment	Landfill membrane installed.	
Accommodate settling and subsidence of the landfill such that the above performance standards will continue to be met	No settlement or subsidence observed. Appears to be in conformance.	
<i>Design Standards</i>		
Minimum top slope of 5%, maximum side slope of 3 horizontal to 1 vertical	Slopes are in conformance.	
Be constructed of material compatible with expected landfill gases	Sand and PVC membrane comprise cap.	
Be constructed to minimize erosion	Final grading and vegetation conform to this requirement.	

TABLE 2E (Cont)

REGULATORY REQUIREMENTS	AS-BUILT CONDITIONS	REMARKS
Be constructed to protect the low permeability layer from adverse effects of frost	PVC membrane and sand layer provided.	
Be constructed to maintain slope stability	Final grading and vegetation conform to this requirement.	
<i>Component Standards</i>		
Subgrade layer: provide adequate structural support for the final cover system and be capable of accommodating anticipated subsidence or settling without impairing its ability to provide structural support; be free of materials that may damage or abrade the low permeability layer or venting layer; be of sufficient thickness to cover all solid waste	6" sand layer installed below membrane.	
Landfill gas venting layer: provide for the free movement of landfill gas out of the landfill to gas control devices or vents; placed below the low permeability layer; minimum hydraulic conductivity 1×10^{-3} cm/sec; be bound on upper surface with filter material where required to ensure integrity of the layer is maintained	3" perforated piping installed in sand layer below PVC membrane.	
Low permeability layer: minimize to the greatest extent practicable the movement or percolation of water into the landfill; promote positive drainage off the landfill cover system and prevent erosion; be designed and constructed to remain impervious for the expected life and post-closure period of the landfill; comprised of: <u>Soil:</u> minimum compacted thickness of 18"; maximum hydraulic conductivity of 1×10^{-7} cm/sec throughout the entire thickness; compacted to minimize void spaces; capable of supporting the weight imposed by post-closure use without settling or causing or contributing to failure of the low permeability layer; be free of materials that may cause or contribute to the increase in permeability or failure of the low permeability layer or	40 mil PVC membrane installed. Field seams sealed. 18" of compacted soil installed per requirements.	

TABLE 2E (Cont)

REGULATORY REQUIREMENTS	AS-BUILT CONDITIONS	REMARKS
<u>Flexible membrane liner:</u> sufficient thickness as determined by DEP; constructed to ensure the seams connecting FML panels are of equal or greater strength than the panels or manufacturer's seams within panels and are oriented parallel to the slope and not across the slope; have sufficient flexibility and strength (tensile strength, puncturability, stress cracking, and chemical compatibility); capable of being seamed to produce leak-tight, high-strength seams that retain their integrity; be constructed of materials or using methods to minimize erosion of soils	40 mil PVC membrane installed per requirements. Factory and field seams tested. Reports included.	
Drainage layer: provide continuous and free-flowing drainage over the entire low permeability layer; placed above the low permeability layer; minimum of 6" of soil with hydraulic conductivity of at least 1×10^{-3} cm/sec or an approved geosynthetic net; if geosynthetic net it must be of sufficient strength to prevent deformation and impairment of function by the weight of vehicles or the final cover, have sufficient flow capability, and be properly oriented for proper function	6" sand drainage layer installed above membrane.	
Vegetative support layer: protect underlying layers from the effects of desiccation, extremes of temperature, and erosion; minimum of 18" thick of which 12" shall consist of soil capable of supporting selected vegetation and 6" may be a drainage layer	12" topsoil installed above 6" sand drainage layer.	
Vegetative cover layer: provide complete coverage of the landfill; minimize erosion of the landfill; promote evapotranspiration of water to the maximum practicable extent; provide effective and permanent cover compatible with the site which shall minimize erosion of the underlying materials; have root systems that shall not compromise the drainage layer or low permeability layer; be composed of plants capable of self-propagation	Vegetation is well established over the entire area.	

TABLE 2E (Cont)

REGULATORY REQUIREMENTS	AS-BUILT CONDITIONS	REMARKS
Air quality protection system designed to control the concentration of explosive gases at 25% of the Lower Explosive Limit of individual components via passive gas vents provided in final cover areas and designed to: maintain integrity of the low permeability cap at the penetration of the cap; provide adequate venting of landfill gases to prevent the buildup of explosive concentrations of gas and lateral migration of gases beyond the boundaries of the landfill; with "T's", goosenecks, or equivalent at the top of the riser pipe; allow for retrofitting for active gas recovery or treatment system if required later; operate without clogging; remain secure from vandalism	3" perforated piping in 100 ft grid and gooseneck gas vents installed.	
Groundwater monitoring systems: minimum of one monitoring well or cluster of wells upgradient for background samples; minimum of 3 monitoring wells or clusters of wells downgradient; wells installed by licensed driller and constructed in manner approved by the DEP	Numerous monitoring wells installed as part of CERCLA activities. Groundwater currently being monitored.	
Surface water monitoring system, if required	Not applicable.	
Gas monitoring capability	3" perforated piping in 100 ft grid and gooseneck gas vents installed.	

8.0 CURRENT CONDITIONS

A visual survey was conducted by Stone & Webster to assess the current conditions of the landfill. The landfill is in good condition with no major deficiencies being observed during the survey. However, minor deficiencies were noted which are discussed in the following subsections. These conditions will be rectified as part of the CERCLA process. Figure 2 (sheets 1 through 3) presents the results of a topographic survey conducted for the site together with relevant information regarding the as-built and current conditions of the landfill including the areas that need improvement.

8.1 PHASE I

The west-central portion of Phase I contains a depressed area into which water has ponded to a depth of approximately one foot. It appears the subsurface material has settled slightly in this area causing this localized condition. There is no other evidence of major settlement in the Phase I area. This depressed area must be rectified before more significant problems arise in this area.

The drainage swales along the eastern and western perimeters are currently overgrown with vegetation and at certain times of the year contain areas of standing water. Additionally, portions of their embankments have eroded, particularly in the western swale. A portion of the liner is also exposed near the western swale and the hill adjacent to the western bank of this swale has eroded in places. None of these deficiencies are considered very significant at this time, but they must be corrected in the near future to ensure that the swales function properly to transport surface water runoff from the landfill area.

There is an area along the southern edge of Phase I where surface water runoff has created a new drainage swale through the landfill. This swale should be enhanced to facilitate drainage through this area. Future erosion in this area can be avoided, if the runoff is allowed to flow in a predetermined manner.

The vegetative cover of Phase I appears to be well established although some areas, particularly near the eastern perimeter, appear to be slightly deficient of topsoil. Based on observations from the existing landfill maintenance and monitoring program, unwanted vegetation, such as purple loosestrife, is establishing a foothold in the Phase I area, a condition which must be dealt with.

8.2 PHASE II

The rip-rapped drainage swale along the northeast portion of Phase II has had a significant amount of sand deposited along its length. It appears that the swale is not functioning as designed, and in fact has been filled in one location to provide vehicle access between the

landfill and the adjacent borrow area. The swale along the southern perimeter is overgrown with vegetation and contains areas of standing water. Both of these conditions must be corrected to ensure proper surface drainage of the landfill.

There is no evidence of any major settlement of the cap and the vegetation appears to be well established except for some sparse areas along the eastern perimeter which will require some additional topsoil and seeding.

8.3 PHASE III

The Phase III area appears to be in very good condition with the vegetation well established and surface water runoff draining as per design. The concrete flared end drainage structure at the southern end is in good condition although the drainage swale is overgrown and must be cleaned out. There is no evidence of any major settlement of the cap.

8.4 PHASE IVA

Phase IVA appears to be in very good condition with the vegetation well established and the surface water runoff draining as per design.

8.5 PHASE IVB

Phase IVB appears to be in very good condition with the vegetation well established. The existing catch basins along the western perimeter require some minor corrective action in the form of resetting rims, regrading areas adjacent to the rims, to ensure that the runoff enters the catch basins. The cleaning of sediments in some of the basins is also recommended. For the most part, however, the drainage system appears to be functioning adequately.

9.0 CONCLUSIONS

Based on a review of available documentation and a visual survey of the as-built conditions of SHL, the closure of the landfill was in general conformance with the design plans approved by MADEP in 1985, and that the closure meets the intent of the regulations in effect at the time of the phased closure operations.

There are minor deficiencies in the existing condition of the landfill which are not considered significant, but which must be corrected in the near term to restore the cap to its optimum design.

10.0 RECOMMENDATIONS

10.1 CAP IMPROVEMENT RECOMMENDATIONS

The following improvements are recommended for the cap at SHL:

- Correct the ponded area in Phase I to improve the drainage through the area and account for future settlement which might lead to a redevelopment of the problem.
- Clean out and refurbish the drainage swales around the perimeter of the landfill to facilitate surface water drainage off the landfill.
- Provide additional topsoil and reseed the areas of Phases I and II which have become sparse. This will enhance the growth of vegetation in these areas.
- Address the issue of unwanted vegetation, such as purple loosestrife, which can aggressively push other vegetation out until it dominates an area.
- Recover the small section of membrane that is exposed in Phase I.
- Regrade the areas around the catch basins in Phase IVB to enhance drainage.
- Stabilize the hill adjacent to Phase I to prevent future erosion.
- Install culverts under the road that has been constructed through the drainage swale leading to Plow Shop Pond.
- Provide a new drainage swale in the center of the landfill (approximately the southern edge of Phase I) where surface water has etched a new path through the slope. By providing a designated course through the center of the landfill, it is less likely that future erosion will occur.

10.2 LONG TERM MAINTENANCE AND MONITORING

Long-term monitoring is required to ensure the landfill is maintained properly for the required post-closure period of 30 years. In particular, the monitoring program should be designed to identify potential problems for early repair before the problems escalate. A detailed long-term monitoring plan will be prepared and provided as part of the CERCLA process. The following steps are recommended to be included as part of that long-term monitoring program.

- Annual visual surveys should be conducted by individuals knowledgeable in landfills as well as plant growth concerns in order to detect and correct problems such as erosion, slipping of soil on the cap, depressions caused by settlement of the refuse layer, the reduction or loss of vegetative cover and invasion of undesirable vegetation or animals which might compromise the flexible membrane. Any problems detected should be repaired and remediated.
- The entire landfill area should be mown on an annual basis to assist with the visual surveys.
- The environmental monitoring systems should be brought into compliance with the current regulations and their maintenance continued. A detailed environmental monitoring checklist will be prepared as part of the long-term maintenance activities.

10.3 LONG TERM GROUNDWATER MONITORING

As stated in the Final FS, groundwater monitoring is proposed to monitor groundwater quality at SHL and to assess future environmental impacts. Based on the hydrogeologic interpretation and analytical data presented in the RI Addendum Report and the modeling presented in the Final FS, a modified groundwater monitoring program was proposed by ABB-ES. Six wells included in the current program, but interpreted as cross-gradient, were deleted and replaced with five existing wells better positioned to monitor downgradient groundwater quality. In addition, installation of three new wells was proposed at the north end of the landfill to create nested triplets of shallow/water table, mid-depth, and deep overburden wells at SHL-9, SHL-22, and SHL-5. Wells would be sampled semi-annually for a minimum of 30 years, consistent with 310 CMR 19.142. Because the Preferred Alternative includes institutional controls which would prohibit installation of drinking water wells, semi-annual monitoring should be sufficient. Monitoring locations and analytical parameters are included below. Detailed plans for long-term groundwater monitoring will be developed at a later date and submitted for regulatory review and concurrence as part of the CERCLA process.

Monitoring Well Locations	Monitoring Parameters
SHL-3	<u>Volatile Organic Compounds</u>
SHL-4	USEPA Method 624 plus acetone, 2-butanone, 2-methyl pentanone, and xylenes
SHL-5	<u>Inorganics</u>
SHL-9	Arsenic, Barium, Cadmium, Chromium, Cyanide, Iron, Lead, Manganese, Mercury, Selenium, Silver, Copper, Zinc
SHL-10	<u>General Parameter</u>
SHL-11	pH (measured in field)
SHL-19	Temperature (measured in field)
SHL-20	Specific Conductance (measured in field)
SHL-22	Dissolved Oxygen (measured in field)
SHM-93-10C	Oxygen-reduction potential (measured in field)
SHM-93-22C	Total Dissolved Solids
3 Newly Installed Wells	Total Suspended Solids
	Chloride
	Hardness
	Nitrite-Nitrate as N
	Sulfate
	Alkalinity
	Biochemical Oxygen Demand
	Chemical Oxygen Demand
	Total Organic Carbon

Note: Groundwater elevations will be measured as part of the groundwater sampling program.

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ABB-ES	ABB Environmental Services, Inc.
AEC	Army Environmental Center
AOC	Area of Contamination
ASL	Above Sea Level
CERCLA Act	Comprehensive Environmental Response, Compensation and Liability
CMR	Code of Massachusetts Regulations
COR	Close-Out Report
DEQE	Dept. of Environmental Quality Engineering
E&E	Ecology and Environment, Inc.
EPA	Environmental Protection Agency
FS	Feasibility Study
IAG	Interagency Agreement
MADEP	Massachusetts Dept. of Environmental Protection
NED	New England Division
NPL	National Priorities List
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
SA	study area
SHL	Shepley's Hill Landfill
USACOE	U.S. Army Corps of Engineers

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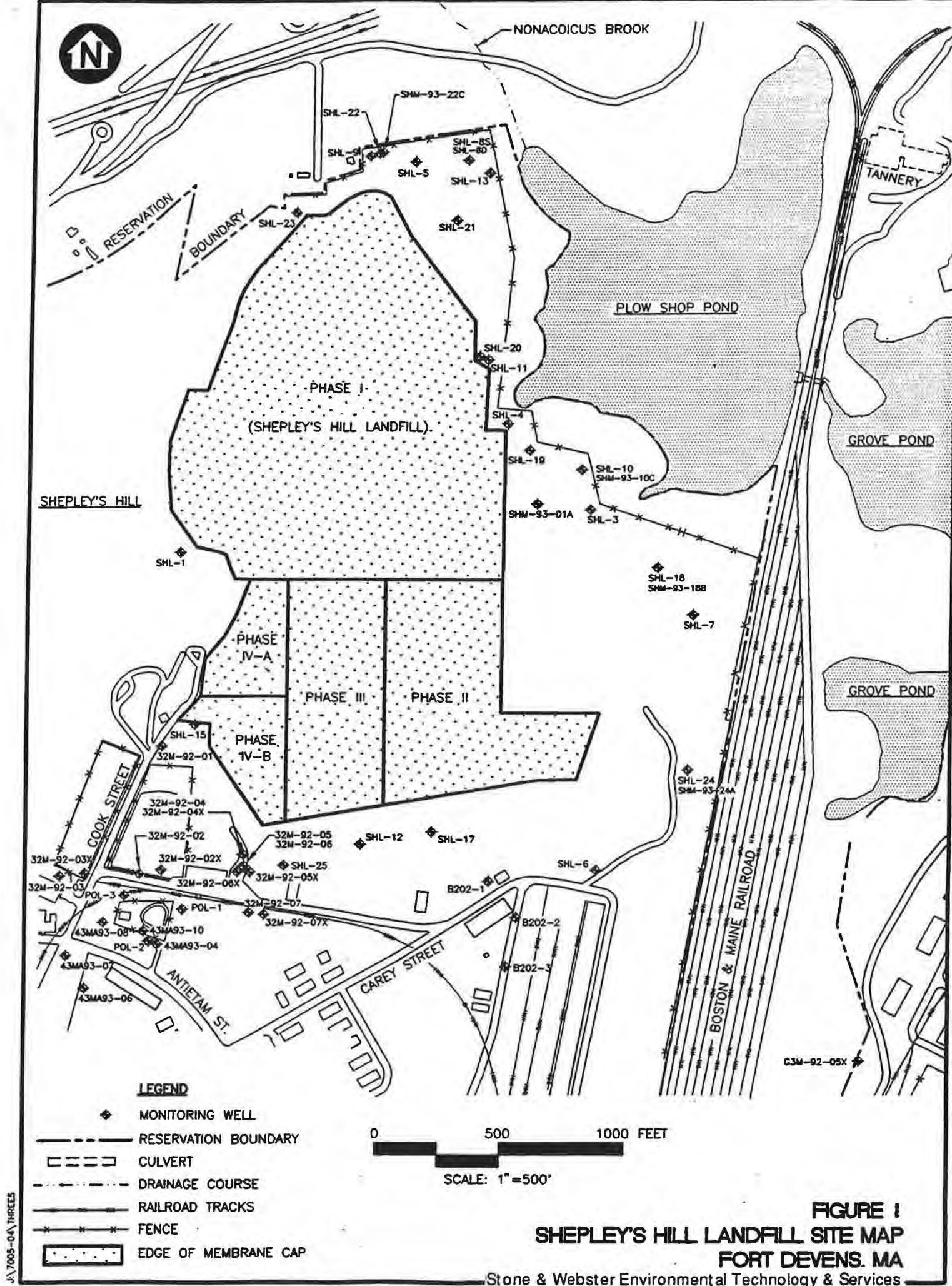
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US Army Corps of Engineers
New England Division

APPENDIX A TO CLOSE-OUT REPORT

PERTINENT RECORDS COMPILED FOR CLOSE-OUT REPORT

**SHEPLEY'S HILL LANDFILL
FORT DEVENS, MASSACHUSETTS**

Prepared under
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Stone & Webster Environmental
Technology & Services

MADEP APPROVED CLOSURE PLAN

DESIGN REPORT
Fort Devens Sanitary Landfill
Fort Devens, Mass.

January 1985

Prepared for:
Department of the Army
Headquarters Fort Devens
Fort Devens, Massachusetts 01433

Prepared by:
Gale Engineering Company, Inc.
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Design Report
Fort Devens Sanitary Landfill
Fort Devens, Mass.

Purpose

This design report is prepared by Gale Engineering Company, Inc., Braintree, Mass. as part of their consulting engineering services relative to the Fort Devens sanitary landfill to provide additional information not readily shown on plans for the sanitary landfill and to discuss the basis on which various aspects of the design are predicated. In addition, certain specific information needed by the Massachusetts D.E.Q.E. for their review is included.

General Description

The sanitary landfill is located on approximately 50 acres of open land at the northerly limit of the main fort. The site is generally bounded by Plow Shop Pond, Shepley's Hill, the main fort area and a wetland/woodland to the north. In the Fort Devens master plan, the future use of the area is for open space, which could be compatible with the completed, capped landfill. Prior to the start of dumping in the late 1940's, the site contained several kettle holes and a wetland-hydrologically connected to the present wetland at the north boundary. The nearest buildings are located on the fort to the south, with several residences on private property to the northwest being the next closest structures. A buffer between the refuse area and all buildings has been maintained to reduce detrimental environmental impacts such as gas migration, odors and visual disturbance. There are several wells located within 2000 feet of the site.

Existing Topography

The existing topography consists of large areas of uneven and unvegetated surfaces, both above refuse and in locations where cover material has been excavated. The general slope of the surface directs runoff toward the north, but many depressions exist which act as retention areas. Development of the landfill has been hampered by a lack of planning which has resulted in the existing, unsatisfactory conditions. The site, in its virgin state, had several kettle holes and wetlands which have been filled with refuse, some of it being placed below the groundwater table, which is approximately elevation 217. The 100 year flood, based on the FIRM maps for the Town of Ayer, would reach an elevation of 222 and would cause additional saturation of refuse, particularly at the northern portion of the landfill. Shepley's Hill, the western boundary, has many ledge outcrops visible, indicating only shallow soil cover with the water table probably being at the ledge face at a depth of only several feet. The plans of the existing topography are based on aerial



mapping done in 1982 and upgraded by field survey work done in December 1983.

Field Investigations and Research

A major aspect of our services for the Fort Devens sanitary landfill was determining the existing extent of refuse deposition. To accomplish this goal, we retained a private contractor to excavate a series of forty test pits at various locations around the perimeter of the site. Two areas of special interest, the site adjacent to the northern boundary (wetlands) and a location to the southeast where reports indicated flammable fluids, were investigated extensively. The northern area had substantial amounts of decaying rubbish which we have recommended be removed and replaced with clean fill to create a "virgin" buffer between the wetland and the landfill. The flammable fluids report was not substantiated by test pits or other research. As noted on the plan, a substantial portion of the information was gained by interviews with various base personnel and civilians employed off-base. All data was cross-checked for accuracy by independent means including test pits, interviews or written materials as appropriate. We have proposed to cap all refuse areas that remain after removal of refuse in some areas to reduce the potential for leachate formation.

Operations Plan

Based on data provided by Fort Devens personnel, the anticipated refuse disposal rate is 30 tons per day, which is equivalent to 5 lbs. per person per day for the base population of 12,000. The refuse consists of generally domestic waste with limited amounts of demolition material. This design rate appears to be highly conservative based on our experience since tires, appliances and other items of salvage value are recycled by the Property Disposal office. The refuse is deposited in dumpsters located at various locations on the base which are then consolidated by packer trucks which bring the refuse to the landfill for disposal. Refuse brought to the landfill by other methods is minimal. Due to the refuse composition, disposal methods and improved operating methods we expect an in-site density of 1000 lbs. per cubic yard of refuse. Based on the design disposal rate, predicted in-site density and proposed operating procedures, we expect the remaining life of the landfill at approximately four years. We believe that the life may be slightly extended by recycling additional materials or due to the conservation in the disposal rate. The area of operations consists of approximately 20 acres located near the existing access road and on top of refuse previously deposited. Cell construction will consist of windrows in a north-south direction along the grid lines (100' apart maximum) with heights of no more than ten feet (sixty feet across at the base with 3:1 slopes). The cell bottoms will be pitched to drain toward the south when empty with temporary berms at the top of the working area to prevent leachate formation. In accordance with D.E.Q.E. rules, refuse will be deposited in two foot layers with six inch daily cover between refuse layers. There is adequate cover material of acceptable quality available on the site which will be excavated as part of the grading of off-landfill, "virgin" areas.



Much of the present operation of the landfill conforms to existing D.E.Q.E. regulations. Some improvements in control of litter and drainage will be made to conform with the operating procedures specified as part of this project. The present access road (paved with a lockable gate), fire protection equipment (hydrant, extinguishers), personnel-equipment shelter and bulldozer are generally adequate. An excellent salvage program and hazardous waste controls are present at the base which act to prevent unacceptable wastes from being deposited at the landfill. The operating procedures also provide a realistic means of determining acceptable limits of litter for various areas within the project site.

Proposed Topography

The proposed topography takes into consideration adjacent areas in addition to the area in which refuse has been deposited. The refuse area will be filled to a high point located near the access road at the southwest corner. This "dome" will have a maximum elevation of 274, which will keep it below the rest of Shepley's Hill and approximately at the tree line of the hills along Plow Shop Pond. This will reduce the visual impact substantially. Areas not included in the operations plan will be graded to a 2% slope, with runoff being split to several different discharge locations to the north and east. The operations plan area will be graded at 3%, with a maximum proposed depth of fill of ten feet. Two diversion ditches, one along the base of Shepley's Hill and one along the southeasterly limit of the refuse area, will be constructed to intercept off-site and on-site runoff. The southeasterly ditch will intercept a proposed subsurface drain, with several catch basins, that will intercept runoff at the access road and areas to the southwest and two existing subsurface drains. All of the drains will be equipped with grease/oil traps to prevent pollution. An impermeable cap will be installed on the refuse area and extend to the proposed subsurface drain, southeasterly ditch and Shepley's Hill ledge to prevent leachate formation. During the grading of the area, refuse will be removed from all areas beyond the limits of the cap, including a 100 foot buffer between the wetland to the north and the landfill.

Drainage

Presently there is no runoff control on the site, so some rainfall collects in depressions causing leachate from percolation while the remainder flows to the wetlands (north) and Plow Shop Pond (east). Due to the limited soil cover on Shepley's Hill, paved and highly impermeable areas to the south and the high slopes along the various hills to the east, we have estimated the runoff coefficient at 45% for existing conditions. This coefficient will roughly double to 90% causing increased runoff rates and volumes. Due to the relatively large area and volume of Plow Shop Pond, the impact on that body will be minimal; however, the wetlands located to the north will be measurably impacted. Based on an increased flow of approximately 50 c.f.s., an additional volume of runoff of 1.5 acre-feet will be discharged into the wetland during a 10 year storm. The flooded area between the spillway and the railroad culvert downstream is approximately eight acres, based on the Ayer FIRM map, so an increase of .2 foot is expected. This will be reduced



somewhat since flow through the railroad culvert will increase because of the higher water surface. In a 100 year storm, the spillway would be totally inundated and the flooded area that would be impacted would include both Plow Shop Pond and the wetland so the effect would be negligible. The subsurface drain to the southwest is designed for a 10 year storm and the diversion ditches to the west and southeast are adequate for 100 year storms. Consideration of flow velocities and erosion led to the use of several grade stabilization structures and riprap at outfalls.

Leachate Collection

Although we have prepared a design for a leachate collection system, we do not believe that this is an appropriate solution to a problem which is only potential and/or undefined at this time. Due to the age (40+ years) of the landfill, the extent of area in which refuse has already been deposited, the dumping of refuse directly into a groundwater in the early days of landfill use and the proposed use of mitigating measures, the installation of a leachate collection system appears unreasonable. If a leachate problem is found to exist, then it will probably be connected to past practices and require remedial measures that would pertain to the entire site (pumping perimeter wells, perimeter barrier, removal of refuse) and thus include the operations area, which is located within the area in which refuse has already been deposited. We recommend the capping of areas not contained in the operation area as soon as grading is completed, installation of the proposed subsurface drain and diversion ditches and implementation of the operations plan and procedures which will act to substantially reduce future leachate formation at the site. We have done limited testing of surface and ground waters in the vicinity of the landfill (Appendix A) which supports our contention that a leachate collection system for the operation area is inappropriate.

Water Monitoring

To detect leachate discharges from the landfill and other degradation of water quality we have proposed a surface and groundwater monitoring system. Samples will be taken three times per year and tested for a range of parameters that have been found to be indicative of leachate. This list of parameters includes those contained in the D.E.Q.E. draft regulations and additional chemicals we consider to be of significance. Additional parameters, or increased testing frequency, may be proposed in the future based on the results of the first several samples. The five groundwater monitoring wells have been located to provide data on groundwater entering the site (wells #1 and #2) and leaving the landfill (wells #3, #4 and #5) so that an evaluation of the impact of the landfill on groundwater quality can be made by comparison of the results. The surface water samples have been laid out with the same rationale of some upgradient (#1, #2 and #3) and some downstream (#4 - #11) to provide a basis of comparison. It should be noted that if a degradation of Plow Shop Pond occurs with or without a consistent degradation of groundwater passing through the landfill site, that a survey of the existing industrial sites on the north side of the pond should be undertaken to determine if one, or more, are discharging pollutants that are impacting on the pond's water quality. Data on Barcad equipment, being considered for well sampling, is included in Appendix B.



Gas Control

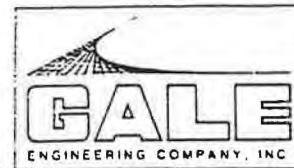
Gas control is a topic which, similar to leachate collection, has not been well studied as yet so there is little data on which to base designs. We are proposing to install perforated pipes along all grid lines (100 feet on center, east-west and north-south) cross-connected to allow flow in all directions. These pipes will be installed in the top gravel cover layer approximately 3 inches below the impermeable cap material. The gravel cover and sand/gravel cap cushion will facilitate the migration of gas to the perforated pipes due to their high permeability. At convenient locations, determined by future uses of the area and any indications of gas pocketing, vents will be installed to tap into the perforated pipe network and release the gas. There are no buildings within several hundred feet of the landfill and the buffer areas are generally open, vegetated spaces that are underlain by gravel, so the gas would tend to be released into the atmosphere, if it did travel into the buffer zones. The nearest buildings are also "slab-on-grade" construction which minimizes the potential for gas trapping. There are no plans for future buildings to be placed on the refuse deposition areas.

Mobilization Dump

To provide an environmentally safe site for refuse disposal in case of a national emergency, we have designed a minor landfill (capacity less than 10,000 cub. yards) on a virgin portion of the site along the easterly boundary. Since this mobilization dump is for emergencies only, it is our opinion that its design and operation does not have to be in strict conformance with D.E.Q.E. rules; although, we have endeavored to meet most of the regulations. Our design includes an impermeable liner extending across the bottom and up the sides (3:1 slopes) of the excavation, with cover material from the hole to be stock piled around the top perimeter and loam with seed to stabilize the slopes and cover material. A catch basin and subsurface drain system is proposed for draining any rainfall that falls in the lined area. This drain system can be quickly rerouted to discharge into a leachate collection tank once refuse has been deposited in the excavation and thus will protect the environment. The limit of refuse being 100 feet from the limit of the 100 year flood and more than twenty feet above maximum groundwater levels also acts as a mitigating measure for possible environmental damage. The only significant environmental protection measure that is not included is a groundwater monitoring well located downgradient of the dump which was not included due to inaccessibility of the area and the minimal potential of leachate contamination since a liner is to be installed.

Hydrogeology

Much of the information concerning the hydrogeology of the landfill site was compiled by Captain Robert Farrell in 1980. He determined that the site was formerly four kettle holes in a glacial sand and gravel deposit that extended to a depth of over 100 feet. It can be visually verified that Shepley's Hill, adjacent to the landfill, is a bedrock drumlin with very shallow soil cover. His research indicated that there were wetlands in the bottoms of the kettle holes and that probably refuse was deposited directly into the groundwater and



has now reached a thickness of 15-30 feet. Based on limited data concerning groundwater slope, grain size, porosity and groundwater flow direction, Captain Farrell found that the groundwater flow is approximately 130 feet/year in a northeasterly or easterly direction. Since this direction is quickly intercepted by Plow Shop Pond, it is very probable that any landfill leachate would discharge to the pond. It may be possible for some leachate to pass under the pond, although there have been no reports of contamination and an extensive study would be needed to determine if this has occurred. Estimates of leachate generation have ranged from 25,000 g.p.d. - 118,000 g.p.d., depending on the parameters used. Captain Farrell's recommendations included:

1. Capping the landfill site.
2. Installation of diversion ditches.
3. Improved operation methods.
4. Development of a closing plan.

All of these items have become part of this project.

RESULTS OF ANALYSES ON SAMPLES RECEIVED FROM GALE ENGINEERING IN FEB. FROM FORT DEVENS, MA.

Sample No.	Result, mg/l												
	Ni	Cd	Pb	Zn	Ag	Cr	Cu	Mn	Fe	Ca	Mg	Hg	Se
1	2.85	0.0087	0.019	0.440	0.0004	0.053	0.045	0.275	5.0	30	5.7	0.020	<0.001
2	2.80	0.0047	0.204	0.137	0.0002	0.017	0.011	0.075	0.47	11	2.5	0.060	<0.001
3	0.68	0.0044	0.024	0.209	0.0003	0.008	0.017	0.050	4.25	7.9	1.7	0.012	<0.001
4	0.72	0.0070	0.021	0.252	0.0002	0.012	0.018	1.75	0.30	101	11	0.002	<0.001
	As	K	Cl ⁻	SO ₄	NH ₃ -N	NO ₃ -N	Na	Alkalinity mg/l as CaCO ₃		pH	Color CU		
1	0.0030	3.05	25.7	20	0.75	1.0	17	120		7.55	20		
2	0.0020	1.90	53.6	11.7	0.17	1.0	15	13		7.4	20		
3	<0.0010	1.60	54	10	0.22	0.9	18	15		8.3	30		
4	0.0045	11	100	47	0.55	3.0	37	160		7.49	-		

Sample 1 - Drinking H₂O no Cl₂ @ well
 Sample 2 - Surface on top of Spillway
 Sample 3 - Surface at R.R. Tracks
 Sample 4 - Well at plow shop

3-28-84

James C. O'Shaughnessy

James C. O'Shaughnessy, Ph.D., P.E.

Frederic C. Blanc

Frederic C. Blanc, Ph.D., P.E.

Note: All samples filtered through 0.45u filter and then acidified prior to metals analysis.

RESULTS OF ANALYSES ON SAMPLES RECEIVED FROM GALE ENGINEERING IN FEBRUARY 1984 FROM FORT DEVENS, MA.

Sample No.	Specific Conductance micromhos/cm	TOC ,mg/l	COD, mg/l	TDS, mg/l	VS, mg/l
1	437	1	1.5	144	16
2	258	1	7.4	139	38
3	286	2	8.3	90	4
4	794	4	12.7	223	28

James C. O'Shaughnessy

James C. O'Shaughnessy, Ph.D., P.E.

3-28-84

Frederic C. Blanc

Frederic C. Blanc, Ph.D., P.E.

CORRESPONDENCE
(Army and Regulatory)



Commonwealth of Massachusetts
Executive Office of Environmental Affairs

**Department of
Environmental Protection**
Central Regional Office

William F. Weld
Governor

Trudy Coxe
Secretary, EOE

Thomas B. Powers
Acting Commissioner

February 24, 1995

Mr. James Chambers
BRAC Environmental Coordinator
Environmental Management Office
Box 19
Fort Devens, MA 01433-5190

RE: Shepley's Hill Landfill As-Built

Dear Mr. Chambers:

The Massachusetts Department of Environmental Protection (MADEP) has completed a partial review of the as-built plans relative to the closure of the Shepley's Hill Landfill. This ongoing review indicates a number of inadequacies regarding the closure of the landfill that must be dealt with prior to the USEPA's Record of Decision.

The USEPA has tentatively approved the Commonwealth of Massachusetts' Solid Waste Management Program as detailed in 310 Code of Massachusetts Regulations (CMR) 19.000 and the MADEP Landfill Technical Guidance Manual (revised September 1993). Therefore, these regulations which require and detail the assessment and closure of landfills, apply to Massachusetts dumps and landfills in lieu of 40 Code of Federal Regulations (CFR) Part 258.

The principal differences noted between the closure and as-built plans is that the as-builts, which were submitted to us piecemeal, do not correlate well with the set of plans (dated May 1985, submitted to MADEP by the Army on March 6, 1985 and approved by the MADEP on May 30 1985). This initial set of plans, consisting of twenty-five drawings, covers the entire landfill and is not broken down into the four phases under which the landfill was ultimately closed. Noted differences between the approved 1985 design and the as-builts include different final grades, slopes, number of catch basins, and gas venting details.

The MADEP believes that many of the deficiencies noted are administrative in nature and might be resolved by the Army or by

Shepley's Hill Landfill As-builts
Fort Devens
February 23, 1995

Page 2

consultants on behalf of the Army by performing a records search to gather necessary information to document previous closure efforts. Suggested record review should include but not be limited to: MADEP Division of Solid Waste Management files; MADEP Bureau of Waste Site Cleanup files; Army files; contacting the companies who conducted the closure activities; etc. The Army must develop a report containing all closure information required by 310 CMR 19.000 and the September 1993 Landfill Guidance Technical Manual.

Our review of correspondence between the MADEP and the Army indicates that the MADEP did conceptually agree to the 1989 closure of Phase IV of the landfill. However, this closure was predicated on the Army completing specific tasks and submission of appropriate as-builts and reports regarding the completed scope of work. These as-builts and closure reports are required under the provisions of 310 CMR 19.000. They have been requested by the MADEP a number of times in writing over the past four years. The as-builts were received in January 1995, but the supporting documentation is still outstanding.

Specific shortcomings noted in the submitted as-builts, which appear to be germane to all four phases of the closure include the following:

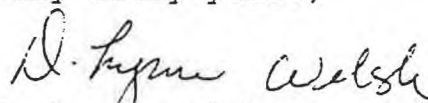
- * Lack of drainage swale information;
- * Gas venting and trenching;
- * Details on cap location and extent;
- * QA/QC test report on cap;
- * Missing Professional Engineer stamp on as-builts;
- * No closure certification as required by 310 CMR 19.011;
- * Long term groundwater monitoring plan.

Shepley's Hill Landfill As-built
Fort Devens
February 23, 1995

Page 3

We believe the closure documentation outlined in this letter will be of benefit to the Army and will allow the remediation of Shepley's Hill Landfill to go forward. Please do not hesitate to contact John Regan at (508) 767-2840 or myself at (508) 792-7653, Extension 3851 should you have any questions or require clarification on any of the MADEP's comments.

Very truly yours,



D. Lynne Welsh
Section Chief
Federal Facilities, CERO

P:\JREGAN\SHCLOS

cc: Informational Repositories
Fort Devens Mailing List
Ron Ostrowski, Fort Devens
Jim Byrne, EPA
Charles George, AEC
Mary Doyle, Metcalf & Eddy
Patricia Momm, ABB
Mark Applebee, ACOE
Judy Kohn, Mass Land Bank

5 Nov 92

MEMORANDUM FOR RECORD

SUBJECT: Final Closure and Post Closure Monitoring and Maintenance Plan,
Fort Devens Landfill

1. Reference letter to Massachusetts Department of Environmental Protection, (encl) and follow-up telephone conversation on 4 Oct 92 between Mr. Purno Rao, Central District, Solid Waste Management Division, DEP and Mr. Norman Black, Technical Services Branch, Directorate of Engineering and Housing, subject as above.

2. During telephone conversation Mr. Black informed Mr. Rao that since the original letter had been prepared a change had been made, at the recommendation of Mr. Rao, to increase the thickness of the synthetic membrane cap from 30 mil. to 40 mil. This change was made in the final closure contract specifications.

3. Mr. Rao said that the plan with the change to 40 mil cap was acceptable.

4. Mr. Black told Mr. Rao that since a negative response or comments were not forthcoming, Fort Devens was proceeding with the final phase of landfill capping. At that time Mr. Rao concurred with the plan of action and recommended proceeding with final capping as planned.

5. This memorandum is to confirm DEP approval of our plan of action for final capping and post closure monitoring and maintenance of the Fort Devens Landfill.

Encl

Norman Black
NORMAN BLACK

C, Technical Services Branch

CF:

DEH

EMO

DEP, Central Region,
Solid Waste Mgmt Div.



DEPARTMENT OF THE ARMY

HEADQUARTERS FORT DEVENS
FORT DEVENS, MASSACHUSETTS 01433-5000



REPLY TO
ATTENTION OF:

Directorate of Engineering
and Housing

SUBJECT: DSWM, CER0-Fort Devens Sanitary Landfill,
Fort Devens, MA: Compliance with new Solid Waste
Management Regulations 310 CMR 19.000

Department of Environmental Protection
Central Regional Office
ATTN: Division of Solid Waste Management
75 Grove Street
Worcester, Massachusetts 01605

Dear Mr. Anderson:

I am writing to follow up on the telephone conversation of 4 June 1992 between Mr. Purno Rao, your office and Mr. Norman Black, the Directorate of Engineering and Housing, as related to the Fort Devens Landfill.

The Fort Devens Sanitary Landfill will stop accepting any new trash by 1 July 1992.

Fort Devens' previously submitted and approved closure plan developed by Gail Engineering is the general guidance document for this final phase (Phase IV B) of the capping. The following improvements which will bring Phase IV B into compliance with changes to final cover design and post closure monitoring (310 CMR 19.112 and 19.142) will be made a part of the contract requirements and closure plan.

a. Final grade for Phase IV B will be increased from the 2% allowed on long runs of Phases I, II and III, to 5% on main slope to catch basins, 2% along the line of catch basins to Phase III match line, and 2% on drainage along west side access road to the catch basin.

b. Upon establishment of subgrade, the gas vent piping will be installed and a 6 inch layer of clean sand will be applied as a gas collection and cushion layer for the flexible membrane liner.

c. Flexible membrane liner will be an approved minimum 30 mil PVC, compatible with and capable of being securely bonded to the existing liners at match lines of Phase III and Phase II A, in order to complete the seal over the landfill as described in the original plan.

d. Cover over the liner will be adjusted from 12 inches of cushion/drainage and 6 inches of top soil to the new standard of a minimum of 6 inches cushion/drainage and 12 inches of soil to support selected vegetation.

Post Closure monitoring and maintenance will consist of the following programable items:

a. Quarterly ground water monitoring is being conducted in accordance with the closure plan and will continue to be carried out as prescribed by 310-CMR-19.000. In addition, increased ground water monitoring has been instituted as part of ongoing Comprehensive Environmental Response, Compensation and Liability Act ("Superfund") site investigation. The Superfund "Remedial Investigation Work Plan" is available for review at the Environmental Response Office, building 689, Fort Devens, MA.

b. Semi-annual visual inspections by walking over the entire cap will be conducted during the months of April and September in order to detect and correct problems such as erosion, slipping of soil on the cap, depressions caused by settling of trash layer, the reduction or loss of vegetative cover and invasion of undesirable vegetation or animals which might compromise the flexible membrane liner. As problems or potential problems are detected, repair and remediation plans will be developed and programmed for accomplishment.

c. The entire area will be mowed on an annual or bi-annual basis, as determined by the visual inspection, to prevent the encroachment of undesirable vegetation. Mowing will be accomplished after the September inspection, when grass seed has matured, in an effort to disperse the seed and promote new growth.

Request your approval of our plan to complete the final cover and implement the Post Closure Monitoring and Maintenance Plan. If you have any questions concerning the closure and post closure plan please contact Mr. Norman E. Black, Directorate of Engineering and Housing, Technical Services Branch. at (508) 796-3021.

Sincerely,



Carrol J. Howard
Lieutenant Colonel, U.S. Army
Acting Installation Commander



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY

HEADQUARTERS FORT DEVENS
FORT DEVENS, MASSACHUSETTS

01433-5100

July 11, 1991

Directorate of Engineering
and Housing

Mr. Mark J. Begley
Department of Environmental Quality Engineering
Solid Waste Branch
Central Region
75 Grove Street
Worcester, Massachusetts 01605

Dear Mr. Begley:

In May 1985, Fort Devens reached an agreement with your office to close down the Fort Devens landfill in four phases. The agreement was modified in May 1989 to allow the fourth and final phase to be broken into two parts. However, with the announced closure of Fort Devens, we are compelled to again change our closure strategy, and request your approval.

Phases I, II, III and IV-A have all been completed. Each of those areas has been brought to final grade, capped with an impervious fabric, and turf has been established. The section of the landfill that will be capped during Phase IV-B is still being operated as a landfill.

In our original closure strategy, we had anticipated filling the Phase IV-B section with construction debris from several very large construction projects. Now that Fort Devens is closing, those construction projects have been canceled. Consequently, the Phase IV-B section has not been filled to near finish grade. Further, since 50% of all solid waste generated on Fort Devens is hauled away by a commercial contractor, we do not anticipate that the landfill can be brought to grade any time soon.

It would be very difficult, and expensive, to attempt to complete Phase IV-B of the landfill closure until that section has been brought close to final grade. We therefore request an extension of our final closure date to September 1994. Not only would the extension give us time to fill the

210 JUL 1991



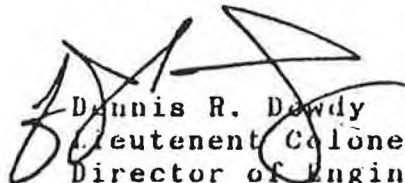
Tim

FYI/Comment

last section, but it would also give us increased flexibility in handling our solid waste stream as base-closure activities proceed. We need that flexibility because it will be quite some time before we can anticipate exactly what will be required to close Fort Devens.

Your favorable response to this request will be greatly appreciated. If you have any questions, please contact Mr. Norman Black, Chief of Technical Services, at (508) 796-3021.

Sincerely,


Dennis R. Dawdy
Lieutenant Colonel, U.S. Army
Director of Engineering
and Housing

DPN-
PI FC
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EPS
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AM



The Commonwealth of Massachusetts

*Executive Office of Environmental Affairs
Department of Environmental Quality Engineering
Central Region
75 Grove Street, Worcester, Massachusetts 01605*

DANIEL S. GREENBAUM
Commissioner

May 19, 1989

Mr. William M. Burke
Directorate of Engineering
and Housing
Department of the Army
Headquarters Fort Devens
Fort Devens, MA 01433-5100

RE: CRO-DSWM Fort Devens
Sanitary Landfill Closure

Attention: A.S.Z.D. D.E.

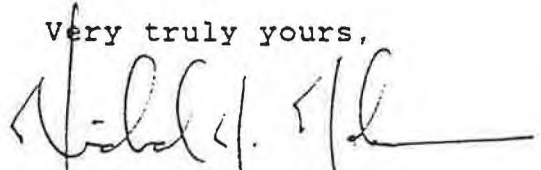
Dear Mr. Burke:

The Department of Environmental Quality Engineering (hereinafter "the Department") is in receipt of the correspondence from Mr. Norman E. Black, Chief of Technical Services. The correspondence summarized the discussions of the meeting held on May 16, 1989, between the Department and the representatives of your Office, and requested the Department for a written approval of the "Conceptual Proposal for the Phased Closure of Phase-IV" of the Fort Devens Sanitary Landfill.

The Department is committed to protecting the waters of the Commonwealth, and is of the opinion that the phased closure of Phase-IV of the Fort Devens Landfill would reduce the area of infiltration of surface water into the fill. Therefore, the Department has conceptually agreed to the proposed phased closure of Section-1 and Section-2 of the Phase-IV area during the construction seasons of 1990 and 1991 respectively. Please be advised that revised plans for the phased closure of Phase-IV shall be submitted to the Department for review and approval. The capping, loaming, and seeding of the respective areas shall be completed by the end of September of that year, in order to establish proper vegetative cover on the Landfill and prevent any erosion of the top soil. Furthermore, it was agreed that appropriate measures will be taken to address the "sunken areas" in Phase-I area.

If you have any questions or comments regarding this matter, please do not hesitate to contact Mr. Purna B. Rao or Mr. Mark J. Begley of the Division of Solid Waste Management at (508) 792-7653.

Very truly yours,

A handwritten signature in dark ink, appearing to read "Michael J. Maher", with a long horizontal flourish extending to the right.

Michael J. Maher
Regional Engineer
Waste Prevention

PBR/jc

cc: Norman E. Black, Chief, Technical Services, DEH, Fort Devens
Doris Valentin-Meyer, Technical Services, DEH, Fort Devens



792-7653

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Quality Engineering
Central Region
75 Grove Street, Worcester, Massachusetts 01605

May 30, 1985

Department of the Army
Headquarters Fort Devens
Fort Devens, Massachusetts

Re: Fort Devens - Solid Waste
Disposal, Plan Approval for
Sanitary Landfill Closure

Attention: Anthony J. Carbone, Colonel, Chief of Staff

Dear Colonel Carbone:

The Department of Environmental Quality Engineering is in receipt of a submittal dated January, 1985, by the Department of the Army, Directorate of Engineering and Housing, Fort Devens, Massachusetts. The submittal included plans in 25 sheets and a report relative to the continued operation and closure of the Fort Devens Sanitary Landfill located adjacent to Cook Street, Fort Devens, Ayer, Massachusetts.

The Plans are titled:

Fort Devens Sanitary Landfill

Prepared by:

Directorate of Engineering and Housing
Fort Devens, Massachusetts
Dated: January, 1985

The accompanying report is titled:

Design Report
Fort Devens Sanitary Landfill
Fort Devens, Massachusetts

Prepared by:

Gale Engineering Company
Braintree, Massachusetts
Dated: January, 1985

A review of the plans indicates that the landfill site is approximately 50 acres in size located at the northerly limit of the Main Fort and is bounded by Plowshop Pond, Shepley's Hill, the Main Fort area and a wetland to the north. The landfill will have a maximum closure elevation of 274 feet, and will operate until 1989, providing four years continued operation.

Areas not included in the operational section of the landfill will be graded to a minimum 2% slope and covered with an impermeable material. Operational sections which will accept additional refuse will be graded to a 3% slope. During regrading of the landfill, refuse will be removed from selected areas including those lying within one hundred (100) feet of the 100 year flood plain to the north and east of the landfill. Thus, there will be a horizontal reduction in the size of the closed landfill with a small vertical increase in order to comply with drainage and slope requirements set forth by the Department.

The final closure will include sealing all areas that contain refuse with an impermeable cap to minimize water infiltration into the landfill, covering the cap with sand, gravel, and loam, and seeding all completed sections which will provide support for cover vegetation and to prevent erosion.

The Department is of the opinion that the abovementioned plans, as submitted, adequately comply with modern engineering standards and the applicable provisions of the "Regulations for the Disposal of Solid Waste by Sanitary Landfill" (310 CMR 19.00), and the Department hereby acting under the authority of Chapter 111, Section 150A of the Massachusetts General Laws, approves the operational and closure plans, subject to the following conditions:

1. The site shall be properly operated and closed in accordance with the approved plans, the "Regulations for the Disposal of Solid Waste by Sanitary Landfill" (310 CMR 19.00) and, the proposed general schedule of compliance covering the four years of estimated life at the landfill. A detailed schedule of compliance shall be submitted by Fort Devens for review and approval no later than December, 1985, outlining additional subsurface hydrogeologic investigation and data compilation necessary to supplement the approved plan. The scope and detail of the information proposed for the work shall be approved by the Department.
2. The operator shall place a layer of at least six (6) inches of uniformly compacted cover material on all exposed refuse including demolition material before the end of each working day. The operator shall place a six inch layer of relatively impervious intermediate cover material, with a hydraulic conductivity of no greater than 1×10^{-5} cm per second, in addition to the six inches of daily cover material on the top and sides of any filled areas which will not be used for one month or longer. This impervious layer shall minimize the percolation of precipitation and shall be at a slope of not less than 2%.
3. A quantity of cover material that is necessary for a full two months of operation will be stockpiled or readily available at all times.
4. Disposal of special wastes, including asbestos, which require special handling must be disposed of in accordance with specific approval of the Department (310 CMR 19.16).
5. No changes or omissions to the approved plans will be made without written approval of the Department.

6. A groundwater monitoring program utilizing the five monitoring wells proposed in the plan shall be implemented to detect contamination from leachate formation and migration throughout the operating life of the facility and for a period of time to be specified by the Department after closure. All monitoring shall be done every four (4) months. At a minimum groundwater samples shall be analyzed for the following parameters: pH, hardness, specific conductance, TOC, TOH, chloride, Iron, Cadmium, Chromium, Lead, Mercury, Sodium Selenium, and Arsenic. A VOA scan will also be required.

If the Department determines that the results of the required analyses indicate uncontrolled contamination of groundwater by leachate, modification of the facility design or operating procedures may be required.

Surface water quality will be monitored every four (4) months to coincide with bi-monthly inspections. Surface monitoring points shall include at a minimum, those points specified in the plan on sheet 20 of 25.
7. Bi-monthly (every two months) inspections and semiannual staking shall be required. Within fifteen (15) days of each inspection an inspection report will be submitted to the Department and the Ayer Board of Health indicating any violations, problems or variations from the approved filling sequence and plans by an engineer registered in the Commonwealth who is experienced in solid waste disposal.
8. A system for gas venting shall be installed. The density at which the vents will be installed must be approved by the Department prior to the installation of said venting system.
9. A program acceptable to the Department, shall be implemented which will address Quality Control/Quality Assurance with respect to the impervious capping. As the impervious material is installed, all work shall be inspected and the cap shall be covered immediately to assure the integrity of the cover and prevent tears or degradation from exposure to ultra-violet radiation.
10. If in the future it is determined that 1) the facility as designed and implemented did not adequately prevent groundwater and/or surface water from penetrating into the fill, 2) remedial measures are required or, 3) other corrective measures are necessary at the site, the Department will require the operator to take the necessary action(s) at that time.

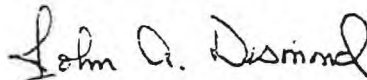
In addition, the Department hereby approves the conceptual design for a mobilization disposal site to be located adjacent to the above mentioned landfill. This mobilization disposal site will be utilized in the event of a national emergency. Prior to the construction of disposal site, final specifications must be submitted for Department review and approval.

The Department also wishes to inform you that on November 8, 1984, the Federal Resource Conservation and Recovery Act (RCRA) was amended by the

Fort Devens Closure - Page 4
May 30, 1985

Hazardous and Solid Waste Amendments of 1984. In particular, Section 3004 of RCRA now requires corrective action for all releases of hazardous waste or constituents from this disposal site. The Federal Environmental Protection Agency has or will be contacting you for the purpose of determining how the recent changes in RCRA will effect environmental requirements at this waste disposal site.

Very truly yours,



John A. Desmond, Chief
Solid and Hazardous Material
For

JAD/MJB/lcp

cc: Madeleine Kolb, Boston DEQE
Ayer Board of Health
Ayer Conservation Commission
Environmental Protection Agency, Gwen S. Ruta

Edmond G. Benoit
Deputy Regional Environmental
Engineer

PHASE I

BARSONS CONSTRUCTION CO., INC.

1241 Kings Road
SCHENECTADY, NEW YORK 12303

BARSONS CONSTRUCTION COMPANY, INC.

Specification Section 06250

☒ Item Landfill Liner

☒ Subcontr. Weigut & Kouli

Date 3-18-86

By R. Lashway

BARSONS CONSTRUCTION CO., INC.

1241 Kings Road
SCHENECTADY, NEW YORK 12303

FT DAVIS Landfill Closure

DEL, Bldg + Gr. Norm Black

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				
1. CONTRACT ID CODE	PAGE OF PAGES			
2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)	
P00003	86 Mar 10	C-336-85	ER 19240-5P	
6. ADMINISTERED BY (If other than Item 6)	CODE			
Contracting Division Building 227 Fort Devens, MA 01433-5340 Attn: Steve Keelhan (617) 796-3948				

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)	(Y)	9A. AMENDMENT OF SOLICITATION NO.
Barsons Construction Co. Inc 1241 Kings Road Schenectady, NY 12303		
		9B. DATED (SEE ITEM 11)
		10A. MODIFICATION OF CONTRACT/ORDER NO.
	X	DAKF31-85-C-0289
		10B. DATED (SEE ITEM 13)
		85 Sep 23
CITY	FACILITY CODE	

11 THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15 and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

N/A

13 THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

(Y)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
X	FAR 52.243-4 Changes (Apr 1984)
	D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 4 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Subject contract for sanitary landfill closure is hereby modified as follows:

Ref. Contract drawing 655-3376, sheet 9 of 9.

Schedule 40 steel pipe, with birdscreen at fitted end shall be used in place of the ductile iron pipe shown in the Gas Vent Detail.

Contract amount remains unchanged at \$2,140,000.00.

Contract completion date remains unchanged at 11 Oct 86.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)	
Robert J. Baran, President		PHYLLIS R. GLASGOW	
15B. CONTRACTOR/OFFICER		16B. UNITED STATES OF AMERICA	
[Signature]		BY [Signature]	
15C. DATE SIGNED		16C. DATE SIGNED	
3/21/86		MAR 28 1986	

STATEMENT AND ACKNOWLEDGMENT

NAME AND ADDRESS OF PRIME CONTRACTOR (Include ZIP Code)

BARSONS CONSTRUCTION COMPANY INC.
1241 KINGS ROAD
SCHENECTADY, NY 12303

NAME AND ADDRESS OF SUBCONTRACTOR (Include ZIP Code)

Wright & Kohli Construction Co., Inc.
P. O. Box 7280
The Woodlands, TX 77380

PRIME CONTRACT NUMBER

DAKF31-85-C-0289

DATE SUBCONTRACT AWARDED (Year, month, day)

February 4, 1986

The prime contractor whose signature appears below states in accordance with the provisions of the clause entitled "Subcontractors" of his above-numbered contract with the UNITED STATES OF AMERICA that a subcontract was awarded on the date shown above by Barsons Construction Co., Inc.

to the subcontractor identified above to perform the following work:

All work per spec section 02598 landfill liner

SUBCONTRACT AMOUNT

☒ \$50,000 OR OVER

☐ UNDER \$50,000

DATE SIGNED (Year, month, day)

February 28, 1986

PROJECT

Landfill Closure

TYPED NAME AND TITLE OF PERSON SIGNING FOR CONTRACTOR

Robert C. Lashway, Project Manager

LOCATION

Ft. Devens, MA

BY (Signature)



The subcontractor whose signature appears below acknowledges that the following clauses are incorporated into and made a part of the subcontract:

Davis-Bacon Act
Contract Work Hours and Safety
Standards Act - Overtime
Compensation
Apprentices and Trainees

Compliance with Copeland Regulations
Withholding of Funds
Subcontracts
Contract Termination - Debarment
Payrolls and Basic Records

Names of intermediate subcontractors, if any, are:

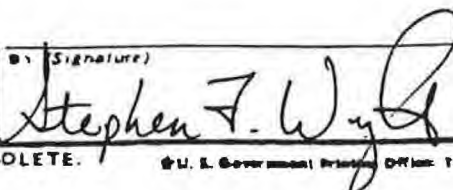
DATE SIGNED (Year, month, day)

2-28-86

TYPED NAME & TITLE OF PERSON SIGNING FOR SUB-CONTRACTOR

Mr. Stephen Wright

BY (Signature)



AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE <i>Mike Callery</i>		PAGE OF 1	
2. AMENDMENT/MODIFICATION NO. P00002		3. EFFECTIVE DATE 86 Jan 29		4. REQUISITION/PURCHASE REQ. NO. C-336-85		5. PROJECT NO. (If applicable) ER-19240-5P	
6. ISSUED BY Contracting Division Building 227 Fort Devens, MA 01433-5340 Attn: Steve Meehan (617) 796-3948		7. ADMINISTERED BY (If other than Item 6) CODE		8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) Barsons Construction Co., Inc 1241 Kings Road Schenectady, NY 12303		9A. AMENDMENT OF SOLICITATION NO. 98. DATED (SEE ITEM 11) 10A. MODIFICATION OF CONTRACT/OR NO. DAKF31-85-C-0289 10B. DATED (SEE ITEM 13) 85 Sep 23	
CODE		FACILITY CODE		11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS			
<input type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended, <input type="checkbox"/> is not tended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.							
12. ACCOUNTING AND APPROPRIATION DATA (If required) N/A							
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.							
(V) A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A. B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b). C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: X FAR 52.243-4 Changes (Apr 1984) D. OTHER (Specify type of modification and authority)							
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input checked="" type="checkbox"/> is required to sign this document and return <u>4</u> copies to the issuing office.							
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)							
Subject contract for Sanitary Landfill Closure is hereby modified as follows: Due to an insufficient volume of clean fill generated from cut areas within the limits of work, the area shown on the attached drawings shall be graded for the purpose of obtaining additional borrow material. Contract amount and performance period remain unchanged.							
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.							
15A. NAME AND TITLE OF SIGNER (Type or print) ROBERT J. BARON, PRESIDENT				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) PHYLLIS R. GLASCOV			
15B. CONTRACTOR/OFFICER'S SIGNATURE <i>(Signature of person authorized to sign)</i>		15C. DATE SIGNED 2/4/86		16B. UNITED STATES OF AMERICA <i>(Signature of Contracting Officer)</i>		16C. DATE SIGNED FEB 11 1986	

1.
-FEBC

Sanitary Landfill Closure, Phase I - Contract #DAKF31-85-C-0289-
Proposed Relocation of 36" Storm Sewer

Contracting
ATTN Steve Meehan

DEH

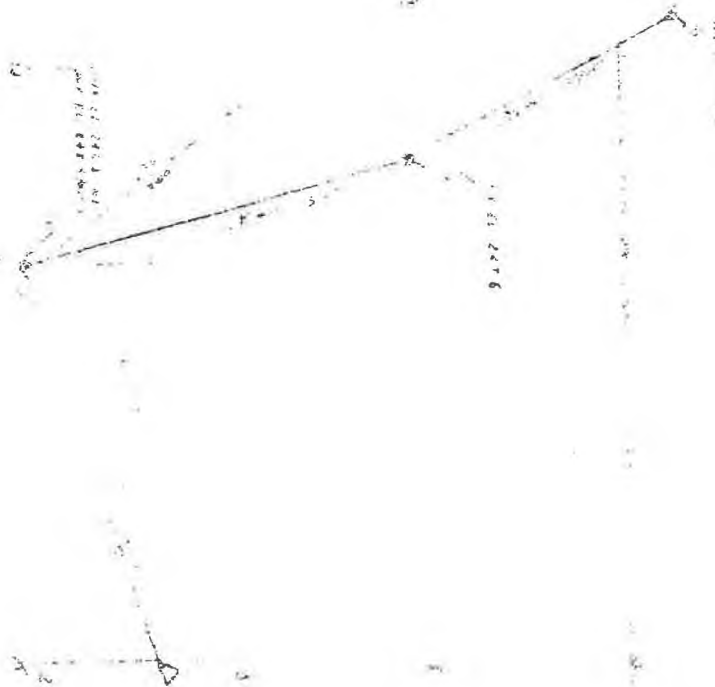
11 December 1985
Mr. Gallery/1g/3931

1. The contractor proposes to relocate approximately 550 feet of 36" storm sewer to avoid a ledge formation. See attached drawing (encl 1).
2. The proposed relocation will not significantly change the design of the system.
3. All related costs to this relocation will be borne by the contractor.
4. The proposed relocation of the storm sewer as shown on enclosure 1 is recommended by DEH.
5. POC is Mr. T. Michael Gallery, Sanitary Landfill Engineer, at 796-3931.

Encl

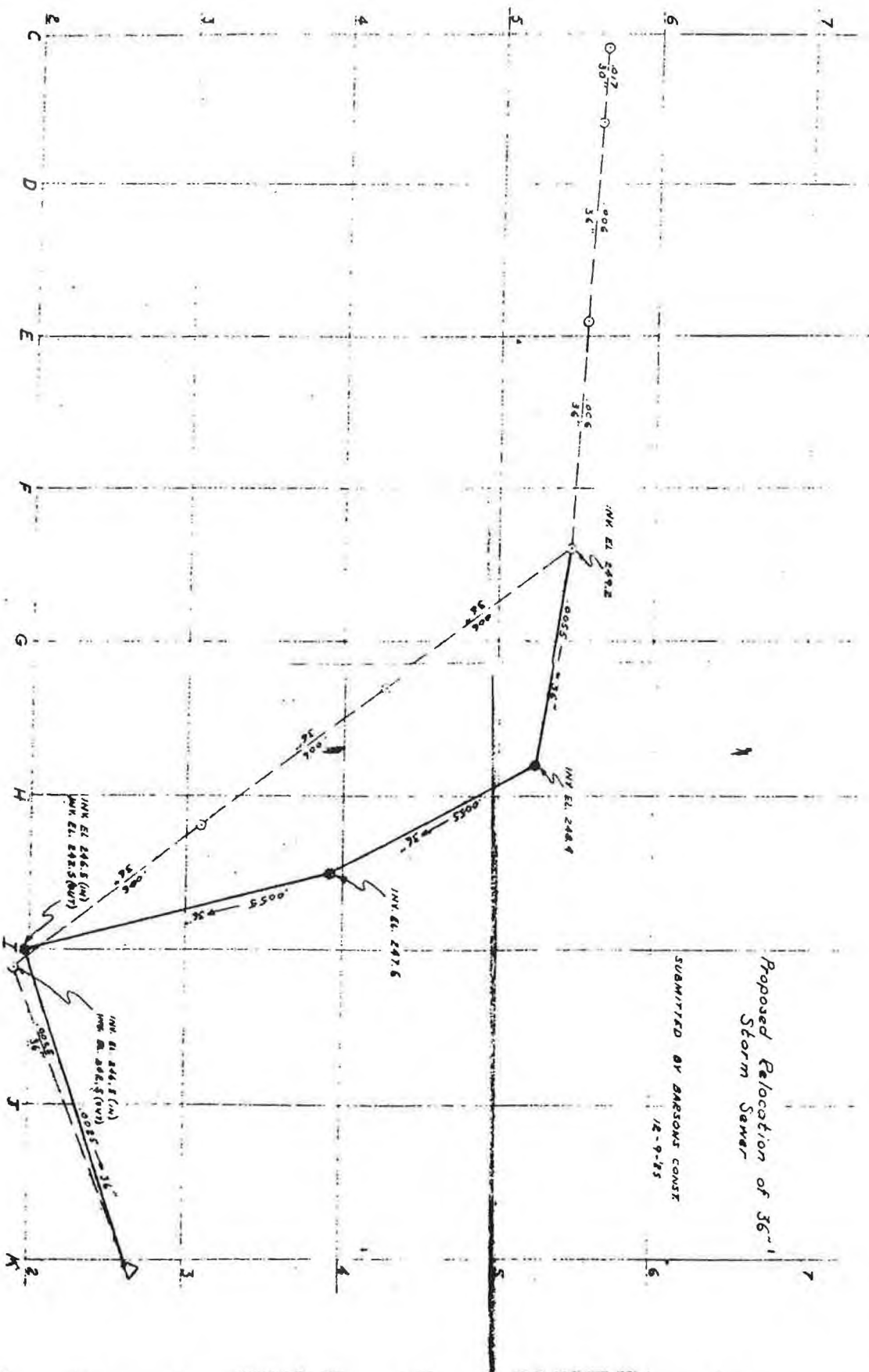
CHARLES E. PERRY
Chief, Buildings & Grounds Division

CF:
FQ
S



imc.

7-23-85



Proposed Relocation of 36" Storm Sewer
SUBMITTED BY BARROWS CONST
12-9-85

ENC 1

SECTION 02102

CLEARING AND GRUBBING

PART 1 - GENERAL

1. DEFINITIONS:

1.1 Clearing: Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including down timber, snags, brush, and rubbish occurring in the areas to be cleared.

1.2 Grubbing: Grubbing shall consist of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas.

PART 2 - EXECUTION

2. Clearing and grubbing shall be performed within the limits of work as shown on the contract drawings.

2.1 CLEARING: Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require.

2.2 GRUBBING: Material to be grubbed, together with logs and other organic debris, shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

3. DISPOSAL OF MATERIALS:

3.1 Disposal of Logs: Logs generated in clearing operation shall be chipped and deposited in the land management yard 1/4 mile from the site, as directed by the Contracting Officer.

3.2 Removing From Site: Stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing.

operations shall be removed from Fort Devens and properly disposed. Permission to dispose of such products on private property shall be in writing, and a copy of this permit shall be filed with the Contracting Officer.

END

02102-2

SECTION 02210

GRADING

PART 1 - GENERAL

1. APPLICABLE PUBLICATIONS: The following publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 Military Standards (Mil. Std.):

MIL-STD-619B	Unified Soil Classification System for Roads, Airfields, Embankments and Foundations
--------------	--

1.2 Delete.

2. DEFINITIONS:

2.1 Satisfactory Materials: Materials classified in MIL-STD-619 as GW, GP, and SW, and free from roots and other organic matter, trash debris, and frozen materials and stones larger than 6 inches in any dimension are satisfactory, except that maximum size stone in the sand and gravel layer directly beneath the liner shall be 3 inches.

2.2 Unsatisfactory Materials: Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Materials classified in MIL-STD-619 as Pt, OH, and OL are unsatisfactory. Unsatisfactory materials also include man-made fills, refuse, or backfills for previous construction.

2.3 Cohesionless and Cohesive Materials: Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Cohesionless materials include materials classified in MIL-STD-619 as GW, GP, SW, and SP. Materials classified as GM and SM will be identified as cohesionless only when the fines have a plasticity index of zero.

2.4 Degree of Compaction: Degree of compaction is a percentage of the maximum density obtained by the test procedure presented in MIL-STD-621, Method 100, compaction effort designation CE 55, abbreviated below as a percent of CE 55 density.

2.5 Topsoil: Material obtained from excavations, suitable for topsoils, is defined as fertile, friable loam, uniform in material and texture, free from materials toxic to grass, subsoil, clay lumps, sod, wood chips, stumps, roots or stones larger than 2 inches in any dimension, construction debris, and other foreign material. Topsoil shall be mixture of sand, silt, and clay, containing between 7 and 25 percent organic matter (as determined by loss on ignition), and exhibiting sandy and clayey properties in equal proportions.

3. SUBSURFACE DATA: Subsurface soil boring logs are shown on the drawings. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations.

PART 2 - PRODUCTS

4. BORROW MATERIAL: Borrow material shall be selected to meet requirements and conditions of the particular fill for which it is to be used. Necessary

clearing, grubbing, disposal of debris, and satisfactory drainage of borrow pits shall be performed by the Contractor as incidental operations to the borrow excavation.

4.1 Selection: Borrow materials shall be obtained from sources within the limits of the landfill, subject to approval. Borrow materials shall be subject to approval. Borrow material from approved sources on Government-controlled land may be obtained without payment of royalties.

4.2 Stones: Stones or rocks larger than the layer of borrow being placed shall be removed by the Contractor before the placement of the next layer.

PART 3 - EXECUTION

5. WIND-BLOWN LITTER:

5.1 Protection: The Contractor shall prevent the scattering of refuse, wind-blown paper, and other light materials by using suitable portable fencing, earthen banks, natural barriers, or any other suitable method.

5.2 Maintenance: The Contractor shall provide for routine maintenance and general cleanliness of the entire sanitary landfill area and adjacent property (beyond limit of work line).

5.3 Fence: The Contractor shall supply, have available on the site, and install as directed a sufficient amount, not less than 300 feet, of 4 foot high temporary fencing, to be used for the control of wind-blown paper. The fence may be a stock fence with wire fabric or a combination wire and wood fabric or other material approved by the Contracting Officer. The fence shall be relocated from time to time by the Contractor as directed by the Contracting Officer, as the locations of filling operations change.

5.4 Control: To provide a standard by which to judge acceptable control of wind-blown litter the following sampling methods will be utilized:

5.4.1 Ten locations shall be sampled for each area. The locations shall be 50 feet, plus or minus 2-1/2 feet, apart, distributed to provide a result indicative of condition of the area.

5.4.2 At each location one square yard shall be evaluated for the presence of wind-blown litter. Each piece of litter larger than one square inch shall be measured for horizontal area exposed. Measurements shall be rounded to the nearest whole inch and the area computed.

02210-3

5.4.3 The limits of acceptable performance:

5.4.3.1 Adjacent property shall have less than 1/10 square foot of litter per square yard, based on an average of all ten samples, with no more than 1/2 square foot of litter at any one location. Locations shall be no more than 100 feet, plus or minus 5 feet, from the limit of work line.

5.4.3.2 Area previously used as landfill but currently not in use shall have less than 1 square foot of litter per square yard, based on an average of all ten samples, with no more than 2 square feet of litter at any one location.

5.4.3.3 Area which has been capped under this Contract shall have less than 1/10 square foot of litter per square yard, based on an average of all ten samples, with no more than 1/2 square foot of litter at any one location.

5.4.3.4 The area in current use as active landfill disposal area (cleared) shall have less than 1/2 square foot of litter per square yard, based on an average of all ten samples, with no more than 1 square foot of litter at any one location. In this area the inspector shall be careful to verify that the litter is wind-blown and not refuse that has not been adequately covered. No samples shall be taken in areas being utilized for refuse disposal at the time of inspection, but only in covered areas or cleared areas not being used on day of inspection.

5.5 Report:

5.5.1 The locations from which samples were taken shall be shown on a sketch of the site, and the quantity of litter at each location and the average for each area noted thereon.

5.5.2 The samples shall be taken by the Contractor, and a written report submitted to the Contracting Officer on a weekly basis.

6. EQUIPMENT: The Contractor shall use as a minimum a bulldozer with an operating weight of approximately 29 tons. The compacting pressure based on the operating weight and ground contact areas for a D7 bulldozer shall be a minimum of 10 pounds per square inch. The equipment shall be properly equipped to withstand the rigors of landfill operation.

7. CONSERVATION OF TOPSOIL AND SATISFACTORY MATERIAL: Where encountered, topsoil and satisfactory material shall be removed without contamination with subsoil or unsatisfactory material and stockpiled convenient to areas for later application or at locations specified. Topsoil and satisfactory material shall be removed to full depth and shall be stored separate from other excavated materials and piled free of roots, stones, and other undesirable materials.

8. EXCAVATION: After topsoil removal has been completed, excavation of every description, regardless of material encountered, within the grading limits of the project shall be performed to the lines and grades indicated. Satisfactory and unsatisfactory excavation material shall be transported to and placed in fill areas within the limits of the work as indicated on the drawings. Excavations carried below depths indicated, without specific directions, shall, except as otherwise specified, be refilled to the proper grade with satisfactory material as directed. All additional work of this nature shall be at the Contractor's expense. Excavation and filling shall be performed in a manner and sequence that will provide drainage at all times. Excavations shall be kept free from water while construction therein is in progress. Material required for fills in excess of that produced by excavation within the grading limits shall be obtained from borrow areas.

9. DITCHES, GUTTERS, AND CHANNEL CHANGES: Ditches, gutters, and channel changes shall be cut accurately to the cross sections and grades indicated. All roots, stumps, rock, and foreign matter in the sides and bottom of ditches, gutters, and channel changes shall be trimmed and dressed or removed to conform to the slope, grade, and shape of the section indicated. Care shall be taken not to excavate ditches and gutters below the grades indicated. Excessive ditch and gutter excavation shall be backfilled to grade either with satisfactory, thoroughly compacted material or with suitable stone or cobble to form an adequate gutter. All ditches and gutters excavated under this section shall be maintained until final acceptance of the work. Satisfactory material excavated from ditches and channel changes shall be placed in fill areas. Unsatisfactory and excess excavated material shall be disposed of in accordance with directions in paragraph EXCAVATION. No excavated material shall be deposited closer to the edges of the ditches than indicated and in no case less than 3 feet.

10. BACKFILL ADJACENT TO STRUCTURES: Backfill adjacent to structures shall be placed and compacted uniformly in such manner as to prevent wedging action or eccentric loading upon or against the structures. Slopes bounding or within areas to be backfilled shall be stepped or serrated to prevent sliding of the fill. During backfilling operations and in the formation of embankments, equipment that will overload the structure in passing over and compacting these fills shall not be used. Backfill for storm drains and subdrains, including the bedding and backfill for structures other than culverts and drains, shall conform to the additional requirements in other applicable sections.

11. COMPACTION OF UNSUITABLE MATERIAL: (UNSATISFACTORY)

11.1 Spreading: The Contractor shall spread refuse evenly in shallow layers, not exceeding two feet thickness before compaction.

11.2 Compacting: The Contractor shall compact each layer thoroughly with at least four passes of the compaction equipment before spreading and compacting following layer.

11.3 Slope Angle: Compacted refuse surface shall have slope angle not exceeding 30 degrees from horizontal.

12. COMPACTION OF SUITABLE MATERIAL: (SATISFACTORY)

12.1 Spreading: The Contractor shall spread suitable material evenly in lifts not exceeding 12 inches compacted thickness.

12.2 Compacting: The Contractor shall compact each lift with at least four passes of the compactor equipment before spreading and compacting following layer.

13. FINISHED EXCAVATION, FILLS, AND EMBANKMENTS: All areas covered by the project, including excavated and filled sections and adjacent transition areas, shall be uniformly smooth graded. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from blade grader operations, except as otherwise specified. Ditches and gutters shall be finished to permit adequate drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials.

Surface on which the liner will be placed shall be free of sharp stones, roots, and other foreign material that could puncture the liner.

14. PROTECTION: Newly graded areas shall be protected from traffic and from erosion, and settlement or washing away that may occur from any cause, prior to acceptance, shall be repaired and grades reestablished to the required elevations and slopes. All work shall be conducted in accordance with the environmental protection requirements of the contract.

END

SECTION 02221

EXCAVATION, TRENCHING, AND BACKFILLING
FOR UTILITIES SYSTEMS

PART 1 - GENERAL

1. APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 Military Standards (Mil. Std.):

MIL-STD-619B	Unified Soil Classification System for Roads, Airfields, Embankments, and Foundations
MIL-STD-621A & Notices 1 & 2	Test Method for Pavement Subgrade, Subbase, and Base-Course Materials

1.2 American Association of State Highway and Transportation Officials (AASHTO) Standards:

T 180-83I	Moisture-Density Relations of Soils Using a 10-Lb (4.54 kg) Rammer and an 18-inch (457 mm) Drop
T 191-83I	Density of Soil In-Place by the Sand-Cone Method
T 205-83I	Density of Soil In-Place by the Rubber-Balloon Method
T 238-79	Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
T 239-76	Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

1.3 American Society for Testing and Materials (ASTM) Publication:

E 548-79	Generic Criteria for Use in the Evaluation of Testing and Inspection Agencies
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2. DEFINITIONS:

2.1 Satisfactory Materials: Satisfactory materials shall consist of any material classified by MIL-STD-619 as GW, GP, and SW.

2.2 Unsatisfactory Materials: Unsatisfactory materials shall be materials that do not comply with the requirements for satisfactory materials. Unsatisfactory materials include but are not limited to those materials containing roots and other organic matter, trash, debris, frozen materials and stones larger than 6 inches, and materials classified in MIL-STD-619, as PT, OH, and OL. Unsatisfactory materials also include man-made fills, refuse, and backfills from previous construction.

2.3 Cohesionless and Cohesive Materials: Cohesionless materials shall include materials classified in MIL-STD-619 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.

2.4 Rock: Rock shall consist of boulders measuring 1/2 cubic yard or more and materials that cannot be removed without systematic drilling and blasting such as rock material in ledges, bedded deposits, unstratified masses and conglomerate deposits, and below ground concrete or masonry structures, exceeding 1/2 cubic yard in volume, except that pavements will not be considered as rock.

2.5 Unyielding Material: Unyielding material shall consist of rock and gravelly soils with stones greater than 6 inches in any dimension or as defined by the pipe manufacturer, whichever is smaller.

2.6 Unstable Material: Unstable material shall consist of materials too wet to properly support the utility pipe, conduit, or appurtenance structure.

2.7 Select Granular Material: Select granular material shall consist of well-graded sand, gravel, crushed gravel, crushed stone or crushed slag composed of hard, tough, and durable particles, and shall contain not more than 10 percent by weight of material passing a No. 200 mesh sieve and no less than 95 percent by weight passing the 1-inch sieve. The maximum allowable aggregate size shall be 6 inches, or the maximum size recommended by the pipe manufacturer, whichever is smaller.

2.8 Degree of Compaction: Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in MIL-STD-621, Method 100, compaction effort designation CE 55 or AASHTO T 180, Method B.

PART 2 - EXECUTION

3. EXCAVATION: Excavation of every description and of whatever substances encountered shall be performed to the lines and grades indicated. Rock excavation shall include removal and disposition of material defined as rock in paragraph DEFINITIONS. Earth excavation shall include removal and disposal of material not classified as rock excavation. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench sufficient to avoid overloading and to prevent slides or cave-ins. Adequate drainage shall be provided for the stockpiles and surrounding areas by means of ditches, dikes, or other approved methods. The stockpiles shall also be protected from contamination with unsatisfactory excavated material or other material that may destroy the quality and fitness of the suitable stockpiled material. If the Contractor fails to protect the stockpiles and any material becomes unsatisfactory as a result, such material, if directed, shall be removed and replaced with satisfactory on site or imported material from approved sources at no additional cost to the Government. Excavated material not required or not satisfactory for backfill shall be disposed of in the landfill area. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating therein shall be removed so that the stability of the bottom and sides of the excavation is maintained. Unauthorized overexcavation shall be backfilled in accordance with paragraph BACKFILLING at no additional cost to the Government.

3.1 Trench Excavation: The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Trench walls below the top of the pipe shall be vertical, and trench walls above the top of the pipe shall be sloped as required to properly complete the work. Trench width below the top of the pipe shall not exceed 24 inches plus pipe outside diameter (O.D.) for pipes of less than 24 inch inside diameter, and shall not exceed 36 inches plus pipe O.D. for larger sizes. Where recommended trench widths are exceeded, redesign shall be performed by the Contractor using

stronger pipe or special installation procedures. The cost of this redesign and the increased cost of pipe or installation procedures shall be borne by the Contractor without additional cost to the Government.

3.1.1 Bottom Preparation: The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 6 inches or greater in any dimension shall be removed to avoid point bearing.

3.1.2 Removal of Unyielding Material: Where unyielding material is encountered in the bottom of the trench, such material shall be removed 12 inches below the required grade and replaced with suitable materials as provided in paragraph BACKFILLING.

3.1.4 Removal of Unstable Material: The Contracting Officer shall be notified where unstable material is encountered in the bottom of the trench.

When removal of unstable material is required due to the fault or neglect of the Contractor in his performance of the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Government.

3.2 Excavation for Appurtenances: Excavation for manholes, catch-basins, inlets, or similar structures shall be sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members.

4. BACKFILLING: Backfill material shall consist of satisfactory material. Backfill shall be placed in layers not exceeding 6 inches loose thickness for compaction by hand operated machine compactors, and 8 inches loose thickness for other than hand operated machines, unless otherwise specified. Each layer shall be compacted to at least 95 percent maximum density for cohesionless soils and 90 percent maximum density for cohesive soils, unless otherwise specified.

4.1 Trench Backfill: Trenches shall be backfilled to the grade shown.

4.1.1 Replacement of Unyielding Material: Unyielding material removed from the bottom of the trench shall be replaced with satisfactory material.

4.1.2 Replacement of Unstable Material: Unstable material removed from the bottom of the trench or excavation shall be replaced with select granular material placed in layers not exceeding 6 inches loose thickness.

4.1.3 Bedding and Initial Backfill: Bedding shall be of the type and thickness shown. Maximum stone size shall not exceed 3 inches. Initial backfill material shall be placed in layers of a maximum of 6 inches loose thickness and compacted with approved tampers to the density of the adjacent soil and to a height of at least 1 foot above the pipe. The backfill shall be brought up evenly on both sides of pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe. Backfill material in this portion of the trench shall consist of satisfactory material at a moisture content that will facilitate compaction, free from stones larger than 6 inches in any dimension.

4.1.4 Final Backfill: The remainder of the trench shall be backfilled with satisfactory material. Backfill material shall be deposited and compacted as follows:

4.1.4.1 Roadways: Backfill shall be deposited in layers of a maximum of 8 inches loose thickness and compacted to 95 percent maximum density for cohesive soils and 95 percent maximum density for cohesionless soils. Water flooding or jetting methods of compaction will not be permitted.

4.1.4.2 Turfed or Seeded Areas and Miscellaneous Areas: Backfill shall be deposited in layers of a maximum of 12-inch loose thickness, and compacted to 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils. Compaction by water flooding or jetting will not be permitted.

4.2 Backfill for Appurtenances: After the catchbasin has been constructed backfill shall be placed in such a manner that the structure will not be damaged by the shock of falling earth. The backfill material shall be deposited and compacted as specified for final backfill, and shall be placed in such a manner as to prevent eccentric loading and excessive stress on the structure.

5. TESTING: Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government.

5.1 Determination of Density: Density tests shall be performed by an approved commercial testing laboratory. Approval of testing facilities shall be based on compliance with ASTM E 548. Tests shall be performed in sufficient numbers to ensure that the specified density is being obtained. A minimum of one test per lift of backfill for every 500 feet of installation shall be performed. Laboratory tests for moisture density relations shall be determined in accordance with MIL-STD-621, Method 100, CE 55. A minimum of one test shall be performed on each different type of material used for backfill. A mechanical tamper may be used, provided the results are correlated with those obtained by the referenced hand tamper or AASHTO T 180, Method B. Field in-place density shall be determined in accordance with MIL-STD-621, Method 106, AASHTO T 191, AASHTO T 205, or AASHTO T 238. When AASHTO T 238 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in AASHTO T 191 or MIL-STD-621, Method 106. AASHTO T 238 results in a wet unit weight of soil and when using this method, AASHTO T 239 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gages shall be checked along with density calibration checks as described in AASHTO T 239. The calibration checks of both the density and moisture gages shall be made at the beginning of a job, on each different type of material encountered.

Copies of calibration curves and results of calibration tests shall be furnished to the Contracting Officer within 24 hours of conclusion of the tests. Trenches improperly compacted shall be reopened to the depth directed, then refilled and compacted to the density specified at no additional cost to the Government.

END

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SECTION 02485

LAWN AND GRASS

PART 1 - GENERAL

1. GENERAL REQUIREMENTS:

1.1 Limits of Lawn: Following areas shall receive topsoil and shall be seeded: capped area, cleared and grubbed areas, regraded and contoured areas except borrow area and area to receive drainline.

1.2 Topsoil: Topsoil stockpile will be established on site under another section of the specification. To extent available topsoil for work of Section 02485 shall be obtained from the previously established stockpile. Additional topsoil required shall be obtained under Section 02485 from off-site sources and at the Contractor's expense.

1.3 Erosion Protection: Lawn and grass areas will be protected against erosion until acceptance of completed turf. Eroded areas shall be replaced with acceptable turf, under Section 02485, using sod if seeded lawn and grass area cannot be established.

1.4 Topsoil Analysis: Stockpiled topsoil shall be analyzed for conformance to specification by independent laboratory, which shall be approved in advance by the Contracting Officer. Report of analysis shall be delivered directly to the Contracting Officer. If report indicates need for soil conditioners and nutrients they shall be added to topsoil as directed by the Contracting Officer and at the Contractor's expense.

1.5 Sod: Sod, otherwise meeting requirements of Section 02485, may be employed at Contractor's option in lieu of conventional lawn and grass construction specified.

1.6 Planting Periods: Planting shall be done only within following periods:

<u>Item</u>	<u>Spring</u>	<u>Fall</u>
Seed	April 15 to May 15	August 20 to October 1
Sod	April 15 to July 1	August 20 to October 15

1.6.1 If seeding cannot be done within dates specified above and before the contract completion date, the

Contractor shall return the following spring or fall to complete the seeding and establishment of grass. The Contractor shall prevent erosion until the seeding is done and turf is established.

2. SUBMITTALS:

2.1 Samples: Following sample shall be submitted in accordance with the SPECIAL CONTRACT REQUIREMENTS:

<u>Material</u>	<u>Quantity Pound</u>
Topsoil	50

PART 2 - PRODUCTS

3. GRASS SEED:

3.1 Seed Characteristics: Grass seed shall be of previous year's crop with not more than 0.5 percent weed seed, and not more than 1.75 percent crop seed, by weight. Seed shall be delivered to site in sealed containers, labeled with name of seed grower and seed formula, in form stated below. Seed shall be dry and free of mold. Seed shall meet following requirements:

<u>Name of Seed</u>	<u>Percent By Weight in Mixture</u>	<u>Minimum Percent Purity</u>	<u>Minimum Percent Germination</u>
Festuca elatior "Kentucky 31" Kentucky "31" Tall Fescue	25	97	90
Poa pratensis Common Kentucky Bluegrass	35	85	80
Lolium multiflorum Annual Ryegrass	20	95	90
Festuca rubra- "rubra" Creeping Red Fescue	20	97	85

3.2 Testing: Seed shall be tested by independent, reputable agricultural testing laboratory, which shall be approved in advance by the Contracting Officer. After delivery of seed to site but before planting, seed samples shall be taken by laboratory, under direction of

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the Contracting Officer, for analysis and determination of quality. Seed which does not conform to requirements of Section 02485 shall be replaced with new seed and analyses repeated, until seed is supplied in conformance with specification.

4. LIME: Lime shall be fine-ground limestone, containing equal to or more than 85 percent total carbonates, by weight, 100 percent passing 20 mesh (1.27 mm) sieve, and equal to or more than 75 percent passing a 100 mesh (0.25 mm) sieve.

5. FERTILIZER: Fertilizer shall be complete commercial product, uniform, dry, and free-flowing.

Fertilizer shall conform to following:

<u>Constituent</u>	<u>Percent Present (min.)</u>
Nitrogen	10
Available phosphoric acid (P_2O_5)	10
Water-soluble potash (K_2O)	10

6. MULCH: Mulch for hydroseeding shall be wood cellulose pulp of type specified by manufacturer for hydroseeding, such as Weyerhaeuser "Silva Fiber", or approved equal.

7. TOPSOIL: Topsoil shall be fertile, friable loam, uniform in material and texture, and shall be free from subsoil, clay lumps, sod, wood chips, stumps, roots or stones larger than 2 inches in any dimension, construction debris, materials toxic to grass, and other foreign material. Topsoil shall be mixture of sand, silt, and clay, containing between 7 and 25 percent organic matter (as determined by loss on ignition), and exhibiting sandy and clayey properties in equal proportions.

7.1 Acidity: Topsoil pH range shall be 5.0 to 7.0.

PART 3 - EXECUTION

8. GRADING:

8.1 Rough Grading: Areas to receive lawn, grass, or sod will be rough graded under another section of the specification.

8.1.1 Rough grade will be left at 6 inches below finished grade.

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8.2 Fine Grading: Fine grading of subgrade shall be performed under Section 02485. This work shall cause minimum possible disturbance of subgrade. Subgrade shall be fine graded to tolerance equal to plus or minus 1/2 inch deviation of average from the plane indicated in each 100 foot square area, with no ridges, ruts, mounds, or depressions exceeding plus or minus 1 inch, and no abrupt deviation from plane. Surface shall be left free from construction debris and other foreign matter, and stones larger than 3 inches in any dimension shall not be visible in or on completed subgrade. There shall be no depressions where water can stand.

8.2.1 Depth of fine-graded subgrade below finished grade shall be 6 inches.

8.3 Excess Material: Excess subsoil and refuse or debris obtained during the work shall be disposed of on site, in areas designated by the Contracting Officer.

8.4 Scarification: If delay in topsoil placement is more than two weeks beyond completion of rough grading of area to receive topsoil, subgrade shall be scarified to 2 inch depth immediately before fine grading and placing topsoil. Subgrade areas which have not been rough graded, and areas which have become hard since being rough graded, shall also be scarified, as specified above, not more than four days before placing topsoil.

9. PLACING TOPSOIL:

9.1 Limitations:

9.1.1 Topsoil shall not be placed until possible to follow immediately or within 24 hours with seeding or sodding.

9.1.2 Topsoil shall not be placed when subgrade or topsoil are frozen, excessively wet, or excessively dry.

9.2 Placing:

9.2.1 Topsoil shall be spread in uniform layer, to thickness which will compact to depth required to bring final lawn and grass surfaces to required elevation.

9.2.2 Surface shall be rolled as required to provide firm base for subsequent operations. Stones, roots, and other debris visible at surface, which are larger than 1-1/2 inches in any dimension, shall be removed.

10. PLACING LIMESTONE AND FERTILIZER:

10.1 Limestone:

10.1.1 Ground limestone shall be spread over surface at rate which will result in pH of 6.5 for top 3 inches of topsoil.

10.2 Fertilizer: Fertilizer shall be spread over surface at rate of 0.02 pound per square feet.

10.3 Fertilizer and Limestone:

10.3.1 Fertilizer and limestone shall be spread in uniform application, using approved mechanical spreader.

10.3.2 Fertilizer and lime shall be mixed thoroughly into top 3 inches of topsoil by disking, harrowing, or other approved means. Surface shall then be leveled and rolled as required to provide firm base for subsequent operations.

11. PLACING SEED:

11.1 Conditioning Surface: Final surface of topsoil immediately before seeding shall be within plus or minus 1/2 inch of required elevation, with no ruts, mounds, ridges, or other faults, and no pockets or low spots in which water can collect. Stones, roots, and other debris larger than 1-1/2 inches in any dimension, which are visible at surface, shall be removed and resulting holes filled with topsoil, leaving plane and uniform surface.

11.2 Applying Seed: Seed shall be spread with approved mechanical spreader, to given uniform application at following rate:

<u>Seed</u>	<u>Rate pounds per square foot</u>
Grass seed	0.010

11.2.1 Seed shall be applied in two equal applications. Direction of spreader travel for second pass shall be perpendicular to that of first pass. Seeding shall not be done when it is raining or snowing or when wind velocity exceeds 5 miles per hour.

11.2.2 Following seeding area shall be lightly raked to mingle seed with top 1/8 to 1/4 inch of soil. Area shall then be smoothed, stones and other debris larger than 1-1/2 inches in any dimension and which are visible on surface shall be removed, and surface shall be rolled with a roller having weight of 60 to 90 pounds per foot of width and diameter equal to or larger than 2 feet.

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11.2.3 At Contractor's option, seed may be spread by hydroseeding method, utilizing power equipment commonly used for that purpose. Seed, lime, fertilizer, and mulch shall be mixed and applied to achieve application quantities specified herein for conventional seeding method, with mulch applied at rate of 1,200 pounds per acre. Material shall be applied in two equal applications, with equipment during second pass moving perpendicular to direction employed during first pass. Other provisions specified above for conventional seeding shall apply also to hydroseeding.

11.3 Watering: Following seeding entire area shall be watered with lawn sprinklers or other approved means. Initial watering shall continue until equivalent of 2 inch depth of water has been applied to entire seeded surface, at rate which will not dislodge seed. Watering shall be repeated thereafter as frequently as required to prevent surface drying, until grass attains average height of 1/4 inch. Watering methods and apparatus shall not be permitted to injure surface.

12. SODDING

12.1 Cutting and Delivery: After Contracting Officer's inspection and approval of sod source sod shall be cut into square or rectangular sections, retaining sufficient native soil on roots for protection and continued viability of grass. Sod shall be kept moist during delivery and while in stacks, and shall be protected from exposure to wind, sun, and freezing. Sod shall be cut and moved only when soil moisture conditions are favorable to successful planting. Sections of sod may vary in length but shall be equal in width and not larger than will permit lifting and handling without breaking. Sod shall not be dumped from vehicles. If necessary, ground shall be watered to optimum moisture content before sod is cut. Damaged sod will be rejected.

12.2 Placing:

12.2.1 Edges of sodded areas shall be smooth, and sodded areas shall conform to design cross sections and grade. At edges adjacent to curbs, paved areas, etc., top surface of earth in sod shall be 1/2 inch below adjacent hard surface.

12.2.2 Immediately after sodding operations have been completed, entire surface shall be compacted with culti-packer roller or other approved equipment weighing 100 to 160 pounds per foot of roller.

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12.2.3 Completed sod shall immediately be watered sufficiently to uniformly wet soil to at least bottom of sod bed.

12.2.4 Sod shall be placed and all sodding operations completed within 72 hours following stripping from sod source bed.

12.2.5 Surface of completed sodded area shall be smooth. Sod shall be laid edge-to-edge, with tight-butted, staggered joints. Immediately after laying sod shall be pressed firmly into contact with sod bed by tamping or rolling, to eliminate air pockets. Following compaction screened topsoil of good quality shall be used to fill cracks, and excess soil shall be worked into grass with rakes or other suitable equipment. Grass shall not be smothered with excess fill soil.

13. MAINTENANCE:

13.1 Operations: Except as otherwise specified below, maintenance shall include all operations required to produce an established lawn, including but not limited to:

- Mowing
- Replanting
- Resodding
- Watering.

13.2 Timing:

13.2.1 Maintenance of lawn and grass areas shall begin upon completion of seeding or sodding.

13.2.2 Maintenance of sodded areas shall begin upon completion of sodding.

13.2.3 Maintenance shall continue until completion of extended maintenance period as specified in Paragraph EXTENDED MAINTENANCE.

13.3 Repairs:

13.3.1 After grass has sprouted, areas which fail to show uniform stand of grass shall be replanted as often as necessary to establish acceptable stand of grass.

13.3.2 Scattered bare spots shall not exceed 72 square inches each.

13.3.3 Scattered bare spots not exceeding total of 15 percent of area sown with seed will be acceptable without reseeding required.

13.4 Mowing: First mowing shall be done when average height of grass is 2-1/2 inches, with mower set to cut at height of 2 inches. Subsequent mowings shall be made at intervals not greater than two weeks, with height of cut set at 2 inches. With Contracting Officer's prior permission mowings during periods of slow growth or dormancy may be spaced at greater intervals.

13.5 Lime and Fertilizer: If lawn or grass is established in fall and maintenance is required to continue into spring months, lawn and grass shall receive application of lime and fertilizer in spring. Lime and fertilizer shall be spread in uniform layer over entire lawn surface, at rate of .05 pound per square foot for lime and 0.02 pound per square foot for fertilizer.

14. EXTENDED MAINTENANCE: The Contractor shall maintain grass for one complete growing season, April 15 through October 15, following contract completion date. Extended maintenance operations shall conform to Paragraph MAINTENANCE.

END

SECTION 02501

STORM-DRAINAGE SYSTEM

1. APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 Federal Specifications (Fed. Spec.):

RR-F-621C	Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole
SS-S-210A	Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints

1.2 Deleted.

1.3 American Association of State Highway and Transportation Officials (AASHTO) Publications:

M 33-81	Preformed Expansion Joint Filler for Concrete (Bituminous Type)
M 170-82	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
M 198-75 (R 1982)	Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets
M 199-82	Precast Reinforced Concrete Manhole Sections
T 180-74 (R 1982)	Moisture-Density Relations of Soils Using a 10-Lb (4.5 kg) Rammer and an 18-inch (457 mm) Drop
Specification - 1983 1984 Interim Update	Standard Specifications for Highway Bridges

1.4 American Society for Testing and Materials (ASTM) Publications:

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A 220-76	Pearlitic Malleable Iron Castings
C 32-73 (R 1979)	Sewer and Manhole Brick (Made from Clay or Shale)
C 33-84	Concrete Aggregates
C 55-75 (R 1980)	Concrete Building Brick
C 62-81	Building Brick (Solid Masonry Units Made from Clay or Shale)
C 76-82	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
C 139-73 (R 1979)	Concrete Masonry Units for Construction of Catch Basin and Manholes
C 231-82	Air Content of Freshly Mixed Concrete by the Pressure Method
C 270-82	Mortar for Unit Masonry
C 425-77 (R 1982)	Compression Joints for Vitrified Clay Pipe and Fittings
C 443-79	Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
C 478-82a	Precast Reinforced Concrete Manhole Sections
D 1751-73 (R 1978)	Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
D 1752-67 (R 1978)	Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

2. DELIVERY, STORAGE, AND HANDLING OF MATERIALS:

2.1 Delivery and Storage: Materials delivered to site shall be inspected for damage, unloaded, and stored with

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the minimum of handling. Do not store materials directly on the ground. Inside of pipes and fittings shall be kept free of dirt and debris.

2.2 Handling: Materials shall be handled in such a manner as to insure delivery to the trench in sound undamaged condition. Pipe shall be carried to the trench not dragged. Gasket materials and plastic materials that are not to be installed immediately shall not be stored in the direct sunlight.

3. SUBMITTALS:

3.1 Manufacturers Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Contracting Officer prior to installation. Installation of the item will not be allowed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

4. PIPE FOR STORM DRAINS shall be as indicated and shall conform to requirements for the following pertinent types:

4.1 Reinforced Concrete Pipe: ASTM C 76 or AASHTO M 170, Class IV, Wall B.

5. DRAINAGE STRUCTURES:

5.1 Catch Basins: Construction shall be of precast reinforced concrete or precast concrete segmental blocks, complete with frames and gratings.

5.1.1 Catch basin shall be designed to safely withstand AASHTO H-20 loading as specified in AASHTO Specification.

5.2 Headwalls: Construction shall be of reinforced concrete.

6. MATERIALS FOR DRAINAGE STRUCTURES:

6.1 Concrete: Unless otherwise specified, concrete shall be normal weight utilizing Type II cement, and shall have a 28 day ultimate compressive strength (f'_c) not less than 3000 pounds per square inch (psi). Aggregate shall conform to ASTM C 33. Maximum aggregate size shall be 3/4 inch. The concrete mixture shall have air

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content by volume of concrete, based on measurements made immediately after discharge from the mixer, of 5 to 7 percent. Air content shall be determined in accordance with ASTM C 231. The concrete covering over steel reinforcing shall be not less than 1 inch thick for covers and not less than 1-1/2 inches thick for walls and flooring. Expansion-joint filler material shall conform to ASTM D 1751, D 1752, or AASHTO M 33 or shall be resin-impregnated fiberboard conforming to the physical requirements of ASTM D 1752.

6.2 Mortar: Mortar for brick or block construction shall conform to ASTM C 270, Type M, except the maximum placement time shall be 1 hour.

6.2.1 The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar but in no case shall exceed 5.2 gallons of water per sack of cement. Water shall be clean and free of harmful acids, alkalies, and organic impurities. The mortar shall be used within 30 minutes after the ingredients are mixed with water.

6.3 Precast Reinforced Concrete Catch Basins: Shall conform to ASTM C 478 or AASHTO M 199. Joints between precast concrete risers and tops shall be made with flexible watertight, rubber-type gaskets meeting the requirements of Paragraph: Flexible Watertight Joints.

6.4 Precast Concrete Segmental Blocks: Shall conform to ASTM C 139, not more than 8 inches thick, not less than 8 inches long, and of such shape that joints can be sealed effectively and bonded with cement mortar.

6.5 Brick: Shall conform to ASTM C 62, Grade SW; ASTM C 55, Grade S-I or S-II; or ASTM C 32, Grade MS. Mortar for jointing and plastering shall consist of one part portland cement and two parts fine sand. Lime may be added to the mortar in a quantity not more than 25 percent of the volume of cement. The joints shall be filled completely and shall be smooth and free from surplus mortar on the inside of the structure. Brick work shall be plastered with 1/2 inch of mortar over entire surface.

6.6 Frame and Cover or Gratings: Fabrication shall be from one or more of the material options presented in Fed. Spec. RR-F-621, except the malleable cast iron option shall conform to ASTM A 220, Grade 40010. Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the plans. Frames and

covers for curb inlets and for areas not subject to vehicular traffic or storage may be malleable iron if so indicated. Malleable-iron frames and covers shall conform to ASTM A 220 and shall be of the weight, shape, and size indicated.

7. JOINTS:

7.1 For Concrete Pipe:

7.1.1 Flexible Watertight Joints:

7.1.1.1 Materials and Test Requirements: Flexible watertight joints shall be made with rubber-type gaskets for concrete pipe. The design of joints and the physical requirements for rubber-type gaskets shall conform to ASTM C 443 or AASHTO M 198. Factory-fabricated resilient joint materials shall be, at the option of the Contractor, one of three types and of the materials and manufacture conforming to ASTM C 425. Gaskets shall have not more than one factory-fabricated splice. Material conforming to Fed. Spec. SS-S-210 is acceptable as an alternate to ASTM C 443, provided the necessary installation instructions are furnished.

7.1.1.2 Installation: Gaskets and jointing materials shall be as recommended by the particular manufacturer in regard to use of lubricants, cements, adhesives, and other special installation requirements. Surfaces to receive lubricants, cements, or adhesives shall be clean and dry. Gaskets and jointing materials shall be affixed to the pipe not more than 24 hours prior to the installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Gaskets and jointing materials shall be inspected before installing the pipe; any loose or improperly affixed gaskets and jointing materials shall be removed and replaced. The pipe shall be aligned with the previously installed pipe, and the joint pulled together. If, while making the joint, the gasket or jointing material becomes loose and can be seen through the exterior joint recess when joint is pulled up to within 1 inch of closure, the pipe shall be removed and the joint remade.

8. EXCAVATION AND TRENCHING FOR STORM DRAINS AND DRAINAGE STRUCTURES: Excavation of trenches and backfilling for storm drains shall be in accordance with SECTION: EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS and the following requirements.

8.1 Trenching: Width of trenches at any point below the top of the pipe shall be not greater than the outside diameter of the pipe plus 24 inches to permit satisfactory jointing and the thorough tamping of the bedding material under and around the pipe. Sheeting and bracing where required shall be placed within the trench width as specified. Care shall be taken not to overexcavate. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures shall be necessary. Cost of this redesign and increased cost of pipe or installation shall be borne by the Contractor without additional cost to the Government.

8.2 Removal of Rock: Rock in either ledge or boulder formation shall be replaced with selected materials to provide a compacted earth cushion having a thickness between unremoved rock and the pipe of at least 8 inches or 1/2-inch for each foot of fill over the top of the pipe, whichever is greater, but not more than three-fourths the nominal diameter of the pipe. Where bell-and-spigot pipe is used, the cushion shall be maintained under the bell as well as under the straight portion of the pipe. Rock excavation shall be as specified and defined in SECTION: EXCAVATION, TRENCHING, AND BACK-FILLING FOR UTILITIES SYSTEMS.

8.3 Removal of Unstable Material: Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Contracting Officer, is encountered in bottom of trench, such material shall be removed to depth required and replaced to the proper grade with selected material, compacted as provided in Paragraph BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor in his performance of shoring and sheeting, water removal, or other specified requirements, resulting material shall be excavated and replaced by the Contractor without additional expense to the Government.

9. BEDDING: The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe. The pipe shall be bedded carefully in a soil foundation accurately shaped and rounded to conform to the lowest one-fourth of the outside portion of circular pipe or to the lower curved portion of pipe arch for the entire length of pipe or arch. When necessary, the bedding shall be tamped. Bell holes and depressions for joints shall be only of such length, depth, and width as required for properly making the particular type joint.

10. PLACING PIPE: Each pipe shall be carefully examined before being laid, and defective or damaged pipe shall not be used. Pipelines shall be laid to the grades and alinement indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. All pipe in place shall be inspected before backfilling, and those damaged during placement shall be removed and replaced at no additional cost to the Government.

10.1 Concrete Pipe: Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow.

11. BACKFILLING: Shall be as specified in Section 02221.

END

SECTION 02598

LANDFILL LINER

PART 1 - GENERAL

1. APPLICABLE PUBLICATIONS: The following publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 American Society for Testing and Materials (ASTM) Publications:

- | | |
|-----------------|--|
| D 413-82 | Rubber Property-Adhesion to Flexible Substrate |
| D 618-61(1981) | Conditioning Plastics and Electrical Insulating Materials for Testing |
| D 792-66(1979) | Specific Gravity and Density of Plastics by Displacement |
| D 882-83 | Tensile Properties of Thin Plastic Sheeting |
| D 1004-66(1981) | Initial Tear Resistance of Plastic Film and Sheeting |
| D 1203-67(1981) | Volatile Loss From Plastics Using Activated Carbon Methods |
| D 1204-84 | Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperatures |
| D 1239-55(1982) | Resistance of Plastic Films to Extraction by Chemicals |
| D 1593-81 | Nonrigid Vinyl Chloride Plastic Sheeting |
| D 1755-81 | Poly (Vinyl Chloride) Resins |
| D 1790-83 | Brittleness Temperature of Plastic Film by Impact |

D 3083-76(1980) Flexible Poly (Vinyl Chloride)
Plastic Sheeting for Pond, Canal,
and Reservoir Lining

2. GENERAL REQUIREMENTS:

2.1 Sand and Gravel Layer: A 3 inch thick layer of sand and gravel will be placed over subgrade under another section of the specification before liner is installed.

3. SUBMITTALS: Submittals shall be made in accordance with requirements of SPECIAL CONTRACT REQUIREMENTS, modified as indicated below.

3.1 Material Certification: Material certification shall be submitted stating that the material meets or exceeds requirements of Table, "Physical Properties".

3.2 Warranty: Warranty shall be submitted, stating that leaks and defects of material and workmanship in liner and joints shall be repaired or defective portions replaced in site with new material and work. Warranty shall extend for 20 year period from date of Government acceptance of completed project.

PART 2 - PRODUCTS

4. LINER:

4.1 Material: The liner shall be suitably formulated from homopolymer vinyl chloride resin of Type GP in accordance with ASTM D 1755, and compounded with suitable plasticizers, fillers, and additives to impart durability. A biocide shall be included in the material to provide resistance to biological degradation of the membrane. The membrane shall be compounded with carbon black and other ultraviolet stabilizers to provide resistance to ultraviolet degradation.

4.1.1 The carbon black shall be evenly dispersed to produce a uniform color. Water-soluble compounding ingredients shall not be employed.

4.1.2 The membrane shall be uniform throughout and shall be free from dirt, oil, foreign matter, scratches, cracks, creases, bubbles, pits, tears, holes, pinholes, or other defects which may affect the serviceability of the membrane.

4.1.3 The polyvinyl chloride (PVC) membrane lining shall be fabricated from a film width of not less than 58 inches.

02598-2

4.1.4 The lap seams shall be factory bonded using a liquid cement or commercially accepted dielectric sealing devices. Hot-air seaming methods shall not be used. Lap seams shall be used and have a 3/4-inch minimum lap and a 3/4-inch minimum electrode (die) width. The seams shall be watertight and the strength of the bonded seam in either the machine (longitudinal) or transverse direction of the film shall not be less than 80 percent of the breaking strength of the film when tested in a similar direction, or shall tear the parent material when tested in peel adhesion.

4.1.5 The film shall be capable of being bonded to itself by liquid cement for making field splices and repairs. The manufacturer shall furnish a cement-suitable for joining or repairing the larger pieces in the field. The cement shall not be affected by sun or water exposure and shall not produce any detrimental effect to the film.

5. FACTORY FABRICATION: Individual calendar widths of PVC shall be factory fabricated into large panels. The manufacturer of the calendered rolls shall show where a minimum of 2,000,000 square feet of its 76 inch wide material has been installed for lining hydraulic structures. Lap joints with a minimum joint width of 1/2 inch shall be used. Factory made splices shall have a strength of 80 percent of the specified sheet strength. After fabrication, the lining shall be accordion folded in both directions and packaged for minimum handling in the field. Shipping boxes shall be substantial enough to prevent damage to contents.

5. PROPERTIES: Physical properties of liner shall conform to Table, "Physical Properties". Liner samples shall be prepared for testing in accordance with ASTM D 618.

PHYSICAL PROPERTIES		
Property	Required Film Thick-	ASTM
	ness (nominal)	
	30 mil	Test Method
1. Thickness, minimum mm (inch)	0.72 (0.0285)	D 1593, para- graph 8.1.3
2. Specific gravity, minimum	1.20	D 792, Method A

<u>Property</u>	<u>Required Film Thick- ness (nominal)</u>		<u>ASTM</u>
	<u>30 mil</u>		<u>Test Method</u>
3. Tensile properties:			D 882
a. Breaking factor, each direction, minimum, N/mm (lbf/in)	12.0 (69)		
b. Elongation at break, each direction, minimum, percent	300		
c. Modulus at 100 percent elongation, each direction, minimum, N/mm (lbf/in)	4.7 (27)		
4. Bonded seam strength, tensile, each direction, minimum, percent of breaking factor	80		D 882
5. Bonded seam strength, peel adhesion	FTB		D 413
6. Tear resistance (Graves), each direction, minimum, N (lbf)	35.6 (8.0)		D 1004
7. Low temperature impact	Not more than 5 specimens out of 10 shall fail at -28.9 °C (-20 °F)		D 1790
8. Dimensional stability each direction, maximum, percent	5.0		D 1204, 15 minutes at 100 °C (212 °F)
9. Plastizer stability:			
a. Water extraction, maximum, percent weight loss	0.35		D 1239, Immersion in 50 °C (122 °F) distilled water for 24 hours
b. Volatile loss, maximum, percent	0.7		D 1203, Method A

02598-4

<u>Property</u>	Required Film Thick-	<u>ASTM</u> <u>Test Method</u>
	ness (nominal) <u>30 mil</u>	
c. Resistance to soil burial, increase in modulus at 100 percent elongation each direction, maximum, percent	10.0	D 3083, 30-day soil burial

PART 3 - EXECUTION

7. INSTALLATION:

7.1 Preparation:

7.1.1 Surfaces to be lined shall be smooth and free from sharp rocks, other sharp objects, vegetation, and stubble when liner is placed.

7.1.2 Surfaces to receive liner shall be inspected by installer to determine whether there are defects present which might injure or impair its permanence or water-proofness.

7.1.3 Surfaces to receive liner shall be maintained in acceptable condition until liner installation is complete.

7.1.4 Lining installation shall begin only after certification referred to under paragraph "Submittals", above, has been furnished to and approved by Contracting Officer.

7.2 Field Engineer: Lining manufacturer's field engineer shall be present at all times during installation.

7.3 Seams: Field seams shall be 100 percent inspected by Contractor and lining manufacturer's technical representative.

7.4 Connections to Metal: Metal to be in contact with membrane shall be fully sealed and bonded thereto, using trowel coat of compatible mastic over entire contact surface.

8. PLACING LINING: The PVC lining shall be placed over the prepared surfaces to be lined in such a manner as to assure minimum handling.

8.1 General: Placing methods shall be designed to minimize handling.

8.2 Fitting: The lining shall be closely fitted and sealed around inlets, outlets and other projections through the lining.

8.3 Damage: Lining damaged during installation shall be replaced or repaired by using an additional piece of lining.

8.4 Field Joints: Lap joints shall be used to seal factory-fabricated panels of PVC together in the field. Lap joints shall be formed by lapping the edges of panels a minimum of 2 inches. The contact surfaces of the panels shall be wiped clean to remove all dirt, dust or other foreign materials. Sufficient cold-applied vinyl-to-vinyl bonding adhesive shall be applied to the contact surfaces in the joint area, and the two surfaces pressed together immediately. Wrinkles shall be smoothed out. Field splices shall have a strength of 80 percent of the specified sheet strength.

8.5 Joints to Structures: Curing compounds and coatings shall be completely removed from the joint area. Joining of PVC to concrete shall be made with vinyl-to-vinyl concrete adhesive and mechanically fastened. Unless otherwise shown on the drawings, the minimum width of concrete to PVC joint shall be 8 inches.

8.6 Repairs to PVC: Any necessary repairs to PVC shall be patched with the lining material itself and cold applied vinyl-to-vinyl splicing adhesive. The splicing adhesive shall be applied to the contact surfaces of both the patch and lining to be repaired, and the two surfaces pressed together immediately. Wrinkles shall be smoothed out.

8.7 Quality of Workmanship: Completed joints shall be tightly bonded. Lining injury from scuffing, penetration by foreign objects, and distress from rough subgrade shall be replaced or covered and sealed with an additional layer of PVC of the proper size. A technical service representative of the lining manufacturer shall be made available to the Contractor. The technical service representative shall instruct Contractor's personnel in correct methods for handling and installing liner.

9. ANCHORAGE: Immediately following liner installation cloth bags filled with sand shall be placed over it. Bags shall be placed as required to prevent liner billowing in wind. Bags shall remain until gravel layer is placed over liner. Bags may remain during and after gravel placement, at Contractor's option. Gravel will be provided and placed over membrane under SECTION: GRADING. Liner shall not be left exposed to the atmosphere without protection of the sand and gravel layer for more than 48 hours.

10. SPECIAL EDGE: Along grid line 13 from G thru R, the liner edge shall be lapped over itself and seamed in accordance with the manufacturer's recommendations so that another liner could be attached in the future.

END

PHASE II

2 June 88
(Date)

SUBJECT: Contract NO DAKF3187C 0157 Modification(s) _____

TITLE OF CONTRACT: PHASE II Sanitary Landfill

TO: Contracting Officer, Fort Devens, MA 01433-5340

1. An inspection of the work completed under subject contract has been conducted by this office and it has been determined that the project has been completed by the Contractor in accordance with the terms and specifications of the contract.

2. Required completion date (As per contract) 15 May 1988

3. Actual completion date of work (Except for minor deficiencies) _____

4. Final completion date and acceptance 12 May 1988


5. Remarks, if any:

1. Reference letter from DEH, Operations to DOC, Admin dated 23 Nov 87; and letter from DOC to Wes Construction Corporation, dated 2 Dec 87; both subject above contract, attachments 2 and 3.

2. Reference Contract Progress Report, subject same contract, attachment 1.

3. Contractor has completed all work necessary to meet the requirements of subject contract.

4. Recommend final and full payment be made with letter expressing our appreciation for a job well done.


NORMAN E. BLACK, CH, TECH SERVS BR
Contracting Officer's Representative

WES CONSTRUCTION CORP.

850 Providence Highway (Route 1)

Dedham, MA 02026-6822

TEL. (617) 326-4030

FAX (617) 326-9957

May 24, 1988

Mr. Robert Kruzewski
Contract Administrator
Department of the Army
Contracting Division
Building 227
Fort Devens, MA 01433-5340

RE: Fort Devens
Phase II Sanitary Landfill
Contract No. DAKF
31-87-C-0157

Dear Mr. Kruzewski:

The purpose of this letter is to advise you that as per the terms of our contract all work has been completed as of May 15, 1988. We have met at the job site with Mr. Norm Black, and have completed to his satisfaction the minor repairs which were required by erosion over the winter.

Attached are copies of the contract progress report and final requisition. Please process for payment.

Also attached for you records are:

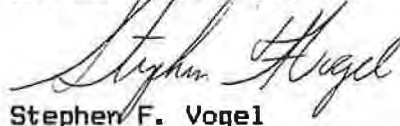
1. Certified payroll affidavits for the current period.
2. Copies of the warranty on the PVC liner material.

Thank you for the cooperation we received from yourself and Mr. Norm Black during the course of this project.

If you have any questions, please contact me.

Sincerely,

WES CONSTRUCTION CORP.



Stephen F. Vogel

SFV/smt

cc EJC



Established 1948

WATERSAVER COMPANY, INC.

P.O. BOX 16465

DENVER, COLORADO 80216

(303) 623-4111

Plant and Office — 5870 E. 58th Ave.

WARRANTY AND AGREEMENTS

All goods sold by the Watersaver Company, Inc., are covered by the following warranties and agreements:

1. Roll goods are warranted by the manufacturer. Said manufacturer's warranty given to the purchaser is the only warranty applicable to such roll goods and is expressly in lieu of any warranty by the Watersaver Company, Inc., expressed or implied, including any implied warranty of merchantability or fitness for a particular purpose.

2. Fabrication of the roll goods into panels by the Watersaver Company, Inc., is warranted to be free from defects in workmanship under normal use and service. Liability under this warranty shall be limited to repair or replacement at the option of the Watersaver Company, Inc., of the goods which prove to be defective; provided, however, that any claim under this warranty be made in writing to the Watersaver Company, Inc., within thirty (30) days after the alleged defect is first noticed or should have been noticed by the purchaser.

This warranty is expressly in lieu of all other warranties, express or implied, including the warranties of merchantability and fitness for a particular purpose and of all other obligations or liabilities on the part of the Watersaver Company, Inc., and Watersaver Company, Inc., neither assumes, nor authorizes any other person for it, any other liability in connection with this sale of goods. This warranty shall not apply to any goods that have been subject to accident, negligence, alteration, abuse or misuse. The Watersaver Company, Inc., shall in no event be liable for any breach of warranty in an amount exceeding the purchase price of the goods and shall not be responsible for any special, direct, indirect, consequential or incidental damages in excess of said purchase price.

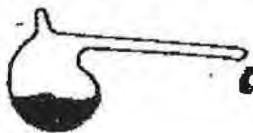
Department of the Army
(owner)

Ft. Deven, Massachusetts
(project location)

January 4, 1988
(date)

WATERSAVER COMPANY, INC.

by James O. Bryan Vice President
(name) (title)

*Industrial & Environmental Plastics, Inc.*

156 Christol Street

Metuchen, New Jersey 08840

Phone (201) 494-4984

November 18, 1987

Mr. Jim Bryan
V.P. Liners Div.
Watersaver Company Inc.
P.O. Box 16465
Denver, CO 80216

Dear Mr. Bryan,

Enclosed herewith are the test results, per ASTM D 3083-modified, on the Field Seams for the Fort Devens, MA, Phase II Landfill Closure Project.

The average strength of the liner's seams is 58.0 lbs. per inch of seam length. All of the samples that were tested broke outside of the bonded seam area, which is indicative of excellent seam quality.

Yours Truly,

Richard H. Dickinson
Tech. Consultant & Agent for
Dynamit Nobel of America Inc.
/gw

Encl.

CC: Wes Construction Co.
Wright & Kohli Const. Co.

Post-It™ brand fax transmittal memo 7671		# of pages → 2
To DAWN	From S. WRIGHT	
Co.	Co.	
Dept.	Phone #	
Fax # 617 589-2922	Fax #	

Fort Devens (Watersaver Company Inc.) Field Seam Tests*
 Tested per D.N.A. Laboratory Project #51-131
 Tests Conducted via ASTM D 3083**

<u>Sample Identification</u>	<u>Seam Strength*** (in pounds)</u>	<u>Observations (visual)</u>
FDS 1	60.1	****
FDS 2	63.1	****
FDS 3	57.4	****
FDS 4	52.9	****
FDS 5	57.0	****
FDS 6	58.4	****
FDS 7	63.0	****
FDS 8	58.1	****
FDS 9	58.9	****
FDS 10	53.9	****
FDS 11	56.3	****
FDS 12	56.6	****
FDS 13	61.3	****
FDS 14	55.5	****

- * Samples sent via Wright & Kohli Construction Company.
 ** Test machine grip separation modified to 2.0" + seam width.
 *** Average Seam Strength for the liner (lot average) is 58.0 lbs.,.
 **** All sample breaks occurred outside of the bonded seam area.

T.Q./P.S./R.H.D.

typed 11-18-87

AMENDMENT OF SOLICITATION MODIFICATION OF CONTRACT

2. AMENDMENT/MODIFICATION NO. P00002	3. EFFECTIVE DATE 87 Nov 9	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicable)
6. ISSUED BY Directorate of Contracting building 227 Fort Devens, MA 01433-5340 ATTN: Bob Kruzewski (617) 796-2829		7. ADMINISTERED BY (If other than Item 6) CODE	

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) Wes Construction Corp. 850 Providence HWY (route 1) Dedham, MA 02026 (617) 326-4030	(y) 9A. AMENDMENT OF SOLICITATION NO. 9B. DATED (SEE ITEM 11) 10A. MODIFICATION OF CONTRACT/ORDER NO. x DAKF3187C0157 10B. DATED (SEE ITEM 13) 87 Jul 21
CODE	FACILITY CODE

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

N/A

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

(y) A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
x C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: changes FAR 52.243-4 (Apr 84)
D. OTHER (Specify type of modification and authority)


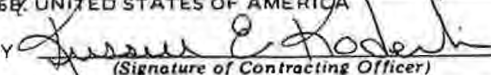
E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 4 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This modification, P00002 is initiated to incorporate the following change to subject contract for Phase II, sanitary landfill, Fort Devens, MA.

1. Block 10B of modification P00001 dated 87 Aug 25 is changed to read as block 10B above.

2. In lieu of proposed structure, due to the potential for erosion in the newly constructed drainage swale, the contractor shall install a filter fabric liner with a layer of 8-12" rip-rap. Approximately 1500 sy of filter fabric and rip-rap. This shall be placed from the edge of Plow Shop Pond approximately 720 feet in length by 15 feet wide. Rip-rap will also be placed at the end of the existing loamed swale to slow the flow of water in the swale. (con't)---
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) Edward J. Comeau Exec V.P.	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) RUSSELL E. RODERICK		
15B. CONTRACTOR/OFFEROR  (Signature of person authorized to sign)	15C. DATE SIGNED Nov 20 1987	16B. UNITED STATES OF AMERICA  (Signature of Contracting Officer)	16C. DATE SIGNED 87 Nov 30

DAKF31-87-C-0157

Modification - P00002

Page 2

Contract price remains unchanged at \$897,000.00. Contract Completion date remains at 15 May 88.

RECORD OF CONTRACT ADMINISTRATION

CONTRACT NO:

CONTRACT PERFORMANCE SCHEDULE:

CONTRACTOR: *Wai Construction*

DATE	ACTION
2 Nov 87	<p>Norm Black - hand carried this change to the office. He said the recent rain we had caused the erosion. What the contractor has proposed is a lot of work but will save time in the long run. He felt by doing this it will last longer & protect the pond.</p> <p><i>Phyllis Russell</i> PHYLLIS M. LOISELLE CONTRACT SPECIALIST</p>
3 Nov -	<p>Spoke with Russell - He said go ahead. Called the Rte - gave him the go ahead.</p> <p><i>Phyllis Russell</i> PHYLLIS M. LOISELLE CONTRACT SPECIALIST</p>

WES CONSTRUCTION CORP.
850 Providence Highway (Route 1)
DEDHAM, MASS. 02026

October 30, 1987

Mr. Robert Kruzewski
Contract Administrator
Department of the Army
Contracting Division
Building 227
Fort Devens, MA 01433-5340

Re: Fort Devens
Phase II Sanitary Landfill
Contract No. DAKF-31-87-C-
0157

Dear Mr. Kruzewski:

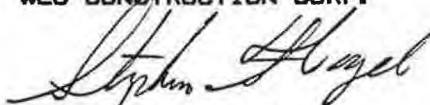
In order to minimize the potential for erosion in the newly constructed drainage swale on the above referenced project, we have listed below our proposal to accomplish this without any additional cost to the department of the Army, nor any additional time extension.

The previously approved modification to this contract lowered the elevation of the proposed drainage swale. This effectively eliminated the need for the concrete grade stabilization structure originally specified. In lieu of the proposed structure, WES CONSTRUCTION CORP. proposes to install a filter fabric liner with a layer of 8 - 12" riprap. We would install approximately 1,500 SY of filter fabric and riprap. This would be placed from the edge of Plow Shop Pond approximately 720 feet in length by 15 feet wide. Riprap will also be placed at the end of the existing loamed swale to slow the flow of water in the swale. This riprap will help eliminate the potential for erosion in the swale and minimize the material and silt from being washed into the pond.

If you have any questions, please contact us.

Sincerely,

WES CONSTRUCTION CORP.



Stephen F. Vogel
Project Manager

SFV/mev

cc: EJC

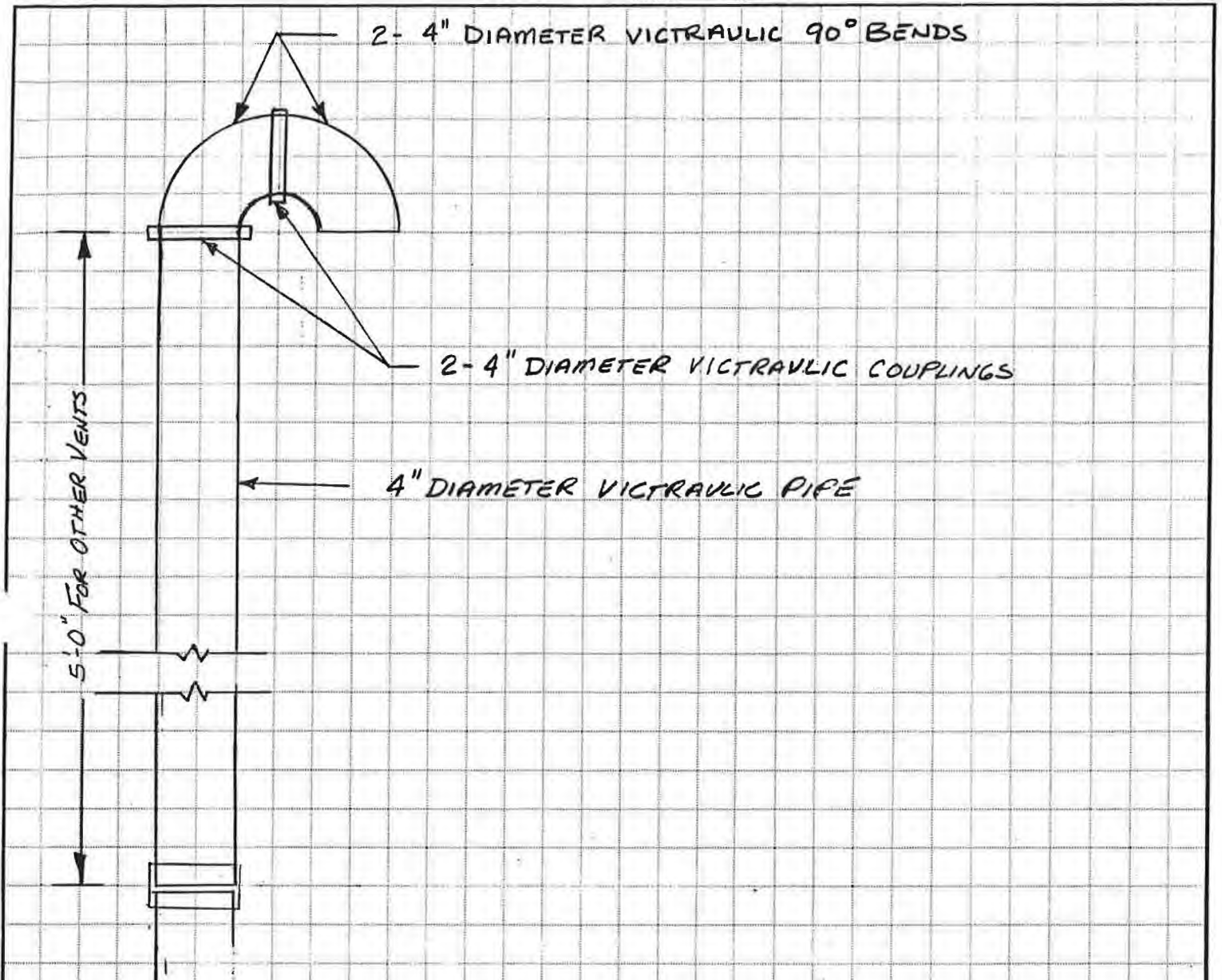
F-381

ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED

FORSCOM **FORM** **59-2-R**
1 MAR 76

WES CONSTRUCTION CORP.
850 Providence Highway
DEDHAM, MASSACHUSETTS 02026
(617) 326-4030

JOB DAKE 187CØ157
SHEET NO. 1 OF 1
CALCULATED BY KJV DATE 8/25/87
CHECKED BY _____ DATE _____
SCALE NONE



NOTES:

1. VICTRAULIC PIPE AND FITTINGS
2. VICTRAULIC COUPLINGS
3. PIPE, FITTINGS, AND COUPLINGS TO BE GALVANIZED

MATERIAL APPROVAL SUBMITTAL

TO (Contracting Officer)	FROM (Contractor)	DATE
Robert J. Kruzewski	WES CONSTRUCTION CORP.	08-28-87

CONTRACT NUMBER DAKF3187C0157	SUBMISSION NUMBER 1	SUBMITTAL <input checked="" type="checkbox"/> NEW <input type="checkbox"/> RESUBMITTAL
PREVIOUS SUBMISSION NUMBER	PROJECT NUMBER ER-19240- 5P	

[illegible]

TYPED OR PRINTED NAME AND GRADE Rex V.P.	SIGNATURE [Signature]	DATE 6/1/17
---	--------------------------	----------------

FOR GOVT USE ONLY

TO DFAE

For Evaluation and Action

TYPED OR PRINTED NAME AND GRADE	SIGNATURE	DATE
---------------------------------	-----------	------

TO
CONTRACTING OFFICER

Recommend ☒ Approval ☐ Disapproval as Indicated Above and Subject to Any Applicable Comments on the Reverse Side

TYPED OR PRINTED NAME AND GRADE Norman E. Black	SIGNATURE Norman E. Black	DATE 9/15/87
--	------------------------------	-----------------

TO (Contractor)

Approved ☐ Disapproved as Indicated Above and Subject to Any Applicable Comments on the Reverse Side. Request Resubmittal
on Disapproved Items Within Days of Date Shown Below.

TYPED OR PRINTED NAME AND GRADE	SIGNATURE	DATE
	<i>[Signature]</i>	9/16/87

WATERSAVER VINYL LINER (PVC) 100'

30 MM (1.18")

1.5

100'



WATERSAVER COMPANY, INC.

POST OFFICE BOX 16465 • DENVER, COLORADO 80216 • (303) 623-4111

01 - GENERAL REQUIREMENTS

The work covered by these specifications consists of installing a polyvinyl chloride (PVC) plastic lining in the (lagoon, reservoir, canal, etc.) where shown on the drawings or directed by the Engineer. All work shall be done in strict accordance with the drawings and these specifications and subject to the terms and conditions of the contract.

02 - PVC MATERIALS

A. **General.** The materials supplied under these specifications shall be first quality products and manufactured specifically for the purposes of this work, and which have been satisfactorily demonstrated by prior use to be suitable and durable for such purposes. The manufacturer of the calendered rolls shall show where a minimum of 2,000,000 sq. ft. (185,000 sq.m.) of its 76" (193 cm) wide material has been installed for lining hydraulic structures.

B. **Description of PVC Materials.** PVC (polyvinyl chloride) plastic lining shall consist of 76" (193 cm) widths of calendered polyvinyl chloride sheeting fabricated into large sections by means of special factory-bonded seams into a single panel, or into the minimum number of large panels required to fit the jobsite as supplied by WATERSAVER CO., INC., P.O. Box 16465, Denver, Colorado (303-623-4111).

1. **Physical Characteristics** - The PVC materials shall have the following physical characteristics.

PROPERTIES	VALUE	TEST METHOD
Color	Black	
Thickness, mils., $\pm 5\%$	30	ASTM D-1593
Tensile Strength, min., psi	2200	ASTM D-882
(lbs./in. width, min.)	(66)	
Modulus @ 100% Elongation min. psi	1000	ASTM D-882
(lbs./in. width, min.)	(30)	ASTM D-882
Ultimate Elongation, % min.	325	ASTM D-882
Tear Resistance:		
(a) Elmendorf, grams, min.	6000	ASTM D-1922
(gms./mil., min.)	(200)	
(b) Graves Tear, lbs. min.	8.25	ASTM D-1004
(lbs./in. min.)	(275)	
Low Temperature Impact, Pass, °F	-20	ASTM D-1790
Volatility, % loss, max.	0.75	ASTM D-1203
Water Extraction		
(@ 104°F, 24 hrs.) % loss, max.	0.25	ASTM D-1239
Specific Gravity, min.	1.23	ASTM D-792
Dimensional Stability		
(@ 212°F, 15 min.) % max. change	5.0	ASTM D-1204
Resistance to Soil Burial:		
Tensile Strength Loss, % max.	5.0	ASTM D-3083
Elongation Loss, % max.	20.0	

ENGINEERING SPECIFICATION GUIDE
030 POLYVINYL CHLORIDE (PVC) MEMBRANE LINER

2. PVC materials shall be manufactured from domestic virgin polyvinyl chloride resin and specifically compounded for the use in hydraulic facilities. Reprocessed material shall not be used. It shall be neutral gray to black in color and produced in a standard minimum width of at least 76" (193 cm). Thickness shall be as shown on the drawings. Certification test results showing that the sheeting meets the specifications shall be supplied on request.

03 - FACTORY FABRICATION

Individual calender widths of PVC shall be factory fabricated into large panels.

The manufacturer of the calendered rolls shall show where a minimum of 2,000,000 sq.ft. (185,000 sq.m.) of its 76" (193 cm) wide material has been installed for lining hydraulic structures. Lap joints with a minimum joint width of 1/2 inch (13 mm) shall be used. Factory made splices shall have a strength of 80% of the specified sheet strength. After fabrication, the lining shall be accordion folded in both directions and packaged for minimum handling in the field. Shipping boxes shall be substantial enough to prevent damage to contents.

04 - PLACING OF PVC LINING

A. **General** - Installation shall be performed by a contractor that has previously installed a minimum of 2,000,000 sq.ft. (185,000 sq.m.) of this material or by a contractor that has a fabricator field representative in attendance. The surface (substrate) to receive the liner shall be smooth, and free of sharp objects that could puncture the lining. All vegetation must be removed. A soil sterilant may be required at the discretion of the Engineer. The PVC lining shall be placed over the prepared surfaces to be lined in such a manner as to assure minimum handling. It shall be sealed to all concrete structures and other openings through the lining in accordance with details shown on the drawings submitted by the contractor and approved by the Engineer. The lining shall be closely fitted and sealed around inlets, outlets and other projections through the lining. Any portion of lining damaged during installation shall be removed or repaired by using an additional piece of lining as specified hereinafter.



1. **Field Joints** - Lap joints will be used to seal factory fabricated panels of PVC together in the field. Lap joints shall be formed by lapping the edges of panels a minimum of 2 inches (50 mm). The contact surfaces of the panels shall be wiped clean to remove all dirt, dust or other foreign materials. Sufficient cold-applied vinyl to vinyl bonding adhesive shall be applied to the contact surfaces in the joint area, and the two surfaces pressed together immediately. Any wrinkles shall be smoothed out. Field made splices shall have a strength of 80% of the specified sheet strength.

2. **Joints to Structures** - All curing compounds and coatings shall be completely removed from the joint area. Joining of PVC to concrete shall be made with vinyl to concrete adhesive and mechanically fastened. Unless otherwise shown on the drawings, the minimum width of concrete to PVC joint shall be 8 inches (20 cm).

3. **Repairs to PVC** - Any necessary repairs to the PVC shall be patched with the lining material itself and cold applied vinyl to vinyl splicing adhesive. The splicing adhesive shall be applied to the contact surfaces of both the patch and lining to be repaired, and the two surfaces pressed together immediately. Any wrinkles shall be smoothed out.

4. **Quality of Workmanship** - All joints, on completion of the work, shall be tightly bonded. Any lining surface showing injury due to scuffing, penetration by foreign objects or distress from rough subgrade shall, as directed by the Engineer, be replaced or covered and sealed with an additional layer of PVC of the proper size. A Technical Service Representative will be made available to the contractor if the contractor desires. The contractor will bear the expense of this Technical Service Representative. The Technical Service Representative is not directly responsible for the quality of the work involved; such responsibility will be solely that of the contractor.



AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				TRACT ID CODE J	PAGE OF PAGES 1 2	
2. AMENDMENT/MODIFICATION NO. P00001		3. EFFECTIVE DATE 87 Aug 25		4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO. (If applicable)
ISSUED BY Directorate of Contracting Bldg 227 Fort Devens, MA 01433-5340 Attn: Mr. Kruzewski (617) 796-2829		7. ADMINISTERED BY (If other than Item 6)		CODE		
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) Wes Construction Corp 850 Providence Highway (Route 1) Dedham, MA				9A. AMENDMENT OF SOLICITATION NO.		
				9B. DATED (SEE ITEM 11)		
				10A. MODIFICATION OF CONTRACT/ORDER NO. X DAKF31-87-C-0157		
				10B. DATED (SEE ITEM 13) 98 Jul 21		
CODE		FACILITY CODE		11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS		
<input type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended, <input type="checkbox"/> is not extended. (Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items B and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.)						
12. ACCOUNTING AND APPROPRIATION DATA (If required)						
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.						
A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.						
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).						
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: X Changes FAR 52.243-4 (APR 1984)						
D. OTHER (Specify type of modification and authority)						
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input checked="" type="checkbox"/> is required to sign this document and return <u>4</u> copies to the issuing office.						
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) This modification P00001 is initiated to incorporate the following changes to subject contract for Phase II Sanitary Landfill, Fort Devens, MA:						
1. Change the design contours to minimize the borrow needed to establish liner,.						
2. Liner filled seams are to be air lance tested to detect defects in lieu of the vacuum suction box specified in Section 02598, paragraph 7.3. The air lance test is an industry standard for this installation.						
3. Erosion blanket may be installed at the discretion of the general contractor and Curlex Blankets manufactured by American Excelsion Company may be used as an equal to the SC150						
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.						
15A. NAME AND TITLE OF SIGNER (Type or print) Edward J Comeau Exec V.P.				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) RUSSELL E. RODERICK		
15B. CONTRACTOR/OFFEROR  (Signature of person authorized to sign)		15C. DATE SIGNED Aug 28 1987		16B. UNITED STATES OF AMERICA BY  (Signature of Contracting Officer)		16C. DATE SIGNED 87 Aug 31

manufactured by North American Green Inc specified on the drawings.

4. Stumps in the fill area shall remain.
5. Stumps in cut areas to be cleared will be buried in the landfill a minimum of two feet below capping subgrades.
6. The construction of the drainage ditch along the south side of the Phase II contract requires that trash may have to be removed and relocated to achieve the required side slopes.
7. Contract completion date now reads 15 May 1988 in order to complete loaming and seeding beyond fall planting season of 1 Oct 1987. The extended maintenance requirement of Section 02485, paragraph 14 will be Oct 15, 1987.
8. As per the Wes Construction Corp. proposal of Aug 24, 1987, paragraph 2A, the limit of the loam and seed for this contract is the Phase II landfill liner limit as shown on Contract Drawing Sheets 3, 5 and 6 only.

This change is at no cost to the government.

WES CONSTRUCTION CORP.
850 Providence Highway (Route 1)
DEDHAM, MASS. 02026

August 24, 1987

HAND DELIVERED

Mr. Robert Kruzewski
Contract Administrator
Department of the Army
Contracting Division
Building 227
Fort Devens, MA 01433-5340

Re: Fort Devens
Phase II Sanitary Landfill
Contract No. DAKF-31-87-C-0157

Dear Mr. Kruzewski:

In view of the very large deficiency of borrow materials required to bring the Phase II existing ground to the contract design grades and the resultant high extra cost to the Dept. of the Army, we have prepared a proposal listed below to accomplish the complete capping of Phase II without any additional cost to the Department of the Army.

Our proposal consists of:

1. Changing the design contours to minimize the borrow needed to establish liner subgrade by: *See attached drawing* *not here* *MCD*
 - A. Lowering the drainage ditch beyond the 6 line.
 - B. Grading the existing refuse cells to minimize trash removal and minimize borrow requirement.
 - C. Keep the slope between the P line and the T to a minimum 2% without removing trash.
 - D. Revise the side slopes of the drainage ditch from the 1 vertical and 3 horizontal as shown to a slope on the north side of the drainage ditch between grid lines K&S as a 1 vertical and a 5 horizontal. This has been done to minimize the sloughing problem that can occur between the sand cover layer and the liner on long steep slopes. The south side of the drainage ditch and the balance of the drainage ditch to the end of the liner as well as the remainder the ditch to the stabilization structure is to have side slopes of 1 vertical to 4 horizontal to minimize sloughing and/or erosion.
 - E. Refer to WES CONSTRUCTION CORP. revised contour drawings W203-1&2 dated August 21, 1987 enclosed for the approximate revised contours. These contours may be further modified to meet the actual field conditions.

F. In addition to the regrading and the filling of the capping area and the excavation of the drainage ditch, additional sand cover borrow will be required from another on site source in the approximate amount of 20,000 cubic yards. Our proposal is predicated upon all the excavation from the drainage ditch beyond the liner and the additional approximate 20,000 cubic yards of on site (adjacent area) material as being suitable for the sand cover layer.

G. The existing hill south east of area 5 is to be reserved for the additional borrow required for this contract. *Suitable*

2. The following items and/or details are listed for clarification:

A. The limit of the loam and seed for this contract is the Phase II landfill liner limit as shown on contract drawings sheet 3, 5 and 6 only. *OK*

B. Due to the high fills required along the south side of the drainage ditch, the fills will extend beyond the limit of work line. *OK*

This embankment will be sloped on a one vertical to a three horizontal. *OK*

The area beyond the liner limit line will not be loamed and seeded. (see enclosed sketch WES W203-SK1). *OK*

C. The buffer layer under the liner is to be a 6" thick layer. *OK*

D. The total width of the stabilization structure detailed on drawing sheet 4 of 6 is to be a maximum of 30 feet.

E. The liner along the M line is to end horizontally for a future connection by others. *OK*

F. The 12 inches of sand cover over the liner may be spread in one layer. *OK*

G. The filling of the existing over excavated borrow area is to be by others. *Outside KR's WORK AREA*

H. Grading of areas outside the Phase II capping and drainage ditch are by others. *Same as G.*

I. The gas vent installation as shown on the contract drawings consists of four radial branches of 3 inch diameter perforated polyethylene pipe approximately 30 feet in length, each branch typical at each gas vent location.

Should you require additional vents due the revised contours, that work will be performed on a time and material basis.

3. The following are additional modifications to the contract that are part of this proposal:
- A. A time extension is required to complete the loaming and seeding beyond fall planting season of October 1. The time extension request is to the end of the spring planting seasons of May 15, 1988. The extended maintenance requirement of Section 02485, Paragraph 14 will be to October 15, 1988. *Exempt*
 - B. The liner field seams are to be air lance tested to detect defects in lieu of the vacuum suction box specified in Section 02598, Paragraph 7.3. The air lance test is an industry standard for this installation. *OK to use*
 - C. Erosion blanket may be installed at the discretion of the general contractor and Curlex Blankets manufactured by American Excelsior Company may be used as an equal to the SC150 manufactured by North American Green Inc. specified on the drawings. *OK if made*
 - D. Stumps in fill areas will remain. *OK*
Stumps in cut areas to be cleared will be burried in the landfill a minimum of two feet below capping subgrades.
4. The construction of the drainage ditch along the south side of the Phase II contract requires that trash may have to be removed and relocated to achieve the required side slopes.
5. The scope of this proposed modification requires an immediate approval to allow us to begin the construction.

We are available to review any questions that you may have with our proposal.

Sincerely,

WES CONSTRUCTION CORP.

Edward J. Comeau

Edward J. Comeau
Executive Vice President

EJC/mev

cc: Norman Black
SFV

F-359

8/24/87

Mr. Norm Black, CR has proposal is acceptable in all respects.

Atkinson



DEPARTMENT OF THE ARMY

HEADQUARTERS FORT DEVENS
FORT DEVENS, MASSACHUSETTS 01433

OFFICE OF THE
ATTORNEY GENERAL

AFZD-DOC (715h)

SUBJECT: Designation of Contracting Officer's Representative (COR)

Norm Black
Directorate of Engineering & Housing
Fort Devens, MA 01433
(617) 796-3021

1. Pursuant to the provisions of AFARS Subpart 42.90 you are hereby designated Contracting Officer's Representative (COR) in administration of the following contract:

Contract Number: DAKF31-87-C-0157
Title: Phase II Sanitary Landfill, Fort Devens, MA
Contractor: Wes Construction
Contract Period: 11 August 1987 thru 8 Jan 1988

2. You are authorized by this designation to take any or all action with respect to the following which could lawfully be taken by me as Contracting Officer, except any action specifically prohibited by the terms of subject contract:

a. Verify that the Contractor performs, the technical requirements of the contract in accordance with the contract terms, conditions and specifications.

b. Perform or cause to be performed, inspections necessary in connection with 2a above and to verify that the Contractor has corrected all deficiencies. Perform acceptance for the Government of services performed under this contract.

c. Maintain liaison and direct communications with the Contractor.

d. Monitor the Contractor's performance and notify the Contractor of deficiencies observed during the surveillance, and direct appropriate action to effect correction. Record and report to the undersigned incidents of faulty or nonconforming work delays or problems.

e. Coordinate site entry for Contractor Personnel and, if to be provided, insure that Government furnished property is available when required.

SUBJECT: Designation of Contracting Officer's Representative (COR)

3. Limitations. You are not empowered to award, agree to, or sign any contract (including delivery or purchase orders) or modification thereto, or in any way to obligate the payment of money by the Government. You may not take any action which may impact on contract or delivery order schedules, funds or scope. All contractual agreements, commitments or modifications which involve prices, quantities, quality or delivery schedules shall be made only by the Contracting Officer.
4. This designation as a Contracting Officer's Representative shall remain in effect through the life of the contract unless sooner revoked by the Contracting Officer and such termination of the designation shall be in writing. If your designation is revoked for any reason before completion of this contract, turn your records over to the successor COR or obtain disposition instructions from the Contracting Officer. If you are reassigned or separated from service, you shall request termination and relief from your duties from the Contracting Officer sufficiently in advance of reassignment or separation to permit timely selection and designation of a successor COR.
5. You are further required to maintain adequate records to sufficiently describe the performance of your duties as Contracting Officer's Representative during the life of this contract and to distribute such records as applicable. As a minimum the COR file shall contain the following:
 - a. Copy of COR designation letter.
 - b. Copy of contract and modification thereto.
 - c. Copy of correspondence between COR and Contractor.
 - d. Names of technical and administrative personnel assisting the COR.
 - e. Copy of records of COR inspections.
 - f. Copy of statement indicating that COR has read and understands AR 600-50 (updated semi-annually).
6. You are required to submit a monthly report to the Contract Administrator concerning performance of services rendered under this contract. Problem areas should be brought to the immediate attention of the Contracting Officer.
7. All personnel engaged in Procurement and related activities shall conduct business dealings with industry or a manner above reproach in every respect and shall protect the US Government's interest, as well as maintain its reputation for fair and equal dealings with all contractors. AR 600-50 sets forth applicable standards of conduct for all personnel directly and indirectly involved in procurement. All COR's shall review AR 600-50 semi-annually.
8. Any COR who may have direct or indirect financial interests which would place him in a position where there is a conflict between his private interests and the public interests of the United States shall advise his supervisors and the

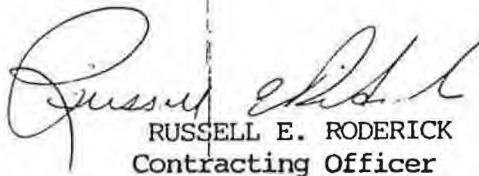
AFZD-100 (715h)

SUBJECT: Designation of Contracting Officer's Representative (COR)

Contracting Officer of the conflict so that appropriate action may be taken. A COR shall avoid the appearance of such conflict to maintain public confidence in the US Government's conduct of business with the private sector.

9. You are required to acknowledge receipt of this appointment on the original copy and return it to the Contracting Officer for retention in the contract file. The duplicate copy may be retained by you. Your signature also serves as certification that you have read and understood the contents of AR 600-50.

10. In your absence, I hereby appoint Joe Dean with all authority granted you in this appointment to serve as COR in your place. When the above individual is required to act in your stead, notification shall be made to the Contracting Officer in sufficient time for the Contracting Officer to notify the Contractor prior to your absence.


RUSSELL E. RODERICK
Contracting Officer

Receipt of this appointment is hereby acknowledged:

COR

Norman E. Block
Norman E. Block
Name (Print or Type)

Norman E. Block 776-3021
Signature/Phone Number

Alternate COR

JOSEPH P. DEAN JR
Name (Print or Type)

Joseph P. Dean 796-3931
Signature/Phone Number

Contractor

Edward J. Comeau
Name (Print or Type)

Edward J. Comeau 617-326-4030
Signature/Phone Number



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
HEADQUARTERS FORT DEVENS
FORT DEVENS, MASSACHUSETTS 01433-5000

Contracting Division

- Wes Construction
- 850 Providence Hwy
- Dedham, MA 02026
- (617) 326-4030

NOTICE TO PROCEED

CONTRACT NUMBER DAKF31-87-C-0157

DATE 11 August 1987

Gentlemen:

You are hereby notified to proceed with work under contract number DAKF31-87-C-0157 to perform Phase II Sanitary Landfill, Ft. Devens, MA not later than 30 days after receipt of this notice.

In accordance with the terms of your contract, the completion date is hereby determined to be 8 January 1988. Failure to meet this completion date may be cause for assessment of liquidated damages.

The Contracting Officer's Representative on this project is: _____
(Name)

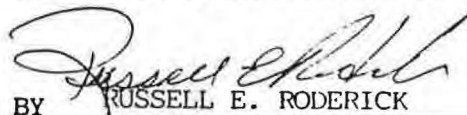
Norm Black, 796-3021.
(telephone)

The Contract Administrator is Bob Kruzewski, 796-2829.
(Name) (telephone)

Your attention is again invited to your copy of the Contracting Officer's Representative's letter of appointment delineating the scope of his authority to act on behalf of the Contracting Officer.


Sincerely,

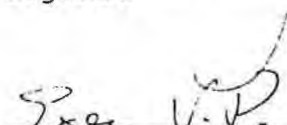
THE UNITED STATES OF AMERICA


BY RUSSELL E. RODERICK

Contracting Officer

RECEIPT IS HEREBY ACKNOWLEDGED


Signature


Title Fred V.P. Date Aug 10 1987

LANDFILL CLOSURE - PHASE II

FORT DEVENS, MASSACHUSETTS

SPECIFICATIONS

SECTION 02102

CLEARING AND GRUBBING

PART 1 - GENERAL

1. APPLICABLE PUBLICATIONS: The following publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 Commonwealth of Massachusetts, Department of Public Works:

1973 Specification and 1985 Supplemental Specifications.	Standard Specifications for Highways and Bridges.
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2. DEFINITIONS:

2.1 Clearing: Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including down timber, snags, brush, and rubbish occurring in the areas to be cleared.

2.2 Grubbing: Grubbing shall consist of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas.

PART 2 - EXECUTION

3. Clearing and grubbing shall be performed within the limits of work as shown on the contract drawings.

3.1 CLEARING: Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require.

3.2 GRUBBING: Material to be grubbed, together with logs and other organic debris, shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

4. DISPOSAL OF MATERIALS:

4.1 Disposal of Logs: Logs generated in clearing operation shall be chipped and deposited in the land management yard 1/4 mile from the site, as directed. Material too large to chip will be disposed as per para 4.2 Removing From Site.

4.2 Removing From Site: Stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations shall be removed from Fort Devens and properly disposed. Permission to dispose of such products on private property shall be in writing, and a copy of this permit shall be filed with the Contracting Officer.

SECTION 02210

GRADING

PART I - GENERAL

1. APPLICABLE PUBLICATIONS: The following publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 Military Standards (Mil. Std.):

MIL-STD-619B	Unified Soil Classification System for Roads, Airfields, Embankments and Foundations
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2. DEFICIENCIES:

2.1 Satisfactory Materials: Materials classified in MIL-STD-619 as GW, GP, and SW, and free from roots and other organic matter, trash debris, and frozen materials and stones larger than 6 inches in any dimension are satisfactory, except that maximum size stone in the sand and gravel layer directly beneath the clean sand buffer layer shall be 1/2 inch.

2.2 Unsatisfactory Materials: Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Materials classified in MIL-STD-619 as Pt, OH, and OL are unsatisfactory. Unsatisfactory materials also include man-made fills, refuse, or backfills for previous construction.

2.3 Cohesionless and Cohesive Materials: Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Cohesionless materials include materials classified in MIL-STD-619 as GW, GP, SW, and SP. Materials classified as GM and SM will be identified as cohesionless only when the fines have a plasticity index of zero.

2.4 Degree of Compaction: Degree of compaction is a percentage of the maximum density obtained by the test procedure presented in MIL-STD-621, Method 100, compaction effort designation CE 55, abbreviated below as a percent of CE 55 density.

2.5 Topsoil: All topsoil shall be imported from sources approved by the Contracting Officer. Imported materials suitable for topsoil are defined as fertile, friable, loam uniform in materials and texture, free from subsoil, clay lumps, sod, woodchips, stumps, roots, materials toxic to grass, stones larger than one and one-half inches in any

dimension, glass fragments, bottles, cans, metal, construction debris, and other foreign materials. Topsoil shall be a mixture of clean sand, silt, and clay containing between 7 and 25% organic matter (determined by loss on ignition) and exhibiting sandy and clayey properties in equal proportions.

3. **SUBSURFACE DATA:** Subsurface soil boring logs are shown on the drawings. These data represent the best subsurface information available; however, variation may exist in the subsurface between boring locations.

PART 2 - PRODUCTS

4. **BORROW MATERIAL:** Borrow material shall be selected to meet requirements and conditions of the particular fill for which it is to be used. Necessary clearing, grubbing, disposal of debris, and satisfactory drainage of borrow pits shall be performed by the Contractor as incidental operations to the borrow excavation.

4.1 Selection: Borrow materials shall be obtained from sources within the limits of the landfill, subject to approval. Borrow materials shall be subject to approval. Borrow material from approved sources on Government-controlled land may be obtained without payment.

4.2 Stones: Exposed and loose stones or rocks in the layer of borrow being compacted shall be removed by the Contractor before the placement of the next layer. Layer directly above and below the liner shall be free of all stones and gravel (clean sand).

PART 3 - EXECUTION

5. **WIND-BLOWN LITTER:**

5.1 Maintenance: The Contractor shall provide for routine maintenance and general cleanliness of sanitary landfill area and adjacent property from debris created by his operation (beyond limit of work line).

5.2 Protection: The Contractor shall prevent the scattering of refuse, wind-blown paper, and other light materials by using suitable portable fencing. The Contractor shall supply, have available on the site, and install as directed a sufficient amount, not less than 300 feet, of 4 foot high temporary fencing, to be used for the control of wind-blown paper. The fence may be a stock fence with wire fabric or a combination wire and wood fabric or other material approved by the Contracting Officer. The fence shall be relocated from time to time by the Contractor as the locations of filling operations change.

5.4 Control: To provide a standard by which to judge acceptable control of wind blown litter, the following sampling method will be utilized.

5.4.1 Ten locations shall be sampled for each area. The locations shall be 50 feet, plus or minus 2-1/2 feet apart, distributed to provide a result indicative of condition of the area.

5.4.2 At each location one square yard shall be evaluated for the presence of wind-blown litter. Each piece of litter larger than one square inch shall be measured for horizontal area exposed. Measurements shall be rounded to the nearest whole inch and the area computed.

5.4.3 The limits of acceptable performance:

5.4.3.1 Adjacent property shall have less than 1/10 square foot of litter per square yard, based on an average of all ten samples, with no more than 1/2 square foot of litter at any one location. Locations shall be no more than 100 feet, plus or minus 5 feet, from the limit of work line.

5.4.3.2 Area previously used as landfill but currently not in use shall have less than 1 square foot of litter per square yard, based on an average of all ten samples, with no more than 2 square feet of litter at any one location.

5.4.3.3 Area which has been capped under this Contract shall have less than 1/10 square foot of litter per square yard, based on an average of all ten samples, with no more than 1/2 square foot of litter at any one location.

5.4.3.4 The area in current use as active landfill disposal area (cleared) shall have less than 1/2 square foot of litter per square yard, based on an average of all ten samples, with no more than 1 square foot of litter at any one location. In this area the inspector shall be careful to verify that the litter is wind-blown and not refuse that has not been adequately covered. No samples shall be taken in areas being utilized for refuse disposal at the time of inspection, but only in covered areas or cleared areas not being used on day of inspection.

5.5 REPORTS:

5.5.1 The locations from which samples were taken shall be shown on a sketch of the site, and the quantity of litter at each location and the average for each area noted thereon.

5.5.2 The samples shall be taken by the Contractor, and a written report submitted to the Contracting Officer on a weekly basis.

6. EQUIPMENT: The Contractor shall use equipment of operating weight sufficient to ensure proper compacting pressure. The compacting pressure based on the operating weight and ground contact areas shall be a minimum of 10 pounds per square inch.

7. EXCAVATION: Excavation of every description, regardless of material encountered, within the grading limits of the project shall be performed to the lines and grades indicated. Satisfactory and unsatisfactory excavation material shall be transported to and placed in fill areas within the limits of the work as indicated on the drawings. Excavations carried below depths indicated, without specific directions, shall, except as otherwise specified, be re-filled to the proper grade with satisfactory material as directed. All additional work of this nature shall be at the Contractor's expense. Excavation and filling shall be performed in a manner and sequence that will provide drainage at all times. Excavations shall be kept free from water while construction therein is in progress. Material required for fills in excess of that produced by excavation within the grading limits shall be obtained from borrow areas.

8. DITCHES, GUTTERS, AND CHANNEL CHANGES: Ditches, gutters, and channel changes shall be cut accurately to the cross sections and grades indicated. All roots, stumps, rock, and foreign matter in the sides and bottom of ditches, gutters, and channel changes shall be trimmed and dressed or removed to conform to the slope, grade, and shape of the section indicated. Care shall be taken not to excavate ditches and gutters below the grades indicated. Excessive ditch and gutter excavation shall be backfilled to grade either with satisfactory, thoroughly compacted materials or with suitable stone or cobble to form an adequate gutter. All ditches and gutters excavated under this section shall be maintained until final acceptance of the work. Satisfactory material excavated from ditches and channel changes shall be placed in fill areas. Unsatisfactory and excess excavated material shall be disposed of in accordance with directions in paragraph 7. EXCAVATION. No excavated material shall be deposited closer to the edges of the ditches than indicated and in no case less than 3 feet.

9. BACKFILL ADJACENT TO STRUCTURES: Backfill adjacent to structures shall be placed and compacted uniformly in such a manner as to prevent wedging action or eccentric loading upon or against the structures. Slopes bounding or within areas to be backfilled shall be stepped or serrated to prevent sliding of the fill. During backfilling operations and in the formation of embankments, equipment that will

overload the structure in passing over and compacting these fills shall not be used. Backfill for storm drains and subdrains, including the bedding and backfill for structures other than culverts and drains, shall conform to the additional requirements in other applicable sections.

10. COMPACTION OF UNSATISFACTORY MATERIAL:

10.1 Spreading: The Contractor shall spread refuse evenly in shallow layers, not exceeding two feet thickness before compaction. The upper layer of refuse shall be mixed with sand and gravel in roughly equal volumes prior to compacting.

10.2 Compacting: The Contractor shall compact each layer thoroughly with at least four passes of the compaction equipment before spreading and compacting following layer.

10.3 Slope Angle: Compacted refuse surface shall have slope angle not exceeding 30 degrees from horizontal.

11. COMPACTION OF SATISFACTORY MATERIAL:

11.1 Spreading: The Contractor shall spread suitable material evenly in lifts not exceeding 6 inches compacted thickness. A six inch buffer layer of clean sand shall be spread over the upper layer of refuse (mixed with sand and gravel) prior to liner placement.

11.2 Compacting: The Contractor shall compact each lift with at least four passes of the compaction equipment (roller) before spreading and compacting following layer. The layer above the liner shall not be compacted.

12. FINISHED EXCAVATION, FILLS, AND EMBANKMENTS: All areas covered by the project, including excavated and filled sections and adjacent transition areas, shall be uniformly smooth graded. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from blade grader operations, except as otherwise specified. Ditches and gutters shall be finished to permit adequate drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials. Surface on which the liner will be placed shall be free of all stones, roots, and other foreign material that could puncture the liner.

13. PROTECTION: Newly graded areas shall be protected from traffic and from erosion, and settlement or washing away that may occur from any cause, prior to acceptance, shall be repaired and grades reestablished to the required elevations and slopes. All work shall be conducted in accordance with the environmental protection requirements of the contract.

SECTION 02485

LAWN AND GRASS

PART 1 - GENERAL

1. GENERAL REQUIREMENTS:

1.1 Limits of Lawn: Following areas shall receive topsoil and shall be seeded: capped area, cleared and grubbed areas, regraded and contoured areas except borrow area.

1.2 Topsoil: Topsoil shall be obtained from off-site sources and at the Contractor's expense. Topsoil sources shall be submitted to the Contracting Officer for approval prior to delivery to the site. All topsoil shall be imported from sources approved by the Contracting Officer. Imported materials suitable for topsoil are defined as fertile, friable, loam uniform in materials and texture, free from subsoil, clay lumps, sod, woodchips, stumps, roots, materials toxic to grass, stones larger than 1-1/2 inches in any dimension, glass fragments, bottles, cans, metal, construction debris, and other foreign materials. Topsoil shall be a mixture of clean sand, silt, and clay containing between 7 and 25 percent organic matter (determined by loss on ignition) and exhibiting sandy and clayey properties in equal proportions.

1.3 Topsoil Analysis: Topsoil shall be analyzed for conformance to specification by independent laboratory, which shall be approved in advance by the Contracting Officer. Report of analysis shall be delivered directly to the Contracting Officer. If report indicates need for soil conditioners and nutrients, they shall be added to topsoil as directed by the Contracting Officer and at the Contractor's expense.

1.4 Erosion Protection: Lawn and grass areas will be protected against erosion until acceptance of completed turf. Eroded areas shall be replaced with acceptable turf, using sod if seeded lawn and grass area cannot be established.

1.5 Sod: Sod may be employed at Contractor's option in lieu of conventional lawn and grass construction specified over the landfill cap. All ditch bottoms and slopes shall receive sod.

1.6 Planting Periods: Planting shall be done only within following periods:

<u>Item</u>	<u>Spring</u>	<u>Fall</u>
Seed	April 15 to May 15	August 20 to October 1
Sod	April 15 to July 1	August 20 to October 15

1.6.1 If seeding cannot be done within dates specified above and before the contract completion date, the Contractor shall return the following spring or fall to complete the seeding and establishment of grass. The Contractor shall prevent erosion until the seeding is done and turf is established.

2. SUBMITTALS:

2.1 Samples: Following sample shall be submitted in accordance with the SPECIAL CONTRACT REQUIREMENTS:

<u>Material</u>	<u>Quantity</u> <u>Pound</u>
Topsoil	50

PART 2 - PRODUCTS

3. GRASS SEED:

3.1 Seed Characteristics: Grass seed shall be of previous year's crop with not more than 0.5 percent weed seed, and not more than 1.75 percent crop seed, by weight. Seed shall be delivered to site in sealed containers, labeled with name of seed grower and seed formula, in form stated below. Seed shall be dry and free of mold. Seed shall meet following requirements:

<u>Name of Seed</u>	<u>Percent by</u> <u>Weight in</u> <u>Mixture</u>	<u>Minimum</u> <u>Percent</u> <u>Purity</u>	<u>Minimum</u> <u>Percent</u> <u>Germination</u>
Festuca elatior "Kentucky 31" Kentucky "31" Tall Fescue	50	97	90
Trifolium Repens White Clover	30	85	80
Lolium multiflorum Annual Ryegrass	20	95	90

3.2 Testing: Seed shall be tested by independent, reputable agricultural testing laboratory, which shall be approved in advance by the Contracting Officer. After delivery of seed to site but before planting, seed samples shall be taken by COR, for analysis and determination of quality. Seed which does not conform to requirements of paragraph 3.1 Seed Characteristics, shall be replaced with new seed and analyses repeated, until seed is supplied in conformance with specification.

4. LIME: Lime shall be fine-ground limestone, containing equal to or more than 85 percent total carbonates, by weight, 100 percent passing 20 mesh (1.27 mm) sieve, and equal to or more than 75 percent passing a 100 mesh (0.25 mm) sieve.

5. FERTILIZER: Fertilizer shall be complete commercial product, uniform, dry, and free-flowing. Fertilizer shall conform to the following:

<u>Constituent</u>	<u>Percent Present (min.)</u>
Nitrogen	10
Available phosphoric acid (P_2O_5)	10
Water-soluble potash (K_2O)	10

6. MULCH: Mulch for hydroseeding shall be wood cellulose pulp of type specified by manufacturer for hydroseeding.

7. ACIDITY: Topsoil pH range shall be 5.0 to 7.0.

PART 3 - EXECUTION

8. GRADING:

8.1 Rough Grading: Areas to receive lawn, grass, or sod will be rough graded under Section 02210, paragraph 12: FINISHED EXCAVATION, FILLS, AND EMBANKMENTS.

8.1.1 Rough grade will be left at 6 inches below finished grade.

8.2 Fine Grading: Fine grading shall be performed to cause minimum possible disturbance of subgrade. Subgrade shall be fine graded to tolerance equal to plus or minus 1/2 inch deviation of average from the plane indicated in each 100 foot square area, with no ridges, ruts, mounds, or depressions exceeding plus or minus 1 inch, and no abrupt deviation from plane. Surface shall be left free from construction debris and other foreign matter, and stones larger than 3 inches in any dimension shall not be visible in or on completed subgrade. There shall be no depressions where water can stand. Surface shall be compacted to 95% (ninety-five).

8.3 Excess Material: Excess subsoil and refuse or debris obtained during the work shall be disposed of on site, in areas designated by the Contracting Officer or designated representative.

8.4 Scarification: If delay in topsoil placement is more than two weeks beyond completion of rough grading of area to receive topsoil, subgrade shall be scarified to 2 inch depth immediately before fine grading and placing topsoil. Subgrade areas which have not been rough graded, and areas which have become hard since being rough graded, shall also be scarified, as specified above, not more than four days before placing topsoil.

9. PLACING TOPSOIL:

9.1 Limitations:

9.1.1 Topsoil shall not be placed when subgrade or topsoil are frozen, excessively wet, or excessively dry.

9.2 Placing:

9.2.1 Topsoil shall be spread in uniform layer, to thickness which will compact to depth required to bring final lawn and grass surfaces to required elevation.

9.2.2 Surface shall be rolled as required to provide firm base for subsequent operations. Stones, roots, and other debris visible at surface, which are larger than 1-1/2 inches in any dimension, shall be removed.

10. PLACING LIMESTONE AND FERTILIZER:

10.1 Limestone:

10.1.1 Ground limestone shall be spread over surface at rate which will result in pH of 6.5 for top 3 inches of topsoil.

10.2 Fertilizer: Fertilizer shall be spread over surface at rate of 0.02 pound per square feet.

10.3 Fertilizer and Limestone:

10.3.1 Fertilizer and limestone shall be spread in uniform application, using approved mechanical spreader.

10.3.2 Fertilizer and lime shall be mixed thoroughly into top 3 inches of topsoil by disking, harrowing, or other approved means. Surface shall then be leveled and rolled as required to provide firm base for subsequent operations.

11. PLACING SEED:

11.1 Conditioning Surface: Final surface of topsoil immediately before seeding shall be within plus or minus 1/2 inch of required elevation, with no ruts, mounds, ridges, or other faults, and no pockets or low spots in which water can

collect. Stones, roots, and other debris larger than 1-1/2 inches in any dimension, which are visible at surface, shall be removed and resulting holes filled with topsoil, leaving plane and uniform surface.

11.2 Applying Seed: Seed shall be spread with approved mechanical spreader, to give uniform application at following rate:

<u>Seed</u>	<u>Rate pounds per square foot</u>
Grass seed	0.010

11.2.1 Seed shall be applied in two equal applications. Direction of spreader travel for second pass shall be perpendicular to that of first pass. Seeding shall not be done when it is raining or snowing or when wind velocity exceeds 5 miles per hour.

11.2.2 Following seeding, area shall be lightly raked to mingle seed with top 1/8 to 1/4 inch of soil. Area shall then be smoothed, stones and other debris larger than 1-1/2 inches in any dimension and which are visible on surface shall be removed, and surface shall be rolled with a roller having weight of 60 to 90 pounds per foot of width and diameter equal to or larger than 2 feet.

11.2.3 At Contractor's option, seed may be spread by hydroseeding method, utilizing power equipment commonly used for that purpose. Seed, lime, fertilizer, and mulch shall be mixed and applied to achieve application quantities specified herein for conventional seeding method, with mulch applied at rate of 1,200 pounds per acre. Material shall be applied in two equal applications, with equipment during second pass moving perpendicular to direction employed during first pass. Other provisions specified above for conventional seeding shall apply also to hydroseeding.

11.3 Watering: Following seeding, entire area shall be watered with lawn sprinklers or other approved means. Initial watering shall continue until equivalent of 2 inch depth of water has been applied to entire seeded surface, at rate which will not dislodge seed. Watering shall be repeated thereafter as frequently as required to prevent surface drying, until grass attains average height of 1/4 inch. Watering methods and apparatus shall not be permitted to injure surface.

12. SODDING:

12.1 Cutting and Delivery: After Contracting Officer or designated representative's inspection and approval of sod source, sod shall be cut into square or rectangular

sections, retaining sufficient native soil on roots for protection and continued viability of grass. Sod shall be kept moist during delivery and while in stacks, and shall be protected from exposure to wind, sun, and freezing. Sod shall be cut and moved only when soil moisture conditions are favorable to successful planting. Sections of sod may vary in length but shall be equal in width and not larger than will permit lifting and handling without breaking. Sod shall not be dumped from vehicles. If necessary, ground shall be watered to optimum moisture content before sod is cut. Damaged sod will be rejected.

12.2 Placing:

12.2.1 Edges of sodded areas shall be smooth, and sodded areas shall conform to design cross sections and grade. At edges adjacent to curbs, paved areas, etc., top surface of earth in sod shall be 1/2 inch below adjacent hard surface.

12.2.2 Immediately after sodding operations have been completed, entire surface shall be compacted with culti-packer roller or other approved equipment weighing 100 to 160 pounds per foot of roller.

12.2.3 Completed sod shall immediately be watered sufficiently to uniformly wet soil to at least bottom of sod bed.

12.2.4 Surface of completed sodded area shall be smooth. Sod shall be laid edge-to-edge, with tight-butted, staggered joints. Immediately after laying, sod shall be pressed firmly into contact with sod bed by tamping or rolling, to eliminate air pockets. Following compaction, screened topsoil of good quality shall be used to fill cracks, and excess soil shall be worked into grass with rakes or other suitable equipment. Grass shall not be smothered with excess fill soil.

12.2.5 On slopes steeper than 3 to 1, sod shall be held securely in place by fastening lines of sod with wooden stakes. The stakes shall be not less than 12 inches in length, and they shall be spaced 3 feet apart and driven flush with the surface of the sod. Other methods of fastening sod to slopes may be used where staking is not practical upon approval by the Contracting Officer's Representative.

13. MAINTENANCE:

13.3 Operations: Except as otherwise specified below, maintenance shall include all operations required to produce an established lawn, including but not limited to:

- Mowing
- Replanting
- Resodding
- Watering.

13.2 Timing:

13.2.1 Maintenance of lawn and grass areas shall begin upon completion of seeding or sodding.

13.2.2 Maintenance of sodded areas shall begin upon completion of sodding.

13.2.3 Maintenance shall continue until completion of extended maintenance period as specified in paragraph 14: EXTENDED MAINTENANCE.

13.3 Repairs:

13.3.1 After grass has sprouted, areas which fail to show uniform stand of grass shall be replanted as often as necessary to establish acceptable stand of grass.

13.3.2 Scattered bare spots shall not exceed 72 square inches each.

13.3.3 Scattered bare spots not exceeding total of 15 percent of area sown with seed will be acceptable without reseeding required.

13.4 Mowing: First mowing shall be done when average height of grass is 2-1/2 inches, with mower set to cut at height of 2 inches. Subsequent mowings shall be made at intervals not greater than two weeks, with height of cut set at 2 inches. With Contracting Officer's prior permission, mowings during periods of slow growth or dormancy may be spaced at greater intervals.

13.5 Lime and Fertilizer: If lawn or grass is established in fall and maintenance is required to continue into spring months, lawn and grass shall receive application of lime and fertilizer in spring. Lime and fertilizer shall be spread in uniform layer over entire lawn surface, at rate of .05 pound per square foot for lime and 0.02 pound per square foot for fertilizer.

14. EXTENDED MAINTENANCE: The Contractor shall maintain grass for one complete growing season, April 15 through October 15, following contract completion date. Extended maintenance operations shall conform to paragraph 13: MAINTENANCE.

SECTION 02598

LANDFILL LINER

PART 1 - GENERAL

1. APPLICABLE PUBLICATIONS: The following publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 American Society for Testing and Materials (ASTM) Publications:

D 413-82	Rubber Property-Adhesion to Flexible Substrate
D 618-61(1981)	Conditioning Plastics and Electrical Insulating Materials for Testing
D 792-66(1979)	Specific Gravity and Density of Plastics by Displacement
D 882-83	Tensile Properties of Thin Plastic Sheeting
D 1004-66(1981)	Initial Tear Resistance of Plastic Film and Sheeting
D 1203-67(1981)	Volatile Loss From Plastics Using Activated Carbon Methods
D 1204-84	Linear Dimensional Changes of Non- Rigid Thermoplastic Sheeting or Film at Elevated Temperatures
D 1239-55(1982)	Resistance of Plastic Films to Extraction by Chemicals
D 1593-81	Nonrigid Vinyl Chloride Plastic Sheeting
D 1755-81	Poly (Vinyl Chloride) Resins
D 1790-83	Brittleness Temperature of Plastic Film by Impact
D 3083-76(1980)	Flexible Poly (Vinyl Chloride) Plastic Sheeting for Pond, Canal, and Reservoir Lining

1.2 National Sanitation Foundation (NSF)

2. GENERAL REQUIREMENTS:

2.1 Sand Layer: A 6 inch thick layer of sand will be placed over refuse layer in accordance with Section 02210, paragraph 11: COMPACTION OF SATISFACTORY MATERIAL, before liner is installed.

3. SUBMITTALS: Submittals shall be made in accordance with requirements of SPECIAL CONTRACT REQUIREMENTS, modified as indicated below.

3.1 Material Certification: Material certification shall be submitted stating that the material meets or exceeds requirements of Table, "Physical Properties".

3.2 Warranty: Warranty shall be submitted, stating that leaks and defects of materials and workmanship in liner and joints shall be repaired or defective portions replaced on site with new material and work. Warranty shall extend for 20 year period from date of Government acceptance of completed project.

PART 2 - PRODUCTS

4. LINER:

4.1 Material: The liner shall be suitably formulated from homopolymer vinyl chloride resin of Type GP in accordance with ASTM D 1755, and compounded with suitable plasticizers, fillers, and additives to impart durability. A biocide shall be included in the material to provide resistance to biological degradation of the membrane. The membrane shall be compounded with carbon black and other ultraviolet stabilizers to provide resistance to ultraviolet degradation. The liner shall meet the requirements of Standard No. 54 of NSF.

4.1.1 The carbon black shall be evenly dispersed to produce a uniform color. Water-soluble compounding ingredients shall not be employed.

4.1.2 The membrane shall be uniform throughout and shall be free from dirt, oil, foreign matter, scratches, cracks, creases, bubbles, pits, tears, holes, pinholes, or other defects which may affect the serviceability of the membrane.

4.1.3 The polyvinyl chloride (PVC) membrane lining shall be fabricated from a film width of not less than 58 inches.

4.1.4 The lap seams shall be factory bonded using a liquid cement or commercially accepted dielectric sealing devices. Hot-air seaming methods shall not be used. Lap seams shall

be used and have a 3/4-inch minimum lap and a 3/4-inch minimum electrode (die) width. The seams shall be water-tight and the strength of the bonded seam in either the machine (longitudinal) or transverse direction of the film shall not be less than 80 percent of the breaking strength of the film when tested in a similar direction, or shall tear the parent material when tested in peel adhesion.

4.1.5 The film shall be capable of being bonded to itself by liquid cement for making field splices and repairs. The manufacturer shall furnish a cement suitable for joining or repairing the larger pieces in the field. The cement shall not be affected by sun or water exposure and shall not produce any detrimental effect to the film.

5. FACTORY FABRICATION: Individual calendar widths of PVC shall be factory fabricated into large panels. The manufacturer of the calendered rolls shall show where a minimum of 2,000,000 square feet of its 76 inch wide material has been installed for lining hydraulic structures. Lap joints with a minimum joint width of 1/2 inch shall be used. Factory made splices shall have a strength of 80 percent of the specified sheet strength. After fabrication, the lining shall be accordion folded in both directions and packaged for minimum handling in the field. Shipping boxes shall be substantial enough to prevent damage to contents.

6. PROPERTIES: Physical properties of liner shall conform to Table, "Physical Properties". Liner samples shall be prepared for testing in accordance with ASTM D 618.

PHYSICAL PROPERTIES

<u>Property</u>	<u>Required Film Thickness (nominal) (30 mil)</u>	<u>ASTM Test Method</u>
1. Thickness, minimum mm (inch)	0.72 (0.0285)	D 1593, para 8.1.3
2. Specific gravity, minimum	1.20	D 792, Method A
3. Tensile properties:		D 882
a. Breaking factor, each direction, minimum, N/mm (lbf/in)	12.0 (69)	
b. Elongation at break, each direction, minimum, percent	300	

<u>Property</u>	<u>Required Film Thickness (nominal) (30 mil)</u>	<u>ASTM Test Method</u>
c. Modulus at 100 percent elongation, each direction, minimum, N/mm (lbf/in)	4.7 (27)	
4. Bonded seam strength, tensile, each direction, minimum, percent of breaking factor	80	D 882
5. Bonded seam strength, peel adhesion	FTB	D 413
6. Tear resistance (Graves), each direction, minimum, N (lbf)	35.6 (8.0)	D 1004
7. Low temperature impact	Not more than 5 specimens out of 10 shall fail at -28.9 degrees C (-20 degrees F)	D 1790
8. Dimensional stability each direction, maximum, percent	5.0	D 1204, 15 minutes at 100 degrees C (212 degrees F)
9. Plastizer stability:		
a. Water extraction, maximum, percent weight loss	0.35	D 1239, Immersion in 50 degrees C (122 degrees F) distilled water for 24 hours
b. Volatile loss, maximum, percent	0.7	D 1203, Method A
c. Resistance to soil burial, increase in modulus at 100 percent elongation each direction, maximum, percent	10.0	D 3083, 30-day soil burial

PART 3 - EXECUTION

7. INSTALLATION:

7.1 Preparation:

7.1.1 Surfaces to be lined shall be smooth and free from sharp rocks, other sharp objects, vegetation, and stubble when liner is placed.

7.1.2 Surfaces to receive liner shall be inspected by installer to determine whether there are defects present which might injure or impair its permanence or water-proofness.

7.1.3 Surfaces to receive liner shall be maintained in acceptable condition until liner installation is complete.

7.1.4 Lining installation shall begin only after certification referred to under paragraph 3: Submittals, has been furnished to and approved by Contracting Officer.

7.2 Field Engineer: Lining manufacturer's field engineer shall be present at all times during installation.

7.3 Seams: Field seams shall be 100 percent visually inspected by Contractor and lining manufacturer's technical representative. Seams shall also be tested with a vacuum suction box to locate any defects that are present.

7.4 Connections to Metal: Metal to be in contact with membrane shall be fully sealed and bonded thereto, using trowel coat of compatible mastic over entire contact surface. A stainless steel clamp shall be placed around rubber boot at gas ventilation pipes.

8. PLACING LINING: The PVC lining shall be placed over the prepared surfaces to be lined in such a manner as to assure minimum handling.

8.1 General: Placing methods shall be designed to minimize handling.

8.2 Fittings: The lining shall be closely fitted and sealed around inlets, outlets, and other projections through the lining.

8.3 Damage: Lining damaged during installation shall be replaced or repaired by using an additional piece of lining.

8.4 Field Joints: Lap joints shall be used to seal factory-fabricated panels of PVC together in the field. Lap joints shall be formed by lapping the edges of panel a minimum of 2 inches. The contact surfaces of the panels

shall be wiped clean to remove all dirt, dust or other foreign materials. Sufficient cold-applied vinyl-to-vinyl bonding adhesive shall be applied to the contact surfaces in the joint area, and the two surfaces pressed together immediately. Wrinkles shall be smoothed out. Field splices shall have a strength of 80 percent of the specified sheet strength. A minimum of one test per field splice shall be performed to ensure that the minimum specified strength is attained. Results of field splice tests shall be submitted to the Contracting Officer.

8.5 Joints to Structures: Curing compounds and coatings shall be completely removed from the joint area. Joining of PVC to concrete shall be made with vinyl-to-vinyl concrete adhesive and mechanically fastened. Unless otherwise shown on the drawings, the minimum width of concrete to PVC joint shall be 8 inches.

8.6 Repairs to PVC: Any necessary repairs to PVC shall be patched with the lining material itself and cold applied vinyl-to-vinyl splicing adhesive. The splicing adhesive shall be applied to the contact surfaces of both the patch and lining to be repaired, and the two surfaces pressed together immediately. Wrinkles shall be smoothed out.

8.7 Quality of Workmanship: Completed joints shall be tightly bonded. Lining injury from scuffing, penetration by foreign objects, and distress from rough subgrade shall be replaced or covered and sealed with an additional layer of PVC of the proper size. A technical service representative of the lining manufacturer shall be made available to the Contractor. The technical service representative shall instruct Contractor's personnel in correct methods for handling and installing liner.

9. ANCHORAGE: Immediately following liner installation, cloth bags filled with sand shall be placed over it. Bags shall be placed as required to prevent liner from billowing in wind. Bags shall remain until sand layer is placed over liner. Bags may remain during and after sand placement, at Contractor's option. Sand will be provided and placed over membrane as specified in section: GRADING. Liner shall not be left exposed to the atmosphere without protection of the sand layer for more than 48 hours.

10. SPECIAL EDGE: Along grid line 13 from G thru R, the liner edge shall be seamed to the existing liner in accordance with the manufacturer's recommendations.

PHASE III



E.T.&L. CONSTRUCTION CORP.
RTE. 117 & DELANEY ST. • P.O. BOX 245
STOW, MA 01775
(508) 897-4353

LETTER OF TRANSMITTAL

TO DEPARTMENT OF THE ARMY
DIRECTOR OF CONSTRUCTION
BUILDING 227
FORT DEVENS
FORT DEVENS, MA 01433-5340

DATE	4/24/89	JOB NO.	88-7
ATTENTION	MS. PHYLLIS LOISELLE		
RE:	CONTRACT # DAKF 31-88-C-1		

WE ARE SENDING YOU ☐ Attached ☐ Under separate cover via _____ the following items:

- ☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☒ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
41	4/24/89	TRANS.#5	WITH (4) COPIES OF INDEPENDENT PIPE LETTER DATED 4/20/89 RE: 6" SCH. SCH. 40 PIPE FOR GAS VENT
			AND (4) COPIES OF A.D.S. CERT. OF COMPLIANCE DATED 3/16/89 RE: 3" PERFORATED A.D.S. TUBING

THESE ARE TRANSMITTED as checked below:

- ☒ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval
☐ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution
☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints
☐ For review and comment ☐ _____
☐ FOR RECORD

REMARKS _____

COPY TO _____

SIGNED:

GEORGE S. KELLAND

If enclosures are not as noted, kindly notify us at once.



INDEPENDENT PIPE & SUPPLY CORP.

WHITMAN ROAD • CANTON, MASSACHUSETTS 02021 • (617) 828-8500 • FAX (617) 828-1321

Rhode Island Division:

EASTERN SUPPLY • 50 BACON STREET • PAWTUCKET, RI 02860 • (401) 725-1700

April 20, 1989

ET&L Construction Corp.
Route 117 & Delaney Sts.
Stow, Massachusetts 01775

Ref: Our Invoice 160245

Gentlemen:

Please be advised that the materials shipped on our Invoice 160245, your Purchase Order 88-7, conforms to the required specifications which is 6" Sch. 40 ERW pipe & 6" standard L/R weld ells.

Very truly yours,

INDEPENDENT PIPE & SUPPLY CORP.

Barbara Roberto
Quality Assurance Assistant

BR/ljl

4-20-89

BARBARA ROBERTO



STONEBROOK INDUSTRIAL AREA BOX 389 LUDLOW, MASSACHUSETTS 01056 (413) 589-0515

CERTIFICATE OF COMPLIANCE
(Manufactured or Fabricated Material)

Date March 16, 1989

WE HEREBY CERTIFY THAT 3" Highway Perforated Tubing (#381)
(Description, or Kind of Material)

Furnished to Penn Culvert North Billerica, MA E.T. & L. Construction Stow, MA
(Name of Contractor) (Prime or Sub)

For Use On _____
(Project Name)

Federal No. _____ State No. _____

In the Amount of 8,400 Feet #381
(Quantity Represented)

Identified By Delivery Slip Number Invoice #I36-053054-001
(Label, Marking, Seal No., Consignment)

Shipped March 17, 1989 Delivered March 17, 1989

Shipped Via Mc Cormick Trucking
(Method of Shipment, Car No., Truck No.)

MEETS THE REQUIREMENTS OF THE PERTINENT PROJECT PLANS, SPECIAL PROVISIONS AND SPECIFICATIONS OF THE MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS, DIVISION OF ROADS AND BRIDGES IN ALL RESPECTS. PROCESSING, PRODUCT TESTING AND INSPECTION CONTROL OF RAW MATERIALS ARE IN CONFORMANCE WITH ALL APPLICABLE SPECIFICATIONS, DRAWINGS AND/OR STANDARDS OF ALL ARTICLES FURNISHED.

All records and documents pertinent to this certificate and not submitted herewith will be maintained available by the undersigned for a period of not less than three years from date of final payment to the State from Federal Funds.

ADVANCED DRAINAGE SYSTEMS, INC.
(Manufacturer or Supplier)

Signed by: Dean S. Carpenter
Dean S. Carpenter
(Quality Control)



E.T.&L. CONSTRUCTION CORP.
RTE. 117 & DELANEY ST. • P.O. BOX 245
STOW, MA 01775

(508) 897-4353

TO DEPARTMENT OF THE ARMY
DIRECTOR OF CONSTRUCTION
BUILDING 227
FORT DEVENS
FORT DEVENS, MA 01433-5000

LETTER OF TRANSMITTAL

DATE	3/7/89	JOB NO.	88-7
ATTENTION	MR. GLEA ROBERT KRUZENSKI		
RE:	CONTRACT # DAKF31-88-C7		

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

- | | | | | |
|---|---------------------------------------|--------------------------------|----------------------------------|---|
| <input type="checkbox"/> Shop drawings | <input type="checkbox"/> Prints | <input type="checkbox"/> Plans | <input type="checkbox"/> Samples | <input type="checkbox"/> Specifications |
| <input type="checkbox"/> Copy of letter | <input type="checkbox"/> Change order | <input type="checkbox"/> _____ | | |

COPIES	DATE	NO.	DESCRIPTION
1	3/7/89	TRANS.#4	WITH (4) COPIES OF A.D.S. CUT SHEET

THESE ARE TRANSMITTED as checked below:

- | | | |
|--|---|---|
| <input checked="" type="checkbox"/> For approval | <input type="checkbox"/> Approved as submitted | <input type="checkbox"/> Resubmit _____ copies for approval |
| <input type="checkbox"/> For your use | <input type="checkbox"/> Approved as noted | <input type="checkbox"/> Submit _____ copies for distribution |
| <input type="checkbox"/> As requested | <input type="checkbox"/> Returned for corrections | <input type="checkbox"/> Return _____ corrected prints |
| <input type="checkbox"/> For review and comment | <input type="checkbox"/> _____ | |
| <input type="checkbox"/> FOR RECORD | | |

REMARKS _____

COPY TO _____

SIGNED:

If enclosures are not as noted, kindly notify us at once.

GEORGE S. KELLAND

FÖRSCOM 1 FORM 59-2-R
MAR 76

Easy-to-use heavy-duty ADS fittings

Split Coupling



3"-311 8"-811
4"-411 10"-1011
5"-511 12"-1211
6"-611 15"-1511

Snap Coupling



3"-312 6"-612
4"-412 8"-812
5"-512 10"-1012

Internal Coupler



4"-415
5"-515
6"-615

Internal Reducing Coupler



5"-4"-425
6"-5"-526

Reducing Coupler



4" x 3"-314 8" x 6"-816
5" x 4"-514 10" x 8"-1018
6" x 4"-614 12" x 10"-1210
6" x 5"-516 15" x 12"-1512

Snap Tee



3"-321 5"-525
4"-421 6"-626

Saddle Tee



4"-443 6"-646
5"-545 8"-843

Blind Tee



3"-341 5"-541
4"-441 6"-641

Reducing Tee (Single)



523-5" to 3" 624-6" to 4"
524-5" to 4" 625-6" to 5"

45° "Y"



3"-322 5"-522
4"-422 6"-622

Spin-on Couplings



18"-1811
24"-2411

Split End Cap



3"-331 8"-831
4"-431 10"-1031
5"-531 12"-1231
6"-631 15"-1531

End Plug



18"-1833
24"-2433

Snap Adapter



3"-362 6"-662
4"-462 8"-862
5"-562

Reducing Tee (Multiple)



644-5" to 6"/6" to 5"
6" to 4"/6" to 3"
844-8" to 6"/8" to 6"
8" to 5"/8" to 4"
1044-10" to 10"/10" to 8"
10" to 6"
1244-12" to 12"/12" to 10"
12" to 8"
1544-15" to 15"/15" to 12"
15" to 10"
1844-18" to 18"

Perforated Tubing



3"-301-300' Coils
4"-401-250' Coils
5"-501-165' Coils
6"-601-100' Coils
8"-801-20' Lengths
10"-1001-20' Lengths
12"-1201-20' Lengths
15"-1501-20' Lengths
18"-1801-20' Lengths
24"-2401-20' Lengths
(301 and 401 also available in bundles of ten-10' lengths.)

Non-Perforated Tubing



3"-351-300' Coils
4"-451-250' Coils
5"-551-165' Coils
6"-651-100' Coils
8"-851-20' Lengths
10"-1051-20' Lengths
12"-1251-20' Lengths
15"-1551-20' Lengths
18"-1851-20' Lengths
24"-2451-20' Lengths
(351 and 451 also available in bundles of ten-10' lengths.)

Protective Wrap



Drain Guard®
3"-372
4"-472
5"-572
6"-672
8"-872
10"-1072
12"-1272
Sock
373-300' Coils
473-250' Coils
573-165' Coils
673-100' Coils
873-20' Lengths
1073-20' Lengths
1273-20' Lengths
1573-20' Lengths
1873-20' Lengths
2473-20' Lengths



Heavy Duty Tubing

Perf. 8"-801 10"-1001 12"-1201 15"-1501 18"-1801 24"-2401
Non-Perf. 851-20' Lengths 1051-20' Lengths 1251-20' Lengths 1551-20' Lengths 1851-20' Lengths 2451-20' Lengths



45° ELL

4"-445



90° ELL

3"-390
4"-490

Advanced Drainage Systems, Inc., is America's leading manufacturer of quality corrugated polyethylene pipe. Manufactured of selected polyethylene resins, ADS pipe meets the strictest product quality standards and industry specifications.

In addition, ADS manufactures a complete line of fittings and couplings, simplifying installations for highway and construction drainage applications.

From coast to coast, ADS tubing is available through the industry's most extensive distribution network. For the name of your local distributor, contact the nearest ADS sales office.

Nationwide Sales and Manufacturing Network

CALIFORNIA

Madera (209) 674-0054
(209) 674-0903*

GEORGIA

Montezuma (912) 472-7556

ILLINOIS

Harvard (815) 943-5477
Monticello (217) 762-9448

IOWA

Cresco (319) 547-3105
Creston (515) 782-8565
Eagle Grove (515) 448-5101
Iowa City (319) 338-9448
(319) 338-3689*

KENTUCKY

Livermore (502) 733-4324
Versailles (606) 873-8046

MASSACHUSETTS

Palmer (413) 283-9797

MICHIGAN

Bad Axe (517) 269-9506
Owosso (517) 723-5208

MINNESOTA

Rochester (507) 281-5450*

NORTH CAROLINA

Charlotte (704) 527-0137*
Rowland (919) 422-3303

OHIO

London (614) 852-9554
(614) 852-4067*
Napoleon (419) 599-9565
Wooster (419) 599-0585*
(216) 264-4949

TENNESSEE

Brentwood (615) 373-9964*

TEXAS

Ennis (214) 875-6591

VIRGINIA

Buena Vista (703) 261-6131

WASHINGTON

Bellevue (206) 643-2770*
Washougal (206) 835-8522

*Sales Office Only

Insist on the ADS green stripe.

It's your sign of quality—#1 in the land.



Corporate Office / 3300 Riverside Drive, Columbus, Ohio 43221 / (614) 457-3051

(BE)

MATERIAL APPROVAL SUBMITTAL

Rec'd 15 Dec 68
7 31 11 PM (P)



E.T.&L. CONSTRUCTION CORP.

BOX 245, STOW, MASSACHUSETTS 01775

E. T. & L. CONSTRUCTION CORP.

QUALITY CONTROL PROGRAM

(Per Special Contract Requirements Section 34 Page 256)

It is the policy of E.T.&L. Construction Corp. to furnish and install only 1st quality materials in a professional and workman like manner as required by the particular project plans and specifications.

Each and every project is staffed by a project superintendent and respective craft foreman who are responsible for installing the work as required by the contract. The job superintendent is officially designated by E.T.&L. Construction Corp. as its project quality control officer with complete responsibility for installation of the work in compliance with the contract requirements.

The E.T.&L. Construction Corp.'s quality control program is outlined as follows:

1. All horizontal and vertical control and layout will be checked and verified for accuracy prior to the placement of any materials on the project.
2. All materials purchased and delivered to the project will be checked for any flaws or defects in manufacture or breakage from transport prior to incorporation into the work. Also that they comply with the project specifications.
3. All contract requirements for earth excavation, rock excavation, embankment, filling, grading and compaction will be met or exceeded by E.T.&L. Construction Corp. prior to proceeding with further work above or on the work described.
4. The work of all subcontractors will be monitored and inspected by E.T.&L. Construction Corp. to assure compliance with all quality standards set forth in the contract.
5. It is the policy of E.T.&L. Construction Corp. to correct, repair, or replace any work not found to comply with the contract plans, specifications and requirements.



E.T.&L. CONSTRUCTION CORP.


BOX 245, STOW, MASSACHUSETTS 01775

6. In E.T.&L. Construction Corp.'s forty-three (43) year history this policy has worked successfully to satisfy the contract requirements on hundreds of private, municipal, State and Federally funded projects throughout Massachusetts which the company has completed.

Very truly yours,

E. T. & L. CONSTRUCTION CORP.

BY:


Garry P. Balboni, P.E.

Vice President - Operations

GPB/cw

STATEMENT AND ACKNOWLEDGMENT

FORM APPROVED
OMB NO.
3090-0119

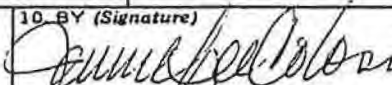
PART I - STATEMENT OF PRIME CONTRACTOR

1. PRIME CONTRACT NO. KF31-88-C-1001	2. DATE SUBCONTRACT AWARDED 24-Oct.-88	3. SUBCONTRACT NUMBER S-88-7-1
4. PRIME CONTRACTOR (Name, address and ZIP code) E.T.&L. Construction Corp. Rte. #117 & Delaney Street Stow, Mass. 01775		5. SUBCONTRACTOR (Name, address and ZIP code) Wright & Kunkel ^{LINING} Construction Co., Inc. P.O. Box 7280 The Woodlands, Texas 77380

6. The prime contractor states that under the contract shown in Item 1, a subcontract was awarded on date shown in Item 2 by (Name of Awarding Firm) E.T.&L. Construction Corp.

to the subcontractor identified in Item 5, for the following work:

Furnishing and Installing Complete-In-Place the Landfill Liner
as specified in Specification Section 02598

7. PROJECT Landfill Closure Phase II	8. LOCATION Ft. Devens Ft. Devens, Mass. 01433	
9. NAME AND TITLE OF PERSON SIGNING Jennie Lee Colosi	10. BY (Signature) 	11. DATE SIGNED 31-Oct.-88

PART II - ACKNOWLEDGMENT OF SUBCONTRACTOR

12. The subcontractor acknowledges that the following clauses of the contract shown in Item 1 are included in this subcontract:

Contract Work Hours and Safety
Standards Act - Overtime
Compensation - Construction
Payrolls and Basic Records
Withholding of Funds

Davis-Bacon Act
Apprentices and Trainees
Compliance with Copeland Regulations
Subcontracts
Contract Termination-Debarment

13. NAME(S) OF ANY INTERMEDIATE SUBCONTRACTORS, IF ANY

14. NAME AND TITLE OF PERSON SIGNING <u>STEPHEN F. WRIGHT</u> <u>PRESIDENT</u>	15. BY (Signature) 	16. DATE SIGNED 11-22-88
---	--	---------------------------------

**MEMBRANE LINER
ENGINEERING SPECIFICATION GUIDE**

POLYVINYL CHLORIDE (PVC)



	Test Method	Specified Values				
Thickness mils (Nominal $\pm 5\%$)	ASTM D-1593	20	30	40	50	60
Specific Gravity, min.	ASTM D 792	1.23	1.23	1.23	1.23	1.23
Tensile Strength, psi, min. (Breaking Factor, lbs./in. width, min.)	ASTM D 882	2300 46	2300 69	2300 92	2300 115	2300 138
Elongation, @ Break, % min.	ASTM D 882	325	350	400	450	450
Modulus @ 100% Elongation, psi, min. (lbs./in. width min.)	ASTM D 882	1000 (20.0)	1000 (30.0)	1000 (40.0)	1000 (50.0)	1000 (60.0)
Tear Resistance, lbs./in., min. (lbs., min.)	ASTM D 1004	300 (6.0)	300 (9.0)	300 (12.0)	300 (15.0)	250 (15.0)
Low Temperature, °F	ASTM D 1790	-15	-20	-25	-30	-30
Dimensional Stability, % change, max.	ASTM D 1204 (212°F, 15 min.)	3.5	3.5	3.5	3.5	3.5
Water Extraction % loss, max.	ASTM D 3083	0.35	0.35	0.35	0.35	0.35
Volatility % loss, max.	ASTM D 1203	0.90	0.70	0.50	0.50	0.50
Resistance to Soil Burial % change, max.	ASTM D 3083					
Tensile Strength		-5	-5	-5	-5	-5
Elongation, @ Break		-20	-20	-20	-20	-20
Modulus @ 100% Elongation		+20	+20	+20	+20	+20
Hydrostatic Resistance, psi, min.	ASTM D 751	60	85	110	150	175
Factory Seam Requirements*						
Bonded Seam Strength (factory seam, breaking factor, ppi width)	ASTM D 3083, Modified	36.8	55.2	73.6	92	110.4

*Factory bonded seam strength is the responsibility of the fabricator.



GENERAL REQUIREMENTS

1.01 Scope:

The work covered by these specifications consists of furnishing and installing a polyvinyl chloride (PVC) plastic lining where shown on the drawings or directed by the Engineer. All work shall be done in strict accordance with the drawings and these specifications are subject to the terms and conditions of the contract. It is the intent of these specifications to ensure a first quality finished product is provided.

1.02 Materials:

PVC (polyvinyl chloride) lining shall consist of 72" (182 cm) minimum, widths of calendered polyvinyl chloride sheeting fabricated into large sections by means of special factory-bonded seams into a single panel, or into the minimum number of large panels required to complete the project, as supplied by WATERSAVER CO., INC., P.O. BOX 16465, DENVER, COLORADO 80216-0465 (303) 289-1818.

The materials supplied under these specifications shall be first quality products and manufactured specifically for the purposes of this work, and which have been satisfactorily demonstrated by prior use to be suitable and durable for such purposes. The manufacturer of the calendered rolls shall show, upon request where a minimum of 100,000,000 sq. ft. (9,290,227 sq. m.) of 72" (182 cm) minimum width material has been manufactured for lining hydraulic structures.

PVC sheeting shall be formulated and manufactured domestically from 100% virgin polyvinyl chloride resin and be specifically compounded for use in hydraulic structures. Reprocessed or reground materials shall not be used. No factory set up or trim materials that are foreign to the virgin formulation shall be used. Only first quality phthalate and/or phosphate plasticizers shall be used. The use of water soluble formulation ingredients is prohibited.

The compound must contain a biocide at a viable formulation level. There shall not be any unmixed formulation ingredients. The sheeting shall contain no deep gas checks, no surface divots, no windows, and shall not exhibit cold flow. It must have good surface quality and be free of pinholes and blisters.

It shall be uniform in color, size, and thickness. The material shall have the minimum physical property characteristics, as outlined in the specifications. Certified test results showing that the sheeting meets or exceeds the specification shall be supplied upon request.

1.04 Factory Fabrication:

Individual calendered widths of PVC shall be factory fabricated into large panels so as to minimize field seaming during installation. Factory fabricated seams shall have a minimum of one-half inch (1/2") nominal width. All factory fabricated seams shall have a strength of at least 80% of the specified sheet strength. The fabricator shall be experienced and shall show, upon request, where a minimum of 100,000,000 sq. ft. of material has been fabricated and successfully installed. Factory fabrication shall be by WATERSAVER CO., INC., P.O. BOX 16465, DENVER, COLORADO 80216-0465 (303) 289-1818.

1.05 Packaging and Handling:

After factory fabrication, the panels shall be double accordion folded in both directions and packaged so as to minimize handling at the jobsite. Shipping boxes shall be water resistant, strong enough to prevent damage to the contents, and shall be banded to heavy duty wood pallets. Panels which have been delivered to the jobsite shall be unloaded and stored in their original, unopened containers in a safe dry area and protected from the direct heat of the sun. Whenever possible, a 6" minimum air space between the pallets should be provided, especially for an extended period of time. Pallets shall not be stacked.

1.06 Installation:

General—Installation shall be performed by an authorized Installation Contractor who has previously installed a minimum of 2,000,000 sq. ft. (185,000 sq. m.) of this material or by a Contractor who has a Watersaver Field Representative in attendance. The surface (substrate) to receive the liner shall be smooth and free of sharp objects that could puncture the lining. All vegetation must be removed. A soil sterilant may be required at the discretion of the Engineer. The PVC lining shall be placed over the prepared surfaces to be lined in such a manner as to assure minimum handling. The panels shall be placed in such a manner as to minimize field seaming. Horizontal field seams on slopes shall be kept to a minimum.

The membrane shall be sealed to all concrete structures and other openings through the lining in accordance with details shown on the drawings submitted by the Contractor and approved by the Engineer. Factory fabricated pipe seals shall be used to seal all pipes penetrating the liner. Any portion of the lining damaged during installation shall be removed or repaired by using an additional piece of the same membrane as specified here-in. The liner shall be installed in a relaxed condition and shall be free of stress or tension upon completion of the installation. Stretching the liner to fit is not permissible.

A nominal 12 inches (10" minimum) of approved cover material shall be placed over the PVC lining as shown on the drawings. Cover material shall be approved by the Engineer prior to placement. Soil containing sharp, jagged rocks, roots, debris or any other material, which may puncture the membrane, shall not be used as cover material.

The Contractor may choose the equipment and manner with which to place the cover over the liner, provided: the Contractor satisfactorily demonstrates to the Engineer that both the equipment and manner used to place the chosen cover material over the lining will not have any detrimental effects on the liner.

Field seams will be made to seal factory fabricated panels of PVC together in the field. Seams shall be formed by lapping the edges of panels a minimum of 6 inches (15 cm). The contact surfaces of the panels shall be wiped clean to remove all dirt, dust or other substance. Sufficient vinyl to vinyl bodied solvent shall be applied to the contact surfaces in the seam area, and the two surfaces pressed together immediately. Any wrinkles shall be smoothed out. Field seams shall have a strength of at least 80% of the specified sheet strength.

All curing compounds and coatings shall be completely removed from the joint area. Joining of PVC to concrete shall be made with vinyl to concrete bonding adhesive. Unless otherwise shown on the drawings, the minimum width of concrete to PVC joint shall be 6 inches (15 cm). In addition, mechanical attachment may be necessary.

.10 Repairs to PVC:

Any necessary repairs to the PVC shall be made with the lining material itself and cold applied vinyl to vinyl splicing adhesives. Patches should be cut so as to cover the area to be repaired by a minimum of 4" in all directions. Patches should be cut with rounded corners. The splicing adhesive shall be applied to the contact surface between the patch and the lining, and the two surfaces pressed together immediately. Any wrinkles shall be smoothed out.

.11 Quality of Workmanship:

All joints, on completion of the work, shall be tightly bonded. Any lining surface showing injury due to scuffing, penetration by foreign objects, or distress from rough subgrade, shall, as directed by the Engineer, be replaced or covered and sealed with an additional layer of PVC of the proper size. A Water-saver Field Service Representative will be required during the liner installation if the installation is not done by an authorized installer. The Contractor will bear the expense of this Field Service Representative. The Field Service Representative is not directly responsible for the quality of the work involved; such responsibility will be solely that of the Contractor.

SPECIFIC PVC FLEXIBLE MEMBRANE LINER INFORMATION

PVC membrane liners are the most widely used of all polymeric membranes for waste impoundments. They show good chemical resistance to many inorganic chemicals; however, the inclusion of organic solvents may limit their applicability (consult Watersaver Company, Inc. for specific applications). Special "Oil Resistant" (PVC-OR) grades of PVC are also available that possess a high resistance to oil and other organic hydrocarbon attack.

PVC liner materials are produced in roll form in various widths and thicknesses. Most liners are used as unsupported sheeting, but fabric reinforcement can be incorporated. PVC compounds contain 25% to 35% of one or more plasticizers to make the sheeting flexible and rubberlike. They also contain 1% to 5% of a chemical stabilizer and various amounts of other additives. The PVC compound should not contain any water soluble ingredients. There is a wide choice of plasticizers that can be used in PVC sheeting, depending upon the application and service conditions under which the PVC compound will be used. Plasticizer selection is an extremely important aspect of a PVC liner material, since the loss of plasticizer will result in a change in physical properties. There are three basic mechanisms for plasticizer loss: volatilization, extraction and microbiologic attack. The use of the proper plasticizers and an effective biocide can virtually eliminate microbiological attack and minimize volatility and extraction. The PVC polymer itself is not affected by these conditions.

The principal reason for loss of plasticizer is by volatilization in the heat of the sun rather than solution in the waste fluid. Carbon black prevents ultraviolet attack, but does cause the absorption of solar energy raising the temperature to a level that could cause vaporization of the plasticizer. A soil or other suitable cover material must be used to protect the PVC from heat, ultraviolet and weathering.

Plasticized PVC sheeting has excellent Tensile, Elongation, Puncture and Abrasion Resistance properties. It is readily seamed by solvent welding and dielectric welding methods.

Watersaver Company supplies PVC, which utilizes only first quality resin, primary plasticizers, stabilizers, biocides and other additives. Watersaver Company offers a wide variety of custom fabricated PVC panels.

USES OF PVC LINERS

PVC liners can be used in many different applications, including:

- | | |
|----------------------------|--|
| -solid waste landfills | -tailings impoundments |
| -landfill caps | -irrigation reservoirs |
| -water treatment ponds | -reserve pit liners |
| -sewage lagoons | -fly ash disposal cells |
| -sand filter beds | -irrigation canals |
| -evapotranspiration fields | -moisture barriers |
| -golf course ponds | -leachate collection ponds |
| -decorative lakes | -fire water ponds |
| -fish hatcheries | -stormwater detention ponds |
| -mining heap leach pads | -solar evaporation ponds |
| | -industrial waste ponds & impoundments |

The above information is furnished to aid in selecting PVC for use as a geomembrane. Watersaver Company, Inc., as a supplier of materials only, does not assume responsibility for errors in selection, design, engineering, quantities, dimensions or installation.

For additional information, contact Watersaver Company, Inc.

MATERIAL APPROVAL SUBMITTAL

FORSCOM FORM 59-2-R
1 MAR 76

UNIVERSITY OF MASSACHUSETTS
SOIL AND PLANT TISSUE LAB
240 BEAVER STREET
WALTHAM, MA 02154-8096

LAB NUMBER: 5880630-137
BAG NUMBER: 4902

DATE SENT: / /

SOIL WEIGHT: 4.14 g/5cc
CROP: LAWN

SOIL FROM MIDDLESEX COUNTY

ET AND L CONSTRUCTION
RTE 117 & DELANEY ST
STOW, MA 01775

CONCERNS: WILL PICK UP.

LIMESTONE AND FERTILIZER RECOMMENDATIONS FOR TURF MAINTENANCE:

Total lime required is 297 lb of dolomitic limestone/1000 sq ft.
Apply 50 lb/1000 sq ft in early spring and again in September.
Test the soil again next year.

Use 2 lb/1000 sq ft P205, and 4 lb/1000 sq ft K2O.
See recommendations for nitrogen requirements, and information about
applying the correct amount of fertilizer.

SOIL PH 4.9
BUFFER PH 6.1

NITROGEN: NO3 = 15 PPM

NH4 = 6 PPM

NUTRIENT LEVELS: PPM LOW MEDIUM HIGH VERY HIGH

PHOSPHORUS (P)	6	XXXXXXXXXXXX			
POTASSIUM (K)	41	XXXXXXXXXXXX			
CALCIUM (CA)	87	IX			
MAGNESIUM (MG)	19	XXXXXX			

CATION EXCH CAP.
13.0 MEQ/100G

PERCENT BASE SATURATION
K= 1.0 MG= 1.4 CA= 4.1

MICRONUTRIENT LEVELS
ALL NORMAL

SUBSTANCES THAT CAN BE TOXIC TO PLANTS:
ALUMINUM 211 PPM SOIL RANGE: 0-200 PPM

The lead level in this soil is low.



Lab number : 5880630-137

Percent organic matter: 7.061

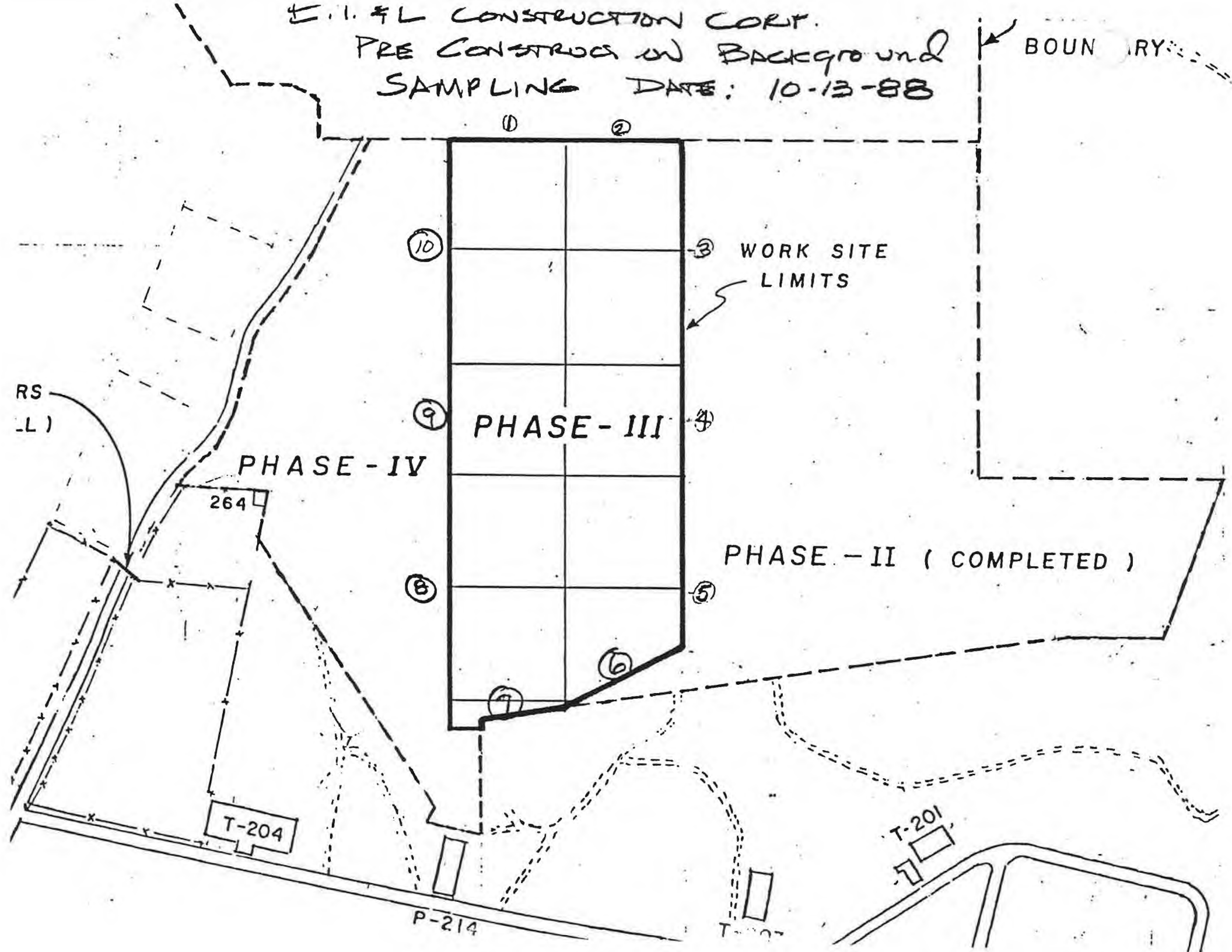
ET AND L CONSTRUCTION
RTE 117 & DELANEY ST
STOW, MA 01775

E.I. & L CONSTRUCTION CORP.

PRE CONSTRUCTION BACKGROUND

SAMPLING DATE: 10-13-88

BOUNDARY



PROJECT NAME

LANDFILL CLOSURE PHASE III
FORT DEVENS, MASS.

CONTRACT NO.

DAKF31-88-C-1001

CONTRACTOR

E.T.&L. CONSTRUCTION CORP.

WIND BLOWN LITTER SAMPLE REPORT

DATE OF SAMPLING:

10-13-88

AREA #
(See Plan Sketch)

No. of
Litter
Per SY

Avg. Total Area
of Litter
Per SY

Comments

PIECES

1.	2	.45 SF	PAPER
2.	3	.90 SF	PAPER
3.	6	4.5 SF	PAPER + PLASTIC WRAPERS
4.	10	6.75 SF	"
5.	12	6.0 SF	"
6.	5	2.25 SF	PAPER & PLASTIC PROTRUDING FROM COVER
7.	5	1.35 SF	"
8.	4	1.35 SF	"
9.	0	0 SF	
10.	0	0 SF	
11.			

See Instructions on Reverse

MATERIAL APPROVAL SUBMITT

TO (Contracting Officer)

Ms Phyllis R. GLASGOW

FROM (Contractor)

E.T. & L CONSTRUCTION CORP.

DATE

10-11-88

CONTRACT NUMBER

DAKF31-88-C-1001

SUBMISSION NUMBER

1

SUBMITTAL

☒ NEW☐ RESUBMITTAL

PREVIOUS SUBMISSION NUMBER

PROJECT NUMBER

FB19318-7P

TO BE COMPLETED BY CONTRACTOR

FOR GOVT USE ONLY

Item No	Specification Section/ Para No./Drawing No	Description of Material (Include Type, Model No, Catalog No, Mfg, etc.)	Approved	Dis- approved	See Below Reverse	Initial
1	SPEC. CONF. REQ. PARA 20	CONTRACT PROGRESS SCHEDULE FORM 59R	<input checked="" type="checkbox"/>			
2	SEC 02485 PARA 2.1	BAQ SAMPLE OF TOPSOIL			<input checked="" type="checkbox"/>	
3	SEC. 02598 PARA 7.1.4	CERTIFICATION OF LINING MATERIAL & INSTALLATION	<input checked="" type="checkbox"/>			hok
(2)	—	We will test topsoil, but per spec. 02485 para 1.3 the contractor also needs to test topsoil at an independent lab and submit report. Sample delivered by Contractor EPTS 10/13/88				

TYPED OR PRINTED NAME AND GRADE

GARRY P. BALBONI P.E.

SIGNATURE

Garry P. Balboni P.E.

DATE

10-11-88

FOR GOVT USE ONLY

TO

DFAE

EPTS

For Evaluation and Action

TYPED OR PRINTED NAME AND GRADE

ROBERT J. KRZEWski

SIGNATURE

Robert Krzewski

DATE

8/10/83

TO

CONTRACT SPECIALIST
CONTRACTING OFFICERRecommend ☒ Approval ☐ Disapproval as Indicated Above and Subject to Any Applicable Comments on the Reverse Side

TYPED OR PRINTED NAME AND GRADE

Beverly Ellorn

SIGNATURE

Beverly Ellorn

DATE

10/14/88

TO (Contractor)

SEE COMMENTS

☒ Approved ☐ Disapproved as Indicated Above and Subject to Any Applicable Comments on the Reverse Side. Request Resubmittal on Disapproved Items Within Days of Date Shown Below.

TYPED OR PRINTED NAME AND GRADE

ROBERT J. KRZEWski

SIGNATURE

Robert Krzewski

DATE

8/10/83

FORSCOM CONTRACT SPECIALIST

MAR 78

Phyllis Glasgow 18 OCT 1988



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
HEADQUARTERS FORT DEVENS
FORT DEVENS, MASSACHUSETTS



AFZD-DOC(715h)

05 October 1988

MEMORANDUM FOR: GLEN HAGSTROM, CH, CONSTR. MGMT. BR., DEH, EP&S, FORT DEVENS, MA

SUBJECT: Designation of Contracting Officer's Representative
(COR)

1. Pursuant to the provisions of AFARS Subpart 42.90 you are hereby designated Contracting Officer's Representative (COR) in administration of the following contract:

Contract Number: DAKF31-88-C-1001

Title: Landfill Closure, Phase III, Fort Devens, MA

Contractor: E. T. & L. Construction Corp.

Contract Period: 06 Oct 88 thru 06 Oct 89

2. You are authorized by this designation to take any and all action with respect to the following which could lawfully be taken by me as Contracting Officer, except any action specifically prohibited by the terms of subject contract:

a. Verify that the Contractor performs, the technical requirements of the contract in accordance with the contract terms, conditions and specifications.

b. Perform or cause to be performed, inspections necessary in connection with 2a above and to verify that the Contractor has corrected all deficiencies. Perform acceptance for the Government of services performed under this contract.

c. Maintain liaison and direct communications with the Contractor.

d. Monitor the Contractor's performance and notify the Contractor of deficiencies observed during the surveillance, and direct appropriate action to effect correction. Record and report to the undersigned incidents of faulty or non conforming work delays or problems.

e. Coordinates site entry for Contractor personnel and if to be provided insure that Government furnished property is available when required.

3. Limitations: You are not empowered to award, agree to, or sign any contract (including delivery or purchase orders) or modification thereto, or in any way to obligate the payment of money by the Government. You may not take any action which may impact on contract or delivery order schedules, funds or scope. All contractual agreements, commitments or modifications which involve prices, quantities, quality or delivery schedules shall be made only by the Contracting Officer.

AFZD-DOC(715h)

SUBJECT: Designation of Contracting Officers Representative

4. This designation as a Contracting Officer's Representative shall remain in effect through the life of the contract unless sooner revoked by the Contracting Officer and such termination of the designation shall be in writing. If your designation is revoked for any reason before completion of this contract, turn your records over to the successor COR or obtain disposition instructions from the Contracting Officer. If you are reassigned or separated from service, you shall request termination and relief from your duties from the Contracting Officer sufficiently in advance of reassignment or separation to permit timely selection and designation of a successor COR.

5. You are further required to maintain adequate records to sufficiently describe the performance of your duties as Contracting Officer's Representative during the life of this contract and to distribute such records as applicable. As a minimum the COR file shall contain the following:

- a. Copy of COR designation letter.
- b. Copy of contract and modifications thereto.
- c. Copy of correspondence between COR and Contractor.
- d. Names of technical and administrative personnel assisting the COR.
- e. Copy of records of COR inspections.
- f. Copy of statement indicating that COR has read and understands AR 600-50 (updated semi-annually).

6. You are required to submit a monthly report to the Contract Administrator concerning performance of services rendered under this contract. Problem areas should be brought to the immediate attention of the Contracting Officer.

7. All personnel engaged in Procurement and related activities shall conduct business dealings with industry or a manner above reproach in every respect and shall protect the US Government's interest, as well as maintain its reputation for fair and equal dealings with all contractors. AR 600-50 sets forth applicable standards of conduct for all personnel directly and indirectly involved in procurement. All COR's shall review AR 600-50 semi-annually, and provide certification to the Contracting Officer.

8. Any COR who may have direct or indirect financial interest which would place him in a position where there is a conflict between his private interests and the public interests of the United States shall advise his supervisors and the Contracting Officer of the conflict so that appropriate action may be taken. A COR shall avoid the appearance of such conflict to maintain public confidence in the US Government's conduct of business with the private sector.

9. You are invited to acknowledge receipt of this appointment on the original copy and return it to the Contracting Officer for retention in the contract file. The duplicate copy may be retained by you. Your signature also serves as certification that you have read and understood the contents of AR 600-50.

AFZD-DOC(715h)

SUBJECT: Designation of Contracting Officers Representative

10. In your absence, I hereby appoint Doris Meyer with all authority granted you in this appointment to serve as COR in your place. When the above individual is required to act in your stead, notification shall be made to the Contracting Officer in sufficient time for the Contracting Officer to notify the Contractor prior to your absence.

A handwritten signature in cursive script, reading "Phyllis R. Glasgow".

PHYLLIS R. GLASGOW
Contracting Officer

Receipt of this appointment is hereby acknowledged:

COR:

(Your signature certifies that you have read AR 600-50 within the last six (6) months.)

Glen Hagstrom

Name (Print/Type)

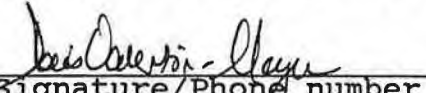

Signature/Phone Number
(508) 796-3685

Alternate COR:

(Your signature certifies that you have read AR 600-50 within the last six (6) months.)

Doris Meyer

Name (Print/Type)


Signature/Phone number
(508) 796-3021

Contractor:

E. T. & L. Construction Corp

Name(Print/Type)


Signature/Phone number
(508) 897-4353

Administrator:

Dale E. Aubin

Name (Print/Type)


Signature/Phone number
(508) 796-2194

Contract Number: DAKF31-88-C-1001



DEPARTMENT OF THE ARMY
HEADQUARTERS FORT DEVENS
FORT DEVENS, MASSACHUSETTS



REPLY TO
ATTENTION OF:

05 October 1988

Directorate of Contracting

SUBJECT: DAKF31-88-C-1001, Landfill Closure, Phase III, Ft.
Devens, MA

E.T. & L Construction Corp.
Rte 117 & Delaney Street
Stow, MA 01775

Listed below are Material Approval Submittals required by Contract Clause #19. These submittals shall be accomplished on the attached FORSCOM Form 59-2-R and shall be submitted no later than 18 October 1988.

<u>Specification Section/ Paragraph No./Drawing No.</u>	<u>Description of Material</u>
Special Contract Requirements, para. 32	As Built Drawings of Completed Project
Sec 02210, para. 5.5.1	Sketch of Sample Locations
Sec 02210, para. 5.5.2	Written Report of Samples
Sec 02485, para. 2.1	Sample of Topsoil
Sec 02485, para. 3.2	Sample of Seed
Sec 02598, para. 7.1.4	Certification of Lining Installation

Questions concerning Material Approval Submittals processing may be directed to the undersigned at (508) 796-2194.

DALE E. AUBIN
Contract Administrator

1 Enclosure
as



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
HEADQUARTERS FORT DEVENS
FORT DEVENS, MASSACHUSETTS



Directorate of Contracting

NOTICE TO PROCEED

CONTRACT NO. DAKF31-88-C-1001

E. T. & L. Construction Corp.
Rte. 117 & Delomey Street
Stow, MA 01775

DATE: 05 October 1988

Gentlemen:

You are hereby notified to proceed with work under contract number DAKF31-88-C-1001, Landfill Closure, Phase III, Fort Devens, MA.

In accordance with the terms of your contract, the completion date is hereby determined to be 06 October 1989.

The contracting Officer's Representative on this project is Glen Hagstrom (508) 796-3685.

The Contract Administrator is Dale E. Aubin (508) 796-2194.

Your attention is again invited to your copy of the Contracting Officer's Representative's letter of appointment delineating the scope of his authority to act on behalf of the Contracting Officer.

Sincerely,

PHYLLIS R. GLASGOW
Contracting Officer

RECEIPT IS ACKNOWLEDGED.

(Signature)
Vice President 10/5/88
(Title) (Date)



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
HEADQUARTERS FORT DEVENS
FORT DEVENS, MASSACHUSETTS 01433-5000

Directorate of Contracting

CONTRACT NO: DAKF31-88-C-1001
SOLICITATION NO: DAKF31-88-R-0851

E.T.&L. Construction Corp.
Rte. 117 & Delaney St.
Stow, MA 01775

Gentlemen:

Enclosed is your approved copy of above contract for Landfill Closure, Phase III, Fort Devens, MA.

A Contract Specialist in the Administration Section of this office will be contacting you in the very near future.

Kindly acknowledge receipt of contract by filling in the space provided below. The signed original copy of this letter must be forwarded to the Directorate of Contracting, Contract Administration Branch by return mail.

Sincerely,

Phyllis R. Glasgow
for PHYLLIS R. GLASGOW

Enclosure

Contracting Officer

TO: Directorate of Contracting
Contract Administration Branch
Building 227
Fort Devens, MA 01433-5340

RECEIPT IS ACKNOWLEDGED

E.T.&L. Construction Corp.
(FIRM)

September 21, 1988
(DATE)

Jennie Lee Colosi, Vice President
(PRINT/TYPE NAME AND TITLE)

Jennie Lee Colosi
(SIGNATURE)

FtDevFL 77
Nov 86

Prev ed obs.

SPECIFICATIONS

FOR

PHASE III LANDFILL CLOSURE

PROJECT REQUEST NUMBER EB-19318-7P

FORT DEVENS, MASSACHUSETTS

<u>SECTION NUMBER</u>	<u>DESCRIPTION</u>	<u>NO. OF PAGES</u>
Section 2210	Grading	5
Section 2485	Lawn and Grass	7
Section 2598	Landfill Liner	6

DIRECTORATE OF ENGINEERING AND HOUSING
FORT DEVENS, MASSACHUSETTS 01433-5100

SECTION 02210

GRADING

PART I - GENERAL

1. **APPLICABLE PUBLICATIONS:** The following publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 Military Standards (Mil. Std.):

MIL-STD-619B	Unified Soil Classification System for Roads, Airfields, Embankments and Foundations
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2. **DEFICIENCIES:**

2.1 Satisfactory Materials: Materials classified in MIL-STD-619 as GW, GP, and SW, and free from roots and other organic matter, trash debris, and frozen materials and stones larger than 6 inches in any dimension are satisfactory, except that maximum size stone in the sand and gravel layer directly beneath the clean sand buffer layer shall be 1/2 inch.

2.2 Unsatisfactory Materials: Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Materials classified in MIL-STD-619 as Pt, OH, and OL are unsatisfactory. Unsatisfactory materials also include man-made fills, refuse, or backfills for previous construction.

2.3 Cohesionless and Cohesive Materials: Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Cohesionless materials include materials classified in MIL-STD-619 as GW, GP, SW, and SP. Materials classified as GM and SM will be identified as cohesionless only when the fines have a plasticity index of zero.

2.4 Degree of Compaction: Degree of compaction is a percentage of the maximum density obtained by the test procedure presented in MIL-STD-621, Method 100, compaction effort designation CE 55, abbreviated below as a percent of CE 55 density.

2.5 Topsoil: All topsoil shall be imported from sources approved by the Contracting Officer. Imported materials suitable for topsoil are defined as fertile, friable, loam uniform in materials and texture, free from subsoil, clay lumps, sod, woodchips, stumps, roots, materials toxic to grass, stones larger than one and one-half inches in any

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dimension, glass fragments, bottles, cans, metal, construction debris, and other foreign materials. Topsoil shall be a mixture of clean sand, silt, and clay containing between 7 and 25% organic matter (determined by loss on ignition) and exhibiting sandy and clayey properties in equal proportions.

3. **SUBSURFACE DATA:** Subsurface soil boring logs are shown on the drawings. These data represent the best subsurface information available; however, variation may exist in the subsurface between boring locations.

PART 2 - PRODUCTS

4. **BORROW MATERIAL:** Borrow material shall be selected to meet requirements and conditions of the particular fill for which it is to be used. Necessary clearing, grubbing, disposal of debris, and satisfactory drainage of borrow pits shall be performed by the Contractor as incidental operations to the borrow excavation.

4.1 **Selection:** Borrow materials shall be obtained from the source listed on the drawings.

Borrow materials shall be subject to approval. Borrow material from approved sources on Government-controlled land may be obtained without payment.

4.2 **Stones:** Exposed and loose stones or rocks in the layer of borrow being compacted shall be removed by the Contractor before the placement of the next layer. Layer directly above and below the liner shall be free of all stones and gravel (clean sand).

PART 3 - EXECUTION

5. **WIND-BLOWN LITTER:**

5.1 **Maintenance:** The Contractor shall provide for routine maintenance and general cleanliness of sanitary landfill area and adjacent property from debris created by his operation (beyond limit of work line).

5.2 **Protection:** The Contractor shall prevent the scattering of refuse, wind-blown paper, and other light materials by using suitable portable fencing. The Contractor shall supply, have available on the site, and install as directed a sufficient amount, not less than 300 feet, of 4 foot high temporary fencing, to be used for the control of wind-blown paper. The fence may be a stock fence with wire fabric or a combination wire and wood fabric or other material approved by the Contracting Officer. The fence shall be relocated from time to time by the Contractor as the locations of filling operations change.

5.4 Control: To provide a standard by which to judge acceptable control of wind blown litter, the following sampling method will be utilized.

5.4.1 Ten locations shall be sampled for each area. The locations shall be 50 feet, plus or minus 2-1/2 feet apart, distributed to provide a result indicative of condition of the area.

5.4.2 At each location one square yard shall be evaluated for the presence of wind-blown litter. Each piece of litter larger than one square inch shall be measured for horizontal area exposed. Measurements shall be rounded to the nearest whole inch and the area computed.

5.4.3 The limits of acceptable performance:

5.4.3.1 Adjacent property shall have less than 1/10 square foot of litter per square yard, based on an average of all ten samples, with no more than 1/2 square foot of litter at any one location. Locations shall be no more than 100 feet, plus or minus 5 feet, from the limit of work line.

5.4.3.2 Area previously used as landfill but currently not in use shall have less than 1 square foot of litter per square yard, based on an average of all ten samples, with no more than 2 square feet of litter at any one location.

5.4.3.3 Area which has been capped under this Contract shall have less than 1/10 square foot of litter per square yard, based on an average of all ten samples, with no more than 1/2 square foot of litter at any one location.

5.4.3.4 The area in current use as active landfill disposal area (cleared) shall have less than 1/2 square foot of litter per square yard, based on an average of all ten samples, with no more than 1 square foot of litter at any one location. In this area the inspector shall be careful to verify that the litter is wind-blown and not refuse that has not been adequately covered. No samples shall be taken in areas being utilized for refuse disposal at the time of inspection, but only in covered areas or cleared areas not being used on day of inspection.

5.5 REPORTS:

5.5.1 The locations from which samples were taken shall be shown on a sketch of the site, and the quantity of litter at each location and the average for each area noted thereon.

5.5.2 The samples shall be taken by the Contractor, and a written report submitted to the Contracting Officer on a weekly basis.

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6. EQUIPMENT: The Contractor shall use equipment of operating weight sufficient to ensure proper compacting pressure. The compacting pressure based on the operating weight and ground contact areas shall be a minimum of 10 pounds per square inch.

7. EXCAVATION: Excavation of every description, regardless of material encountered, within the grading limits of the project shall be performed to the lines and grades indicated. Satisfactory and unsatisfactory excavation material shall be transported to and placed in fill areas within the limits of the work as indicated on the drawings. Excavations carried below depths indicated, without specific directions, shall, except as otherwise specified, be re-filled to the proper grade with satisfactory material as directed. All additional work of this nature shall be at the Contractor's expense. Excavation and filling shall be performed in a manner and sequence that will provide drainage at all times. Excavations shall be kept free from water while construction therein is in progress. Material required for fills in excess of that produced by excavation within the grading limits shall be obtained from borrow areas.

8. DITCHES, GUTTERS, AND CHANNEL CHANGES: Ditches, gutters, and channel changes shall be cut accurately to the cross sections and grades indicated. All roots, stumps, rock, and foreign matter in the sides and bottom of ditches, gutters, and channel changes shall be trimmed and dressed or removed to conform to the slope, grade, and shape of the section indicated. Care shall be taken not to excavate ditches and gutters below the grades indicated. Excessive ditch and gutter excavation shall be backfilled to grade either with satisfactory, thoroughly compacted materials or with suitable stone or cobble to form an adequate gutter. All ditches and gutters excavated under this section shall be maintained until final acceptance of the work. Satisfactory material excavated from ditches and channel changes shall be placed in fill areas. Unsatisfactory and excess excavated material shall be disposed of in accordance with directions in paragraph 7. EXCAVATION. No excavated material shall be deposited closer to the edges of the ditches than indicated and in no case less than 3 feet.

9. BACKFILL ADJACENT TO STRUCTURES: Backfill adjacent to structures shall be placed and compacted uniformly in such a manner as to prevent wedging action or eccentric loading upon or against the structures. Slopes bounding or within areas to be backfilled shall be stepped or serrated to prevent sliding of the fill. During backfilling operations and in the formation of embankments, equipment that will

overload the structure in passing over and compacting these fills shall not be used. Backfill for storm drains and subdrains, including the bedding and backfill for structures other than culverts and drains, shall conform to the additional requirements in other applicable sections.

10. COMPACTION OF UNSATISFACTORY MATERIAL:

10.1 Spreading: The Contractor shall spread refuse evenly in shallow layers, not exceeding two feet thickness before compaction. The upper layer of refuse shall be mixed with sand and gravel in roughly equal volumes prior to compacting.

10.2 Compacting: The Contractor shall compact each layer thoroughly with at least four passes of the compaction equipment before spreading and compacting following layer.

10.3 Slope Angle: Compacted refuse surface shall have slope angle not exceeding 30 degrees from horizontal.

11. COMPACTION OF SATISFACTORY MATERIAL:

11.1 Spreading: The Contractor shall spread suitable material evenly in lifts not exceeding 6 inches compacted thickness. A six inch buffer layer of clean sand shall be spread over the upper layer of refuse (mixed with sand and gravel) prior to liner placement.

11.2 Compacting: The Contractor shall compact each lift with at least four passes of the compaction equipment (roller) before spreading and compacting following layer. The layer above the liner shall not be compacted.

12. FINISHED EXCAVATION, FILLS, AND EMBANKMENTS: All areas covered by the project, including excavated and filled sections and adjacent transition areas, shall be uniformly smooth graded. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from blade grader operations, except as otherwise specified. Ditches and gutters shall be finished to permit adequate drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials. Surface on which the liner will be placed shall be free of all stones, roots, and other foreign material that could puncture the liner.

13. PROTECTION: Newly graded areas shall be protected from traffic and from erosion, and settlement or washing away that may occur from any cause, prior to acceptance, shall be repaired and grades reestablished to the required elevations and slopes. All work shall be conducted in accordance with the environmental protection requirements of the contract.

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SECTION 02485

LAWN AND GRASS

PART 1 - GENERAL

1. GENERAL REQUIREMENTS:

1.1 Limits of Lawn: Following areas shall receive topsoil and shall be seeded: capped area, regraded and contoured areas.

1.2 Topsoil: Topsoil shall be obtained from off-site sources and at the Contractor's expense. Topsoil sources shall be submitted to the Contracting Officer for approval prior to delivery to the site. All topsoil shall be imported from sources approved by the Contracting Officer. Imported materials suitable for topsoil are defined as fertile, friable, loam uniform in materials and texture, free from subsoil, clay lumps, sod, woodchips, stumps, roots, materials toxic to grass, stones larger than 1-1/2 inches in any dimension, glass fragments, bottles, cans, metal, construction debris, and other foreign materials. Topsoil shall be a mixture of clean sand, silt, and clay containing between 7 and 25 percent organic matter (determined by loss on ignition) and exhibiting sandy and clayey properties in equal proportions.

1.3 Topsoil Analysis: Topsoil shall be analyzed for conformance to specification by independent laboratory, which shall be approved in advance by the Contracting Officer. Report of analysis shall be delivered directly to the Contracting Officer. If report indicates need for soil conditioners and nutrients, they shall be added to topsoil as directed by the Contracting Officer and at the Contractor's expense.

1.4 Erosion Protection: Lawn and grass areas will be protected against erosion until acceptance of completed turf. Eroded areas shall be replaced with acceptable turf, using sod if seeded lawn and grass area cannot be established.

1.5 Sod: Sod may be employed at Contractor's option in lieu of conventional lawn and grass construction specified over the landfill cap. All ditch bottoms and slopes shall receive sod.

1.6 Planting Periods: Planting shall be done only within following periods:

<u>Item</u>	<u>Spring</u>	<u>Fall</u>
Seed	April 15 to May 15	August 20 to October 1
Sod	April 15 to July 1	August 20 to October 15

1.6.1 If seeding cannot be done within dates specified above and before the contract completion date, the Contractor shall return the following spring or fall to complete the seeding and establishment of grass. The Contractor shall prevent erosion until the seeding is done and turf is established.

2. SUBMITTALS:

2.1 Samples: Following sample shall be submitted in accordance with the SPECIAL CONTRACT REQUIREMENTS:

<u>Material</u>	<u>Quantity Pound</u>
Topsoil	50

PART 2 - PRODUCTS

3. GRASS SEED:

3.1 Seed Characteristics: Grass seed shall be of previous year's crop with not more than 0.5 percent weed seed, and not more than 1.75 percent crop seed, by weight. Seed shall be delivered to site in sealed containers, labeled with name of seed grower and seed formula, in form stated below. Seed shall be dry and free of mold. Seed shall meet following requirements:

<u>Name of Seed</u>	<u>Percent by Weight in Mixture</u>	<u>Minimum Percent Purity</u>	<u>Minimum Percent Germination</u>
Festuca elatior "Kentucky 31" Kentucky "31" Tall Fescue	50	97	90
Trifolium Repens White Clover	30	85	80
Lolium multiflorum Annual Ryegrass	20	95	90

3.2 Testing: Seed shall be tested by independent, reputable agricultural testing laboratory, which shall be approved in advance by the Contracting Officer. After delivery of seed to site but before planting, seed samples shall be taken by COR, for analysis and determination of quality. Seed which does not conform to requirements of paragraph 3.1 Seed Characteristics, shall be replaced with new seed and analyses repeated, until seed is supplied in conformance with specification.

4. LIME: Lime shall be fine-ground limestone, containing equal to or more than 85 percent total carbonates, by weight, 100 percent passing 20 mesh (1.27 mm) sieve, and equal to or more than 75 percent passing a 100 mesh (0.25 mm) sieve.

5. FERTILIZER: Fertilizer shall be complete commercial product, uniform, dry, and free-flowing. Fertilizer shall conform to the following:

<u>Constituent</u>	<u>Percent Present (min.)</u>
Nitrogen	10
Available phosphoric acid (P_2O_5)	10
Water-soluble potash (K_2O)	10

6. MULCH: Mulch for hydroseeding shall be wood cellulose pulp of type specified by manufacturer for hydroseeding.

7. ACIDITY: Topsoil pH range shall be 5.0 to 7.0.

PART 3 - EXECUTION

8. GRADING:

8.1 Rough Grading: Areas to receive lawn, grass, or sod will be rough graded under Section 02210, paragraph 12: FINISHED EXCAVATION, FILLS, AND EMBANKMENTS.

8.1.1 Rough grade will be left at 6 inches below finished grade.

8.2 Fine Grading: Fine grading shall be performed to cause minimum possible disturbance of subgrade. Subgrade shall be fine graded to tolerance equal to plus or minus 1/2 inch deviation of average from the plane indicated in each 100 foot square area, with no ridges, ruts, mounds, or depressions exceeding plus or minus 1 inch, and no abrupt deviation from plane. Surface shall be left free from construction debris and other foreign matter, and stones larger than 3 inches in any dimension shall not be visible in or on completed subgrade. There shall be no depressions where water can stand. Surface shall be compacted to 95% (ninety-five).

8.3 Excess Material: Excess subsoil and refuse or debris obtained during the work shall be disposed of on site, in areas designated by the Contracting Officer or designated representative.

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8.4 Scarification: If delay in topsoil placement is more than two weeks beyond completion of rough grading of area to receive topsoil, subgrade shall be scarified to 2 inch depth immediately before fine grading and placing topsoil. Subgrade areas which have not been rough graded, and areas which have become hard since being rough graded, shall also be scarified, as specified above, not more than four days before placing topsoil.

9. PLACING TOPSOIL:

9.1 Limitations:

9.1.1 Topsoil shall not be placed when subgrade or topsoil are frozen, excessively wet, or excessively dry.

9.2 Placing:

9.2.1 Topsoil shall be spread in uniform layer, to thickness which will compact to depth required to bring final lawn and grass surfaces to required elevation.

9.2.2 Surface shall be rolled as required to provide firm base for subsequent operations. Stones, roots, and other debris visible at surface, which are larger than 1-1/2 inches in any dimension, shall be removed.

10. PLACING LIMESTONE AND FERTILIZER:

10.1 Limestone:

10.1.1 Ground limestone shall be spread over surface at rate which will result in pH of 6.5 for top 3 inches of topsoil.

10.2 Fertilizer: Fertilizer shall be spread over surface at rate of 0.02 pound per square feet.

10.3 Fertilizer and Limestone:

10.3.1 Fertilizer and limestone shall be spread in uniform application, using approved mechanical spreader.

10.3.2 Fertilizer and lime shall be mixed thoroughly into top 3 inches of topsoil by disking, harrowing, or other approved means. Surface shall then be leveled and rolled as required to provide firm base for subsequent operations.

11. PLACING SEED:

11.1 Conditioning Surface: Final surface of topsoil immediately before seeding shall be within plus or minus 1/2 inch of required elevation, with no ruts, mounds, ridges, or other faults, and no pockets or low spots in which water can

collect. Stones, roots, and other debris larger than 1-1/2 inches in any dimension, which are visible at surface, shall be removed and resulting holes filled with topsoil, leaving plane and uniform surface.

11.2 Applying Seed: Seed shall be spread with approved mechanical spreader, to give uniform application at following rate:

<u>Seed</u>	<u>Rate pounds per square foot</u>
Grass seed	0.010

11.2.1 Seed shall be applied in two equal applications. Direction of spreader travel for second pass shall be perpendicular to that of first pass. Seeding shall not be done when it is raining or snowing or when wind velocity exceeds 5 miles per hour.

11.2.2 Following seeding, area shall be lightly raked to mingle seed with top 1/8 to 1/4 inch of soil. Area shall then be smoothed, stones and other debris larger than 1-1/2 inches in any dimension and which are visible on surface shall be removed, and surface shall be rolled with a roller having weight of 60 to 90 pounds per foot of width and diameter equal to or larger than 2 feet.

11.2.3 At Contractor's option, seed may be spread by hydroseeding method, utilizing power equipment commonly used for that purpose. Seed, lime, fertilizer, and mulch shall be mixed and applied to achieve application quantities specified herein for conventional seeding method, with mulch applied at rate of 1,200 pounds per acre. Material shall be applied in two equal applications, with equipment during second pass moving perpendicular to direction employed during first pass. Other provisions specified above for conventional seeding shall apply also to hydroseeding.

11.3 Watering: Following seeding, entire area shall be watered with lawn sprinklers or other approved means. Initial watering shall continue until equivalent of 2 inch depth of water has been applied to entire seeded surface, at rate which will not dislodge seed. Watering shall be repeated thereafter as frequently as required to prevent surface drying, until grass attains average height of 1/4 inch. Watering methods and apparatus shall not be permitted to injure surface.

12. SODDING:

12.1 Cutting and Delivery: After Contracting Officer or designated representative's inspection and approval of sod source, sod shall be cut into square or rectangular

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sections, retaining sufficient native soil on roots for protection and continued viability of grass. Sod shall be kept moist during delivery and while in stacks, and shall be protected from exposure to wind, sun, and freezing. Sod shall be cut and moved only when soil moisture conditions are favorable to successful planting. Sections of sod may vary in length but shall be equal in width and not larger than will permit lifting and handling without breaking. Sod shall not be dumped from vehicles. If necessary, ground shall be watered to optimum moisture content before sod is cut. Damaged sod will be rejected.

12.2 Placing:

12.2.1 Edges of sodded areas shall be smooth, and sodded areas shall conform to design cross sections and grade. At edges adjacent to curbs, paved areas, etc., top surface of earth in sod shall be 1/2 inch below adjacent hard surface.

12.2.2 Immediately after sodding operations have been completed, entire surface shall be compacted with culti-packer roller or other approved equipment weighing 100 to 160 pounds per foot of roller.

12.2.3 Completed sod shall immediately be watered sufficiently to uniformly wet soil to at least bottom of sod bed.

12.2.4 Surface of completed sodded area shall be smooth. Sod shall be laid edge-to-edge, with tight-butt, staggered joints. Immediately after laying, sod shall be pressed firmly into contact with sod bed by tamping or rolling, to eliminate air pockets. Following compaction, screened topsoil of good quality shall be used to fill cracks, and excess soil shall be worked into grass with rakes or other suitable equipment. Grass shall not be smothered with excess fill soil.

12.2.5 On slopes steeper than 3 to 1, sod shall be held securely in place by fastening lines of sod with wooden stakes. The stakes shall be not less than 12 inches in length, and they shall be spaced 3 feet apart and driven flush with the surface of the sod. Other methods of fastening sod to slopes may be used where staking is not practical upon approval by the Contracting Officer's Representative.

13. MAINTENANCE:

13.3 Operations: Except as otherwise specified below, maintenance shall include all operations required to produce an established lawn, including but not limited to:

- Mowing
- Replanting
- Resodding
- Watering.

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13.2 Timing:

13.2.1 Maintenance of lawn and grass areas shall begin upon completion of seeding or sodding.

13.2.2 Maintenance of sodded areas shall begin upon completion of sodding.

13.2.3 Maintenance shall continue until completion of extended maintenance period as specified in paragraph 14: EXTENDED MAINTENANCE.

13.3 Repairs:

13.3.1 After grass has sprouted, areas which fail to show uniform stand of grass shall be replanted as often as necessary to establish acceptable stand of grass.

13.3.2 Scattered bare spots shall not exceed 72 square inches each.

13.3.3 Scattered bare spots not exceeding total of 15 percent of area sown with seed will be acceptable without reseeding required.

13.4 Mowing: First mowing shall be done when average height of grass is 2-1/2 inches, with mower set to cut at height of 2 inches. Subsequent mowings shall be made at intervals not greater than two weeks, with height of cut set at 2 inches. With Contracting Officer's prior permission, mowings during periods of slow growth or dormancy may be spaced at greater intervals.

13.5 Lime and Fertilizer: If lawn or grass is established in fall and maintenance is required to continue into spring months, lawn and grass shall receive application of lime and fertilizer in spring. Lime and fertilizer shall be spread in uniform layer over entire lawn surface, at rate of .05 pound per square foot for lime and 0.02 pound per square foot for fertilizer.

14. EXTENDED MAINTENANCE: The Contractor shall maintain grass for one complete growing season, April 15 through October 15, following contract completion date. Extended maintenance operations shall conform to paragraph 13: MAINTENANCE.

SECTION 02598

LANDFILL LINER

PART 1 - GENERAL

1. APPLICABLE PUBLICATIONS: The following publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 American Society for Testing and Materials (ASTM) Publications:

D 413-82	Rubber Property-Adhesion to Flexible Substrate
D 618-61(1981)	Conditioning Plastics and Electrical Insulating Materials for Testing
D 792- 86	Specific Gravity and Density of Plastics by Displacement
D 882-83	Tensile Properties of Thin Plastic Sheeting
D 1004-66(1981)	Initial Tear Resistance of Plastic Film and Sheeting
D 1203- 86	Volatile Loss From Plastics Using Activated Carbon Methods
D 1204-84	Linear Dimensional Changes of Non- Rigid Thermoplastic Sheeting or Film at Elevated Temperatures
D 1239-55(1982)	Resistance of Plastic Films to Extraction by Chemicals
D 1593-81	Nonrigid Vinyl Chloride Plastic Sheeting
D 1755-81	Poly (Vinyl Chloride) Resins
D 1790-83	Brittleness Temperature of Plastic Film by Impact
D 3083-76(1980)	Flexible Poly (Vinyl Chloride) Plastic Sheeting for Pond, Canal, and Reservoir Lining

1.2 National Sanitation Foundation (NSF)

2. GENERAL REQUIREMENTS:

2.1 Sand Layer: A 6 inch thick layer of sand will be placed over refuse layer in accordance with Section 02210, paragraph 11: COMPACTION OF SATISFACTORY MATERIAL, before liner is installed.

3. SUBMITTALS: Submittals shall be made in accordance with requirements of SPECIAL CONTRACT REQUIREMENTS, modified as indicated below.

3.1 Material Certification: Material certification shall be submitted stating that the material meets or exceeds requirements of Table, "Physical Properties".

3.2 Warranty: Warranty shall be submitted, stating that leaks and defects of materials and workmanship in liner and joints shall be repaired or defective portions replaced on site with new material and work. Warranty shall extend for 20 year period from date of Government acceptance of completed project.

PART 2 - PRODUCTS

4. LINER:

4.1 Material: The liner shall be suitably formulated from homopolymer vinyl chloride resin of Type GP in accordance with ASTM D 1755, and compounded with suitable plasticizers, fillers, and additives to impart durability. A biocide shall be included in the material to provide resistance to biological degradation of the membrane. The membrane shall be compounded with carbon black and other ultraviolet stabilizers to provide resistance to ultraviolet degradation. The liner shall meet the requirements of Standard No. 54 of NSF.

4.1.1 The carbon black shall be evenly dispersed to produce a uniform color. Water-soluble compounding ingredients shall not be employed.

4.1.2 The membrane shall be uniform throughout and shall be free from dirt, oil, foreign matter, scratches, cracks, creases, bubbles, pits, tears, holes, pinholes, or other defects which may affect the serviceability of the membrane.

4.1.3 The polyvinyl chloride (PVC) membrane lining shall be fabricated from a film width of not less than 58 inches.

4.1.4 The lap seams shall be factory bonded using a liquid cement or commercially accepted dielectric sealing devices. Hot-air seaming methods shall not be used. Lap seams shall

be used and have a 3/4-inch minimum lap and a 3/4-inch minimum electrode (die) width. The seams shall be water-tight and the strength of the bonded seam in either the machine (longitudinal) or transverse direction of the film shall not be less than 80 percent of the breaking strength of the film when tested in a similar direction, or shall tear the parent material when tested in peel adhesion.

4.1.5-- The film shall be capable of being bonded to itself by liquid cement for making field splices and repairs. The manufacturer shall furnish a cement suitable for joining or repairing the larger pieces in the field. The cement shall not be affected by sun or water exposure and shall not produce any detrimental effect to the film.

5. FACTORY FABRICATION: Individual calendar widths of PVC shall be factory fabricated into large panels. The manufacturer of the calendered rolls shall show where a minimum of 2,000,000 square feet of its 76 inch wide material has been installed for lining hydraulic structures. Lap joints with a minimum joint width of 1/2 inch shall be used. Factory made splices shall have a strength of 80 percent of the specified sheet strength. After fabrication, the lining shall be accordion folded in both directions and packaged for minimum handling in the field. Shipping boxes shall be substantial enough to prevent damage to contents.

6. PROPERTIES: Physical properties of liner shall conform to Table, "Physical Properties". Liner samples shall be prepared for testing in accordance with ASTM D 618.

PHYSICAL PROPERTIES

<u>Property</u>	<u>Required Film</u>	
	<u>Thickness (nominal)</u>	<u>ASTM</u>
	<u>(30 mil)</u>	<u>Test Method</u>
1. Thickness, minimum mm (inch)	0.72 (0.0285)	D 1593, para 8.1.3
2. Specific gravity, minimum	1.20	D 792, Method A
3. Tensile properties:		D 882
a. Breaking factor, each direction, minimum, N/mm (lbf/in)	12.0 (69)	
b. Elongation at break, each direction, minimum, percent	300	

<u>Property</u>	<u>Required Film Thickness (nominal) (30 mil)</u>	<u>ASTM Test Method</u>
c. Modulus at 100 percent elongation, each direction, minimum, N/mm (lbf/in)	4.7 (27)	
4. Bonded seam strength, tensile, each direction, minimum, percent of breaking factor	80	D 882
5. Bonded seam strength, peel adhesion	FTB	D 413
6. Tear resistance (Graves), each direction, minimum, N (lbf)	35.6 (8.0)	D 1004
7. Low temperature impact	Not more than 5 specimens out of 10 shall fail at -28.9 degrees C (-20 degrees F)	D 1790
8. Dimensional stability each direction, maximum, percent	5.0	D 1204, 15 minutes at 100 degrees C (212 degrees F)
9. Plastizer stability:		
a. Water extraction, maximum, percent weight loss	0.35	D 1239, Immersion in 50 degrees C (122 degrees F) distilled water for 24 hours
b. Volatile loss, maximum, percent	0.7	D 1203, Method A
c. Resistance to soil burial, increase in modulus at 100 percent elongation each direction, maximum, percent	10.0	D 3083, 30-day soil burial

PART 3 - EXECUTION

7. INSTALLATION:

7.1 Preparation:

7.1.1 Surfaces to be lined shall be smooth and free from sharp rocks, other sharp objects, vegetation, and stubble when liner is placed.

7.1.2 Surfaces to receive liner shall be inspected by installer to determine whether there are defects present which might injure or impair its permanence or water-proofness.

7.1.3 Surfaces to receive liner shall be maintained in acceptable condition until liner installation is complete.

7.1.4 Lining installation shall begin only after certification referred to under paragraph 3: Submittals, has been furnished to and approved by Contracting Officer.

7.2 Field Engineer: Lining manufacturer's field engineer shall be present at all times during installation.

7.3 Seams: Field seams shall be 100 percent visually inspected by Contractor and lining manufacturer's technical representative. Seams shall also be tested with a vacuum suction box to locate any defects that are present.

7.4 Connections to Metal: Metal to be in contact with membrane shall be fully sealed and bonded thereto, using trowel coat of compatible mastic over entire contact surface. A stainless steel clamp shall be placed around rubber boot at gas ventilation pipes.

8. PLACING LINING: The PVC lining shall be placed over the prepared surfaces to be lined in such a manner as to assure minimum handling.

8.1 General: Placing methods shall be designed to minimize handling.

8.2 Fittings: The lining shall be closely fitted and sealed around inlets, outlets, and other projections through the lining.

8.3 Damage: Lining damaged during installation shall be replaced or repaired by using an additional piece of lining.

8.4 Field Joints: Lap joints shall be used to seal factory-fabricated panels of PVC together in the field. Lap joints shall be formed by lapping the edges of panel a minimum of 2 inches. The contact surfaces of the panels

shall be wiped clean to remove all dirt, dust or other foreign materials. Sufficient cold-applied vinyl-to-vinyl bonding adhesive shall be applied to the contact surfaces in the joint area, and the two surfaces pressed together immediately. Wrinkles shall be smoothed out. Field splices shall have a strength of 80 percent of the specified sheet strength. A minimum of one test per field splice shall be performed to ensure that the minimum specified strength is attained. Results of field splice tests shall be submitted to the Contracting Officer.

8.5 Joints to Structures: Curing compounds and coatings shall be completely removed from the joint area. Joining of PVC to concrete shall be made with vinyl-to-vinyl concrete adhesive and mechanically fastened. Unless otherwise shown on the drawings, the minimum width of concrete to PVC joint shall be 8 inches.

8.6 Repairs to PVC: Any necessary repairs to PVC shall be patched with the lining material itself and cold applied vinyl-to-vinyl splicing adhesive. The splicing adhesive shall be applied to the contact surfaces of both the patch and lining to be repaired, and the two surfaces pressed together immediately. Wrinkles shall be smoothed out.

8.7 Quality of Workmanship: Completed joints shall be tightly bonded. Lining injury from scuffing, penetration by foreign objects, and distress from rough subgrade shall be replaced or covered and sealed with an additional layer of PVC of the proper size. A technical service representative of the lining manufacturer shall be made available to the Contractor. The technical service representative shall instruct Contractor's personnel in correct methods for handling and installing liner.

9. ANCHORAGE: Immediately following liner installation, cloth bags filled with sand shall be placed over it. Bags shall be placed as required to prevent liner from billowing in wind. Bags shall remain until sand layer is placed over liner.

Sand will be provided and placed over membrane as specified in section: GRADING. Liner shall not be left exposed to the atmosphere without protection of the sand layer for more than 48 hours.

10. SPECIAL EDGE: Along grid line 13 from I thru M, along grid line M and along drainage ditch within lines K through M, the liner edge shall be seamed to the existing liner in accordance with the manufacturer's recommendations.

PHASE IVA

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

CONTRACT ID CODE

PAGE OF PAGES

2. AMENDMENT/MODIFICATION NO. P00001	3. EFFECTIVE DATE 90 Jul 19	4. REQUISITION/PURCHASE REQ. NO. W13GPY9186C462	5. PROJECT NO. (If applicable) EB-19248-8J
6. ISSUED BY CODE	7. ADMINISTERED BY (If other than Item 6) CODE		

Directorate of Contracting
Building 227
Fort Devens, MA 01433-5340
Attn: P. Loiselle (508)796-2025

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)

WES Construction Corp
850 Providence Highway
Dedham, MA 02026

(617) 326-4030

9A. AMENDMENT OF SOLICITATION NO.

9B. DATED (SEE ITEM 11)

10A. MODIFICATION OF CONTRACT/ORDER

X DAKF31-89-C-0745

10B. DATED (SEE ITEM 13)

89 Sep 30

CODE

FACILITY CODE

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

N/A

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

X ☒ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

Mutual Agreement

☐ D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 1 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Describe by UCF section heading, including solicitation/contract subject matter where feasible.)
a. Subject contract referenced in block 10a above for Landfill Closure, Phase IV-A, Fort Devens is changed as follows:

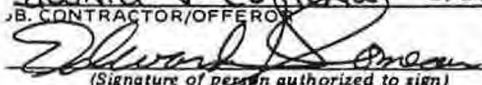

Contract completion date is changed from 7 Aug 90 to 31 Oct 90 in order to allow the Government to utilize as much of the landfill capacity as possible.

CONTRACTOR'S RELEASE STATEMENT

In consideration of this modification for the time extension as complete equitable adjustment, the contractor hereby releases to Government from any and all liability under this modification, for further equitable adjustments including claims for delay associated with this modification.

b. Contract total remains unchanged.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) Edward J. Comeau Exec. V.P.	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) ROBERT J. KRZEWSKI		
15B. CONTRACTOR/OFFEROR  (Signature of person authorized to sign)	15C. DATE SIGNED 7/23/90	16B. UNITED STATES OF AMERICA BY  (Signature of Contracting Officer)	16C. DATE SIGNED 90 Aug 81

INSTRUCTIONS

Instructions for items other than those that are self-explanatory, are as follows:

- (a) Item 1 (Contract ID Code). Insert the contract type identification code that appears in the title block of the contract being modified.
- (b) Item 3 (Effective date).
- (1) For a solicitation amendment, change order, or administrative change, the effective date shall be the issue date of the amendment, change order, or administrative change.
 - (2) For a supplemental agreement, the effective date shall be the date agreed to by the contracting parties.
 - (3) For a modification issued as an initial or confirming notice of termination for the convenience of the Government, the effective date and the modification number of the confirming notice shall be the same as the effective date and modification number of the initial notice.
 - (4) For a modification converting a termination for default to a termination for the convenience of the Government, the effective date shall be the same as the effective date of the termination for default.
 - (5) For a modification confirming the contracting officer's determination of the amount due in settlement of a contract termination, the effective date shall be the same as the effective date of the initial decision.
- (c) Item 6 (Issued By). Insert the name and address of the issuing office. If applicable, insert the appropriate issuing office code in the code block.
- (d) Item 8 (Name and Address of Contractor). For modifications to a contract or order, enter the contractor's name, address, and code as shown in the original contract or order, unless changed by this or a previous modification.
- (e) Items 9, (Amendment of Solicitation No.—Dated), and 10, (Modification of Contract/Order No.—Dated). Check the appropriate box and in the corresponding blanks insert the number and date of the original solicitation, contract, or order.
- (f) Item 12 (Accounting and Appropriation Data). When appropriate, indicate the impact of the modification on each affected accounting classification by inserting one of the following entries:
- (1) Accounting classification
Net increase \$
 - (2) Accounting classification
Net decrease \$
- NOTE: If there are changes to multiple accounting classifications that cannot be placed in block 12, insert an asterisk and the words "See continuation sheet".
- (g) Item 13. Check the appropriate box to indicate the type of modification. Insert in the corresponding blank the authority under which the modification is issued. Check whether or not contractor must sign this document. (See FAR 43.103.)
- (h) Item 14 (Description of Amendment/Modification).
- (1) Organize amendments or modifications under the appropriate Uniform Contract Format (UCF) section headings from the applicable solicitation or contract. The UCF table of contents, however, shall not be set forth in this document.
 - (2) Indicate the impact of the modification on the overall total contract price by inserting one of the following entries:
 - (i) Total contract price increased by \$
 - (ii) Total contract price decreased by \$
 - (iii) Total contract price unchanged.
 - (3) State reason for modification.
 - (4) When removing, reinstating, or adding funds, identify the contract items and accounting classifications.
 - (5) When the SF 30 is used to reflect a determination by the contracting officer of the amount due in settlement of a contract terminated for the convenience of the Government, the entry in Item 14 of the modification may be limited to —
 - (i) A reference to the letter determination; and
 - (ii) A statement of the net amount determined to be due in settlement of the contract.
 - (6) Include subject matter or short title of solicitation/contract where feasible.
- (i) Item 16B. The contracting officer's signature is not required on solicitation amendments. The contracting officer's signature is normally affixed last on supplemental agreements.

WES CONSTRUCTION CORP.850 Providence Highway
DEDHAM, MASSACHUSETTS 02026**LETTER OF TRANSMITTAL****(617) 326-4030**

TO

Phyllis Loisele
Contract Administrator
Building 227
Fort Devens, MA 01433 -
5340

DATE	11/3/89	JOB NO.
ATTENTION		
RE:	LANDFILL Closure Phase IV-A Ft. Devens, Mass	
Contract # DAKF31-89-C-0745		

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

- | | | | | |
|---|---------------------------------------|--------------------------------|----------------------------------|---|
| <input type="checkbox"/> Shop drawings | <input type="checkbox"/> Prints | <input type="checkbox"/> Plans | <input type="checkbox"/> Samples | <input type="checkbox"/> Specifications |
| <input type="checkbox"/> Copy of letter | <input type="checkbox"/> Change order | <input type="checkbox"/> _____ | | |

COPIES	DATE	NO.	DESCRIPTION
#	11/3/89		Proposed Wes Construction Corp. Quality Control Program
#			Construction Quality Control Daily Report

THESE ARE TRANSMITTED as checked below:

- | | | |
|--|---|---|
| <input checked="" type="checkbox"/> For approval | <input type="checkbox"/> Approved as submitted | <input type="checkbox"/> Resubmit _____ copies for approval |
| <input type="checkbox"/> For your use | <input type="checkbox"/> Approved as noted | <input type="checkbox"/> Submit _____ copies for distribution |
| <input type="checkbox"/> As requested | <input type="checkbox"/> Returned for corrections | <input type="checkbox"/> Return _____ corrected prints |
| <input type="checkbox"/> For review and comment | <input type="checkbox"/> _____ | |
| <input type="checkbox"/> FOR BIDS DUE _____ 19 _____ <input type="checkbox"/> PRINTS RETURNED AFTER LOAN TO US | | |

REMARKS _____

COPY TO

Glen Hagesstrom

SIGNED:



A/c

See Instructions on Reverse		MATERIAL APPROVAL SUBMITTAL			
TO (Contracting Officer) <i>Robert KRUZEWSKI</i>		FROM (Contractor) <i>WES Construction Corp</i>		DATE <i>11/6/89</i>	
CONTRACT NUMBER <i>DAKF 31-89-C-0745</i>		SUBMISSION NUMBER <i>4</i>		SUBMITTAL <input checked="" type="checkbox"/> NEW <input type="checkbox"/> RESUBMITTAL	
PREVIOUS SUBMISSION NUMBER <i>3</i>		PROJECT NUMBER <i>EB 19248-85</i>			
TO BE COMPLETED BY CONTRACTOR				FOR GOVT USE ONLY	
Item No	Specification Section/ Para No/Drawing No	Description of Material (Include Type, Model No, Catalog No, Mfg, etc.)	Approved	Dis- approved	See Reverse
		<i>QC Program + Checklist</i>	<input checked="" type="checkbox"/>		<i>GSJ</i>
	<i>Very good package, should add one more item for grade control which has already be done by stake out.</i>				
TYPED OR PRINTED NAME AND GRADE <i>PHYLLIS M. LOISELLE</i> CONTRACT SPECIALIST		SIGNATURE <i>Phyllis M Loiselle</i>		DATE <i>11/6/89</i>	
FOR GOVT USE ONLY					
TO DFAE					
For Evaluation and Action					
TYPED OR PRINTED NAME AND GRADE <i>PHYLLIS M. LOISELLE</i> CONTRACT SPECIALIST		SIGNATURE <i>Phyllis M Loiselle</i>		DATE <i>11/6/89</i>	
TO CONTRACTING OFFICER					
Recommend <input checked="" type="checkbox"/> Approval <input type="checkbox"/> Disapproval as Indicated Above and Subject to Any Applicable Comments on the Reverse Side					
TYPED OR PRINTED NAME AND GRADE <i>GLEN W. HAGSTROM</i> CHIEF CONSTRUCTION		SIGNATURE <i>Glen W. Hagstrom</i>		DATE <i>11/9/89</i>	
TO (Contractor)					
<input type="checkbox"/> Approved <input type="checkbox"/> Disapproved as Indicated Above and Subject to Any Applicable Comments on the Reverse Side. Request Resubmittal on Disapproved Items Within _____ Days of Date Shown Below.					
TYPED OR PRINTED NAME AND GRADE <i>PHYLLIS M. LOISELLE</i> CONTRACT SPECIALIST		SIGNATURE <i>Phyllis M Loiselle</i>		DATE <i>11/14/89</i>	

WES CONSTRUCTION CORP.

850 Providence Highway (Route 1)
Dedham, MA 02026-6822
TEL. (617) 326-4030
FAX (617) 326-9957

November 3, 1989

Phyllis Loiselle
Contract Administrator
Building 227
Ft. Devens, MA 01433-5350

RE: Landfill Closure
Phase IV-A
Contract #
DAKF31-89-C-0745

Dear Ms. Loiselle:

In accordance with Contract Clause 111 52.246-4112 Quality Control Program Documentation, WES CONSTRUCTION CORP. and their subcontractors will undertake a quality control program to include the following:

I. Construction Phases:

- A. Excavated material to be compacted in two foot maximum lifts and compacted utilizing tracks of dozer.
- B. Six inch sand base for liner to be spread in one lift and compacted with four passes of smooth drum compactor.
- C. Sand base surface to be inspected for stones to ensure a smooth uniform surface free of sharp rocks before liner placement.
- D. Liner placement will be conducted under supervision of liner subcontractor with care taken to minimize handling.
- E. Field seams to be tested by air lancing to demonstrate a leak free quality seam.
- F. Contractor to spread 12" clean sand over liner using a bulldozer under supervision of site superintendent.
- G. Contractor to spread 6" of loam over sand using a bulldozer under supervision of site superintendent.
- H. Loam and seed samples to be delivered to contracting officer before installation.
- I. Seed, lime, and mulch to be installed using hydroseeding method.

II. Inspections:

Inspections to be conducted by WES CONSTRUCTION CORP.'S site superintendent for each operation A-I at the following times:

- A. Start of operation
- B. Daily as operation continues
- C. At end of operation

III. Reports:

Reports to be recorded at the completion of each phase of work and retained at jobsite for inspection.

Page 2
Fort Devens
Ms. Phyllis Loiselle

We trust this program will satisfy your requirements.

Sincerely,

WES CONSTRUCTION CORP.



Stephen F. Vogel
Project Manager

CC: Glen Hagstrom
Tom Healy

(CONTRACTOR)

1. Work Performed Today by Prime Contractor (include Plant and Labor Break-down): _____

2. Work Performed Today by Subcontractors (Include Plant and Labor Break-down):

3. Type and Results of Inspection: (Indicate whether: P-Preparatory, I-Initial, or F-Follow-up and Include Satisfactory Work Completed or Deficiencies with Action to be Taken.) _____

4. List Type and Location of Tests Performed and Results of Those Tests: _____

5. Verbal Instructions Received from Government Personnel on Construction Deficiencies or Re-testing Required: _____

6. Safety Violations Observed and Actions Taken: _____

7. Remarks: _____

8. CERTIFICATION: I certify that the above report is complete and correct and that I, or my authorized representative, have inspected all work performed this day by the prime contractor and each subcontractor and have determined that all materials, equipment, and workmanship are in strict compliance with the plans and specifications, except as may be noted above.

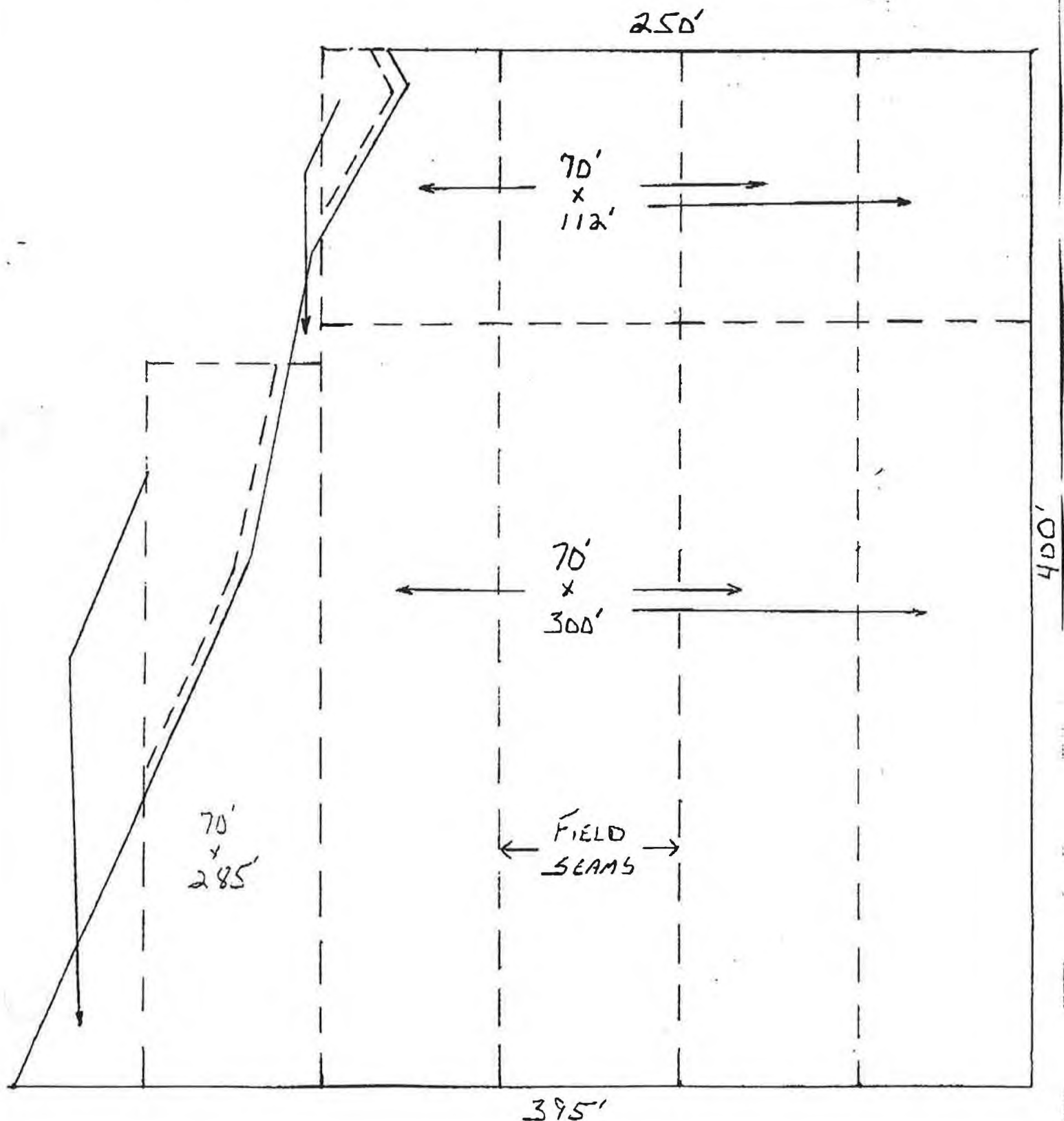
Contractor's Designated Quality
Control Representative

[illegible]

PANELS FURNISHED IN
70' X 300' PANELS AND PHASE IV. A
Field Spliced AS required 1" = 50'

30 MIL PVC

135,310 SQ. FT.



WATER SAVER PVC

MEMBRANE LINER ENGINEERING SPECIFICATION GUIDE

POLYVINYL CHLORIDE (PVC)



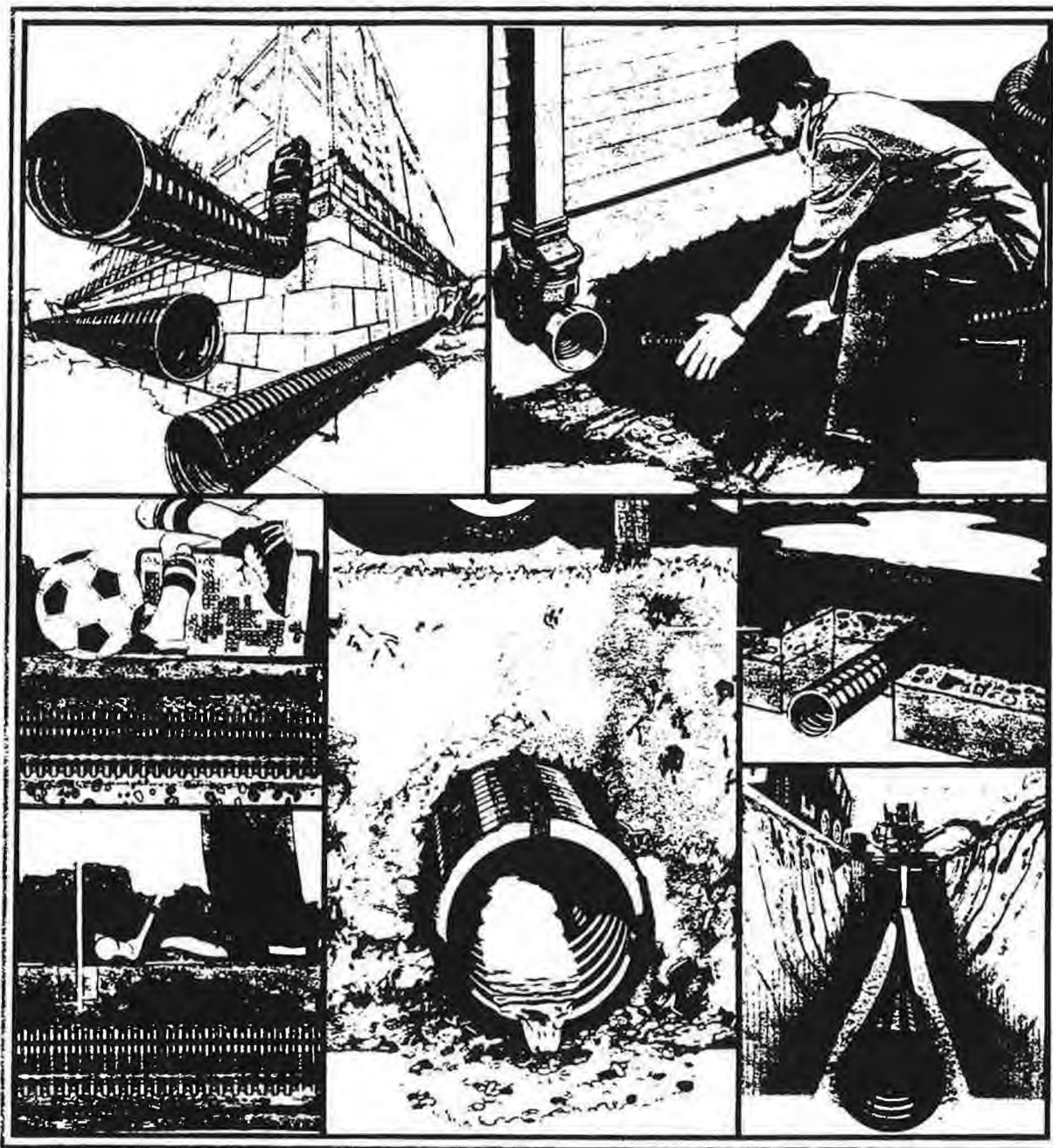
Property	Test Method	Specified Values				
Thickness mils (Nominal $\pm 5\%$)	ASTM D-1593	20	30	40	50	60
Specific Gravity, min.	ASTM D 792	1.23	1.23	1.23	1.23	1.23
Tensile Strength, psi, min. (Breaking Factor, lbs./in. width, min.)	ASTM D 882	2300 46	2300 69	2300 92	2300 115	2300 138
Elongation, @ Break, % min.	ASTM D 882	325	350	400	450	450
Modulus @ 100% Elongation, psi, min. (lbs./in. width min.)	ASTM D 882	1000 (20.0)	1000 (30.0)	1000 (40.0)	1000 (50.0)	1000 (60.0)
Tear Resistance, lbs./in., min. (lbs., min.)	ASTM D 1004	300 (6.0)	300 (9.0)	300 (12.0)	300 (15.0)	250 (15.0)
Low Temperature, °F	ASTM D 1790	-15	-20	-25	-30	-30
Dimensional Stability, % change, max.	ASTM D 1204 (212°F, 15 min.)	3.5	3.5	3.5	3.5	3.5
Water Extraction % loss, max.	ASTM D 3083	0.35	0.35	0.35	0.35	0.35
Volatility % loss, max.	ASTM D 1203	0.90	0.70	0.50	0.50	0.50
Resistance to Soil Burial % change, max.	ASTM D 3083					
Tensile Strength		-5	-5	-5	-5	-5
Elongation, @ Break		-20	-20	-20	-20	-20
Modulus @ 100% Elongation		+20	+20	+20	+20	+20
Hydrostatic Resistance, psi, min.	ASTM D 751	60	85	110	150	175
Factory Seam Requirements*						
Bonded Seam Strength (factory seam, breaking factor, ppi width)	ASTM D 3083, Modified	36.8	55.2	73.6	92	110.4

*Factory bonded seam strength is the responsibility of the fabricator.

[illegible]

ADS corrugated polyethylene tubing

02610/ADV
BuyLine 0805



**We'll show you dozens of
reasons why it's
#1 in the land.**

ADS
ADVANCED DRAINAGE SYSTEMS, INC.

Choose ADS tubing

Corrugated polyethylene tubing from Advanced Drainage Systems, Inc. provides years of trouble-free drainage in a wide variety of applications, at a cost of just pennies per foot. Lightweight ADS tubing is available in continuous coiled lengths, or in straight lengths, and is flexible and easy to install, requiring less labor than traditional drainage materials. ADS tubing is manufactured with high density polyethylene resin, a virtually chemically inert material, so it resists corrosion and abrasion, and won't rot, rust or break down during handling.

ADS grain aeration pipe contains specially designed perforations with a durable, knitted polyester "sock" wrap to maximize air flow and prevent restriction of the perforations.

A full line of accessory fittings and couplings help simplify even the most challenging installations.

Residential and Commercial Construction

Ideal for all homesite and commercial drainage, ADS tubing is lighter, easier to handle, and requires less time and equipment to install than PVC, clay, concrete or corrugated metal. ADS snap-on fittings and couplings keep installation time and labor to a minimum.



Exterior foundation drains are necessary for both residential and industrial buildings, below the level of the lowest floor, where high water tables and rainwater result in wet basements. These drains are placed to collect and channel water away from footers and basement walls to a suitable outlet.

Interior foundation drains where ground water is a problem. These drains intercept water that otherwise would gain entry through the basement walls or floor.

Downspout run-off drains using corrugated plastic pipe are used to channel water collected in the roof gutters to areas away from the building. These can be discharged into storm sewers, into the curb at the edge of the street, or into other suitable outlets.

Low-spot drainage in lawns or yards can be accomplished using surface inlets and corrugated polyethylene tubing to collect and carry the water to a storm sewer or other disposal area.

Basement window well drainage prevents rainwater from seeping down the foundation wall and entering the basement. This is accomplished by running a length of non-perforated tubing from the drain in the bottom of the well to the disposal area.



Driveway and sidewalk underdrainage is used to prevent frost damage or pavement deterioration due to unstable bases. Installation of perforated drainage tubing in a bed of gravel allows the water to drain out of the base course and be channeled away from the pavement.

SB2 gravel-less septic system, a recent innovation, is constructed of 8" and 10" tubing encased in a spun/bonded nylon mesh material. Drain Guard protective wrap and eliminates the need for gravel. Alternately, of the most common methods for home wastewater disposal are septic tank leach fields utilizing 4" ADS tubing, which features virtual immunity to the corrosive environment found in septic tank leach fields.

Highways and Roads

Excess water in the subbase of highway pavements is the leading cause of pavement failures; the adverse effects of inadequate drainage are evident in highways which begin to deteriorate after only two to three years. ADS corrugated polyethylene berm and underdrains collect and remove excess subbase water and reduce pavement damage. Continuous lengths require fewer fittings and connections and less labor to install.



Culverts

Culverts are easily drained with ADS culvert pipe; it is lighter and easier to handle and install than clay, concrete or corrugated metal, resulting in reduced labor costs. ADS culvert pipe has excellent load bearing strength, meeting the toughest requirements. It is approved by most state departments of transportation, and many county and local regulatory agencies. ADS culvert pipe is available in 10", 12", 15", 18" and 24" diameters, in 20' standard lengths.

Parking Lots

The durability of ADS tubing makes it especially suitable for parking lot applications. Excellent deflection qualities enable ADS tubing to resist critical loading conditions without damage.

Airport Runways

Airport runways suffer from the same water-related problems as highways and roads. Whereas corrugated steel, concrete or clay pipe have been widely used in the past, corrugated polyethylene tubing has recently been approved by the Federal Aviation Administration for use as collector systems, culverts and runway underdrains.



Golf Courses

Golf courses are kept lush, green and playable with ADS tubing. ADS tubing resists rot and is flexible, so it follows ground contours and adapts to underground obstacles. It's adaptable to a wide range of soil conditions, including sand traps that collect water or are subject to erosion. Proper installation is an important factor, and ADS provides detailed installation recommendations for every type of soil and topographical condition.

Athletic/Recreational

Strong and durable ADS tubing provides year after year of reliable drainage with minimal maintenance, to keep landscapes as hardy as they are beautiful. Slope drainage is easy with ADS. In sandy or other problem soils, ADS Drain Guard keeps drains flowing. In the case of athletic fields and other places where it is desirable to use the areas as soon as possible after a down-pour, the ADS drainage system provides runoff that keeps up with rainfall.

Utility Companies

Public utilities and manufacturing companies have experienced problems with excess water in coal handling and storage operation. In the winter, freezing of wet coal is a problem, while during the warmer months, coal piles often must be sprayed with water to reduce coal dust and eliminate spontaneous combustion.

The ADS drainage system utilizing corrugated polyethylene tubing under the coal pile is an effective means of removing excess water. Filter protective wrap is required to prevent particles of soil or coal from entering the tubing.



Mining

ADS tubing offers low cost of installation plus excellent performance in corrosive and abrasive environments, solving mine-related water problems. These include drainage of coal piles, hollow-fills, earth dams, dam overflows, air ducts, deep shaft mines, sedimentation ponds, and roads.

Railroads

Poor railroad drainage often results in an unstable subbase and unsafe conditions. ADS tubing is used on new projects as well as to correct problems caused by excess water in existing railbeds. ADS performs under severe loading applications, making it ideal for railroad bed drainage.

Grain/Commodity Aeration

ADS aeration pipe can be easily adapted to all types of grain storage facilities (temporary as well as permanent), including metal buildings, round silos and wooden bins, resulting in uniform air flow.

Technical Notes

ADS corrugated polyethylene tubing is structurally designed to be used as culvert pipe and for other heavy duty drainage applications. This corrugated pipe may also be adapted to other drainage needs.

Applicable Specifications and Installation Guidelines

1. ASTM F 405, Standard Specification for Corrugated Polyethylene Tubing and Fittings.
2. ASTM F 667, Standard Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings.
3. AASHTO M 252, Standard Specification for Polyethylene Corrugated Drainage Tubing.
4. AASHTO M 294, Standard Specification for Corrugated Polyethylene Pipe, 12" to 24" diameter.
5. ADS Installation Guidelines for Culvert and Other Heavy-Duty Drainage Applications.

**Look for the ADS
green stripe.**

**It's your sign of quality—
#1 in the land.**

ADS
ADVANCED DRAINAGE SYSTEMS, INC.

Easy-to-use heavy-duty ADS fittings

Split Coupling



3"-311 8"-811
4"-411 10"-1011
5"-511 12"-1211
6"-611 15"-1511

Snap Coupling



3"-312 6"-612
4"-412 8"-812
5"-512 10"-1012

Internal Coupler



4"-415
5"-515
6"-615
8"-815

Internal Reducing Coupler



5"-4"-425
6"-5"-526

Reducing Coupler



4" x 3"-314 8" x 6"-816
5" x 4"-514 10" x 8"-1018
6" x 4"-614 12" x 10"-1210
6" x 5"-516 15" x 12"-1512

Snap Tee



3"-321 5"-525
4"-421 6"-626

Saddle Tee



4"-443 6"-646
5"-545 8"-843

Blind Tee



3"-341 5"-541
4"-441 6"-641

Downspout Adapter



3" - 364 (3 1/4 x 2 1/2)
4" - 464 (3 1/4 x 2 1/2)
4" - 465 (3 x 4 1/4)

45° "Y"



3"-322 5"-522
4"-422 6"-622

Spin-on Couplings



18"-1811
24"-2411

Split End Cap



3"-331 8"-831
4"-431 10"-1031
5"-531 12"-1231
6"-631 15"-1531

Snap Adapter



3"-362 6"-862
4"-462 8"-862
5"-562

Reducing Tee (Multiple)



644-8" to 6"/6" to 5"
6" to 4"/6" to 3"
844-8" to 8"/8" to 6"
8" to 5"/8" to 4"
1044-10" to 10"/10" to 8"
10" to 6"
1244-12" to 12"/12" to 10"
12" to 8"
1544-15" to 15"/15" to 12"
15" to 10"

Perforated Tubing



3"-301-300' Coils
4"-401-250' Coils
5"-501-185' Coils
6"-601-100' Coils
8"-801-20' Lengths
10"-1001-20' Lengths
12"-1201-20' Lengths
15"-1501-20' Lengths
18"-1801-20' Lengths
(301 and 401 also available in bundles of ten-10' lengths.)

Non-Perforated Tubing



3"-351-300' Coils
4"-451-250' Coils
5"-551-165' Coils
6"-651-100' Coils
8"-851-20' Lengths
10"-1051-20' Lengths
12"-1251-20' Lengths
15"-1551-20' Lengths
18"-1851-20' Lengths
(351 and 451 also available in bundles of ten-10' lengths.)

Protective Wrap



Drain Guard
3"-372
4"-472
5"-572
6"-672
8"-872
10"-1072
12"-1272

Sock
373-300' Coils
473-250' Coils
573-165' Coils
673-100' Coils
873-20' Lengths
1073-20' Lengths
1273-20' Lengths
1573-20' Lengths

Heavy Duty Tubing



Perf.
8"-801
10"-1001
12"-1201
15"-1501
18"-1801
24"-2401

Non-Perf.
851-20' Lengths
1051-20' Lengths
1251-20' Lengths
1551-20' Lengths
1851-20' Lengths
2451-20' Lengths

45° ELL



4"-445

90° ELL



3"-390
4"-490

Advanced Drainage Systems, Inc., is America's leading manufacturer of quality corrugated polyethylene pipe. Manufactured of selected polyethylene resins, ADS pipe meets the strictest product quality standards and industry specifications.

In addition, ADS manufactures a complete line of fittings and couplings, simplifying installations for highway and construction drainage applications.

From coast to coast, ADS tubing is available through the industry's most extensive distribution network. For the name of your local distributor, contact the nearest ADS sales office.

Nationwide Sales and Manufacturing Network

CALIFORNIA

Madera
Madera

209-674-0903
209-674-0054

COLORADO

Fort Collins

303-493-7234

FLORIDA

Lakeland

813-665-8668

GEORGIA

Montezuma

912-472-7556

ILLINOIS

Monticello
Hanover

217-762-9448
615-843-5477

IOWA

Iowa City
Creston
Eagle Grove
Iowa City

319-338-3689
515-782-8565
515-488-5101
515-338-9448

KENTUCKY

Livemore
Versailles

502-733-4324
606-873-8046

MASSACHUSETTS

Ludlow

413-589-0515

MICHIGAN

Owosso
Bad Axe
Owosso

517-725-7883
517-269-9508
517-723-5208

NORTH CAROLINA

Charlotte
Rowland

704-527-0137
919-422-3303

OHIO

London
London
Napoleon
Wooster

614-852-4067
614-852-9554
419-599-9565
216-264-4949

PENNSYLVANIA

Muncy

717-546-7686

TENNESSEE

Brentwood

615-373-9964

TEXAS

Ennis

214-875-6591

VIRGINIA

Buena Vista

703-261-6131

WASHINGTON

Washougal

206-835-8522

*Regional Sales Office

Insist on the ADS green stripe.

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Corporate Office
3300 Riverside Drive
Columbus, Ohio 43221
(614) 457-3051



ADVANCED DRAINAGE SYSTEMS, INC.



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
HEADQUARTERS FORT DEVENS
FORT DEVENS, MASSACHUSETTS
01433-5340



AFZD-DOC (715)

25 October 1989

MEMORANDUM FOR: Glen Hagstrom, DEH EP&S, FORT DEVENS, MA

SUBJECT: Designation of Contracting Officer's Representative

1. Pursuant to the provisions of AFARS Subpart 42.90 you are hereby designated Contracting Officer's Representative (COR) in administration of the following contract:

Contract Number: DAKF31-89-C-0745

Title: Landfill Closure, Phase IV-A

Contractor: Wes Construction Corp.

Contract Period: 25 October 1989 thru 7 August 1990 (180 days- Exclusionary period from 15 Dec 89 - 31 Mar 90)

2. The limitations on your authority are identified in specific terms in the clause entitled, "Appointment of Contracting Officer's Representative," found at Part I, Section E of the contract. You should read and become thoroughly familiar with your responsibilities. Any questions you have regarding this appointment should be brought to the immediate attention of the Contracting Officer.

3. This designation as a COR shall remain in effect through the life of the contract unless sooner revoked by the Contracting Officer. Any such termination shall be in writing. If your designation is revoked before completion of this contract, turn over your records to your successor COR or obtain disposition instructions from the Contracting Officer. If you are reassigned or separated from the service, you shall request termination and relief from your duties from the Contracting Officer sufficiently in advance of reassignment to permit timely selection and designation of a successor.

4. You are required to maintain adequate records to sufficiently describe the performance of your duties as COR during the life of this contract and to distribute such records as appropriate. As a minimum the COR file shall contain the following:

- a. Copy of COR designation letter.
- b. Copy of the contract and any modifications thereto.
- c. Copy of any correspondence between COR and contractor.
- d. Names of technical and administrative personnel assisting the COR.
- e. Copy of records of all inspections.
- f. Copy of statement indicating that COR has read and understands AR 600-50 (updated semi-annually).

5. All personnel engaged in contracting and related activities shall conduct business dealings with industry in a manner above

AFZD-DOC (715h)

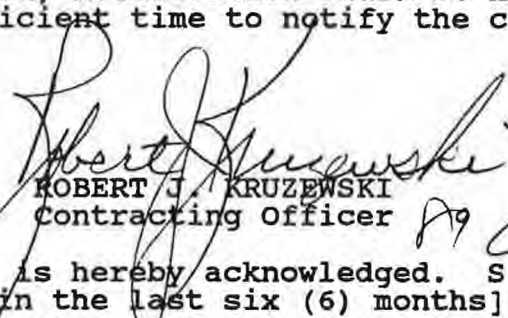
SUBJECT: Designation of Contracting Officer's Representative

reproach in every respect and shall protect the Government's interest as well as maintain its reputation for fair and equal dealings with all contractors. AR 600-50 sets forth applicable standards of conduct for all personnel directly or indirectly involved in contracting. All CORs shall review AR 600-50 semi-annually and provide certification to the Contracting Officer.

6. Any COR who may have direct or indirect financial interest which would place him in a position where there is a conflict between his private interests and the public interests of the United States shall advise his supervisor and the Contracting Officer of the conflict so that appropriate action may be taken. A COR shall avoid the appearance of such conflict to maintain public confidence in the Government's conduct of business with the private sector.

7. You are required to acknowledge receipt of this appointment on the copy provided and return it to the Contracting Officer for inclusion in the official file. Retain the original in your file. Your signature also serves as certification that you have read and understand AR 600-50.

8. Rick Green is hereby appointed as alternate COR with full authority to serve in your absence. When the above individual is required to act in your stead, notification shall be made to the Contracting Officer in sufficient time to notify the contractor prior to your absence.



ROBERT J. KRUEZEWski
Contracting Officer

Receipt of this appointment is hereby acknowledged. Signatures certify you have read [within the last six (6) months] and understand AR 600-50:

COR:

Glen Hagstrom

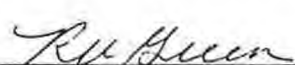
Name (print or type)

 508-796-3685
Signature/Phone Number

ALT:

Rick Green


Name (print or type)


Signature/Phone Number

Contractor:

Wes Construction Corp

Name (print or type)

 617-326-4030
Signature/Phone Number

Contract Number: DAKF31-89-C-0745



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
HEADQUARTERS FORT DEVENS
FORT DEVENS, MASSACHUSETTS
01433-5340



Directorate of Contracting

NOTICE TO PROCEED

CONTRACT NUMBER: DAKF31-89-C-0745

DATE: 25 October 1989

Wes Construction Corp.
850 Providence Highway
Dedham, MA 02026

Gentlemen:

You are hereby notified to proceed with work under contract number DAKF31-89-C-0745 for the Landfill Closure, Phase IV-A, Fort Devens, MA, no later than 24 November 1989.

In accordance with the terms of the contract, the completion date has been determined to be 7 August 1990, with an exclusionary period from 15 December 1989 through 31 March 1990. Failure to meet the completion date may be cause for assessment of liquidated damages in the amount of \$56.00 per day.

The Contracting Officer's Representative on this project is: Glen Hagstrom, (508)796-3685.

The Contract Administrator is Phyllis Loiselle, (508)796-2025.

Your attention is again invited to your copy of the Contracting Officer's Representative's letter of appointment and the paragraphs in the contract delineating the scope of his authority to act on behalf of the Contracting Officer.

Sincerely,

THE UNITED STATES OF AMERICA

BY

Robert J. Kruzewski
Robert J. Kruzewski
Contracting Officer

RECEIPT IS HEREBY ACKNOWLEDGED

Stephen H. Hugel
Signature

Title

10/25/89
Date

SPECIFICATIONS
FOR
PHASE IV-A LANDFILL CLOSURE
PROJECT REQUEST NUMBER KB-19248-8J
FORT DEVENS, MASSACHUSETTS

<u>SECTION NUMBER</u>	<u>DESCRIPTION</u>	<u>PAGE NO.</u>
Section 2210	Grading	2 - 6
Section 2485	Lawn and Grass	7 - 13
Section 2598	Landfill Liner	14 - 19

DIRECTORATE OF ENGINEERING AND HOUSING
FORT DEVENS, MASSACHUSETTS 01433-5100

SECTION 02210

GRADING

PART I - GENERAL

1. **APPLICABLE PUBLICATIONS:** The following publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 **Military Standards (Mil. Std):**

2. **DEFICIENCIES:**

MIL-STD-619B	Unified Soil Classification System for Roads, Airfields, Embankments and Foundations.
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2. **DEFINITIONS:**

2.1 **Satisfactory Materials:** Materials classified in MILSTD619 as GW, GP, and SW, and free from roots and other organic matter, trash debris, and frozen materials and stones larger than 6 inches in any dimension are satisfactory, except that maximum size stone in the sand and gravel layer directly beneath the clean sand buffer layer shall be 1/2 inch.

2.2 **Unsatisfactory Materials:** Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Materials classified in MIL-STD-619 as Pt, OH, and OL are unsatisfactory. Unsatisfactory materials also include man-made fills, refuse, or backfills for previous construction.

2.3 **Cohesionless and Cohesive Materials:** Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Cohesionless materials include materials classified in MIL-STD-619 as GW, GP, SW, and SP. Materials classified as GM and SM will be identified as cohesionless only when the fines have a plasticity index of zero.

2.4 **Degree of Compaction:** Degree of compaction is a percentage of the maximum density obtained by the test procedure presented in MIL-STD-621, Method 100, compaction effort designation CE 55, abbreviated below as a percent of CE 55 density.

2.5 **Topsoil:** All topsoil shall be imported from sources approved by the Contracting Officer. Imported materials suitable for topsoil are defined as fertile, friable, loam uniform in

materials and texture, free from subsoil, clay lumps, sod, woodchips, stumps, roots, materials toxic to grass, stones larger than one and one-half inches in any dimension, glass fragments, bottles, cans, metal, construction debris, and other foreign materials. Topsoil shall be a mixture of clean sand, silt, and clay containing between 7 and 25% organic matter (determined by loss on ignition) and exhibiting sandy and clayey properties in equal proportions.

PART 2 - PRODUCTS

3. **BORROW MATERIAL:** Borrow material shall be selected to meet requirements and conditions of the particular fill for which it is to be used. Necessary clearing, grubbing, disposal of debris, and satisfactory drainage of borrow pits shall be performed by the **CONTRACTOR** as incidental operations to the borrow excavation.

3.1 **Selection:** Borrow materials is located on **GOVERNMENT** property. The **GOVERNMENT** will provide to the **CONTRACTOR** access to the borrow area located off Walker Road (Shirley, MA). Borrow materials shall be subject to approval. Borrow material from approved sources on **GOVERNMENT**-controlled land may be obtained without payment.

3.2 **Stones:** Exposed and loose stones or rocks in the layer of borrow being compacted shall be removed by the **CONTRACTOR** before the placement of the next layer. Layer directly above and below the liner shall be free of all stones and gravel (clean sand).

PART 3 - EXECUTION

4. **WIND-BLOWN LITTER:**

4.1 **Maintenance:** The **CONTRACTOR** shall provide for routine maintenance and general cleanliness of sanitary landfill area and adjacent property from debris created by his operation (beyond limit of work line).

4.2 **Protection:** The **CONTRACTOR** shall prevent the scattering of refuse, wind-blown paper, and other light materials by using suitable portable fencing. The **CONTRACTOR** shall supply, have available on the site, and install as directed a sufficient amount, not less than 300 feet, of 4 foot high temporary fencing, to be used for the control of wind-blown paper. The fence may be a stock fence with wire fabric or a combination wire and wood fabric or other material approved by the Contracting Officer. The fence shall be relocated from time to time by the **CONTRACTOR** as the locations of filling operations change.

4.3 **Control:** To provide a standard by which to judge acceptable control of wind blown litter, the following sampling method will be utilized.

4.3.1 Ten locations shall be sampled for each area. The locations shall be 50 feet, plus or minus 2-1/2 feet apart, distributed to provide a result indicative of condition of the area.

4.3.2 At each location one square yard shall be evaluated for the presence of wind-blown litter. Each piece of litter larger than one square inch shall be measured for horizontal area exposed. Measurements shall be rounded to the nearest whole inch and the area computed.

4.3.3 The limits of acceptable performance:

4.3.3.1 Adjacent property shall have less than 1/10 square foot of litter per square yard, based on an average of all ten samples, with no more than 1/2 square foot of litter at any one location. Locations shall be no more than 100 feet, plus or minus 5 feet, from the limit of work line.

4.3.3.2 Area previously used as landfill but currently not in use shall have less than 1 square foot of litter per square yard, based on an average of all ten samples, with no more than 2 square feet of litter any one location.

4.3.3.3 Area which has been capped under this Contract shall have less than 1/10 square foot of litter per square yard, based on an average of all ten samples, with no more than 1/2 square foot of litter at any one location.

4.3.3.4 The area in current use as active landfill disposal area (cleared) shall have less than 1/2 square foot of litter per square yard, based on an average of all ten samples, with no more than 1 square foot of litter at any one location. In this area the inspector shall be careful to verify that the litter is wind-blown and not refuse that has not been adequately covered. No samples shall be taken in areas being utilized for refuse disposal at the time of inspection, but only in covered areas or cleared areas not being used on day of inspection.

4.4 REPORTS:

4.4.1 The locations from which samples were taken shall be shown on a sketch of the site, and the quantity of litter at each location and the average for each area noted thereon.

4.4.2 The samples shall be taken by the **CONTRACTOR**, and a written report submitted to the Contracting Officer on a weekly basis.

5. **EQUIPMENT:** The **CONTRACTOR** shall use equipment of operating weight sufficient to ensure proper compacting pressure. The compacting pressure based on the operating weight and ground contact areas shall be a minimum of 10 pounds per square inch.

6. **EXCAVATION:** Excavation of every description, regardless of material encountered, within the grading limits of the project shall be performed to the lines and grades indicated. Satisfactory and unsatisfactory excavation material shall be transported to and placed in fill areas within the limits of the work as indicated on the drawings. Excavation carried below depths indicated, without specific directions, shall, except as other wise specified, be refilled to the proper grade with satisfactory material as directed. All additional work of this nature shall be at the **CONTRACTOR'S** expense. Excavations shall be kept free from water while construction therein is in progress. Material required for fills in excess of that produced by excavation within the grading limits shall be obtained from borrow areas.

7. **DITCHES, GUTTERS, AND CHANNEL CHANGES:** Ditches, gutters, and channel changes shall be cut accurately to the cross sections and grades indicated. All roots, stumps, rock, and foreign matter in the sides and bottom of ditches, gutters, and channel changes shall be trimmed and dressed or removed to conform to the slope, grade, and shape of the section indicated. Care shall be taken not to excavate ditches and gutters below the grades indicated. Excessive ditch and gutter excavation shall be backfilled to grade either with satisfactory, thoroughly compacted materials or with suitable stone or cobble to form an adequate gutter. All ditches and gutters excavated under this section shall be maintained until final acceptance of the work. Satisfactory material excavated from ditches and channel changes shall be placed in fill areas. Unsatisfactory and excess excavated material shall be disposed of in accordance with directions in paragraph 7. **EXCAVATION.** No excavated material shall be deposited closer to the edges of the ditches than indicated and in no case less than 3 feet.

8. **BACKFILL ADJACENT TO STRUCTURES:** Backfill adjacent to structures shall be placed and compacted uniformly in such a manner as to prevent wedging action or eccentric loading upon or against the structures. Slopes bounding or within areas to be backfilled shall be stepped or serrated to areas to prevent sliding of the fill. During backfilling operations and in the formation of embankments, equipment that will overload the structure in passing over and compacting these fills shall not be used. Backfill for storm drains and subdrains, including the bedding and backfill for structures other than culverts and drains, shall conform to the additional requirements in other applicable sections.

9. COMPACTION OF UNSATISFACTORY MATERIAL:

9.1 Spreading: The **CONTRACTOR** shall spread refuse evenly in shallow layers, not exceeding two feet thickness before compaction. The upper layer of refuse shall be mixed with sand and gravel in roughly equal volumes prior to compacting.

9.2 Compacting: The **CONTRACTOR** shall compact each layer thoroughly with at least four passes of the compaction equipment before spreading and compacting following layer.

9.3 Slope Angle: Compacted refuse surface shall have slope angle not exceeding 30 degrees from horizontal.

10. COMPACTION OF SATISFACTORY MATERIAL:

10.1 Spreading: The **CONTRACTOR** shall spread suitable material evenly in lifts not exceeding 6 inches compacted thickness. A six inch buffer layer of clean sand shall be spread over the upper layer of refuse (mixed with sand and gravel) prior to liner placement.

10.2 Compacting: The **CONTRACTOR** shall compact each lift with at least four passes of the compaction equipment (roller) before spreading and compacting following layer. The layer above the liner shall not be compacted.

11. FINISHED EXCAVATION, FILLS, AND EMBANKMENTS: All areas covered by the project, including excavated and filled sections and adjacent transition areas, shall be uniformly smooth graded. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from blade grader operations, except as otherwise specified. Ditches and gutters shall be finished to permit adequate drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turving materials. Surface on which the liner will be placed shall be free of all stones, roots, and other foreign material that could puncture the liner.

12. PROTECTION: Newly graded areas shall be protected from traffic and from erosion, any settlement or washing away that may occur from any cause, prior to acceptance, shall be repaired and grades reestablished to the required elevations and slopes. All work shall be conducted in accordance with the environmental protection requirements of the contract.

SECTION 02485

LAWN AND GRASS

PART 1 - GENERAL

1. GENERAL REQUIREMENTS:

1.1 Limits of Lawn: Following areas shall receive topsoil and shall be seeded: capped area, regraded and contoured areas.

1.2 Topsoil: Topsoil shall be obtained from off-site sources and at the **CONTRACTOR'S** expense. Topsoil sources shall be submitted to the Contracting Officer for approval prior to delivery to the site. All topsoil shall be imported from sources approved by the Contracting Officer. Imported materials suitable for topsoil are defined as fertile, friable, loam uniform in materials and texture, free from subsoil, clay lumps, sod, woodchips, stumps, roots, materials toxic to grass, stones larger than 1-1/2 inches in any dimension, glass fragments, bottles, cans, metal, construction debris, and other foreign materials. Topsoil shall be a mixture of clean sand, silt, and clay containing between 7 and 25 percent organic matter (determined by loss on ignition) and exhibiting sandy and clayey properties in equal proportions.

1.3 Topsoil Analysis: Topsoil shall be analyzed for conformance to specification by independent laboratory, which shall be approved in advance by the Contracting Officer. Report of analysis shall be delivered directly to the Contracting Officer. If report indicates need for soil conditioners and nutrients, they shall be added to topsoil as directed by the Contracting Officer and at the **CONTRACTOR'S** expense.

1.4 Erosion Protection: Lawn and grass areas will be protected against erosion until acceptance of completed turf. Eroded areas shall be replaced with acceptable turf, using sod if seeded and grass area cannot be established.

1.5 Sod: Sod may be employed at **CONTRACTOR'S** option in lieu of conventional lawn and grass construction specified over the landfill cap.

1.6 Planting Periods: Planting shall be done only within following periods:

<u>Item</u>	<u>Spring</u>	<u>Fall</u>
Seed	April 15 to May 15	August 20 to October 1
Sod	April 15 to July 1	August 20 to October 15

1.6.1 If seeding cannot be done within dates specified above and before the contract completion date, the **CONTRACTOR** shall return the following spring or fall to complete the seeding and establishment of grass. The **CONTRACTOR** shall prevent erosion until the seeding is done and turf is established.

2. SUBMITTALS:

2.1 Samples: Following sample shall be submitted in accordance with the SPECIAL CONTRACT REQUIREMENTS:

<u>Material</u>	<u>Quantity Pound</u>
Topsoil	11b

PART 2 - PRODUCTS

3. GRASS SEED:

3.1 Seed Characteristics: Grass seed shall be of previous year's crop with not more than 0.5 percent weed seed, and not more than 1.75 percent non-crop seed, by weight. Seed shall be delivered to site in sealed containers, labeled with name of seed grower and seed formula, in form stated below. Seed shall be dry and free of mold. Seed shall meet following requirements:

<u>Name of Seed</u>	<u>Percent by Weight in Mixture</u>	<u>Minimum Percent Purity</u>	<u>Minimum Percent Germination</u>
Festuca elatior "Kentucky 31" Kentucky "31" Tall Fescue	65	97	90
Trifolium Repens White Clover	15	85	80
Lolium multiflorum Annual Ryegrass	20	95	90

3.2 Testing: Seed shall be tested by independent, reputable agricultural testing laboratory, which shall be approved in advance by the Contracting Officer. After delivery of seed to site but before planting, seed samples shall be taken by COR, for analysis and determination of quality. Seed which does not conform to requirements of paragraph 3.1 Seed Characteristics, shall be replaced with new seed and analyses repeated, until seed is supplied in conformance with specification.

4. LIME: Lime shall be fine-ground limestone, containing equal to or more than 85 percent total carbonates, by weight, 100 percent passing 20 mesh (1.27 mm) sieve, and equal to or more than 75 percent passing a 100 mesh (0.25 mm) sieve.

5. FERTILIZER: Fertilizer shall be complete commercial product, uniform, dry, and free-flowing. Fertilizer shall conform to the following:

<u>Constituent</u>	<u>Percent Present (min.)</u>
Nitrogen	10
Available phosphoric acid (P_2O_5)	10
Water-soluble potash (K_2O)	10

6. MULCH: Mulch for hydroseeding shall be wood cellulose pulp of type specified by manufacturer for hydroseeding.

7. ACIDITY: Topsoil pH range shall be 5.0 to 7.0.

PART 3 - EXECUTION

8. GRADING:

8.1 Rough Grading: Areas to receive lawn, grass, or sod will be rough graded under Section 02210, paragraph 12: FINISHED EXCAVATION, FILLS, AND EMBANKMENTS.

8.1.1 Rough grade will be left at 6 inches below finished grade.

8.2 Fine Grading: Fine grading shall be performed to cause minimum possible disturbance of subgrade. Subgrade shall be fine graded to tolerance equal to plus or minus 1/2 inch deviation of average from the plane indicated in each 100 foot square area, with no ridges, ruts, mounds, or depressions exceeding plus or minus 1 inch, and no abrupt deviation from plane. Surface shall be left free from construction debris and other foreign matter, and stones larger than 3 inches in any dimension shall not be visible in or on completed subgrade. There shall be no depressions where water can stand. Surface shall be compacted on 95% (ninety-five).

8.3 Excess Material: Excess subsoil and refuse or debris obtained during the work shall be disposed of on site, in areas designated by the Contracting Officer or designated representative.

8.4 Scarification: If delay in topsoil placement is more than two weeks beyond completion of rough grading of area to receive topsoil), subgrade shall be scarified to 2 inch depth immediately before fine grading and placing topsoil. Subgrade areas which have not been rough graded, and areas which have become hard since being rough graded, shall also be scarified, as specified above, not more than four days before placing topsoil.

9. PLACING TOPSOIL:

9.1 Limitations:

9.1.1 Topsoil shall not be placed when subgrade or topsoil are frozen, excessively wet, or excessively dry.

9.2 Placing:

9.2.1 Topsoil shall be spread in uniform layer, to thickness which will compact to depth required to bring final lawn and grass surfaces to required elevation.

9.2.2 Surface shall be rolled as required to provide firm base for subsequent operations. Stones, roots, and other debris visible at surface, which are larger than 1-1/2 inches in any dimension, shall be removed.

10. PLACING LIMESTONE AND FERTILIZER:

10.1 Limestone:

10.1.1 Ground limestone shall be spread over surface at rate which will result in pH of 6.5 for top 3 inches of topsoil.

10.2 Fertilizer: Fertilizer shall be spread over surface at rate of 0.02 pound per square feet.

10.3 Fertilizer and Limestone:

10.3.1 Fertilizer and limestone shall be spread in uniform application, using approved mechanical spreader.

10.3.2 Fertilizer and lime shall be mixed thoroughly into top 3 inches of topsoil by disking, harrowing, or other approved means. Surface shall then be leveled and rolled as required to provide firm base for subsequent operations.

11. PLACING SEED:

11.1 Conditioning Surface: Final surface of topsoil immediately before seeding shall be within plus or minus 1/2 inch of required elevation, with no ruts, mounds, ridges, or other faults, and no pockets or low spots in which water can collect. Stones, roots,

and other debris larger than 1-1/2 inches in any dimension, which are visible at surface, shall be removed and resulting holes filled with topsoil, leaving plane and uniform surface.

11.2 Applying Seed: Seed shall be spread with approved mechanical spreader, to give uniform application at following rate:

<u>Seed</u>	<u>Rate pounds per acre</u>
Grass seed	300

11.2.1 Seed shall be applied in two equal applications. Direction of spreader travel for second pass shall be perpendicular to that of first pass. Seeding shall not be done when it is raining or snowing or when wind velocity exceeds 5 miles per hour.

11.2.2 Following seeding, area shall be lightly raked to mingle seed with top 1/8 to 1/4 inch of soil. Area shall then be smoothed, stones and other debris larger than 1-1/2 inches in any dimension and which are visible on surface shall be removed, and surface shall be rolled with a roller having weight of 60 to 90 pounds per foot of width and diameter equal to or larger than 2 feet.

11.2.3 At CONTRACTOR'S option, seed may be spread by hydroseeding method, utilizing power equipment commonly used for that purpose. Seed, lime, fertilizer, and mulch shall be mixed and applied to achieve application quantities specified herein for conventional seeding method, with mulch applied at rate of 1,200 pounds per acre. Material shall be applied in two equal applications, with equipment during second pass moving perpendicular to direction employed during first pass. Other provisions specified above for conventional seeding shall apply also to hydroseeding.

12. SODDING:

12.1 Cutting and Delivery: After Contracting Officer or designated representative's inspection and approval of sod source, sod shall be cut into square or rectangular sections, retaining sufficient native soil on roots for protection and continued viability of grass. Sod shall be kept moist during delivery and while in stacks, and shall be protected from exposure to wind, sun, and freezing. Sod shall be cut and moved only when soil moisture conditions are favorable to successful planting. Sections of sod may vary in length but shall be equal in width and not larger than will permit lifting and handling without breaking. Sod shall not be dumped from vehicles. If necessary, ground shall be watered to optimum moisture content before sod is cut. Damaged sod will be rejected.

12.2 Placing:

12.2.1 Edges of sodded areas shall be smooth, and sodded areas shall conform to design cross sections and grade. At edges adjacent to curbs, paved areas, etc., top surface of earth in sod shall be 1/2 inch below adjacent hard surface.

12.2.2 Immediately after sodding operations have been completed, entire surface shall be compacted with culti-packer roller or other approved equipment weighing 100 to 160 pounds per foot of roller.

12.2.3 Completed sod shall immediately be watered sufficiently to uniformly wet soil at least bottom of sod bed.

12.2.4 Surface of completed sodded area shall be smooth. Sod shall be laid edge-to-edge, with tight-butted, staggered joints. Immediately after laying, sod shall be pressed firmly into contact with sod bed by tamping or rolling, to eliminate air pockets. Following compaction, screened topsoil of good quality shall be used to fill cracks, and excess soil shall be worked into grass with rakes or other suitable equipment. Grass shall not be smothered with excess fill soil.

12.2.5 On slopes steeper than 3 to 1, sod shall be held securely in place by fastening lines of sod with wooden stakes. The stakes shall be not less than 12 inches in length, and they shall be spaced 3 feet apart and driven flush with the surface of the sod. Other methods of fastening sod to slopes may be used where staking is not practical upon approval by the Contracting Officer's Representative.

13. MAINTENANCE:

13.1 Operations: Except as otherwise specified below, maintenance shall include all operations required to produce an established lawn, including but not limited to:

- Mowing
- Replanting
- Resodding
- Watering

13.2 Timing:

13.2.1 Maintenance of lawn and grass areas shall begin upon completion of seeding or sodding.

13.2.2 Maintenance shall continue until completion of extended maintenance period as specified in paragraph 14: EXTENDED MAINTENANCE.

13.3 Repairs:

13.3.1 After grass has sprouted, areas which fail to show uniform stand of grass shall be replanted as often as necessary to establish acceptable stand of grass.

13.3.2 Scattered bare spots shall not exceed 72 square inches each.

13.3.3 Scattered bare spots not exceeding total of 15 percent of areas sown with seed will be acceptable without reseeding required.

13.4 Mowing: First mowing shall be done when average height of grass is 2-1/2 inches, with mower set to cut at height of 2 inches. Subsequent mowings shall be made at intervals not greater than two weeks, with height of cut set at 2 inches. With Contracting Officer's prior permission, mowings during periods of slow dormancy may be spaced at greater intervals.

13.5 Lime and Fertilizer: If lawn or grass is established in fall and maintenance is required to continue into spring months, lawn and grass shall receive application of lime and fertilizer in spring. Lime and fertilizer shall be spread in uniform layer over entire lawn surface, at rate of .05 pound per square foot for lime and 0.02 pound per square foot for fertilizer.

14. EXTENDED MAINTENANCE: The **CONTRACTOR** shall maintain grass for one complete growing season, April 15 through October 15, following contract completion date. Extended maintenance operations shall conform to paragraph 13: MAINTENANCE.

SECTION 02598

LANDFILL LINER

PART 1 - GENERAL

1. APPLICABLE PUBLICATIONS: The following publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 American Society for Testing and Materials (ASTM) Publications:

D 413-82	Rubber Property-Adhesion to Flexible Substrate
D 618-61(1981)	Conditioning Plastics and Electrical Insulating Materials for Testing
D 792-86	Specific Gravity and Density of Plastics by Displacement
D 882-83	Tensile Properties of Thin Plastic Sheeting
D 1004-66(1981)	Initial Tear Resistance of Plastic Film and Sheeting
D 1203-86	Volatile Loss From Plastics Using Activated Carbon Methods
D 1204-84	Linear Dimensional Changes of Non-Rigid Thermoplastic Sheeting or Film at Elevated Temperatures
D 1239-55(1982)	Resistance of Plastic Films to Extraction by Chemicals
D 1593-81	Poly (Vinyl Chloride) Resins
D 1790-83	Brittleness Temperature of Plastic Film by Impact
D 3083-76(1980)	Flexible Poly (Vinyl Chloride) Plastic Sheeting for Pond, Canal, and Reservoir Lining

1.2 National Sanitation Foundation (NSF)

2. GENERAL REQUIREMENTS:

2.1 Sand Layer: A 6 inch thick layer of sand will be placed over refuse layer in accordance with Section 02210, paragraph 11: COMPACTION OF SATISFACTORY MATERIAL, before liner is installed.

3. SUBMITTALS: Submittals shall be made in accordance with requirements of SPECIAL CONTRACT REQUIREMENTS, modified as indicated below.

3.1 Material Certification: Material certification shall be submitted stating that the material meets or exceeds requirements of Table, "Physical Properties".

3.2 Warranty: Warranty shall be submitted, stating that leaks and defects of materials and workmanship in liner and joints shall be repaired or defective portions replaced on site with new material and work. Warranty shall extend for 20 year period from date of GOVERNMENT acceptance of completed project.

PART 2 - PRODUCTS

4. LINER:

4.1 Material: The liner shall be suitably formulated from homopolymer vinyl chloride resin of Type GP in accordance with ASTM D 1755, and compounded with suitable plasticizers, fillers, and additives to impart durability. A biocide shall be included in the material to provide resistance to biological degradation of the membrane. The membrane shall be compounded with carbon black and other ultraviolet stabilizers to provide resistance to ultraviolet degradation. The liner shall meet the requirements of Standard No. 54 of NSF.

4.1.1 The carbon black shall be evenly dispersed to produce a uniform color. Water-soluble compounding ingredients shall not be employed.

4.1.2 The membrane shall be uniform throughout and shall be free from dirt, oil, foreign matter, scratches, cracks, creases, bubbles, pits, tears, holes, pinholes, or other defects which may affect the serviceability of the membrane.

4.1.3 The polyvinyl chloride (PVC) membrane lining shall be fabricated from a film width of not less than 58 inches.

4.1.4 The lap seams shall be factory bonded using a liquid cement or commercially accepted dielectric sealing devices. Hot-air seaming methods shall not be used. Lap seams shall be used and have a 3/4-inch minimum lap and a 3/4-inch minimum electrode (die) width. The seams shall be water-tight and the strength of the bonded seam is either the machine (longitudinal) or

transverse direction of the film shall not be less than 80 percent of the breaking strength of the film when tested in a similar direction, or shall tear the parent material when tested in peel adhesion.

4.1.5 The film shall be capable of being bonded to itself by liquid cement for making field splices and repairs. The manufacturer shall furnish a cement suitable for joining or repairing the larger pieces in the field. The cement shall not be affected by sun or water exposure and shall not produce any detrimental effect to the film.

5. FACTORY FABRICATION: Individual calendar widths of PVC shall be factory fabricated into large panels. The manufacturer of the calendered rolls shall show where a minimum of 2,000,000 square feet of its 76 inch wide material has been installed for lining hydraulic structures. Lap joints with a minimum joint width of 1/2 inch shall be used. Factory made splices shall have a strength of 80 percent of the specified sheet strength. After fabrication, the lining shall be accordion folded in both directions and packaged for minimum handling in the field. Shipping boxes shall be substantial enough to prevent damage to contents.

6. PROPERTIES: Physical properties of liner shall conform to Table, "Physical Properties". Liner samples shall be prepared for testing in accordance with ASTM D 618.

PHYSICAL PROPERTIES

<u>Property</u>	<u>Required Film Thickness (nominal) (30 mil)</u>	<u>ASTM Test Method</u>
1. Thickness, minimum mm (inch)	0.72 (0.0285)	D1593, para 8.1.3
2. Specific gravity, minimum	1.20	D 792, Method A
3. Tensile properties:		D 882
a. Breaking factor, each direction, minimum, N/mm (lbf/in)	12.0 (69)	
b. Elongation at break, each direction, minimum, percent	300	

c. Modulus at 100 percent elongation, each direction, minimum, N/mm (1bf/in) 4.7 (27)

<u>Property</u>	<u>Required Film Thickness (nominal) (30 mil)</u>	<u>ASTM Test Method</u>
4. Bonded seam strength, tensile, each direction, minimum, percent of breaking factor	80	D 882
5. Bonded seam strength, peel adhesion	FTB	D 413
6. Tear resistance (Graves), each direction, minimum, N (1bf)	35.6 (8.0)	D 1004
7. Low temperature impact	Not more than 5 specimens out of 10 shall fail at -28.9 degrees C (-20 degrees F)	D 1790
8. Dimensional stability each direction, maximum, percent	5.0	D 1204, 15 minutes at 100 degrees C (212 degrees F)
9. Plastizer stability:		
a. Water extraction, maximum, percent weight loss	0.35	D 1239 Immersion in 50 degrees C (122 degrees F) distilled water for 24 hours
b. Volatile loss, maximum, percent	0.7	D 1203, Method A

c. Resistance to
soil burial, increase
in modulus at 100 percent
elongation each direction,
maximum, percent

10.0

D 3083, 30-
day soil
burial

PART 3 - EXECUTION

7. INSTALLATION:

7.1 Preparation:

7.1.1 Surfaces to be lined shall be smooth and free from sharp rocks, other sharp objects, vegetation, and stubble when liner is placed.

7.1.2 Surfaces to receive liner shall be inspected by installer to determine whether there are defects present which might injure or impair its permanence or water-proofness.

7.1.3 Surfaces to receive liner shall be maintained in acceptable condition until liner installation is complete.

7.1.4 Lining installation shall begin only after certification referred to under paragraph 3: Submittals, has been furnished to and approved by Contracting Officer.

7.2 Field Engineer: Lining manufacturer's field engineer shall be present at all times during installation.

7.3 Seams: Field seams shall be 100 percent visually inspected by **CONTRACTOR** and lining manufacturer's technical representative. Seams shall also be tested with a vacuum suction box to locate any defects that are present.

7.4 Connections to Metal: Metal to be in contact with membrane shall be fully sealed and bonded thereto, using trowel coat of compatible mastic over entire contact surface. A stainless steel clamp shall be placed around rubber boot at gas ventilation pipes.

8. PLACING LINING: The PVC lining shall be placed over the prepared surfaces to be lined in such a manner as to assure minimum handling.

8.1 General: Placing methods shall be designed to minimize handling.

8.2 Fittings: The lining shall be closely fitted and sealed around inlets, outlets, and other projections through the lining.

8.3 Damage: Lining damaged during installation shall be replaced or repaired by using an additional piece of lining.

8.4 Field Joints: Lap joints shall be used to seal factory-fabricated panels of PVC together in the field. Lap joints shall be formed by lapping the edges of panel a minimum of 2 inches. The contact surfaces of the panels shall be wiped clean to remove all dirt, dust or other foreign materials. Sufficient cold-applied vinyl-to-vinyl bonding adhesive shall be applied to the contact surfaces in the joint area, and the two surfaces pressed together immediately. Wrinkles shall be smoothed out. Field splices shall have a strength of 80 percent of the specified sheet strength. A minimum of one test per field splice shall be performed to ensure that the minimum specified strength is attained. Results of field splice tests shall be submitted to the Contracting Officer.

8.5 Joints to Structures: Curing compounds and coatings shall be completely removed from the joint area. Joining of PVC to concrete shall be made with vinyl-to-vinyl concrete adhesive and mechanically fastened. Unless otherwise shown on drawings, the minimum width of concrete to PVC joint shall be 8 inches.

8.6 Repairs to PVC: Any necessary repairs to PVC shall be patched with the lining material itself and cold applied vinyl-to-vinyl splicing adhesive. The splicing adhesive shall be applied to the contact surfaces of both the patch and lining to be repaired, and the two surfaces pressed together immediately. Wrinkles shall be smoothed out.

8.7 Quality of Workmanship: Completed joints shall be tightly bonded. Lining injury from scuffing, penetration by foreign objects, and distress from rough subgrade shall be replaced or covered and sealed with an additional layer of PVC of the proper size. A technical service representative of the lining manufacturer shall be made available to the **CONTRACTOR**. The technical service representative shall instruct **CONTRACTOR'S** personnel in correct methods for handling and installing liner.

9. ANCHORAGE: Immediately following liner installation, cloth bags filled with sand shall be placed over it. Bags shall be placed as required to prevent liner from billowing in wind. Bags shall remain until sand layer is placed over liner. Sand will be provided and placed over membrane as specified in section: GRADING: Liner shall not be left exposed to the atmosphere without protection of the sand layer for more than 48 hours.

10. SPECIAL EDGE: Along grid line 13 from I thru G +50 and along grid line I from 9 to 13. The liner edge shall be seamed to the existing liner in accordance with the manufacturer's recommendations.

PHASE IVB



STAFF INDUSTRIES INC. 240 Chene Street • Detroit, MI 48207 • Telephone (313) 259-1820
Fax (313) 259-0631

July 11, 1995

Mr. Pete Veneto
Stone & Webster Engineering Corp.
245 Summer St.
Boston, MA 02210

Re: Fort Devins, MA
Phase IV-B Landfill Closure
40 mil PVC Cover System
Our File No. J11513

Dear Mr. Veneto:

Enclosed please find the following submittal documentation for the above referenced project:

CGT Authorization Letter for Fabrication
CGT Manufacturer's Certifications
Staff Industries Factory Seam Test Reports
Staff Industries Field Seam Test Reports

Please advise if any additional documentation is required.

Sincerely yours,

STAFF INDUSTRIES, INC.

A handwritten signature in cursive script that reads "Darren Manees".

Darren Manees

Encl.

cc: J11513

July 31/91



Mr. Gary Lechner
Staff Industries, Inc.
240 Chene Street
Detroit, MI 48207

Dear Mr. Lechner:

Please accept this letter confirming that Staff Industries, Inc., is an approved fabricator of Canadian General-Tower Limited Geoliner® PVC and related products.

We sincerely appreciate your support and look forward to our continuing participation in your business.

Sincerely,

CANADIAN GENERAL-TOWER LIMITED

Tom Letourneau
Market Development Manager

TL/dl

CANADIAN
GENERAL-TOWER
LIMITED

Certification Results:
Containment Liners

Polyvinyl Chloride

<u>Property</u>	<u>N.S.F. Spec Specified</u>	<u>Result</u>	<u>Test Method</u>
Thickness (mils)	40.0	39.4	ASTM D1593
Specific Gravity (min)	min 38.0- 1.20	1.27	ASTM D792
Tensile (lbs, min)	92 x 92	114.1 x 109.1	ASTM D882
Elongation (%) At Break	350 x 350	611 x 629	ASTM D882
100% Modulus (lbs, min)	36 X 36	59.2 x 56.0	ASTM D882
Tear Resistance (lbs, min)	10 X 10	14.2 x 13.5	ASTM D1004
Low Temperature (F)	-20°F	PASSED	ASTM D1790
Dim. Stability (% max)	5 x 5	1.2 x 0.6	ASTM D1204 (212°F 15 min.)
Water Extraction (% max)	0.35	0.02	ASTM D3083
Volatile Loss (% max)	0.6	0.4	ASTM D1203

Resistance to Soil Burial

Formula Used
Previously
Tested
Satisfactorily

Hydrostatic Resistance (psi)	82	PASSED 150	ASTM D751 METHOD A
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CGT Identification No.: 56590

CGT Lot No.: P3050A

Roll Numbers: 28 - 36

Yours truly,

CANADIAN GENERAL-TOWER LIMITED

Paul Lussier for
Bill Mercer
Testing Supervisor
/ag

CANADIAN
GENERAL-TOWER
LIMITED

Certification Results:
Containment Liners

Polyvinyl Chloride

<u>Property</u>	<u>N.S.F. Spec Specified</u>	<u>Result</u>	<u>Test Method</u>
Thickness (mils)	40.0	39.1	ASTM D1593
Specific Gravity (min)	min 38.0- 1.20	1.27	ASTM D792
Tensile (lbs, min)	92 x 92	116.5 x 113.3	ASTM D882
Elongation (%) At Break	350 x 350	634 x 643	ASTM D882
100% Modulus (lbs, min)	36 X 36	58.5 x 57.4	ASTM D882
Tear Resistance (lbs, min)	10 X 10	14.0 x 13.1	ASTM D1004
Low Temperature (F)	-20°F	PASSED	ASTM D1790
Dim. Stability (% max)	5 x 5	1.3 x 0.2	ASTM D1204 (212°F 15 min.)
Water Extraction (% max)	0.35	0.02	ASTM D3083
Volatile Loss (% max)	0.6	0.4	ASTM D1203
Resistance to Soil Burial		Formula Used Previously Tested Satisfactorily	
Hydrostatic Resistance (psi)	82	PASSED 150	ASTM D751 METHOD A

CGT Identification No.: 56590

CGT Lot No.: P3050A

Roll Numbers: 37 - 45

Yours truly,

CANADIAN GENERAL-TOWER LIMITED

Paul Luss
Bill Mercer
Testing Supervisor
/ag

CANADIAN
GENERAL-TOWER
LIMITED

Certification Results:
Containment Liners

Polyvinyl Chloride

<u>Property</u>	<u>N.S.F. Spec Specified</u>	<u>Result</u>	<u>Test Method</u>
Thickness (mils)	40.0 min 38.0	39.3	ASTM D1593
Specific Gravity (min)	1.20	1.27	ASTM D792
Tensile (lbs, min)	92 x 92	117.9 x 115.0	ASTM D882
Elongation (%) At Break	350 x 350	631 x 648	ASTM D882
100% Modulus (lbs, min)	36 X 36	59.1 x 57.1	ASTM D882
Tear Resistance (lbs, min)	10 X 10	14.0 x 13.6	ASTM D1004
Low Temperature (F)	-20°F	PASSED	ASTM D1790
Dim. Stability (% max)	5 x 5	1.1 x 0.3	ASTM D1204 (212°F 15 min.)
Water Extraction (% max)	0.35	0.03	ASTM D3083
Volatile Loss (% max)	0.6	0.4	ASTM D1203

Resistance to Soil Burial

Formula Used
Previously
Tested
Satisfactorily

Hydrostatic Resistance (psi)	82	PASSED 150	ASTM D751 METHOD A
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CGT Identification No.: 56590

CGT Lot No.: P3050A

Roll Numbers: 46 - 54

Yours truly,

CANADIAN GENERAL-TOWER LIMITED

Paul Luster for
Bill Mercer
Testing Supervisor
/ag

CANADIAN
GENERAL-TOWER
LIMITED

Certification Results:
Containment Liners

Polyvinyl Chloride

<u>Property</u>	<u>N.S.F. Spec Specified</u>	<u>Result</u>	<u>Test Method</u>
Thickness (mils)	40.0	40.0	ASTM D1593
Specific Gravity (min)	min 38.0- 1.20	1.27	ASTM D792
Tensile (lbs, min)	92 x 92	116.8 x 112.9	ASTM D882
Elongation (%) At Break	350 x 350	640 x 634	ASTM D882
100% Modulus (lbs, min)	36 X 36	58.6 x 57.2	ASTM D882
Tear Resistance (lbs, min)	10 X 10	14.2 x 13.8	ASTM D1004
Low Temperature (F)	-20°F	PASSED	ASTM D1790
Dim. Stability (% max)	5 x 5	1.5 x +0.1	ASTM D1204 (212°F 15 min.)
Water Extraction (% max)	0.35	0.03	ASTM D3083
Volatile Loss (% max)	0.6	0.4	ASTM D1203

Resistance to Soil Burial

Formula Used
Previously
Tested
Satisfactorily

Hydrostatic Resistance (psi)	82	PASSED 150	ASTM D751 METHOD A
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CGT Identification No.: 56590

CGT Lot No.: P3050A

Roll Numbers: 55 - 63

Yours truly,

CANADIAN GENERAL-TOWER LIMITED

Paul Mercer for

Bill Mercer
Testing Supervisor
/ag

CANADIAN
GENERAL-TOWER
LIMITED

Certification Results:
Containment Liners

Polyvinyl Chloride

<u>Property</u>	<u>N.S.F. Spec Specified</u>	<u>Result</u>	<u>Test Method</u>
Thickness (mils)	40.0	40.3	ASTM D1593
Specific Gravity (min)	min 38.0- 1.20	1.27	ASTM D792
Tensile (lbs, min)	92 x 92	115.7 x 110.8	ASTM D882
Elongation (%) At Break	350 x 350	604 x 621	ASTM D882
100% Modulus (lbs, min)	36 X 36	59.4 x 55.9	ASTM D882
Tear Resistance (lbs, min)	10 X 10	14.2 x 13.7	ASTM D1004
Low Temperature (F)	-20°F	PASSED	ASTM D1790
Dim. Stability (% max)	5 x 5	1.2 x 0.1	ASTM D1204 (212°F 15 min.)
Water Extraction (% max)	0.35	0.02	ASTM D3083
Volatile Loss (% max)	0.6	0.4	ASTM D1203
Resistance to Soil Burial			

Formula Used
Previously
Tested
Satisfactorily

Hydrostatic Resistance (psi)	82	PASSED 150	ASTM D751 METHOD A
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CGT Identification No.: 56590

CGT Lot No.: P3050A

Roll Numbers: 64 - 72

Yours truly,

CANADIAN GENERAL-TOWER LIMITED

Paul Lussier for
Bill Mercer
Testing Supervisor
/ag

CANADIAN
GENERAL-TOWER
LIMITED

Certification Results:
Containment Liners

Polyvinyl Chloride

<u>Property</u>	<u>N.S.F. Spec Specified</u>	<u>Result</u>	<u>Test Method</u>
Thickness (mils)	40.0	39.5	ASTM D1593
Specific Gravity (min)	min 38.0 1.20	1.27	ASTM D792
Tensile (lbs, min)	92 x 92	116.2 x 109.9	ASTM D882
Elongation (%) At Break	350 x 350	614 x 623	ASTM D882
100% Modulus (lbs, min)	36 X 36	63.3 x 59.5	ASTM D882
Tear Resistance (lbs, min)	10 X 10	14.9 x 13.1	ASTM D1004
Low Temperature (F)	-20°F	PASSED	ASTM D1790
Dim. Stability (% max)	5 x 5	0.9 x 0.1	ASTM D1204 (212°F 15 min.)
Water Extraction (% max)	0.35	0.01	ASTM D3083
Volatile Loss (% max)	0.6	0.4	ASTM D1203
Resistance to Soil Burial			

Formula Used
Previously
Tested
Satisfactorily

Hydrostatic Resistance (psi)	82	PASSED 150	ASTM D751 METHOD A
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CGT Identification No.: 56590

CGT Lot No.: P3078A

Roll Numbers: 136 - 144

Yours truly,

CANADIAN GENERAL-TOWER LIMITED

Joe Smith
Bill Mercer
Testing Supervisor
/ag

CANADIAN
GENERAL-TOWER
LIMITED

Certification Results:
Containment Liners

Polyvinyl Chloride

<u>Property</u>	<u>N.S.F. Spec Specified</u>	<u>Result</u>	<u>Test Method</u>
Thickness (mils)	40.0	39.9	ASTM D1593
Specific Gravity (min)	min 38.0		
	1.20	1.27	ASTM D792
Tensile (lbs, min)	92 x 92	114.4 x 112.7	ASTM D882
Elongation (%) At Break	350 x 350	608 x 645	ASTM D882
100% Modulus (lbs, min)	36 X 36	62.9 x 60.4	ASTM D882
Tear Resistance (lbs, min)	10 X 10	13.7 x 12.8	ASTM D1004
Low Temperature (F)	-20°F	PASSED	ASTM D1790
Dim. Stability (% max)	5 x 5	0.9 x 0.0	ASTM D1204 (212°F 15 min.)
Water Extraction (% max)	0.35	0.00	ASTM D3083
Volatile Loss (% max)	0.6	0.4	ASTM D1203

Resistance to Soil Burial

Formula Used
Previously
Tested
Satisfactorily

Hydrostatic Resistance (psi)	82	PASSED 150	ASTM D751 METHOD A
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CGT Identification No.: 56590

CGT Lot No.: P3078A

Roll Numbers: 145 - 153

Yours truly,

CANADIAN GENERAL-TOWER LIMITED

Bill Mercer
Bill Mercer
Testing Supervisor
/ag

CANADIAN
GENERAL-TOWER
LIMITED

Certification Results:
Containment Liners

Polyvinyl Chloride

<u>Property</u>	<u>N.S.F. Spec Specified</u>	<u>Result</u>	<u>Test Method</u>
Thickness (mils)	40.0	39.5	ASTM D1593
Specific Gravity (min)	min 38.0 1.20	1.27	ASTM D792
Tensile (lbs, min)	92 x 92	118.9 x 109.2	ASTM D882
Elongation (%) At Break	350 x 350	638 x 622	ASTM D882
100% Modulus (lbs, min)	36 X 36	64.3 x 60.8	ASTM D882
Tear Resistance (lbs, min)	10 X 10	13.6 x 12.7	ASTM D1004
Low Temperature (F)	-20°F	PASSED	ASTM D1790
Dim. Stability (% max)	5 x 5	0.8 x +0.1	ASTM D1204 (212°F 15 min.)
Water Extraction (% max)	0.35	0.00	ASTM D3083
Volatile Loss (% max)	0.6	0.4	ASTM D1203
Resistance to Soil Burial		Formula Used Previously Tested Satisfactorily	
Hydrostatic Resistance (psi)	82	PASSED 150	ASTM D751 METHOD A

CGT Identification No.: 56590

CGT Lot No.: P3078A

Roll Numbers: 154 - 162

Yours truly,

CANADIAN GENERAL-TOWER LIMITED

Joe Smith for
Bill Mercer
Testing Supervisor
/ag

Staff Industries, Inc.
240 Chene St.
Detroit, MI 48207

PEEL ADHESION TEST - PVC

Test type: per ASTM D413 (NSF Modified)

Instron Corporation

Operator name: James Clark

Series IX Automated Materials Testing System 1.09

Test Date: 21 Dec 1992

Sample Identification: P151301A

Sample Type: ASTM

Interface Type: 1011 Series

Machine Parameters of test:

Sample Rate (pts/sec): 10.000

Humidity (%): 50

Crosshead Speed (in/min): 2.0000

Temperature (deg. F): 72

JOB NUMBER..... J11513

RUN NUMBER..... R-1-1

FAB. DATE..... 12/5/92

MATERIAL..... 40 mil Blk CGT

NSF REQUIREMENT..... 10 lbs/in

Dimensions:

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
Width (in)	1.0000	1.0000	1.0000	1.0000	1.0000
Thickness (in)	.04000	.04000	.04000	.04000	.04000
Spec gauge len (in)	2.0000	2.0000	2.0000	2.0000	2.0000
Grip distance (in)	2.0000	2.0000	2.0000	2.0000	2.0000

Out of 5 specimens, 0 excluded.

Sample comments: All five specimens passed.

Specimen Number	Seam No.	Displcmnt at Max.Load (in)	Load/Width at Max.Load (lbs/in)	Stress at Max.Load (psi)	Avg Load/W from 1.5 to 3.5 in. (lbs/in)	Avg Stress from 1.5 to 3.5 in. (psi)
1	2	3.5650	27.50	687.5	24.25	606.3
2	7	2.0460	29.25	731.2	27.41	685.3
3	10	3.4650	31.50	787.5	27.61	690.4
4	13	.8177	20.50	512.5	18.10	452.4
5	19	2.9140	23.75	593.7	22.28	557.0
Mean:		2.5610	26.50	662.5	23.93	598.3
Standard Deviation:		1.1460	4.39	109.8	3.96	98.9
CofOfVar:		44.74	16.57	16.57	16.53	16.53

Staff Industries, Inc.
240 Chene St.
Detroit, MI 48207

BONDED SEAM STRENGTH TEST - PVC

Test type: per ASTM D3083 (NSF Modified)

Operator name: James Clark

Sample Identification: B151301A

Interface Type: 1011 Series

Machine Parameters of test:

Sample Rate (pts/sec): 10.000

Crosshead Speed (in/min): 20.0000

Instron Corporation

Series IX Automated Materials Testing System 1.09

Test Date: 21 Dec 1992

Sample Type: ASTM

Humidity (%): 50

Temperature (deg. F): 72

JOB NUMBER..... J11513

RUN NUMBER..... R-1-1

FAB. DATE..... 12/5/92

MATERIAL..... 40 mil Blk CGT

NSF REQUIREMENT..... 74 lbs

Dimensions:

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
Width (in)	1.0000	1.0000	1.0000	1.0000	1.0000
Thickness (in)	.04000	.04000	.04000	.04000	.04000
Spec gauge len (in)	5.0000	5.0000	5.0000	5.0000	5.0000
Grip distance (in)	5.0000	5.0000	5.0000	5.0000	5.0000

Out of 5 specimens, 0 excluded.

Sample comments: All specimens passed. Failures occurred in the material, at seam edge.

Specimen Number	Seam No.	Displcmnt at Max.Load (in)	Load at Max.Load (lbs)	Stress at Max.Load (psi)	Strain at Max.Load (in/in)	Elongation at Max.Load (%)
1	3	12.17	93.25	2331.	2.434	243.4
2	6	11.94	94.25	2356.	2.388	238.8
3	11	11.75	92.75	2319.	2.349	234.9
4	14	12.36	94.00	2350.	2.471	247.1
5	18	11.91	92.50	2313.	2.381	238.1
Mean:		12.02	93.35	2334.	2.405	240.5
Standard Deviation:		.24	.76	19.	.048	4.8
CofOfVar:		1.99	.82	.82	1.99	1.99

Staff Industries, Inc.
240 Chene St.
Detroit, MI 48207

PEEL ADHESION TEST - PVC

Test type: per ASTM D413 (NSF Modified)

Operator name: James Clark

Sample Identification: P151302A

Interface Type: 1011 Series

Machine Parameters of test:

Sample Rate (pts/sec): 10.000

Crosshead Speed (in/min): 2.0000

Instron Corporation

Series IX Automated Materials Testing System 1.09

Test Date: 21 Dec 1992

Sample Type: ASTM

Humidity (%): 50

Temperature (deg. F): 72

JOB NUMBER..... J11513

RUN NUMBER..... R-2-1

FAB. DATE..... 12/6/92

MATERIAL..... 40 mil Blk CGT

NSF REQUIREMENT..... 10 lbs/in

Dimensions:

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
Width (in)	1.0000	1.0000	1.0000	1.0000	1.0000
Thickness (in)	.04000	.04000	.04000	.04000	.04000
Spec gauge len (in)	2.0000	2.0000	2.0000	2.0000	2.0000
Grip distance (in)	2.0000	2.0000	2.0000	2.0000	2.0000

Out of 5 specimens, 0 excluded.

Sample comments: All five specimens passed.

Specimen Number	Seam No.	Displcmnt at Max.Load (in)	Load/Width at Max.Load (lbs/in)	Stress at Max.Load (psi)	Avg Load/W from 1.5 to 3.5 in. (lbs/in)	Avg Stress from 1.5 to 3.5 in. (psi)
1	1	1.336	20.00	500.0	17.33	433.2
2	6	1.253	25.25	631.2	21.73	543.2
3	9	2.829	29.25	731.2	26.66	666.5
4	15	3.600	28.75	718.7	25.19	629.7
5	18	2.174	25.50	637.5	24.05	601.3
Mean:		2.238	25.75	643.7	22.99	574.8
Standard Deviation:		.999	3.70	92.4	3.64	91.1
CofOfVar:		44.64	14.35	14.35	15.84	15.84

Staff Industries, Inc.
240 Chene St.
Detroit, MI 48207

BONDED SEAM STRENGTH TEST - PVC

Test type: per ASTM D3083 (NSF Modified)

Operator name: James Clark

Sample Identification: 8151302A

Interface Type: 1011 Series

Machine Parameters of test:

Sample Rate (pts/sec): 10.000

Crosshead Speed (in/min): 20.0000

Instron Corporation

Series IX Automated Materials Testing System 1.09

Test Date: 21 Dec 1992

Sample Type: ASTM

Humidity (%): 50

Temperature (deg. F): 72

JOB NUMBER..... J11513

RUN NUMBER..... R-2-1

FAB. DATE..... 12/6/92

MATERIAL..... 40 mil Blk CGT

NSF REQUIREMENT..... 74 lbs

Dimensions:

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
Width (in)	1.0000	1.0000	1.0000	1.0000	1.0000
Thickness (in)	.04000	.04000	.04000	.04000	.04000
Spec gauge len (in)	5.0000	5.0000	5.0000	5.0000	5.0000
Grip distance (in)	5.0000	5.0000	5.0000	5.0000	5.0000

Out of 5 specimens, 0 excluded.

Sample comments: All specimens passed. Failures occurred in the material, at seam edge.

Specimen Number	Seam No.	Displcmnt at Max.Load (in)	Load at Max.Load (lbs)	Stress at Max.Load (psi)	Strain at Max.Load (in/in)	Elongation at Max.Load (%)
1	2	11.11	90.75	2269.	2.221	222.1
2	4	10.25	86.75	2169.	2.050	205.0
3	9	10.50	87.75	2194.	2.099	209.9
4	12	10.88	90.25	2256.	2.175	217.5
5	17	12.11	96.75	2419.	2.423	242.3
Mean:		10.97	90.45	2261.	2.194	219.4
Standard Deviation:		.72	3.90	97.	.144	14.4
CofOfVar:		6.58	4.31	4.31	6.58	6.58

Staff Industries, Inc.
240 Chene St.
Detroit, MI 48207

PEEL ADHESION TEST - PVC

Test type: per ASTM D413 (NSF Modified)

Operator name: James Clark

Sample Identification: P151303A

Interface Type: 1011 Series

Machine Parameters of test:

Sample Rate (pts/sec): 10.000

Crosshead Speed (in/min): 2.0000

Instron Corporation

Series IX Automated Materials Testing System 1.09

Test Date: 21 Dec 1992

Sample Type: ASTM

Humidity (%): 50

Temperature (deg. F): 72

JOB NUMBER..... J11513
RUN NUMBER..... R-3-1
FAB. DATE..... 12/6/92
MATERIAL..... 40 mil Blk CGT
NSF REQUIREMENT..... 10 lbs/in

Dimensions:

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
Width (in)	1.0000	1.0000	1.0000	1.0000	1.0000
Thickness (in)	.04000	.04000	.04000	.04000	.04000
Spec gauge len (in)	2.0000	2.0000	2.0000	2.0000	2.0000
Grip distance (in)	2.0000	2.0000	2.0000	2.0000	2.0000

Out of 5 specimens, 0 excluded.

Sample comments: All five specimens passed.

Specimen Number	Seam No.	Displcmnt at Max.Load (in)	Load/Width at Max.Load (lbs/in)	Stress at Max.Load (psi)	Avg Load/W from 1.5 to 3.5 in. (lbs/in)	Avg Stress from 1.5 to 3.5 in. (psi)
1	3	1.913	26.25	656.2	24.93	623.2
2	8	3.500	27.75	693.7	23.37	584.4
3	11	2.472	22.50	562.5	21.43	535.8
4	14	1.735	26.50	662.5	24.39	609.8
5	16	3.565	21.50	537.5	18.89	472.2
Mean:		2.637	24.90	622.5	22.60	565.1
Standard Deviation:		.862	2.73	68.3	2.47	61.7
CofOfVar:		32.67	10.97	10.97	10.92	10.92

Staff Industries, Inc.
240 Chene St.
Detroit, MI 48207

BONDED SEAM STRENGTH TEST - PVC

Test type: per ASTM D3083 (NSF Modified)

Operator name: James Clark

Sample Identification: B151303A

Interface Type: 1011 Series

Machine Parameters of test:

Sample Rate (pts/sec): 10.000

Crosshead Speed (in/min): 20.0000

Instron Corporation

Series IX Automated Materials Testing System 1.09

Test Date: 21 Dec 1992

Sample Type: ASTM

Humidity (%): 50

Temperature (deg. F): 72

JOB NUMBER..... J11513

RUN NUMBER..... R-3-1

FAB. DATE..... 12/6/92

MATERIAL..... 40 mil Blk CGT

NSF REQUIREMENT..... 74 lbs

Dimensions:

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
Width (in)	1.0000	1.0000	1.0000	1.0000	1.0000
Thickness (in)	.04000	.04000	.04000	.04000	.04000
Spec gauge len (in)	5.0000	5.0000	5.0000	5.0000	5.0000
Grip distance (in)	5.0000	5.0000	5.0000	5.0000	5.0000

Out of 5 specimens, 0 excluded.

Sample comments: All specimens passed. Failures occurred in the material, at seam edge.

Specimen Number	Seam No.	Displcmnt at Max.Load (in)	Load at Max.Load (lbs)	Stress at Max.Load (psi)	Strain at Max.Load (in/in)	Elongation at Max.Load (%)
1	2	10.47	86.75	2169.	2.093	209.3
2	5	12.74	97.00	2425.	2.549	254.9
3	8	11.28	90.50	2263.	2.256	225.6
4	12	10.70	86.50	2163.	2.141	214.1
5	16	10.69	88.00	2200.	2.137	213.7
Mean:		11.18	89.75	2244.	2.235	223.5
Standard Deviation:		.93	4.35	109.	.185	18.5
CofOfVar:		8.29	4.85	4.85	8.29	8.29

Staff Industries, Inc.
240 Chene St.
Detroit, MI 48207

BONDED SEAM STRENGTH TEST

Field Seam Sample

per ASTM D3083 (NSF Modified)

Operator name: James Clark

Sample Identification: F151301B

Interface Type: 1011 Series

Machine Parameters of test:

Sample Rate (pts/sec): 10.000

Crosshead Speed (in/min): 20.0000

Instron Corporation

Series IX Automated Materials Testing System 6.02

Test Date: 22 May 1993

Sample Type: ASTM

Humidity (%): 50

Temperature (deg. F): 72

J/K NUMBER..... J11513/K1665
MATERIAL..... 40 mil blk CGT
SAMPLE DATE(S)..... 5/7/93
SAMPLE NUMBER(S).... Sample #1
NSF REQUIREMENT..... 74 lbs/in

Dimensions:

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
Width (in)	1.0000	1.0000	1.0000	1.0000	1.0000
Thickness (in)	.04000	.04000	.04000	.04000	.04000
Spec gauge len (in)	8.0000	8.0000	8.0000	8.0000	8.0000
Grip distance: (in)	8.0000	8.0000	8.0000	8.0000	8.0000

Out of 5 specimens, 0 excluded.

Sample comments: All specimens passed. Failures occurred in the material, at seam edge.

Specimen Number	Displcmnt at Max.Load (in)	Load at Max.Load (lbs)	Stress at Max.Load (psi)
1	15.15	84.75	2119.
2	14.00	83.25	2081.
3	13.46	81.50	2038.
4	13.15	79.75	1994.
5	13.87	81.00	2025.
Mean:	13.93	82.05	2051.
Standard Deviation:	.76	1.96	49.
CofOfVar:	5.48	2.39	2.39

Staff Industries, Inc.
240 Chene St.
Detroit, MI 48207

BONDED SEAM STRENGTH TEST

Field Seam Sample

per ASTM D3083 (NSF Modified)

Operator name: James Clark

Sample Identification: F1513028

Interface Type: 1011 Series

Machine Parameters of test:

Sample Rate (pts/sec): 10.000

Crosshead Speed (in/min): 20.0000

Instron Corporation

Series IX Automated Materials Testing System 6.02

Test Date: 22 May 1993

Sample Type: ASTM

Humidity (%): 50

Temperature (deg. F): 72

J/K NUMBER..... J11513/K1665
MATERIAL..... 40 mil blk CGT
SAMPLE DATE(S)..... 5/7/93
SAMPLE NUMBER(S).... Sample #2
NSF REQUIREMENT..... 74 lbs/in

Dimensions:

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
Width (in)	1.0000	1.0000	1.0000	1.0000	1.0000
Thickness (in)	.04000	.04000	.04000	.04000	.04000
Spec gauge len (in)	7.5000	7.5000	7.5000	7.5000	7.5000
Grip distance: (in)	7.5000	7.5000	7.5000	7.5000	7.5000

Out of 5 specimens, 0 excluded.

Sample comments: All specimens passed. Failures occurred in the material, at seam edge.

Specimen Number	Displcmnt at Max.Load (in)	Load at Max.Load (lbs)	Stress at Max.Load (psi)
1	13.31	82.50	2063.
2	12.95	81.25	2031.
3	13.84	85.25	2131.
4	13.89	85.25	2131.
5	13.27	84.25	2106.
Mean:	13.45	83.70	2093.
Standard Deviation:	.40	1.77	44.
CofOfVar:	2.98	2.12	2.12

Staff Industries, Inc.
240 Chene St.
Detroit, MI 48207

PEEL ADHESION TEST

Field Seam Sample

per ASTM D413 (NSF Modified)

Operator name: James Clark

Sample Identification: F151301P

Interface Type: 1011 Series

Machine Parameters of test:

Sample Rate (pts/sec): 10.000

Crosshead Speed (in/min): 2.0000

Instron Corporation

Series IX Automated Materials Testing System 6.02

Test Date: 22 May 1993

Sample Type: ASTM

Humidity (%): 50

Temperature (deg. F): 72

J/K Number..... J11513/K1665
MATERIAL..... 40 mil blk CGT
SAMPLE DATE(S)..... 5/7/93
SAMPLE NUMBER(S).... Sample #1
NSF REQUIREMENT..... 10 lbs/in

Dimensions:

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
Width (in)	1.0000	1.0000	1.0000	1.0000	1.0000
Thickness (in)	.04000	.04000	.04000	.04000	.04000
Spec gauge len (in)	2.0000	2.0000	2.0000	2.0000	2.0000
Grip distance (in)	2.0000	2.0000	2.0000	2.0000	2.0000

Out of 5 specimens, 0 excluded.

Sample comments: All five specimens passed.

	Displcmnt at Max.Load (in)	Load/Width at Max.Load (lbs/in)	Stress at Max.Load (psi)
Specimen Number			
1	1.189	23.75	593.7
2	3.368	28.75	718.7
3	2.490	27.00	675.0
4	2.837	30.25	756.2
5	2.911	28.25	706.2
Mean:	2.559	27.60	690.0
Standard Deviation:	.827	2.45	61.2
CofOfVar:	32.31	8.87	8.87

Staff Industries, Inc.
240 Chene St.
Detroit, MI 48207

PEEL ADHESION TEST

Field Seam Sample

per ASTM D413 (NSF Modified)

Operator name: James Clark

Sample Identification: F151302P

Interface Type: 1011 Series

Machine Parameters of test:

Sample Rate (pts/sec): 10.000

Crosshead Speed (in/min): 2.0000

Instron Corporation

Series IX Automated Materials Testing System 6.02

Test Date: 22 May 1993

Sample Type: ASTM

Humidity (%): 50

Temperature (deg. F): 72

J/K Number..... J11513/K1665
MATERIAL..... 40 mil blk CGT
SAMPLE DATE(S)..... 5/7/93
SAMPLE NUMBER(S).... Sample #2
NSF REQUIREMENT..... 10 lbs/in

Dimensions:

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
Width (in)	1.0000	1.0000	1.0000	1.0000	1.0000
Thickness (in)	.04000	.04000	.04000	.04000	.04000
Spec gauge len (in)	2.0000	2.0000	2.0000	2.0000	2.0000
Grip distance: (in)	2.0000	2.0000	2.0000	2.0000	2.0000

Out of 5 specimens, 0 excluded.

Sample comments: All five specimens passed.

Specimen Number	Displcment at Max.Load (in)	Load/Width at Max.Load (lbs/in)	Stress at Max.Load (psi)
1	1.834	21.25	531.2
2	2.194	23.50	587.5
3	2.979	27.25	681.2
4	2.630	26.25	656.2
5	2.225	24.00	600.0
Mean:	2.372	24.45	611.2
Standard Deviation:	.441	2.37	59.2
CofOfVar:	18.58	9.68	9.68

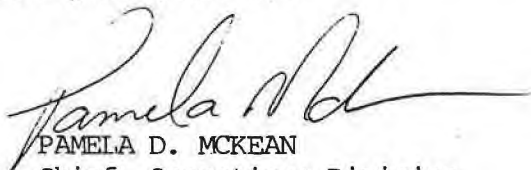
05 March 1993

MEMORANDUM FOR DOC, Contract Admin Division, ATTN: Lee Bradley, Box 34

SUBJECT: Phase IV-B Landfill Closure, Contract #DAKF31-92-C-0062

1. Subject contractor (T.J. Battye Trucking) has delivered and the Government has taken possession of the synthetic membrane cover called for in the contract.
2. The liner is being stored in building T-244, Ft Devens, MA.
3. The delivery and relinquishing of possession of the liner brings contract progress to 49% as shown on attached contract progress report (encl 1).

Encl


PAMELA D. MCKEAN
Chief, Operations Division

R E C O R D O F C O N T R A C T

PRE-AWARD

ADMINISTRATION

SOLICITATION NO:

PROJECT TITLE: *Landfill Capping*

CONTRACT SPECIALIST: *Bradley*

CONTRACT NO: *92-C-0062*

CONTRACT PERFORMANCE SCHEDULE:

CONTRACTOR: *T. J. Battye Trucking*

CONTRACT SPECIALIST: *Bradley*

DATE

ACTION

*1430
28 Dec 92*

*Spoke with Tom McNaughton who
confirmed T. J. Battye had delivered
the Membrane liner to the Government
and that its presently stored in a
Govt Bldg under Govt Control.
Requested Tom have Norm Black
come to DOC to sign Progress Report
upon his return from vacation.*

*J. Bradley
28 Dec 92*

MATERIAL APPROVAL SUBMITTAL

TO (Contracting Officer) Ms. Debra L. Wells Contract Administrator		FROM (Contractor) T.J. Battye trucking		DATE 30 Nov 92
CONTRACT NUMBER DAKF31-92-C-0062		SUBMISSION NUMBER -2-	SUBMITTAL <input checked="" type="checkbox"/> NEW	<input type="checkbox"/> RESUBMITTAL
PREVIOUS SUBMISSION NUMBER -1-		PROJECT NUMBER Phase IV-B Landfill Closure		

[illegible]

TYPED OR PRINTED NAME AND GRADE Thomas J. Battye, Owner		SIGNATURE <i>Thomas J. Battye</i>	DATE 30 Nov 92
TO		FOR GOVT USE ONLY	

TO OFAE - Norman Black

For Evaluation and Action

TYPED OR PRINTED NAME AND GRADE <i>Lee Bradley</i>	SIGNATURE <i>Lee Bradley</i>	DATE <i>30 Nov 92</i>
---	---------------------------------	--------------------------

TO
CONTRACTING OFFICER

TO CONTRACTING OFFICER

Recommend ☒ Approval ☐ Disapproval as Indicated Above and Subject to Any Applicable Comments on the Reverse Side

TYPED OR PRINTED NAME AND GRADE Norman E. Black	SIGNATURE Norman E. Black	DATE 7 Dec 92
--	------------------------------	------------------

TO (Contractor)

TO (Contractor)

Approved ☒ Disapproved as Indicated Above and Subject to Any Applicable Comments on the Reverse Side. Request Resubmittal on Disapproved Items Within _____ Days of Date Shown Below.

TYPED OR PRINTED NAME AND GRADE Lee Bradley	SIGNATURE 	DATE 7 Dec 92
--	--	------------------

Up here, the best you can build.



**Down here, ADS tubing,
the foundation for trouble-
free drainage.**

ADS
ADVANCED DRAINAGE SYSTEMS, INC.

ADS corrugated polyethylene

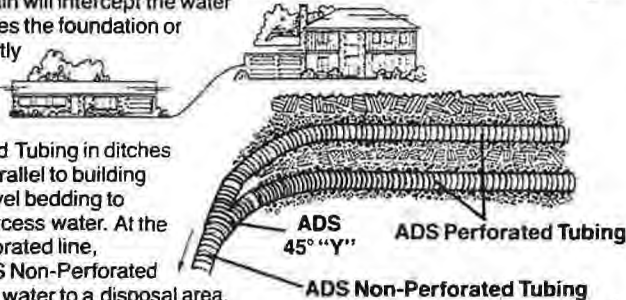
Affordable ADS tubing costs just pennies per foot installed and is available in diameters from 3" to 24".

Rely on ADS pipe & tubing to meet all your drainage needs.

Interceptor Drains

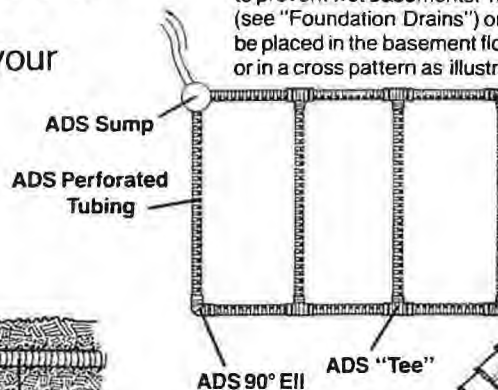
If the building is on a slope, ADS tubing installed as a curtain drain will intercept the water before it reaches the foundation or creates unsightly wet areas around the building. Use

ADS Perforated Tubing in ditches on the slope parallel to building encased in gravel bedding to intercept the excess water. At the end of the perforated line, connect to ADS Non-Perforated Tubing to carry water to a disposal area.



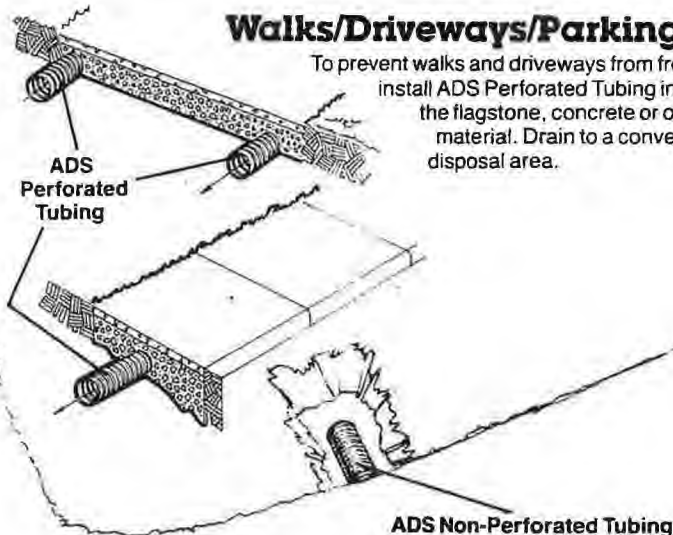
Underslab Drainage

ADS Perforated Tubing can be installed in new or retrofit construction to prevent wet basements. Tubing can be installed outside (see "Foundation Drains") or inside the basement. ADS tubing should be placed in the basement floor approximately one foot from the inside wall or in a cross pattern as illustrated. Line should have a minimum grade and lead into a sump at one corner of the basement or to an outside drain. Tubing should be installed in a gravel envelope such as is recommended for foundation footing drains outside buildings.



Walks/Driveways/Parking Areas

To prevent walks and driveways from frost damage, install ADS Perforated Tubing in gravel beneath the flagstone, concrete or other paving material. Drain to a convenient disposal area.



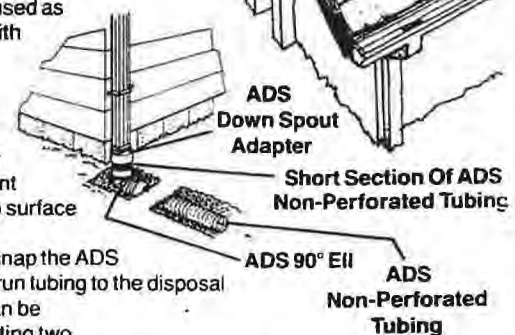
Driveway Culverts

To carry water beneath the driveway, use ADS 10", 12", 15", 18" or 24" Culvert Pipe. Crushed stone, gravel or compacted soil backfill should be used as the bedding material around the culvert, with aggregate size not exceeding one inch.

Downspout Run-offs

To carry rainwater from the building and avoid water seeping down basement wall and creating wet basement problems, use ADS Non-Perforated Tubing from downspout to surface inlet, dry well, or other disposal area.

Place an ADS Downspout Adapter on the end of the downspout, snap the ADS Non-Perforated Tubing into the snap coupling on lower end of adapter and run tubing to the disposal area. If a shallow line is needed from the downspout, an ADS 90° Ell can be used. ADS "Tee's", "Y's" and other fittings are available for connecting two or more downspouts to the same line.



ubing: perfect for homesite and

Swimming Pool Drains

Use ADS Non-Perforated Tubing for overflows and for gravity flow drains and run line into a disposal area.

ADS 90° Ell

ADS Non-Perforated Tubing

Window Wells

Basement window wells should be drained to prevent rainwater from seeping down to the foundation wall and entering the basement. The window well can be easily drained by running a line of ADS Non-Perforated Tubing from a drain in the bottom of the well to a disposal area. The flexibility of ADS tubing will be helpful in making grade changes and curves away from the well. ADS 90° Ells are available for extremely sharp curves.

ADS
Perforated
End Plug

ADS 90° Ell

ADS Non-Perforated Tubing

Foundation Drains

Wet basements are generally caused by ground water that is either adjacent to or higher than the basement floor. To prevent water from entering either the basement wall or at the footings, install ADS Perforated Tubing in a gravel envelope completely around the house.

The bottom of the line should be as low as the bottom of the wall or footing course, with a minimum slope. It should run to a storm sewer or other disposal area.

Although ADS Tubing will bend around corners, 90° Ells with snap couplings are available where local codes require them. An ADS "Tee" will tie together the ends of the foundation drain at the line leading to the disposal area.

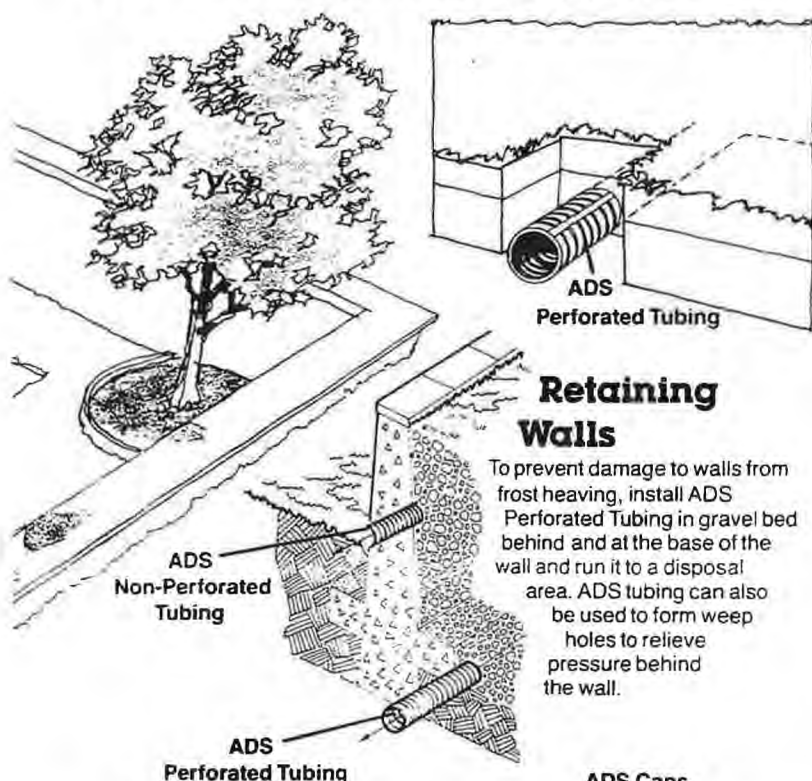
ADS
Perforated Tubing

commercial drainage.

Low Spots

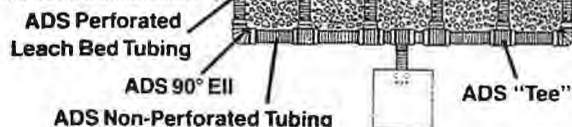
For wet spots in lawn or other areas, use ADS Perforated Tubing installed in gravel envelope to pick up water and carry it to a catch basin or other disposal area. In heavy clay soils, several lines of ADS Perforated Tubing may be needed to speed drainage. Tubing should be installed in gravel envelope.

A surface inlet can also be installed where lawns collect rainwater. Install this inlet at the low point and use ADS Non-Perforated Tubing to carry the water from the inlet to a storm sewer or other disposal area.



Septic Tank Disposal Fields

SB2, ADS' perforated leach bed tubing, is ideally suited for septic tank disposal fields. State and local health codes and soil conditions govern area of absorption field and method of installation. Refer to ADS' SB2 brochure and contact regulatory agencies before installation is made.



Other ADS Pipe & Tubing Uses:

Road bed drainage Athletic fields Golf course drainage As a conduit for underground telephone and power line services and ducts for warm air heating in underslab construction.

Airport runways Parking lots Manhole drains

The key factors to be considered when installing ADS Corrugated Tubing are:

1. Care during installation

Care should be taken to prevent damage to the tubing during the backfilling operation. Avoid dropping large clods or rocks directly on tubing. Impact loads of all types should be avoided until tubing is properly bedded.

2. Bedding

It is preferred that tubing be bedded in a gravel envelope. However, selected soil backfill material may also be used with satisfactory results. The bedding material should be placed around the tubing to a depth at least 2" over the top of tubing. When selected soil bedding material from the trench excavation is used, small loose particles of soil that will flow around the tubing and minimize soil setting should be chosen. Avoid large rocks that may damage the tubing or large clods of soil that cause voids and subsequent excessive settling. Selected soil bedding materials should be tamped.

3. Depth of Cover

If vehicular traffic is expected over tubing there should be a minimum of 12" of cover over tubing if gravel bedding is used and 24" of cover if selected soil bedding material is used. Typical recommended gravel envelope materials would be pea gravel 6 A stone or pit run coarse sand and gravel mixes.

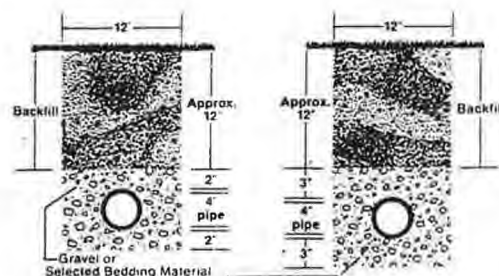
4. Proper grade

The grade or "fall" on which tubing is laid is critical in that reversals in grade will greatly reduce the effectiveness of the system. Best drainage practice calls for a continuous downhill fall, or grade over the entire length of the drain line. A fall of 0.2 inches per 10 feet of length is generally considered adequate. Greater amounts of fall will promote more rapid drainage.

5. Proper selection of materials

Proper selection of material is determined by the application. If the line is to serve as a drainage line, Perforated Tubing should be used. If the line serves only to convey water away from an area (such as downspout run-offs, etc.) Non-Perforated Tubing is best, as it will not dissipate water into the surrounding area.

Non-Perforated Tubing should also be used if the line runs close to trees where root penetration may be a problem. If the soil being drained is sandy or silty, then either "Drain-Guard" or a gravel envelope should be used to prevent fine soils from entering and blocking the line. If the above recommended guidelines are followed when installing a drainage system, ADS tubing will provide an easy-to-install, safe, permanent and efficient drainage system.



Note: 12" width is suggested to allow easy access for proper bedding. Other widths may be used if good bedding practices can be obtained.

Easy-to-use heavy-duty ADS fittings

Split Coupling  3"-311 8"-811 4"-411 10"-1011 5"-511 12"-1211 6"-611 15"-1511	Snap Coupling  3"-312 6"-612 4"-412 8"-812 5"-512 10"-1012	Internal Coupler  4"-415 5"-515 6"-615 8"-815	Septic Tank Adapter  4"-463	Reducing Coupler  4" x 3"-314 8" x 6"-816 5" x 4"-514 10" x 8"-1018 6" x 4"-614 12" x 10"-1210 6" x 5"-516 15" x 12"-1512	
Snap Tee  3"-321 5"-525 4"-421 6"-626	Blind Tee  3"-341 5"-541 4"-441 6"-641	45° "Y"  3"-322 5"-522 4"-422 6"-622	Downspout Adapter  3"-364 (3/4 x 2 1/2) 4"-464 (3/4 x 2 1/2) 4"-465 (3 x 4 1/4) 4"-466 (2 1/8 x 2 1/8)	End Plugs  Perforated 4" - 434 Non-Perforated 3" - 333 4" - 433 5" - 533 6" - 633	
Spin-on Couplings  18"-1811 24"-2411	Split End Cap  3"-331 8"-831 4"-431 10"-1031 5"-531 12"-1231 6"-631 15"-1531	Snap Adapter  3"-362 6"-662 4"-462 8"-862 5"-562	90° ELL  3"-390 4"-490	Reducing Tee (Multiple)  644-6" to 6 7/8" to 5" 5" to 4 1/2" to 3" 844-8" to 8 7/8" to 6" 8" to 5 7/8" to 4" 1044-10" to 10 7/8" to 8" 10" to 6" 1244-12" to 12 7/8" to 10" 12" to 8" 1544-15" to 15 7/8" to 12" 15" to 10" 1844-18" to 18" 2444-24" to 24"	
Perforated Tubing  3"-301-300' Coils 4"-401-250' Coils 5"-501-165' Coils 6"-601-100' Coils 8"-801-20' Lengths (301 and 401 also available in bundles of ten-10' lengths.)	Non-Perforated Tubing  3"-351-300' Coils 4"-451-250' Coils 5"-551-165' Coils 6"-651-100' Coils 8"-851-20' Lengths (351 and 451 also available in bundles of ten-10' lengths.)	Septic Vented ELL No. 497 	Distribution Boxes  1369-Regular  1370-Hillside		
Protective Wrap  Drain Guard® 3"-372 4"-472 5"-572 6"-672 8"-872 10"-1072 12"-1272 Sock 373-300' Coils 473-250' Coils 573-165' Coils 673-100' Coils 873-20' Lengths 1073-20' Lengths 1273-20' Lengths 1573-20' Lengths 1873-20' Lengths 2473-20' Lengths	Heavy Duty Tubing  Perf. 8"-801 10"-1001 12"-1201 15"-1501 18"-1801 24"-2401 Non-Perf. 851-20' Lengths 1051-20' Lengths 1251-20' Lengths 1551-20' Lengths 1851-20' Lengths 2451-20' Lengths	Sump Liners & Lids for Basement  1536 Regular Lid 1537 Heavy Duty Lid 1530 30" Liner 1524 24" Liner	*SB2 Gravel-less Leach Bed Tubing  Filter wrapped. 1/2" holes. 8" & 10" diam. 20' Lengths		Septic System Leach Field Tubing (1/2" to 3/4" diam. hole.)  4"-402-10' Lengths (402 also available in coils.)

Advanced Drainage Systems, Inc., is America's leading manufacturer of quality corrugated polyethylene pipe. Manufactured of selected polyethylene resins, ADS pipe meets the strictest product quality standards and industry specifications.

In addition, ADS manufactures a complete line of fittings and couplings, simplifying installations for highway and construction drainage applications.

From coast to coast, ADS tubing is available through the industry's most extensive distribution network. For the name of your local distributor, contact the nearest ADS sales office.

Insist on the ADS green stripe.

It's your sign of quality — #1 in the land.

Nationwide Sales and Manufacturing Network

CALIFORNIA Madera (209) 674-0054 (209) 674-0903	MICHIGAN Bad Axe Owosso (517) 269-9506 (517) 723-5208 (517) 725-7883
COLORADO Fort Collins (303) 493-7234	NORTH CAROLINA Charlotte Rowland (704) 527-0137 (919) 422-3303
FLORIDA Lakeland (813) 665-8668	OHIO London (614) 852-9554 (614) 852-4067 (419) 599-9565 (216) 264-4949
GEORGIA Montezuma (912) 472-7556	PENNSYLVANIA Muncy (717) 546-7686
ILLINOIS Harvard (815) 943-5477 (217) 762-9448	TENNESSEE Brentwood (615) 373-9964
IOWA Creston Eagle Grove Iowa City (515) 782-8565 (515) 448-5101 (319) 338-9448 (319) 338-3689	TEXAS Ennis (214) 875-6591
KENTUCKY Livermore Versailles (502) 733-4324 (606) 873-8046	VIRGINIA Buena Vista (703) 261-6131
MASSACHUSETTS Ludlow (413) 589-0515	WASHINGTON Washougal (206) 835-6522



Corporate Office 3300 Riverside Drive
Columbus, Ohio 43221 (614) 457-9999

When you install ADS tubing, you can be sure it will provide dependable drainage for many years to come. Problems that often surface with other drainage materials simply don't occur with ADS tubing. Drainage is economically efficient because ADS tubing is:

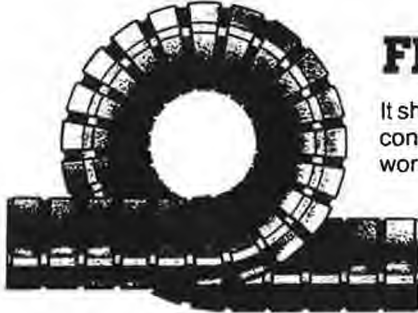
Easy to Install.

Lightweight tubing saves time and labor. No special tools or fittings are needed. There's no waste because you simply cut coiled tubing to required length.



Unrestricted Water Intake.

Uniform slots provide unrestricted, rapid water intake and quicker drainage to handle heavy rains.



Flexible.

It shifts with the ground, so contractors don't have to worry about callbacks due to misalignment and clogging.



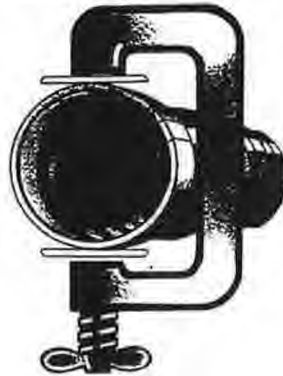
Durable.

Rugged construction gives ADS tubing its long, reliable life. Unaffected by alkalis or chemicals in soil or effluent, ADS tubing won't rust or corrode and also withstands extreme temperature changes including freezing and thawing.



Strong and Tough.

ADS tubing won't break during handling and installation, so contractors don't have to worry about costly, time-consuming replacement.



Assured Effluent Flow.

ADS tubing features uniformly sized and spaced drilled holes for effective outflow of effluent, and promotes leaching action.



See "ADS Tubing Installation Guidelines" for proper installation. Installation procedures for drainage applications shown in this brochure are generally typical, but may require modification due to variations in federal, state and local building codes, local soils and grade conditions.

Drainage installations illustrated are normally drained into a storm sewer, through the curb out to the gutter, into a dry well, or a combination of the three. As a general rule, codes do not permit such drainage into sanitary sewer systems.

Chemical Resistance – ASTM D 543 Tests verify that ADS plastic tubing resists the following solutions:

ASTM	Meets Heavy Duty Tubing requirements of ASTM F405 and F667.
BOCA	Research Report #80-01
SBCC	Compliance Report #8386
IAPMO	File #1549
Also approved by most state, county and local Sanitarians.	

Chemical	Concentration in Water Solution
Sodium carbonate	0.1N
Sodium sulfate	0.1N
Sodium chloride	5%
Sulfuric acid	0.1N
Acetic acid	5%
Hydrochloric acid	0.2N
Sodium hydroxide	0.2N
Ivory Soap	5%
Household detergent	5%
Raw sewage	—

ARTERIAL APPROVAL SUBMITTAL

DATE _____

Oct. 22, 1992

SUBMITTAL

-1-

☒ Y

NEW

RESUBMITTAL

PROJECT NUMBER

Phase IV-B Landfill Closure

FOR GOVT USE ONLY

Initial

Flexible Membrane Liner

DATE _____

FOR GOVT USE ONLY

TO DEAE

For Evaluation and Action

DATE _____

TO CONTRACTING OFFICER

Recommend ☒ Approval ☐ Disapproval as Indicated Above and Subject to Any Applicable Comments on the Reverse Side

DATE _____

TO (Contractor)

☒ Approved ☐ Disapproved as Indicated Above and Subject to Any Applicable Comments on the Reverse Side. Request Resubmittal or Disapproved Items Within Days of Date Shown Below.

DATE _____

July 31/91



Mr. Gary Lechner
Staff Industries, Inc.
240 Chene Street
Detroit, MI 48207

Dear Mr. Lechner:

Please accept this letter confirming that Staff Industries, Inc., is an approved fabricator of Canadian General-Tower Limited Geoliner® PVC and related products.

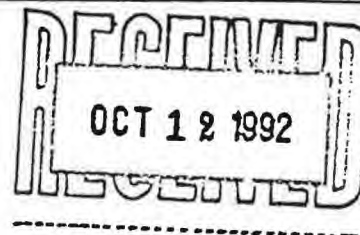
We sincerely appreciate your support and look forward to our continuing participation in your business.

Sincerely,

CANADIAN GENERAL-TOWER LIMITED

Tom Letourneau
Market Development Manager

TL/dl



Certification Results:
Containment Liners

Polyvinyl Chloride

<u>Property</u>	<u>N.S.F. Spec Specified</u>	<u>Result</u>	<u>Test Method</u>
Thickness (mils)	40.0	39.9	ASTM D1593
	min 38.0		
Specific Gravity (min)	1.20	1.27	ASTM D792
Tensile (lbs, min)	92 x 92	116.4 x 109.5	ASTM D882
Elongation (%) At Break	250 x 350	621 x 637	ASTM D882
100% Modulus (lbs, min)	35 x 35	39.8 x 55.2	ASTM D882
Tear Resistance (lbs, min)	10 x 10	4.7 x 13.8	ASTM D1004
Low Temperature (F)	-20°F	PASSED	ASTM D1790
Dim. Stability (% max)	5 x 5	1.6 x 0.1	ASTM D1204 (212°F 15 min.)
Water Extraction (% max)	0.35	0.03	ASTM D3083
Volatile Loss (% max)	0.6	0.4	ASTM D1203

Resistance to Soil Burial

Formula Used
Previously
Tested
Satisfactorily

Hydrostatic Resistance (psi)	82	PASSED 150	ASTM D751 METHOD A
---------------------------------	----	------------	-----------------------

CGT Identification No.: 56590

CGT Lot No.: P3050A

Roll Numbers: 1 - 9

Yours truly,

CANADIAN GENERAL-TOWER LIMITED

Bill Mercer
Bill Mercer
Testing Supervisor
/ag

Phase IV B

CONTAINMENT LINER MATERIAL LIMITED WARRANTY

PROJECT: _____

APPROXIMATE SIZE: _____

INSTALLATION DATE: _____

SAMPLE

Canadian General-Tower Limited (CGT) warrants that the liner material to be used in the above referenced project will perform satisfactorily when incorporated into a liner to be used for the containment of the aqueous effluent which is defined as follows and according to the conditions set forth in the additional pages of this agreement:

CGT further warrants that the material, if properly fabricated and installed, will have a useful service life for a period of 20 years providing the liner material is continuously protected against weathering exposure and mechanical damage at all times. In addition, the maximum effluent temperature is not to exceed _____ and the pH of the effluent is to be maintained between _____ and _____.

This warranty does not cover damage caused by mechanical, physical or other external forces or damage caused by solutions of greater concentrations than the one defined above.

This warranty is subject to the following:

1. This warranty is conditional upon (a) normal use and service of the liner for the purpose and in the manner for which it is designed and manufactured, (b) installation of the liner on preconsolidated soil, free of sharp protrusions, and (c) proper sealing, fabricating and installation of the liner. Deviation from any of these conditions will void this warranty.
2. CGT shall not be responsible for damage to the liner due to external agents, including but not limited to, damage resulting from exposure of the liner to harmful chemicals; abuse by machinery, equipment or people; excessive pressure or stress from any sources; or acts of God, casualty or catastrophe, such as, but not limited to, unusual storms or other weather conditions, flooding, earthquakes, floating debris, insects or animals.
3. Upon breach of warranty, CGT's sole liability shall be, at its option, either to (a) repair the defective material or (b) supply the buyer with repair or replacement material, charging the buyer only for a portion of that material (at the then-current price) in proportion to the portion of the 20 year warranty period that has elapsed since the date

of purchase. In no event, however, shall CGT's liability under this warranty exceed an amount equal to the sales price of the defective portion of the liner multiplied by a fraction, the numerator of which shall be the number of years remaining in the 20 year warranty period and the denominator of which shall be 20.

4. To enable CGT technical staff to properly determine the cause of any alleged defect and to take appropriate steps to effect timely corrective measures, if such defect is within the warranty, any claim for alleged breach of warranty must be made and presented to CGT within 30 days after the alleged defect is first noticed, or all warranties will be deemed to have been waived by the buyer.
5. THERE ARE NO WARRANTIES GIVEN BY US TO YOU WITH RESPECT TO THE MERCHANDISE COVERED HERewith OTHER THAN THOSE SPECIFICALLY DESCRIBED HEREIN. THOSE WARRANTIES ARE IN THE PLACE AND INSTEAD OF THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR USE. In no event shall CGT be liable for any special, incidental or consequential damages for, resulting from, or in connection with, any breach of warranty or any loss resulting from use of the liner by the buyer. CGT does not assume nor authorize any person to assume for it, any other or additional liability of any kind in connection with the sale of the liner to the buyer or the buyer's use of the liner.

CANADIAN GENERAL-TOWER LIMITED

BY: _____

TITLE: _____

DATE: _____

ACKNOWLEDGED AND ACCEPTED

(Name of Buyer)

BY: _____

TITLE: _____

DATE: _____



STAFF INDUSTRIES INC. 240 Chene Street - Detroit, MI 48207 - Telephone (313) 259-1820
Fax (313) 259-0631

LIMITED WARRANTY ON FACTORY FABRICATION OF NON-EXPOSABLE MEMBRANE

Shipping Date: _____

PURCHASER: _____ TYPE OF MATERIAL: _____

Staff Industries, Inc., ("Staff") hereby warrants to Purchaser, subject to the terms and conditions contained herein, that the factory fabrication by Staff of materials delivered to Purchaser, for which this warranty applies, shall be free of defects in workmanship and shall withstand the effects of normal weather conditions and normal wear and tear, for a period of 20 year(s) from the shipping date of _____. Weather which shall not be considered normal, for purposes of the Limited Warranty, shall be that which is customarily considered to be in the nature of an act of God, casualty or catastrophe, including, but not limited to, earthquake, flood, piercing hail, ice damage, hurricane, tornado or fire.

This Limited Warranty is expressly conditioned upon normal use and service of the materials supplied by Staff for the purpose and in the manner for which said materials are designed and manufactured. Normal use and service shall include, by way of example and not limitation, exposure of the delivered materials to harmful chemicals or solid falling objects; abuse of machinery, equipment, people, insects or animals; excessive pressures or stresses on the delivered materials during and/or after installation; failure to properly prepare the soil base underlying the delivered material free from any protrusions capable of piercing the delivered material, or for consolidation base with due consideration for the water table and water content of said soil base; and, with respect to non-exposable materials, failure to properly cover and maintain an earthen cover upon the delivered materials free of any protrusions capable of piercing the delivered material. Deviation from any aforesaid conditions shall void this Limited Warranty.

Staff's liability pursuant to this Limited Warranty shall be and is hereby limited to, at its option, (a) repair of the defective material, or (b) the supply to Purchaser of materials in replacement of materials found to be defective, charging Purchaser therefore, on pro rata basis at the then current price in such a manner as to charge Purchaser only that portion of the warranted 20 year life which has elapsed since _____. Staff's liability under this Warranty shall in no event exceed the sale price of materials sold to Purchaser pursuant to the above quotation.

Any claims of defective materials under this Limited Warranty must be made to Staff by Purchaser within **thirty (30) days** after the alleged defect in the delivered materials was noticed or should have been noticed. Any claim of alleged defective materials not received by Staff within said **thirty (30) day** period shall be deemed to have been waived by Purchaser.

THE ABOVE LIMITED WARRANTIES ARE GRANTED TO PURCHASER IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THIS LIMITED WARRANTY AND THE REMEDIES SET FORTH HEREIN ARE THE EXCLUSIVE REMEDIES AVAILABLE TO PURCHASER IN THE EVENT THE DELIVERED MATERIALS ARE CLAIMED OR FOUND TO BE DEFECTIVE. NEITHER STAFF, NOR ITS AGENTS, OFFICERS, DIRECTORS, SHAREHOLDERS, SUCCESSORS, OR ASSIGNS SHALL BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT OR CONSEQUENTIAL DAMAGES, LOSSES OR INJURIES (INCLUDING, WITHOUT LIMITATION, LOST PROFITS) RESULTING FROM OR CAUSED BY THE DELIVERED MATERIALS, OR ANY DEFECT, FAILURE OR MALFUNCTION THEREOF, OR THE INSTALLATION BY STAFF THEREOF.

STAFF INDUSTRIES, INC.

DATE: _____

BY: _____
Edward C. Staff, Vice President

This STAFF INDUSTRIES, INC., LIMITED WARRANTY
is accepted by the below signed Purchaser-User:

(Signature of Authorized Representative of Purchaser-User)

(Name, please Print)

(Firm/Agency/Organization Name)

(Purchaser-User Address)

(City, State, Zip Code)



1. EQUIPMENT/SUPPLIES

- Staff Seaming Adhesive
- Empty Coffee Cans or Similar Containers
- 2" Wide Paint Brushes
- Clean Rags
- Solvent-Resistant Gloves
- Safety Goggles
- Shears—Minimum 6"
- Lead or Sand Bags

- Steel Roller At Least 1" Wide
- 1" x 10" x 16' Smooth Wooden Plank
(hole drilled at one end for pulling with rope)

OPTIONAL—REFER TO COLD TEMPERATURE
FIELD SEAMING BELOW

- 110 Volt Industrial-Use Heat Gun
- Extension Cords—12 Gauge, 100'

2. SAFETY PRECAUTIONS

- Adhesive is a flammable liquid with a flash point of 6° F (T C C) min.
- Keep adhesive container closed and away from excessive heat, sparks, or open flame.
- Use with adequate ventilation. Can cause irritation of eyes, nose and throat. Avoid inhalation, prolonged or repeated breathing of vapors, and contact with eyes or skin.
- Do not take internally. If swallowed, do not induce vomiting, call a physician immediately.
- In case of skin contact, immediately wash with soap and water.

- In case of eye contact, immediately flush eyes with water for at least 15 minutes. Consult a physician immediately.
- In case of inhalation and subsequent dizziness or nausea, discontinue use and provide fresh air. If breathing is difficult, administer oxygen.

Safety equipment may be required to exhaust fumes and provide fresh air where natural ventilation is inadequate.

Use of mask respirators with organic vapor cartridges is recommended if prolonged or repeated breathing of vapors occurs.

3. HANDLING AND STORAGE

PVC is shipped in a protective casing and inspected before leaving the factory. Visible damage to the shipment should be noted on the freight receipt. PVC should remain packaged in dry storage until ready for use. Direct sun rays should be avoided for prolonged periods before use. Material should not be unfolded under extreme cold or windy conditions.

Once PVC is unfolded from packing case and prepared for use, care must be taken that the material is not damaged. Sharp objects, hard bottom shoes, vehicles and equipment are but some of the things that must not be allowed to come in direct contact with the material. The area to be covered must be smooth and free from sharp objects that could puncture the lining.

4. FIELD SEAMING

Use only Staff Adhesives to bond membrane seams during installation. Seam bonding should not be performed in the rain or when liners or liner panels are exposed to mud, standing water, or extreme cold.

Use a 1" x 10" x 16' wooden plank as an underlying work surface. A rope inserted through a hole in one end of the board will permit pulling the board into position as seaming progresses.

To begin, position the panels so that all seams overlap a minimum of four (4) inches. Make certain that the overlap is consistent for the entire length of the seam. Use the equivalent of a whitewash brush to remove sand and a damp rag to remove soil or dirt from the bonding surfaces. Begin seaming at the mid-point of the panels and work toward the ends so that two crews can work simultaneously after initial bonding. Adhesive may be applied using two-inch paint brushes and clean containers filled ¼ full of adhesive. This reduces adhesive evaporation and helps avoid accidental spillage on the liner or cover.

A minimum material temperature of approximately 40° is required for optimum bonding. If the ambient temperature is lower than this, it will be necessary to heat the material with a heat gun to attain a material temperature high enough so that the material feels warm to the touch. Lift the upper panel edge enough to apply adhesive simultaneously to both surfaces in

maximum increments of 18 inches. Extreme care must be taken to apply the proper amount of adhesive. Too much adhesive can soften the material (via solvent attack). Too little adhesive may not achieve optimum bonding. Thinner PVC sheeting (.010", .015", .020" thick) will not require as much adhesive as thicker PVC sheeting (.030", .040", .050" thick). Seaming sample material on a trial and error basis will help you determine how much adhesive should be applied. After applying adhesive, promptly begin applying light rolling pressure. Then, gradually increase the pressure. Start rolling at least 2" back from the outside flap, rolling toward and perpendicular to the outside exposed edge. Any excess adhesive flowing from the seamed area must immediately be wiped up. Wipe *toward* the leading edge of the seam *not* away from it, to minimize spreading apart of the material. A minimum 2" wide bonded area should be achieved with no loose flaps on the exposed seam edge. Placing lead bags on the finished seam will also help the bonding process (as a result of the downward pressure they apply). Repeat this entire procedure until the panels are completely seamed.

Seams develop adequate shear strength in approximately 15 minutes, but should be inspected 30-60 minutes after bonding to detect and reseal any questionable areas.

5. PATCHING

Cuts, rips or tears in panels must be repaired promptly to prevent further damage. Using PVC roll material, cut patch pieces a minimum of 3" larger than the damaged area of the panel. Patches should have

rounded corners with no nicks around the edges. Position the patch over the damaged area and follow the seaming procedure outlined above.



INDUSTRIES INC.

MATERIAL SAFETY DATA SHEET

Mfr.'s Name: Staff Industries Inc.
Address: 240 Chene Street
Detroit, Michigan 48207
Telephone: 313-259-1820

Mfr.'s Chemical I.D.: VV 215 VINYL ADHESIVE

Mfr.'s Contact: Gary M. Lechner
Date Prepared: February 14, 1986
Emergency Telephone: 313-259-1820

SECTION 1 - IDENTITY

Common Name: VV 215 Vinyl Adhesive
Chemical Name: NA
Formula: NA
Chemical Family: Adhesive mixture

SECTION 2 - HAZARDOUS INGREDIENTS

Hazardous Components	%	Threshold Limit Value (ACGIH)
Cyclohexanone	>1%	25 ppm
Tetrahydrofuran	>1%	200 ppm

Note: The balance of this product is composed of materials classified by the American Conference of Governmental Industrial Hygienists (ACGIH) as non-toxic.

SECTION 3 - PHYSICAL & CHEMICAL CHARACTERISTICS (Fire & Explosion Data)

Initial Boiling Point: 151°F	Vapor Density (Air=1): 3.4	Vapor Pressure (mm Hg): 114
% Volatile by Volume: 87		Specific Gravity (water=1): approx. 1.0
Solubility in Water: slightly	Reactivity in Water: non-reactive	
Appearance & Odor: Clear, syrup-like liquid with hydrocarbon/ether odor.		
Flash Point: 6°F (TCC) min.	Flammability Limits (lower): 1.8%	Flammability Limits (upper): 11.8%
Extinguisher Media: Foam, dry chemical, CO2, water.		Auto-ignition Temp.: 610°F
Special Fire Fighting Procedures: Use self-contained breathing apparatus and protective clothing.		

Fire & Explosion Hazards: This material is a fire and explosion hazard if heated. Vapors can flow to distant ignition sources.

This document is a health and safety guide only. Do not use as a product specification sheet.

FORC 1985 This information is believed to be accurate, but no warranty, expressed or implied, is made.

Mfr.'s Chemical I.D.:

VV 215 VINYL ADHESIVE**SECTION 4 - PHYSICAL HAZARDS**

Stability: Unstable -	<input type="checkbox"/>	Conditions NA
Stable -	<input checked="" type="checkbox"/>	to Avoid:

Incompatibility (materials to avoid):	Strong oxidizing agents.
---------------------------------------	--------------------------

Hazardous Decomposition Products:	Oxides of carbon and nitrogen; hydrochloric gas.
-----------------------------------	--

[Hazardous Polymerization] May Occur -	<input type="checkbox"/>	Conditions NA
Will Not Occur -	<input checked="" type="checkbox"/>	to Avoid:

SECTION 5 - HEALTH HAZARDS

Threshold Limit Value:	See "Section 2"
------------------------	-----------------

[Signs & Symptoms of overexposure]	Acute: Inhalation can cause symptoms ranging from mild depression to convulsions and loss of consciousness. Skin contact causes burning and irritation.
------------------------------------	---

	Chronic: Dizziness, nausea, headache, impaired Central Nervous System (C.N.S.) function. Long term exposures can lead to liver and kidney damage.
--	---

Medical Conditions Generally Aggravated by Exposure:	Skin, liver, kidney and C.N.S. disfunctions
--	---

[Chemical listed as Carcinogen or Potential Carcinogen]	National Toxicology Program	YES	<input type="checkbox"/>	I.A.R.C. Monographs	YES	<input type="checkbox"/>	OSHA	YES	<input type="checkbox"/>
		NO	<input checked="" type="checkbox"/>		NO	<input checked="" type="checkbox"/>		NO	<input checked="" type="checkbox"/>

OSHA PEL:	Cyclohexanone, 50 ppm; Tetrahydrofuran, 200 ppm
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ACGIH TLV:	See "Section 2"
------------	-----------------

Emergency & First Aid Procedures:

Inhalation:	Remove to fresh air, restore breathing, advise physician not to use adrenalin.
-------------	--

Eyes:	Flush with water, call physician.
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Skin:	Remove contaminated clothing, flush with water.
-------	---

Ingestion:	Contact physician and Poison Control Center immediately to determine appropriate action.
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SECTION 6 - SPECIAL PROTECTION INFORMATION

Respiratory Protection:	Use half face with organic vapor-acid gas cartridge at <250 ppm. Use S.C.B.A. at >250 ppm.
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Ventilation:	Local exhaust recommended. Maintain adequate velocity to prevent explosive concentration.
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Personal Protective Equipment:	Gloves and aprons should be selected from chemical selection chart; goggles or face shields are recommended.
--------------------------------	--

SECTION 7 - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage:	Store in well ventilated, fire proof area, away from any source of heat or ignition. Use spark proof tools and prohibit smoking.
--	--

Other Precautions:	Ground all metal containers and avoid prolonged skin contact.
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Steps to be Taken in Case Material is Released or Spilled:	Remove all sources of ignition; use absorbant and dispose of properly.
--	--

Waste Disposal Methods:	Refer to local and federal EPA regulations.
-------------------------	---

STANDARD SPECIFICATIONS FOR PREPARATION OF SUPPORTING SURFACES

Preparation of Earth Subgrade. The surface of the subgrade shall be prepared by excavating and trimming the earth to elevations and sections as shown on the drawings. The prepared subgrade shall be free from loose earth, rock, cobbles, rubbish or other foreign materials. The surface of the completed subgrade shall be smooth, uniform and free from sudden changes in grade.

1. **Additional Excavation and Backfill.** As directed by the Engineer, in the lining area where gravelly materials containing large cobbles or boulders exist, these materials shall be excavated to a depth of a minimum of 3 inches and the areas backfilled and compacted to grade with selected and approved materials.

2. **Preparation of Subgrade.** Before final rolling and compaction, the entire subgrade shall be freed of abrupt breaks, rock, cobbles, boulders, debris and other foreign materials and shall be approved by the Engineer for installation of the lining.

3. **Rolling and Compaction of Subgrade.** Compaction of the earth subgrade shall be accomplished with a vibrating roller or a steel wheel roller weighing not less than 50 pounds per linear inch of drum width. Two coverages by the roller shall be required. Areas not accessible to the roller shall be compacted by approved mechanical or hand tampers.

4. **Maintenance of Subgrade.** The earth subgrade shall be maintained in a smooth, uniform and compacted condition during installation of the lining.

Preparation of Paved Surfaces. Concrete and other types of paved surfaces which are to be lined shall have all rough edges and projections removed in the area of lining. All cracks in the concrete shall be cleaned and filled with a sand-cement mortar. Extruded expansion joint material and joint sealers shall be cut off flush. The entire surface to be lined shall be cleaned of all foreign materials and swept thoroughly.

COVERING THE LINER

Staff recommends that, whenever possible, liners be covered with earth or other suitable

material to protect against mechanical damage, vandalism, and—in the case of some liner materials—damage resulting from exposure to chemicals, or sunlight.

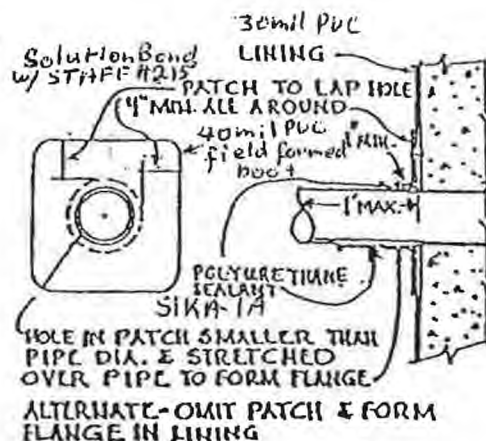
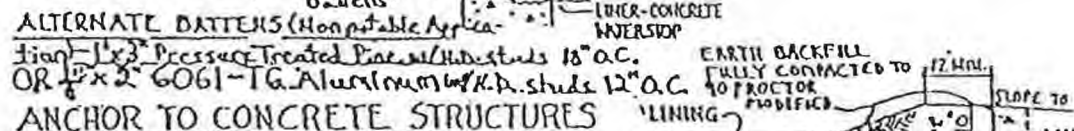
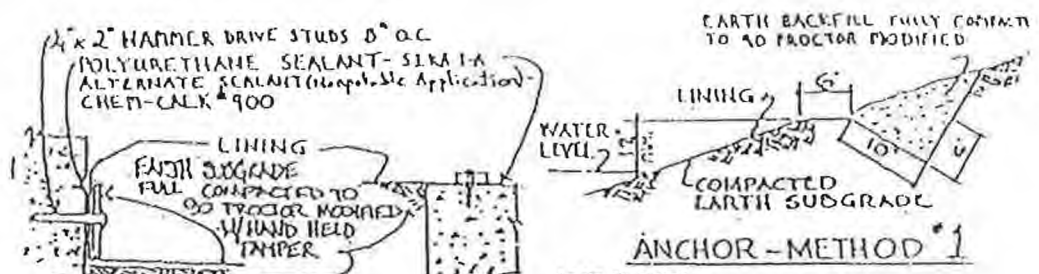
A minimum 12 inch thick earthen cover, free of foreign objects, is recommended for most liner applications. Sand or similar material can be used. Use erosion-resistant material such as smooth gravel at the waterline. Containment structures holding liquids. In both liquid and solid containment applications, gravel extending down slopes to a depth of at least three feet helps inhibit silt attack or erosion due to wave action. Slopes deeper than 3:1 are difficult to cover due to sliding of earthen cover material on the sloped membrane surface.

When covering the liner, care must be exercised to avoid damaging the membrane. Earth or other covering materials must be free of sharp rocks, sticks or other debris that can tear or puncture the liner.

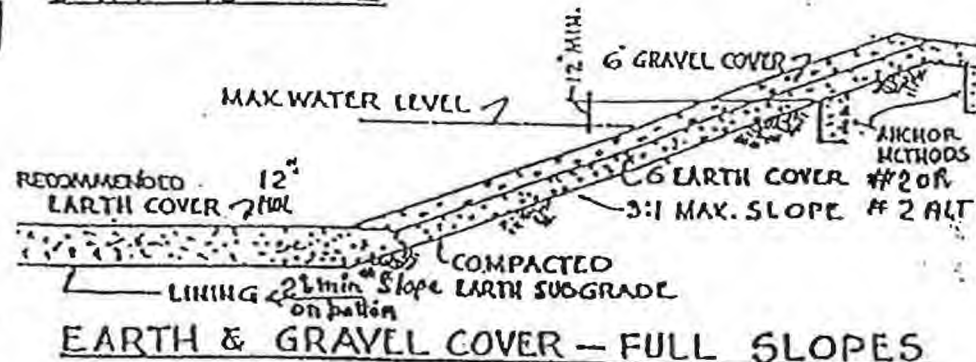
Earthmoving equipment should remain on top of a minimum of 12-18 inches of covering material at all times and must not be driven on the liner itself. Cover material should be placed on top of the liner surface and should only be spread over previously placed cover material. Placement of a non-woven geotextile fabric above the lining will provide protection from mechanical damage possible from placement of cover material.

Cover slopes from the bottom by pushing the earthen material upward. This reduces tension on the membrane caused by soil falling downhill.

During the covering operation an observer must work in conjunction with the equipment operator, removing debris and staking areas that may have been damaged during the covering operation. These marked areas can later be uncovered by hand for inspection and repair.



SEAL TO PIPE





DEPARTMENT OF THE ARMY
HEADQUARTERS FORT DEVENS
FORT DEVENS, MASSACHUSETTS
01433-5340

REPLY TO
ATTENTION OF:

AFZD-DOC (715h)

2 October 1992

MEMORANDUM FOR NORMAN E. BLACK, DEH, TECHNICAL SERVICES, BLDG 1620,
FORT DEVENS, MA 01433

SUBJECT: Designation of Contracting Officer's Representative (COR)

1. Pursuant to the provisions of AFARS Subpart 42.90 you are hereby designated Contracting Officer's Representative (COR) in administration of the following contract:

Contract Number: DAKF31-92-C-0062

Title: Phase IV Fort Devens Land Fill and Capping, Fort
Devens, MA.

Contractor: T. J. Battye Trucking

Contract Period: From notice to proceed until contract is
completed, terminated or rescinded..

2. You are authorized by this designation to take any and all action with respect to the following which could lawfully be taken by me as Contracting Officer, except any action specifically prohibited by the terms of subject contract:

a. Verify that the Contractor performs, the technical requirements of the contract in accordance with the contract terms, conditions and specifications.

b. Perform or cause to be performed, inspections necessary in connection with 2a above and to verify that the Contractor has corrected all deficiencies. Perform acceptance for the Government of services performed under this contract.

c. Maintain liaison and direct communications with the Contractor.

d. Monitor the Contractor's performance and notify the Contractor of deficiencies observed during the surveillance, and direct appropriate action to effect correction. Record and report to the undersigned incidents of faulty or non conforming work delays or problems.

e. Coordinates site entry for Contractor personnel and if to be provided insure that Government furnished property is available when required.

3. Limitations: You are not empowered to award, agree to, or sign any contract (including delivery or purchase orders) or modification thereto, or in any way to obligate the payment of money by the Government. You may not take any action which may impact on contract or delivery order schedules, funds or scope. All contractual agreements, commitments or modifications which involve prices, quantities, quality or delivery schedules shall be made only by the Contracting Officer.

AFZD-DOC (715h)

SUBJECT: Designation of Contracting Officers Representative

4. This designation as a Contracting Officer's Representative shall remain in effect through the life of the contract unless sooner revoked by the Contracting Officer and such termination of the designation shall be in writing. If your Designation is revoked for any reason before completion of this contract, turn your records over to the successor COR or obtain disposition instructions from the Contracting Officer. If you are reassigned or separated from service, you shall request termination and relief from your duties from the Contracting Officer sufficiently in advance of reassignment or separation to permit timely selection and designation of a successor COR.

5. You are further required to maintain adequate records to sufficiently describe the performance of your duties as Contracting Officer's Representative during the life of this contract and to distribute such records as applicable. As a minimum the COR file shall contain the following:

- a. Copy of COR designation letter.
- b. Copy of contract and modifications thereto.
- c. Copy of correspondence between COR and Contractor.
- d. Names of technical and administrative personnel assisting the COR.
- e. Copy of records of COR inspections.
- f. Copy of statement indicating that COR has read and understands AR 600-50 (updated semi-annually).

6. You are required to submit a monthly report to the Contract Administrator concerning performance of services rendered under this contract. Problem areas should be brought to the immediate attention of the Contracting Officer.

7. All personnel engaged in Procurement and related activities shall conduct business dealings with industry or a manner above reproach in every respect and shall protect the US Government's interest, as well as maintain its reputation for fair and equal dealings with all contractors. AR 600-50 sets forth applicable standards of conduct for all personnel directly and indirectly involved in procurement. All COR's shall review AR 600-50 semi-annually, and provide certification to the Contracting Officer.

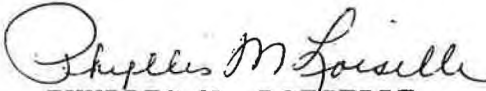
8. Any COR who may have direct or indirect financial interest which would place him in a position where there is a conflict between his private interests and the public interests of the United States shall advise his supervisors and the Contracting Officer of the conflict so that appropriate action may be taken. A COR shall avoid the appearance of such conflict to maintain public confidence in the US Government's conduct of business with the private sector.

9. You are invited to acknowledge receipt of this appointment on the original copy and return it to the Contracting Officer for retention in the contract file. The duplicate copy may be retained by you. Your signature also serves as certification that you have read and understood the contents of AR 600-50.

AFZD-DOC (715h)

SUBJECT: Designation of Contracting Officers Representative

In your absence, I hereby appoint Thomas McNaughton with all authority granted to you in this appointment to serve as COR in their place. If the above individual is required to act in your stead, notification shall be made to the Contracting Officer in sufficient time for the Contracting Officer to notify the contractor of your absence.


PHYLLIS M. LOPELLE
Contracting Officer

RECEIVED
OCT 12 1960
FBI

Receipt of this appointment is hereby acknowledged:

COR:

(Your signature certifies that you have read AR 600-50 within the last six (6) months.)

NORMAN E. BLACK
Name (Print/Type)

Signature/Phone Number
(508) 796-3021

Alternate COR:

(Your signature certifies that you have read AR 600-50 within the last six (6) months.)

THOMAS MCNAUGHTON
Name (Print/Type)

Signature/Phone number
(508) 796-2014

Contractor:

T. J. BATTYE TRUCKING
Name (Print/Type)

Signature/Phone number
(508) 683-4757

Administrator:

LAVERNE ROLAND
Name (Print/Type)



Signature/Phone number
(508) 796-3726

Contract Number: DAKF31-92-C-0062

Receipt of this appointment is hereby acknowledged:

COR:

(Your signature certifies that you have read AR 600-50 within the last six (6) months.)

NORMAN E. BLACK
Name (Print/Type)

Signature/Phone Number
(508) 796-3021

Alternate COR:

(Your signature certifies that you have read AR 600-50 within the last six (6) months.)

THOMAS MCNAUGHTON
Name (Print/Type)

Signature/Phone number
(508) 796-2014

Contractor:

T. J. BATTYE TRUCKING
Name (Print/Type)


Signature/Phone number
(508) 683-4757

Administrator:

LAVERNE ROLAND
Name (Print/Type)

Signature/Phone number
(508) 796-3726

Contract Number: DAKF31-92-C-0062



DEPARTMENT OF THE ARMY
HEADQUARTERS FORT DEVENS
FORT DEVENS, MASSACHUSETTS

REPLY TO
ATTENTION OF:

011433-5340

Directorate of Contracting

NOTICE TO PROCEED

CONTRACT NO. DAKF31-92-C-0062 ^{62 NLP}

2 October 1992

T. J. Battye Trucking
51 Old Ferry Road
Methuen, MA 01844

Dear Mr. Battye:

You are hereby notified to proceed with work under Contract Number DAKF31-92-C-0062, Phase IV-B Fort Devens Land Fill Closure and Capping, Fort Devens, MA.

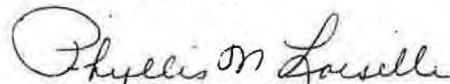
In accordance with the terms of the Contract, the period of performance is hereby determined to be 6 Oct 1992 through 15 Oct 1992, Nine (9) days. Fifteen (15) Apr 1993 through 3 Oct 1993, One Hundred and Seventy One (171) days for a total of One Hundred and Eighty (180) days performance period.

The Contracting Officer's Representative on this project is Norman E. Black (508) 796-3021.

The Contract Administrator is Laverne Roland (508) 7963-3726.

Your attention is invited to your copy of the Contracting Officer's Representative's letter of appointment delineating the scope of his authority to act on behalf of the Contracting Officer.

Sincerely,


PHYLLIS M. LOISELLE
Contracting Officer

RECEIPT IS ACKNOWLEDGED.


(Signature)

OWNER 10/6/92
(Title)

SECTION C

DESCRIPTION/SPECIFICATIONS

FOR

PHASE IV-B LANDFILL CLOSURE

PROJECT REQUEST NUMBER EB-19323-2J

FORT DEVENS, MASSACHUSETTS

<u>DESCRIPTION</u>	<u>PAGE NO.</u>
Special Conditions	2
Scope of Work	3
Extent of Area	3
Government Supplied Materials	3
Environmental Protection	3 - 6
Grading	6 - 7
Gas Vent System	7
Flexible Membrane Liner	7 - 13
Top Cushion Layer	13
Topsoil	13 - 14
Vegetative Cover	14 - 16
Extended Maintenance	17
APPENDIX	18 - 20

DIRECTORATE OF ENGINEERING AND HOUSING
FORT DEVENS, MASSACHUSETTS 01433-5100
LANDFILL CLOSURE, PHASE IV-B
FORT DEVENS, MASSACHUSETTS

SPECIAL CONDITIONS:

1. The total completion time allowed for this project is 180 days. Contract provides for an exclusionary period during the winter months. The requirement for extended maintenance of the lawn and grass areas is not included in the 180 days of completion. This work, stated in para 13 and 14 of the technical specifications will be performed during the growing season following completion.
2. A retainage of 6% of the contract total will be withheld until the requirements of extended maintenance are completed.
3. Contractor shall notify the Contracting Officer ten days before beginning work on site.
4. Landfill Closure Phases III and IV-A shall not be driven on or otherwise disturbed, except for the attachment of new and existing liner and meeting existing contours.
5. The contractor shall submit as-built drawings of the project.

**SPECIFICATION
PHASE IV-B
LANDFILL CLOSURE**

1. **Scope of Work:** Provide all labor, equipment, materials, supplies and tools, except as supplied by the Government in paragraph 3, necessary to haul fill material; grade and compact sub-course; haul and spread sand cushion; install gas vent pipe; install flexible membrane cap (FMC); cover FMC with sand cushion/drainage layer; haul and spread topsoil; and establish vegetative cover over approximately 4 acres of solid waste landfill located at Fort Devens, MA in accordance with applicable parts of 310 CMR 19.000 and the following specifications. All work shall be conducted in accordance with the environmental protection requirements of the contract.

2. **Extent of Area:** The area to be capped is approximately 4 acres and is bounded on the North edge by phase IV-A, on the East edge by phase III, on the South edge by the contour of a hill, on the Southwest corner by a chain link fence and on the West edge by an access road (extension of Cook St.) as shown in Appendix, drawing #1.

3. **Government Supplied Material:** Government will provide a source of gravel and sand fill material at a site off Walker Road, approximately 2.5 miles from the landfill. The material supplied is suitable for the base course but will have to be screened by the contractor to meet the specifications for cushion layers below and above the flexible membrane liner.

4. **Environmental Protection:**

4.1 **References:**

- Massachusetts General Law, Chapter 21
- 310 Code of Massachusetts Regulations 30.00, "HAZARDOUS WASTE REGULATIONS"
- Environmental Protection Agency Regulations, 40 CFR 262, "STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE"
- Environmental Protection Agency Regulation, 40 CFR 261, "IDENTIFICATION AND LISTING OF HAZARDOUS WASTE"
- Environmental Protection Agency Regulation, 40 CFR 268, "LAND DISPOSAL RESTRICTIONS"
- Department of Labor Regulations, 29 CFR 1919.1200, "HAZARD COMMUNICATION"
- Department of Transportation Regulations, 49 CFR 171 thru 177, "HAZARDOUS WASTE REGULATIONS"

4.2 Hazardous waste may be generated as a result of this contract. (A hazardous waste is any material no longer suitable for its intended manufactured purpose, or is discarded, or is abandoned, which poses a hazard to health or the environment. Such wastes include, but are not limited to, those which are toxic, corrosive, flammable, or reactive, or otherwise listed at 40 CFR 261, and applicable State laws and regulations as referenced above. The most likely hazardous waste which may be generated by this contract is gasoline, diesel fuel, and motor or hydraulic oil due to spills and water solvents generated by field seams or pipe connections.

4.3 Contractors hired by the Government are required to comply with all federal, State, and Army Regulations regarding the handling and management of hazardous wastes and materials. The contractor can expect unannounced federal and State regulatory agency and Fort Devens Environmental Management Task Force inspections to ensure compliance with federal, State, and Fort Devens hazardous waste/material regulations.

4.4 The contractor shall properly characterize waste streams to identify hazardous constituents and non-hazardous wastes. To accomplish this characterization, laboratory analysis may be required to sufficiently identify all hazardous constituents in accordance with Federal Regulation 40 CFR 262.11 and 40 CFR 261.20 through 261.33 as well as applicable State regulations. The waste characterization information must then be used to complete the EPA form 8700-22 (Uniform Hazardous Waste Manifest), associated land disposal certifications, and other forms required by the disposal facility selected by the contractor.

4.5 The contractor shall be responsible for having suspect waste streams analyzed by an independent laboratory certified by the appropriate regulating State for determination of hazardous constituent levels and for the required tests, sufficient to comply with Land Disposal restrictions (reference 40 CFR 268 et seq.). The TSDF may require this testing before accepting any waste if the Contractor doesn't have the original containers or MSDS for solvents or spilled debris. Split samples shall be given to the Fort Devens Environmental Management Task Force for every sample taken. Results of the lab analysis must be provided in writing to the COR within 10 days of the generation of waste and prior to shipment or transportation. Specifically, the lab report shall include:

- Proof of Laboratory Certification
- Analysis results
- Laboratory Limits of Detection For Each Test Done
- Test(s) run and test method(s) used
- Verification of QA/QC procedures
- Sample Container Type
- Sample Preservation Method(s)
- Date Sampled
- Date Analyzed

4.6 EPA form 8700-22 (or required State equivalent) shall be used by the contractor to transport all waste generated within the scope of this contract, including waste determined to be non-hazardous. (Non-hazardous waste will be classified as MA-99 in the state of Massachusetts.)

4.7 The contractor shall containerize, label, handle, and store all hazardous waste in accordance with State and Federal Regulations, reference 40 CFR 262.30 and 49 CFR 171 thru 177. Hazardous waste must be stored in a hazardous waste accumulation area approved by the Environmental Management Task Force.

4.8 The contractor is responsible for providing proper storage of the hazardous waste generated within the scope of this contract in accordance with 310 CMR 30.300 and all other applicable State and federal regulations regarding hazardous waste. **NOTE:** The contractor is responsible for the proper handling, storage and disposal of all waste generated due to negligence on the contractor's part, and all waste generated by the contractor outside the scope of this contract.

4.9 Hazardous waste generated on Post or at a Fort Devens supported site, within the scope of this contract, shall be disposed of by the contractor through the use of EPA form 8700-22 (or required State equivalent), with the use of a licensed hazardous waste hauler and a licensed hazardous waste treatment/disposal facility, and coordination with the Fort Devens Environmental Management Task Force (for authorized manifest signature). The Environmental Management Task Force shall authorize and supervise the transport of all hazardous waste on Fort Devens and on the supported sites. The above referenced laws, regulations, and procedures shall be followed by the contractor at all times. **NOTE:** The contractor is responsible for the proper handling and disposal of all waste generated due to negligence on the contractor's part, and all waste generated by the contractor outside the scope of this contract. Manifest and supporting documentation shall be delivered within three (3) working days to IEMO for verification. Four (4) additional work hours shall be provided for manifest signature on the day of transportation. The Contractor should not plan on the manifest being returned earlier than the end of the 4-hour period. The Contractor shall provide a Certificate of Disposal from the TSDF.

4.10 Any release of a hazardous waste or hazardous material, on Post or at sites supported by Fort Devens, greater than 1 (one) pound or 1 (one) gallon shall be immediately reported to the Fort Devens Fire Department at (508) 796-2117 and (Fort Devens Environmental Management Task Force, at (508) 796-3002/2195) during normal working hours.

4.11 Under no circumstances are hazardous wastes to be transported onto Fort Devens.

4.12 Less hazardous or non-hazardous materials will be substituted for hazardous materials, unless specifically required elsewhere in this contract. Where hazardous materials are needed, users will adhere to all applicable federal, OSHA, and State regulations regarding the management and handling of hazardous materials. In the absence of regulations, users will apply the best available technology or management in the use, handling, and disposal of hazardous materials. An MSDS for each hazardous material to be used in the performance of this contract shall be submitted to the Contracting Officer.

4.13 The Contractor shall immediately contact the Installation Environmental Task Force Office any time they are contacted by a Federal, State or local environmental, public safety, or occupational health and safety regulatory agency, or are required by law to contact such agency. The Contractor shall state the name and telephone number of the agency point of contact, shall summarize the nature and substance of the contact, and shall provide a copy of any written communications to the Contracting Officer not later than the end of the business day after sending it or receiving it. Any contact with such agency to determine the requirements of law as it relates to this contract shall be through the Installation Environmental Task Force Office.

5. Grading - General: All areas covered by the project, including excavated and filled sections and adjacent transition areas, shall be uniformly smooth graded and compacted. The finished surface shall be free from irregular surface changes as is ordinarily obtainable from blade grader operations. All newly graded areas shall be protected from traffic and from erosion. Any settlement or washing away that may occur prior to acceptance shall be repaired by the Contractor at no cost to the Government. All elevations and slopes shall be in accordance with specifications.

6. Sub-Grade: Grade the entire area to develop a compacted subgrade which when capped will provide a smooth even slope transition from the match lines of phase IV-A and phase III to outside edge of the liner and tie into the existing drainage system. Expected drainage pattern is shown in Appendix, on drawing #1. Subgrade fill material shall not have stones larger than six inches in any dimension. The final six inch subgrade layer (directly beneath the sand buffer - paragraph 7) shall not have any stones larger than 1/2 inch in any dimension.

6.1 Subgrade shall be compacted in six inch lifts with at least four passes of compaction equipment (roller) delivering at least 10 pounds per square inch of pressure. All ditches and gutters shall be finished to permit adequate drainage.

7. **Lower Cushion Layer:** This buffer layer shall consist of compacted six inch clean sand layer free of all stones, roots or other foreign material that could puncture the flexible membrane liner. This layer will be placed on the finished subgrade and will have the gas venting system as described in para 8, installed in it prior to the placement of the liner. The finished grade shall be free from irregular surface changes to provide a smooth surface for placement of the flexible membrane liner. This layer shall have a minimum hydraulic conductivity equal to or greater than 1×10^{-3} cm/sec. See Appendix, drawing #4 for general configuration of layers.

8. **Gas Vent:** Gas ventilation system is to be installed under entire capped area on 100 foot grid with one run of pipe at intersect of line at phase IV-A and IV-B and perpendicular run at the intersect of line at phase III and IV-B. These 2 lines will act as the base lines for layout of the remainder of the grid.

8.1 Gas vent piping shall be 3" perforated connected and cross connected to form a square grid and so the entire system is tied together. Perforated caps shall be installed on pipe ends.

8.1.1 Gas vent piping and connections (tees, elbows, and caps) shall be perforated pipe. Pipe shall conform to A.S.T.M. F-405 and F-667, and be installed in the sand cushion layer directly under the Flexible Membrane Liner.

8.1.2 6" Schedule 40 steel vent pipe shall be installed at the center of the grid. See Appendix, Drawing #2 for detail of vent pipe installation.

9. Flexible Membrane Liner:

9.1 **APPLICABLE PUBLICATIONS:** The following publications listed form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

9.1.1 American Society for Testing and Materials (ASTM) Publications:

D 413-82	Rubber Property-Adhesion to Flexible Substrate
D 618-61(1981)	Conditioning Plastics and Electrical Insulating Materials for Testing
D 792-86	Specific Gravity and Density of Plastics by Displacement
D 882-83	Tensile Properties of Thin Plastic Sheeting
D 1004-66(1981)	Initial Tear Resistance of Plastic Film

D 1203-86	and Sheeting Volatile Loss From Plastics Using Activated Carbon Methods
D 1204-84	Linear Dimensional Changes of Non-Rigid Thermoplastic Sheeting or Film at Elevated Temperatures
D 1239-55(1982)	Resistance of Plastic Films to Extraction by Chemicals
D 1593-81	Poly (Vinyl Chloride) Resins
D 1790-83	Brittleness Temperature of Plastics Film by Impact
D 3083-76(1980)	Flexible Poly (Vinyl Chloride) Plastic Sheeting for Pond, Canal, and Reservoir Lining

9.2 GENERAL REQUIREMENTS:

9.2.1 **Sand Layer:** A 6 inch thick layer of sand will be placed over base course layer in accordance with paragraph 7, before liner is installed.

9.2.2 **SUBMITTALS:** Submittals shall be made in accordance with requirements of **SPECIAL CONTRACT REQUIREMENTS**, modified as indicated below.

9.2.3 **Material Certification:** Material certification shall be submitted stating that the material meets or exceeds requirements of paragraphs 9.3 and 9.4.

9.2.4 **Warranty:** Warranty shall be submitted, stating that leaks and defects of materials and workmanship in liner and joints shall be repaired or defective portions replaced on site with new material and work. Warranty shall extend for a 20 year period from date of GOVERNMENT acceptance or completed project.

9.2.5 **Material Safety Data Sheet:** The Contractor shall submit a 'Material Safety Data Sheet' to the COI for any chemical cleaners or adhesives to be used in the performance of this contract.

9.3 LINER:

9.3.1 **Material:** The liner shall be suitably formulated from homopolymer vinyl chloride resin of Type GP in accordance with ASTM D 1755, and compounded with suitable plasticizer, fillers, and additives to impart durability. A biocide shall be included in the material to provide resistance to biological degradation of the membrane. The membrane shall be compounded with carbon black and other ultraviolet stabilizers to provide resistance to ultraviolet degradation.

9.3.2 The carbon black shall be evenly dispersed to produce a uniform color. Water-soluble compounding ingredients shall not be employed.

9.3.3 The membrane shall be uniform throughout and shall be free from dirt, oil, foreign matter, scratches, cracks, creases, bubbles, pits, tears, holes, pinholes, or other defects which may affect the serviceability of the membrane.

9.3.4 The polyvinyl chloride (PVC) membrane lining shall be fabricated from a film width of not less than 58 inches.

9.3.5 The lap-seams shall be factory bonded using a liquid cement or commercially accepted dielectric sealing devices. Hot-air seaming methods shall not be used. Lap seams shall be used and have a 3/4-inch minimum lap and a 3/4-inch minimum electrode (die) width. The seams shall be water-tight and the strength of the bonded seam in either the machine (longitudinal) or transverse direction of the film shall not be less than 80 percent of the breaking strength of the film when tested in a similar direction, or shall tear the parent material when tested in peel adhesion.

9.3.6 The film shall be capable of being bonded to itself by liquid cement for making field splices and repairs. The contractor shall furnish the manufacturers recommended cement suitable for joining or repairing the larger pieces in the field. The cement shall not be affected by sun or water exposure and shall not produce any detrimental effect to the film.

9.3.7 Individual calendar widths of PVC shall be factory fabricated into large panels. The manufacturer of the calendered rolls shall show where a minimum of 2,000,000 square feet of its 76 inch wide material has been installed for lining hydraulic structures. Lap joints with a minimum joint width of 3/4 inch shall be used. Factory made splices shall have a strength of 80 percent of the specified sheet strength. After fabrication, the lining shall be accordion folded in both directions and packaged for minimum handling in the field. Shipping boxes shall be substantial enough to prevent damage to contents.

9.4 **PROPERTIES:** Physical properties of liner shall conform to Table, "Physical Properties". Liner samples shall be prepared for testing in accordance with ASTM D 618.

PHYSICAL PROPERTIES

<u>Property</u>	<u>Required Film Thickness (nominal) (40 mil)</u>	<u>ASTM Test Method</u>
1. Thickness, mils, minimum	36	D1593, para 8.1.3
2. Specific gravity, minimum	1.20	D 792, Method A
3. Tensile properties:		D 882
a. Breaking factor, each direction, minimum, lbs/in., width	80	
b. Elongation at break, each direction, minimum, percent	300	
<u>Property</u>	<u>Required Film Thickness (nominal) (40 mil)</u>	<u>ASTM Test Method</u>
c. Modulus at 100 percent elongation, each direction, minimum, lbs/in., width	30	
4. Bonded seam strength, tensile, each direction, minimum, percent of breaking factor	80	D 882
5. Bonded seam strength, peel adhesion	FTB	D 413
6. Tear resistance (Graves), each direction, minimum, (lbs min)	30	D 1004
7. Low temperature impact	Not more than 5 specimens out of 10 shall fail at -28.9 degrees C (-20 degrees F)	D 1790

8. Dimensional stability each direction, maximum, percent	5.0	D 1204, 15 minutes at 100 degrees C (212 degrees F)
9. Plastizer stability:		
a. Water extraction, maximum, percent weight loss	0.35	D 1239 Immersion in 50 degrees C (122 degrees F) distilled water for 24 hours
b. Volatile loss, maximum, percent	0.7	D 1203, Method A
c. Resistance to soil burial, increase in modulus at 100 percent elongation each direction, maximum, percent	10.0	D 3083, 30-day soil burial

9.5 INSTALLATION:

9.5.1 Preparation:

9.5.1.1 Surfaces to be capped shall be smooth and free from sharp rocks, other sharp objects, vegetation, and stubble in accordance with paragraph 7, when liner is placed.

9.5.1.2 Surfaces to receive liner shall be inspected by installer to determine whether there are defects present which might injure or impair its permanence or water-proofness.

9.5.1.3 Surfaces to receive liner shall be maintained in acceptable condition until liner installation is complete.

9.5.1.4 Lining installation shall begin only after certification referred to under paragraph 9.2.2 "Submittals", has been furnished to and approved by Contracting Officer.

9.5.2 **Field Engineer:** Lining manufacturer's field engineer or technical representative shall be present at all times during installation.

9.5.3 **Seams:** Field seams shall be 100 percent visually inspected by **CONTRACTOR** and lining manufacturer's technical representative. Seams shall also be tested with a air blast or vacuum suction box test to locate any defects that are present. All defects shall be repaired and retested prior to covering. Flexible membrane liners shall be constructed to ensure that the seams connecting FML panels are oriented parallel to the slope and not across the slope.

9.5.4 Connections to Metal: Metal to be in contact with membrane shall be fully sealed and bonded thereto, using trowel coat of compatible mastic over entire contact surface. A stainless steel clamp shall be placed around rubber boot at gas ventilation pipes.

9.5.5 PLACING LINING: The PVC lining shall be placed over the prepared surfaces to be capped in such a manner as to assure minimum handling.

9.5.5.1 Fittings: The lining shall be closely fitted and sealed around inlets, outlets, and other projections through the lining.

9.5.5.2 Damage: Lining damaged during installation shall be replaced or repaired by using an additional piece of lining.

9.5.5.3 Field Joints: Lap joints shall be used to seal factory-fabricated panels of PVC together in the field. Panels shall be oriented on the slope to ensure that seams connecting FML panels are oriented parallel to the slope. Lap joints shall be formed by lapping the edges of panel, a minimum of 4 inches. The contact surfaces of the panels shall be wiped clean to remove all dirt, dust or other foreign materials. Sufficient cold-applied vinyl-to-vinyl bonding adhesive shall be applied to the contact surfaces in the joint area, and the two surfaces pressed together immediately. Wrinkles shall be smoothed out. Field splices shall have a strength of 80 percent of the specified sheet strength. A minimum of one test per field splice shall be performed to ensure that the minimum specified strength is attained. Results of field splice tests shall be submitted to the Contracting Officer.

9.5.5.4 Joints to Structures: Curing compounds and coatings shall be completely removed from the joint area. Joining of PVC to concrete shall be made with vinyl-to-vinyl concrete adhesive and mechanically fastened. Unless otherwise shown on drawings, the minimum width of concrete to PVC joint shall be 8 inches.

9.5.5.5 Repairs to PVC: Any necessary repairs to PVC shall be patched with the lining material itself and cold applied vinyl-to-vinyl splicing adhesive. The splicing adhesive shall be applied to the contact surfaces of both the patch and lining to be repaired, and the two surfaces pressed together immediately. Wrinkles shall be smoothed out.

9.5.5.6 Quality of Workmanship: Completed joints shall be tightly bonded. Lining injury from scuffing, penetration by foreign objects, and distress from rough subgrade shall be replaced or covered and sealed with an additional layer of PVC of the proper size. A technical service representative of the lining manufacturer shall instruct CONTRACTOR'S personnel in correct methods for handling and installing liner.

9.5.5.7 ANCHORAGE: Immediately following liner installation, cloth bags filled with sand shall be placed over it. Bags shall be placed as required to prevent liner from billowing in wind. Bags shall remain until sand layer is placed over liner. Sand will be provided and placed over membrane as specified in paragraph 10. Liner shall not be left exposed to the atmosphere without protection of the sand layer for more than 48 hours.

9.5.6 SPECIAL EDGES: Along Phase III match line and Phase IVA match line, the liner edge shall be seamed to the existing liner in accordance with the manufacturer's recommendations. Along the South and West edges the liner shall be locked in place as shown in Appendix, drawing #3, Liner/Membrane Anchor Trench.

10. TOP CUSHION LAYER: After installation and acceptance of the flexible membrane liner, a minimum of 6 inches of clean sand as defined in paragraph 7 "Lower Cushion Layer", shall be spread on top of the liner to serve as a cushion and buffer to protect the liner. This layer will be uncompacted and in addition to being a buffer shall act as a filter/drainage layer, see Appendix, drawing #4 for general configuration of layers.

11. TOPSOIL LAYER: The topsoil shall be obtained from off-site sources by the contractor. Topsoil shall be certified as free of hazardous materials as defined by State and Federal Hazardous Material regulations. The topsoil shall be a fertile, friable, loam consisting of a mixture of clean sand, silt and clay containing between 7 and 25% organic matter (determined by ignition) and exhibiting sandy and clayey properties in equal proportions. The topsoil will be uniform in materials and texture, free from subsoil, clay lumps, sod, woodchips, stumps, roots, stones larger than 1 1/2 inches in any dimension, glass fragments, bottles, cans, metal, construction debris, other foreign materials and materials toxic to grass.

11.1 Topsoil shall not be placed when subgrade or topsoil are frozen, excessively dry or excessively wet. The topsoil shall be spread uniformly over the sand buffer/drainage layer to depth that when compacted will provide a minimum 12 inches of topsoil and will bring the final lawn and grass surfaces to required finished elevation of the cap. The surface of the areas to be turfed shall be rolled and finished to provide a firm base for subsequent operations and produce a surface suitable for the application of turf materials and the establishment of turf.

11.2 Soil Amendments: Limestone and fertilizer -

11.2.1 Limestone: Ground or pelletized agricultural limestone shall be spread in a uniform application using approved mechanical spreader, over the surface to be seeded, at a rate which will result in pH of 6.5 for the top 3 inches of soil.

11.2.2 Fertilizer: Fertilizer shall be a complete commercial product, uniform, dry and free flowing. Fertilizer shall consist of the following analysis of nutrients by weight.

Nitrogen	10%
Phosphoric Acid (P2O2)	10%
Water Soluble Potash (K2O)	10%

11.2.2.1 Fertilizer shall be spread in a uniform application using approved mechanical spreader, over the entire area to be seeded, at the rate of 800 lbs per acre.

11.2.3 After application the lime and fertilizer shall be incorporated into the top 3 inches of soil by disking, harrowing or other approved means. The surface shall then be leveled to remove ruts, mounds, ridges or pockets and low spots where water can collect and any other faults observed, leaving a plane and uniform surface in preparation of seeding.

12. VEGETATIVE COVER:

12.1 Seed Characteristics: Grass seed shall be of previous year's crop with not more than 0.5 percent weed seed, and not more than 1.75 percent non-crop seed, by weight. Seed shall be delivered to site in sealed containers, labeled with name of seed grower and seed formula. Seed shall be dry and free of mold. Seed shall be certified as meeting the following requirements:

<u>Name of Seed</u>	<u>Percent by Weight in Mixture</u>	<u>Minimum Percent Purity</u>	<u>Minimum Percent Germination</u>
Festuca elatior Kentucky "31" Tall Fescue	65	97	90
Trifolium repens White Clover	20	85	80
Lolium multiflorum Annual Ryegrass	15	95	90

12.1.1 Seed shall be spread with approved mechanical spreader to give uniform application by making two equal applications. The direction of the spreader travel for the second pass shall be perpendicular to the first pass. Seed shall be applied at the rate of 150 lbs per acre.

12.1.2 Seeding shall not be done when its raining or snowing or when wind velocity exceeds 5 MPH.

12.1.3 Following seeding, area shall be lightly raked or dragged to mingle seed with top 1/8 to 1/4 inch of soil. Areas shall then be smoothed, stones and other debris larger than 1-1/2 inches in any dimension and which are visible on surface shall be removed, and surface shall be rolled with a roller having weight of 60 to 90 pounds per foot of width and diameter equal to or larger than 2 feet.

12.2 **Hydro-Seeding:** At **CONTRACTOR'S** option, seed may be spread by hydroseeding method, utilizing power equipment commonly used for that purpose. Seed, lime fertilizer, and mulch shall be mixed and applied to achieve application quantities specified herein for conventional seeding method, with mulch applied at rate of 1,200 pounds per acre. Material shall be applied in two equal applications, with equipment during second pass moving perpendicular to direction employed during first pass. Other provisions specified above for conventional seeding shall apply also to hydroseeding.

12.3 **SODDING:**

12.3.1 **Sod:** Sod may be employed at **CONTRACTOR'S** option in lieu of conventional lawn and grass construction specified.

12.3.2 **Cutting and Delivery:** After Contracting Officer or designated representative's inspection and approval of sod source, sod shall be cut into square or rectangular sections, retaining sufficient native soil on roots for protection and continued viability of grass. Sod shall be kept moist during delivery and while in stacks, and shall be protected from exposure to wind, sun and freezing. Sod shall be cut and moved only when soil moisture conditions are favorable to successful planting. Sections of sod may vary in length but shall be equal in width and not larger than will permit lifting and handling without breaking. Sod shall not be dumped from vehicles. If necessary, ground shall be watered to optimum moisture content before sod is cut. Damaged sod will be rejected.

12.3.3 **Placing:** Edges of sodded areas shall be smooth, and sodded areas shall conform to design cross sections and grade. At edges adjacent to curbs, paved areas, etc., top surface of earth in sod shall be 1/2 inch below adjacent hard surface.

12.3.4 Surface of completed sodded area shall be smooth. Sod shall be laid edge-to-edge, with tight-butted, staggered joints. Immediately after laying, sod shall be pressed firmly into contact with sod bed by tamping or rolling, to eliminate air pockets. Following compaction, screened topsoil of good quality shall be used to fill cracks, and excess soil shall be worked into grass with rakes or other suitable equipment. Grass shall not be smothered with excess fill soil.

12.3.5 On slopes steeper than 3 to 1, sod shall be held securely in place by fastening lines of sod with wooden stakes. The stakes shall be not less than 12 inches in length, and they shall be spaced 3 feet apart and driven flush with the surface of the sod. Other methods of fastening sod to slopes may be used where staking is not practical upon approval by the Contracting Officer's Representative.

12.3.6 Immediately after sodding operations have been completed, entire surface shall be compacted with culti-packer roller or other approved equipment weighing 100 to 160 pounds per foot of roller.

12.3.7 Completed sod shall immediately be watered sufficiently, to uniformly wet soil at least to the bottom of the sod.

12.4 Planting Periods: Planting shall be done only within following periods:

Item	Spring	Fall
Seed	April 15 to May 15	August 20 to October 1
Sod	April 15 to July 1	August 20 to October 15

13. MAINTENANCE:

13.1 Operations: Except as otherwise specified below, maintenance shall include all operations required to produce an established lawn, including but not limited to:

Mowing	Watering
Replanting	Lime and Fertilizing
Resodding	

13.2 Timing:

13.2.1 Maintenance of lawn and grass areas shall begin upon completion of seeding or sodding.

13.2.2 Maintenance shall continue until completion of extended maintenance period as specified in paragraph 14: **EXTENDED MAINTENANCE.**

13.3 Repairs:

13.3.1 After grass has sprouted, areas which fail to show uniform stand of grass shall be replanted as often as necessary to establish acceptable stand of grass.

13.3.2 Scattered bare spots shall not exceed 72 square inches each.

13.3.3 Scattered bare spots not exceeding total of 15 percent of areas sown with seed will be acceptable without reseeding required.

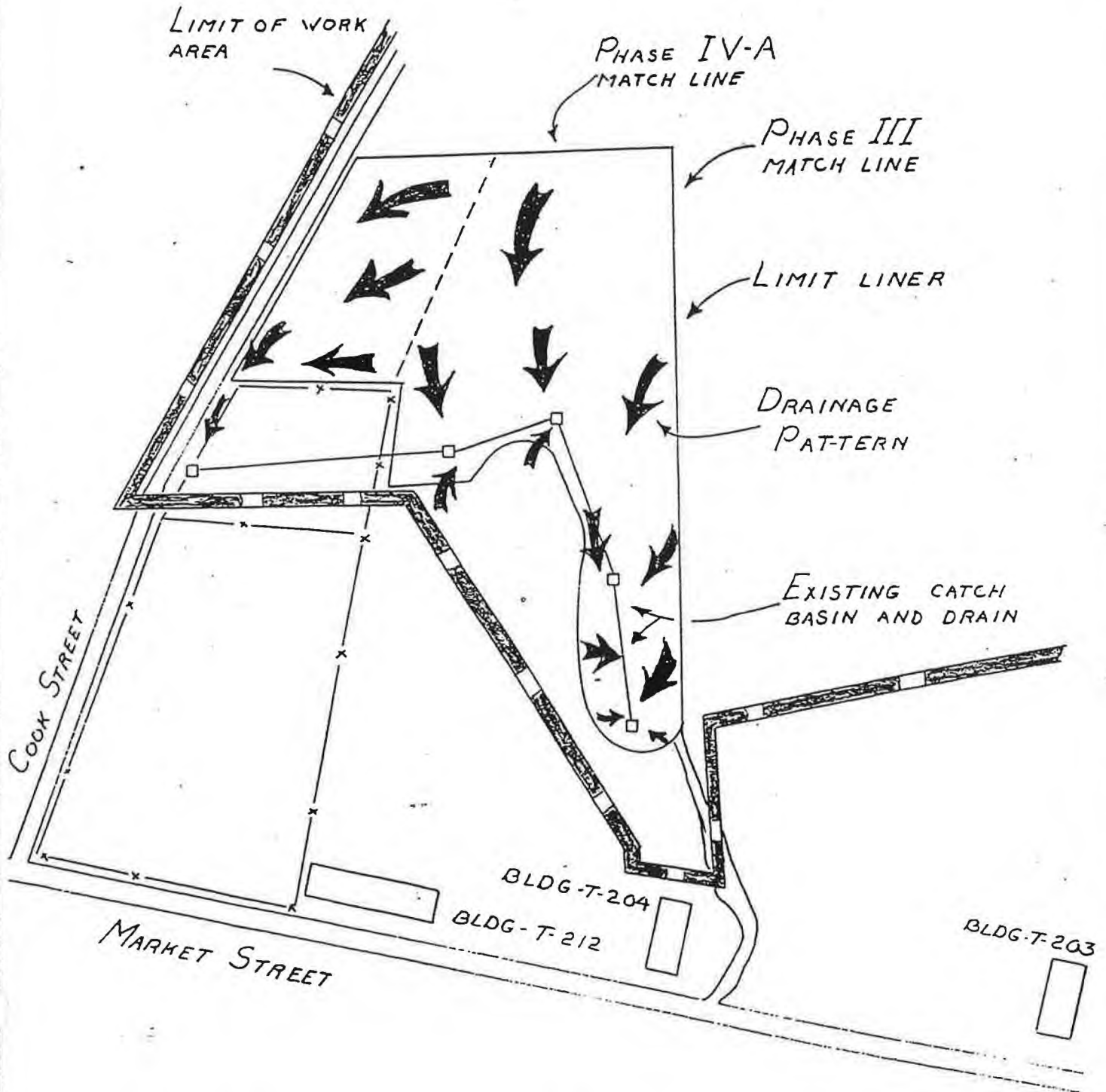
13.4 **Mowing:** First mowing shall be done when average height of grass is 2-1/2 inches, with mower set to cut at height of 2 inches. Subsequent mowings shall be made at intervals not greater than two weeks, with height of cut set at 2 inches. With Contracting Officer's prior permission, mowings during periods of slow dormancy may be spaced at greater intervals.

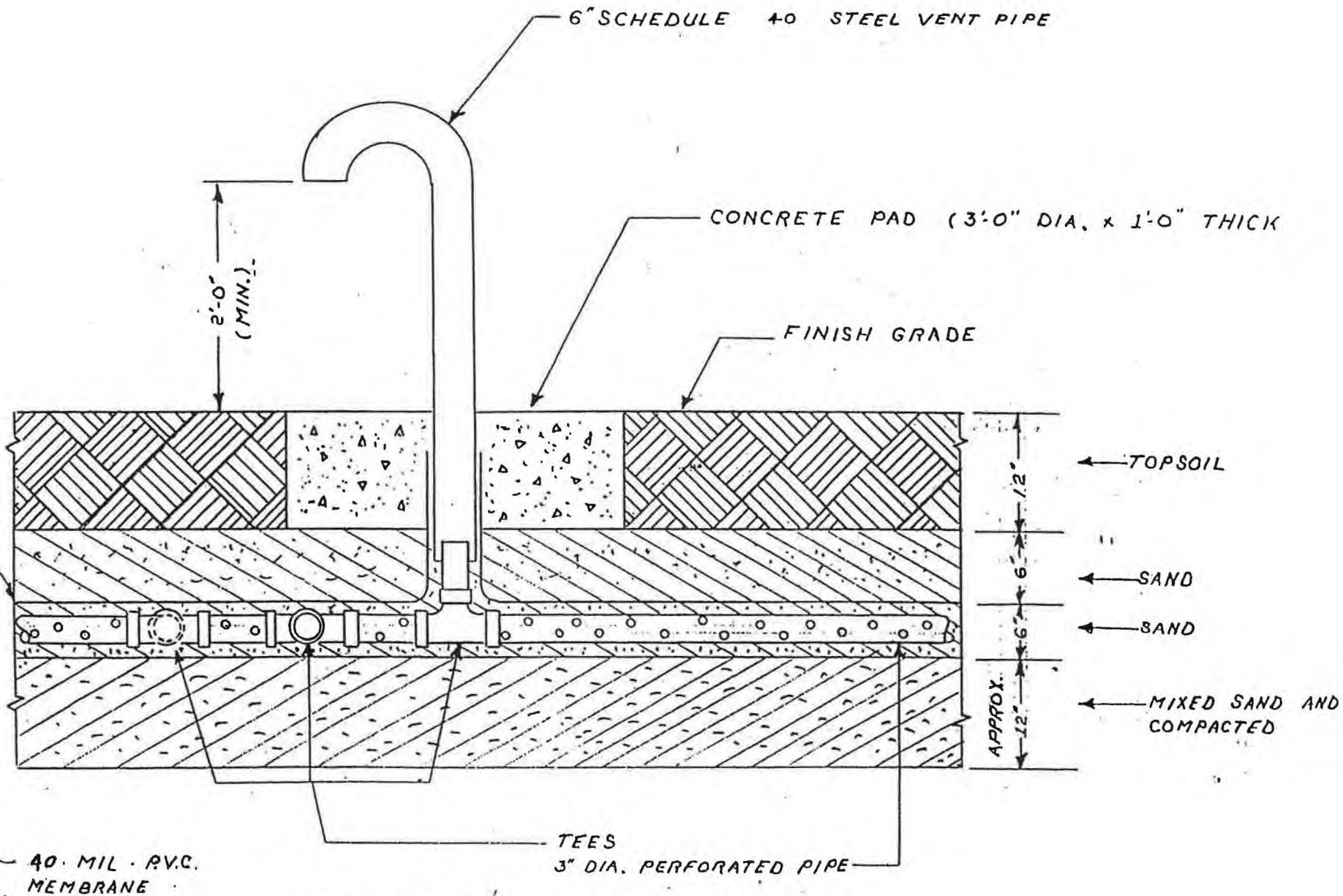
13.5 **Lime and Fertilizer:** If lawn or grass is established in fall and maintenance is required to continue into spring months, a standard agriculture soil test will be made and the grassed area shall receive application of lime and fertilizer. Lime and fertilizer shall be spread in uniform layer over entire lawn surface. Lime shall be applied at a rate which will achieve a soil pH of 6.5. Fertilizer with an analysis of 10-10-10 shall be applied at the rate which will result in 80 lbs of nitrogen per acre.

14. **EXTENDED MAINTENANCE:** The **CONTRACTOR** shall maintain grass for one complete growing season, April 15 through October 15, following contract completion date. Extended maintenance operations shall conform to paragraph 13: **MAINTENANCE**.

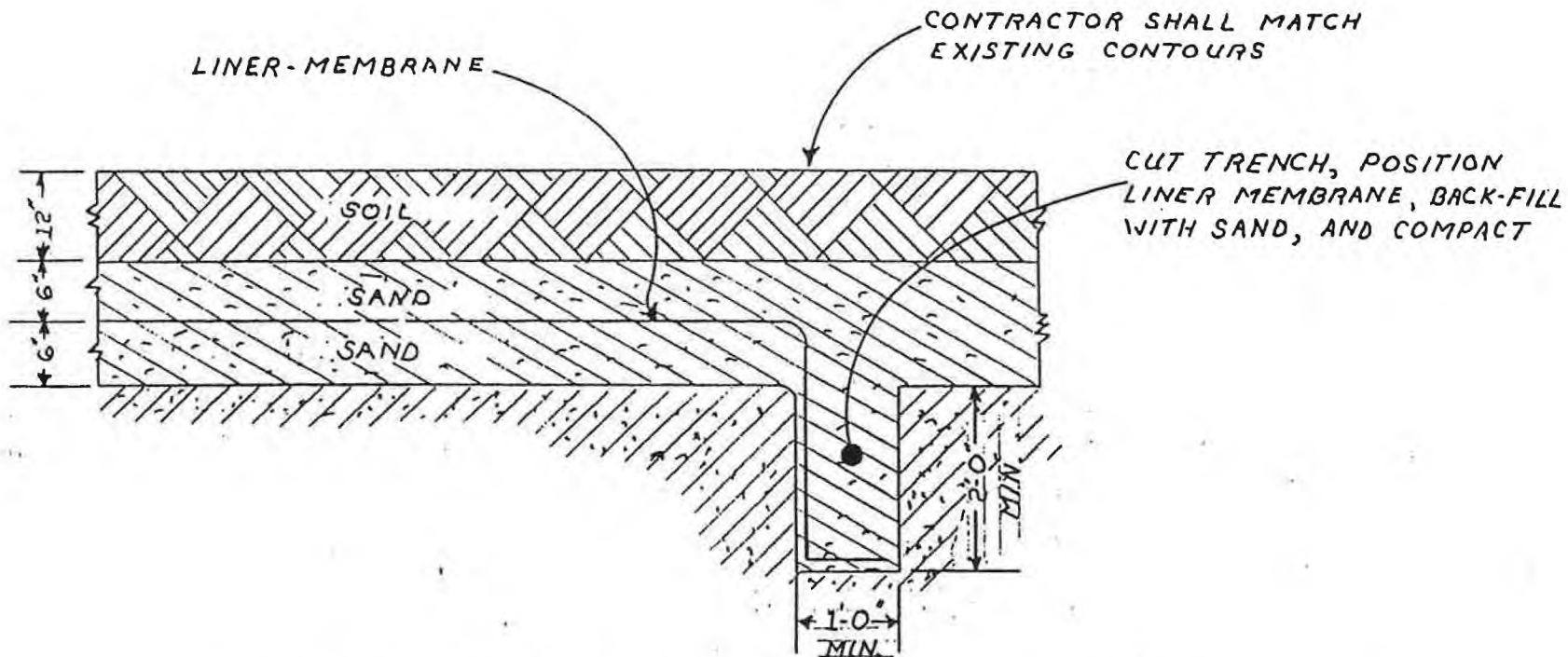
14.1 **Erosion Protection:** Lawn and grass areas will be protected against erosion until acceptance of completed turf. Eroded areas shall be repaired with acceptable fill material and re-seeded. If grass area cannot be established by seeding, sod will be used.

FORT DEVENS LANDFILL CLOSURE PHASE IV-B





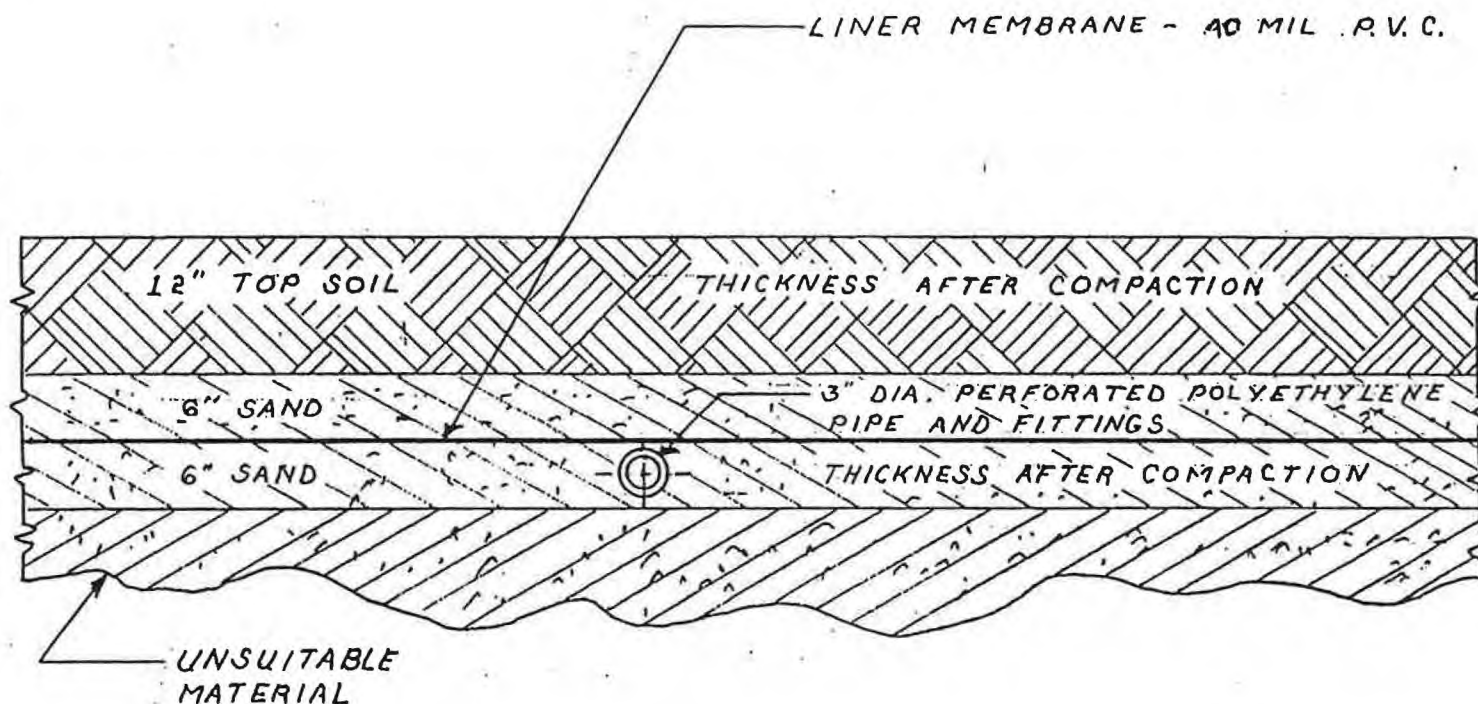
GAS VENT DETAIL



LINER-MEMBRANE ~ ANCHOR TRENCH

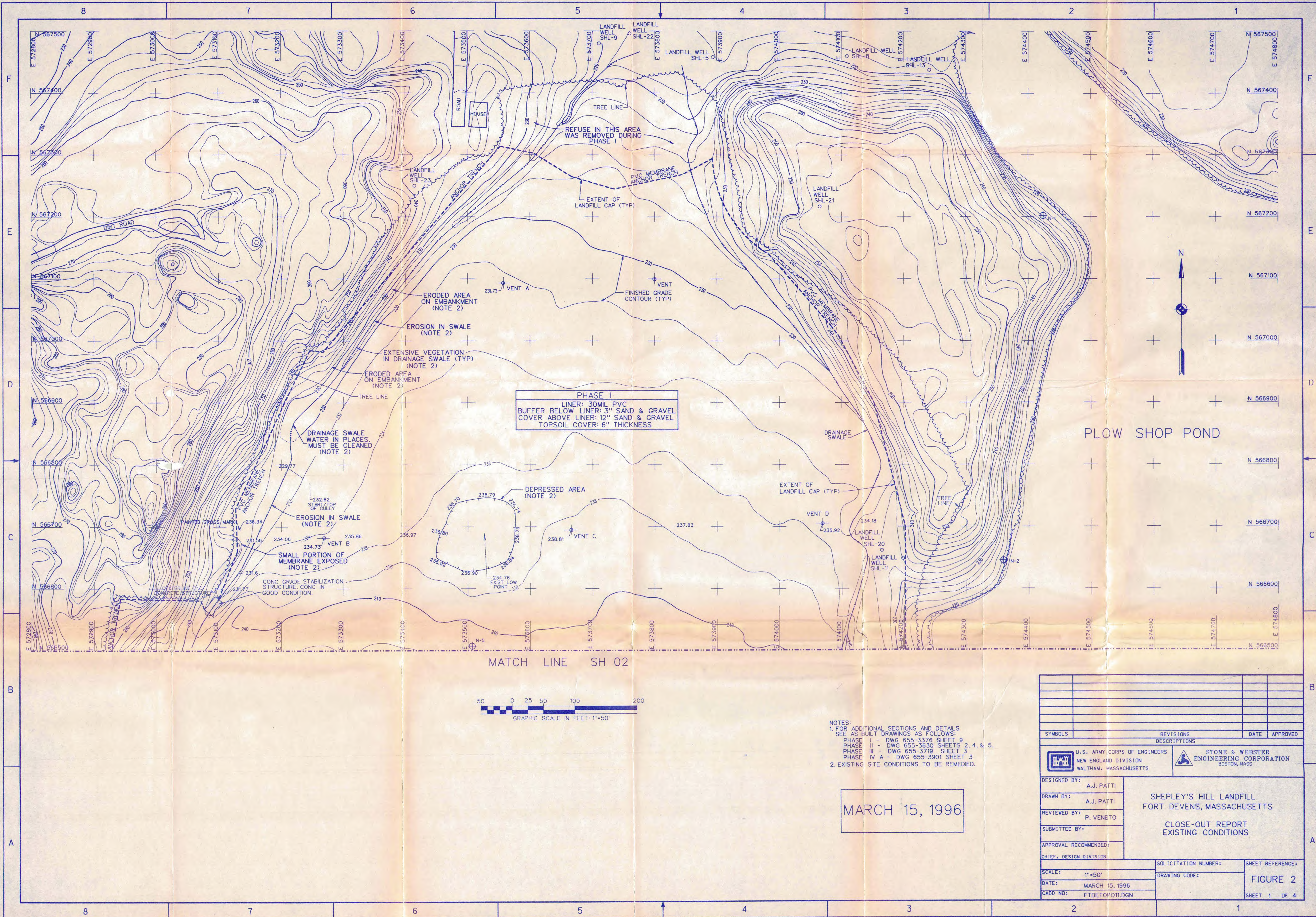
NOTE

THE ANCHOR TRENCH SHALL BE INSTALLED AT THE OUTER LIMITS OF THE NEW LANDFILL CAP, EXCEPT WHERE THE NEW LANDFILL CAP MEETS THE EXISTING CAP AT PHASE-III AND PHASE-IV-A

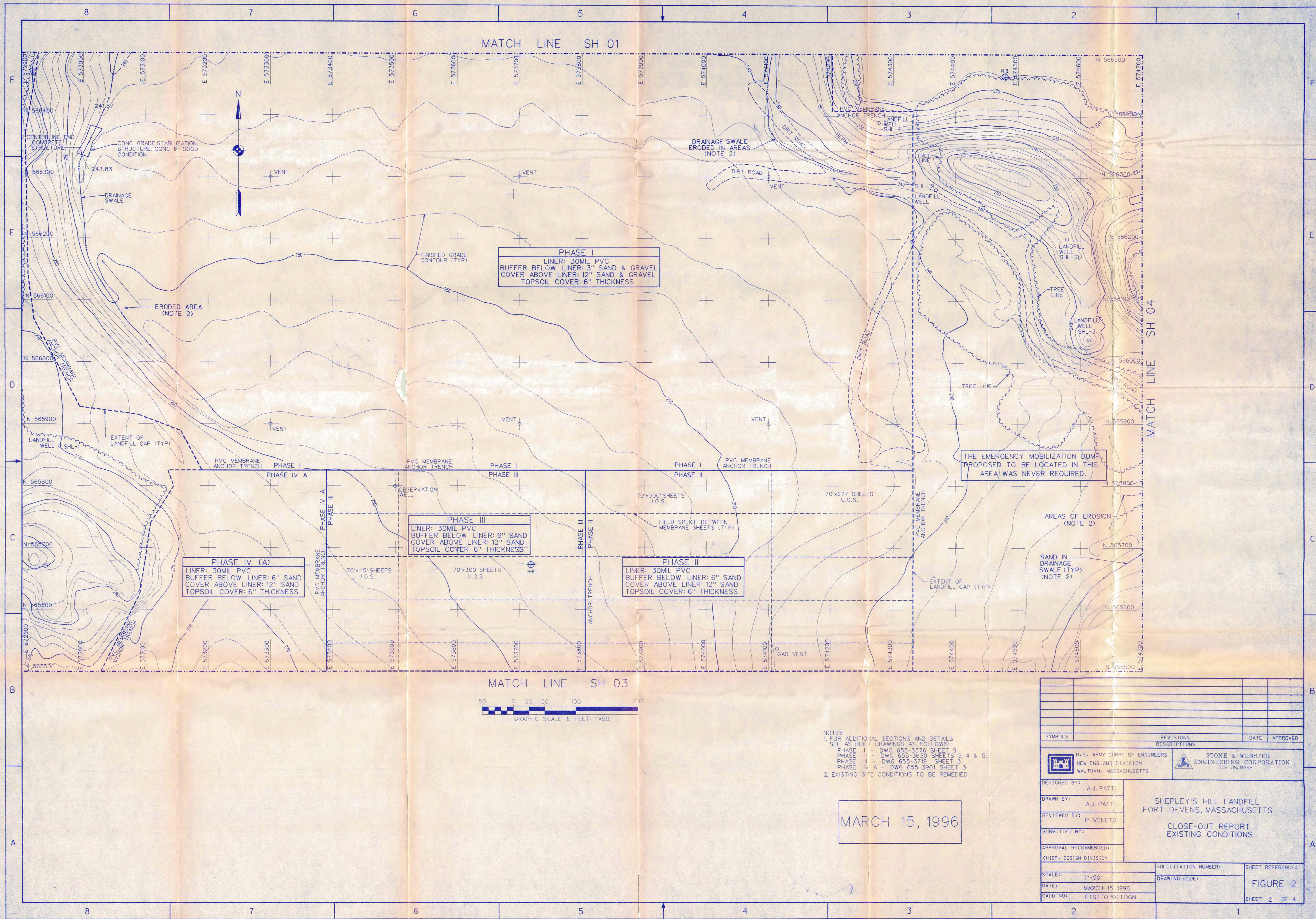


LANDFILL CAP SECTION

PHOTOGRAPHS



SYMBOLS		REVISIONS		DATE	APPROVED
DESCRIPTIONS					
U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION WALTHAM, MASSACHUSETTS					
STONE & WEBSTER ENGINEERING CORPORATION BOSTON, MASS					
DESIGNED BY:	A.J. PATTI				
DRAWN BY:	A.J. PATTI				
REVIEWED BY:	P. VENETO				
SUBMITTED BY:					
APPROVAL RECOMMENDED:					
CHIEF, DESIGN DIVISION					
SOLICITATION NUMBER:		SHEET REFERENCE:			
SCALE: 1"=50'		DRAWING CODE:		FIGURE 2	
DATE: MARCH 15, 1996					
CADD NO: FTDET0P011.DGN				SHEET 1 OF 4	



PHASE I
LINER: 30MIL PVC
BUFFER BELOW LINER: 3" SAND & GRAVEL
COVER ABOVE LINER: 12" SAND & GRAVEL
TOPSOIL COVER: 6" THICKNESS

PHASE III
LINER: 30MIL PVC
BUFFER BELOW LINER: 6" SAND
COVER ABOVE LINER: 12" SAND
TOPSOIL COVER: 6" THICKNESS

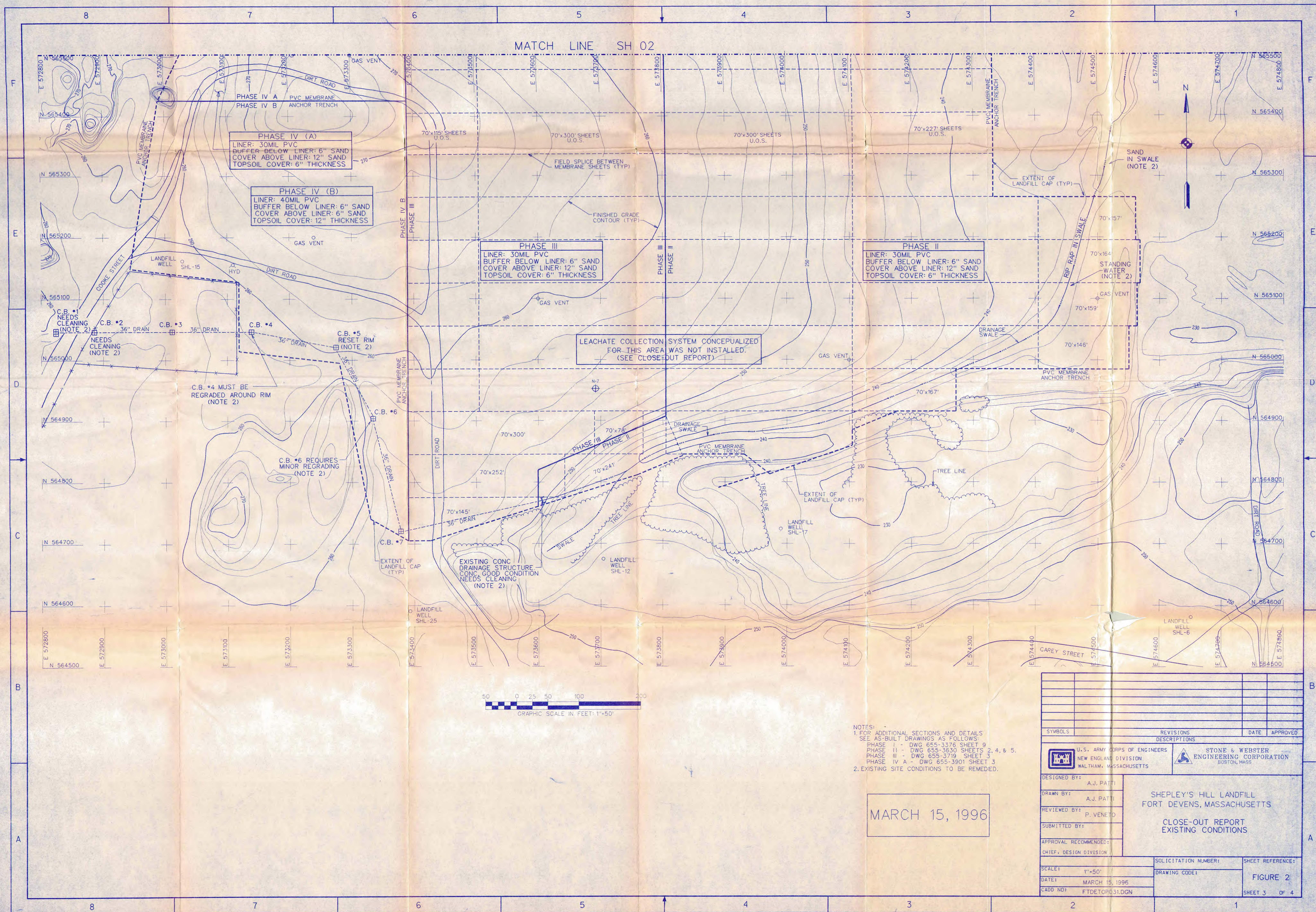
PHASE II
LINER: 30MIL PVC
BUFFER BELOW LINER: 6" SAND
COVER ABOVE LINER: 12" SAND
TOPSOIL COVER: 6" THICKNESS

PHASE IV (A)
LINER: 30MIL PVC
BUFFER BELOW LINER: 6" SAND
COVER ABOVE LINER: 12" SAND
TOPSOIL COVER: 6" THICKNESS

NOTES:
1. FOR ADDITIONAL SECTIONS AND DETAILS
SEE AS-BUILT DRAWINGS AS FOLLOWS:
PHASE I - DWG 655-3376 SHEET 9
PHASE II - DWG 655-3630 SHEETS 2, 4, & 5
PHASE III - DWG 655-3719 SHEET 3
PHASE IV A - DWG 655-3901 SHEET 3
2. EXISTING SITE CONDITIONS TO BE REMEDIED.

MARCH 15, 1996



SYMBOLS		REVISIONS		DATE	APPROVED
DESCRIPTIONS					
U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION WALTHAM, MASSACHUSETTS					
STONE & WEBSTER ENGINEERING CORPORATION BOSTON, MASS					
DESIGNED BY:	A.J. PATTI				
DRAWN BY:	A.J. PATTI				
REVIEWED BY:	P. VENETO				
SUBMITTED BY:					
APPROVAL RECOMMENDED:	CHIEF, DESIGN DIVISION				
SCALE:	1"=50'		SOLICITATION NUMBER:	SHEET REFERENCE:	
DATE:	MARCH 15, 1996		DRAWING CODE:	FIGURE 2	
CADD NO:	FTDET0021.DGN		SHEET 2 OF 4		

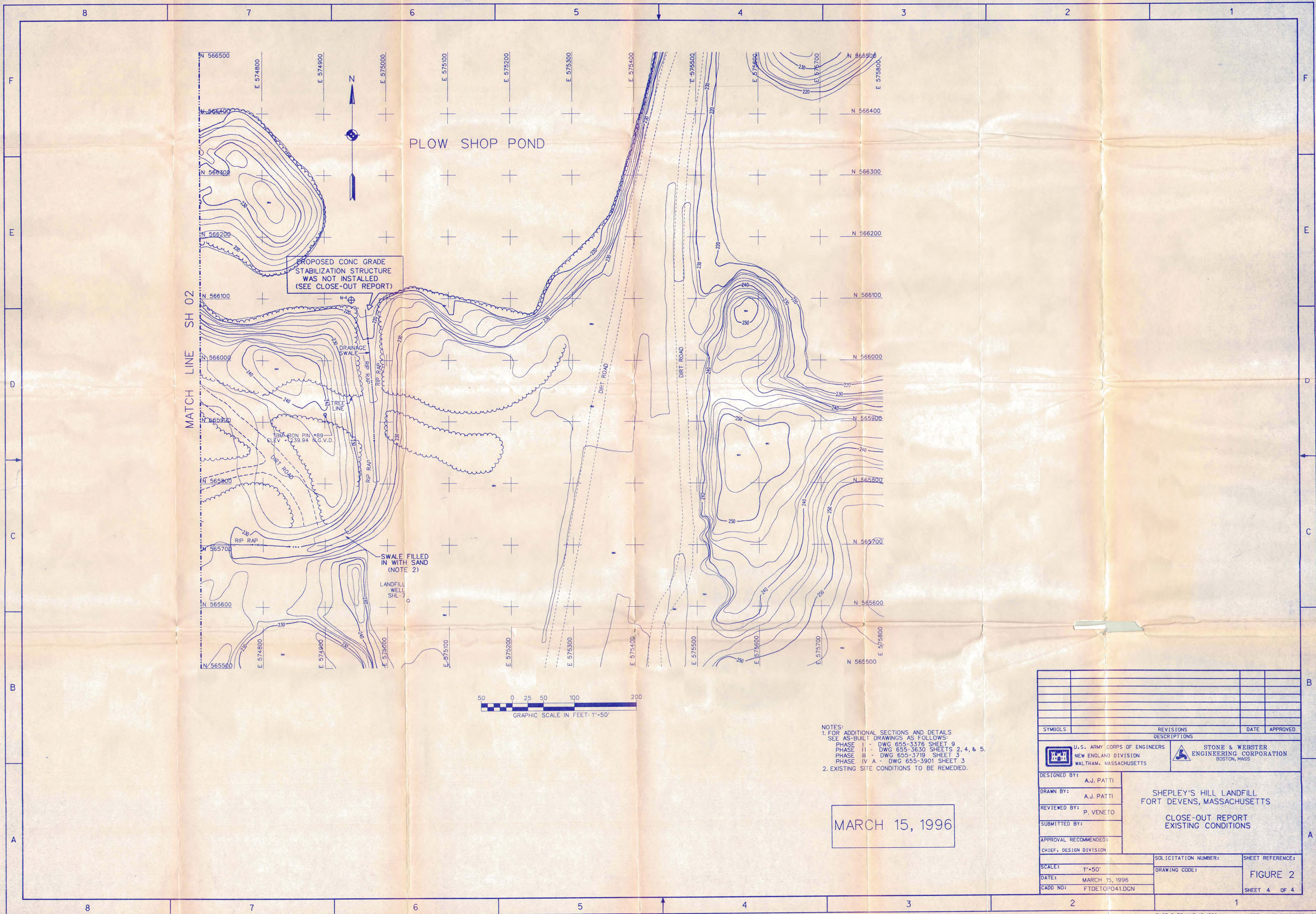


NOTES:

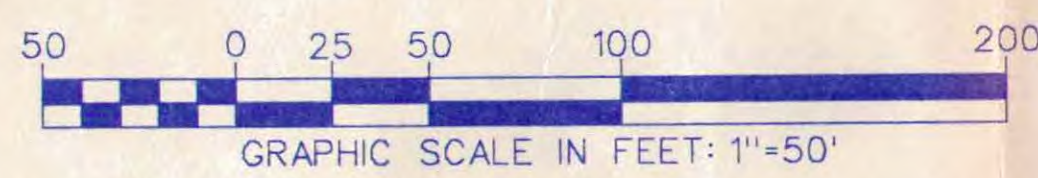
1. FOR ADDITIONAL SECTIONS AND DETAILS
SEE AS-BUILT DRAWINGS AS FOLLOWS:
PHASE I - DWG 655-3376 SHEET 9
PHASE II - DWG 655-3630 SHEETS 2, 4, & 5.
PHASE III - DWG 655-3719 SHEET 3
PHASE IV A - DWG 655-3901 SHEET 3
2. EXISTING SITE CONDITIONS TO BE REMEDIATED.

MARCH 15, 1996

SYMBOLS		REVISIONS		DATE	APPROVED
DESCRIPTIONS					
		U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION WALTHAM, MASSACHUSETTS		 STONE & WEBSTER ENGINEERING CORPORATION BOSTON, MASS	
DESIGNED BY:		SHEPLEY'S HILL LANDFILL FORT DEVENS, MASSACHUSETTS CLOSE-OUT REPORT EXISTING CONDITIONS			
A.J. PATTI					
DRAWN BY:					
A.J. PATTI					
REVIEWED BY:					
P. VENETO					
SUBMITTED BY:					
APPROVAL RECOMMENDED:					
CHIEF, DESIGN DIVISION					
SCALE:		SOLICITATION NUMBER:		SHEET REFERENCE:	
1"=50'		DRAWING CODE:		FIGURE 2	
DATE:		MARCH 15, 1996		SHEET 3 OF 4	
CADD NO:		FTDETOPG31.DGN			



PROPOSED CONC GRADE
STABILIZATION STRUCTURE
WAS NOT INSTALLED
(SEE CLOSE-OUT REPORT)



- NOTES:
1. FOR ADDITIONAL SECTIONS AND DETAILS
SEE AS-BUILT DRAWINGS AS FOLLOWS:
PHASE I - DWG 655-3376 SHEET 9
PHASE II - DWG 655-3630 SHEETS 2, 4, & 5.
PHASE III - DWG 655-3719 SHEET 3
PHASE IV A - DWG 655-3901 SHEET 3
2. EXISTING SITE CONDITIONS TO BE REMEDIED.

MARCH 15, 1996

SYMBOLS		REVISIONS		DATE		APPROVED	
DESCRIPTIONS		DESCRIPTIONS		DATE		APPROVED	
U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION WALTHAM, MASSACHUSETTS		STONE & WEBSTER ENGINEERING CORPORATION BOSTON, MASS					
DESIGNED BY: A.J. PATTI		SHEPLEY'S HILL LANDFILL FORT DEVENS, MASSACHUSETTS					
DRAWN BY: A.J. PATTI		CLOSE-OUT REPORT EXISTING CONDITIONS					
REVIEWED BY: P. VENETO							
SUBMITTED BY:							
APPROVAL RECOMMENDED: CHIEF, DESIGN DIVISION							
SCALE: 1"=50'		SOLICITATION NUMBER:		SHEET REFERENCE:			
DATE: MARCH 15, 1996		DRAWING CODE:		FIGURE 2			
CADD NO: FTDETOPO41.DGN				SHEET 4 OF 4			