Southwest Closure Area
Construction Report
Hidden Valley Landfill
Pierce County, Washington

Prepared for

Land Recovery Inc.

December 31, 1992

Prepared by

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Project 0202-001.51

Construction Report
Southwest Closure
Hidden Valley Landfill

The engineering material and data contained in this report were prepared under the supervision and direction of the undersigned, whose seal as a registered professional engineer is affixed below.

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EXECUTIVE SUMMARY

Closure of the southwest portion of the Hidden Valley Landfill in Pierce County, Washington, was constructed between June 1992 and September 1992.

The closure construction described in this report was performed to close 26 acres of the southwest area at the Hidden Valley Landfill in compliance with WAC 173-304-460(3)(E), Minimal Functional Standards (MFS). The final closure was completed using a 60-mil very low density polyethylene geomembrane as the primary infiltration barrier of precipitation into the waste.

A construction quality assurance (CQA) program was established to document that construction was in accordance with the contract documents. The CQA program included full-time construction monitoring and field engineering services, along with laboratory materials testing. The monitors and engineers were employed to observe construction, coordinate testing, and provide design clarification during the work and assure construction was completed in general accordance with the design intent.

This report includes descriptions of the CQA program, construction techniques, modifications made during construction, and materials testing results. This report documents that the southwest closure at the Hidden Valley Landfill was constructed in accordance with the design intent.

1 INTRODUCTION

1.1 Introduction

This report summarizes the landfill closure of the southwest closure area at the Hidden Valley Landfill. The closure was performed in accordance with the Memorandum of Agreement (MOA) between the Tacoma Pierce County Health Department (TPCHD) and Land Recovery Inc. (LRI)(1986), Consent Decree with the Department of Ecology, Area 2 on Exhibit B, and the Minimum Functional Standards (MFS) for solid waste handling (WAC 173-304-460-[3][e]. The area closed extended over a greater area than required by the MOA.

The Hidden Valley Landfill is located approximately five miles south of the City of Puyallup on the east side of South Meridian Street (State Route 161) in Pierce County, Washington (see Figure 1).

The southwest closure area covers approximately 26.2 acres of the landfill as shown on Drawing 1, Final Grading Plan, which is included at the end of this report. The closure joined an existing closure on the north side of the landfill, extended to the limits of the east liner area on the east side, and to the limit of municipal solid waste (MSW) on the west and south sides.

This report includes the following:

- Project Description
- Construction Personnel Organization
- Construction Details
- Quality Assurance Function
- Summary of Modifications Made During Construction
- As-Built Documentation and Quality Assurance Data Summaries

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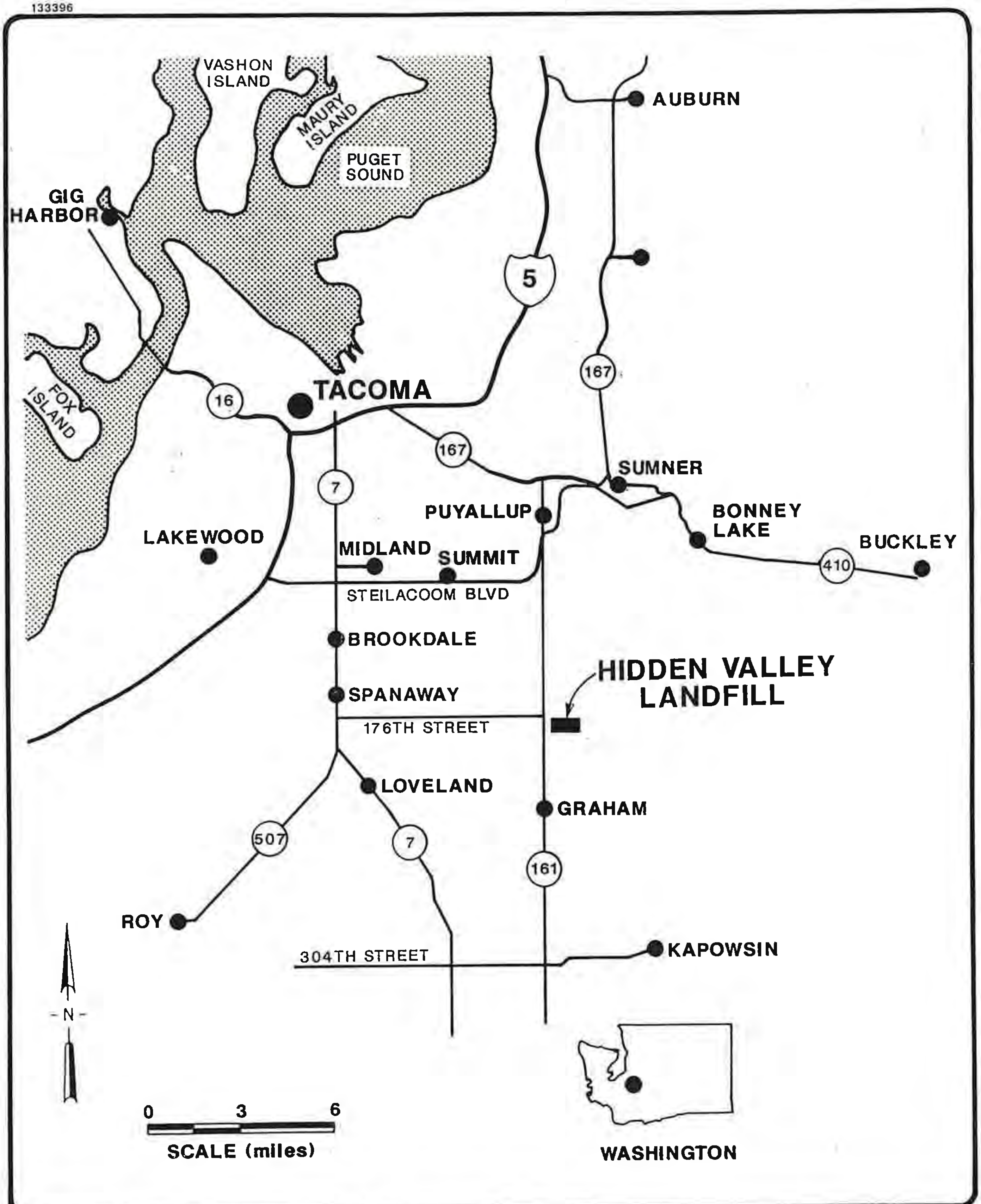

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Figure 1
HIDDEN VALLEY LANDFILL
SOUTHWEST CLOSURE
CONSTRUCTION REPORT
LOCATION MAP

2 PROJECT DESCRIPTION

2.1 Site Description

The Hidden Valley Landfill is an active municipal solid waste landfill in Pierce County. The site lies in the northern one-half, northwest quarter, Section 34, Township 19 North, Range 4 East, of the Frederickson Quadrangle. It is bordered on the west by the Paul Bunyan rifle range, and on the north by the proposed development of the 176th Street East and the Thun Field-Pierce County Airport. To the south and east, Puyallup Sand and Gravel Company owns and operates a gravel processing operation. These area's are shown in Figure 2, Site Vicinity Map. The site has been in operation since the mid 1960's, and it currently receives approximately 1,100 tons of refuse per day.

2.2 Reference Documents

The reference documents listed below provide background for the southwest closure construction. These documents are available on request from the owner and provide information relevant to the design, operation, and construction of the Hidden Valley Landfill.

- Predesign Report for Land Recovery, Inc., Hidden Valley Landfill Southwest Closure, prepared by EMCON Northwest, Inc., April 1992.

- Work plan for Southwest Closure Construction, Hidden Valley Landfill, Pierce County, Washington, prepared by EMCON Northwest, Inc., June 1992.

- Project Manual for Land Recovery Inc., Hidden Valley Landfill Southwest Closure Geosynthetics Installation, prepared by EMCON Northwest, Inc., June 1992.

- Hidden Valley Landfill Southwest Closure Final Design Drawings, prepared by EMCON Northwest, Inc., June 1992.

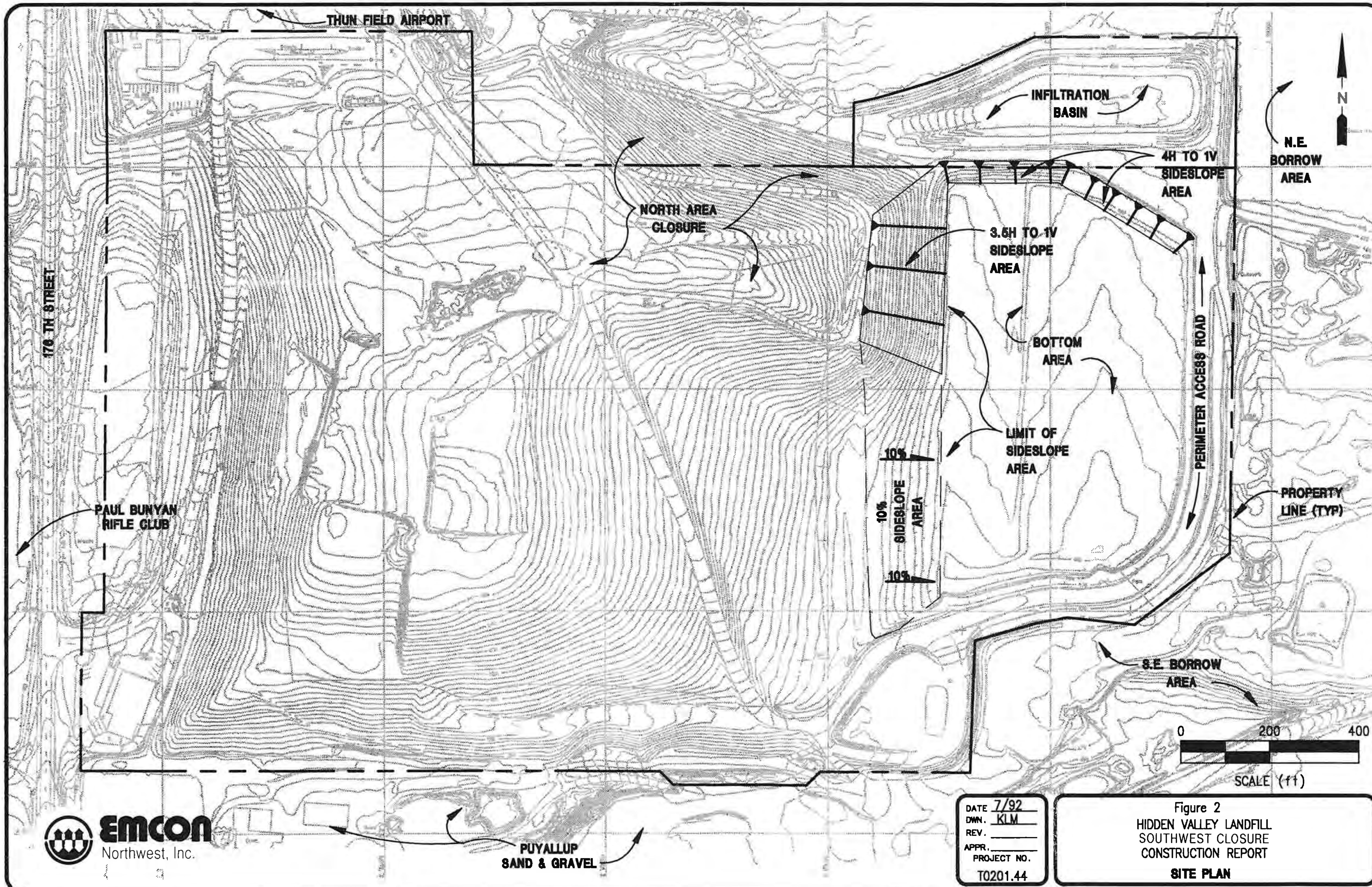

Figure 2
HIDDEN VALLEY LANDFILL
SOUTHWEST CLOSURE
CONSTRUCTION REPORT
SITE PLAN

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- Hidden Valley Operations Plan, prepared by EMCON Northwest, March 1990.

- Hidden Valley Landfill Post 1991 Master Plan, prepared by EMCON Northwest, Inc., March 1992.

3 CONSTRUCTION PERSONNEL ORGANIZATION

This section of the report includes a description of the parties responsible for the southwest closure construction.

There were six primary parties: the owner, Land Recovery, Inc.; the engineer, EMCON Northwest, Inc.; the contractors, Serrot Corporation, Inc., E.J. Rody & Son's Inc., Puyallup Sand and Gravel; and the project surveyor, D.A. Berg, PLS. For the purpose of this report we will refer to the parties as owner, engineer, contractors, and surveyor.

The owner was the primary party, responsible for the landfill development, including funding of the project. EMCON provided a resident project representative to assistant LRI's management of the project. EMCON provided recommendations to LRI regarding construction techniques and scheduling.

The engineer was the project designer, providing design engineering, resident engineering, and construction quality assurance services. EMCON contracted with other consultants to provide soils and geosynthetic laboratory testing.

The contractors were retained under contract directly with the owner to perform the work described in their respective construction project manuals. Specific work elements performed by the contractors included HDPE piping installation and all geosynthetics installation.

4 CONSTRUCTION DETAILS

4.1 General Closure Description

Closure construction was performed to mitigate impact to ground water by elimination of surface water infiltration into the landfill and to prevent off-site migration of landfill gases.

To perform the mitigating construction, the landfill was covered with a relatively impermeable cover system, surface water drainage systems were constructed and gas collection and transmission systems were installed. Work on the project began in June 1992 and was completed in September 1992.

The construction details and general installation techniques are described in the following paragraphs.

4.2 Final Grading

The purpose of final grading was to cover exposed refuse and place earthfill to construct final cover subgrade. To meet this requirement, prior to final grading, the existing interim plastic cover was removed exposing several areas where refuse was not covered by soil. These areas were covered with soil. In addition, the south end of the landfill, the last to receive refuse prior to closure, was compacted and covered with soil. Additional earthfill was then placed to fill the final cover area to design subgrade. Where no additional soil fill was required, minor regrading was required to obtain proper slope and a smooth surface.

The maximum slope angle allowed by the Minimum Functional Standards (MFS) for closure of landfills is 33 percent (3H:1V). The minimum slope is two percent. Two area's of the closure have slopes of 3H:1V, they are the southwest corner above the recycling building and the slope on the west side of the entrance road. The rest of the slopes closed as part of this project ranged from 4H:1V to 6H:1V.

The top slope has a grade of two percent. The final grades of the closure slopes are shown on the As-built Drawing of Records, Drawing 1.

4.3 Entrance and Access Roads

4.3.1 Entrance Roads

One of the first tasks performed, was the construction of a temporary access road into the site. The purpose of this road was to provide access to the landfill while cover construction was performed under the permanent access road. This road was constructed by a cut and fill method and was constructed as part of the final subgrade preparation. Cuts were made into existing refuse which exposed refuse and soil. Where refuse was exposed, bank run soil was placed to cover the refuse and build the subgrade. The bank run was compacted, then covered with 12 inches of 3-inch minus bank-run material. The 3-inch material was then topped off with 6 inches of compacted ⅝ inch crushed rock. The road was then compacted and sprayed with Lignosite for dust control. Lignosite is a biodegradable tacking product used in place of an asphalt emulsion. Upon completion of the temporary road, traffic was diverted to it, allowing cover construction to begin under the paved entrance road.

Following temporary access road construction final cover was constructed under the main access road. This was done prior to any other final cover work. Construction of final cover under the road required subgrade preparation. Subgrade was prepared by removing asphalt and soil along approximately 520 feet of the existing main access road. The removed asphalt and soil were used to construct a 3H:1V slope along the west side of the main access road as part of subgrade preparation. The regraded road alignment including the asphalt were covered with compacted bankrun soil. The entire regraded road alignment was then covered with bedding soil in preparation for geomembrane installation.

Geomembrane was then installed along the road alignment and down to the toe of the west facing slope. It was also welded to existing geomembrane at the north end of the road. Along the east side of the road geomembrane was left exposed so that it could be welded to geomembrane during the remaining final cover construction.

The final cover section was then constructed over the geomembrane. The final cover was then covered with a paved road section. The final cover and road section details are shown on Drawing 6, Section B.

After proper curing of the asphalt, landfill traffic was rerouted to the main road, allowing regrading of the temporary road to match the surrounding slope.

4.3.2 Access Roads

Two access roadways were constructed as part of the closure project.

The first access road was the main access road, which will carry customer traffic to the active fill area. The slope of this road varies from three to six percent. Its alignment transverses down across the western slope and down the southern slope and to the active fill area (Drawing 1).

The second access road was constructed across the crest of the refuse mound. It provides access for landfill gas system maintenance and will connect future access roads traversing the east slope areas. A typical cross-section of the maintenance road is provided on Drawing 6, Section C.

4.4 Final Cover

4.4.1 General

The purpose of the final cover system is to stop infiltration of surface water into the landfill, provide a barrier to prevent uncontrolled landfill gas venting, and support vegetation.

To accomplish this several layers of soil and geosynthetics were constructed over the refuse. The cover system cross-section is shown on Drawing 6, Detail 1. Each of the soil and geosynthetic layers are described in following sections.

4.4.2 Bedding Layer

The purpose of the bedding layer is to provide a protective bedding under the geomembrane. The bedding layer consists of fine sand imported from Puyallup Sand and Gravel, a borrow source located approximately 1 mile north of the landfill. The bedding layer was placed in a 4-inch-thick layer over the entire closure area, and finish graded with a steel drum roller. Gradation testing was performed on this material during the Construction Quality Assurance (CQA) program to verify compliance with specifications. Laboratory test results are provided in Appendix B.

4.4.3 Geomembrane

Geomembrane was placed directly over the bedding layer. The geomembrane is 60-mil very low density polyethylene (VLDPE) sheeting. Both smooth and textured product was installed. Textured geomembrane was installed on slopes steeper than approximately 5H:1V (20 percent). The textured sheet increases frictional resistance and provides greater stability for the overlying cover soils. Smooth geomembrane was installed on the top slope area. Limits of each geomembrane type are shown on Drawing 2.

The deployment process began by unrolling the geomembrane rolls and cutting panels to required dimensions. Following deployment, geomembrane panels were welded using primarily the hot wedge welding process. However, the extrusion welding process was also used. In areas where the hot wedge welder could not be utilized, the seam was welded using the extrusion welding technique. Extrusion welding was typically used for destructive test repairs, gas well boots, and intersecting weld locations or corners. Figure 3 shows cross-sections of both seam welding techniques.

Following deployment and seam welding, each weld was visually inspected and subjected to non-destructive and destructive testing. Non-destructive testing consisted of vacuum box testing of all seams. Destructive testing consisted of shear and peel tests on samples of the seams. The seam testing procedures and results are discussed in more detail in Section 5.4 of this report.

4.4.4 Drainage Layer

The purpose of the drainage layer is to collect and drain surface water which infiltrates the overlying topsoil and vegetative soil materials. This water drains through the free-draining, granular material along the surface of the geomembrane and exits through underdrain pipes or free drains into surface water ditches.

The drainage layer was placed in a single 12-inch-thick layer over the entire geomembrane area, except for the landfill access roads. See Drawing 5, Detail 3 for details of the landfill access road construction. During placement and grading of the drainage layer, only low ground pressure dozers were allowed on the 12-inch layer of drainage material. All other traffic over the drainage layer was on landfill access roads or roads constructed from the drainage layer material that were temporarily increased

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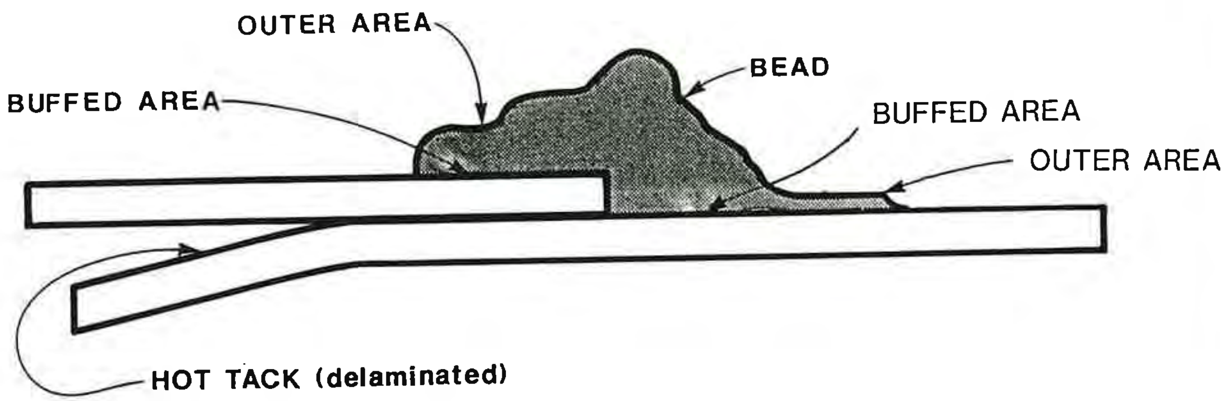

EXTRUSION WELD

HOT WEDGE OR FUSION WELD

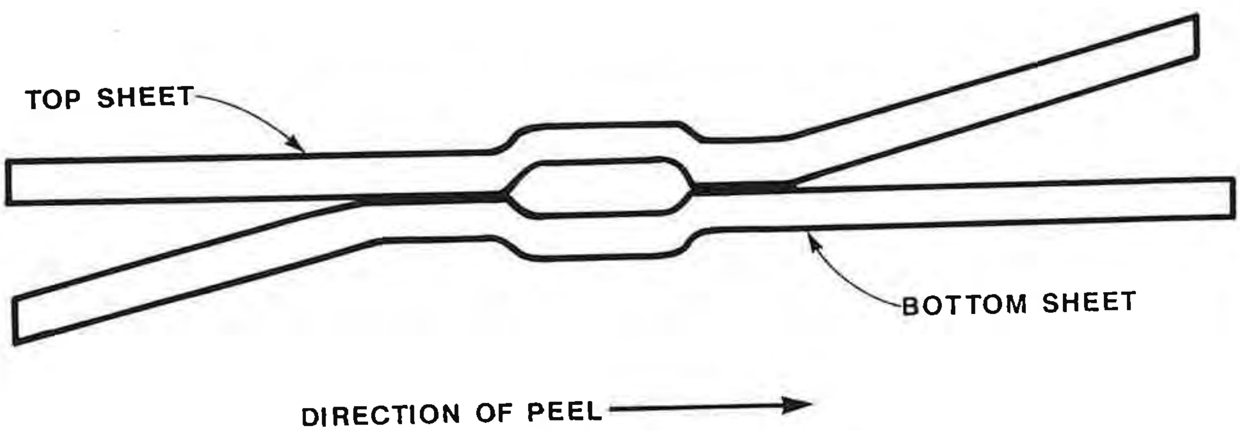

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Figure 3
HIDDEN VALLEY LANDFILL
SOUTHWEST CLOSURE
CONSTRUCTION REPORT
HDPE GEOMEMBRANE WELDS

to 3 feet thick. Increasing the depth was done to protect the geomembrane from equipment loading and possible puncture.

Gradation and permeability testing was performed on this material as part of the CQA program. Results are presented in Appendix B.

4.4.5 Geotextile

The purpose of the geotextile is to provide a filtering medium between the vegetative soil and the drainage layer. This protects the drainage layer from clogging, by keeping fine soil particles out of the drainage layer.

Non-woven geotextile was placed over the drainage layer. The geotextile is a nominal 6 ounce per square yard product. Other physical properties for the geotextile are given on Table 1. The geotextile was deployed in similar orientation as the geomembrane as shown on the geomembrane panel layout drawings. The geotextile was overlapped a minimum of 1 foot and seamed with a Leister welder (heat seam).

4.4.6 Vegetative Soil

Approximately 8 inches of vegetative soil was placed directly over the top of the geotextile. The purpose of the vegetative soil is to provide a rooting medium under the topsoil and to provide a protective soil layer over the drainage layer and geotextile.

Gradation and permeability testing was performed on this material as part of the CQA program. Results are presented in Appendix B.

4.4.7 Topsoil

Topsoil was placed directly over the vegetative layer in a single six-inch-layer. The topsoil provides a soil layer capable of supporting grassy vegetation.

4.5 Surface Water Control

Surface water control facilities were constructed to minimize erosion, to prevent ponding of water on the landfill, to control the rate of storm water discharge, and to minimize the movement of water-borne soil particles to off-site locations. The surface water drainage plan for the southwest closure area is shown on Drawing 3, Drainage Plan.

Table 1

Non-Woven Geotextile Specifications

Test	Test Designation	Minimum Requirements
Fabric Weight	ASTM D-3776	12.0 oz/yd.^{2}
Grab Tensile	ASTM D-4632	280 lbs.
Mullen Burst	ASTM D-3786	400 psi.
Puncture Resistance	ASTM D-4833	130 lbs.
Permittivity	ASTM D-4491	1.0 sec.$^{-1}$
Test	**Test Designation**	**Minimum Requirements**
Fabric Weight	ASTM D-3776	5.7 oz/yd.^{2}
Grab Tensile	ASTM D-4632	150 lbs.
Mullen Burst	ASTM D-3786	250 psi.
Puncture Resistance	ASTM D-4833	80 lbs.
Permittivity	ASTM D-4491	1.45 sec.$^{-1}$

4.5.1 Drainage Plan

The roadside, and perimeter drainage ditches were all built to meet or exceed the MFS requirement, which requires collection of all runoff resulting from a 24-hour, 25-year storm event from the closed portion of a landfill (WAC 173-304-460[3][a][iv]). Other drainage ditches and storm water structures were designed for a 24-hour, 100-year storm.

4.5.2 Drainage Ditches

The drainage ditches are generally "V"-ditches with rock lining (see Drawing 6, Sections B and D, and Drawing 7, Section A).

The roadside drainage ditches were constructed on the uphill side of the access road, with the road surface sloped toward the ditch. The rock facing extends up the ditch and daylights at the final cover surface and the road surface. A cross-section of the access road is shown on Drawing 6, Section D and includes details of the roadside ditch.

The perimeter ditches were built similar to the roadside drainage ditch. However, the perimeter ditch includes a soil berm to one side. The rock lining daylights into the final cover on one side and extends to the top of the berm on the other.

4.5.3 Culverts

Culverts were constructed to convey storm water under the roadways. All culverts are corrugated metal pipe with a 12-inch minimum diameter. One exception is a 6-inch PVC pipe which was installed to convey storm water from the southwest perimeter ditches, via a catch basin around the recycling center, to the western infiltration depression.

4.5.4 Toe Drains

The purpose of toe drains is to provide an outlet into surface water ditches for water collecting in the drainage layer. Toe drains were constructed using 3-inch diameter perforated ADS pipe placed parallel and uphill to each drainage ditch. Solid wall T-connections were installed at approximately 50-foot intervals. An ADS solid wall pipe connected to the tee drains to the surface water ditches. Each joint was duck-taped to prevent separation during installation. The toe drains were placed directly on the geomembrane with the tee-connections daylighting into the surface water ditches. A typical toe drain is shown on Drawing 6, Detail 2.

4.5.5 Storm Water Pump Station

A storm water pump station was constructed near the southeast corner of the landfill. The purpose of the pump station is to collect storm water from the south end of the closed landfill and pump it to the northeast infiltration basin. The pump station consists of a 48-inch-diameter manhole and a 4-inch submersible pump. Storm water collected in the manhole is pumped through a 4-inch-diameter PVC pipe which tees into an 8-inch header discharge line. The 8-inch discharge line is located parallel to the perimeter access road. It terminates into the northeast infiltration basin.

4.5.6 Storm Water Routing

Storm water collected on the final cover is directed to either the northeast infiltration basin or the western infiltration depression. Generally, storm water generated on the west side of the closure is directed to the western infiltration basin. This accounts for approximately 25 percent of the storm water. The remaining storm water is directed to the northeast infiltration basin. Details of storm water routing are shown on Drawing 3.

4.5.7 Hydroseeding

Hydroseeding was performed to provide a grassy ground cover over the entire southwest closure area and other areas disturbed by the construction. Hydroseeding mixes used for this project are shown on Table 2. The purpose of the hydroseeding is to reduce erosion of the soil surfaces and to provide an aesthetically pleasing appearance to the completed closure project.

Table 2

Hydroseed Mix

Seed Type	% By Weight
Double Dwarf Tall Fescues	90%
White Clover	10%
(Rate of application, 100 lbs/acre)	

4.6 Landfill Gas Collection System

4.6.1 General

The landfill gas collection system constructed as part of the southwest closure area was connected to the active gas system currently serving the north area closure.

New construction included vertical extraction wells, lateral and header pipelines, valving, condensate drains, and future condensate collection air and discharge lines. The following paragraphs describe these items.

4.6.2 Vertical Extraction Wells

Thirty-six new vertical gas wells were installed in the southwest closure area prior to regrading the site. Vertical extraction wells consist of solid and perforated schedule 40 PVC well casings installed in 24-inch-diameter boreholes drilled into the landfill. Well casings were fitted with a telescoping coupling to allow the casing to move along with refuse settlement. The boreholes were backfilled with washed 1.5-inch-diameter drain rock around the perforated section of the well casing. The washed rock was topped off with a bentonite seal to prevent air and water intrusion into the perforated section. The remainder of the borehole was backfilled with soil. A detail of the gas wells is shown on Drawing 9, Detail 1.

4.6.3 Header Pipeline

Two main header pipelines were installed to connect the new wells to the existing north area closure gas collection system. Header locations are shown on Drawing 5. Wells are connected to the headers via individual laterals. Each lateral includes a valve which allows the operator to control the vacuum pressure in each well. Laterals are connected to the headers with a flexible connection. The flexible connection absorbs expansion and contraction of the collection piping and accommodates landfill settlement. Each valve connection includes monitoring ports for measuring flow rate of the gas and gas quality.

To ease operations and maintenance of the newly installed gas collection system the headers and valves were installed close to landfill access roads. In order to install the header next to the road, the header was installed through culverts which pass under the access road in two locations. Locations of headers, header crossings, laterals and valves are shown on Drawing 5.

4.6.4 Condensate Drain

As landfill gas travels through collection piping, it cools and generates condensate. To control this condensate and prevent it from filling and blocking the collection lines, condensate drains were installed. A total of three condensate drains were constructed. The condensate drains consist of an 8-foot-deep by 16-inch-diameter pipe sealed at both ends. A PVC canister trap is located at the bottom of the drain. The condensate drains to the canister trap, then overflows into the 16-inch-diameter pipe. From there, it drains through a drainage port drilled into the pipe wall, disperses into a gravel pack, and eventually drains into the refuse. A "waterseal" within the canister trap prevents ambient air from being drawn into the gas system due to vacuum pressure on the collection system (see Drawing 9, Detail 2).

If collection and removal of the condensate is required in the future, the existing 16-inch pipe condensate drains can be modified to become collection sumps. The modification would be made by plugging the drainage port which allows the liquid to drain into the landfill. A pneumatically operated PVC pump could then be suspended near the bottom of the sump to remove the condensate (see Drawing 9, Detail 2). For this reason, two 1.5-inch-diameter high density polyethylene (HDPE) pipes were installed directly on top of the geotextile, one as an air supply to operate the pump, the other as a discharge line to transmit the condensate to the Hidden Valley leachate pre-treatment plant.

5 QUALITY ASSURANCE PROGRAM

5.1 General

The EMCON construction quality assurance (CQA) program documents that work performed by the owner and the contractors is in compliance with the construction work plan and project manual. The construction work plan is entitled "Work Plan Southwest Closure Hidden Valley." The work plan includes guidelines for the work performed by the owner. The project manuals for the contractors is entitled "Project Manual for Land Recovery, Incorporated Hidden Valley Landfill Southwest Closure Geosynthetics Installation."

5.2 Construction Monitoring

Construction monitoring included observation and materials testing. The monitoring was critical to establish confidence that the construction was executed correctly, uniformly, and using the proper materials. Materials testing was necessary to verify that the construction materials met specification.

Guidelines for material testing frequencies were established in the project CQA program.

The CQA program, conducted by EMCON included geomembrane and geotextile conformance testing. EMCON subcontracted this function to AGP Laboratories, Inc. Geomembrane conformance testing is presented in Appendix C; geotextile conformance testing is presented in Appendix E.

5.3 Field Engineering Services

Field engineering services were provided by the field representatives of EMCON and office engineering support. These services included clarifying questions from the contractors and owner's constructors, providing design interpretation, observing construction, and modifying designs when appropriate. Modifications during construction are described in Section 6 and shown on the record drawings (see as-built drawings of record included at the end of this report).

5.4 Geomembrane Quality Assurance

Geomembrane quality assurance included conformance testing, monitoring the installation, and field testing. The quality assurance functions performed on the geomembrane are described below.

The CQA organization performed the following VLDPE geomembrane monitoring and testing:

- Inventoried rolls of geomembrane delivered to the site.
- Sampled geomembrane at the frequency of one sample for every 100,000 sq. ft. of material delivered and coordinated geomembrane conformance testing.
- Monitored panel deployment and maintained a panel layout record drawing.
- Qualified extruder guns and hot wedge welders for daily welding with field start-up samples and tests.
- Monitored tack and seam welds.
- Monitored hot wedge welding.
- Monitored welded seam vacuum testing.
- Monitored welded seam air pressure testing.
- Located defects in geomembrane and defective weld areas, and recorded their repairs.
- Located destructive weld samples, and coordinated laboratory destructive testing of the welds.
- Made on-site measurements such as material thickness and panel locations.

Results of geomembrane conformance testing are presented in Appendix C. Tables 3-A and 3-B list the specified geomembrane properties.

Table 3A
Geomembrane Properties

Test	Test Designation	Frequency (see footnotes)
Sheet Thickness	ASTM D-1593, para. 9.1.3	20 per roll
Oxidation Induction Time of Polyolefins	ASTM D-3895	(5)
Tensile Strength Yield	ASTM D-638	(3)
Tensile Strength Break	ASTM D-638	(3)
Elongation at Yield	ASTM D-638	(3)
Elongation at Break	ASTM D-638	(3)
Modulus of Elasticity	ASTM D-638	(3)
Tear Resistance	ASTM D-1004, Die C	(3)
Puncture Resistance	FTMS-101C, Method 2065	(3)
Resistance to Soil Burial	ASTM D-3083**	(4)
Dimensional Stability (each direction)	ASTM D-1204, 212°F, 15 min.	(1)
Environmental Stress Crack	ASTM D-1693	(5)
Low Temperature Brittleness	ASTM D-746	(4)
Carbon Black Content	ASTM D-1603	(3)
Carbon Black Dispersion	ASTM D-3015	(3)

NOTES:

** As modified in National Sanitation Foundation - Standard Number 54, Appendix A, revised May 1990.
(1) One per 100,000 square feet of sheet produced or one per resin batch, whichever results in the greatest number of tests.
(2) One test on typical sheet and seam. Perform a shear test (ASTM D-638) on a sample obtained from the same sheet and a shear test (ASTM D-4437) on the seam.
(3) One per 50,000 square feet or one per resin batch, whichever results in the greater number of tests.
(4) Certification only required.
(5) One test per resin batch.

Table 3B
Textured Geomembrane Properties

Test	Test Designation	Requirements
Sheet Thickness	ASTM D-1593, para. 9.1.3	60 mils minus 10% for any measurement and the average of all measurements for any roll, not less than 58 mils
Oxidation Induction Time of Polyolefins	ASTM D-3895	Min. 50 minutes
Tensile Strength Yield	ASTM D-638	Min. 126 lb. per in. width
Tensile Strength Break	ASTM D-638	Min. 70 lb. per in. width
Elongation at Yield	ASTM D-638	Min. 10%
Elongation at Break	ASTM D-638	Min. 300%
Modulus of Elasticity	ASTM D-638	Min. 80,000 lb.
Tear Resistance	ASTM D-1004, Die C	Min. 24 lb.
Puncture Resistance	FTMS-101C, Method 2065	Min. 57 lb.
Resistance to Soil Burial	ASTM D-3083	10% max. change
Dimensional Stability (each direction)	ASTM D-1204, 212°F, 15 min.	3% max. change
Environmental Stress Crack	ASTM D-1693	> 1,500 hours
Low Temperature Brittleness	ASTM D-746	Minus 40°F
Carbon Black Content	ASTM D-1603	2 to 3%
Carbon Black Dispersion	ASTM D-3015	A-2 minimum

5.4.1 Destructive Testing of Welded Seams

Destructive testing of welded geomembrane seams included both on-site and off-site laboratory testing. The welded seam testing included shear and peel strengths of the welded seams. A minimum of one sample was taken for approximately 750 linear feet of welded geomembrane seam. The location of the destructive test samples are shown on the panel layout record drawings. One hundred fifty samples were recovered. Each sample was approximately 36-inches-long by 12-inches-wide, and was cut into three separate samples. One sample was tested by the construction quality assurance (CQA) organization; one sample was tested by Serrot, the lining contractor, as part of their quality control program; and one sample was archived on-site. The CQA testing was performed by EMCON. All CQA samples were sent to an independent laboratory by EMCON for destructive testing.

If a destructive test failed, additional samples were cut 10 feet in each direction from the location of the failed test sample and re-tested. If the additional test samples passed, then the entire seam between the passing test samples were capped and vacuum tested. If the additional samples failed, then the re-testing process was repeated until passing tests were obtained, and the area between passing test samples were capped and vacuum tested. The destructive test results are summarized in Appendix D.

5.4.2 Non-Destructive Air Pressure Testing

Hot wedge welded seams were tested by the installer using air pressure. The hot wedge welding technique creates an air channel in the welded seam. The testing technique involves cutting access ports at the ends of the welded seam. The installer seals both ends of the air channel with clamps then inserts a needle equipped with a pressure gauge into the air channel. The air channel is pressurized to 30 psi for 5 minutes. A test is considered passing when there is less than a 2 psi drop in air pressure in 5 minutes. The 2 psi drop is attributed to expansion of the geomembrane material. The CQA organization observed and recorded results of the air pressure testing.

5.4.3 Non-Destructive Vacuum Testing

All extrusion welded seams and seam repairs were vacuum tested by the installer. The vacuum testing equipment and operating techniques were monitored by the CQA personnel. Leaks detected by vacuum testing were marked and recorded for repair. Documentation of vacuum testing was recorded on the daily seaming logs prepared by the CQA personnel.

The vacuum testing technique is performed by wetting the welded seam with a soapy water solution. A vacuum box is then placed over the seam and a vacuum applied to the geomembrane seam. Defects in the seam are detected by air bubbles appearing in the soapy solution. If detected, defects are marked and repaired.

5.4.4 Visual Observations

The CQA organization also visually monitored the geomembrane during installation. Any suspected defect in the geomembrane panels or seams were marked and repaired.

5.4.5 Panel Layout Drawings

Panel layout drawings were prepared as construction progressed. These drawings show the locations of each geomembrane panel, seam, and destructive test. Panel layout drawings are presented in Appendix F. Panel placement logs, indicating roll numbers and placement dates, were prepared daily by the CQA personnel.

5.5 Geotextile

5.5.1 General

The CQA organization performed the following geotextile monitoring and testing:

- Inventoried rolls of geotextile delivered to the site.
- Sampled geotextile at the frequency of one sample for every 250,000 square feet of material delivered and performed material conformance testing.
- Monitored deployment of geotextile and observed material for defects.
- Monitored geotextile panel layout and seaming for conformance with specifications.

Non-woven geotextile specifications are listed on Table 1 for the 6 oz per square yard geotextile, and the 12 oz per square yard geotextile; respectively. Conformance test results are presented in Appendix E.

5.6 Earthwork

The CQA Program monitored all aspects of earthwork construction. The monitoring included visual observation of the work and testing to verify compliance with project specifications. Laboratory testing included gradation and permeability testing from bulk samples taken during placement of the soils. The CQA monitoring for the soil components of the project are discussed in the following sections.

5.6.1 Bedding Layer

Quality assurance work performed for the bedding layer included observing the layer thickness and conducting laboratory testing on samples taken during construction.

Layer thickness was monitored by digging potholes in the layer to measure uniformity of thickness. Grain size analysis tests were performed to verify that gradation requirements were met. The material was classified as a fine sand with some silt and trace fine gravel. Results from the grain size analysis tests for the bedding layer are presented in Appendix B.

5.6.2 Drainage Layer

Quality assurance work performed for the drainage layer included observing the layer thickness and conducting laboratory testing on samples taken during construction.

Layer thickness was monitored by observing construction in accord with construction stakes and digging potholes in the layer to measure uniformity of thickness. Grain size analysis tests were performed to verify that gradation requirements were met. The material was classified as a rounded washed gravel with some fine to coarse sand. The material was a washed rock mixed with concrete sand. Results from the grain size analysis tests for the drainage layer are presented in Appendix B.

Samples of the drainage layer were also tested for permeability. The permeability tests were conducted using a fixed-wall permeameter. Results of permeability tests for the drainage layer are presented in Appendix B.

5.6.3 Vegetative Soil

Quality assurance work performed for the vegetative soil included observing the layer thickness and conducting laboratory testing on samples taken during construction.

Layer thickness was monitored by digging potholes in the layer to measure uniformity of thickness. Grain size analysis tests were performed to verify that gradation requirements were met. The material was classified as a sandy gravel with some silt. The material was generally a bank run material with a maximum particle size of 3 inches. Results from the grain size analysis tests for the vegetative soil are presented in Appendix B.

Samples of the vegetative soil were also tested for permeability. The permeability tests were conducted using a fixed-wall permeameter. Results of permeability tests for the vegetative soil are presented in Appendix B.

5.6.4 Topsoil

Quality assurance work performed for the topsoil included observing the layer thickness and conducting laboratory testing on samples taken during construction.

Layer thickness was monitored by digging potholes in the layer to measure uniformity of thickness. Grain size analysis tests were performed to verify that gradation requirements were met. The material was classified as silty, gravelly sand with some organics. The material was generally topsoil stripped from the adjacent gravel mining operations. Results from the grain size analysis tests for the topsoil are presented in Appendix B.

Samples of the topsoil were also tested for permeability. The permeability tests were conducted using a fixed-wall permeameter. Results from the permeability tests for the topsoil are presented in Appendix B.

6 MODIFICATIONS DURING CONSTRUCTION

6.1 General

Modifications were made to the project design during construction. Many of the modifications were made to fit the design to conditions encountered in the field. Others were made by request of the constructors after the engineer reviewed their affect on the design intent. This section describes those modifications. The record drawings show the as-built construction and reflect the modifications.

6.2 Drainage Plan

Three changes were made to the drainage plan. The first was changes in the catch basin details behind the Recycling Center. The second was modifications to the southeast pump station. The third was modifications to the top slope drainage ditch.

Originally the south perimeter drainage ditch was designed to drain into the catch basin behind the Recycling Center through a pipe stubout. This required geomembrane boot around the concrete catch basin. However, the elevation of the catch basin was lowered allowing the drainage ditch to flow into the top of the catch basin. This allowed simplification of the geomembrane boot. The geomembrane was installed as a flapped connection under the catch basin steel grating. The detail of this catch basin is shown on Drawing 8, Detail 1. As a result of this change, Drawing 8, Detail 2 was not used.

The southeast pump station was originally designed to handle only the drainage from the lower drainage sub-basin. The drainage ditch directly above this drainage sub-basin was originally designed to drain to the Leachate Pretreatment Buildings pump station via the building's storm drain system. However, the engineer decided that this drainage ditch would unduly burden the leachate building's storm water pumping system as additional paved area had already been added to the leachate building's pump station. Therefore, the drainage ditch directly above the lower sub-basin was directed down to the southeast pump station. The storm water was directed through a 12-inch diameter culvert under the main access road as shown on Drawing 3. The pump size at the southeast pump station was checked for the increased flows and the pumps were determined sufficient to handle the increased flow. This flow to the pump station is only temporary, until the East Area is closed and its additional perimeter drainage ditch is constructed. At that time this additional flow will be directed into the East Area's perimeter surface water ditch.

In addition, booting geomembrane around the 12-inch culvert was not required because the culvert was installed on tope of the geomembrane. The geomembrane was flapped under the steel grating into the top of the manhole structure. The modification to the culvert is shown on Drawing 8, Detail 3. As a result of the modification, Drawing 8, Detail 4 was not used.

Two surface water drainage ditches were designed to drain the east portion of the top slope. The two ditch types are shown on Drawing 8, Sections A and B. Only the drainage ditch shown in Section A was constructed. This ditch type met the needs of ditch type B.

6.3 Access Roadways

During construction of the entrance road and main access roadway, an extra layer of non-woven geotextile was placed over the geomembrane to protect and cushion it during placement of the overlying soils. The non-woven geotextile was a nominal 12-ounce fabric. In the access roadway, the 12-ounce material was laid down the center traffic lanes, 24-foot wide, and a nominal 6-ounce fabric was placed under the shoulder areas. In the entrance road, the entire road width was underlain by the 12-ounce fabric. Cross-sections of these roadways showing the modifications are shown on Drawing 6, Sections B and D.

6.4 Anchor Trench Details

Modifications were made to the geomembrane anchor systems.

Two alternatives were provided for the temporary anchor trench at the top of the steeper slopes. The contractor chose to use Drawing 7, Section C, Alternative 2 which allowed for temporary anchoring by soil piles. Therefore, Drawing 7, Section C, Alternative 1 was not used.

The anchor trench along the side slope liner area was modified. The overlying cover soils were not extended over the trench itself. Due to the lower slope angle in this area, the engineer determined that the full depth of cover soils was not necessary and would allow easier access to the geomembrane for connection with subsequent final covers. This modification is shown on Drawing 7, Section D.

The anchor trench proposed at the bottom of the slope along the southern perimeter was not installed. Utilities were present in this area which would of made it difficult and risky to install an anchor trench. As an alternative, the geomembrane was extended laterally out into the southern maintenance road. This modification is shown on Drawing 7, Section A.

6.5 Landfill Gas System

The landfill gas system was modified during gas well installation and header system construction. Originally 27 gas wells were planned for the closure area. During construction, landfill gas migration to the south indicated the need for additional wells along the south property line. A total of 36 wells were installed plus one well installed just off the eastern edge of the closure area near the top of the landfill. The locations of installed wells are shown on Drawing 4.

The collection system was reconfigured slightly during construction. The final collection system layout is shown on Drawing 5.

A 12-inch culvert for the gas header was planned under the main access road. The location of this culvert was moved slightly toward the top of the landfill and its size was increased to 18-inches. In addition, the culvert was planned to be embedded in a sand/cement slurry to prevent crushing. The embedment was deleted by LRI with the understanding that if the culvert was crushed, it would be accessed and repaired. Details for this culvert are shown on Drawing 9, Detail 3 and Section A. The culvert location is shown on Drawing 5.

7 SUMMARY

The construction activities described in this report were observed by EMCON Northwest, Inc., based on our observations and the test results presented in this report, we believe the Southwest Closure Construction at the Hidden Valley Landfill was performed in a good workman-like manner, and in substantial compliance with the construction contract documents.

Appendix A

RECORD DRAWINGS

SOUTHWEST CLOSURE

HIDDEN VALLEY LANDFILL
PIERCE COUNTY, WASHINGTON

JUNE 1992

PREPARED FOR

LAND RECOVERY, INCORPORATED

P.O.Box 73057 Puyallup, Wa. 98373 (206) 847-7555

PREPARED BY

EMCON
Northwest, Inc.

18912 North Creek Parkway Suite 210 Bothell, WA. 98011
(206) 485-5000

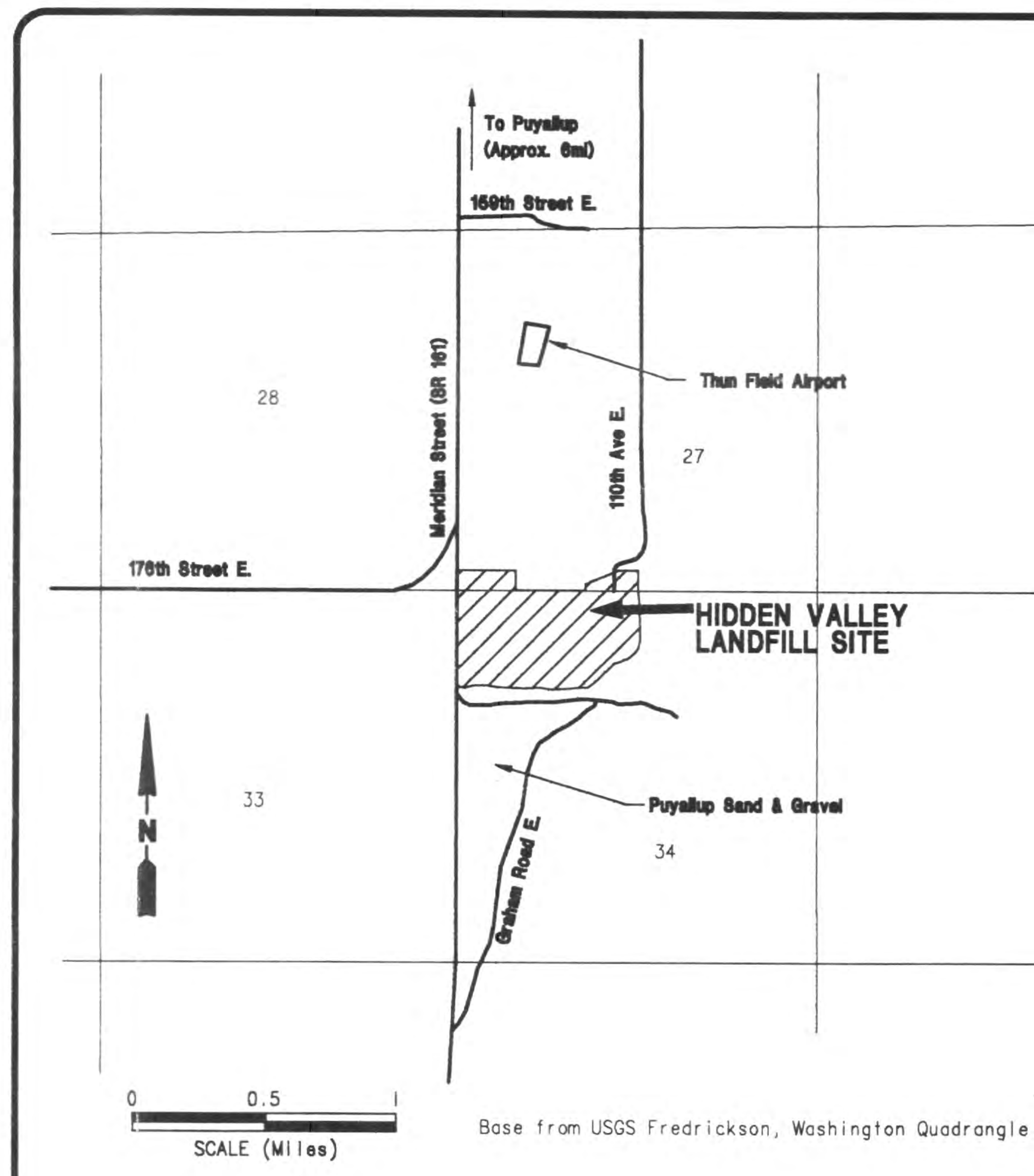
DRAWING INDEX

DRAWING NUMBER	TITLE AND DESCRIPTION	LATEST REVISION NUMBER	LATEST REVISION DATE
1	SITE AND FINAL GRADING PLAN	1	12-31-92
2	GEOMEMBRANE COVER LAYOUT	1	12-31-92
3	DRAINAGE PLAN	1	12-31-92
4	GAS WELL LOCATIONS	1	12-31-92
5	GAS SYSTEM LAYOUT	1	12-31-92
6	COVER DETAILS	1	12-31-92
7	COVER DETAILS	1	12-31-92
8	COVER DETAILS	1	12-31-92
9	GAS SYSTEM DETAILS	1	12-31-92

MARK J. AMRHEIN STATE OF WASHINGTON 23715 REGISTERED PROFESSIONAL ENGINEER
6/10/92
EXPIRES 11/1/93

MARK S. SADLER STATE OF WASHINGTON 24660 REGISTERED PROFESSIONAL ENGINEER
6/10/92
EXPIRES 2/9/94

AS-BUILT RECORDS



LOCATION MAP

Legal Description

Parcel A: A portion of Parcel "B", Pierce County DBLR 8811300615);
That part of the North Half of the Northwest Quarter of Section 34, Township 19 North, Range 4 East, Willamette Meridian, Pierce County, Washington, lying west of the centerline of 110th Ave E vacated by Pierce County Ordinance No. 91-85 recorded under Pierce County Auditor No. 9109100073.
AND,
That part of the South Half of the Northwest Quarter of Section 34 Township 19 North, Range 4, Willamette Meridian, Pierce County, Washington. described as follows: Beginning at the intersection of the north line of said South Half of the Northwest Quarter with the east right-of-way line of SR16) said right-of-way line being parallel with and 75 feet east of the west line of said Northwest Quarter; thence South 00 30'38" West (bearing meridian is Pierce county Record of Survey 8803210291) along said right-of-way line 30.00 feet; thence South 89 46'26" East, 1305 feet parallel with said north line of the South Half; thence South 44 46'26" East, 42.43 feet; thence South 89 46'26" East, 300 feet; thence North 45 13'34" East, 42.43 feet; thence South 89 East, 336.40 feet to the centerline of vacated 110th Ave E; thence North 02 21'04" East, 30.02 feet along said centerline to said north line of the South Half; thence North 89 46'26" West, 2002.37 feet to the Point of Beginning,
AND,
the South 300 feet of the West 950 feet of the Southwest Quarter of Section 27, Township 19 North, Range 4 East, Willamette Meridian, Pierce County, Washington, EXCEPT that portion conveyed to the State of Washington by instrument dated March 25, 1958 and recorded April 23, 1958 under Auditor's Fee No. 1815798 together with access thereto on permanent right-of-way or easement.
Pierce County vacated 110th Avenue East by Ordinance No. 91-85 recorded under Pierce Auditor No. 9109100073

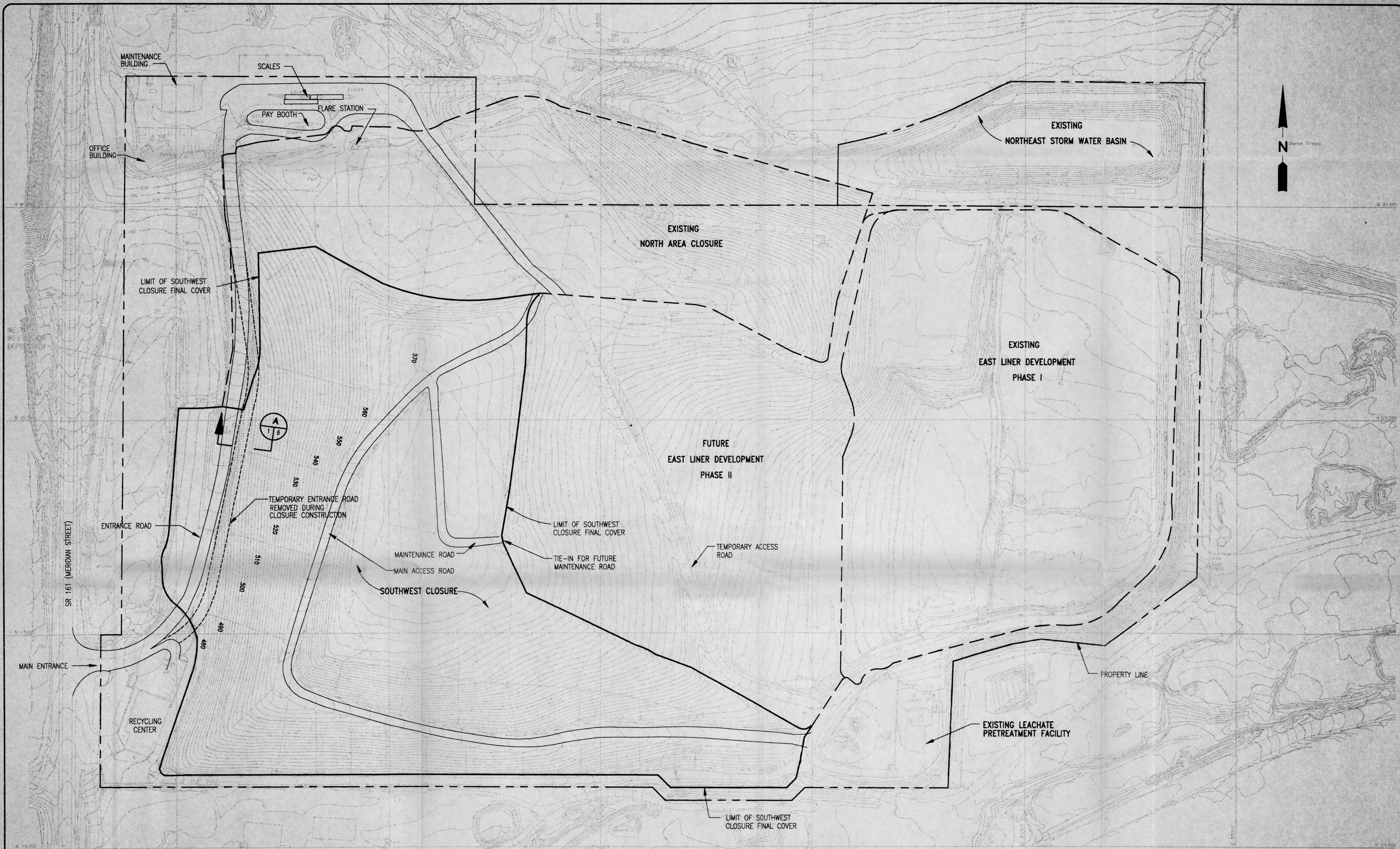
SITE ADDRESS:
17925 Meridian Street
Puyallup, Wa. 98373

APPROVED:

Mark J. Amrhein — 6-10-92
PROJECT COORDINATOR — DATE

Mark S. Sadler — JUNE 10, 1992
EXECUTIVE MANAGER — DATE

HIDDEN T0201C62 5-9-92



0 100 200

SCALE (ft)

Topography prepared by photogrammetric methods by;
NIES MAPPING GROUP, INC.: Date of aerial; Jan. 19, 1992

MARK J. AMRHEIN
STATE OF WASHINGTON
23715
REGISTERED
PROFESSIONAL ENGINEER
12/31/92
EXPIRES 11/1/93

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY
1	12/31/92	AS-BUILT RECORDS	MC	GRW	MJA	MSS
0	6/10/92	ISSUED FOR CONSTRUCTION	MDC	STP	MJA	MSS

DATE OF ISSUE 6-10-92 DWN BY MDC CHK BY MJA
DES BY STP APP BY MSS

EMCON Northwest, Inc.

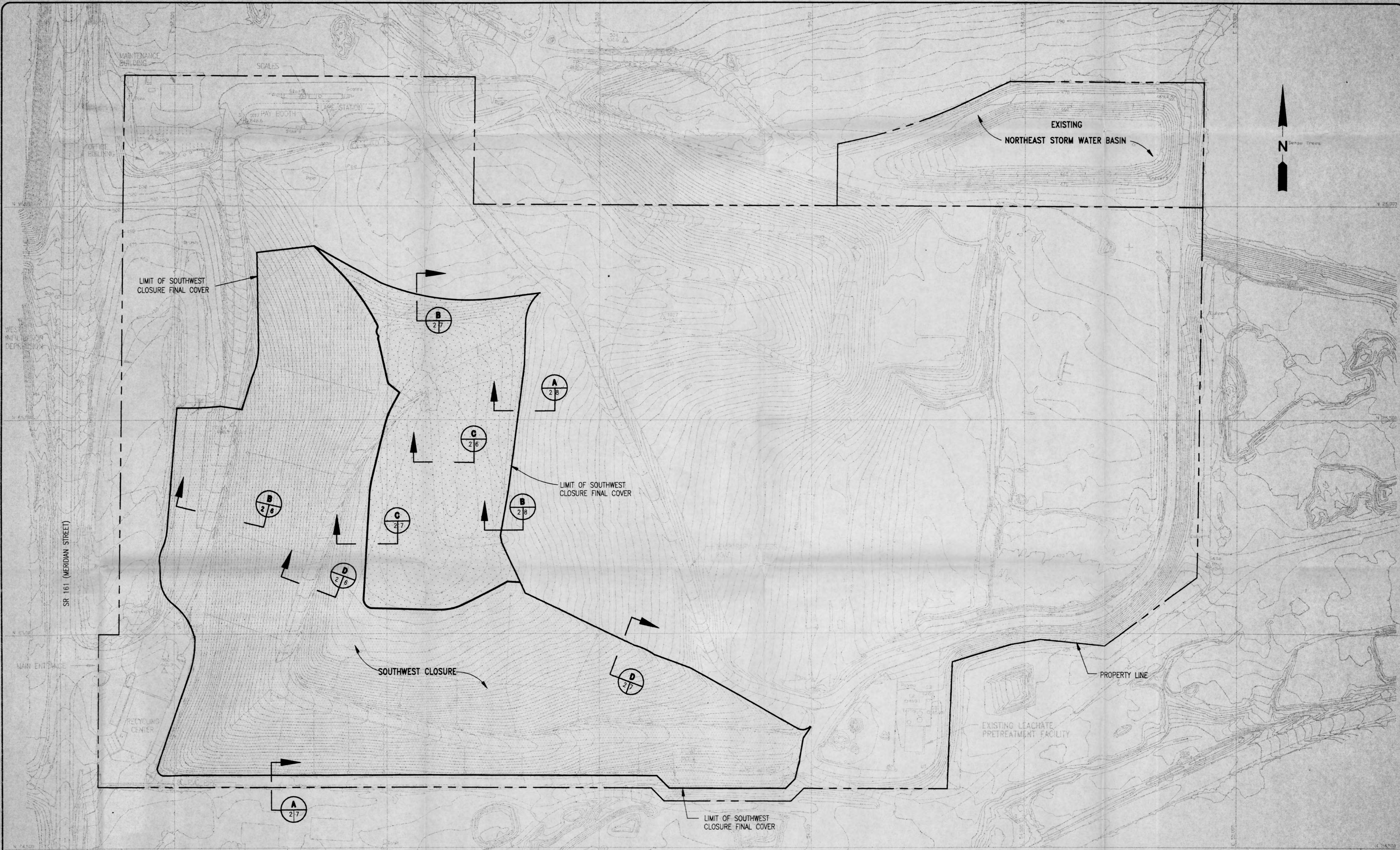
AS-BUILT RECORDS

LAND RECOVERY, INC.
HIDDEN VALLEY LANDFILL
PIERCE COUNTY, WASHINGTON
SOUTHWEST CLOSURE
SITE AND FINAL GRADING PLAN

DRAWING NO 1

PROJECT NO 0202-001.51

SCALE: 1= 100 12-30-92 0202\001\51C02



0 100 200
SCALE (ft)

Topography prepared by photogrammetric methods by; NIES MAPPING GROUP, INC.; Date of aerial; Jan. 19, 1992

LEGEND

60-mil VLDPE Textured Geomembrane Areas

60-mil VLDPE Smooth Geomembrane Areas

MARK J. AMRHEIN
STATE OF WASHINGTON
23715
REGISTERED PROFESSIONAL ENGINEER
12/31/92
EXPIRES 11/1/93

AS-BUILT RECORDS

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY
1	12/31/92	AS-BUILT RECORDS	MC	GRW	MJA	MSS
0	6/10/92	ISSUED FOR CONSTRUCTION	MDC	STP	MJA	MSS

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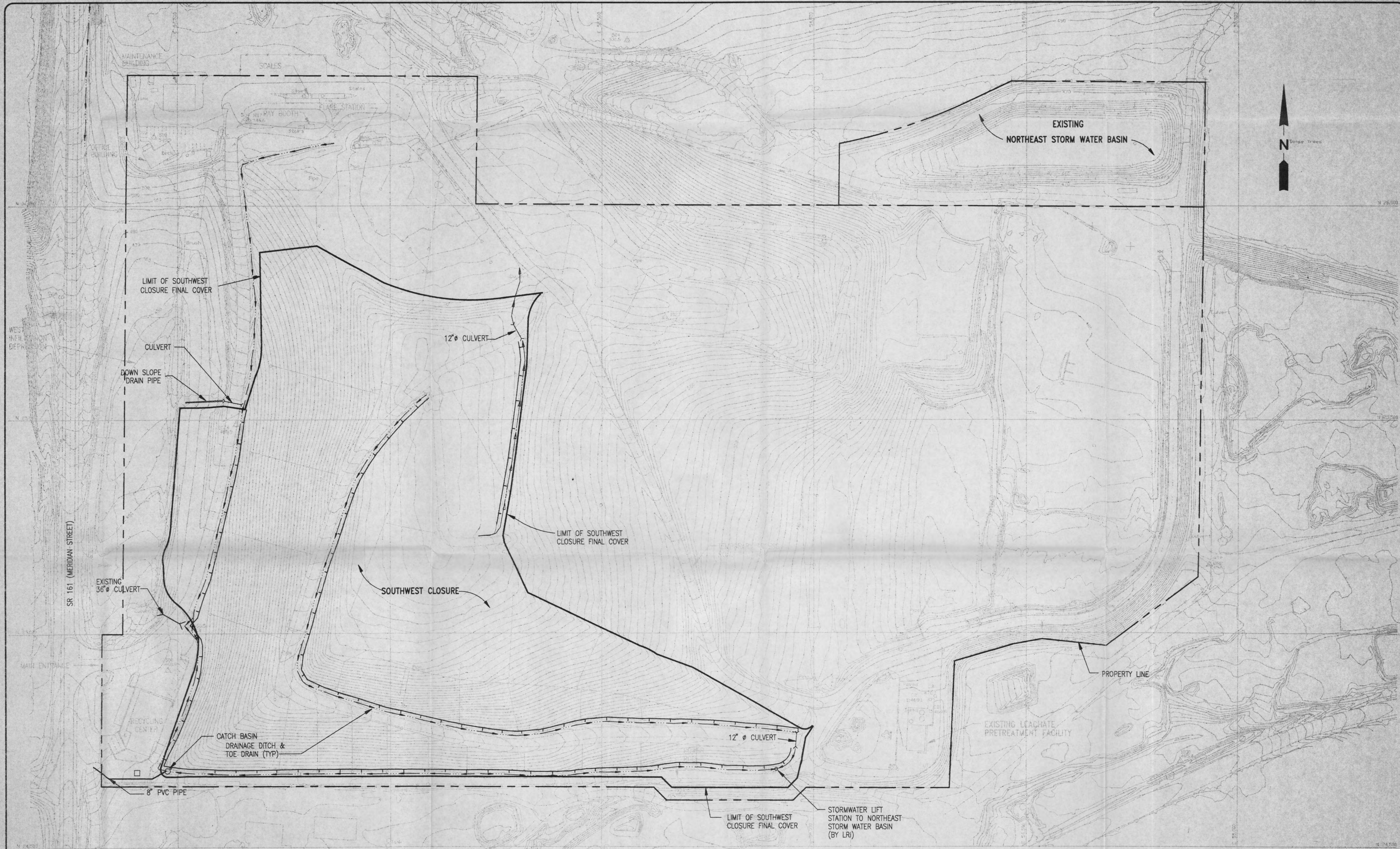
DES BY JEV APP BY MSS

EMCON Northwest, Inc.

LAND RECOVERY, INC.
HIDDEN VALLEY LANDFILL
PIERCE COUNTY, WASHINGTON

SOUTHWEST CLOSURE
GEOMEMBRANE COVER LAYOUT

DRAWING NO 2
PROJECT NO 0202-001.51



0 100 200

SCALE (ft)

Topography prepared by photogrammetric methods by; NIES MAPPING GROUP, INC.; Date of aerial; Jan. 19, 1992

LEGEND

Surface Water Drainage Ditch

Toe Drain

MARK J. AMRHEIN, STATE OF WASHINGTON, 23715, REGISTERED PROFESSIONAL ENGINEER

12/31/92

EXPIRES 11/1/93

AS-BUILT RECORDS

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY
1	12/31/92	AS-BUILT RECORDS	MC	GRW	MJA	MSS
0	8/10/92	ISSUED FOR CONSTRUCTION	MDC	STP	MJA	MSS

DATE OF ISSUE 8-10-92 DWN BY MDC CHK BY MJA DES BY JEY APP BY MSS

EMCON Northwest, Inc.

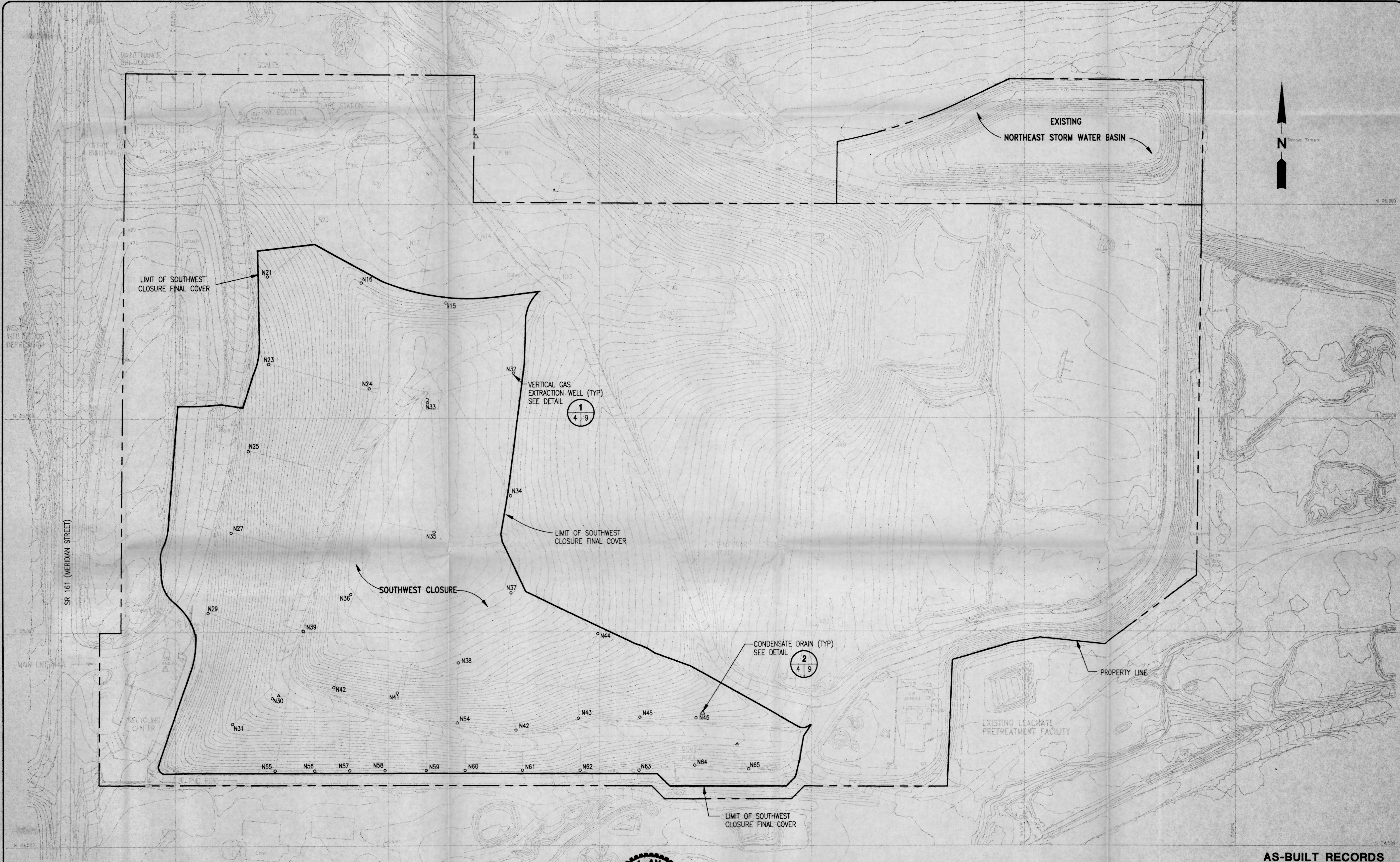
LAND RECOVERY, INC.
HIDDEN VALLEY LANDFILL
PIERCE COUNTY, WASHINGTON

SOUTHWEST CLOSURE
DRAINAGE PLAN

DRAWING NO 3

PROJECT NO 0202-001.51

SCALE: 1= 100 12-30-92 0202\001\51C04



0 100 200

SCALE (ft)

Topography prepared by photogrammetric methods by;
NIES MAPPING GROUP, INC.: Date of aerial; Jan. 19, 1992

LEGEND

o Vertical Extraction Well

△ Condensate Drain

MARK J. AMREIN
STATE OF WASHINGTON
REGISTERED PROFESSIONAL ENGINEER

12/31/92

AS-BUILT RECORDS

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY
1	12/31/92	AS-BUILT RECORDS	MC	GRW	MJA	MSS
0	6/10/92	ISSUED FOR CONSTRUCTION	MDC	STP	MJA	MSS

DATE OF ISSUE 6-10-92 DWN BY MDC DES BY JEV CHK BY MJA APP BY MSS

EMCON Northwest, Inc.

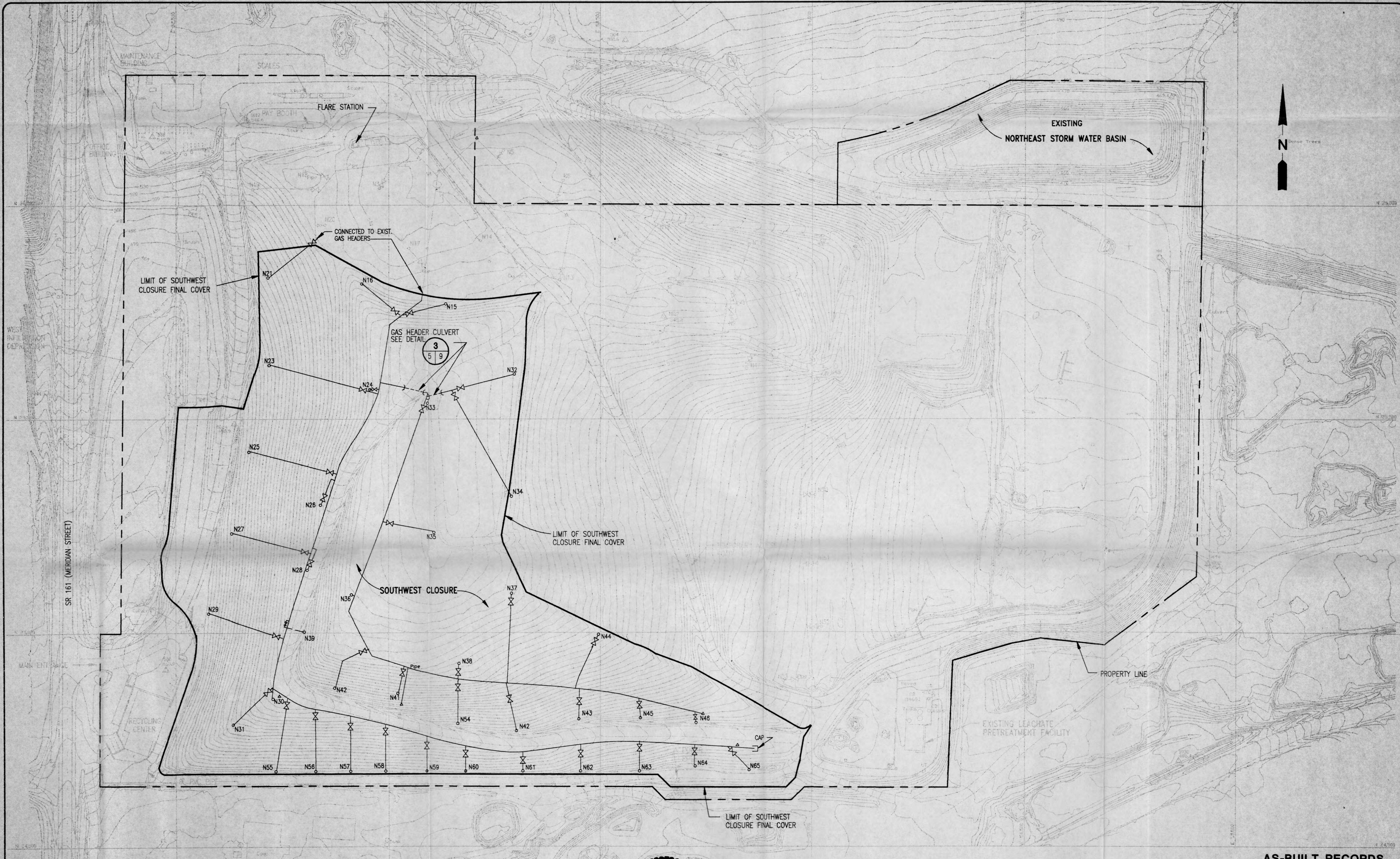
LAND RECOVERY, INC.
HIDDEN VALLEY LANDFILL
PIERCE COUNTY, WASHINGTON

SOUTHWEST CLOSURE
GAS WELL LOCATIONS

DRAWING NO 4

PROJECT NO 0202-001.51

SCALE:1= 100 12-30-92 0202\001\51C05



0 100 200

SCALE (ft)

Topography prepared by photogrammetric methods by;
NIES MAPPING GROUP, INC.: Date of aerial; Jan. 19, 1992

LEGEND
- o Vertical Extraction Well
- — Header Pipe
- △ Condensate Drain

MARK J. AMRHEIN
STATE OF WASHINGTON
23715
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES 11/1/93
Mark Amrhein 12/31/92

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY
1	12/31/92	AS-BUILT RECORDS	MC	GRW	MJA	MSS
0	6/10/92	ISSUED FOR CONSTRUCTION	MDC	STP	MJA	MSS

DATE OF ISSUE 6-10-92 DWN BY MDC DES BY JEV CHK BY MJA APP BY MSS

EMCON Northwest, Inc.

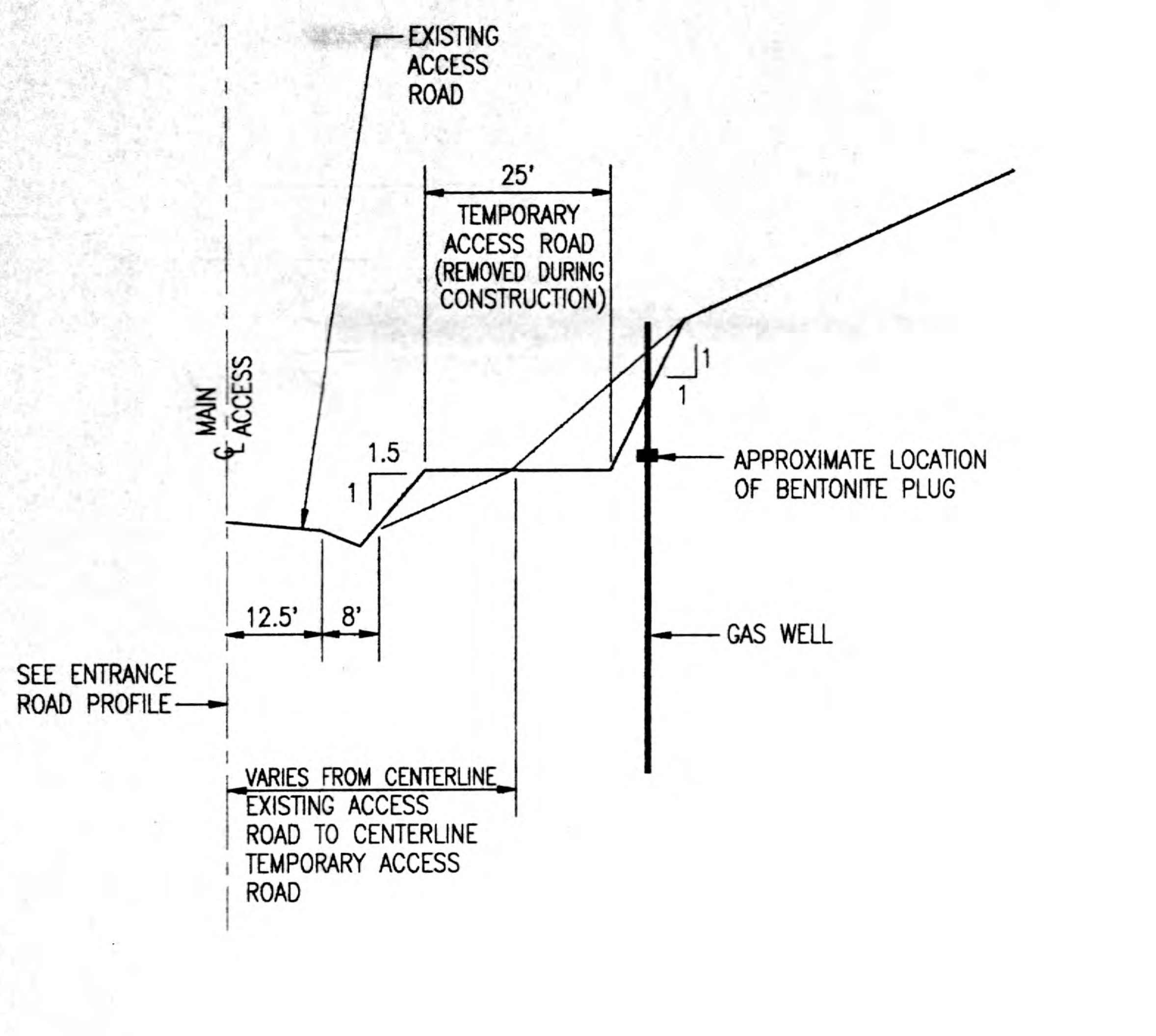
AS-BUILT RECORDS

LAND RECOVERY, INC.
HIDDEN VALLEY LANDFILL
PIERCE COUNTY, WASHINGTON

SOUTHWEST CLOSURE
GAS SYSTEM LAYOUT

DRAWING NO 5
PROJECT NO 0202-001.51

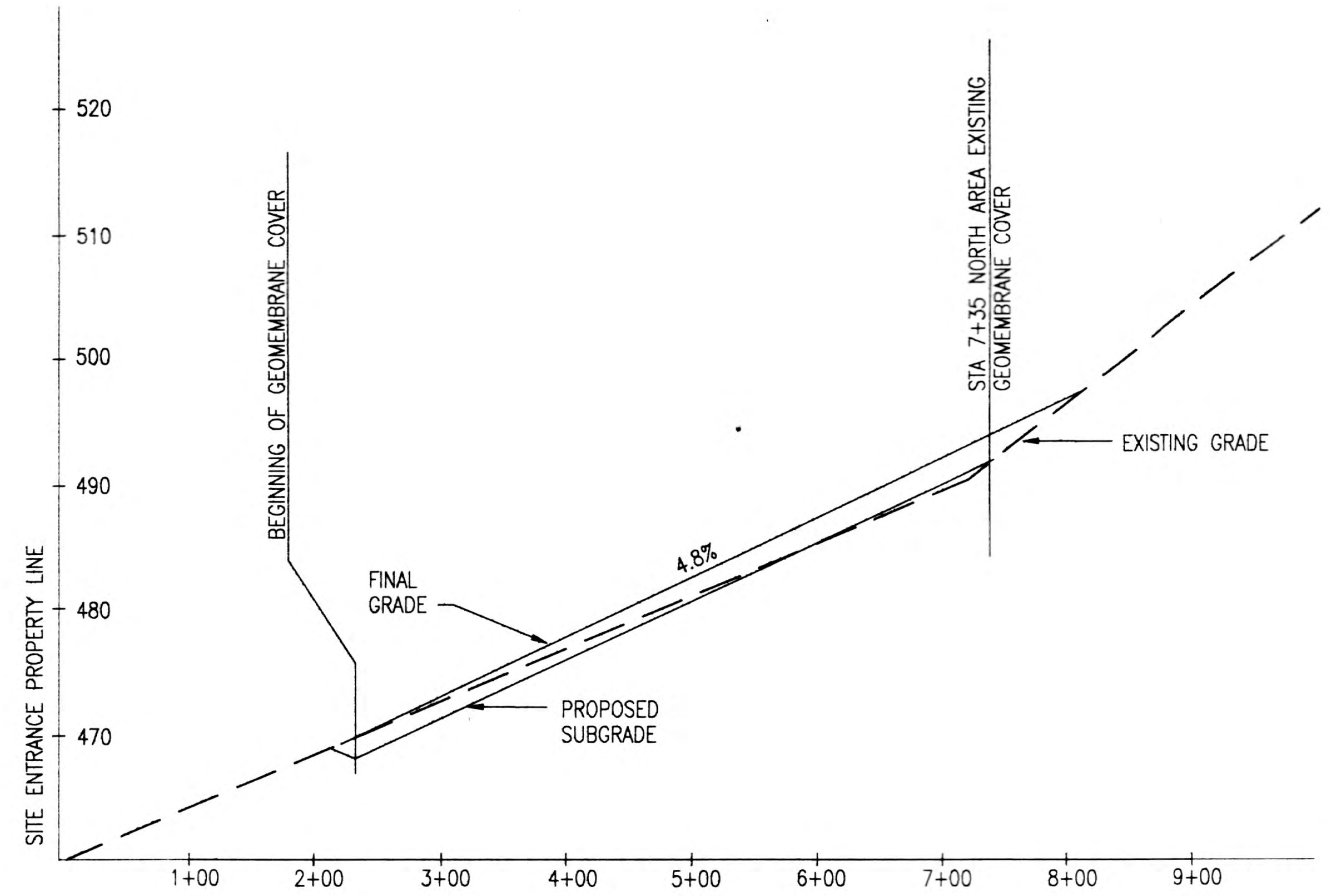
SCALE:1= 100 12-30-92 0202\001\51C06



TYPICAL SECTION OF TEMPORARY ACCESS ROAD

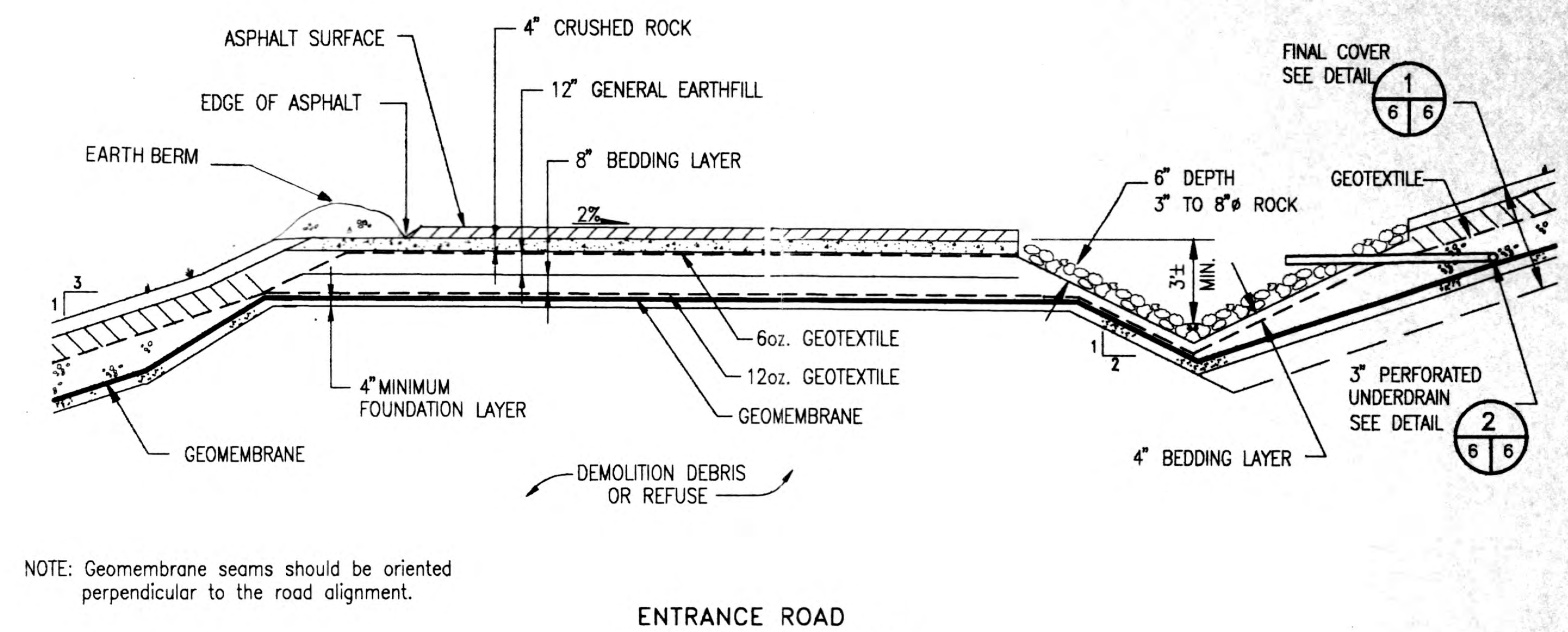
SECTION A 1|6

HORZ: 1" = 20'
VERT: 1" = 10'



ENTRANCE ROAD PROFILE

HORZ SCALE: 1" = 100
VERT SCALE: 1" = 10

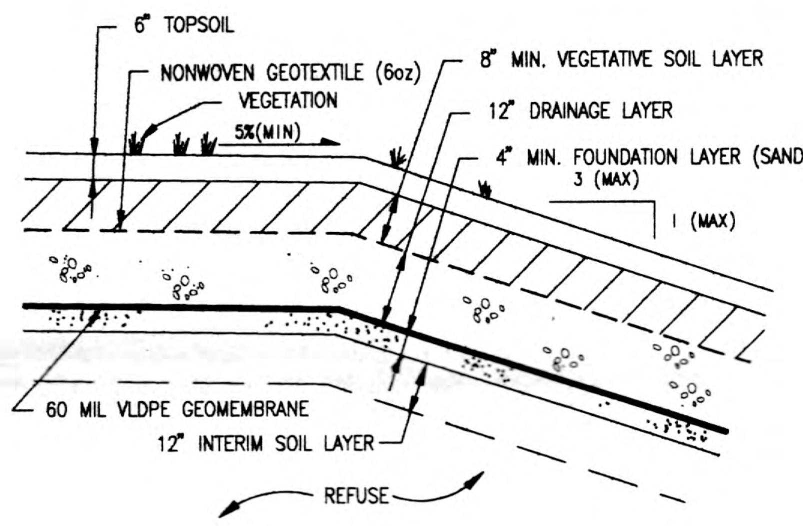


NOTE: Geomembrane seams should be oriented perpendicular to the road alignment.

ENTRANCE ROAD

SECTION B 2|6

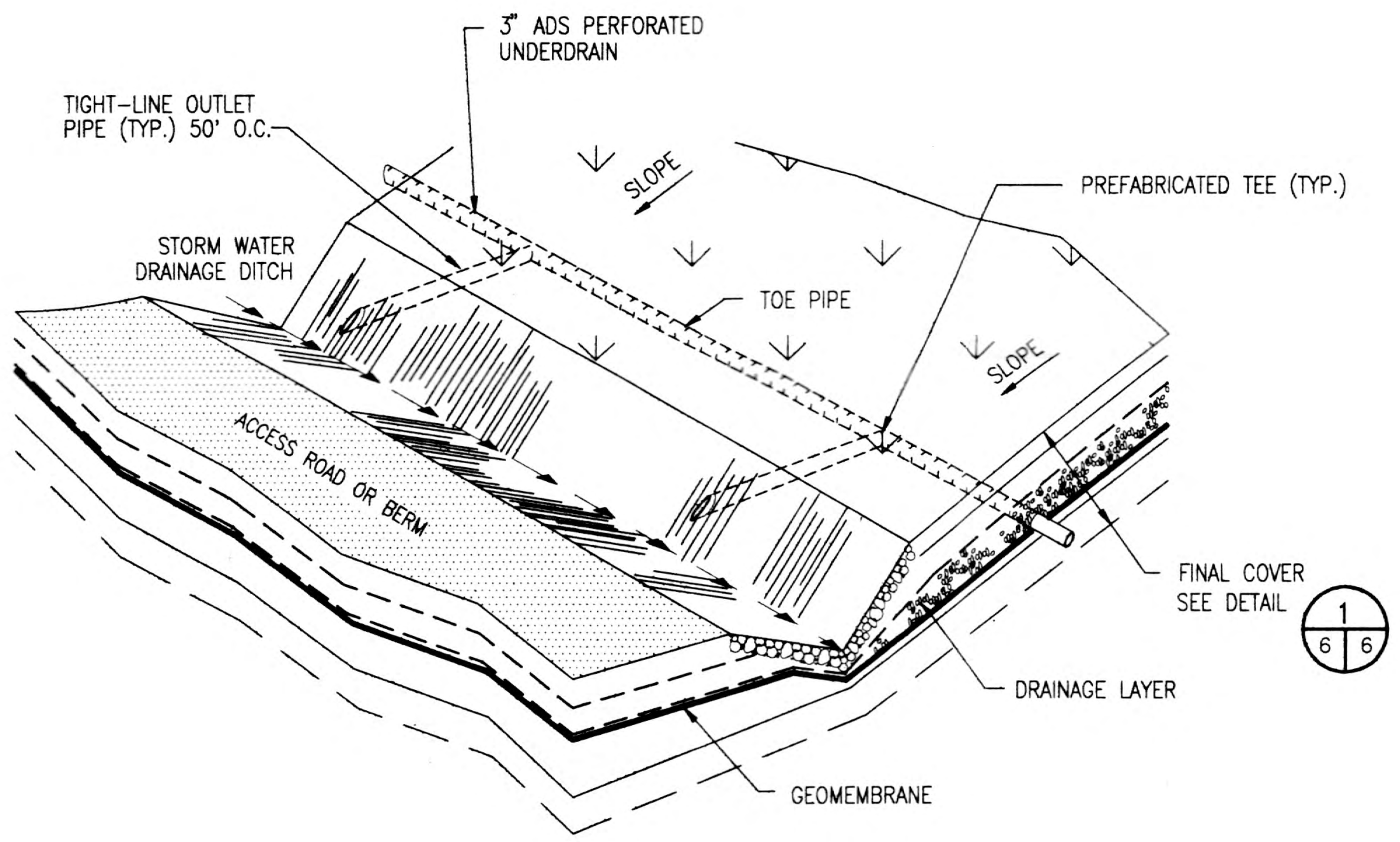
1" = 5'



FINAL COVER

DETAIL 1 6|6

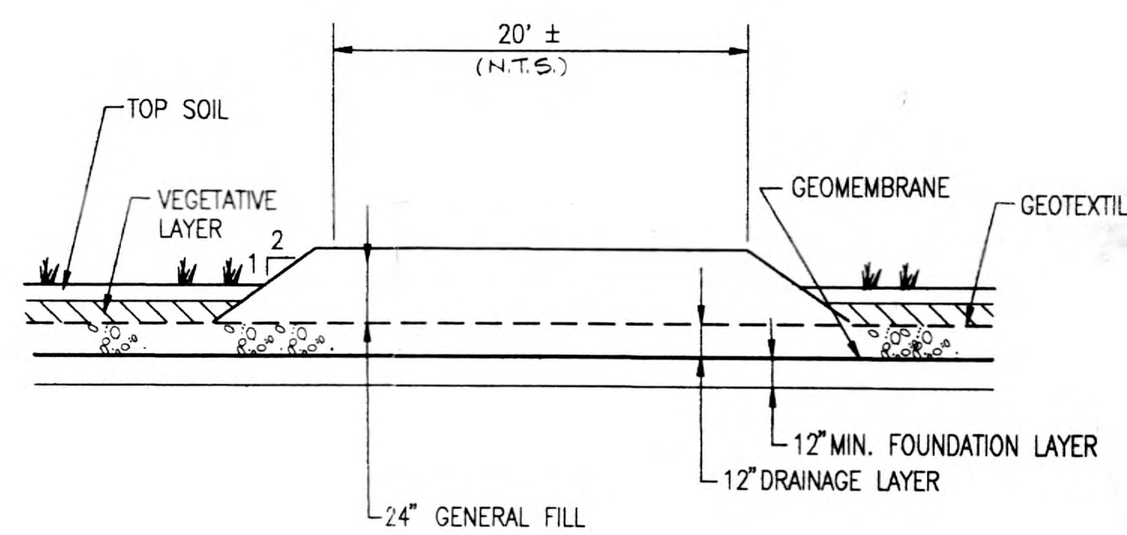
1" = 2'



TOE DRAIN

DETAIL 2 6|6

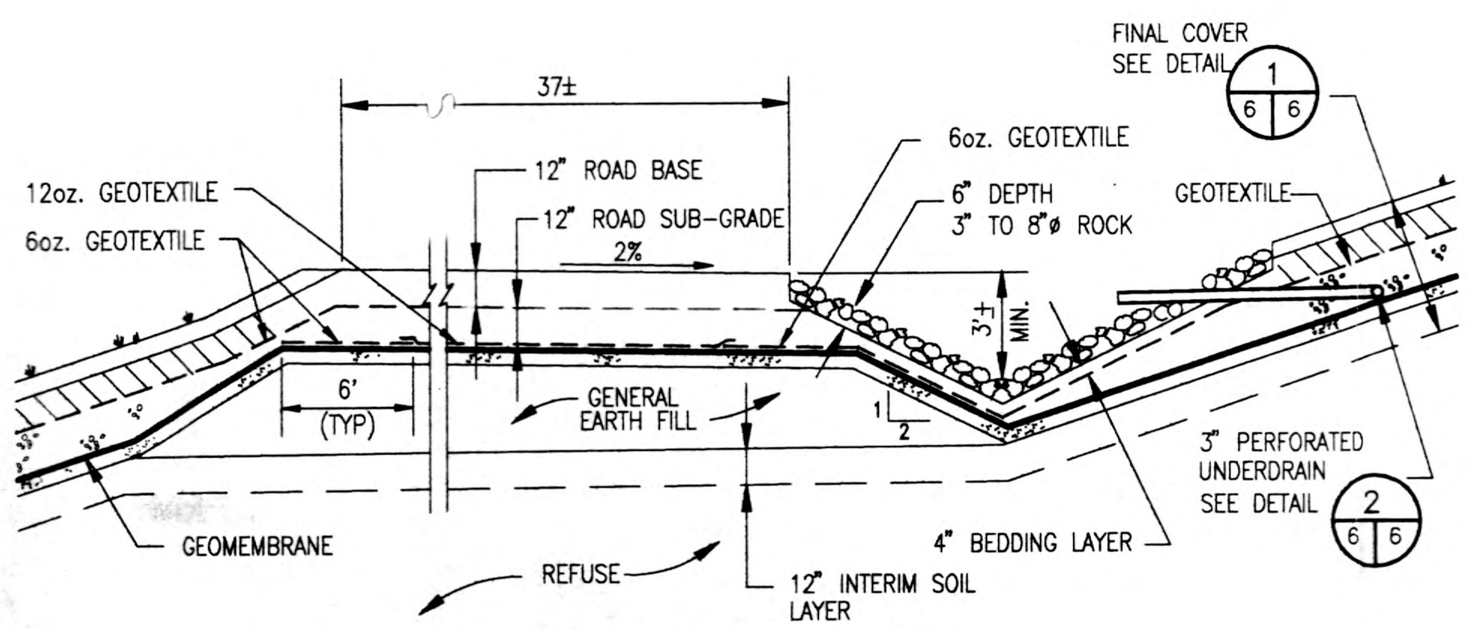
NTS



TOP SLOPE MAINTENANCE ROAD

SECTION C 2|6

1" = 5'



ACCESS ROAD & ROAD SIDE DITCH

SECTION D 2|6

1" = 4'

NOTE: GEOMEMBRANE AND GEOTEXTILE WORK SHOWN ON THIS DRAWING BY GEOSYNTHETIC CONTRACTOR; ALL OTHER WORK BY LAND RECOVERY, INC.

AS-BUILT RECORDS

MARK J. AMRHEIN
STATE OF WASHINGTON
23715
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES 11/1/93
12/31/92

REV	DATE	DESCRIPTION	DRN BY	DES BY	CHK BY	APP BY
1	12/31/92	AS-BUILT RECORDS	MC	GRW	MJA	MSS
0	6-10-92	ISSUED FOR CONSTRUCTION	STP	STP	MJA	MSS

DATE OF ISSUE 6-10-92 | DRN BY MDC | DES BY STP | CHK BY MJA | APP BY MSS

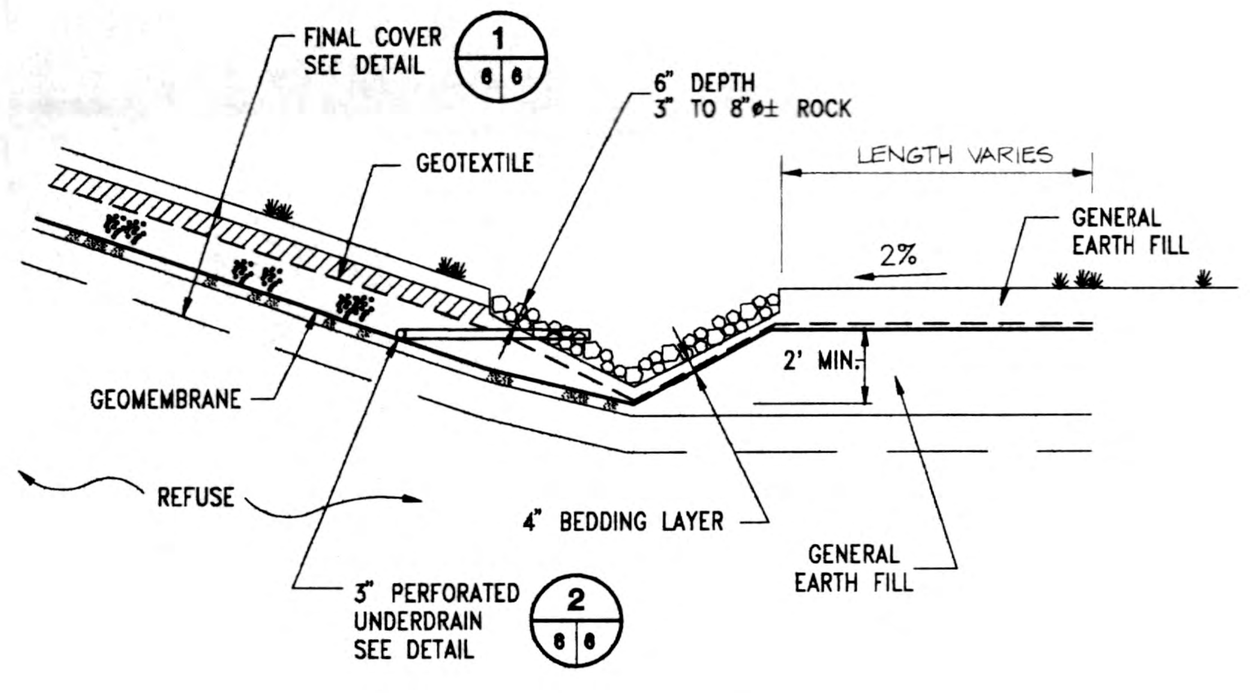
EMCON Northwest, Inc.

LAND RECOVERY, INC.
HIDDEN VALLEY LANDFILL
PIERCE COUNTY, WASHINGTON
SOUTHWEST CLOSURE
COVER DETAILS

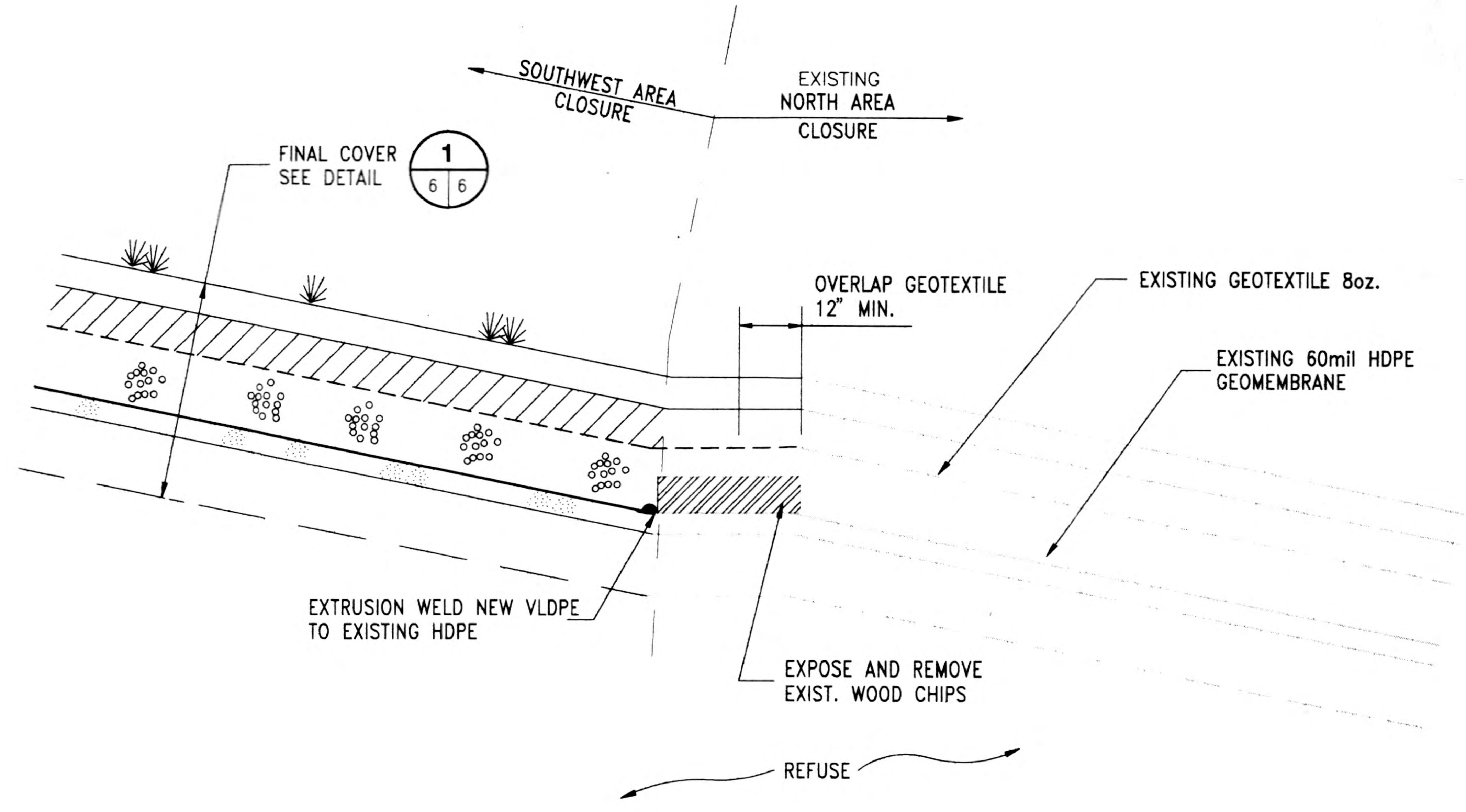
DRAWING NO 6

PROJECT NO T0201.50

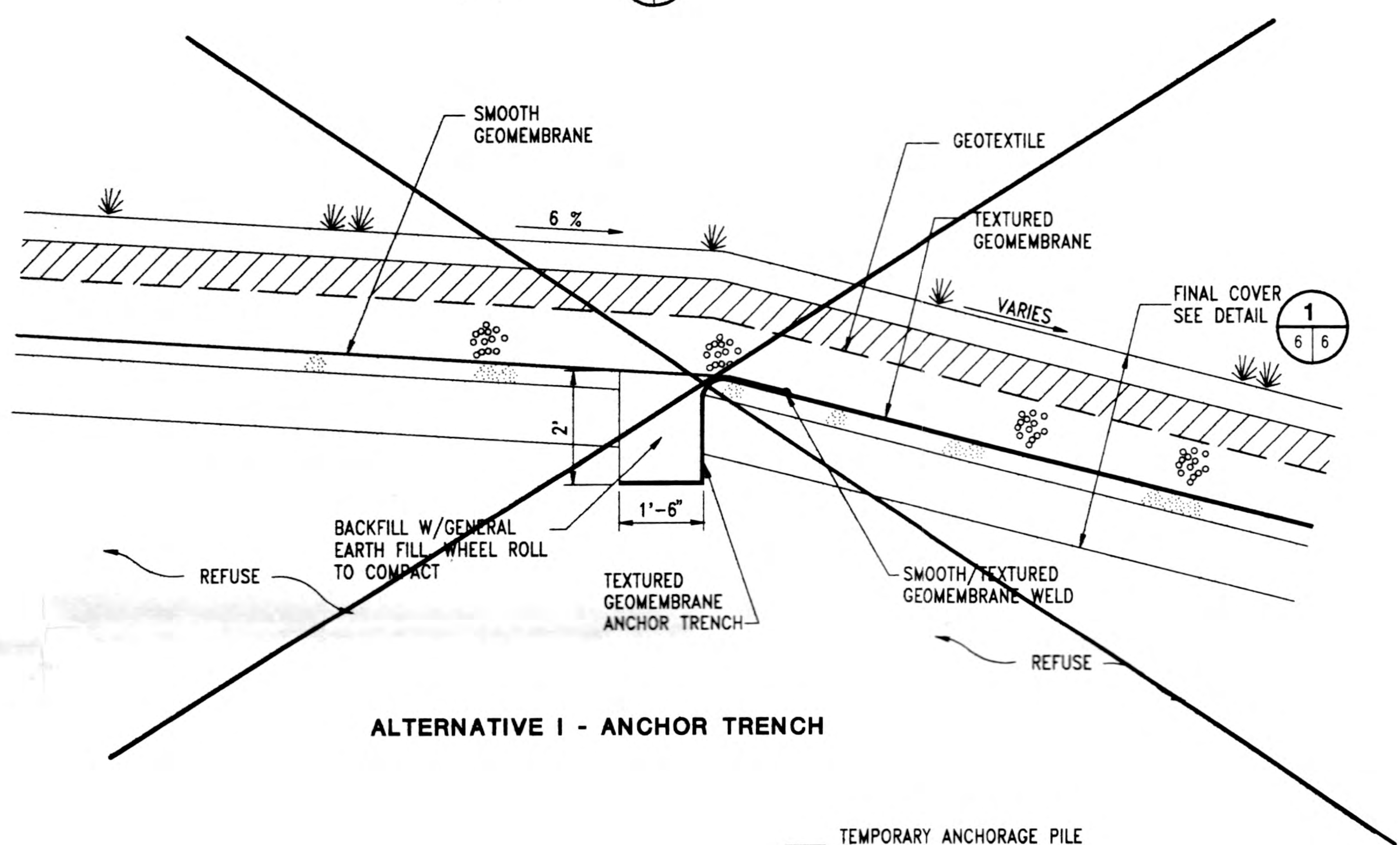
1=1 12-29-92 0202\001\51C07



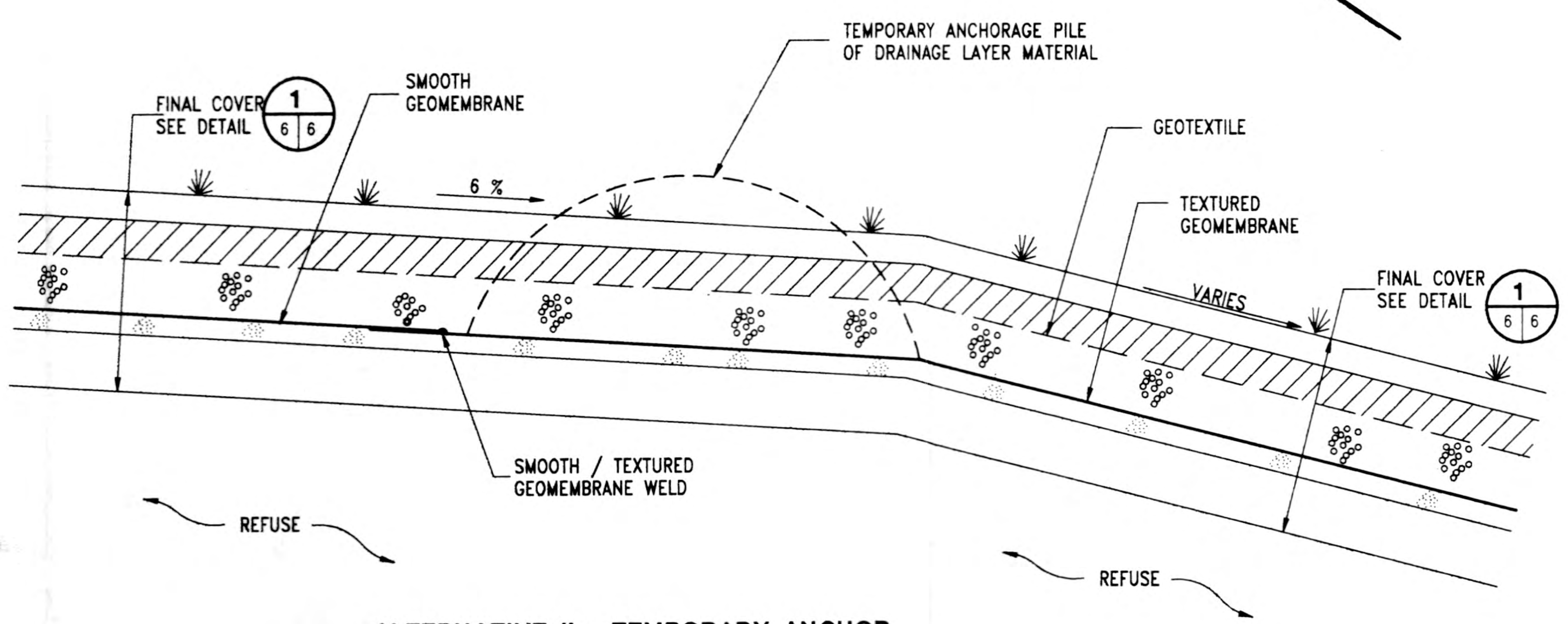
PERIMETER DITCH
SECTION A 2|7
1" = 4'



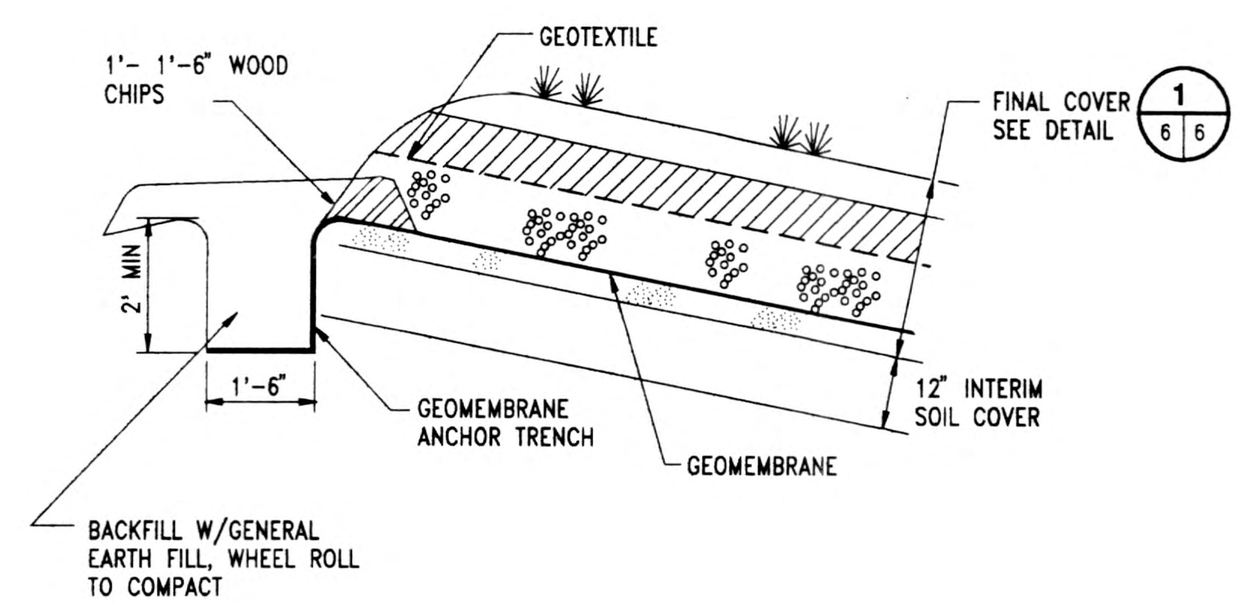
NORTH AREA CONNECTION SECTION
SECTION B 2|7
1" = 2'



ALTERNATIVE I - ANCHOR TRENCH



ALTERNATIVE II - TEMPORARY ANCHOR
SECTION C 2|7
1" = 2'



SIDE SLOPE ANCHOR TRENCH
SECTION D 2|7
1" = 2'

NOTE: GEOMEMBRANE AND GEOTEXTILE WORK SHOWN ON THIS DRAWING BY GEOSYNTHETIC CONTRACTOR; ALL OTHER WORK BY LAND RECOVERY, INC.

AS-BUILT RECORDS

MARK J. AMBERGER — STATE OF WASHINGTON — 23715 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 11/1/93

12/31/92

REV	DATE	DESCRIPTION	DRN BY	DES BY	CHK BY	APP BY
1	12/31/92	AS-BUILT RECORDS	MC	GRW	MJA	MSS
0	6-10-92	ISSUED FOR CONSTRUCTION	MDC	STP	MJA	MSS

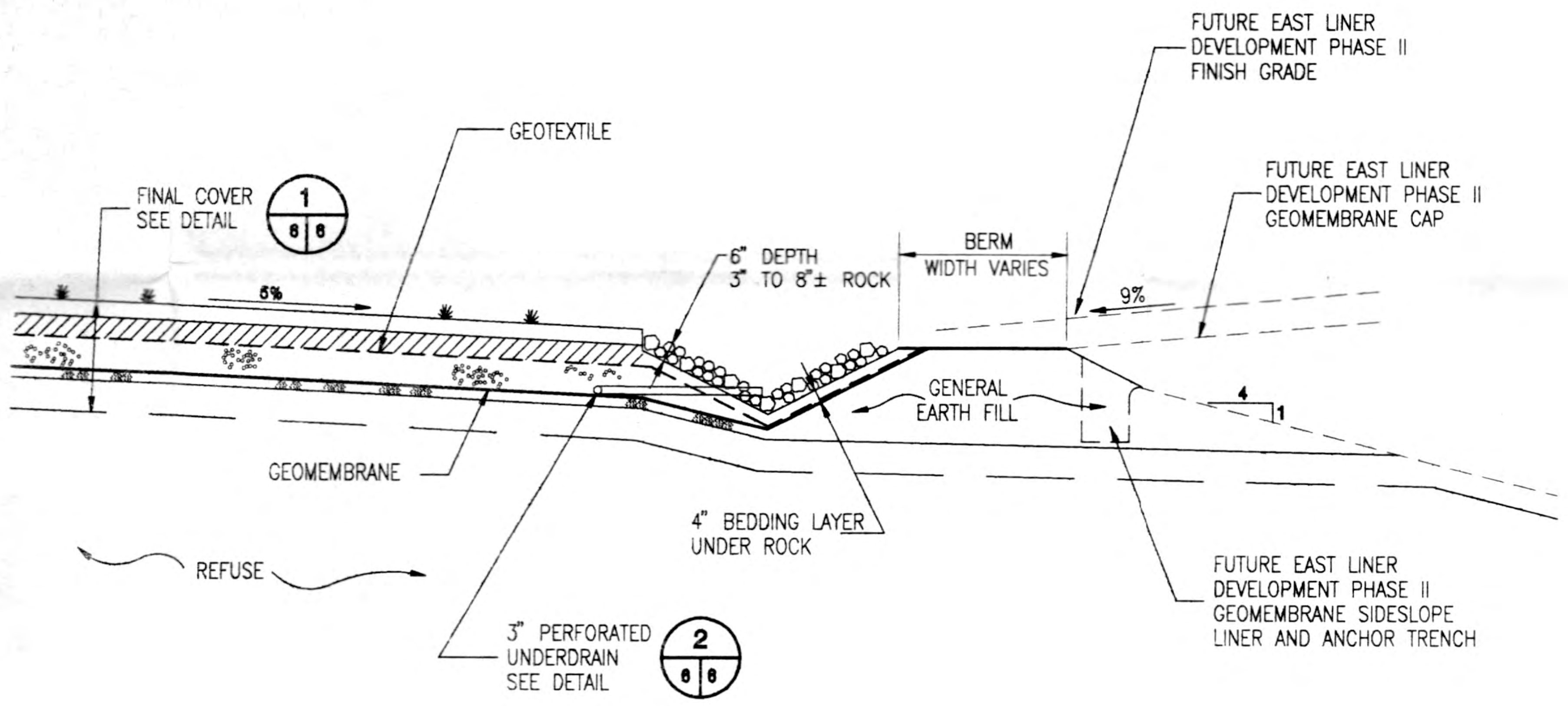
DATE OF ISSUE 6-4-92 DRN BY MDC DES BY STP CHK BY MJA APP BY MSS

EMCON Northwest, Inc.

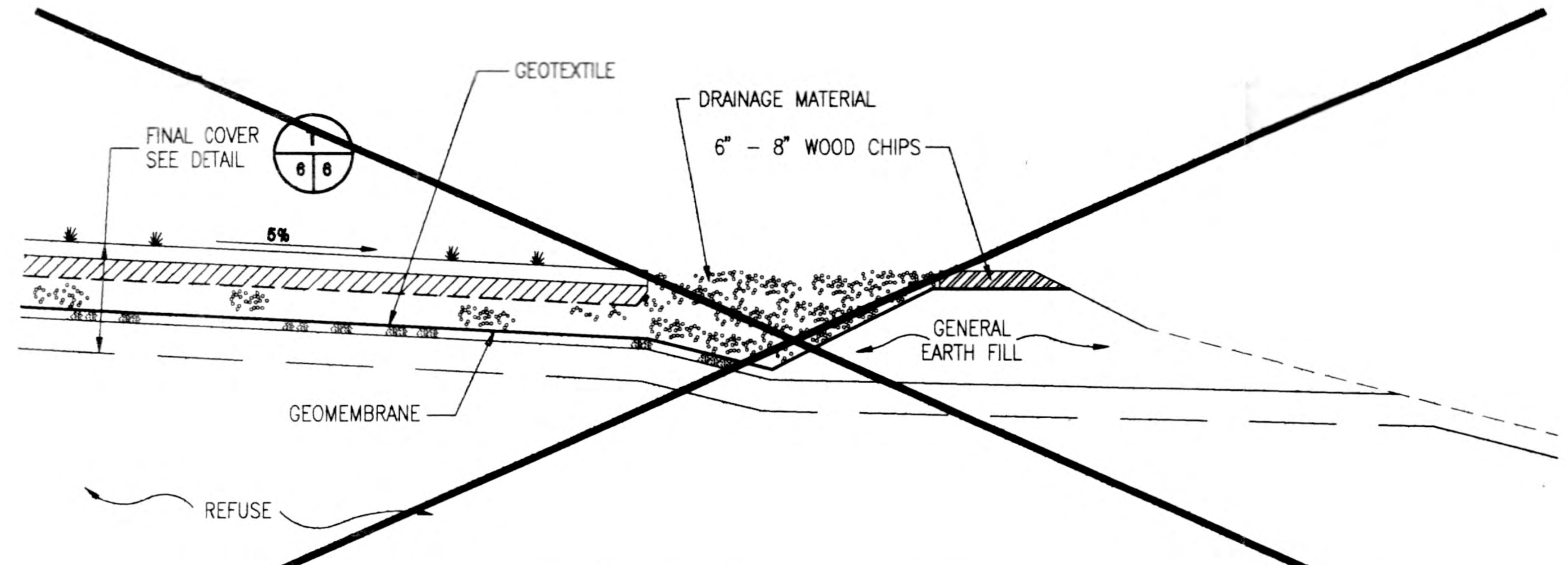
LAND RECOVERY, INC.
HIDDEN VALLEY LANDFILL
PIERCE COUNTY, WASHINGTON
SOUTHWEST CLOSURE
COVER DETAILS

DRAWING NO 7
PROJECT NO T0201.50

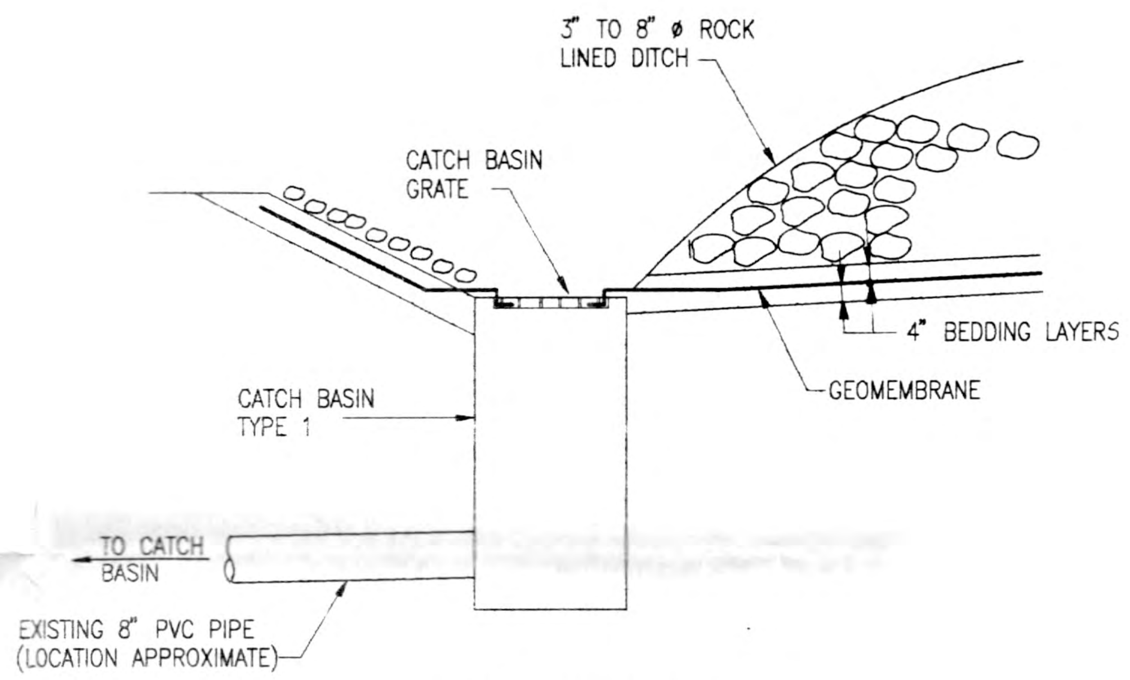
0202\001\51C08



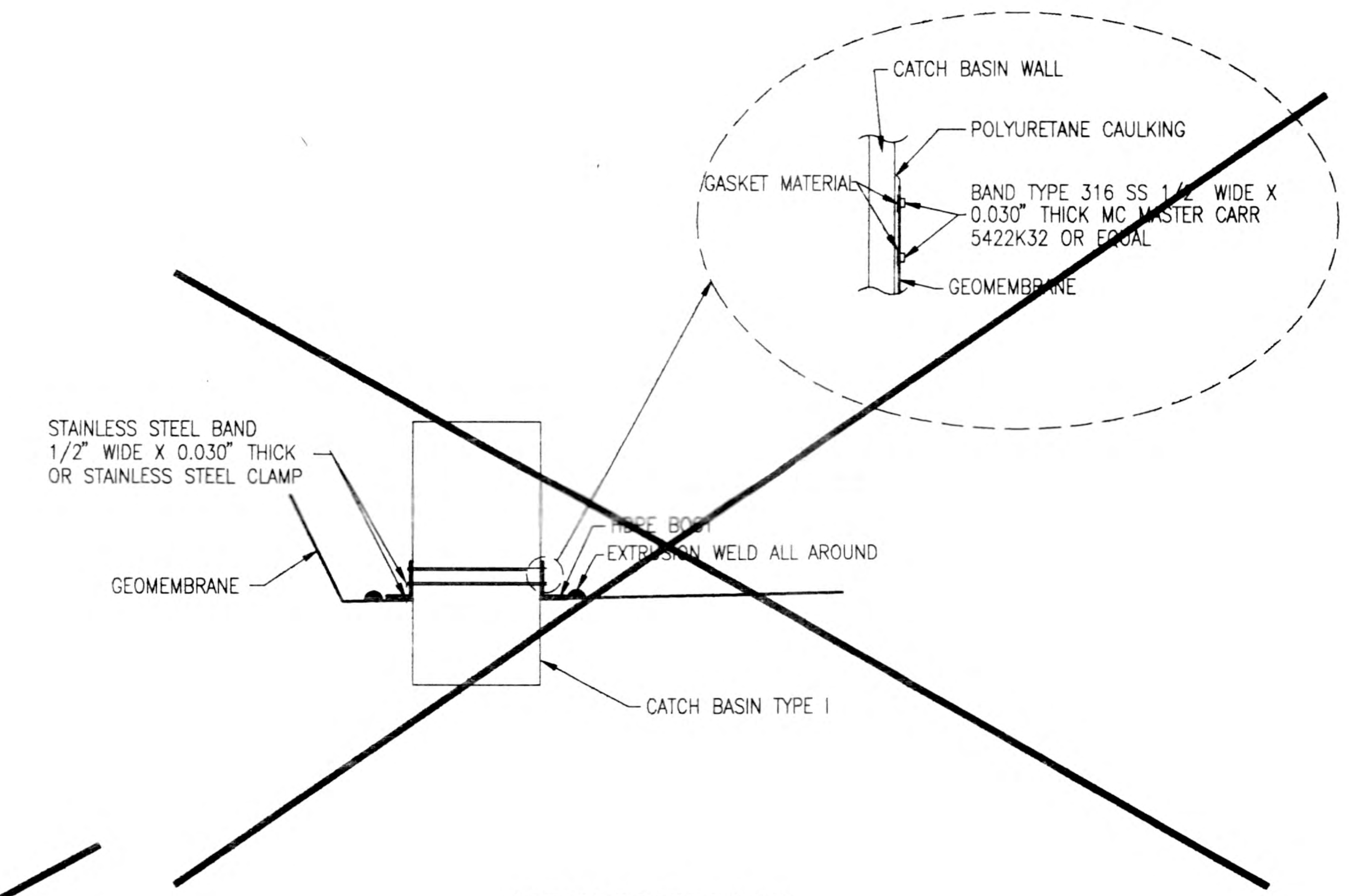
TOP SLOPE DITCH
SECTION (A 2|8)
1" = 4'



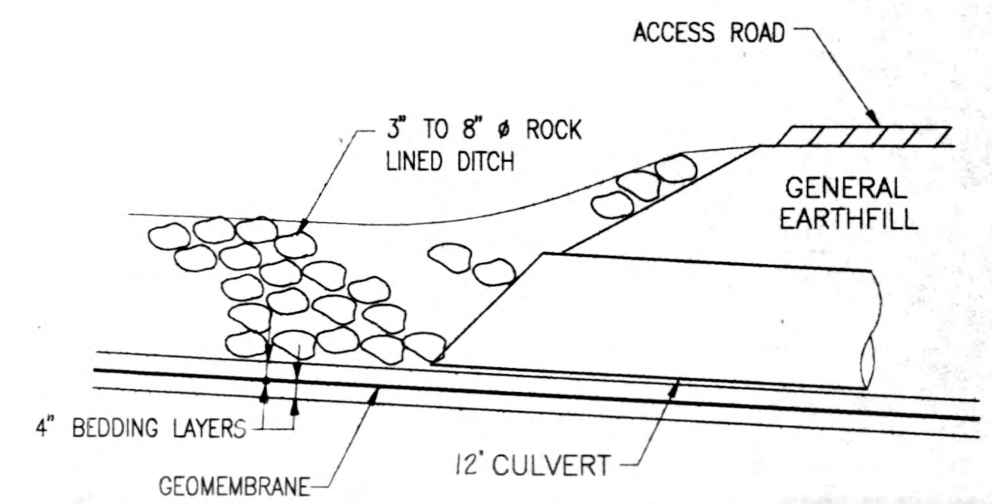
TEMPORARY TOP SLOPE DITCH
SECTION (B 2|8)
1" = 4'



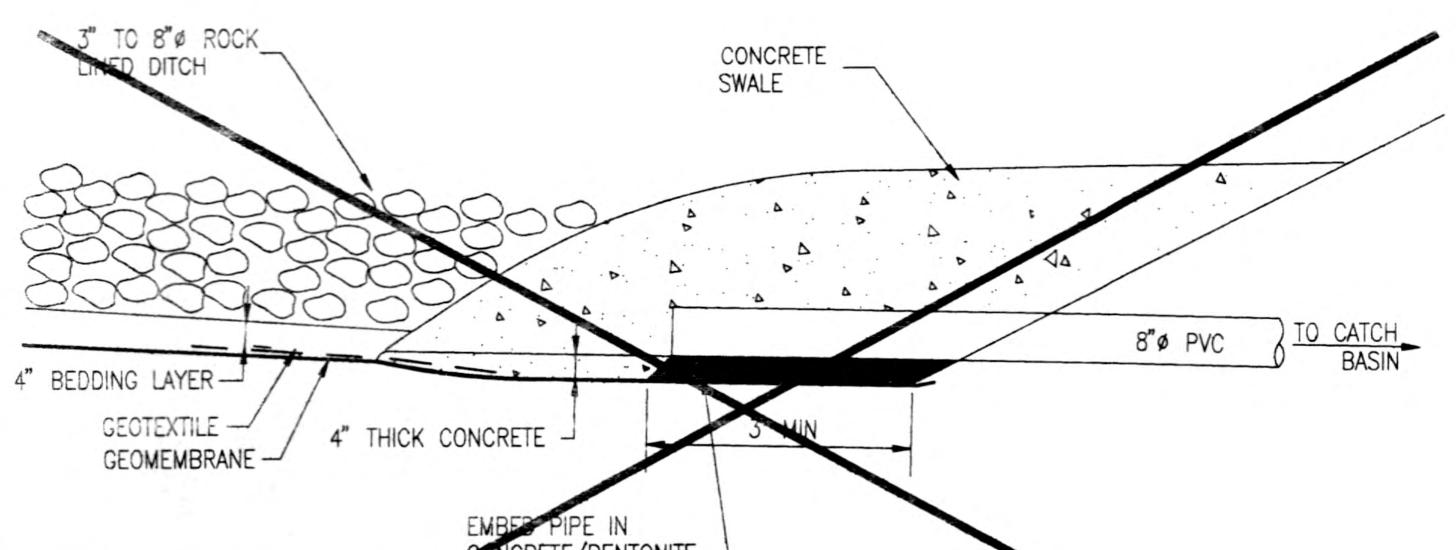
CATCH BASIN INLET
DETAIL (1 3|8)
1" = 2'



CATCH BASIN BOOT
DETAIL (2 8|8)
1" = 2'



CONNECTION TO CATCH BASIN (3 3|8)
N.T.S.



NOTE: ENSURE POSITIVE DRAINAGE FROM ROCK LINED DITCH TO INLET OF PIPE.

INLET SWALE
DETAIL (4 8|8)
1" = 2'

NOTE: GEOMEMBRANE AND GEOTEXTILE WORK SHOWN ON THIS DRAWING BY GEOSYNTHETIC CONTRACTOR; ALL OTHER WORK BY LAND RECOVERY, INC.

MARK J. AMRHEIN — STATE OF WASHINGTON — 23715 — REGISTERED PROFESSIONAL ENGINEER
EXPIRES 11/1/93
12/31/92

AS-BUILT RECORDS

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY
1	12/31/92	AS-BUILT RECORDS	mc	GRV	MJA	MSS
0	6-10-92	ISSUED FOR CONSTRUCTION	STP	STP	MJA	MSS

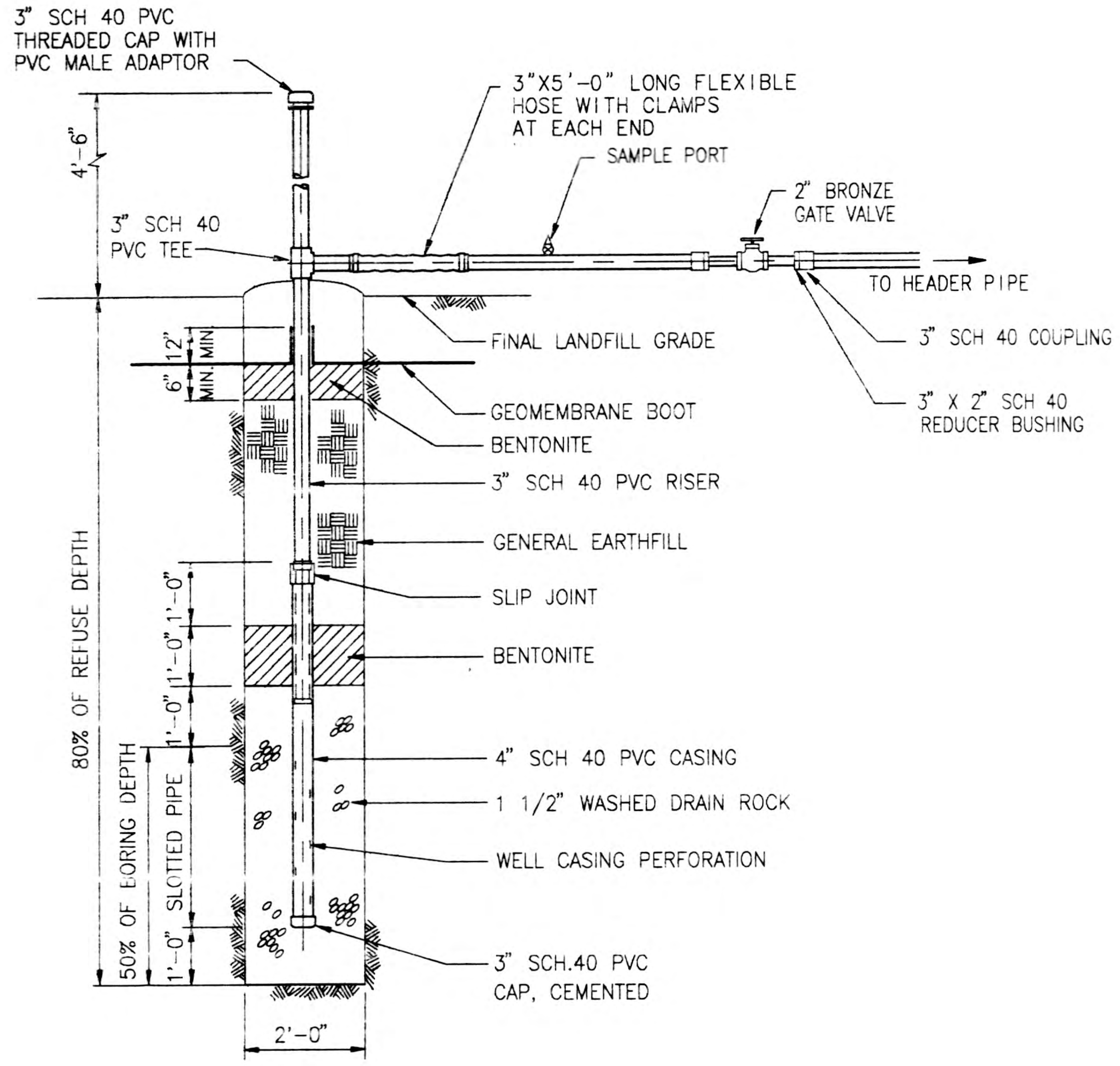
DATE OF ISSUE 6-10-92 — DWN BY STP — DES BY STP — CHK BY MJA — APP BY MSS

EMCON Northwest, Inc.

LAND RECOVERY, INC.
HIDDEN VALLEY LANDFILL
PIERCE COUNTY, WASHINGTON
SOUTHWEST CLOSURE
COVER DETAILS

DRAWING NO 8
PROJECT NO T0201.50

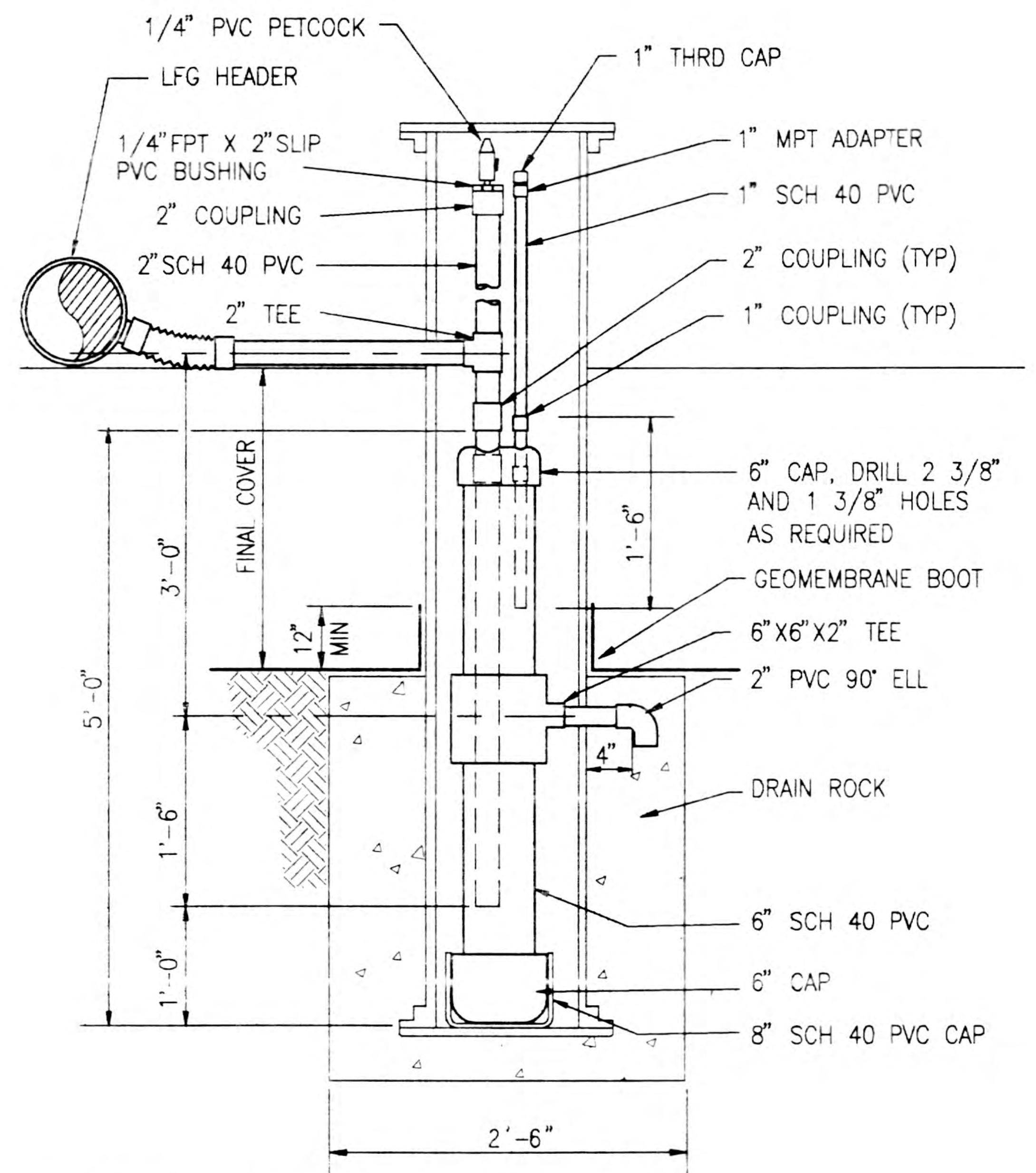
1=1 12-29-92 0202\001\51C09



TYPICAL VERTICAL EXTRACTION GAS WELL

DETAIL 1 (4 | 9)

NO SCALE

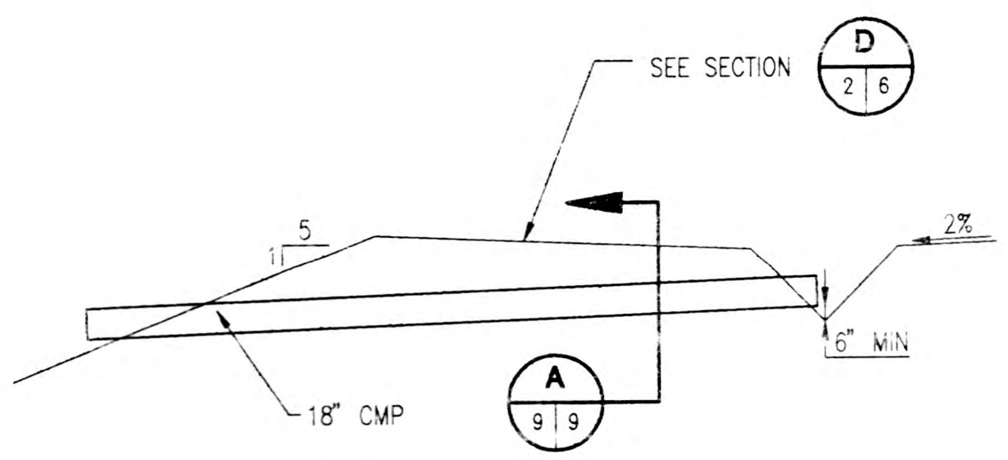


NOTE: BACKFILL AROUND CONDENSATE TRAP W/ PEA GRAVEL.

TYPICAL CONDENSATE DRAIN

DETAIL 2 (4 | 9)

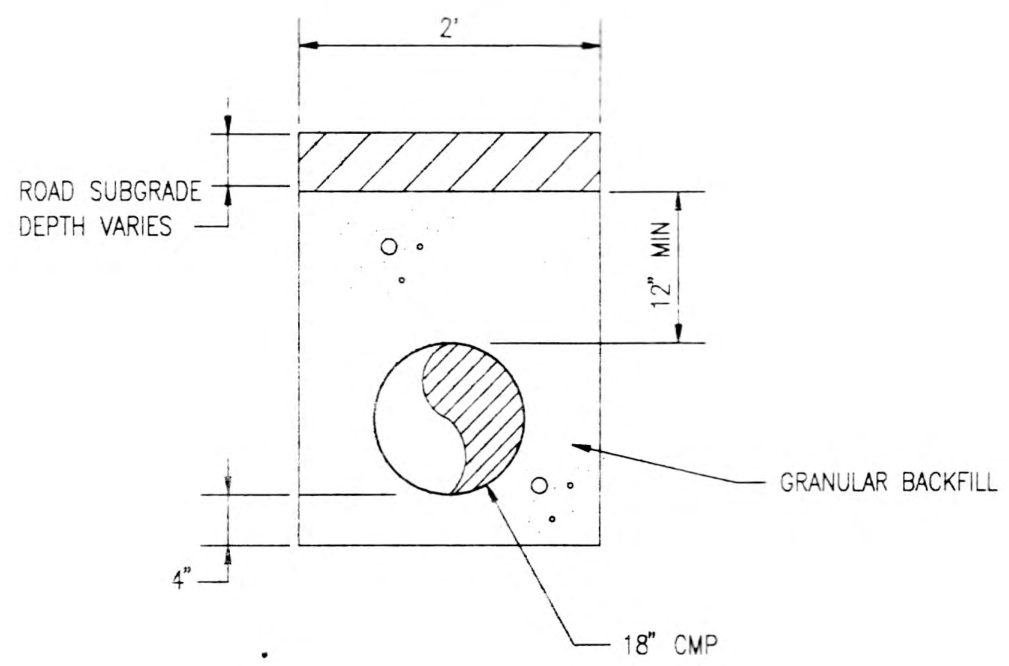
1" = 1'



GAS HEADER CULVERT

DETAIL 3 (5 | 9)

HORI: 1" = 10'
VERT: 1" = 5'



GAS HEADER CULVERT SECTION

SECTION A (9 | 9)

1" = 1'

AS BUILT RECORDS

MARK J. AMRHEIN STATE OF WASHINGTON REGISTERED PROFESSIONAL ENGINEER
EXPIRES 11/1/93
12/31/92

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY
1	12/31/92	AS-BUILT RECORDS	MC	GRW	MJA	MSR
0	6-10-92	ISSUED FOR CONSTRUCTION	STP	STP	MJA	MSR

DATE OF ISSUE 6-4-92 DWN BY MDC DES BY JEY CHK BY DV APP BY MSS

EMCON Northwest, Inc.

LAND RECOVERY, INC.
HIDDEN VALLEY LANDFILL
PIERCE COUNTY, WASHINGTON
SOUTHWEST CLOSURE
GAS SYSTEM DETAILS

DRAWING NO 9
PROJECT NO T0201.50

SCALE: 1=1 12-30-92 0202\001\51C11

Appendix B

LABORATORY SOILS TESTS

LABORATORY TESTING SUMMARY

For The

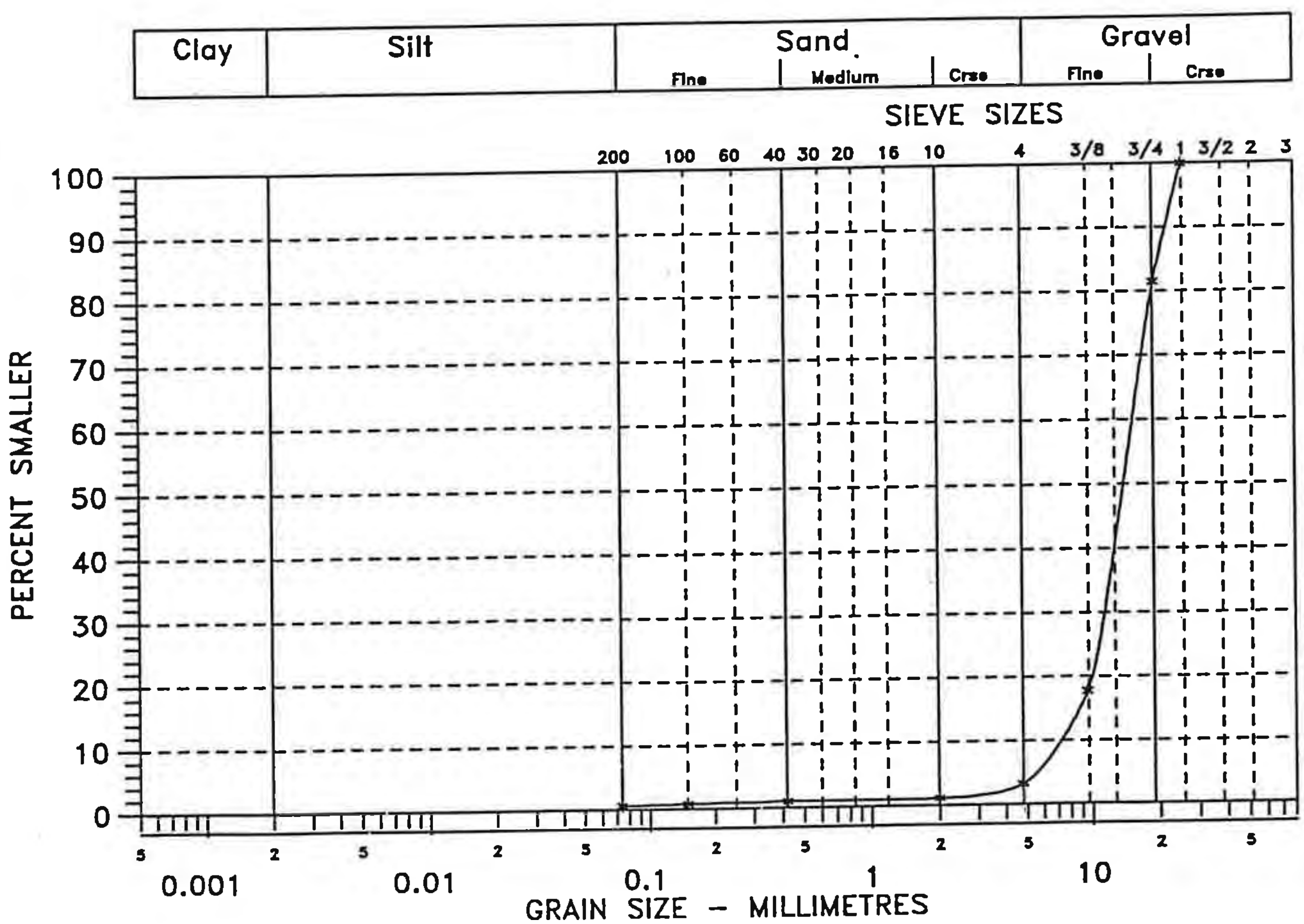
HIDDEN VALLEY LANDFILL PROJECT
Project No. 90113
November 11, 1992

SAMPLE NO.	PERMEABILITY CM/SEC
TOP-1	5.0×10^{-5}
TOP-2	1.6×10^{-4}
TOP-3	1.4×10^{-4}
DR-3	3.7×10^{-2}
DR-4	2.4×10^{-2}
VEG-1	3.8×10^{-2}
VEG-3	1.9×10^{-2}

HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 7/22/92
Remarks: Gray GRAVEL with trace of sand and silt (GP)

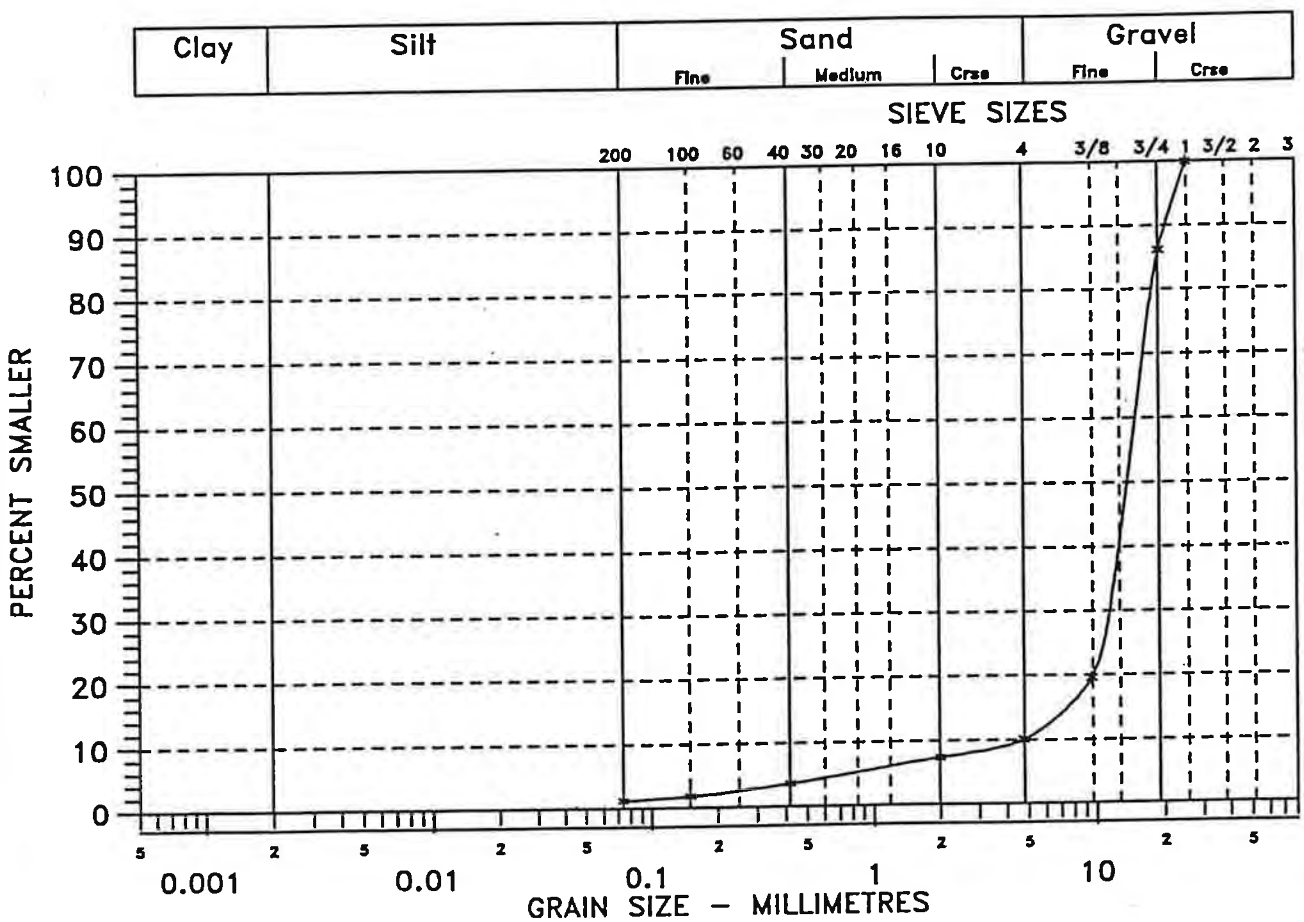
Test Hole Number: --
Sample Number: DR-1
Depth: --
Sample Description:
Gravel: 96.8
Sand: 2.6
Silt: 0.6
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 7/22/92
Remarks: Gray GRAVEL with some sand and trace of silt (GW)

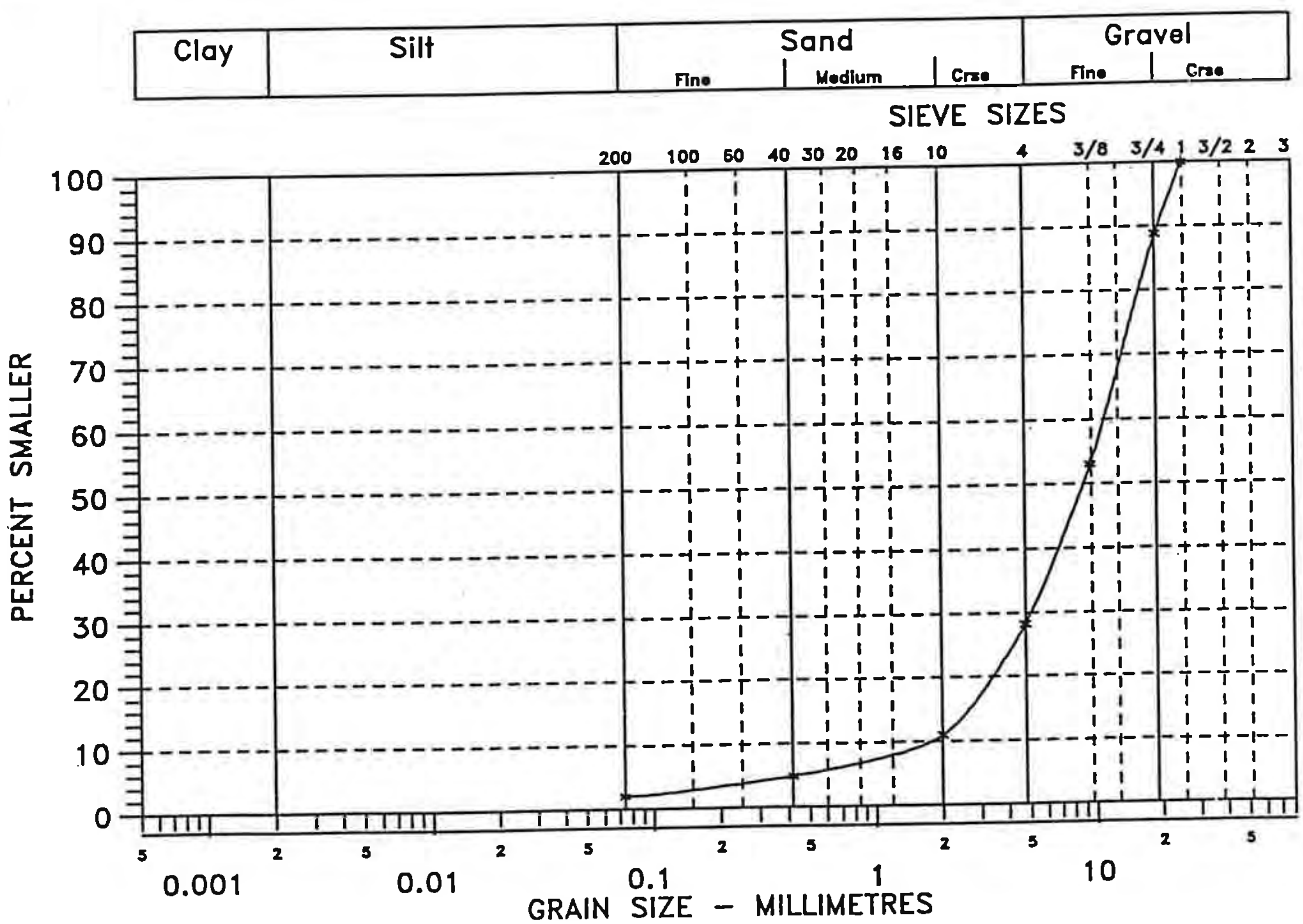
Test Hole Number: --
Sample Number: DR-2
Depth: --
Sample Description:
Gravel: 89.9
Sand: 8.9
Silt: 1.2
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 8/28/92
Remarks: Grayish brown, GRAVEL with some sand and trace of silt (GW)

Test Hole Number: --
Sample Number: DR-1
Depth: --
Sample Description:
Gravel: 89.0
Sand: 9.0
Silt: 2.0
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure

Client: Emcon Northwest

Project Number: 90113

Date Tested: 8/21/92

Remarks: Gray, sandy GRAVEL with trace of silt (GP)

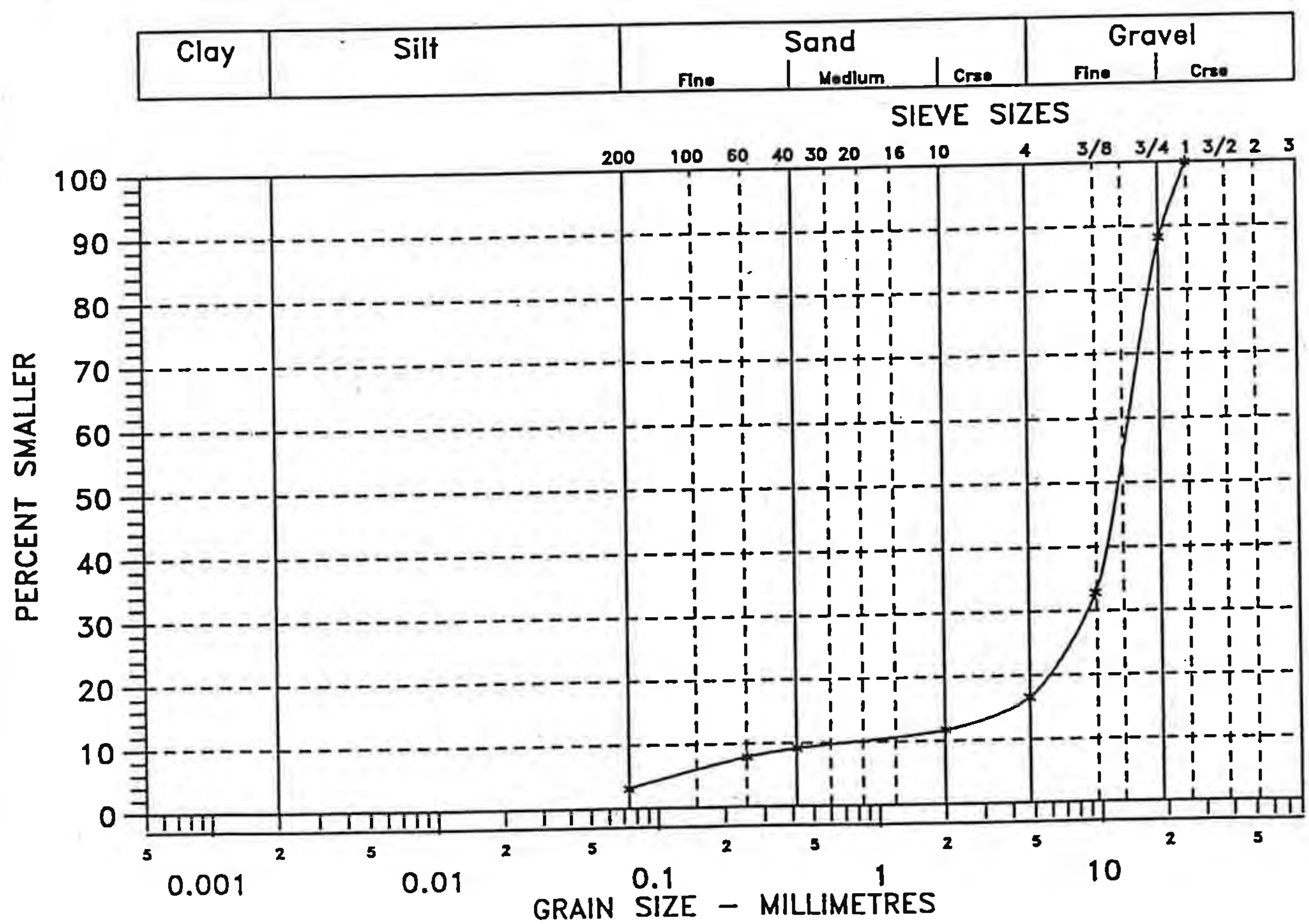
Test Hole Number: --

Sample Number: DR-2

Depth: --

Sample Description:

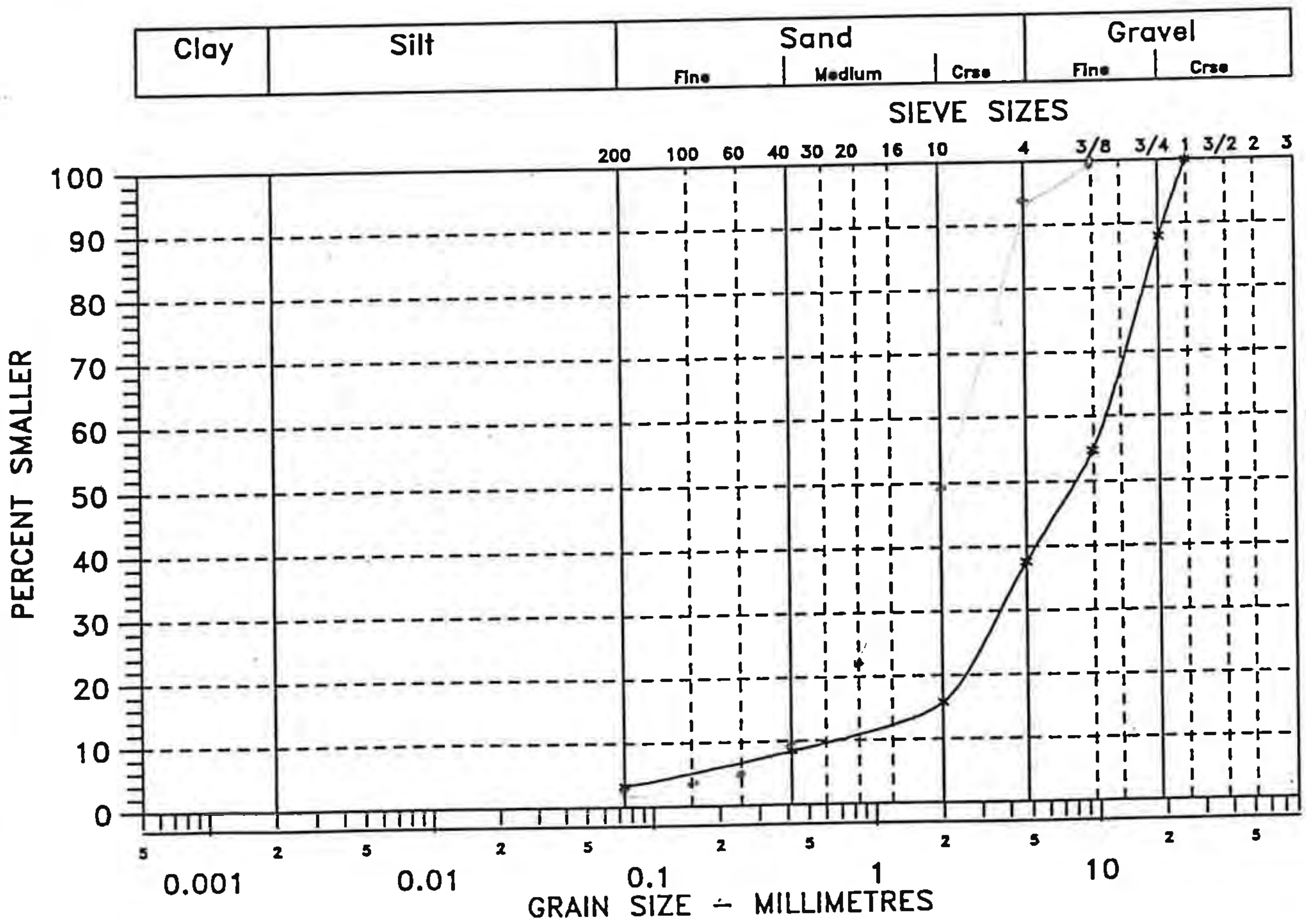
- Gravel: 83.4
- Sand: 13.5
- Silt: 3.1
- Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 8/28/92
Remarks: Grayish brown, sandy GRAVEL with trace of silt (GW)
PERMEABILITY: K= 3.7x10 -2 cm/sec

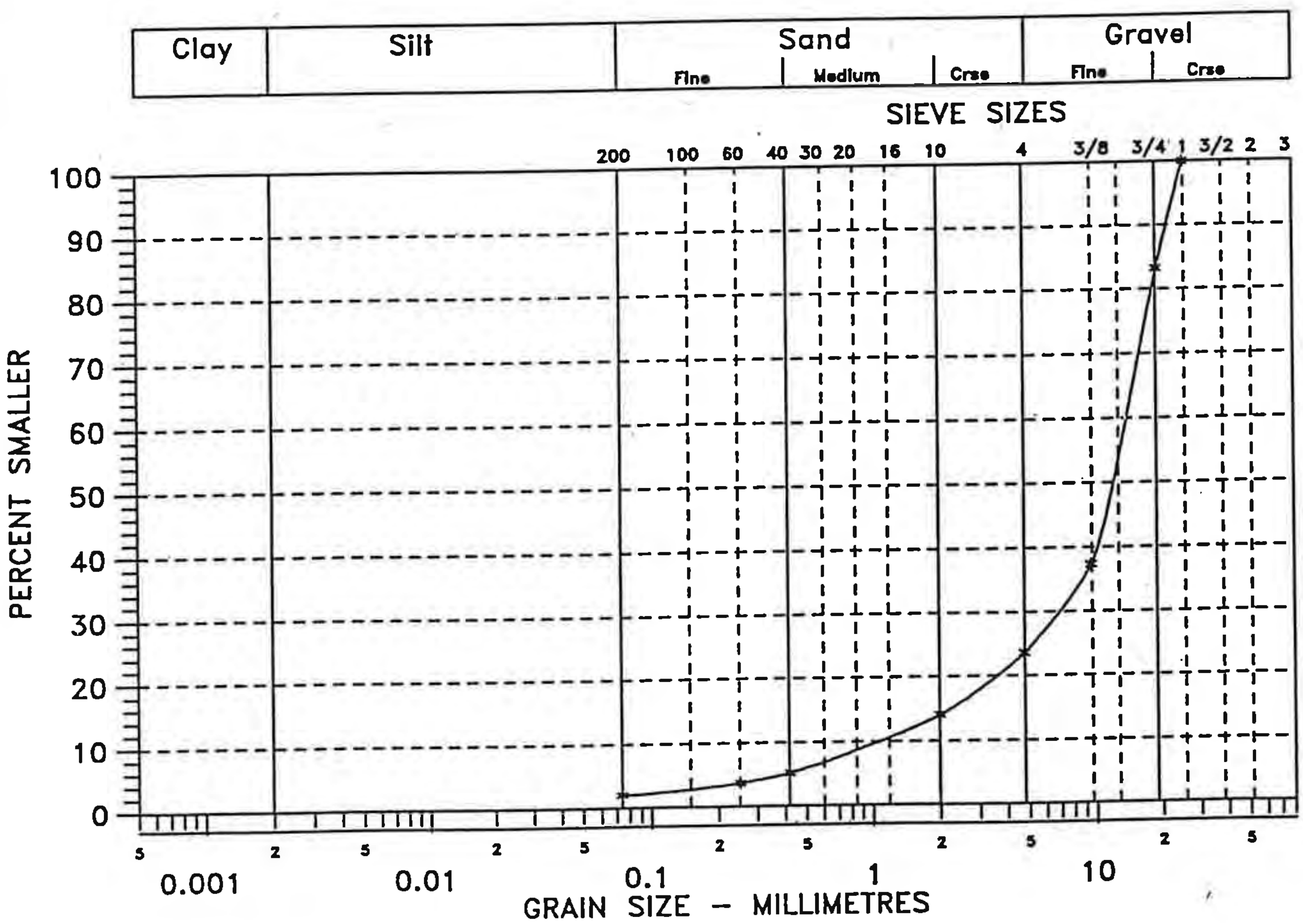
Test Hole Number: --
Sample Number: DR-3
Depth: --
Sample Description:
Gravel: 84.2
Sand: 12.5
Silt: 3.3
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 8/21/92
Remarks: Grayish brown, sandy GRAVEL with trace of silt (GP)
PERMEABILITY: K= 2.4x10 −2 cm/sec

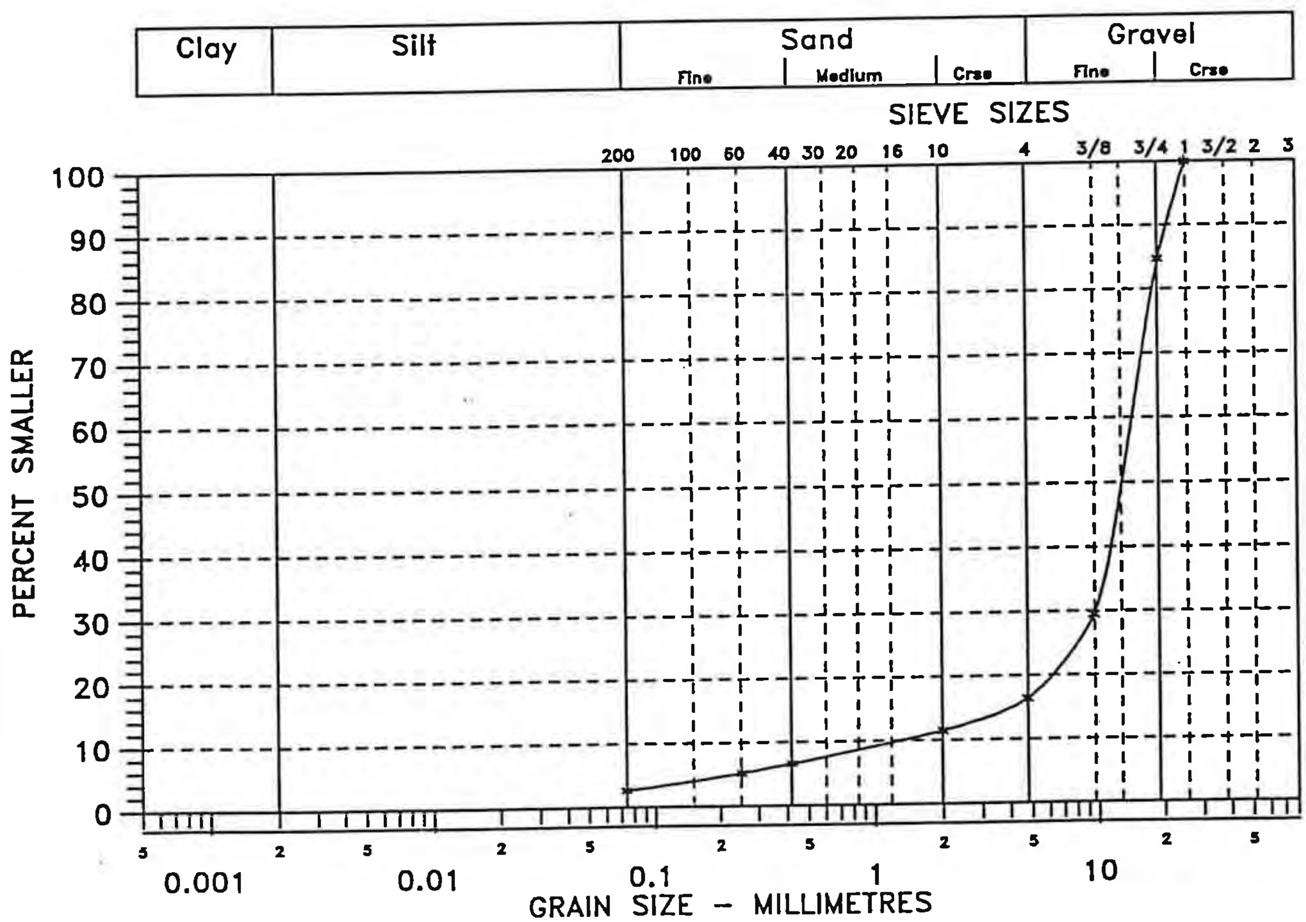
Test Hole Number: --
Sample Number: DR-4
Depth: --
Sample Description:
Gravel: 76.4
Sand: 21.6
Silt: 2.0
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 8/21/92
Remarks: Gray, sandy GRAVEL with trace of silt (GP)

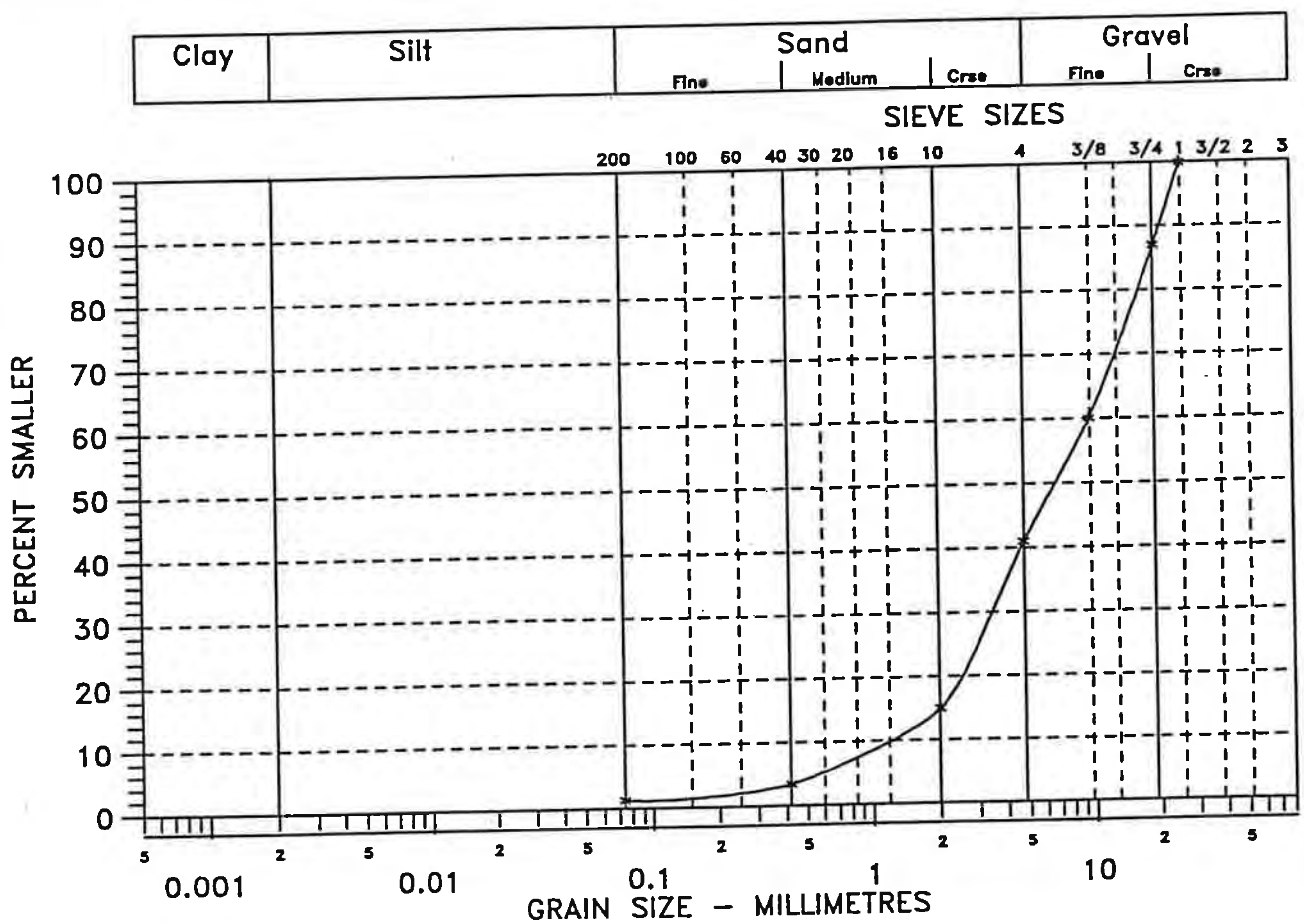
Test Hole Number: --
Sample Number: DR-5
Depth: --
Sample Description:
Gravel: 83.6
Sand: 13.8
Silt: 2.6
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 8/28/92
Remarks: Grayish brown, sandy GRAVEL with trace of silt (GP)

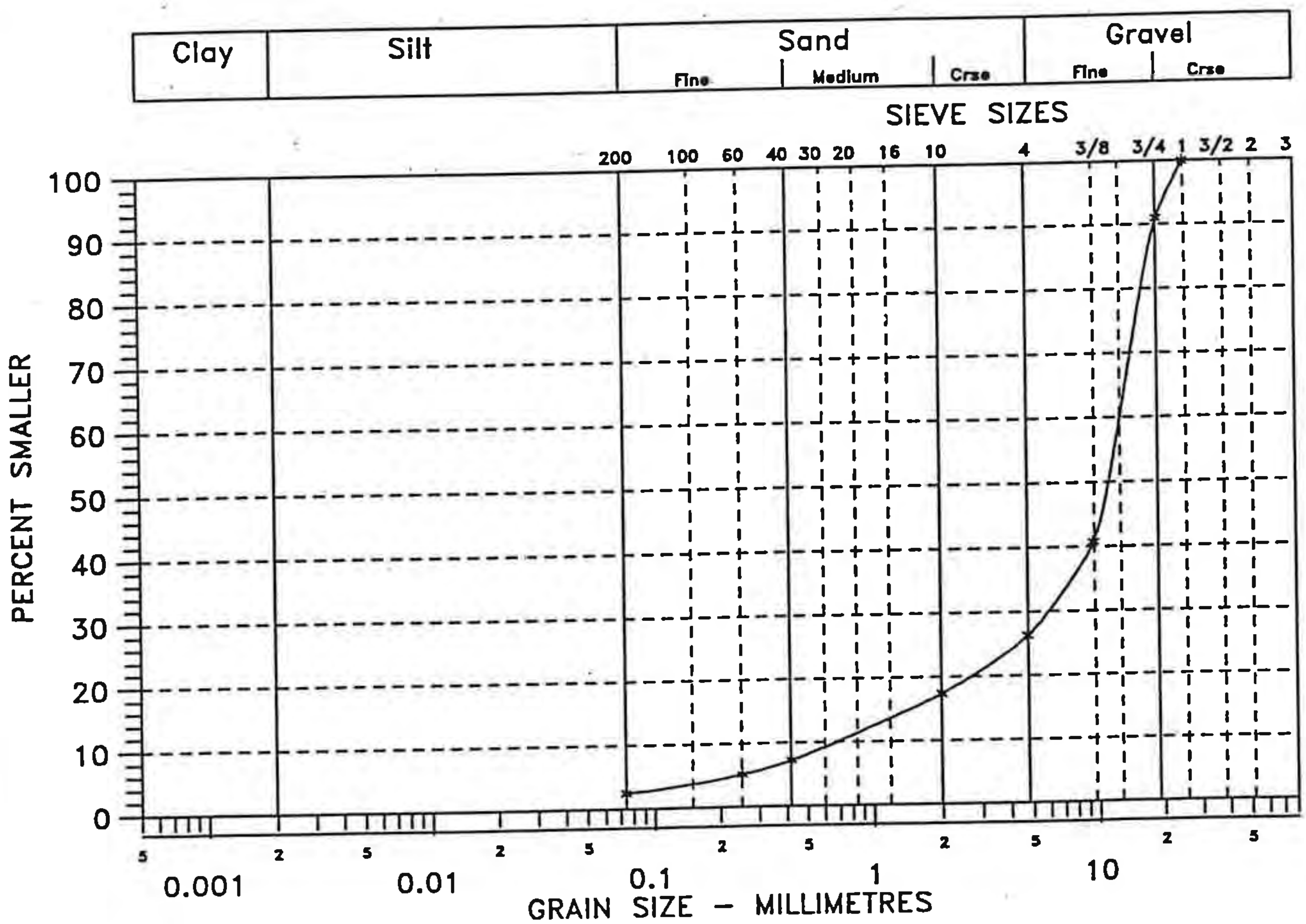
Test Hole Number: --
Sample Number: DR-6
Depth: --
Sample Description:
Gravel: 85.0
Sand: 13.7
Silt: 1.3
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 8/21/92
Remarks: Grayish brown, sandy GRAVEL with trace of silt (GP)

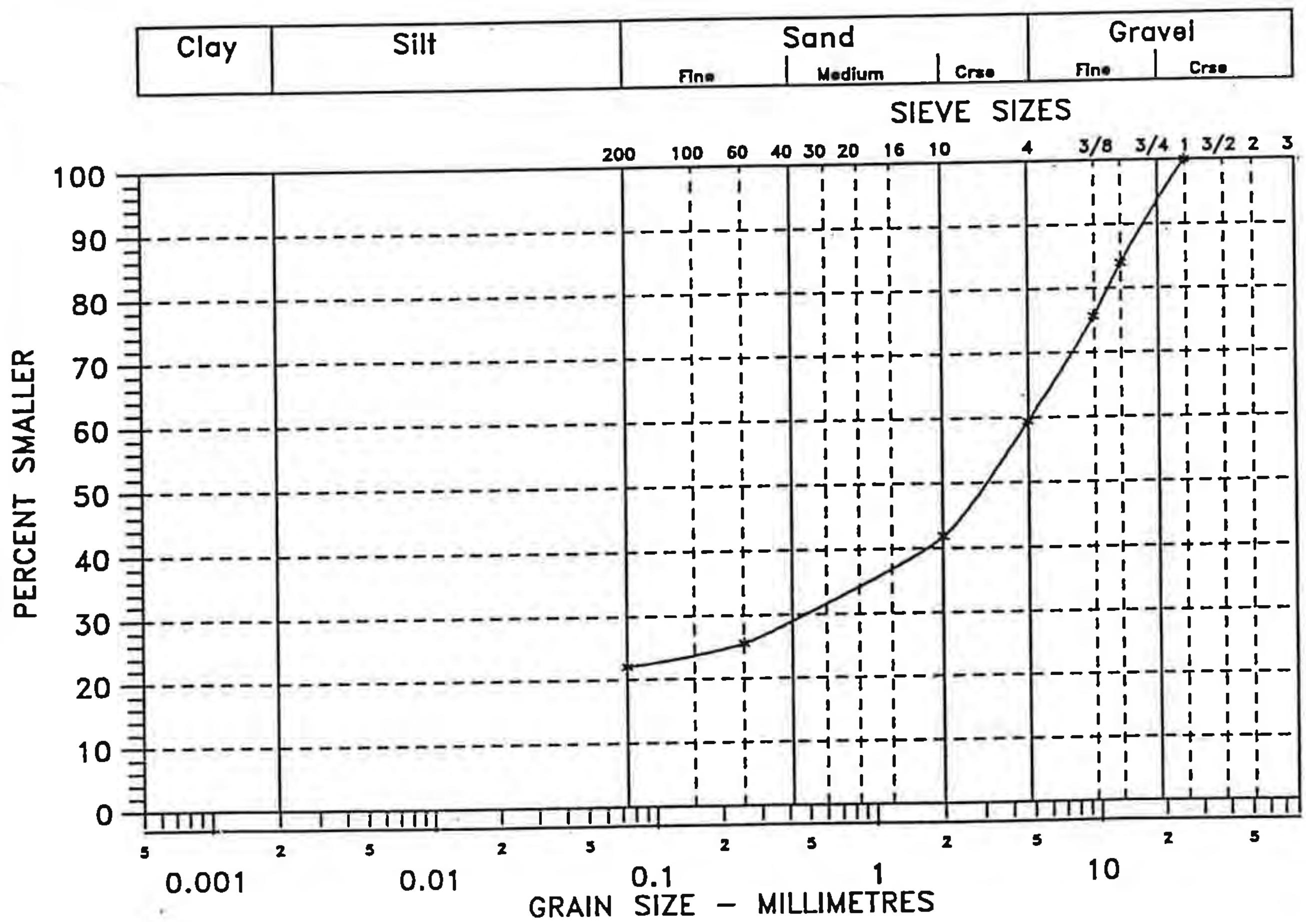
Test Hole Number: --
Sample Number: DR-7
Depth: --
Sample Description:
- Gravel: 73.7
- Sand: 23.8
- Silt: 2.5
- Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 8/31/92
Remarks: Light brown, very sandy, silty GRAVEL (GM)
PERMEABILITY: K= 5.0x10 -5 cm/sec
DRY DENSITY: 95.5 pcf

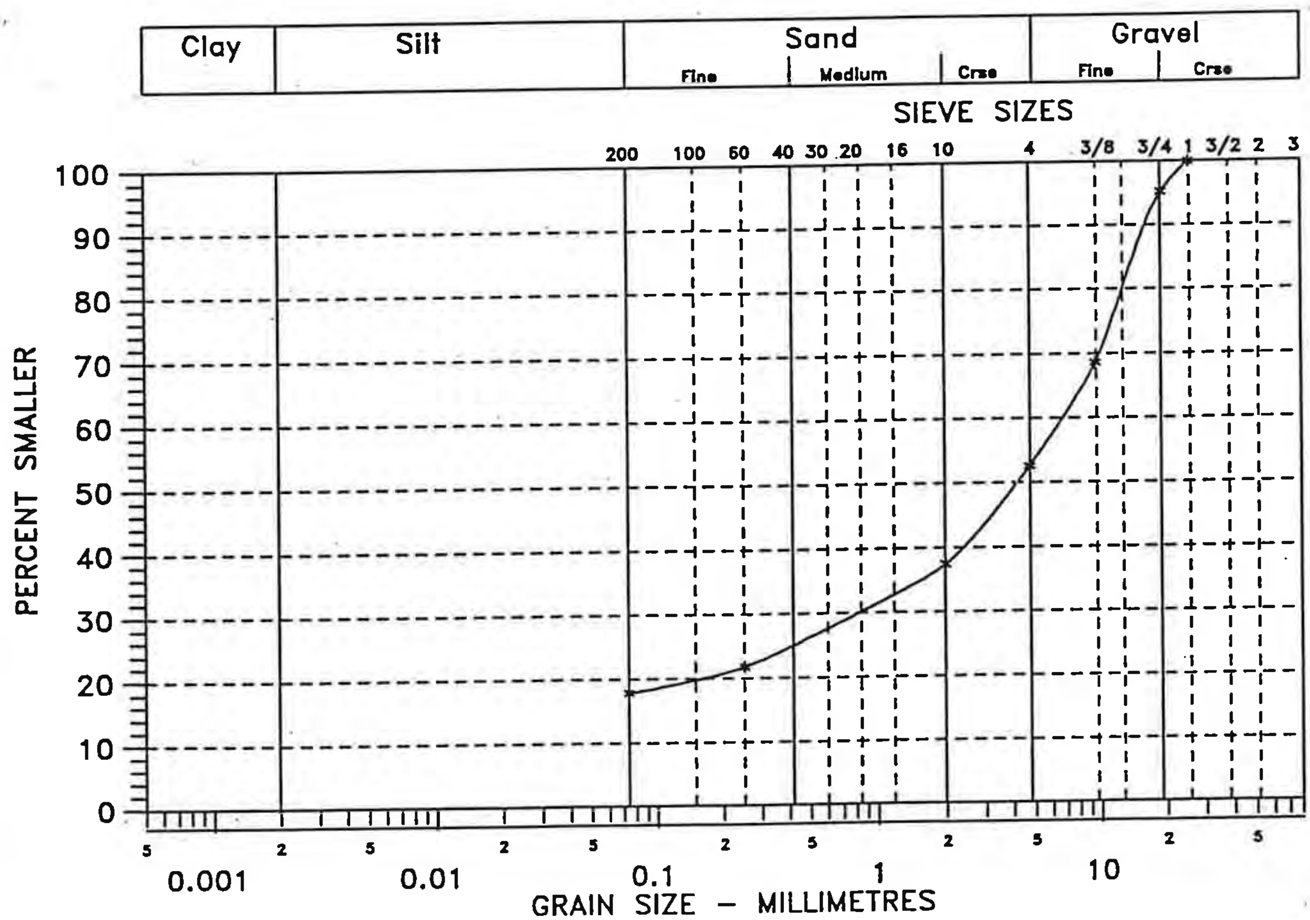
Test Hole Number: --
Sample Number: TOP-1
Depth: --
Sample Description:
Gravel: 40.6
Sand: 37.3
Silt: 22.1
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 8/31/92
Remarks: Light brown, sandy, silty GRAVEL (GM)
PERMEABILITY: K= 1.6x10 -4 cm/sec
DRY DENSITY: 92.7 pcf

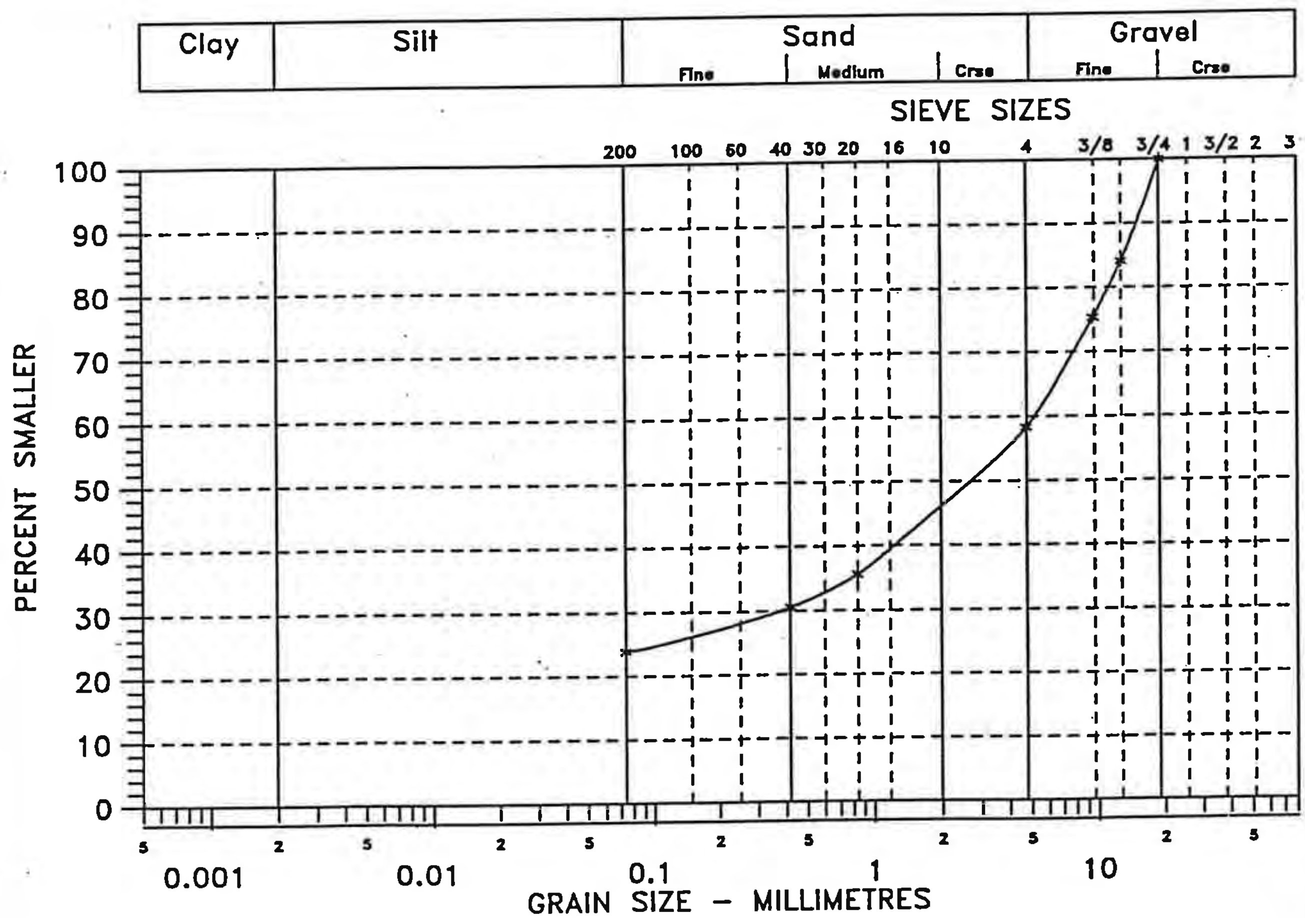
Test Hole Number: --
Sample Number: TOP-2
Depth: --
Sample Description:
Gravel: 47.5
Sand: 34.6
Silt: 17.9
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 9/10/92
Remarks: Light brown, sandy, silty GRAVEL (GM) PERMEABILITY: K= 1.4x10 -4 cm/sec

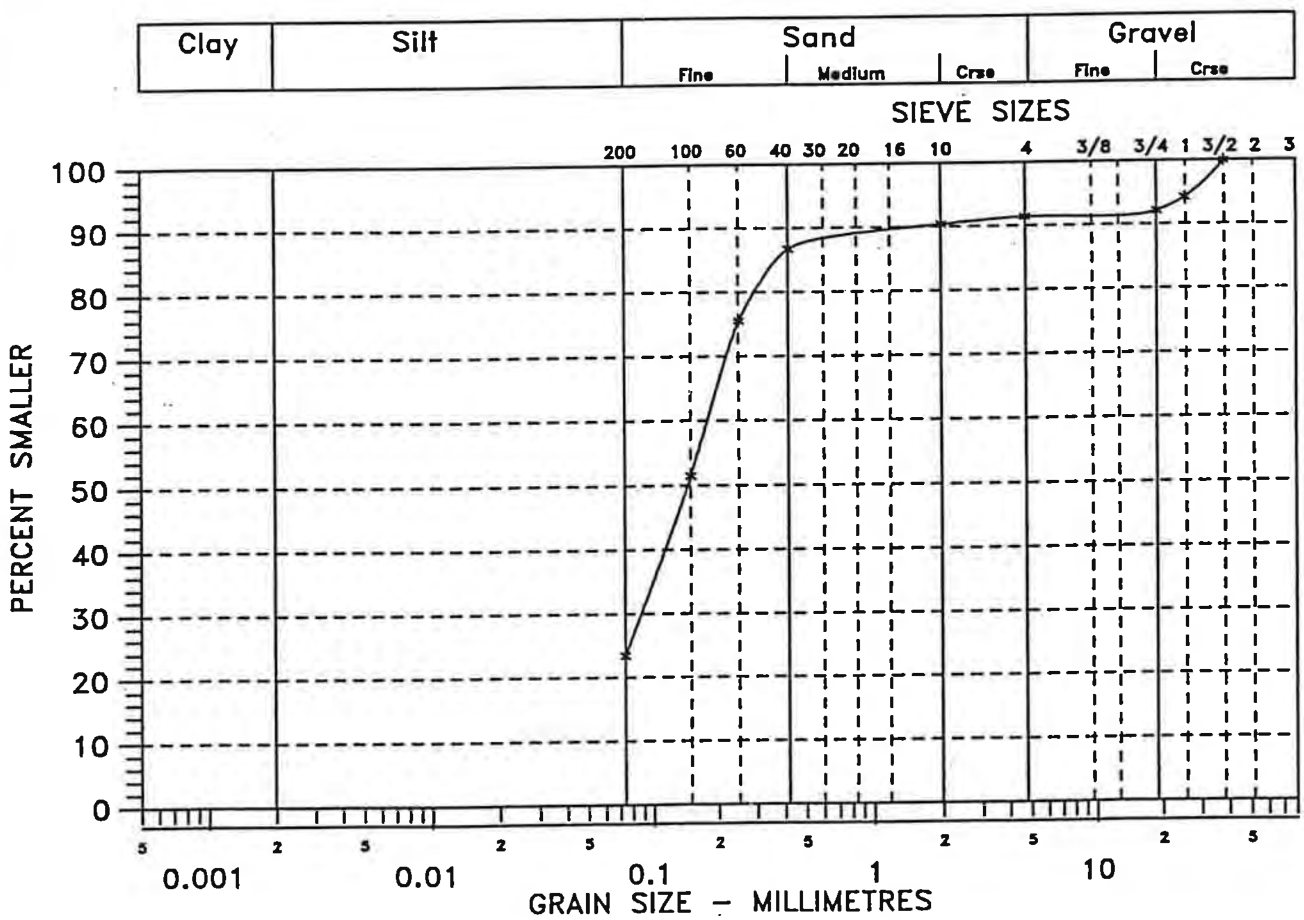
Test Hole Number: --
Sample Number: TOP-3
Depth: --
Sample Description:
Gravel: 41.7
Sand: 34.4
Silt: 23.9
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 7/18/92
Remarks: Olive gray, silty SAND with some gravel (SM)

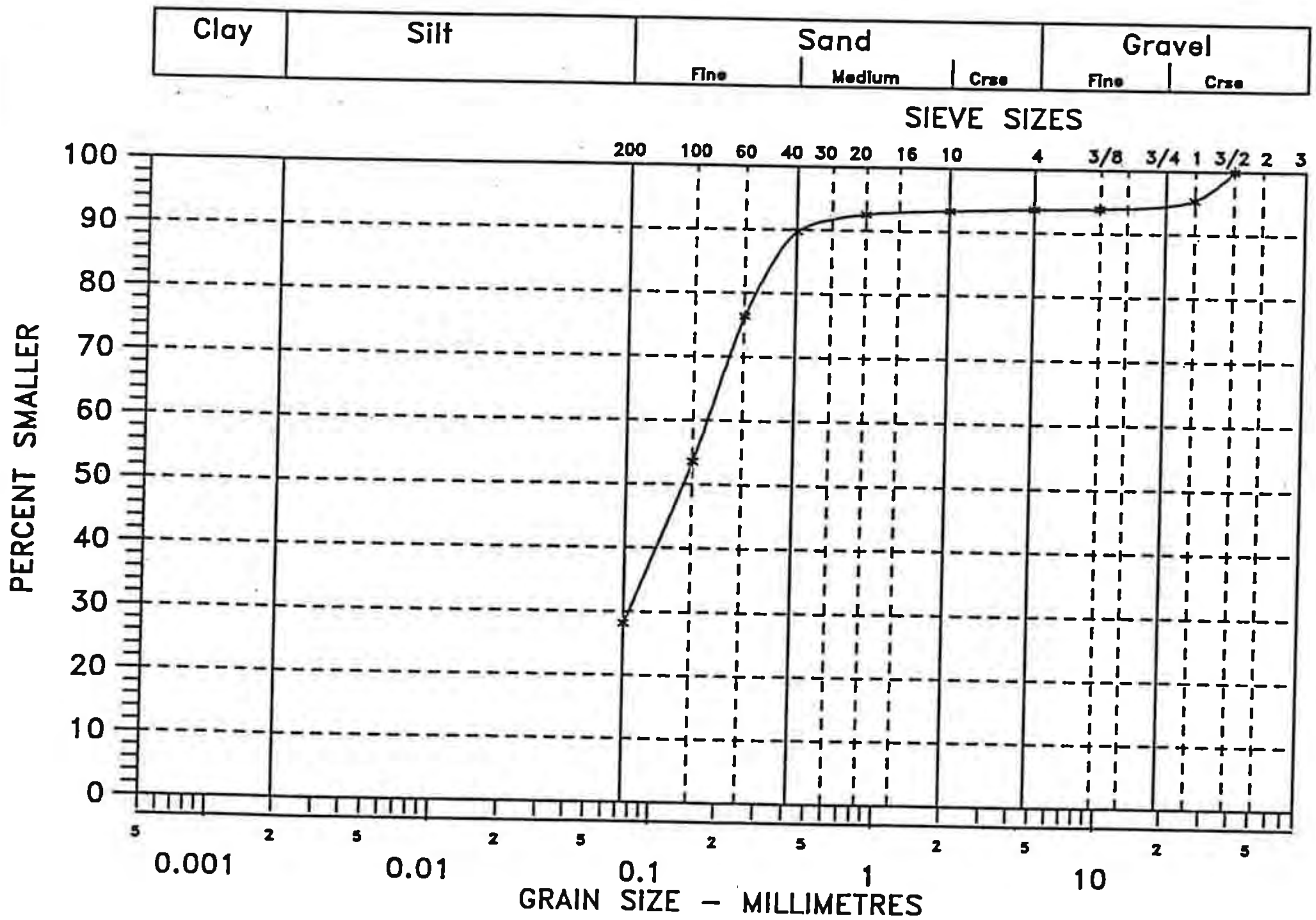
Test Hole Number: --
Sample Number: BED-1
Depth: --
Sample Description:
Gravel: 8.6
Sand: 68.0
Silt: 23.4
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 7/21/92
Remarks: Olive brown, silty SAND with some gravel (SM)

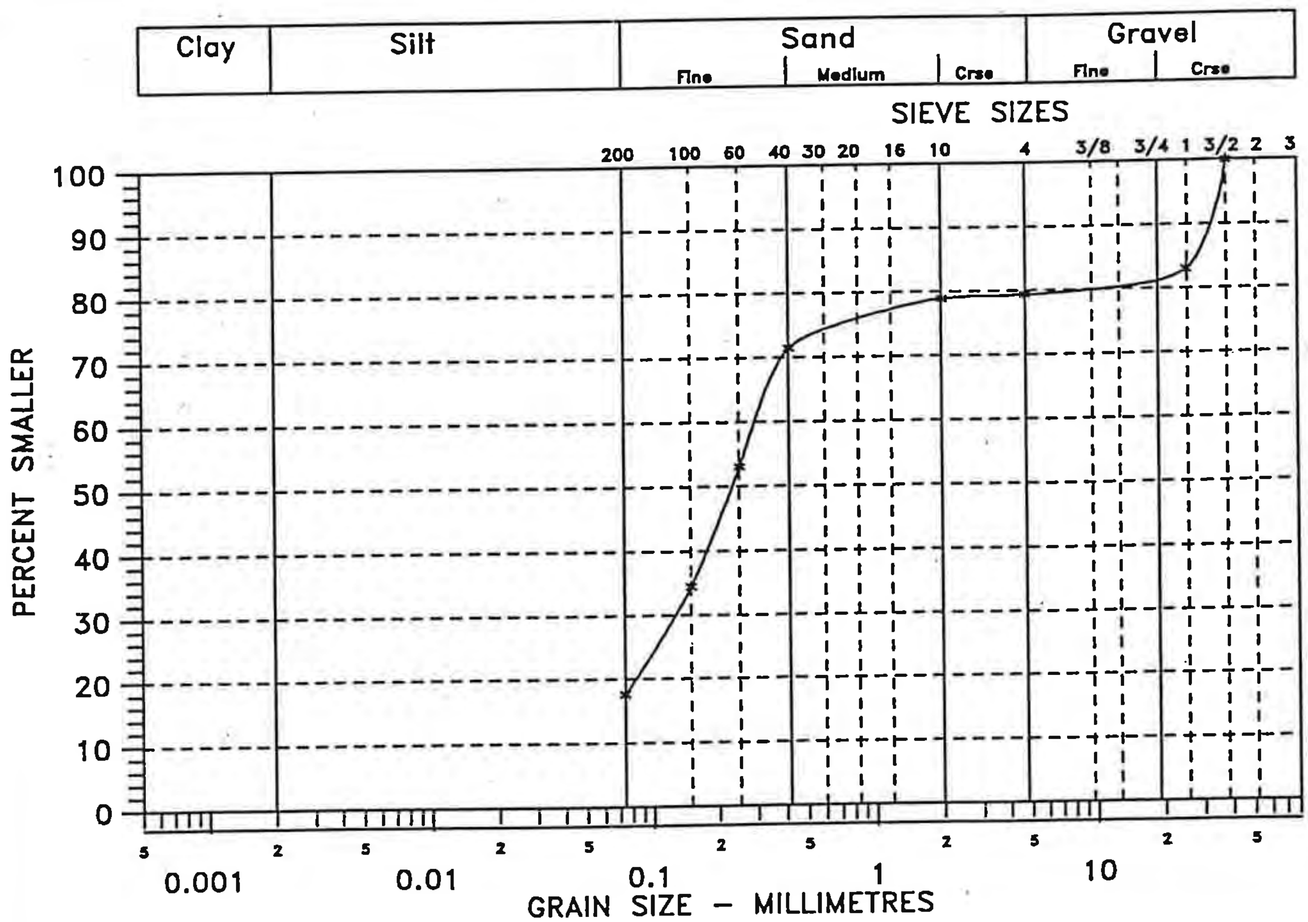
Test Hole Number: --
Sample Number: BED-2
Depth: --
Sample Description:
Gravel: 6.3
Sand: 65.6
Silt: 28.1
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 7/18/92
Remarks: Very dark grayish brown, gravelly, silty SAND (SM)

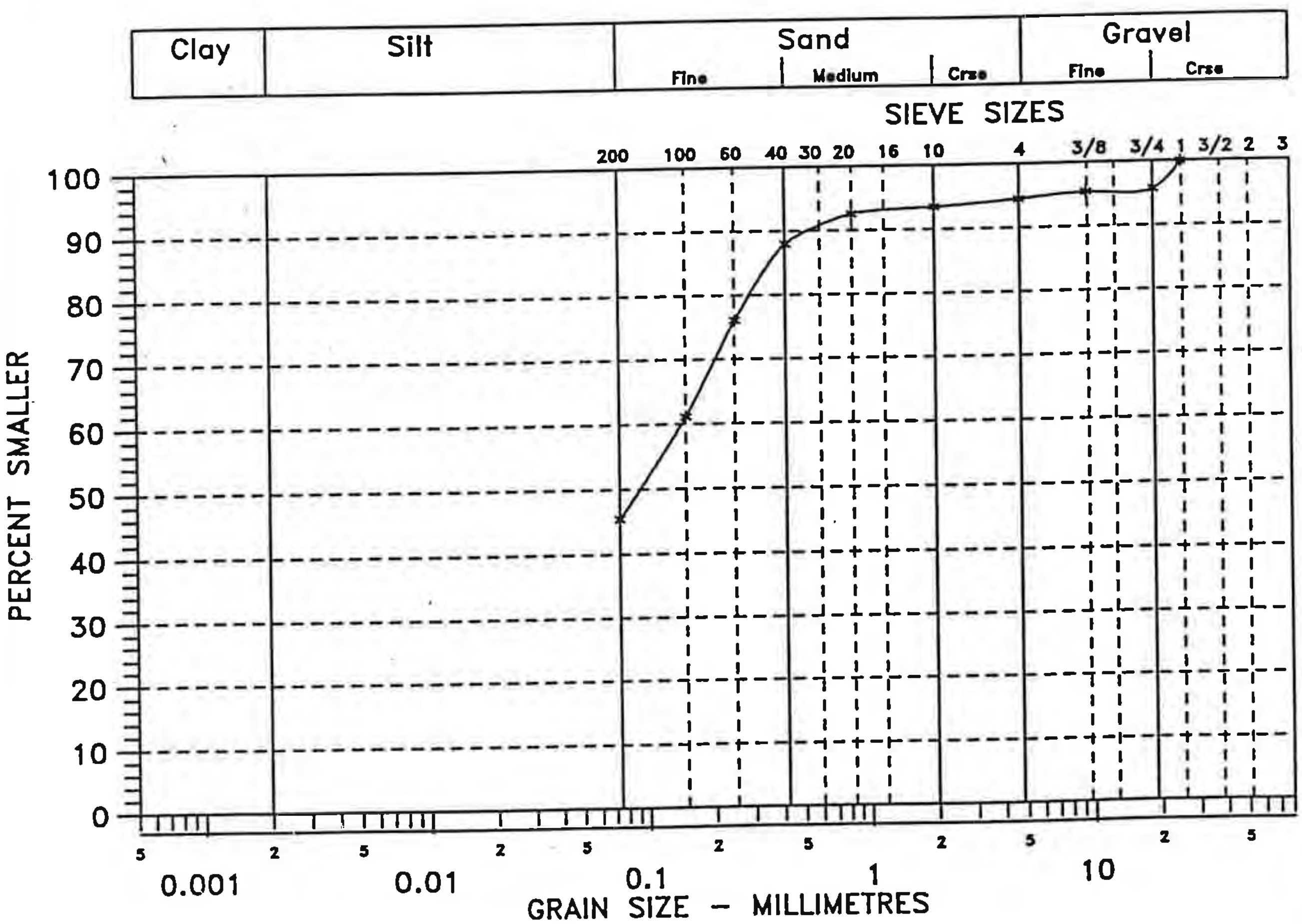
Test Hole Number: --
Sample Number: BED-3
Depth: --
Sample Description:
Gravel: 20.7
Sand: 61.7
Silt: 17.6
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 7/21/92
Remarks: Dark brown, very silty SAND with some gravel (SM)

Test Hole Number: --
Sample Number: BED-4
Depth: --
Sample Description:
- Gravel: 5.5
- Sand: 49.1
- Silt: 45.4
- Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure

Client: Emcon Northwest

Project Number: 90113

Date Tested: 7/18/92

Remarks: Olive, silty, gravelly SAND (SM)

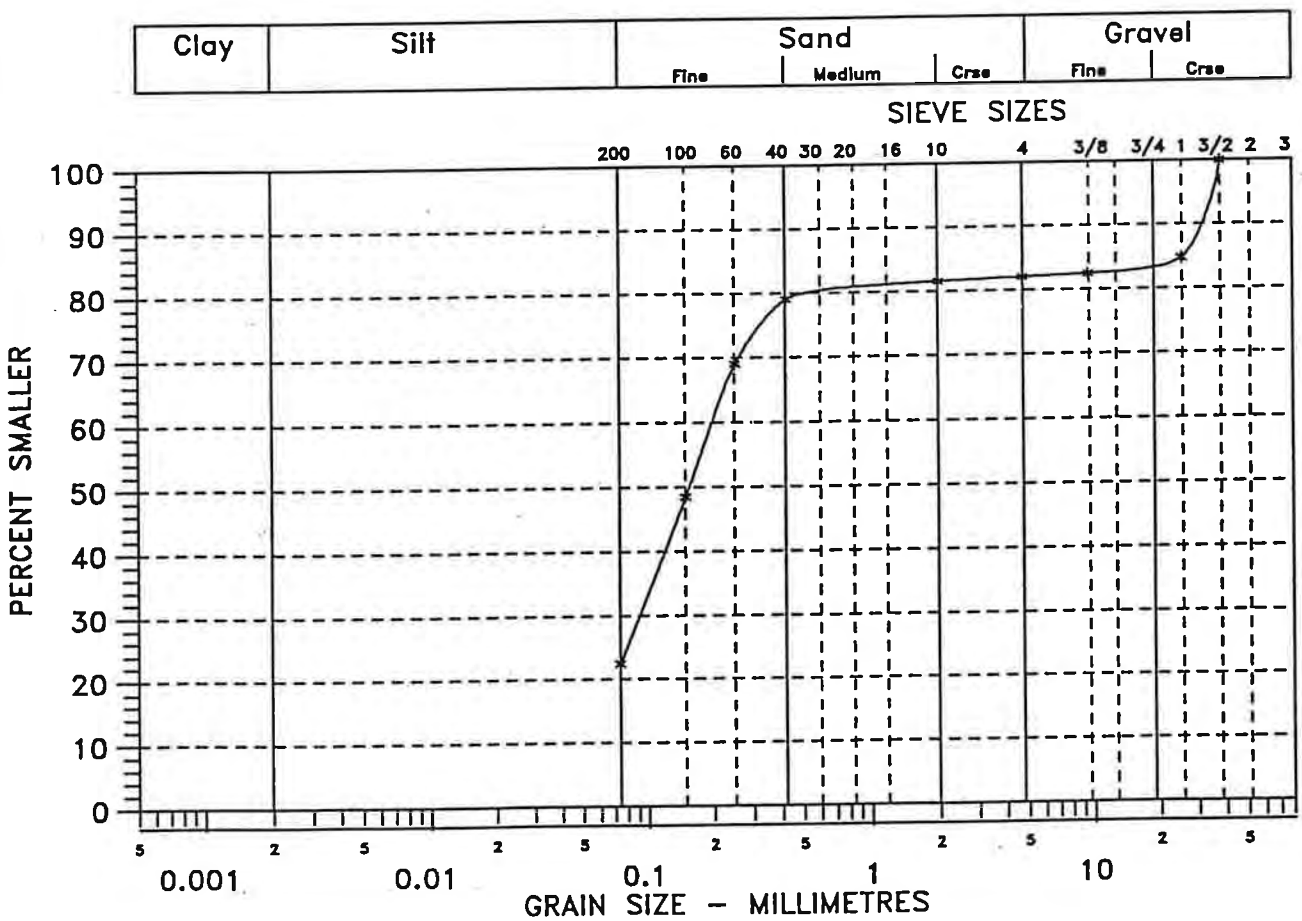
Test Hole Number: --

Sample Number: BED-5

Depth: --

Sample Description:

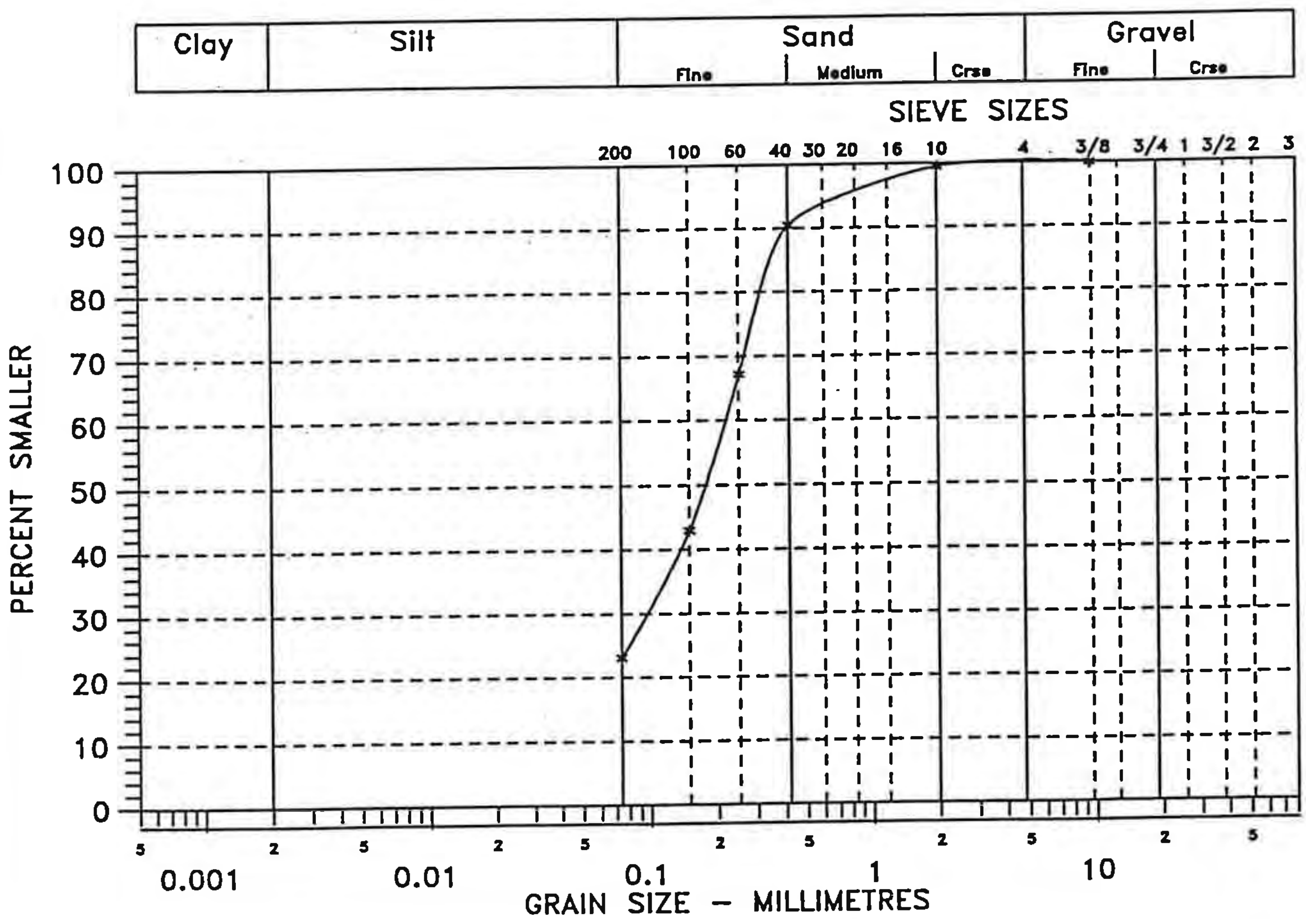
- Gravel: 17.9
- Sand: 59.7
- Silt: 22.4
- Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 7/21/92
Remarks: Olive, silty SAND with trace of gravel (SM)

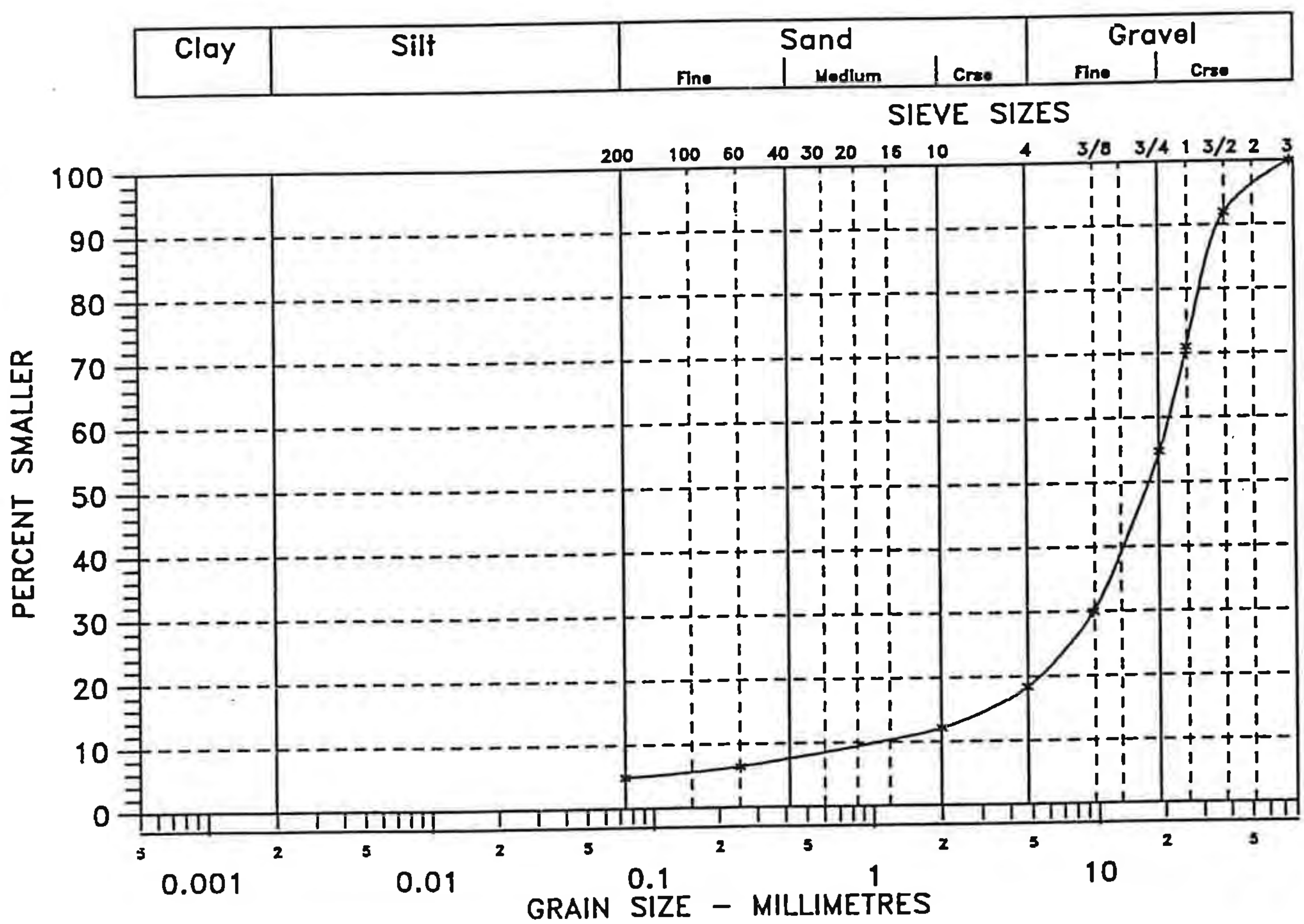
Test Hole Number: --
Sample Number: BED-6
Depth: --
Sample Description:
Gravel: 0.1
Sand: 76.8
Silt: 23.1
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 9/3/92
Remarks: Light brown, sandy GRAVEL with trace of silt (GP)
PERMEABILITY: K= 3.8x10 −2 cm/sec

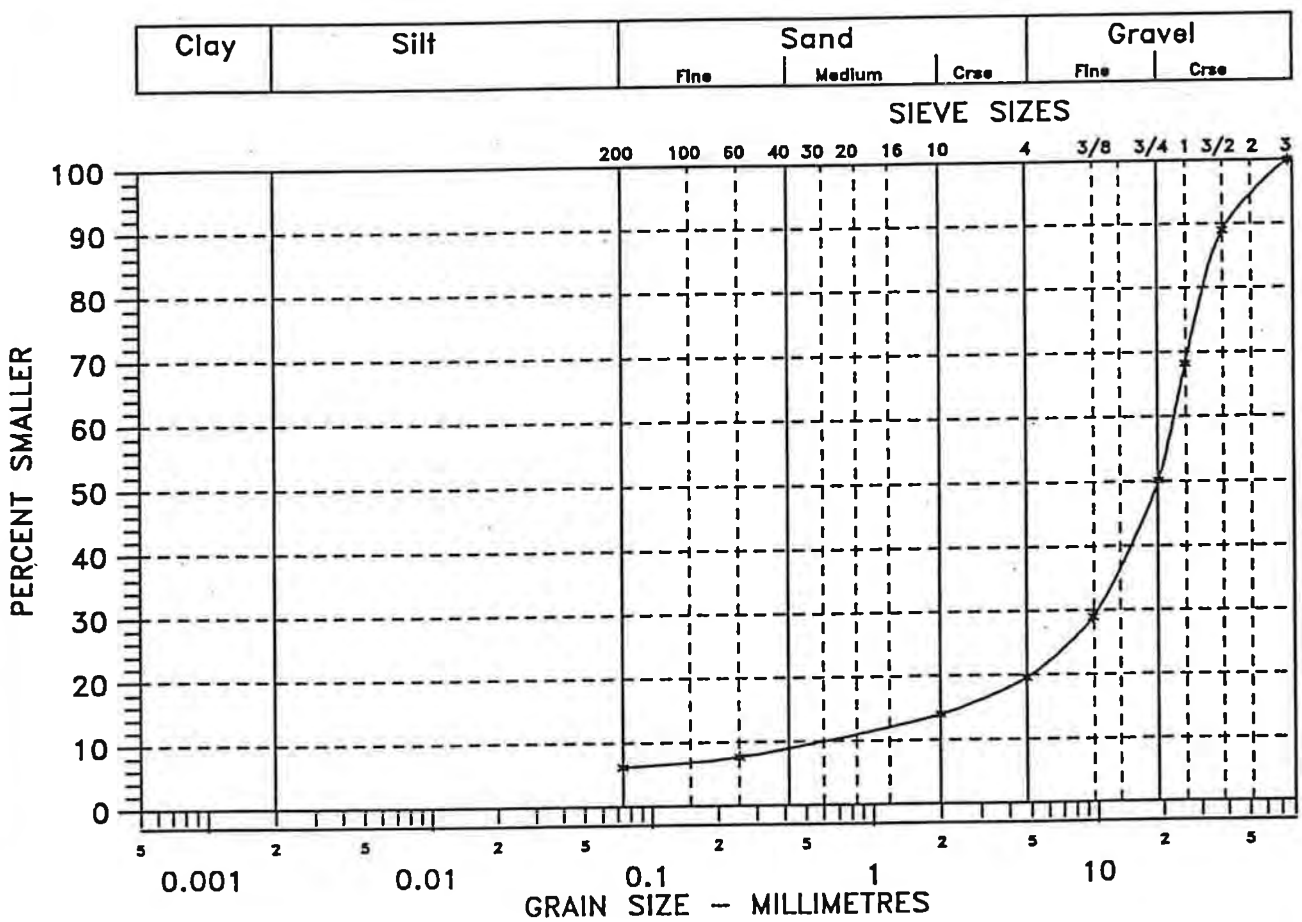
Test Hole Number: --
Sample Number: VEG-1
Depth: --
Sample Description:
Gravel: 81.6
Sand: 13.5
Silt: 4.9
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 9/21/92
Remarks: Light brown, sandy GRAVEL with some silt (GP–GM)

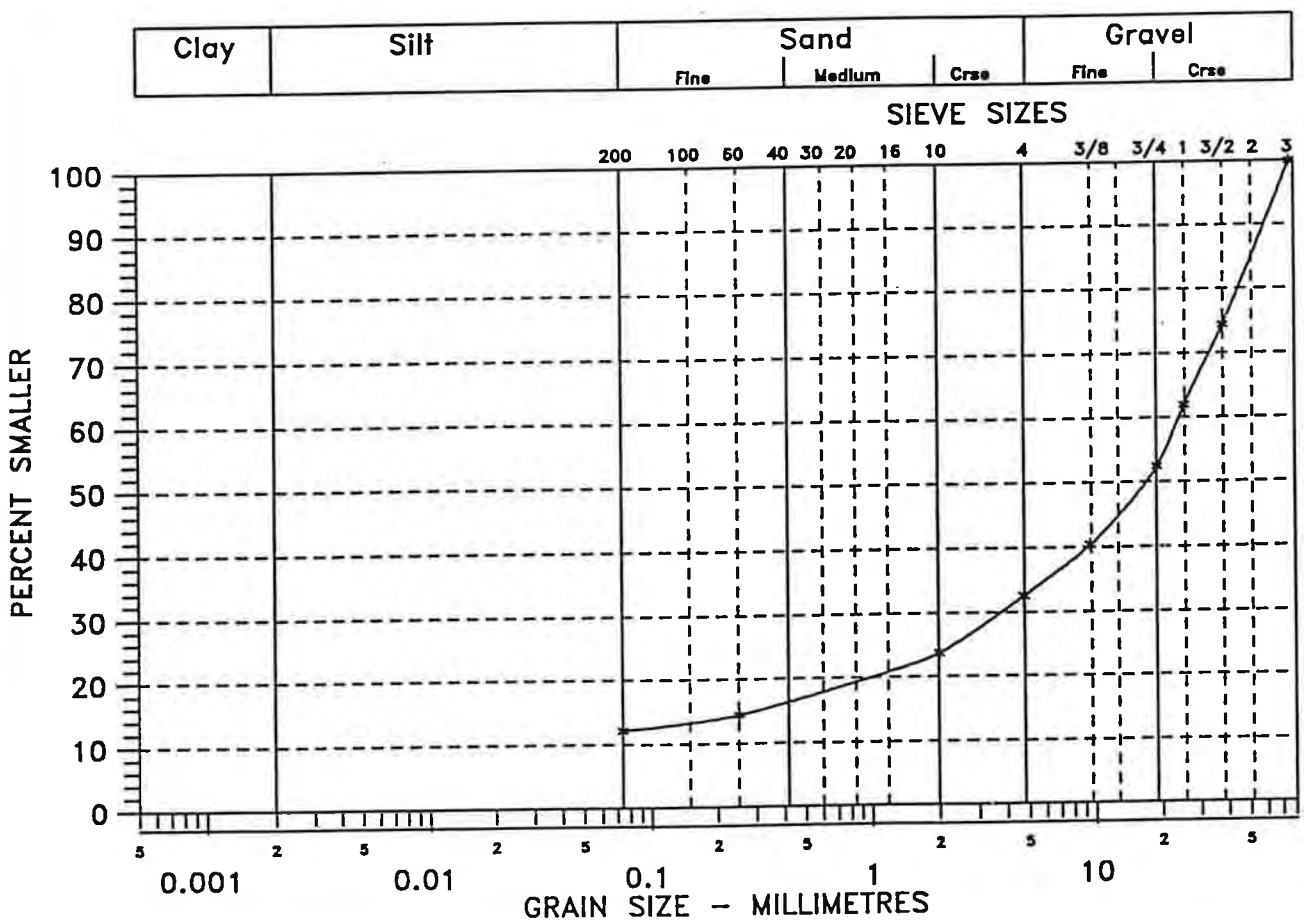
Test Hole Number: --
Sample Number: VEG–2
Depth: --
Sample Description:
Gravel: 80.4
Sand: 13.2
Silt: 6.2
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 9/2/92
Remarks: Light brown, sandy, silty GRAVEL (GM)
PERMEABILITY: K= 1.9x10 $^{-2}$ cm/sec

Test Hole Number: --
Sample Number: VEG-3
Depth: --
Sample Description:
Gravel: 67.5
Sand: 20.3
Silt: 12.2
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure

Client: Emcon Northwest

Project Number: 90113

Date Tested: 9/3/92

Remarks: Grayish brown GRAVEL with some sand and trace of silt (GW)

Test Hole Number: --

Sample Number: VEG-4

Depth: --

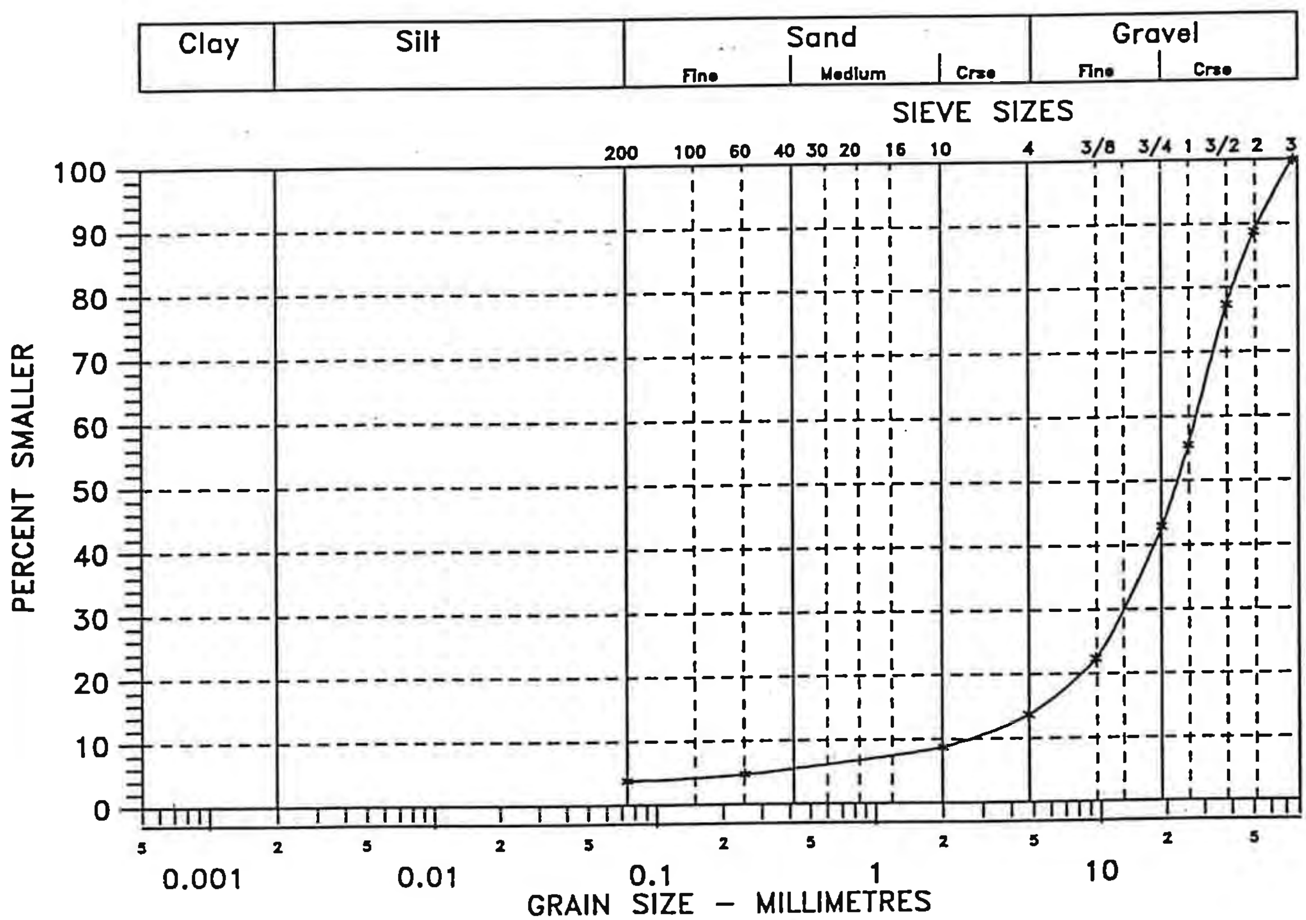
Sample Description:

Gravel: 86.3

Sand: 9.9

Silt: 3.8

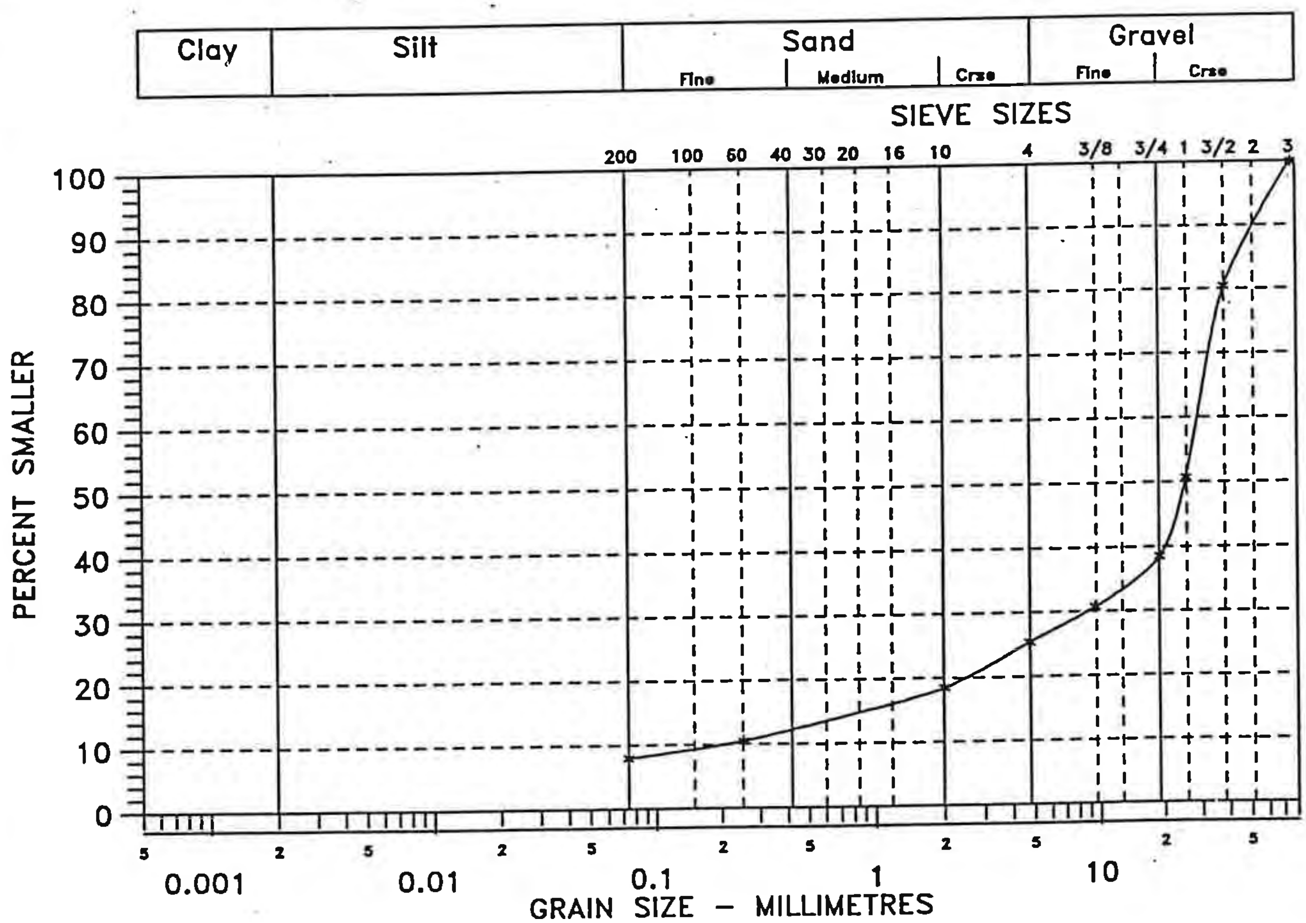
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 8/28/92
Remarks: Yellowish brown, sandy GRAVEL with some silt (GW–GM)

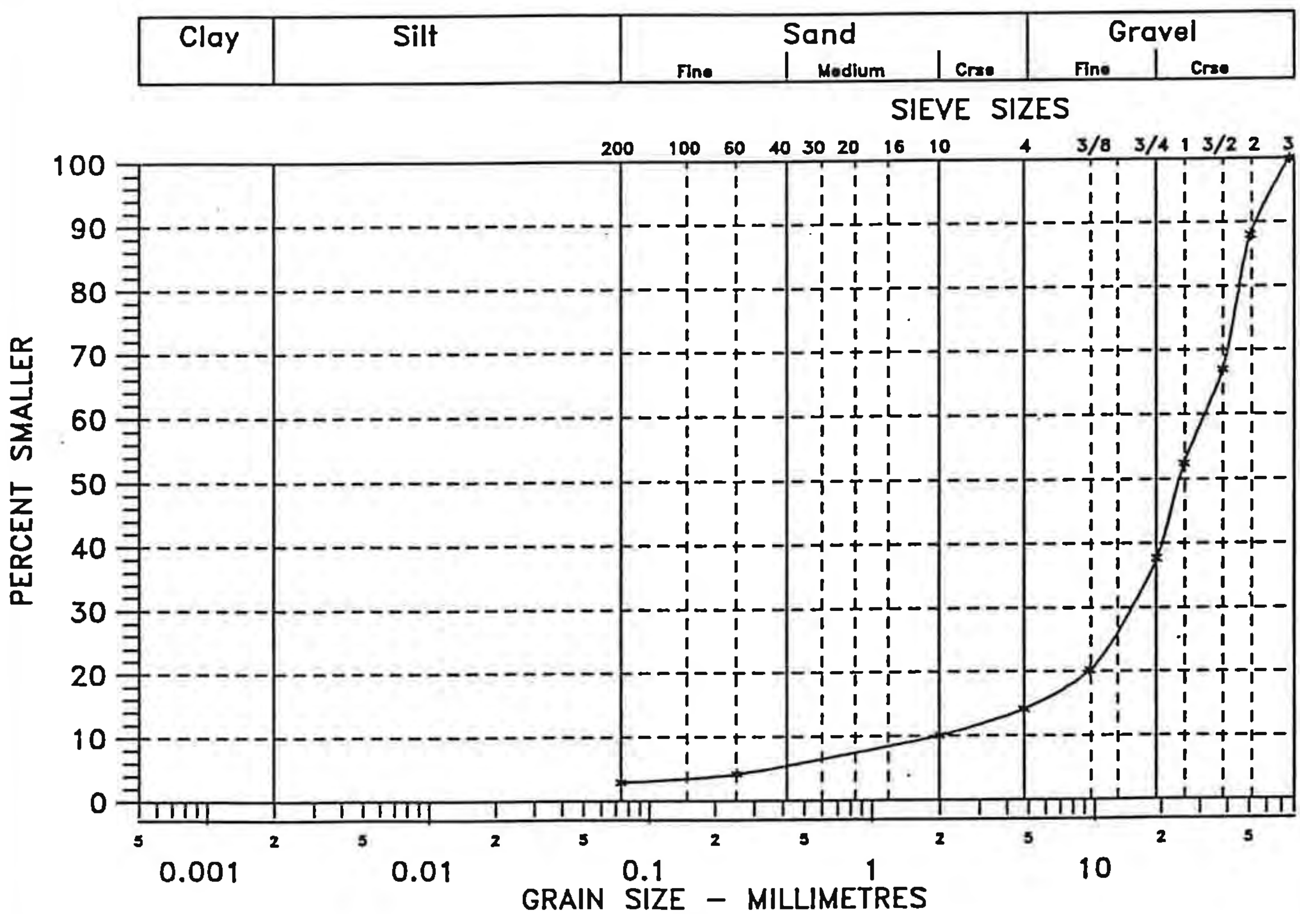
Test Hole Number: ––
Sample Number: VEG–5
Depth: ––
Sample Description:
Gravel: 74.7
Sand: 17.3
Silt: 8.0
Clay:



HONG WEST & ASSOCIATES
GRAIN SIZE DISTRIBUTION

Project: Hidden Valley Landfill Closure
Client: Emcon Northwest
Project Number: 90113
Date Tested: 9/3/92
Remarks: Brown GRAVEL with some sand and trace of silt (GP)

Test Hole Number: --
Sample Number: VEG-6
Depth: --
Sample Description:
Gravel: 85.9
Sand: 11.2
Silt: 2.9
Clay:



Appendix C

SUMMARY OF GEOMEMBRANE CONFORMANCE TESTS

Appendix C

Summary of Geomembrane Conformance Test Results

Client: Hidden Valley LF Pierce County, Washington
Project: Southwest Closure
Date: December 3, 1992
Prepared by: Nick Nickolas

TEXTURED

Geosynthetic Manufacturer: Gundle
Geosynthetic Installer: Serrot
Testing Laboratory: AGP
Nominal Thickness: 60 mils

Sample Number	Roll Number	Carbon Black Content (%)	Carbon Black Dispersion (A)	Specific Gravity	Tensile at Yield (mach/trans) (ppi)	Elongation at Yield (mach/trans) (%)	Tensile at Break (mach/trans) (ppi)	Elongation at Break (mach/trans) (%)
Specification		2.0 - 3.0 (ASTM D-1603)	A-2 Minimum (ASTM D-3015)	0.885-0.918 (ASTM D-792)	126 (ASTM D-638)	10 (ASTM D-638)	70 (ASTM D-638)	300 (ASTM D-638)
CT-01	D05015468	2.6	A-2	N/A	88/87	N/A	181/155	616/549
CT-02	B05015469	2.8	A-2	N/A	85/85	N/A	184/161	611/559
CT-03	C05015443	2.8	A-2	N/A	82/81	N/A	182/157	630/589
CT-04	05015521	2.8	A-1	N/A	93/91	N/A	182/171	619/595
CT-06	C05015517	2.6	A-1	0.923	89/91	N/A	192/175	616/578
CT-07	A05015579	2.5	A-1	0.921	83/80	N/A	170/157	589/560
CT-09	B03016080	2.9	A-1	0.924	78/78	N/A	193/178	654/656

NOTES: (A) Cabot carbon black dispersion classification shart of cabot Technical Report RG-124 used for rating.

Appendix C

Summary of Geomembrane Conformance Test Results
(Continued)

Client: Hidden Valley LF Pierce County, Washington
Project: Southwest Closure
Date: December 3, 1992
Prepared by: Nick Nickolas

SMOOTH

Geosynthetic Manufacturer: Gundle
Geosynthetic Installer: Serrot
Testing Laboratory: AGP
Nominal Thickness: 60 mils

Sample Number	Roll Number	Carbon Black Content (%)	Carbon Black Dispersion (A)	Specific Gravity	Tensile at Yield (mach/trans) (ppi)	Elongation at Yield (mach/trans) (%)	Tensile at Break (mach/trans) (ppi)	Elongation at Break (mach/trans) (%)
Specification		2.0 - 3.0 (ASTM D-1603)	A-2 Minimum (ASTM D-3015)	0.885-0.918 (ASTM D-792)	126 (ASTM D-638)	10 (ASTM D-638)	70 (ASTM D-638)	300 (ASTM D-638)
CT-04A	A03016031	3.1	A-1	0.926	76/74	N/A	227/239	872/1,000
CT-05	A03015969	2.5	A-1	0.924	72/72	N/A	224/224	945/963
CT-08	B03016018	3.0	A-1	0.923	77/71	N/A	244/241	1,070/1,040
CT-10	A03016036	2.7	A-1	0.926	72/73	N/A	228/229	1,040/1,040

NOTES: (A) Cabot carbon black dispersion classification shart of cabot Technical Report RG-124 used for rating.

Appendix D

SUMMARY OF GEOMEMBRANE SEAM DESTRUCTIVE TESTS

Appendix D

Summary of Destructive Test Results

Owner: Land Recovery, Inc. Project Name: South West Closure Hidden Valley Landfill Project Number: 0202-001.51 Prepared by: G. Watters (Checked by NN)	Material: 60 mil smooth VLDPE & 60 mil textured VLDPE Manufacturer: Gundle Lining, Inc. Installer: Serrot Corporation, Inc. Testing Laboratory: AGP Laboratories, Inc. Specifications: Peel: 55 PPI at 200% strain Shear: 65 PPI at 200% strain (PPI - pounds per inch)

Sample Number	Weld Date	Seam Number	Average Peel Value		Average Shear Value			Remarks
			PPI	Failure Type	Break PPI	Yield PPI	Failure Type	
DS-1	7-7-92	1/2	92	FTB/SE-1	111	90	FTB/SE-1	Pass Textured
DS-2	7-7-92	8/9	88	FTB/SE-1	115	92	FTB/SE-1	Pass Textured
DS-3	7-7-92	16/17	86	FTB/SE-1	111	91	FTB/SE-1	Pass Textured
DS-4	7-7-92	19/18	89	FTB/SE-1	113	93	FTB/SE-1	Pass Textured
DS-5	7-7-92	23/24	92	FTB/SE-1	116	96	FTB/SE-1	Pass Textured
DS-6	7-11-92	24/25	83	FTB/SE-1	107	89	FTB/SE-1	Pass Textured
DS-7	7-11-92	12/13	89	FTB/SE-1	100	93	FTB/SE-1	Pass Textured
DS-8	7-11-92	26/27	87	FTB/SE-1	104	95	FTB/SE-1	Pass Textured
DS-9	7-11-92	28/29	77	FTB/SE-1	97	85	FTB/SE-1	Pass Textured
DS-10	7-11-92	30/31	79	FTB/SE-1	100	85	FTB/SE-1	Pass Textured
DS-11	7-11-92	33/34	77	FTB/SE-1	96	85	FTB/SE-1	Pass Textured
DS-12	7-11-92	36/36A	85	FTB/SE-1	113	95	FTB/SE-1	Pass Textured
DS-13	7-11-92	38/39	78	FTB/SE-1	96	82	FTB/SE-1	Pass Textured
DS-14	7-11-92	41/41	84	FTB/SE-1	106	89	FTB/SE-1	Pass Textured
DS-15	7-11-92	44/45	82	FTB/SE-1	100	87	FTB/SE-1	Pass Textured
DS-16	7-11-92	47/48	89	FTB/SE-1	103	87	FTB/SE-1	Pass Textured
DS-17	7-11-92	48/49	85	FTB/SE-1	106	91	FTB/SE-1	Pass Textured
DS-18	7-13-92	52/53	88	FTB/SE-1	105	91	FTB/SE-1	Pass Textured
DS-19	7-13-92	55/56	86	FTB/SE-1	103	90	FTB/SE-1	Pass Textured
DS-20	7-13-92	58/59	80	FTB/SE-1	91	82	FTB/SE-1	Pass Textured
DS-21	7-14-92	107/108	85	FTB/SE-1	108	92	FTB/SE-1	Pass Textured
DS-22	7-15-92	113/114	80	FTB/SE-1	105	87	FTB/SE-1	Pass Textured
DS-23	7-15-92	115/116	83	FTB/SE-1	107	89	FTB/SE-1	Pass Textured
DS-24	7-15-92	117/118	81	FTB/SE-1	104	90	FTB/SE-1	Pass Textured
DS-25	7-15-92	120/121	86	FTB/SE-1	109	91	FTB/SE-1	Pass Textured
DS-26	7-15-92	124/125	85	FTB/SE-1	108	91	FTB/SE-1	Pass Textured
DS-27	7-16-92	125/126	78	FTB/SE-1	100	80	FTB/SE-1	Pass Textured
DS-28	7-16-92	128/128A	87	FTB/SE-1	117	98	FTB/SE-1	Pass Textured
DS-29	7-16-92	130/131	80	FTB/SE-1	101	86	FTB/SE-1	Pass Textured
DS-30	7-16-92	132/133	78	FTB/SE-1	105	86	FTB/SE-1	Pass Textured
DS-31	7-16-92	134/135A	82	FTB/SE-1	102	83	FTB/SE-1	Pass Textured
DS-32	7-16-92	137/138	78	FTB/SE-1	104	87	FTB/SE-1	Pass Textured
DS-33	7-16-92	141A/140	77	FTB/SE-1	104	87	FTB/SE-1	Pass Textured
DS-34	7-16-92	142/142A	80	FTB/SE-1	104	91	FTB/SE-1	Pass Textured

Appendix D

Summary of Destructive Test Results (Continued)

Owner: Land Recovery, Inc.

Project Name: South West Closure
Hidden Valley Landfill

Project Number: 0202-001.51

Prepared by: G. Watters (Checked by NN)

Material: 60 mil smooth VLDPE & 60 mil textured VLDPE
Manufacturer: Gundle Lining, Inc.
Installer: Serrot Corporation, Inc.
Testing Laboratory: AGP Laboratories, Inc.
Specifications:

Peel	Shear
55 PPI at 200% strain	65 PPI at 200% strain

(PPI - pounds per inch)

Sample Number	Weld Date	Seam Number	Average Peel Value		Average Shear Value			Remarks
			PPI	Failure Type	Break PPI	Yield PPI	Failure Type	
DS-35	7-16-92	145/146	75	FTB/SE-1	103	88	FTB/SE-1	Pass Textured
DS-36	7-16-92	148A/147	76	FTB/SE-1	99	84	FTB/SE-1	Pass Textured
DS-37	7-16-92	153/152	80	FTB/SE-1	99	80	FTB/SE-1	Pass Textured
DS-38	7-17-92	155/154	77	FTB/SE-1	101	80	FTB/SE-1	Pass Textured
DS-39	7-17-92	156/157A	76	FTB/SE-1	106	84	FTB/SE-1	Pass Textured
DS-40	7-17-92	162/163	77	FTB/SE-1	100	86	FTB/SE-1	Pass Textured
DS-41	7-17-92	173/172	77	FTB/SE-1	103	84	FTB/SE-1	Pass Textured
DS-42	7-18-92	180/181	78	FTB/SE-1	112	94	FTB/SE-1	Pass Smooth
DS-43	7-18-92	182/181	75	FTB/SE-1	92	80	FTB/SE-1	Pass Smooth
DS-44	7-18-92	184/148	83	FTB/SE-1	107	85	FTB/SE-1	Pass Smooth
DS-45	7-18-92	187/188	76	FTB/SE-1	101	84	FTB/SE-1	Pass Smooth
DS-46	7-18-92	188/189	77	FTB/SE-1	107	89	FTB/SE-1	Pass Smooth
DS-47	7-18-92	194F/194E	78	FTB/SE-1	106	87	FTB/SE-1	Pass Smooth
DS-48	7-18-92	194G/194H	87	FTB/SE-1	107	86	FTB/SE-1	Pass Smooth
DS-49	7-18-92	193/300	80	FTB/SE-1	100	80	FTB/SE-1	Pass Smooth
DS-50	7-18-92	303/135	83	FTB/SE-1	105	80	FTB/SE-1	Pass Text/Smooth
DS-51	7-18-92	303/304	78	FTB/SE-1	92	92	FTB/SE-1	Pass Smooth
DS-52	7-18-92	304/305	85	FTB/SE-1	120	111	FTB/SE-1	Pass Smooth
DS-53	7-21-92	307/308	78	FTB/SE-1	118	111	FTB/SE-1	Pass Smooth
DS-54	7-21-92	310/311	77	FTB/SE-1	99	87	FTB/SE-1	Pass Smooth
DS-55	7-21-92	313/34B	81	FTB/SE-1	116	105	FTB/SE-1	Pass Text/Smooth
DS-56	7-21-92	34B/35B	84	FTB/SE-1	118	107	FTB/SE-1	Pass Smooth
DS-57	7-21-92	312/313	77	FTB/SE-1	113	105	FTB/SE-1	Pass Smooth
DS-58	7-21-92	310/309	77	FTB/SE-1	104	102	FTB/SE-1	Pass Text/Smooth
DS-59	7-21-92	313/314	79	FTB/SE-1	100	84	FTB/SE-1	Pass Textured
DS-60	7-21-92	315/316	80	FTB/SE-1	99	84	FTB/SE-1	Pass Textured
DS-61	7-27-92	527/528	93	FTB/SE-1	105	93	FTB/SE-1	Pass Textured
DS-400	7-10-92	400/401	83	FTB/SE-1	105	86	FTB/SE-1	Pass Textured
DS-401	7-10-92	403/404	82	FTB/SE-1	105	82	FTB/SE-1	Pass Textured
DS-402	7-10-92	410/411	86	FTB/SE-1	108	88	FTB/SE-1	Pass Textured
DS-403	7-10-92	18/19	85	FTB/SE-1	106	86	FTB/SE-1	Pass Textured

Appendix E

SUMMARY OF NON-WOVEN GEOTEXTILE CONFORMANCE TESTS

Appendix E

Summary of Geotextile Conformance Test Results

Client:	Hidden Valley LF Pierce County, Washington
Project:	Southwest Closure
Date:	December 3, 1992
Prepared by:	Nick Nickolas

Geosynthetic Manufacturer: Polyfelt
Geosynthetic Installer: Serrot
Testing Laboratory: AGP
Nominal Unit Weight: 6.0 oz/sq ft.

Sample Number	Roll Number	Mass per Unit Weight (oz/sq. ft.)	Permittivity	Puncture Resistance	Mullen Burst Strength (psi)	Breaking Strength (mach/trans) (lbs)	Apparent Break Elongation (mach/trans) (%)
Specification (minimum requirement)		5.7 oz/yd^2 (ASTM D-3776)	1.45 sec^{-1} (ASTM D-4491)	80 lbs. (ASTM D-4833)	250 psi (ASTM D-3786)	150 lbs. (ASTM D-4632)	(ASTM D-4632)
CT-12	N/A	7.0711	2.58	124	355	232/233	151/114
CT-13	N/A	8.7879	2.39	139	368	252/244	135/120
CT-14	N/A	7.9000	3.57	130	343	230/231	158/128
CT-15	N/A	8.6489	3.37	129	341	288/266	156/133
CT-16	N/A	8.2	2.45	132	399	274/270	133/114
CT-17	N/A	8.2	2.84	126	378	229/258	151/123
CT-18	N/A	8.6	2.35	131	351	221/234	162/126
CT-19	N/A	7.8	2.27	120	336	238/226	148/114
CT-20	N/A	8.4	2.13	112	402	245/235	145/117

Appendix E

Summary of Geotextile Conformance Test Results
(Continued)

Client: Hidden Valley LF Pierce County, Washington
Project: Southwest Closure
Date: December 3, 1992
Prepared by: Nick Nickolas

Geosynthetic Manufacturer: Polyfelt
Geosynthetic Installer: Serrot
Testing Laboratory: AGP
Nominal Unit Weight: 12.0 oz/sq ft.

Sample Number	Roll Number	Mass per Unit Weight (oz/sq. ft.)	Permittivity	Puncture Resistance	Mullen Burst Strength (psi)	Breaking Strength (mach/trans) (lbs)	Apparent Break Elongation (mach/trans) (%)
Specification (minimum requirement)		12.0 oz/yd^2 (ASTM D-3776)	1.0 sec.$^{-1}$ (ASTM D-4491)	130 lbs. (ASTM D-4833)	400 psi (ASTM D-3786)	280 lbs. (ASTM D-4632)	(ASTM D-4632)
CT-11	N/A	13.0827	1.88	170	526	349/335	160/136

Appendix F

GEOMEMBRANE PANEL LAYOUT DRAWINGS

LEGEND

■ DS 48 DESTRUCTIVE SAMPLE LOCATION & NUMBER

P197 PANEL NUMBER

AREA OF TEXTURED GEOMEMBRANE

AREA OF SMOOTH GEOMEMBRANE

0 50 100

SCALE (ft)

N

MARK J. AMRHEIN
STATE OF WASHINGTON
23715
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES 11/1/93
12/31/92

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY
0	12/31/92	AS-BUILT RECORDS	MC	GRW	NN	MJA

DATE OF ISSUE 12-31-92 DWN BY KLM DES BY GRW CHK BY NN APP BY MJA

EMCON Northwest, Inc.

LAND RECOVERY, INC.
HIDDEN VALLEY LANDFILL
PIERCE COUNTY, WASHINGTON

SOUTHWEST CLOSURE
AS BUILT

DRAWING NO 1

PROJECT NO T0201.51

SCALE:1= 100 08-07-92 C:\HIDDEN\T0201C69

MARK J. AMRHEIN, STATE OF WASHINGTON, REGISTERED PROFESSIONAL ENGINEER, 23785
EXPIRES 11/1/93
12/31/92

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY
0	12/31/92	AS-BUILT RECORDS	MC	GRW	NN	MJA

DATE OF ISSUE 12-31-92 DWN BY KLM DES BY GRW CHK BY NN APP BY MJA

EMCON Northwest, Inc.

LAND RECOVERY, INC.
HIDDEN VALLEY LANDFILL
PIERCE COUNTY, WASHINGTON
SOUTHWEST CLOSURE
AS BUILT

DRAWING NO 2
PROJECT NO T0201.51

SCALE:1= 50 08-11-92 \HIDDEN\T0201C70