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CONSTRUCTION REPORT

Circle:

Air	Corr.
Water	Rpt.
DW/RCRA	Int.
HWCU	Enf
SW	Eng.

Company Name

Former Mill E/Koppers Site Remediation

Everett, Washington

September 1999

Prepared for

Weyerhaeuser

Prepared by

EMCON

A Member of The IT Group

Weyerhaeuser

101 East Marine View Drive
Everett, Washington 98201
Tel (425) 339 2800
Fax (425) 339 2786

September 7, 1999

Mr. Paul Skyllingstad
Washington State Department of Ecology
Central Programs -- Industrial Section
PO Box 47706
Olympia, Washington 98504

Re: Mill E/Koppers Remediation Construction Report

Dear Mr. Skyllingstad:

Weyerhaeuser is submitting the Construction Report in accordance with terms in Consent Decree No. 98-2-08718-6 between Weyerhaeuser and the Department of Ecology. The Construction Report documents the as-built construction of the former Mill E/Koppers Site. With this submittal, the remediation project is complete.

After your review, we request that you issue a letter certifying that the construction portion of the Mill E/Koppers remediation project is complete. Please send the letter to me.

The monitoring phase, as defined in the Consent Decree, has already begun. After I receive the certification of construction completion, the new Weyerhaeuser Project Coordinator will be

Shari Brown
Weyerhaeuser Company
Mail Stop CH1L28
33663 Weyerhaeuser Way S
Tacoma, WA 98003
Phone (253-924-2729)
Fax (253-924-2013)

Ms. Shari Brown has been assigned responsibility for the monitoring phase administration of this Consent Decree. Please send all correspondence to her attention.

Circle:

Air	Corr
Water	Rpt
DW/RCRA	Int.
HWCU	Enf
SW	Eng.

Wey00
Everett

It has been a pleasure working with you and your staff over the past several years and through three Consent Decree remediations. Thank you for all your support and help, without it we could not have had such successful projects.

If you have any questions, comments, or require clarification, please contact me at (425) 339-2871.

Sincerely,

Stuart Triolo

Stuart Triolo
Project Manager
9799 final report.DOC

Enclosure: Construction Report Former Mill E/Koppers Site Remediation, Everett WA.- September 1999 prepared by EMCON.

Cc with enclosure: Joe Jackowski -- CH2J28; John Gross -- CH1K29; Mark Schneider -- Perkins Coie; Jane Patarcity -- Beazer East; Thomas Aldrich -- ASARCO; Bob McChesney – Port of Everett.

Cc without enclosure (via e-mail): David Young -- CH2L30; Dave Judkins--CH2L30; Shari Brown -- CH1K29; Ken Johnson -- CH1K29; Kevin Godbout – CH1M27; Brian O'Neal – EMCON.

CONSTRUCTION REPORT

FORMER MILL E/KOPPERS SITE REMEDIATION

EVERETT, WASHINGTON

Prepared for

Weyerhaeuser Company

September 1, 1999

Prepared by

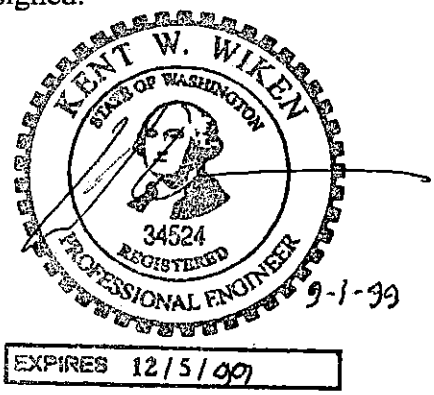
EMCON
(A Member of the IT Group)
18912 North Creek Parkway, Suite 200
Bothell, Washington 98011-8016

Project 793059

Construction Report
Former Mill E/Koppers Site Remediation
Everett, Washington

The construction activities described in this report were observed by the Project Engineer and Construction Quality Assurance Monitors from EMCON. Based on direct observations made by EMCON personnel, materials testing, other laboratory testing, and other construction documentation described in this report, EMCON concludes remediation at the Former Mill E/Koppers Site was constructed in a workman-like manner and in accordance with the intended design. The material and data in this report were prepared under supervision and direction of the undersigned.

EMCON



Kent Wiken, P.E.
Project Engineer

CONTENTS

CONTENTS (Continued)

CONTENTS (Continued)

TABLES AND ILLUSTRATIONS

Tables

Figures

SUMMARY

The Former Mill E/Koppers Site is located in Everett, Washington. Remediation of the site was initiated in November 1998 and completed in June 1999. This report provides background information about the project and documents work that was performed in accordance with the design intent and Consent Decree (Snohomish County Superior Court No. 98–02–08718–6) between the Washington State Department of Ecology (Ecology) and Weyerhaeuser Company. The following paragraphs summarize the content and conclusions of this report.

Section 1 of the report provides an introduction describing project background, provides a description of the project, and describes the organizations involved in the project and their responsibilities.

Section 2 describes the site work performed including demolition, earthwork, and the barrier wall system.

Sections 3 through 6 describe construction quality assurance (CQA) work performed by EMCON documenting the project's compliance with the design intent and conditions of approval. Section 3 describes site work construction observation and testing, including test standards and testing frequencies implemented by the CQA Organization. Section 4 describes the barrier wall installation including construction observation and testing. Section 5 describes CQA for the asphalt cap, crushed rock subbase, asphalt treated base, pavement overlay geotextile, and asphalt surface course including all construction observations and testing. Section 6 describes drainage and erosion control construction observation and testing related to rip rap, separation geotextile, and seeding.

Section 7 describes the installation of the piezometers and vault boxes and includes construction observation, testing, construction phase problems, and resolution.

Section 8 presents daily recordkeeping and photographs documenting progression of the project.

Section 9 describes design modifications and modifications to the CQA program made during construction, and justification for these design and CQA modifications.

In summary, a CQA program was implemented by EMCON during remediation construction. This CQA program, which included observation and testing of the

constructed components, documents the work was completed in accordance with the design intent presented in the construction drawings and specifications. However, like any large construction project, this project was not completed without small construction-phase variances to the specifications and/or drawings. These variances and their resolutions are described as appropriate in other sections of this report.

1 INTRODUCTION

1.1 Purpose

This construction report presents an overview of the construction testing and as-built documentation for final cleanup action of the Former Mill E/Koppers Facility located in Everett, Washington.

1.2 Site Background

1.2.1 Site Description

The site is located on Weyerhaeuser property in Everett, Washington. The site is next to the Snohomish River, approximately 2 miles upstream from the river mouth at Port Gardner Bay. The site boundary encompasses 8.41 acres and includes areas that contain impacted environmental media and components of the final cleanup action (see Appendix A, Drawing Index, Drawing A, and Drawing 1).

Both the site and the adjacent Weyerhaeuser property were used for industrial purposes since the early 1900s. The entire Weyerhaeuser property is zoned for continued industrial use (M-2, heavy manufacturing) by the city of Everett.

1.2.2 Site History

The site history is discussed in detail in the remedial investigation (RI) report (EMCON 1994). The main site activities are summarized as follows:

Wood Treating. The site was used as a lumber storage area from 1915 until American Lumber and Treating Co. (ALTC) constructed a wood treatment facility on leased Weyerhaeuser property in 1948. Wood treatment at the facility continued until 1963 when the lease expired, at which time Weyerhaeuser began to use the site. The wood treatment facility included two steel pressure retorts and aboveground and underground piping. Wood treatment included the use of creosote (sometimes with a petroleum

hydrocarbon carrier), Wolman salts (chromated copper arsenate [CCA]), and pentachlorophenol (PCP) with an oil carrier.

Maintenance. Beginning in 1963, Weyerhaeuser gradually converted the former wood treatment facility into an equipment maintenance facility (the retorts and the aboveground storage tanks were removed). The maintenance facility operated from 1963 to 1984. The petroleum tanks and some petroleum-contaminated soil were removed in 1988.

Mill E Sawmill. Weyerhaeuser built a sawmill, named "Mill E," at the north end of the site in 1971. Mill E was designed to handle small-diameter logs (4 to 12 inches) and produce dimensional lumber. Mill E was shut down in 1984 and the building was demolished, except for the foundation, in 1988.

Post-1984 Activities. Since 1984, when both the vehicle maintenance and Mill E operations shut down, the site has been largely unused. The former wood treating/ maintenance building was used periodically for storage of miscellaneous equipment. The former wood treating/maintenance building is referred to as the "building" in this report.

The site is not currently in use, and industrial operations at the Weyerhaeuser property have been discontinued.

1.2.3 Future Use

The site is expected to be transferred to the Port of Everett in Fall 1999. Property adjacent to the site will be used as an industrial park serving a variety of industrial uses. Future land use for the site will follow M-2 zoning ordinances and be consistent with the land uses of the adjacent property.

1.3 Previous Investigations

This section provides a brief overview of the previous investigations and final cleanup action for the site. Ecology required this cleanup action based on their review of the information contained in the RI and feasibility study (FS) reports (EMCON 1994 and 1997a), and on subsequent series of review meetings. The results of these meetings are described in a series of technical memoranda, correspondence, and reports (EMCON, 1997b, c, d, e, f; Ecology 1997a, b, c; Weyerhaeuser, 1997).

As a result of these negotiations, Ecology required, and Weyerhaeuser agreed to focus on, a cleanup action alternative similar to FS Alternative 3 (cap plus vertical barrier), which included the following major components:

- An approximately 1,600-foot-long vertical barrier wall was installed around the portion of the site where nonaqueous-phase liquids (NAPL) or highly saturated soil contamination have been observed.

- Excavation and off-site disposal of up to 1,200 cubic yards (cy) of hot spot soil above the water table in the former blow pit area. All hot spot soil taken off site was managed as a F032, F034, or F035 listed dangerous waste.[1] The NAPL that appeared on the water surface in the bottom of the excavation was collected using adsorbents, or other measures as appropriate, and disposed as hazardous waste. Once the excavation was complete, it was backfilled using imported soil.

- A low-permeability asphalt cap was installed to cover the vertical barrier containment area to minimize infiltration of precipitation inside the vertical barrier wall and prevent direct contact with impacted soils.

- A soil cap placed over portions of the site outside the vertical barrier to prevent direct contact with impacted soil.

- Institutional controls (e.g., deed restrictions) to control exposure of future site workers to contaminants, as well as to maintain the integrity of the barrier wall and cap.

- Long-term monitoring and maintenance of the above items.

Ecology has determined this alternative will be protective of both human health and the environment, will contain the major sources of groundwater contamination, is consistent with the anticipated future industrial use of the site, and is cost-effective when compared with other alternatives that could achieve similar levels of protection and compliance with the cleanup standards.

1.4 Project Organization

The project organization chart is provided as Figure 1-1 attached. A brief description of the project responsibilities for each member of the project team is outlined in the following paragraphs.

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[1] For purposes of this report, the term "dangerous waste" will be used to include Washington State dangerous wastes as defined pursuant to WAC 173-303, and Federal hazardous wastes as defined by 40 CFR 261.

1.4.1 Weyerhaeuser

Weyerhaeuser directed the cleanup action for the site in accordance with the Consent Decree. The companies listed in the following paragraphs were contracted by Weyerhaeuser to assist in completing the cleanup action.

1.4.2 EMCON

EMCON was responsible for preparing the engineering design report, construction drawings, and technical specifications describing the scope of the clean up action. EMCON also implemented a comprehensive construction quality assurance (CQA) program during construction, provided field engineering services during construction, and prepared this construction report.

1.4.3 WRS, Inc.

WRS Infrastructure and Environment, Inc., (WRS) was the general contractor for the project, providing oversight of all construction, management of subcontractors, and providing construction quality control (CQC) testing.

1.4.4 Clark Leeman

Clark Leeman was the subcontract surveyor for WRS, providing construction layout staking and as-built documentation.

1.4.5 GSE Lining Technology, Inc.

GSE Lining Technology, Inc. was a subcontractor to WRS, supplying the geosynthetic materials for the project including high-density polyethylene (HDPE) barrier wall and geomembrane.

1.4.6 CeCON

CeCON was a subcontractor to WRS, performing earthwork construction and geosynthetic clay liner (GCL) installation for the project.

1.4.7 Western Geo-Constructors, Inc.

Western Geo-Constructors, Inc., a subcontractor to WRS, installed the HDPE barrier wall and HDPE geomembrane apron.

1.4.8 CSR Associated

CSR Associated, a subcontractor to WRS, provided and installed the base rock course, asphalt treated base (ATB), pavement overlay geotextile, and asphalt cap.

1.4.9 Cascade Drilling

Cascade Drilling, Inc., a subcontractor to WRS, provided all materials for the piezometers and piezometer vaults and installed the piezometer.

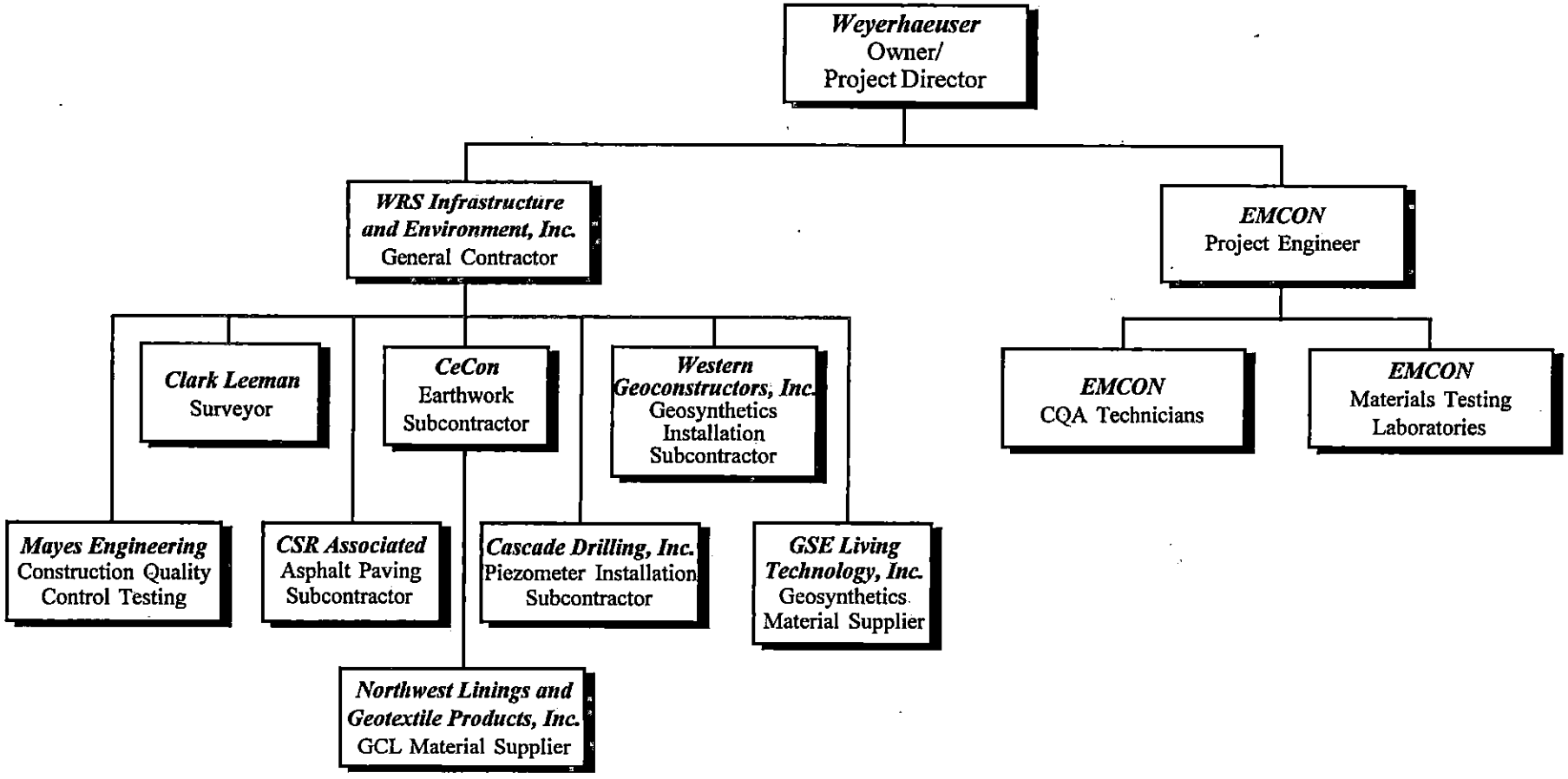
1.4.10 Mayes Engineering

Mayes Engineering, a subcontractor to WRS, provided CQC testing of earthwork during construction.

1.4.11 Northwest Linings and Geotextile Products, Inc.

Northwest Lining and Geotextile Products, Inc. was a subcontractor to WRS, supplying GCL for the project.

Figure 1-1
Former Mill E/Koppers Remediation
Everett, Washington
Project Organization Chart



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2 WORK PERFORMED

2.1 Demolition

2.1.1 Existing Structures

Fencing, concrete slabs and foundations, and other structures located inside the site boundary but outside the barrier wall were removed. All concrete slabs, foundations, or other structures located inside the barrier wall were lowered to a minimum of 18 inches below the finished cap surface but left in place.

2.1.2 Existing Utilities

Where existing utilities crossed the proposed barrier wall alignment, a minimum 5-foot by 5-foot access pit was excavated down to the abandoned utility. The utility pipe was then removed leaving a minimum 2-foot horizontal clearance between the cut utility ends and the barrier wall alignment. Access pits were backfilled with imported soil fill material up to the bottom elevation of the barrier wall trench. Select backfill consisted of soil with 100 percent passing the US standard number 4 sieve.

2.2 Earthwork

2.2.1 Excavation Backfill and Disposal of Contaminated Soils

Prior to commencing excavation of contaminated soils, several site preparation actions were completed to facilitate (1) implementation of excavation in a manner that minimized the generation of dangerous wastes, and (2) management of the generated dangerous waste that is consistent with applicable regulations and the contaminated materials handling plan which was prepared by WRS/CeCON. At a minimum, this site preparation included:

- Construction of temporary truck access and egress roads over the existing contaminated soil so that trucks could reach and leave the loading area without disturbing contaminated soil or becoming contaminated by this soil.

- Construction of a soil loading area adjacent to the hot spot excavation area. This loading area was lined with plastic sheeting placed on a subgrade of imported fill. Temporary plastic sheeting was also placed over the side and tires of the truck being loaded. The subgrade was sloped to direct dewatering liquids and contaminated rainfall back into the excavation.

- Construction of a decontamination area which included a lined equipment and vehicle washing pad. Accumulated wash water was disposed with the excavated soils.

The initial remediation step was to excavate contaminated soil from the blow pit area or "hot spot" described in the FS. The primary excavation area was the area with the most heavily contaminated soils (see Appendix A, Drawing 2). Once the primary area had been excavated, the excavation was expanded horizontally at the same depth until a volume of 1,200 cy was excavated. Excavation depth was determined by the static groundwater table at the time of the excavation. Any other excavation required for site grading, barrier wall installation, utility relocation, or other reasons was handled and excavated in the same way as the 1,200 cy of soil required for the hot spot excavation.

Product (i.e., NAPL) removal consisted of absorbent pads to remove product that accumulated in the excavation. All materials (soil and product) removed from the hot spot excavation were managed as a dangerous waste in accordance with the applicable regulations and the contaminated materials handling plan.

Contaminated materials were placed in plastic sheet-lined dump trucks on site, the trucks were decontaminated and covered, and then the contaminated materials were transported to the Chemical Waste Management facility in Arlington, Oregon, for disposal. A summary list of the disposal manifests is provided in Appendix B.2. Original manifests are on file at Weyerhaeuser and summary information has been submitted on the Dangerous Waste Annual Report to Ecology.

All excavations were backfilled with controlled placement of imported, non-contaminated backfill. The CQA and documentation for the contaminated soils handling is detailed in Section 3.3 of this construction report.

2.2.2 Site Grading

Fill was added across the site to facilitate drainage, to cover contaminated surface soils (soil cap), and to provide subgrade for the asphalt cap. The fill consisted of Snohomish River dredged sand which was stored in nearby stockpiles.

In areas outside of the barrier wall system, a minimum 1-foot vertical thickness of lightly compacted fill (soil cap) was placed over the remediation area to provide a physical barrier preventing direct contact with the underlying contaminated soil. Regrading of

existing contaminated soil in the soil cap area was not required and all final grades were achieved by placing imported (dredged) fill. The soil cap surface was constructed with a slope varying between zero and 0.5 percent. Fill was thickened as needed to eliminate low spots in the surface, and a minimum elevation of 8.0 feet NGVD (1 foot below the 100-year flood elevation of the Snohomish River). Fill was placed directly on the subgrade in one or two loose lifts, roughly graded as shown on the plans, and compacted with at least one pass of compaction equipment. There was no other compaction specification or density testing requirement for the soil cap. Fill was added as required to achieve the minimum 1-foot thickness over the existing topography. Thickness was confirmed by surveying at one point per 10,000 square feet of soil cap (100-foot grid). Once the soil cap is in place, it was hydroseeded with grass seed.

Fill below the asphalt cap (generally inside the barrier wall) was constructed to provide a minimum 0.5 percent slope for the overlying asphalt cap. This fill was placed in 12-inch loose lifts and then compacted. Density was verified as outlined in Section 3.4 of this report. There was some limited excavation at the southeast corner of the asphalt cap to facilitate stormwater drainage and lower the overall elevation of the cap (i.e., reduce fill requirements); this excavated soil was managed as a dangerous waste consistent with the contaminated materials handling plan. There was no regrading of existing site soil to achieve final grades for the asphalt cap.

2.3 Barrier Wall System

As a part of the site remediation, a low-permeability, vertical barrier wall (Gundwall™) system was installed around the area where NAPL and high residual soil contamination have been observed. Gundwall is a prefabricated wall system constructed of panels of HDPE sheets welded to interlocking connectors. A hydrophilic seal is inserted into the joint of the interlock system during installation. This seal swells when hydrated, forming a low-permeability connection between panels. The panels are individually vibrated into place with standard sheet pile vibratory installation equipment and connected using the interlock system. The vibratory installation equipment is fitted with a customized "blind" plate to physically vibrate the flexible HDPE sheet panels into place. The blind plate is then extracted, leaving the Gundwall barrier wall in place. The installed barrier wall alignment is shown in Appendix A, Drawing 2. The barrier wall was imbedded into the continuous, low-permeability silt layer underlying the site. The top of this silt layer is generally 6 to 10 feet below the pre-construction ground surface. The as-built profile of the barrier wall is shown in Appendix A, Drawings 4, 5, and 6.

Prior to installation of the Gundwall barrier wall system, the barrier wall alignment was prepared by pre-driving a steel plate (without the Gundwall attached) using vibratory methods to the depths indicated on the construction plans. This pre-driving was performed to push aside obstructions and soften the ground where the Gundwall was to be installed. During pre-driving, obstructions and sharp rock fill layers were delineated along the proposed barrier wall alignment. Obstructions and sharp rock fill layers were

removed by trenching approximately 1 to 2 feet on each side of the trench centerline. Road plates were vibrated into the soils alongside of the alignment trench, in a box-like arrangement. This arrangement limited the amount of adjacent soil sliding into the trench area. All soils excavated from this trench were managed as a dangerous waste consistent with the contaminated materials handling plan.

At the onset of the project, Gundwall panels were prefabricated at the plant to design lengths based on the contractors panel layout plans. These panel layout plans were developed based on the depth to the silt foundation layer. Gundwall panels were therefore ordered by a certain number of 8-foot-long panels, 9-foot-long panels, 10-foot-panels, etc. In the event that a panel became damaged during construction, new panels were fabricated on site by ordering extra panels and shoes, cutting the panel to the length required, stripping off the used shoe from the damaged panels, and welding the used shoe (or a new shoe) to new Gundwall panels.

Installation of Gundwall involved installing the first panel in the alignment using vibratory methods. The previously placed panel was then prepared for the next panel by hooking a chain onto the above-grade portion of the male interlock, and applying tension to keep the interlock from buckling. A knot was tied in the end of the hydrophilic seal cord and this knot was placed into the bottom of the female interlock of the panel to be installed. The blind plate shoe of the panel was then placed under the bottom of the blind plate and the blind plate with the attached Gundwall panel was moved into place over the wall alignment. The female interlock was slid over the male interlock, and the new Gundwall panel was lowered to the ground surface. The vibratory pile driver then vibrated the Gundwall panel down into place, locking with the previously installed panel. The female interlock of the new panel was kept lubricated using soapy water. Driving of the panel continued until the depth mark on the drive panel was reached (see Section 4.4). The blind plate was then vibrated and pulled out, leaving the installed Gundwall panel in place. This process was continued until the barrier wall installation was complete.

The backfill of the barrier wall trench required for obstruction removal consisted of select backfill in which 100 percent of the soil is finer than the US standard number 4 sieve. The barrier wall trench backfill was placed in 12-inch maximum thickness loose lifts and compacted to a minimum of 90 percent and a maximum of 95 percent of the maximum dry density at a moisture content 2 percentage points below to 4 percentage points above the optimum moisture standard Proctor (ASTM D698).

2.4 Low-Permeability Asphalt Cap

An asphalt cap was constructed over the area surrounded by the barrier wall to minimize surface water infiltration into the contained soils and to prevent direct contact with contaminated soils.

2.4.1 Subgrade Preparation

Grading beneath the asphalt cap consisted of the following:

- Compacted soil sloped at 0.5 to 1.0 percent. The compacted soil was placed in 12- to 18-inch-thick, loose, horizontal lifts and compacted to 95 percent of the maximum dry density, at a moisture content range of 2 percentage points below to 4 percentage points above the optimum moisture content defined by standard Proctor density (ASTM D698).

- For undisturbed soils below where no fill was required (cut areas), the grade was proof rolled to detect soft spots; however, no soft spots were encountered. The proof rolling was performed using a heavy pneumatic-tired roller or loaded dump truck with a tire pressure exceeding 50 psi.

2.4.2 Asphalt Cap Construction

The constructed section for the low-permeability asphalt cap section consists of the following elements (top to bottom):

- A 2-inch asphalt surface course.
- A pavement overlay geotextile layer impregnated with tackcoat.
- A 4-inch-thick, asphalt-treated base course.
- A 4-inch-thick, crushed rock (¾-inch nominal) course.

When impregnated with the bitumen tackcoat, the pavement overlay geotextile performs similarly to a flexible membrane liner inside the asphalt cap. The overlay will significantly reduce stormwater infiltration into the contaminated soil below the cap.

The maximum allowable axle-load capacity for this pavement section has been determined to be 7,100 pounds for a single axle and 13,000 pounds for a tandem axle using the American Association of Highway and Transportation Officials (AASHTO) flexible pavement design criteria.

2.5 Drainage and Erosion Control

The existing stormwater control system for the northern portion of the site and adjacent off-site property consists of a series of catch basins and storm drain pipes that collect water from paved areas and direct it to the existing point of discharge into the Snohomish River at the northeast corner of the site. Because of the high infiltration rate of the on-site sand, most of the stormwater infiltrates into the site soil with little runoff. A stormwater ditch runs parallel to the west side of the site and collects a small amount of runoff, mostly from the area between the west fence line and the ditch itself. The ditch directs this runoff to a discharge point at the southeast end of the site.

The project remediation has divided the site into two areas:

- Impervious asphalt cap area.
- Pervious soil cap area.

Stormwater from the asphalt cap will be managed as uncontaminated runoff. The asphalt cap has been sloped at a minimum 0.5 percent to facilitate drainage. The flow from the asphalt cap area will be collected outside the barrier wall by a perimeter swale system constructed as part of the cap. The collected runoff will be directed toward the southeast corner of the site and discharged into the Snohomish River via a rip rap lined drainage channel and outlet structure.

Stormwater runoff from the soil cap will be negligible due to the high infiltration rate of the cap soils and the flat surface grades. The soil cap elevates the site to no greater than 1 foot below the 100-year flood elevation.

Before any site work began, a silt fence erosion control system was installed across the discharge points along the site boundary to control erosion and sediment. Temporary straw bales were placed around the existing drop structure inlets to further minimize potential sediment clogging of the existing stormwater control systems.

Site drainage was constructed on the asphalt cap as shown in the Drawings. The soil cap area was hydroseeded after construction to prevent erosion. The entire site was constructed with stormwater controls consistent with the City of Everett Stormwater Management Manual and the site grading permit (included as Appendix F.3), as shown on the construction plans.

3 CONSTRUCTION QUALITY ASSURANCE FOR SITE WORK

3.1 General

The scope of site work required to complete the Former Mill E/Koppers Remediation included the following:

- Demolition of existing structures and utilities.
- Excavated and stockpiled contaminated soil.
- Loaded, transported, and disposed of contaminated soil.
- Placement, compaction, and grading of imported soil as engineered fill.
- Placement and grading of imported soil to construct a soil cover.
- Placement, compaction, and grading of base course under the low-permeability asphalt cap.
- Construction of drainage system components, including ditches and culverts.

This section describes monitoring and testing performed to assure this construction met the specified requirements.

3.2 Demolition

Before the site was regraded, EMCON verified that:

- All concrete structures outside the barrier wall alignment such as retaining walls, wing walls, foundations from former mill buildings, and standpipes were removed to the design grade, or were completely excavated and removed from the site. The only structure allowed to stay that was outside the barrier wall alignment was the log dump on the east side.

- Structures within the barrier wall alignment were removed to a minimum of 18 inches below the proposed finished grade.

- Concrete rubble and debris from the demolition were managed consistent with the contaminated materials handling plan. In general, concrete and other aboveground structures were not considered a dangerous waste and were stockpiled for later use as fill. At- or below-grade concrete and other debris were handled as dangerous waste.

- Demolition equipment and haul vehicles were decontaminated in the designated area prior to leaving the site.

- Care was taken not to significantly disturb existing building support piles during demolition, so that lateral movements of the pile would not disturb the underlying silt layer, and excavated soil and the pile caps were managed consistent with the contaminated materials handling plan.

EMCON and Clark Leeman determined the horizontal and vertical location of points where existing utilities crossed the proposed vertical barrier wall installation. The sanitary sewer and city water lines were capped 2 feet on either side of where they crossed the barrier wall alignment. The fire protection water line and underground electrical conduits were also cut, capped, and abandoned where they crossed the barrier wall system.

3.3 Removal of Contaminated Materials

3.3.1 Excavation of Contaminated soils

During excavation of contaminated soils, EMCON verified that the excavation area, truck loading areas, truck entrance, truck exit, and decontamination area were constructed in accordance with the project specifications. The general purpose of the truck entrance, loading area, and exit was to minimize the generation of dangerous waste by preventing trucks from contacting contaminated soil, thereby reducing decontamination requirements. EMCON verified that stormwater runoff from the loading area was managed consistent with the WRS/CeCON contaminated materials handling plan.

EMCON also verified that care was taken to minimize spillage of soil onto the loading area and the truck to reduce the potential for generating excess waste and increasing decontamination requirements. If soil was spilled outside the truck onto the loading area, it was immediately cleaned up and placed into the truck to prevent tracking of this contaminated soil across the site. There were no free liquids in the soil placed into the

trucks. If soil removed from the excavation was determined to contain free liquids, it was dewatered in the lined loading area prior to placement in the truck.

Prior to leaving the site, EMCON verified that the trucks were decontaminated to remove loose soils from the tires and truck body. Decontamination was performed over a large steel grate which covered a steel tray to contain wash residue. The decontamination area was located on the foundation of the former Mill E building. All decontamination residuals were managed as a dangerous waste consistent with the contaminated materials handling plan.

Within the hot spot area (shown on Drawing 2 in Appendix A), EMCON verified the depth of the excavation determined by the excavation depth at which seepage was first encountered (approximately 4 feet below ground surface [bgs]). The excavation did not proceed below the observed seepage depth until the pit had been open not less than 24 hours (to allow the water level to stabilize). After the area was open for the specified time period, the excavation continued downward (to approximately 4 to 4.5 feet) until it was a maximum of 3 inches below the observed groundwater table. Excavation then proceeded horizontally until a minimum volume of 1,200 cy had been removed.

The excavation quantity was measured and checked by EMCON in the trucks using visual methods and measured truck capacity. The total volume was determined by counting the trucks. The hot spot excavation was continued until the sum of load truck volumes reached a volume of 1,200 cy. The hot spot volume calculations are provided in Appendix B.1

In addition, during contaminated materials removal, EMCON CQA technicians:

- Verified that construction staking was performed before work.
- Verified that clearing and stripping was completed in areas required for site access and execution of the work.

3.3.2 Collection of NAPL

EMCON verified that floating product or NAPL encountered in the excavation was removed for disposal as dangerous waste in accordance with the contaminated materials handling plan. NAPL removed with, and contained in, the contaminated soil was direct-loaded into the trucks along with the contaminated soil. NAPL present on the surface of the groundwater in the excavation was removed using absorbent pads or other material. NAPL removal continued until absorption was no longer practical for removing the NAPL. EMCON verified that contaminated absorbent pads were placed in the trucks with the contaminated soil.

3.3.3 Transportation and Disposal of Contaminated Materials

During contaminated materials loading, EMCON CQA technicians:

- Verified loading of soils was restricted to contaminated soil loading areas.
- Verified trucks did not leave the site prior to decontamination in accordance with the contaminated materials handling plan.
- Verified that trucks properly contained the contaminated soil per project specifications and the contaminated materials handling plan.

3.4 General Earthfill

General earthfill was constructed for:

- Engineered fill used as backfill of excavations.
- Soil cover outside of the barrier wall.
- Engineered fill and base course under the low-permeability asphalt cap.

The CQA testing for the earthfill is outlined in the following sections.

3.4.1 Test Procedures

EMCON performed field and laboratory tests consistent with applicable standards, as specified in the technical specifications or the CQA manual. In most instances, the applicable procedure was an ASTM standard.

Where called for in the CQA manual or in the contract documents, the following test standards applied:

Standard	Test Description
ASTM D698	Moisture-density relations of soils and soil-aggregate mixtures, using 5-pound (lb) rammer and 12-inch drop.
ASTM D1556	Density of soil in place by the sand-cone method.
ASTM D422	Particle size analysis of soils.
ASTM D2922	Density of soil and soil-aggregate in place by nuclear methods.

ASTM D3017	Moisture content of soil and soil-aggregate in place by nuclear methods.
ASTM D2216	Laboratory determination of water (moisture) content of soil, rock, and soil-aggregate mixtures.
ASTM D1140	Amount of material in soils finer than the No. 200 sieve.
ASTM D2487	Classification of soils for engineering purposes.
ASTM D2488	Description and identification of soils (visual-manual procedure).

3.4.2 Test Frequencies

Tables 3-1, 3-2, and 3-3 summarize the test frequencies used during earthwork CQA. The "number of tests required" listed establish a minimum number of required tests. Extra testing was performed whenever work or materials were suspect, marginal, or of poor quality. Retesting was also performed to provide additional data for engineering evaluation. Retests did not contribute to the total number of tests performed to satisfy the minimum test frequency.

Table 3-1
Engineered Fill Test Frequencies

Construction Phase Sampling and Testing				
ASTM Test Method	Frequency	Approximate Volume Placed (cy)	Number of Tests Required	Number of Tests Performed
Sample	1 per 2,500 cy placed	18,200	8	8
Unified Soil Classification System (D2487)	1 per 5,000 cy placed		4	4
Visual-Manual Soil Classification (D2488)	Continual during placement		N/A	
Moisture Density Relations (D698)	1 per material type, 1 check point per 10,000 cy		2	3
Particle Size (D422)	1 per 5,000 cy placed		4	4
No. 200 Wash (D1140)	1 per 5,000 cy placed		4	4
In-place Density, Nuclear Method (D2922)	1 per 500 cy placed		37	80
In-place Moisture Content (D2216)	1 per 500 cy placed		37	80

Table 3-2
Soil Cover Test Frequencies

Construction Phase Sampling and Testing				
ASTM Test Method	Frequency	Approximate Volume Placed (cy)	Number of Tests Required	Number of Tests Performed
Sample	1 per 2,500 cy placed	7,000	3	3
Unified Soil Classification System (D2487)	1 per 10,000 cy placed		1	1
Visual-manual Soil Classification (D2488)	Continual during placement		N/A	N/A
Particle Size (D422)	1 per material type		1	1

Table 3-3
Base Course Test Frequencies

Construction Phase Sampling and Testing				
ASTM Test Method	Frequency	Approximate Volume Placed (cy)	Number of Tests Required	Number of Tests Performed
Sample	1 per 2,500 cy placed	2,600	1	1
Unified Soil Classification System (D2487)	1 per 10,000 cy placed		1	1
Visual-manual Soil Classification (D2488)	Continual during placement			
Particle Size (D422)	1 per material type		1	1
In-place Density, Nuclear Material (D2488)	Not Required		0	10
In-place Moisture Content (D2216)	Not Required		0	10

3.4.3 Monitoring

Earthwork testing performed during construction is summarized in paragraph 3.4.2 of this section. The following paragraphs describe the monitoring performed for each type of earthwork.

3.4.3.1 Placement, Compaction, and Grading of Imported Soil as Engineered Fill Below the Asphalt Cap

- Reviewed preconstruction testing.
- Verified conditioning by testing, visual observation of material quality, and consistency of moisture throughout material.
- Verified by review of survey that subgrade tolerances were correct.
- Verified by observation that grade control was established by the contractor.
- Verified by review of survey that lift thickness requirements were met.
- Verified moisture and density of compacted lifts by testing at required frequencies to assure compliance with specifications.
- Verified by observation that surfaces between lifts were scarified.
- Verified by review of survey information that finished grade tolerances and soil thickness.

- Verified by testing that moisture content was maintained until the soil was covered.
- Verified by observation that the surface had not desiccated and that final grading meets specified requirements.

3.4.3.2 Placement and Grading of Imported Soil to Construct Soil Cover

- Verified by testing that material met specified requirements.
- Verified by observation and construction staking that lift thickness met design requirements.
- Verified grade tolerances and finished elevations by survey.

3.4.3.3 Placement, Compaction, and Grading of Base Course Under Low-Permeability Asphalt Cap

- Verified by testing that material met specified gradation.
- Verified by observation that material was placed in a single uniform lift.
- Verified by observation that haul road thickness met specified requirements.

Earthfill testing summaries are provided in Appendix C of this report.

3.5 Construction Phase Problems and Resolutions

Site work was completed in accordance with the specifications with no significant problems. Free draining aggregate (⅝-inch-minus) was utilized as engineered fill under a portion of the geomembrane flap as discussed further in Section 9.7.

4 CONSTRUCTION QUALITY ASSURANCE FOR BARRIER WALL INSTALLATION

4.1 General

As discussed in Section 2.3, a low-permeability, vertical barrier wall system was installed around the area where NAPL and high residual soil contamination have been observed. The as-built barrier alignment wall is shown in Appendix A, Drawings 2 and 3. The barrier wall was imbedded into the continuous, low-permeability silt layer. The top of the silt layer is generally 6 to 10 feet bgs.

The integrity of the Gundwall construction was verified and documented with specific CQC and CQA procedures outlined in the following paragraphs.

4.2 Predriving

During predriving, EMCON performed the following CQA work:

- Verified by observation removal of obstructions.
- Verified by observation segregation of excavated soils into contaminated soil stockpiles.
- Verified by testing the backfilling of trenches with engineered fill.

4.3 On-site Panel Fabrication

During on-site panel fabrication, EMCON visually verified panels were fabricated in accordance with the specifications. EMCON visually observed fabrication CQC of vacuum box and spark tests.

4.4 Installation

The installation depth of each panel was determined by reviewing the horizontal and vertical survey location of each panel against the profile of the silt foundation layer provided on the construction plans. The contractor's CQC technician calculated the drive depth for the panel from the existing ground surface and marked this depth clearly on the blind plate. EMCON's CQA technician then reviewed the depth calculations and, if the two concurred, the CQC instructed the WGC subcontractor to drive the panel. If there was a discrepancy in the depth calculations, the contractors CQC technician and EMCONs CQA technician would resolve the discrepancy to determine the correct drive depth.

EMCON observed installation of the Gundwall panels. EMCON verified that the target depth was achieved by using a laser-level calibrated to survey control points.

All panel joints contained a hydrophilic seal along the entire length of the joint. The nominal Gundwall panel width of 6 feet was used for this project. The installed depth was within the range specified on the barrier wall profile sheets (except as described in Sections 9.5 and 9.6). Gundwall installation began on January 8, 1999, and was completed on March 25, 1999.

4.4.1 Review of Submittals

Before accepting the Gundwall panels, EMCON's project engineer reviewed and approved the following manufacturer's submittals.

- Product information for the mechanical interlock, hydrophilic seal, and geomembrane.
- Shop drawings for panel fabrication.
- Shop drawings for panel layout.
- Installation instructions.
- Fabrication and installation warrantees.

These submittals are provided in Appendix D.1.

4.4.2 Material Conformance Testing

Before delivery, EMCON's project engineer obtained and approved certifications from the manufacturer that the product met the Gundwall specifications for this project. This manufacturer conformance test data is provided in Appendix D.2.

4.4.3 Construction Observation and Testing

During Gundwall installations, the EMCON CQA technician verified the following:

- Preparatory work was completed, as specified.
- No large stone or debris that could damage panels during installation were present along alignment.
- The barrier wall was installed vertically and the driving plate was level.
- Panels were installed in the order and location shown on the shop drawings.
- Surveying was performed to verify the bottom and top elevations of the wall.
- As-built documentation was performed.
- Hydrophilic seal was installed between each mechanical interlock.
- The barrier wall trench backfill was observed and tested by both Mayes Engineering and EMCON to monitor for properly controlled backfill placement.

4.5 Top of Wall Termination

Two types of top of wall terminations were utilized on the project to provide a continuous barrier between the wall and the asphalt cap system. The top of wall terminations consisted of either a welded 40-mil HDPE geomembrane (geomembrane flap) or a geosynthetic clay liner (GCL flap).

4.5.1 Geomembrane Flap

4.5.1.1 Review of Submittals

EMCON reviewed and accepted the following submittals for the geomembrane flap:

- Manufacturer certification for the geomembrane flap material (40-mil thickness HDPE geomembrane, smooth on both sides), resin and extrudate.
- Quality control certification sheets from the manufacturer for the rolls delivered to the site.

- Test weld demonstration of the geomembrane flap to the Gundwall panel material and Gundwall interlock.

4.5.1.2 Material Conformance Testing

EMCON technicians cut conformance test samples for every 100,000 square feet of geomembrane delivered to the site and tested for the following:

- Sheet density.
- Thickness.
- Tensile strength.
- Carbon black content.
- Carbon black dispersion.

The conformance tests results for the one conformance test required for the project are provided in Appendix D.3. The conformance test results were found to be in general accordance with the specifications.

4.5.1.3 Construction Observation and Testing

During installation of the HDPE flap construction testing included:

- Trial weld strength testing daily.
- Spark testing of 100 percent of the weld of the geomembrane flap to the Gundwall.

Results of the construction tests required for the project are provided in Appendix D.3. All test results were found to be in accordance with the specifications.

All geomembrane flap installation was observed by EMCON for:

- Weld integrity using the spark tester. Spark testing involved welding a copper wire into the weld continuously and then passing an electrode over the finished weld. If a spark was observed along the weld, additional extrusion welding was performed in that area until no spark was evident.
- Excessive wrinkling and mitigation of the wrinkles.
- Damage/repair of the geomembrane.

Following testing and repairs (as described in Section 4.6), the installation of the HDPE flap was found to be in accordance with installation criteria.

4.5.2 GCL Flap

4.5.2.1 Review of Submittals

EMCON reviewed and accepted the following submittals for the GCL flap:

- Manufacturer certification for the GCL flap material (bentonite encased in nonwoven geotextile on both sides with threads needle punched through the GCL).
- Quality control certification sheets from the manufacturer for the rolls delivered to the site.

4.5.2.2 Material Conformance Testing

EMCON technicians cut conformance test samples for every 10,000 square feet of GCL delivered to the site and tested for the following:

- Moisture content.
- Mass per unit area.
- Grab strength.
- Permeability.
- Shear strength.

The conformance tests results for the one conformance test required for the project are provided in Appendix D.4. The conformance test results were found to be in accordance with the specifications.

4.5.2.3 Construction Observation and Testing

During installation of the GCL flap, EMCON observed:

- Proper deployment and overlap of the GCL.
- Excessive wrinkling and mitigation of the wrinkles.
- Damage/ repair of the GCL and seaming of the GCL using granular bentonite.

All GCL flap installation was found to be in accordance with the specifications.

4.6 Construction Phase Problems and Resolutions

Obstacles were present in the alignment even after pre-driving, which required trenching for removal, disposal of the excavated contaminated soils (see Section 3.3), and backfilling with engineered fill. In some areas, the engineered fill placed to backfill the

trench was found to have debris in it that would again be an obstacle to the barrier wall installation. In this case, the engineered fill excavated from the trench to remove the obstacle was considered uncontaminated, and was placed back into the trench once the debris obstacle was removed from the fill. Following removal of the obstacle and trench backfilling, the barrier wall was driven into place.

In some areas, the integrity of the silt foundation layer was potentially jeopardized due to removal of obstacles or over-driving panels. This problem was corrected by repairing the silt layer with bentonite. This occurrence is described in detail in Section 9.3 of this report.

In one area, the panel depth was found to be potentially above the silt layer. Verification soil borings were ordered to confirm the actual depth of the silt foundation layer in this area and it was found that the panels were indeed founded within the silt layer. This occurrence is described in detail in Section 9.4 of this report.

As a part of the overall design, the top of the barrier wall was to be connected to the asphalt cap to form a continuous hydraulic barrier to infiltration. The original construction plans proposed the use of a geosynthetic clay liner (GCL) flap to form this connection. However, WRS proposed an alternative to using a 40-mil HDPE geomembrane welded to the barrier wall and extending the geomembrane up into the asphalt. This proposed alternative was approved by Weyerhaeuser and EMCON. During construction, it became evident that after welding the geomembrane to the top of the barrier wall, excessive wrinkling was created due to the irregular alignment of the barrier wall top. This wrinkling required the membrane to be cut and welded to remove the slack, and careful support of the geomembrane with engineered fill. After approximately 810 feet of the geomembrane flap was installed, it became apparent that installing the geomembrane flap correctly was tedious and time-consuming. WRS then decided to return to the originally proposed GCL flap, which proved to be much less problematic and could be installed correctly in approximately one-third the time the geomembrane flap installation required. The use of the geomembrane flap and the GCL flap are detailed in Sections 9.5 and 9.6, respectively.

5 CONSTRUCTION QUALITY ASSURANCE FOR ASPHALT CAP

5.1 General

As outlined in Section 2.4, an asphalt cap was placed over the area surrounded by the barrier wall to minimize surface water infiltration into the contained soils and to prevent direct contact with contaminated soils.

The constructed section for the low-permeability asphalt cap consisted of the following elements (top to bottom):

- A 2-inch asphalt surface course.
- A pavement overlay geotextile layer impregnated with tackcoat.
- A 4-inch-thick, asphalt-treated base course.
- A 4-inch-thick, crushed rock (¾-inch nominal) course.

The following section describes CQA performance during construction of the asphalt cap.

5.2 Subgrade Preparation

During subgrade preparation, EMCON provided the following CQA observations:

- Verified by testing fill density and moisture content.
- Verified by observation proof rolling of cut areas.

5.3 Crushed Rock Subbase Installation

5.3.1 Review of Submittals

EMCON verified that the crushed rock subbase complied with WSDOT, Section 9-03.9(3), base course gradation and was therefore in compliance with the project specifications.

5.3.2 Material Conformance Testing

EMCON obtained and approved crushed rock test results from the supplier documenting the proposed material met specification requirements for this project.

5.3.3 Construction Observation and Testing

During construction of the asphalt cap, EMCON verified the following:

- The base conditions met specified requirements.
- The compacted subgrade was dry and ready to support paving and imposed loads.
- The gradients and elevations of base course were correct.
- Base course was placed to the lines and grades shown on the Drawings.
- Base course was placed in loose lift thickness not exceeding 4 inches.
- Each lift was compacted to a minimum of 90 percent relative compaction at a moisture content minus 2 and plus 4 percentage points of optimum, as determined by ASTM D 1557. Completed base course did not yield under compaction equipment loads.

5.4 Asphalt Treated Base Course Installation

5.4.1 Review of Submittals

EMCON verified that the asphalt treated base course complied with materials defined in WSDOT, Section 4-06.2 and was therefore in compliance with the project specifications.

5.4.2 Material Conformance Testing

EMCON obtained and approved product certifications from the manufacturer that the product met the asphalt cap specifications for this project.

5.4.3 Construction Observation and Testing

EMCON verified the following:

- The asphalt treated base was mixed, transported and placed consistent with WSDOT, Section 4-06.3.
- The contractor determined optimum moisture content and maximum density for all base course consistent with ASTM D 1557 or ASTM D 4253, as applicable (see Section 02222) of the specifications.
- The contractor determined in-place density and moisture content by one or more of the following methods or approved equal: ASTM D 2922, ASTM D 1556, ASTM D 2216, and ASTM D 3017.
- Verified grading tolerances. Line: within 1.0 foot; Grade: within 0.1 foot.

5.5 Pavement Overlay Geotextile Installation

5.5.1 Review of Submittals

Before accepting pavement overlay geotextile, EMCON verified that the manufacturer's submittals were in accordance with project specifications.

5.5.2 Material Conformance Testing

EMCON collected samples of geotextile delivered to the site for conformance testing at a minimum frequency of one (1) per hundred thousand (100,000) square feet of geotextile and had an independent laboratory verify the following criteria was met:

Test	ASTM Test Designation	Unit	Requirement
Tensile Strength	Task Force 25 Method 1	lbs	80 min.
Elongation at Break	Task Force 25 Method 1	%	50 min.
Asphalt Retention	Task Force 25 Method 8	gal / sq. yd	0.2 min.
Melting Point	ASTM D 276	degrees F	300 min.

The conformance test results are provided in Appendix E.1.

5.5.3 Construction Observation and Testing

EMCON verified the following during pavement overly geotextile deployment:

- The geotextile was rolled out, continually keeping the geotextile sheet in sufficient tension to preclude folds and wrinkles.
- The geotextile was ballasted during deployment until tack coat was applied.
- Soil materials were kept out of geotextiles, seams, and overlap.
- Holes or tears in geotextiles were repaired with a patch from the same geotextile material. Overlapped seam of repair was a minimum of 12 inches in all directions.
- Tack coat bitumen was placed over the geotextile in accordance with the specifications.

5.6 Asphalt Surface Course Installation

5.6.1 Review of Submittals

EMCON verified that the asphalt surface course complied with WSDOT, Section 5-04.2, and was in general conformance to the project specifications.

5.6.2 Material Conformance Testing

EMCON obtained and approved product certifications from the manufacturer that the product met the asphalt cap specifications for this project.

5.6.3 Construction Observation and Testing

EMCON verified the following during asphalt surface coat installation:

- Installation was consistent with 1998 Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT) standards.
- The asphalt was placed immediately following application of geotextile layer treated with tackcoat.
- The asphalt was placed to 2-inch minimum compacted thickness.

- The pavement was compacted by rolling as defined by WSDOT, Section 5-04.3 (10). Hand compaction was properly used in areas inaccessible to rolling equipment.
- Rolling was performed with consecutive passes to achieve even and smooth finish without roller marks.
- Drainage swales as indicated on the plans were installed correctly.
- The top of pavement matched the top of piezometer vaults.
- The pavement was protected from mechanical injury for two days or until surface temperature is less than 140°F.

5.7 Construction Phase Problems and Resolutions

Asphalt cap construction was completed in accordance to the specifications with no significant problems.

6 CONSTRUCTION QUALITY ASSURANCE FOR DRAINAGE AND EROSION CONTROL

6.1 Surface Grades

EMCON verified that grading beneath the asphalt cap consisted of compacted soil sloped at 0.5 to 1.0 percent. Grading beneath the soil cap consisted of a minimum 1-foot vertical thickness of lightly compacted fill over the area identified for "soil cap," with a grade varying between zero and 0.5 percent.

6.2 Asphalt Cap Sideslope Construction

During the construction of the asphalt cap sideslope, EMCON verified that points were checked every 50 feet and that existing catch basins were accommodated.

6.3 Ditch Lines

A stormwater ditch runs parallel to the west side of the site and collects a small amount of runoff, mostly from the area between the west fence line and the ditch itself. The ditch directs this runoff to a discharge point at the southeast end of the site. EMCON verified ditch grades based on review of survey information.

6.4 Rip Rap and Separation Geotextile

EMCON verified that the outlet from the asphalt cap and drop structure to the river was lined with a separation geotextile and armored with rip rap in accordance with the project specifications.

6.5 Seeding

Once the soil cap was in place, EMCON verified that the soil cap was hydroseeded with appropriate grasses to prevent any erosion on the site.

6.5.1 Review of Submittals

EMCON reviewed and approved the following submittals with regard to seeding:

- Maintenance data, which includes maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.
- Seed mixture was in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.
- Certificate of compliance from supplier indicating approval of seed mixture.
- Seed mixture was verified to be in accordance with the specifications.
- Grass and fertilizer was brought to the site and deployed using properly functioning hydroseed equipment.

6.6 Construction Phase Problems and Resolution

There were no construction phase problems associated with drainage and erosion control. The seeding mixture was slightly changed from the specification based on subcontractor recommendations and approved by EMCON's project engineer. The seed mixture was changed by replacing Redtop with Highland Bent and reducing the non-phosphorus fertilizer application rate to 200 pounds per acre.

7 PIEZOMETER INSTALLATION

7.1 General

Piezometers were installed inside and outside the barrier wall to monitor the post-construction groundwater levels and measure groundwater quality.

7.2 Piezometer and Vault Box Installation

During piezometer installation, EMCON verified the following:

- Site conditions would be able to support equipment performing drilling operations.
- Structures near the piezometer were protected from damage.
- Traffic-rated, flush-mount (flush with grade) lockable security vaults were installed at locations shown on the Drawings and would be constructed to minimize surface water entry.
- Prepared boring logs and piezometer installation details.

7.2.1 Review of Submittals

EMCON reviewed and approved the following submittals:

- Vault box shop drawings.
- Well casing product data.
- Qualifications of the drilling company, including documentation that the driller specialized in piezometer installation and had a minimum 3 years experience.
- The drilling company's State license to perform this type of work.

7.2.2 Construction Observation and Testing

During Construction, EMCON verified the following:

- Borings were drilled at the correct locations and to diameters and depths indicated, and that, where applicable, drilled through the installed vault.
- The screen length was installed from the bottom of aquifer (top of silt foundation layer aquitard) to 2 feet above high water table elevation.
- The casing bottom was cleaned of loose material.
- The well casing was set firmly in place immediately after drilling.
- The well opening was maintained free of contaminated materials.
- The annular space around the screen zone was backfilled with filter pack (clean Colorado 10-20 silica sand).
- The filter pack extended from approximately 2 to 6 inches below the lowest slot to about 1 to 3 feet above the uppermost slot.
- The annular space directly above the filter pack was sealed with bentonite chips.
- The bentonite seal from the top of the filter pack was extended to the base of the surface security casing.
- Hydrated bentonite chips were placed above the water table.
- The casing top was cut off below grade without permitting cuttings to enter the casing.

7.3 Construction Phase Problems and Resolutions

There were no construction phase problems associated with piezometer construction.

8 DOCUMENTATION

Documentation consisted of daily recordkeeping, testing and installation reports, nonconformance reports (if necessary), progress reports, photographic records, records of design and specification revisions, and this construction report.

8.1 Daily Recordkeeping

At a minimum, EMCON kept daily records consisting of construction progress, a daily construction report, observation and test data sheets, and, as needed, nonconformance and corrective measure reports.

8.1.1 Daily Record of Construction Progress

On the daily field report, EMCON summarized ongoing construction and discussions with the contractor. At a minimum, the following was included in the report:

- Date, project name, project number, and location.
- Weather data.
- A description of all ongoing construction for the day in the area of the monitor's responsibility.
- Items of discussion and names of parties involved in discussions.
- A brief description of tests and observations, identified as passing or failing, or, in the event of failure, a retest.
- Areas of nonconformance and corrective actions, if any, (nonconformance and corrective action form to be attached).
- Summary of materials received and quality documentation.
- Follow-up information on previously reported problems or deficiencies.
- Number of trucks leaving site, noting manifests and weight tickets prepared.

- Summary of decontamination activities.
- Quantity of waste materials, including soil and liquids, generated each day.
- Summary of issues related to implementation of the contaminated materials handling plan.
- Record of any site visitors.
- Signature of the monitor.

8.1.2 Observation and Test Data Sheets

EMCON included the following information on observation and test data sheets:

- Date, project name, and location.
- Weather data, as applicable.
- A reduced-scale site plan showing sample and test locations.
- Test equipment calibrations, if applicable.
- A summary of test results identified as passing, failing, or, in the event of a failed test, a retest.
- Completed calculations.
- Signature of the monitor.

Test data sheets are provided in each appendix as they pertain to specific elements of construction.

8.2 Photographs

EMCON photographed construction activities. They include any significant problems encountered and corrective actions, as well as document construction progress. These photographs are provided in chronological order in Appendix H.

9 MODIFICATIONS DURING CONSTRUCTION

9.1 Crushed Concrete from Demolition Placed in Hot Spot Excavation

In lieu of the hot spot excavation being filled completely with engineered fill, crushed concrete from the site demolition was placed in the bottom of the hot spot excavation and tamped into place using a bucket excavator. The crushed concrete was placed to provide a stable fill below the groundwater table interface. Once the crushed concrete was placed, subsequently placed engineered fill could be readily compacted to specified criteria. Engineered fill was then placed over the concrete rubble fill to the design grade. EMCON approved and observed placement of the rubble in the excavation.

9.2 Predriving Barrier Wall Alignment

As stated in Section 4, the entire barrier wall alignment was predriven with a steel plate to determine the location of obstacles in lieu of ground penetrating radar required in the original specifications. This methodology provided a direct means of determining the location and size of the obstacles and was judged by EMCON's project engineer to be an acceptable alternate to the ground penetrating radar method originally proposed.

Because of the predriving, the contractor (with close observation by EMCON) was not required to trench the upper 2 to 3.5 feet of dense surficial fill along the entire barrier wall alignment unless predriving indicated that an obstruction should be removed. Predriving accurately determined the location of obstacles in the alignment, which were then excavated with a backhoe and the excavated soil was segregated and disposed of in accordance with the contaminated materials handling plan.

9.3 Bentonite Repair of Silt Layer

In some areas the thickness of the barrier wall foundation silt layer was less than 2 feet. Therefore, a construction contingency was developed during the project to maintain the continuity of the silt layer in the event that:

- Obstacles were encountered immediately on top of the silt layer which upon removal may cause disturbance or piping through the silt layer.
- A panel may have been driven inadvertently through the silt layer.

The silt repair technique involved the following sequence:

1. Removing the barrier wall panel from the area to be repaired as applicable.
2. Driving steel (road) plates a minimum of 2 feet horizontally around the repair area using the same vibratory pile driver as used for barrier wall installation. Steel plates were kept a minimum of 1 foot above the bottom of the silt layer as shown on the plans.
3. Excavating out all soil inside the steel plates, being careful to provide horizontal support for the plates and not excavating into the silt layer within 2 feet from the steel plates.
4. Excavating the repair area sufficiently to allow inspection and determine the volume of the damage/hole in the silt layer using sounding measurements.
5. Backfilling the damaged area in the silt using 1.5 times the bentonite volume calculated in step 4.

During construction, silt layer repair was required due to obstacle removal impacting the silt layer from Station 0+99 to 1+08, Station 6+30 to 6+57. Silt layer repair was required due to barrier wall panels being driven through the silt layer from Station 15+88 to 15+96. These repairs are shown on Appendix A, Drawings 4, 5, and 6.

9.4 Shallow Barrier Wall Foundation Depth

On March 5, 1999, barrier wall panels were driven between Stations 8+54.3 and 7+49. After further review by EMCON, it was determined that the barrier wall panels between Stations 8+18.9 and 7+78.2 might not extend 0.5 feet into the inferred top of silt layer. WRS contracted Cascade Drilling to drill three geotechnical boring approximately 5 feet outside the wall alignment at Stations 7+96, 8+07 and 8+19. The EMCON project engineer reviewed core samples taken from these additional borings and elevation

information to determine that the actual elevation of the silt layer in this area was higher than that inferred on the construction plan profile and the wall did indeed extended a minimum of 0.5 feet into the underlying silt layer. The silt layer confirmation borings and the revised "inferred top of silt layer" are shown in Appendix A, Drawing 5.

9.5 Welding HDPE Sheet to Barrier Wall

As noted in Section 4.5, an HDPE geomembrane flap was proposed by WRS to provide a continuous hydraulic barrier between the barrier wall and the asphalt cap. This alternative was accepted by EMCON's project engineer as an alternate to the GCL flap originally proposed in the construction drawings. WRS considered the geomembrane flap more constructible than the GCL flap while providing equivalent function of the GCL flap. EMCON, as the design engineer, agreed the geomembrane flap could be designed as an equivalent alternative to the GCL flap and provided the revised design and specifications for the geomembrane flap.

WRS started construction of the geomembrane flap on March 30, 1999. Difficulties with the geomembrane flap construction included:

- Cutting the geomembrane flap to fit the top of the variable alignment of the Gundwall to eliminate large wrinkles in the geomembrane flap.
- Keeping the weld surfaces freshly ground and clean prior to extrusion welding.
- Slow progress of the extrusion welder.
- Properly supporting the geomembrane flap with fill below the geomembrane without creating potential "folded-over" wrinkles once fill was placed above the geomembrane.

As construction of the geomembrane flap progressed, it became evident it was much more difficult to install correctly than the GCL flap. On May 7, 1999, after approximately 810 linear feet of geomembrane flap had been installed, WRS changed construction procedures back to the originally designed GCL flap. The use of the GCL flap was much less problematic during construction and was completed on May 17, 1999.

9.6 Use of GCL at Top of Barrier Wall Termination

As discussed in Section 9.3, WRS returned to the use of a GCL flap as the tie-in and hydraulic barrier between the asphalt cap and the barrier wall. The detail of this flap is provided on Drawing 6 in Appendix A. The only difference form the original design is that the GCL flap is not installed in a trench.

9.7 Rock Fill Berm Around Perimeter

Due to inclement weather and the need to start the geomembrane flap installation, free draining rock fill (⅝-inch minus) was used as engineered fill along the west side of the barrier wall alignment directly below the geomembrane flap in lieu of engineered fill soil. An approximate 2-inch layer of sand was placed on the surface of the rock fill berm to serve as a cushion between the rock and the overlying geomembrane flap.

LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

REFERENCES

Ecology. 1997a. Letter (re: Ecology's comments on EMCON feasibility study for Former Mill E/Koppers Site) from Nadine Romero, Washington State Department of Ecology, to Stuart Triolo, Weyerhaeuser Company. May 8.

Ecology. 1997b. Letter (re: Ecology's recommendations on remediation alternatives proposed by Weyerhaeuser for Former Mill E/Koppers site) from Nadine Romero, Washington State Department of Ecology, to Stuart Triolo, Weyerhaeuser Company. July 14.

Ecology. 1997c. Letter (re: proposed cleanup action for Former Mill E/Koppers site) from Nadine Romero, Washington State Department of Ecology, to Stuart Triolo, Weyerhaeuser Company. October 13.

EMCON. 1994. Remedial investigation report for former Mill E/Koppers facility. Prepared for Weyerhaeuser Company by EMCON Northwest, Inc. May.

EMCON. 1997a. Feasibility study. Prepared for Weyerhaeuser Company by EMCON. February.

EMCON. 1997b. Letter to Ms. Nadine Romero of Ecology regarding response to preliminary comments on draft feasibility study. May 23.

EMCON. 1997c. Letter to Ms. Nadine Romero of Ecology regarding response to preliminary comments on draft feasibility study. June 3.

EMCON. 1997d. Substantial and disproportionate cost analysis. Prepared for Weyerhaeuser Company by EMCON. August.

EMCON. 1997e. Evaluation of mass removal enhancements to remedial alternative 4. Prepared for Weyerhaeuser Company by EMCON. September.

EMCON. 1997f. Letter (re: comparison of residual soil concentrations) to Nadine Romero. November 11.

EMCON. 1998. Design Basis Memorandum. Prepared for Weyerhaeuser Company by EMCON. January.

EMCON. 1998. Construction Quality Assurance Plan. Prepared for Weyerhaeuser Company by EMCON. March.

EMCON. 1998. Engineering Design Report. Prepared for Weyerhaeuser Company by EMCON. March.

Weyerhaeuser. 1997. Letter (re: proposed cleanup action for Former Mill E/Koppers site) to Nadine Romero, Washington State Department of Ecology. September 29.

APPENDIX A

AS-BUILT RECORD DRAWINGS

APPENDIX B

CONTAMINATED MATERIAL HANDLING

APPENDIX B.1

HOT SPOT VOLUME CALCULATIONS

DATE	TRUCK #	BUCKET COUNT TRK	BUCKET COUNT TRLR	TOTAL COUNT	MATERIAL	cu. YDS H.S. SOIL
UESDAY -1-98						
Load # 1	# 15				CONCRETE	n/a
2	# 11				CONCRETE	
EDNESDAY -2-98						
Load # 3	# 19				Mix w/ other soils	
4	# 17				mix	
5	# 6				mix	
6	# 13				mix	
7	# 601				MIX	
8	# 602				mix	
HURSDAY -3-98						
Load # 9	# 19	14.5	15	29.5		22.125
10	# 15	14	15.5	29.5		22.125
11	# 17	14	15	29		21.75
12	# 11	15	16	31		23.25
13	# 6	14	16	30		22.50
14	# 13	13	15	28		21.00
15	# 602	13	15	28		21.00
16	# 601	14	16	30		22.50
						176.25

DATE	TRUCK #	BUCKET COUNT TRK	BUCKET COUNT TRLR	TOTAL COUNT	MATERIAL	CU. YDS H.S. SOIL
uesday 2-8-98						
ad # 33	19	14	16	30	SOIL	22.50
34	11				CON/MIX other soil	n/a
35	17	15	16	31	H.S. SOIL	23.25
36	15	14	16	30	SOIL	22.50
37	6	14	16	30	SOIL	22.50
38	602	14	15.5	29.5	SOIL	22.125
39	601				CON/MIX (other soil)	n/a 112.875
dnesday 2-98						
d # 40	17	15	16	31	H.S. SOIL	23.25
41	15	14	15.5	29.5	SOIL	22.125
42	19	14	16	30	SOIL	22.50
43	13	13	15	28	SOIL	21.00
44	11	14	15	29	SOIL	21.75
45	6	14	17	31	SOIL	23.25
46	601	14	16	30	SOIL	22.50
47	602	13	16	29	SOIL	21.75
						178.125

DATE	TRUCK #	BUCKET COUNT TRK	BUCKET COUNT TRLR	TOTAL COUNT	MATERIAL	CU. YDS HG SOIL
FRIDAY 1-4-98						
LOAD # 17	# 15	14	17	31	HG SOIL	23.25
18	# 19	14	15.5	29.5	SOIL	22.125
19	# 17	13	15.5	28.5	SOIL	21.375
20	# 11	14	15	29	SOIL	21.75
21	# 6	14	16	30	SOIL	22.50
22	# 601	14	16	30	SOIL	22.50
23	# 13	13	15	28	SOIL	21.00
24	# 602	14	15.5	29.5	SOIL	22.125
						176.625
2NDAY 1-7-98						
LOAD # 25	# 11	13	15	28	SOIL	21.00
26	# 17	14	15	29	SOIL	21.75
27	# 19	14	16	30	SOIL	22.50
28	# 15	14	17	31	SOIL	23.25
29	# 6	14	15.5	29.5	SOIL	22.125
30	# 602	14	15	29	SOIL	21.75
31	# 601	14	16	30	SOIL	22.50
32	# 13	13	15	28	SOIL	21.00
						175.875

DATE		TRUCK #	BUCKET COUNT TRK	BUCKET COUNT TRLR	TOTAL COUNT	MATERIAL	CU. YDS
THURSDAY 12-10-98							
LOAD #	48	# 11	15	16	31	Hy. Soil	23.25
	49	# 19	14	16	30	Soil	22.50
	50	# 15	14	17	31	Soil	23.25
	51	# 17	15	16	31	Soil	23.25
	52	# 13	12	15	27	Soil	20.25
	53	# 6	14	16	30	Soil	22.50
	54	# 601	14	16	30	Soil	22.50
	55	# 602	14	15	29	Soil	21.75
							179.25 ✓
FRIDAY 12-11-98							
LOAD #	56	# 19	14.5	15	29.5	Soil	22.125
	57	# 17	14	15.5	29.5	Soil	22.125
	58	# 11	13	15	28	Soil	21.00
	59	# 15	14	16	30	Soil	22.50
	60	# 13	13	17	30	Soil	22.50
	61	# 602	14	17	31	Soil	23.25
	62	# 6	13	15	28	Soil	21.00
							154.50 ✓

12-11-98
1153.50

DATE	TRUCK #	BUCKET COUNT TRK	BUCKET COUNT TRLR	TOTAL COUNT	MATERIAL	CU. YDS MS SOIL
12-15-98 TUESDAY						
63	#6	14	16	30	other soil 22.50 soil	~~22.50~~
64	#17	13	15	28	other soil 21.00 soil	~~21.00~~
65	#15	14	15	29	other soil 21.75 soil	~~21.75~~
						6.00
66	#11	14	16	30	~~16~~.50 soil other	~~22.50~~
					6 C 4 40 HOT SPOT CORNERS	
						6.00
12-16-98 WEDNESDAY						
67	#15	14	14	28	HOT SPOT SOIL	21.00
68	#17	12	14	26	HOT SPOT SOIL	19.50
						40.5
					12-16-98 TOTAL	1,200 CUBIC YARDS

APPENDIX B.2

SOIL DISPOSAL MANIFESTS

Tabulation of certified weight tickets from Chemical Waste Management of the Northwest (CWMNW)]

* On-site Load Count No.	Manifest Doc. No.	CWMNW-assigned Load No.	Date of Cert. Wt. Ticket	Gross (LB)	W Tare (LB)	Net (LB)	** Net (TON)	Portion of the 1200 CY hot spot soil only (TON)	* On-site Loads Count (CY)
12	98012	340517	12/3/98	103460	38340	65120	32.56	32.56	23.250
9	98009	340512	12/3/98	103880	38660	65220	32.61	32.61	22.125
10	98010	340513	12/3/98	104020	38540	65480	32.74	32.74	22.125
11	98011	340514	12/3/98	105100	38620	66480	33.24	33.24	21.750
15	98015	340521	12/4/98	100820	39400	61420	30.71	30.71	21.000
18	98018	340542	12/4/98	103780	38380	65400	32.70	32.70	22.125
20	98020	340550	12/4/98	104780	38520	66260	33.13	33.13	21.750
19	98019	340544	12/4/98	105280	38480	66800	33.40	33.40	21.376
13	98013	340522	12/4/98	105780	38640	67140	33.57	33.57	22.500
16	98016	340520	12/4/98	107200	39400	67800	33.90	33.90	22.500
17	98017	340543	12/4/98	106760	38640	68120	34.06	34.06	23.250
14	98014	340523	12/4/98	107240	39060	68180	34.09	34.09	21.000
24	98024	340557	12/7/98	102240	38620	63620	31.81	31.81	22.125
22	98022	340558	12/7/98	102440	38800	63640	31.82	31.82	22.500
27	98027	340576	12/7/98	104440	38200	66240	33.12	33.12	22.500
29	98029	340574	12/7/98	104940	38200	66740	33.37	33.37	23.250
26	98026	340575	12/7/98	105380	38140	67240	33.62	33.62	21.750
23	98023	340561	12/7/98	106700	38560	68140	34.07	34.07	21.000
25	98025	340577	12/7/98	106240	38000	68240	34.12	34.12	21.000
21	98021	340553	12/7/98	106800	38260	68340	34.17	34.17	22.500
30	98030	340593	12/8/98	103380	38580	64780	32.39	32.39	21.750
33	98033	340605	12/8/98	103540	37900	65640	32.82	32.82	22.500
31	98031	340584	12/8/98	104340	38580	65760	32.88	32.88	22.500
32	98032	340582	12/8/98	106240	38900	67340	33.67	33.67	21.000
29	98029	340580	12/8/98	106160	38520	67640	33.82	33.82	22.125
35	98035	340606	12/8/98	105820	37860	67960	33.98	33.98	23.250
36	98036	340607	12/8/98	106320	37980	68340	34.17	34.17	22.500
44	98044	340630	12/9/98	101600	37820	63780	31.89	31.89	21.750
41	98041	340628	12/9/98	103660	37880	65780	32.89	32.89	22.125
43	98043	340631	12/9/98	105420	38540	66880	33.44	33.44	21.000
40	98040	340627	12/9/98	105340	37780	67560	33.78	33.78	23.250
42	98042	340626	12/9/98	105420	37580	67840	33.92	33.92	22.500
38	98038	340612	12/9/98	106800	38920	67880	33.94	33.94	22.125
37	98037	340610	12/9/98	108360	37740	70620	35.31	35.31	22.500
50	98050	340663	12/10/98	100760	38260	62500	31.25	31.25	23.250
48	98048	340661	12/10/98	103520	38500	65120	32.56	32.56	23.250
47	98047	340638	12/10/98	103740	38540	65200	32.60	32.60	21.750
52	98052	340665	12/10/98	105750	38580	67180	33.59	33.59	20.250
51	98051	340662	12/10/98	106060	38120	67940	33.97	33.97	23.250
49	98049	340660	12/10/98	106550	38260	68400	34.20	34.20	22.500
45	98045	340645	12/10/98	107180	38580	68600	34.30	34.30	22.500
46	98046	340637	12/10/98	107540	38220	69320	34.66	34.66	23.250
58	98058	340697	12/11/98	101920	37980	63940	31.97	31.97	21.000
60	98060	340696	12/11/98	102500	38240	64260	32.13	32.13	22.500
55	98055	340670	12/11/98	104400	39300	65100	32.55	32.55	21.750
54	98054	340671	12/11/98	104860	39040	65820	32.91	32.91	22.500
53	98053	340669	12/11/98	104980	38360	66220	33.11	33.11	22.500
59	98059	340695	12/11/98	104740	37720	67020	33.51	33.51	22.500
56	98056	340691	12/11/98	106260	38180	68080	34.04	34.04	22.125
57	98057	340692	12/11/98	108440	38340	70100	35.05	35.05	22.125
62	98062	340700	12/14/98	102100	38220	63880	31.94	31.94	21.000
61	98061	340701	12/14/98	103860	39080	64780	32.39	32.39	23.250
# 66	98066	340787	12/15/98	102420	38320	64100	32.05	6.55	6.00
Subtotals - Hot Spot Soils only				5,566,860	2,035,990	3,520,880	1,760.44	1,736.94	1,159.50
1	98001	340488	12/2/98	105780	38960	66900	33.45	n/a	n/a
2	98002	340489	12/2/98	105520	38640	66880	32.84	n/a	n/a
3	98003	340487	12/2/98	107520	38620	68900	34.45	n/a	n/a
4	98004	340488	12/2/98	106060	38640	67420	33.71	n/a	n/a
5	98005	340492	12/3/98	103840	37900	65940	32.97	n/a	n/a
6	98006	340491	12/3/98	105880	38440	67240	33.62	n/a	n/a
7	98007	340490	12/3/98	101500	39640	61860	30.93	n/a	n/a
8	98008	340489	12/3/98	104340	39400	64940	32.47	n/a	n/a
34	98034	340608	12/8/98	101400	38260	63140	31.57	n/a	n/a
39	98039	340611	12/8/98	107300	39120	68180	34.09	n/a	n/a
63	98063	340759	12/15/98	102500	37820	64680	32.34	n/a	n/a
64	98064	340760	12/15/98	106500	38160	68340	34.17	n/a	n/a
65	98065	340766	12/16/98	104380	37900	66480	33.24	n/a	n/a
67	98067	340791	12/17/98	104640	37920	66720	33.36	n/a	n/a
68	98068	340793	12/17/98	105980	38100	67880	33.93	n/a	n/a
69	98069	340847	12/21/98	103680	39600	64080	32.03	n/a	n/a
70	98070	340841	12/21/98	115360	39440	75920	37.96	n/a	n/a
71	98071	340898	12/22/98	104720	37920	66800	33.40	n/a	n/a
72	98072	340897	12/22/98	108340	39080	69260	34.63	n/a	n/a
73	98073	340922	12/23/98	105020	38100	67520	33.76	n/a	n/a
74	98074	340921	12/23/98	104480	39700	64780	32.39	n/a	n/a
75	98075	340920	12/23/98	105680	37960	67720	33.86	n/a	n/a
76	98076	340923	12/23/98	105260	38360	66900	33.45	n/a	n/a
Subtotals				2,426,020	889,760	1,537,240	769.62	-	-
	Total:			7,992,880	2,924,760	5,058,120	2,529.06	1,736.94	1,159.50

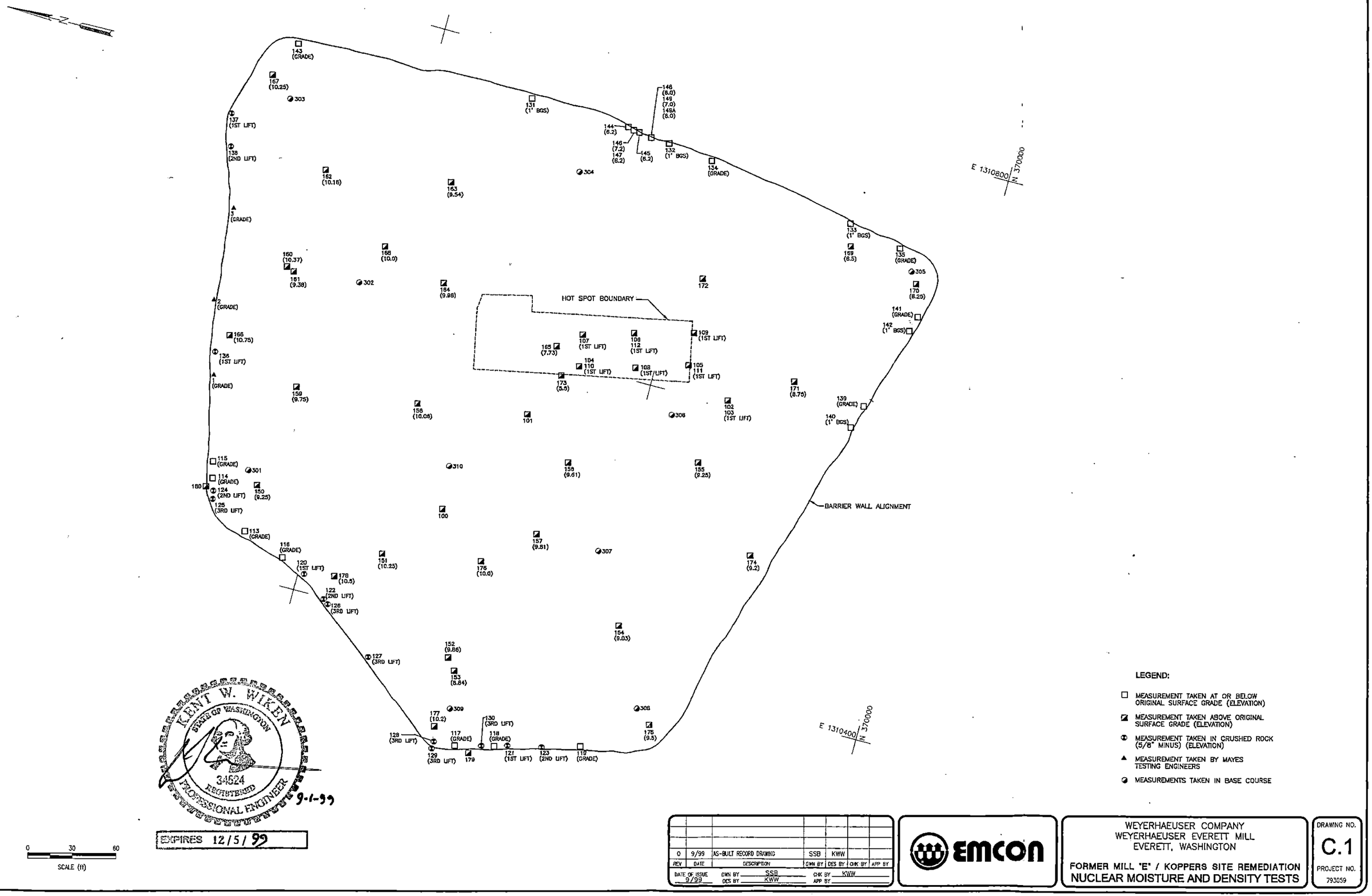
* On-site Load Count No.	Manifest Doc. No.	CWMNW-assigned Load No.	Date of Cert. Wt. Ticket	Gross (LB)	W Tare (LB)	Net (LB)	** Net (TON)	Portion of the 1200 CY hot spot soil only (TON)	
1	99001	341488	1/28/99	104620	39380	65240	32.62	n/a	
2	99002	341489	1/28/99	110560	41140	69420	34.71	n/a	
3	99003	341499	1/28/99	86500	33600	52900	26.45	n/a	
4	99004	341516	1/28/99	103640	39800	63840	31.92	n/a	
5	99005	341517	1/28/99	104340	37740	66600	33.30	n/a	
6	99006	341549	2/1/99	103700	37820	65880	32.94	n/a	
7	99007	341551	2/1/99	104660	39320	65340	32.67	n/a	
8	99008	341550	2/1/99	87780	33580	54200	27.10	n/a	
9	99009	341591	2/1/99	103240	38160	65080	32.54	n/a	
10	99010	341581	2/2/99	106640	39260	67380	33.69	n/a	
11	99011	341689	2/9/99	106100	39000	67100	33.55	n/a	
12	99012	341690	2/9/99	105220	38440	66780	33.39	n/a	
13	99013	341844	2/17/99	105280	38520	66760	33.38	n/a	
14	99014	341843	2/17/99	105980	39280	66700	33.35	n/a	
15	99015	341842	2/17/99	92280	36820	55460	27.73	n/a	
Invoice 004 totals				1,530,540	571,860	958,680	479.34		
16	99016	342948	4/14/99	96760	37000	59760	29.88		
17	99017	342953	4/14/99	82800	33180	49620	24.81		
18	99018	342955	4/14/99	101340	37820	63520	31.76		
19	99020	342990	4/15/99	103000	38280	64720	32.36		
20	99021	343014	4/15/99	87740	33080	54660	27.33		
21	99022	343037	4/16/99	97100	37120	59980	29.99		
22	99023	343034	4/16/99	105660	37800	67860	33.93		
23	99024	343078	4/19/99	99860	37760	62100	31.05		
24	99025	343079	4/19/99	84800	33380	51420	25.71		
25	99026	343091	4/19/99	112300	39920	72380	36.19		
26	99028	343115	4/20/99	106060	40100	67960	33.98		
Invoice 005 totals				1079420	405440	673980	336.99		
27	99019	342997	4/15/99	95120	37080	58040	29.02		
28	99027	343113	4/20/99	103580	38280	65300	32.65		
29	99029	343145	4/21/99	85880	33580	52300	26.15		
30	99030	343154	4/21/99	98040	38640	59400	29.70		
31	99031	343471	5/3/99	103840	37560	66280	33.14		
32	99032	343470	5/3/99	106780	37440	69340	34.67		
33	99033	343468	5/3/99	67400	37720	29680	14.84		
34	99034	343516	5/5/99	104260	37280	66980	33.49		
35	99035	343537	5/5/99	66820	37480	29340	14.67		
Invoice 006 totals				831720	335060	496660	248.33		

APPENDIX C

SUMMARY OF EARTHWORK TEST DATA

APPENDIX C.1

TEST LOCATION DRAWINGS



REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY
0	9/99	AS-BUILT RECORD DRAWING	SSB	KWW		

DATE OF ISSUE 9/99 — DWN BY SSB — DES BY KWW — CHK BY KWW — APP BY

EMCON

WEYERHAEUSER COMPANY
WEYERHAEUSER EVERETT MILL
EVERETT, WASHINGTON

FORMER MILL "E" / KOPPERS SITE REMEDIATION
NUCLEAR MOISTURE AND DENSITY TESTS

DRAWING NO. C.1
PROJECT NO. 793059

APPENDIX C.2

SUMMARY OF NUCLEAR MOISTURE/DENSITY TESTS

1=1 03-05-93 J:\DATA\DWG\001\01C23

EMCON Northwest, Inc.

NUCLEAR MOISTURE-DENSITY TEST SHEET

GUAGE NO. 7447-16808
DATE TESTED 11-24-87
TESTED BY Pete Sievert
REVIEWED BY SB
PROJECT: Weyerhaeuser Nisqually Logging PROJECT NO. 40141-037.123

	DENSITY	MOISTURE							
STANDARD COUNT									
TOTALS	2828	609							
AVERAGES									
SOIL SEGMENT	EF								
TEST NO.	100	101	102	103					
NORTHING									
EASTING									
ELEVATION									
PROBE DEPTH	6"	8"	8"	8"					
DENSITY COUNTS	2								
TOTAL	2758	2220	1603	1623					
AVERAGES									
DENSITY RATIO									
MOISTURE COUNTS									
TOTAL	133	113	245	245					
AVERAGES									
MOISTURE RATIO	11.3	9.3	22.5	22.5					
WET DENSITY(pcf)	116.9	110.4	121.5	121.1					
WATER (pcf)									
% MOISTURE	10.7	9.2	22.8	23.4					
DRY DENSITY(pcf)	105.9	101.1	98.9	98.5					
% RELATIVE COMPACTION	98.2	94.5	92.5	85					
REFERENCE CURVE	107 pcf	107 pcf	107 pcf	116					

REMARKS

TESTS 100 LOCATED 104 ON 1ST 102 LIFT OF ENGINEERED FILL IN BURNED AREA SEE DRAWING #7 FOR LOCATIONS

TEST COMPLETED USING PROCTOR VALUE OF 107 PCF

103 TEST IS SAME LOCATION AS 102 ONLY WITH A PROCTOR VALUE OF 116 PCF

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

1=1 03-05-93 J:\DATA\DWG\001\01C23

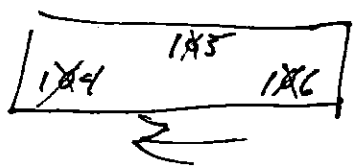
EMCON Northwest, Inc.

NUCLEAR MOISTURE-DENSITY TEST SHEET

GUAGE NO. 3447-16808
DATE TESTED 1-6-93
TESTED BY Tom Skyrocki
REVIEWED BY SB
PROJECT: Mill E/Koppers
PROJECT NO. 40141-037.123

	DENSITY	MOISTURE							
STANDARD COUNT									
	2817	597							
TOTALS									
AVERAGES									
SOIL SEGMENT									
TEST NO.	104	105	106						
NORTHING									
EASTING									
ELEVATION									
PROBE DEPTH	8"	8"	8"						
DENSITY COUNTS									
TOTAL	2652	2722	3040						
AVERAGES									
DENSITY RATIO									
MOISTURE COUNTS									
TOTAL	84	86	76						
AVERAGES									
MOISTURE RATIO	6.5	6.7	5.7						
WET DENSITY(pcf)	104.1	103.2	99.4						
WATER (pcf)									
% MOISTURE	6.7	6.9	6.1						
DRY DENSITY(pcf)	97.6	96.5	93.7						
% RELATIVE COMPACTION	84.2	83.2	80.8						
REFERENCE CURVE	116	116	116						

REMARKS



Hot spot Area

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

1=1 03-05-93 J:\DATA\DWG\001\01C23

EMCON Northwest, Inc.

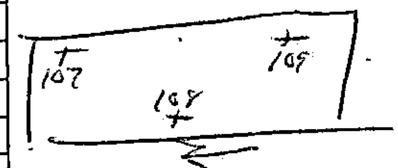
NUCLEAR MOISTURE-DENSITY TEST SHEET

PROJECT: Mill E/Koppers

GUAGE NO. 3440 / 16808
DATE TESTED 1-7-99
TESTED BY Pete Seybert
REVIEWED BY SB
PROJECT NO. 40141-057.103

	DENSITY	MOISTURE							
STANDARD COUNT									
TOTALS									
AVERAGES									
SOIL SEGMENT									
TEST NO.	107	108	109	110	111	112			
NORTHING				(104)	(105)	(106)			
EASTING									
ELEVATION									
PROBE DEPTH									
DENSITY COUNTS									
TOTAL	~~[illegible]~~								
AVERAGES	2406	2377	2808	3009	2628	2571			
DENSITY RATIO									
MOISTURE COUNTS									
TOTAL									
AVERAGES	81	84	78	72	81	82			
MOISTURE RATIO	6.2	6.5	5.9	5.3	6.2	6.3			
WET DENSITY(pcf)	107.7	108.1	102.2	99.9	104.5	105.3			
WATER (pcf)									
% MOISTURE	6.1	6.4	6.1	5.6	6.3	6.4			
DRY DENSITY(pcf)	101.5	101.6	96.4	94.6	98.4	99.6			
% RELATIVE COMPACTION	95.0	95.1	90.2	88.6	92.1	92.7			
REFERENCE CURVE	FR 1276 (B)		107	107	107	107			

REMARKS



Hot Spot Area

Proctor
DD=106.8
M%-11.4

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

1= 1 03-05-93 J:\DATA\DWG\001\01C23

EMCON Northwest, Inc.

NUCLEAR MOISTURE-DENSITY TEST SHEET

GUAGE NO. 2-16806
DATE TESTED 1-26-88
TESTED BY Pete Seyboth
REVIEWED BY SB
PROJECT: Mill-B/Ecology
PROJECT NO. 40141-037.123

	DENSITY	MOISTURE							
STANDARD COUNT									
TOTALS									
AVERAGES	2821	588							
SOIL SEGMENT									
TEST NO.	113	114	115	116	117 ~~118~~	118	119		
NORTHING	OUTSIDE	INSIDE	INSIDE	INSIDE	~~OUTSIDE~~	INSIDE			
EASTING	PANEL	PANEL	PANEL	PANEL	PANEL	PANEL			
ELEVATION	#213	#214	#221	#201	#172	#131			
PROBE DEPTH	8"	8"	8"	8"	8"	4"	4"	8"	8"
DENSITY COUNTS									
TOTAL									
AVERAGES	2537	1652	1525	2109	2073	3192	4180		
DENSITY RATIO									
MOISTURE COUNTS									
TOTAL									
AVERAGES	160	224	139	103	114	195	120		
MOISTURE RATIO	~~#8.3~~	21,0	12,3	8,6	9,7	18,1	10.3.		
WET DENSITY(pcf)	105.6	126,4	123,8	112,2	112,7	121,9	108,8		
WATER (pcf)									
% MOISTURE	8,5	21,2	11,0	8,3	9,4	17,4	10,5		
DRY DENSITY(pcf)	97,4	99,4	111,5	103,6	103,0	103,9	98,5		
% RELATIVE COMPACTION	91,2	93,0	104,1	97,6	96,5	97,3	92,2		
REFERENCE CURVE	107	107	107	107	107	107	107		

REMARKS

USING PROCTOR OF 106.8 TO MEASURE FILL ALONG THE ALIGNMENT. THE FILL BEING MEASURED IS FILL THAT BRINGS THE ALIGNMENT UP TO GRADE

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

1= 1 03-05-93 J:\DATA\DWG\001\01C23

EMCON Northwest, Inc.

NUCLEAR MOISTURE-DENSITY TEST SHEET

GUAGE NO. 3447-16805
DATE TESTED 1-27-95
TESTED BY PETE & GYDEN
REVIEWED BY SB
PROJECT: WEYERHAEUSER MILL E/ KOPPERS
PROJECT NO. 40141-037-123

	DENSITY	MOISTURE
STANDARD COUNT	2805	587
TOTALS	2805	587
AVERAGES	2805	587
SOIL SEGMENT		
TEST NO.	1206	1261
NORTHING	INSIDE	INSIDE
EASTING	PANEL	PANEL
ELEVATION	#132	#166
PROBE DEPTH	8"	8"
DENSITY COUNTS		
TOTAL		
AVERAGES	1152	1071
DENSITY RATIO		
MOISTURE COUNTS		
TOTAL		
AVERAGES	93	116
MOISTURE RATIO	7.6	9.9
WET DENSITY(pcf)	134.7	137.4
WATER (pcf)		
% MOISTURE	5.8	7.8
DRY DENSITY(pcf)	127.2	127.5
% RELATIVE COMPACTION	94.5	94.7
REFERENCE CURVE	134	135

REMARKS

MEASUREMENTS TAKEN ON 1ST LIFT OF CRUSHED ROCK ON THE INSIDE OF THE BARRIER WALL ALIGNMENT.

PROCTOR
134.6 PCF
@
6.6% M

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

1= 1 03-05-93 J:\DATA\DWG\001\01C23

EMCON Northwest, Inc.

NUCLEAR MOISTURE-DENSITY TEST SHEET

GUAGE NO. 3447-16807
DATE TESTED 1-28-99
TESTED BY Pete Seyboth
REVIEWED BY SB
PROJECT: Weyerhaeuser Mill E/Kraft PROJECT NO. 40141.037.123

	DENSITY	MOISTURE							
STANDARD COUNT									
TOTALS									
AVERAGES	2807	601							
SOIL SEGMENT									
TEST NO.	122	123	124						
NORTHING	STATION								
EASTING	11+66	9+61	12+87.5						
ELEVATION									
PROBE DEPTH	8"	8"	8"						
DENSITY COUNTS									
TOTAL									
AVERAGES	1058	955	1940						
DENSITY RATIO									
MOISTURE COUNTS									
TOTAL									
AVERAGES	110	136	145						
MOISTURE RATIO	9.1	11.7	12.6						
WET DENSITY(pcf)	137.8	141.8	114.8						
WATER (pcf)									
% MOISTURE	9.0	9.6	12.3						
DRY DENSITY(pcf)	128.7	130.1	102.2						
% RELATIVE COMPACTION	95.6	96.6	95.9						
REFERENCE CURVE	*	*	*						

REMARKS

* MEASUREMENTS TAKEN ON THE INSIDE OF THE BARRIER WALL ALIGNMENT USING THE CRUSHED ROCK (5/8"-) PROCTOR 134.6 PCF

* MEASUREMENTS TAKEN USING THE CLEAN SAND PROCTOR 106.6 PCF

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

1= 1 03-05-93 J:\DATA\DWG\001\01C23

EMCON Northwest, Inc.

NUCLEAR MOISTURE-DENSITY TEST SHEET

GUAGE NO. 344T-1690T
DATE TESTED 2-2-98
TESTED BY Pete Sigmon
REVIEWED BY SB
PROJECT: Weyerhaeuser Mine/Kaiser PROJECT NO. 40141-037.023

	DENSITY	MOISTURE								
STANDARD COUNT										
	285	601								
TOTALS										
AVERAGES	285	601								
SOIL SEGMENT										
TEST NO.	125	126	127	128	129	130				
NORTHING	STATION									
EASTING	12+81.5	11+77.3	11+18	10+43	10+37	10+02				
ELEVATION										
PROBE DEPTH	8"	8"	8"	8"	8"	8"				
DENSITY COUNTS										
TOTAL										
AVERAGES	991	920	801	1290	854	953				
DENSITY RATIO										
MOISTURE COUNTS										
TOTAL										
AVERAGES	123	114	126	117	115	121				
MOISTURE RATIO	10.3	9.4	10.6	9.7	9.5	10.1				
WET DENSITY(pcf)	144.6	143.4	149.1	130.0	146.4	141.9				
WATER (pcf)										
% MOISTURE	7.7	7.0	7.6	8.0	6.9	7.7				
DRY DENSITY(pcf)	134.3	134.0	138.5	120.3	136.9	131.8				
% RELATIVE COMPACTION	99.8	99.5	102.9	89.4	101.7	97.9				
REFERENCE CURVE	135	135	135	135	135	135				

REMARKS

ALL TESTS PERFORMED USING THE 3/4" CRUSHED ROCK PROCTOR 134.6 PCF

TEST # 128 WAS TAKEN IN LOCATION WITH MIXED SAND AND ROCK.

TEST 129 WAS TAKEN IN SAME AREA WITH ROCK-ONLY IN TEST AREA.

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

1=1 03-05-93 J:\DATA\DWG\001\01C23

EMCON Northwest, Inc.

NUCLEAR MOISTURE-DENSITY TEST SHEET

GUAGE NO. 344T-16808
DATE TESTED 2-3-99
TESTED BY Pete Reyberg
REVIEWED BY SB
PROJECT: Weyerhaeuser Mills/Korpers
PROJECT NO. 40141-037.123

	DENSITY	MOISTURE							
STANDARD COUNT	2824	597							
TOTALS									
AVERAGES	2824	597							
SOIL SEGMENT									
TEST NO.	131	132	133						
NORTHING									
EASTING	1+79	2+87	4+13						
ELEVATION									
PROBE DEPTH	8"	8"	8"						
DENSITY COUNTS	2681	2585	2309						
TOTAL									
AVERAGES	2681	2585	2309						
DENSITY RATIO									
MOISTURE COUNTS	96	98	110						
TOTAL									
AVERAGES	96	98	110						
MOISTURE RATIO	7.7	7.9	9.1						
WET DENSITY(pcf)	103.8	105.0	109.0						
WATER (pcf)									
% MOISTURE	8.0	8.2	9.1						
DRY DENSITY(pcf)	96.0	97.1	99.8						
% RELATIVE COMPACTION	90.1	91.1	93.6						
REFERENCE CURVE	107	107	107						

REMARKS

Test taken using the clean sand Proctor value: 106.8 PCF

All three measurements were taken in the 1st lift of sand fill

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

1= 1 03-05-93 J:\DATA\DWG\001\01C23

EMCON Northwest, Inc.

NUCLEAR MOISTURE-DENSITY TEST SHEET

GUAGE NO. 3447-1688
DATE TESTED 2-4-99
TESTED BY Jeff Hayward
REVIEWED BY SB
PROJECT: _____
PROJECT NO. 4G141-037.123

	DENSITY	MOISTURE
STANDARD COUNT		
	2823	563
TOTALS		
AVERAGES	2823	563
SOIL SEGMENT		
TEST NO.	134	135
NORTHING		
EASTING	3+15	4+53
ELEVATION		
PROBE DEPTH		
DENSITY COUNTS		
	2059	2208
TOTAL		
AVERAGES	2059	2208
DENSITY RATIO		
MOISTURE COUNTS		
	132	129
TOTAL		
AVERAGES	132	129
MOISTURE RATIO	13.1	11.1
WET DENSITY(pcf)	112.9	110.4
WATER (pcf)		
% MOISTURE	12.0	11.2
DRY DENSITY(pcf)	100.8	99.3
% RELATIVE COMPACTION	94.6	93.1 ~~100~~.
REFERENCE CURVE	107	107

REMARKS

TEST TAKEN USING THE CLEAN SAND PROCTOR 106.8 PCF

BOTH MEASUREMENTS WERE TAKEN IN THE 2ND LIFT OF SAND FILL.

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

1= 1 03-05-93 J:\DATA\DWG\001\01C23

EMCON Northwest, Inc.

NUCLEAR MOISTURE-DENSITY TEST SHEET

PROJECT: Wayne/Gresser Mill [illegible]

GUAGE NO. 344T-16808
DATE TESTED 2-8-99
TESTED BY Pete Krayneck
REVIEWED BY SB
PROJECT NO. 40141-032.123

	DENSITY	MOISTURE
STANDARD COUNT		
	2807	660
TOTALS		
AVERAGES	2807	660

SOIL SEGMENT										
TEST NO.	136	137	138							
NORTHING										
EASTING	13+70	15+41	15+28							
ELEVATION										
PROBE DEPTH	8"	8"	8"							
DENSITY COUNTS										
	913	864	904							
TOTAL										
AVERAGES	913	864	904							
DENSITY RATIO										
MOISTURE COUNTS										
	133	136	138							
TOTAL										
AVERAGES	133	136	138							
MOISTURE RATIO	11.4	11.7	11.9							
WET DENSITY(pcf)	143.6	148.9	144.0							
WATER (pcf)										
% MOISTURE										
DRY DENSITY(pcf)	132.2	134.4	132.1							
% RELATIVE COMPACTION	95.3	96.7	95.2							
REFERENCE CURVE	139	139	139							

REMARKS

Tests taken using the crushed rock Proctor value 134.6 PCF

Tests No 136 & 137 were taken in the 1st lift of the material, Test # 138 was taken in the 2nd lift of the material,

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

1=1 03-05-93 J:\DATA\DWG\001\01C23

EMCON Northwest, Inc.

NUCLEAR MOISTURE-DENSITY TEST SHEET

GUAGE NO. 3447-1680
DATE TESTED 2-10-94
TESTED BY Pete Seyboth
REVIEWED BY SB
PROJECT: Weyerhaeuser Mill C/Hoppers
PROJECT NO. 40141-037.123

	DENSITY	MOISTURE							
STANDARD COUNT									
	2826	598							
TOTALS									
AVERAGES	2826	598							
SOIL SEGMENT									
TEST NO.	139	140	141	142	143				
NORTHING									
EASTING	6+06	6+21	5+34	5+44	6+16				
ELEVATION									
PROBE DEPTH	8"	8"	8"	8"	8"				
DENSITY COUNTS									
	2037	1458	2234	1636	2186				
TOTAL									
AVERAGES	2037	1458	2234	1636	2186				
DENSITY RATIO									
MOISTURE COUNTS									
	108	266	91	226	115				
TOTAL									
AVERAGES	108	266	91	226	115				
MOISTURE RATIO	8.9	24.2	7.2	20.8	9.6				
WET DENSITY(pcf)	113.2	124.7	110.0	120.6	110.7				
WATER (pcf)									
% MOISTURE	8.5	24.1	7.0	20.8	9.5				
DRY DENSITY(pcf)	104.3	100.5	102.9	99.8	101.1				
% RELATIVE COMPACTION	97.7	94.1	96.3	93.5	94.6				
REFERENCE CURVE	107	107	107	107	107				

REMARKS

ALL TESTS TAKEN USING THE CLEAN SAND PROCTOR VALUE 106.8 PCF

TESTS 140, 142 & 146 AT 1ST LIFT LOCATIONS

TESTS 139, 141, & 143 ARE AT 2ND LIFT LOCATIONS

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

1= 1 03-05-93 J:\DATA\DWG\001\01C23

EMCON Northwest, Inc.

NUCLEAR MOISTURE-DENSITY TEST SHEET

GUAGE NO. 3447-1688
DATE TESTED 2-23-99
TESTED BY Pete Slaymaker
REVIEWED BY SS
PROJECT: Weyerhaeuser Mills/Locations
PROJECT NO 46141-037.123

	DENSITY	MOISTURE								
STANDARD COUNT										
	2419	604								
TOTALS										
AVERAGES	28.9	604								
SOIL SEGMENT										
TEST NO.	144	145	146	147						
NORTHING										
EASTING	2+56	2+62	2+59	2+59						
ELEVATION	6.2	6.2	7.2	8.2						
PROBE DEPTH	8"	8"	8"	8"						
DENSITY COUNTS										
	1739	2037	2094	2125						
TOTAL										
AVERAGES	1739	2037	2094	2125						
DENSITY RATIO										
MOISTURE COUNTS										
	186	108	100	128						
TOTAL										
AVERAGES	186	108	106	128						
MOISTURE RATIO	16.6	8.8	8.0	10.8						
WET DENSITY(pcf)	118.7	113.4	112.4	111.8						
WATER (pcf)										
% MOISTURE	16.3	8.4	7.7	10.7						
DRY DENSITY(pcf)	102.1	104.6	104.4	101.0						
% RELATIVE COMPACTION	95.6	97.9	97.8	94.5						
REFERENCE CURVE	107	107	107	107						

REMARKS

ALL TESTS TAKEN AS LIFTS ARE PLACED AND COMPACTED IN AN EXCAVATED AREA OF THE ALIGNMENT, USING THE CLEAN SAND PROCTOR VALUE 106.8 PCF

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

1=1 03-05-93 J:\DATA\DWG\001\01C23

EMCON Northwest, Inc.

NUCLEAR MOISTURE-DENSITY TEST SHEET

GUAGE NO. 344T-16808
DATE TESTED 2-24-99
TESTED BY Pete Raymond
REVIEWED BY [illegible]
PROJECT: Weyerhaeuser Mill/Koppers
PROJECT NO. 46141-037.023

	DENSITY	MOISTURE							
STANDARD COUNT	2819	604							
TOTALS									
AVERAGES	2819	604							
SOIL SEGMENT									
TEST NO.	148	149	149A						
NORTHING	2	2	2						
EASTING	~~#~~12+60	12+60	12+60						
ELEVATION	6'	7'	8'						
PROBE DEPTH	8"	8"	8"						
DENSITY COUNTS	1694	2086	2127						
TOTAL									
AVERAGES	1694	2086	2127						
DENSITY RATIO									
MOISTURE COUNTS	150	118	124						
TOTAL									
AVERAGES	150	118	124						
MOISTURE RATIO	13.0	9.8	10.9						
WET DENSITY(pcf)	119.9	112.5	111.8						
WATER (pcf)									
% MOISTURE	12.2	9.5	10.3						
DRY DENSITY(pcf)	106.8	102.7	101.3						
% RELATIVE COMPACTION	100.6	96.1	94.9						
REFERENCE CURVE	107	107	107						

REMARKS

ALL TESTS TAKEN AS EXCAVATION WAS BACK FILLED USING THE CLEAN SAND AS ENGR. FILL. 106.8 PCF

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

1= 1 03-05-93 J:\DATA\DWG\001\01C23

EMCON Northwest, Inc.

NUCLEAR MOISTURE-DENSITY TEST SHEET

GUAGE NO. 3447-16808
DATE TESTED 4-13-98
TESTED BY Tete Petersen
REVIEWED BY SB
PROJECT: Weyerhaeuser Mill-E/Kloppers
PROJECT NO. 46141-037.123

	DENSITY	MOISTURE							
STANDARD COUNT	—	—							
	—	—							
	2787	604							
TOTALS	—	—							
AVERAGES	—	—							
SOIL SEGMENT									
TEST NO.	150	151	152	153	154	155	156	157	158
NORTHING									
EASTING									
ELEVATION	9.25	10.24	9.86	8.84	9.63	9.25	9.61	9.51	10.06
PROBE DEPTH	8"	8"	8"	8"	8"	8"	8"	8"	8"
DENSITY COUNTS									
	1738	1547	2248	2453	1655	1709	1865	1806	1924
TOTAL									
AVERAGES	1738	1547	2248	2453	1655	1709	1865	1806	1924
DENSITY RATIO									
MOISTURE COUNTS									
	147	126	73	121	114	139	166	158	111
TOTAL									
AVERAGES	147	126	73	121	114	139	166	158	111
MOISTURE RATIO	12.7	10.6	5.3	10.1	9.4	11.9	14.6	13.6	9.1
WET DENSITY(pcf)	118.5	122.9	109.6	106.3	120.5	119.2	117.0	117.1	115.0
WATER (pcf)									
% MOISTURE	12	9.4	5.1	10.5	8.5	11.1	14.3	13.2	8.6
DRY DENSITY(pcf)	105.8	112.3	104.3	96.2	111.1	107.3	102.4	103.5	105.9
% RELATIVE COMPACTION	99.1	105.1	97.7	90.1	104.0	100.4	95.9	96.9	99.2
REFERENCE CURVE	107	107	107	107	107	107	107	107	107

REMARKS

Tests no. 150-158 are from the 1st lift of sand PCF-106.8

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

1=1 03-05-93 J:\DATA\DWG\001\01C23

EMCON Northwest, Inc.

NUCLEAR MOISTURE-DENSITY TEST SHEET

GUAGE NO. 344T-16868

DATE TESTED 4-13-99

TESTED BY Pete Seybert

REVIEWED BY SS

PROJECT: Weyerhaeuser Mill-A/Moppers

PROJECT NO. 40141-037.123

	DENSITY	MOISTURE
STANDARD COUNT	2787	604
TOTALS		
AVERAGES		

SOIL SEGMENT									
TEST NO.	159	160	161	162	163	164	165		
NORTHING									
EASTING									
ELEVATION	9.75	10.37	9.38	10.16	9.54	9.98	9.73		
PROBE DEPTH	8"	8"	8"	8"	8"	8"	8"		
DENSITY COUNTS	1757	2102	1593	2037	1862	2569	2464		
TOTAL									
AVERAGES	1757	2102	1583	2037	1862	2569	2464		
DENSITY RATIO									
MOISTURE COUNTS	105	101	174	78	85	72	67		
TOTAL	/								
AVERAGES	105	101	174	78	85	72	67		
MOISTURE RATIO	8.5	8.1	15.4	5.8	6.5	5.2	4.7		
WET DENSITY(pcf)	118.3	111.9	121.6	113.1	116.3	104.9	106.4		
WATER (pcf)									
% MOISTURE	7.7	7.8	14.5	5.4	5.9	5.2	4.6		
DRY DENSITY(pcf)	109.8	103.8	106.2	107.3	109.8	99.7	101.7		
% RELATIVE COMPACTION	102.8	97.2	99.4	100.5	102.8	93.4	95.2		
REFERENCE CURVE	107	107	107	107	107	107	107		

REMARKS

TEST NO. 159-165 ARE FROM THE 1ST LIFT OF SAND

PCF - 106.8

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

EMCON Northwest, Inc.

NUCLEAR MOISTURE-DENSITY TEST SHEET

GUAGE NO. 344T-16808
DATE TESTED
TESTED BY Pete Seyberg
REVIEWED BY SB
PROJECT: Weyerhaeuser Auc-e/Kottens
PROJECT NO. 40141-037.123

	DENSITY	MOISTURE							
STANDARD COUNT	2781	597							
TOTALS									
AVERAGES									
SOIL SEGMENT									
TEST NO.	166	167	168	169	170	171	172	173	174
NORTHING									
EASTING									
ELEVATION	8"	8"	8"	BS	BS	BS	4"	8"	8"
PROBE DEPTH									
DENSITY COUNTS	2148	1971	2378	1237	894	984	1133	2007	1775
TOTAL									
AVERAGES	2148	1971	2378	1237	894	984	1133	2007	1775
DENSITY RATIO									
MOISTURE COUNTS	74	96	71	136	197	169	143	86	91
TOTAL									
AVERAGES	74	96	71	136	197	169	143	86	91
MOISTURE RATIO	5.5	~~5.2~~ 7.7	5.2	11.6	18.0	15.1	12.5	6.7	7.2
WET DENSITY(pcf)	111.2	114.2	107.6	111.8	126.1	127.0	108.7	113.6	118.0
WATER (pcf)									
% MOISTURE	5.2	7.2	5.1	11.5	16.6	13.5	13.0	6.3	6.5
DRY DENSITY(pcf)	105.8	106.5	102.5	100.5	108.2	111.9	96.2	106.9	110.8
% RELATIVE COMPACTION	99.0	99.7	95.9	93.9	101.3	104.7	90.1	100.1	103.8
REFERENCE CURVE	107	107	107	107	107	107	107	107	107

REMARKS

All tests taken on second lift of sand.
Pcf - 106.8

BS - Back Scatter Position

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

1 = 1 03-05-93 J:\DATA\DWG\001\01C23

EMCON Northwest, Inc.

NUCLEAR MOISTURE-DENSITY TEST SHEET

GUAGE NO. 344T-16808
DATE TESTED
TESTED BY [signature]
REVIEWED BY SB
PROJECT: Weyerhaeuser Mill E/Korbans
PROJECT NO. 40141-037.123

	DENSITY	MOISTURE
STANDARD COUNT	2781	597
TOTALS		
AVERAGES		

SOIL SEGMENT									
TEST NO.	175	176	177	178					
NORTHING									
EASTING									
ELEVATION									
PROBE DEPTH	8"	8"	8"	8"					
DENSITY COUNTS	2088	1732	2361	2209					
TOTAL									
AVERAGES	2088	1732	2361	2209					
DENSITY RATIO									
MOISTURE COUNTS	79	116	73	74					
TOTAL									
AVERAGES	79	116	73	74					
MOISTURE RATIO	6.6	9.7	5.4	5.5					
WET DENSITY(pcf)	112.2	118.8	107.9	110.2					
WATER (pcf)									
% MOISTURE	5.6	8.9	5.2	5.2					
DRY DENSITY(pcf)	106.2	109.1	102.5	104.8					
% RELATIVE COMPACTION	99.5	102.1	96.0	98.1					
REFERENCE CURVE	107	107	107	107					

REMARKS

All tests taken on 2nd lift of sand.
PCF - 106.8

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

1= 1 03-05-93 J:\DATA\DWG\001\01C23

EMCON Northwest, Inc.

NUCLEAR MOISTURE-DENSITY TEST SHEET

GUAGE NO. T344 16808
DATE TESTED 5-21-99
TESTED BY Pete Seyboth
REVIEWED BY SB
PROJECT: Weyerhaeuser Mill-Kalama PROJECT NO. 40141-037.123

	DENSITY	MOISTURE
STANDARD COUNT	—	
	2866	629
TOTALS		
AVERAGES	—	
SOIL SEGMENT		
TEST NO.	179	180
NORTHING		
EASTING		
ELEVATION		
PROBE DEPTH	8	8
DENSITY COUNTS		
	1974	2070
TOTAL		
AVERAGES	1974	2070
DENSITY RATIO		
MOISTURE COUNTS		
	100	133
TOTAL		
AVERAGES	100	133
MOISTURE RATIO	8.5	11.8
WET DENSITY(pcf)	115.5	113.5
WATER (pcf)		
% MOISTURE	7.9	11.6
DRY DENSITY(pcf)	107.0	101.6
% RELATIVE COMPACTION	100.2	95.1
REFERENCE CURVE	107	107

REMARKS

ALL TESTS PERFORMED ON SAND FILL ALONG PERIMETER

PCF - 106.8

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

EMCON Northwest, Inc.

NUCLEAR MOISTURE-DENSITY TEST SHEET

GUAGE NO. 344T 16808
DATE TESTED 5-21-99
TESTED BY [illegible]
REVIEWED BY SB
PROJECT: Weyerhaeuser Mill-E/[illegible]
PROJECT NO. 40141-037.123

	DENSITY	MOISTURE
STANDARD COUNT	2866	629
TOTALS		
AVERAGES		

SOIL SEGMENT										
TEST NO.	301	302	303	304	305	306	307	308	309	310
NORTHING										
EASTING										
ELEVATION										
PROBE DEPTH	4"	4"	4"	4"	4"	4"	4"	4"	4"	4"
DENSITY COUNTS	2625	2344	2899	2586	2316	2574	2346	2954	2759	2738
TOTAL										
AVERAGES	2625	2344	2899	2586	2316	2574	2346	2954	2759	2738
DENSITY RATIO										
MOISTURE COUNTS	59	69	64	68	118	122	79	60	72	89
TOTAL										
AVERAGES	59	69	64	68	118	122	79	60	72	89
MOISTURE RATIO	4.4	5.4	4.9	5.3	10.3	10.7	6.4	4.5	5.7	7.4
WET DENSITY(pcf)	134.6	140.5	129.3	135.4	136.6	135.3	140.4	128.3	131.9	132.2
WATER (pcf)										
% MOISTURE	3.3	4.0	3.9	4.6	8.2	8.6	4.8	3.6	4.5	5.6
DRY DENSITY(pcf)	130.2	135.2	124.4	130.1	126.2	124.6	134.1	123.8	126.2	124.8
% RELATIVE COMPACTION	97.3	101.0	92.9	97.2	94.3	93.1	100.1	92.5	94.3	93.2
REFERENCE CURVE	134	134	134	134	134	134	134	134	134	134

REMARKS
ALL TESTS PERFORMED ON BASE COARSE MATERIAL
PCF - 133.9

SOIL SEGMENT: GENERAL EARTHFILL (GF), CLAY COVER (CC), VEGETATIVE COVER (VC), SLUDGE SOLIDIFICATION (SS), SUBGRADE (SG)

MAYES TESTING ENGINEERS, INC.

917-134th St. S.W. • Suite A-1
Everett, WA 98204
PH. (425) 742-9360
Fax (425) 745-1737

10029 So. Tacoma Wy. Suite E-2
Tacoma, WA 98499
PH. (253) 584-3720
FAX (253) 584-3707

JOB NUMBER:

DATE: 1-25-99 Page ____ of ____

PERMIT #:

WEATHER: cloudy

PROJECT: Weyerhaeuser Federal Way

OWNER:

ARCHITECT:

ENGINEER: Emcon

CONTRACTOR: Ce Con Corp

TYPE OF INSPECTION: Soils

INSPECTOR: Mike Mott

SITE TIME: 300 TO: 445

TRAVEL TIME: 0 HOURS

SAMPLES: 0

SUMMARY:

Reported to site to perform density tests on dredged sand placed along Barrier Wall panels #16 to 26. Found all tests @ 90% or above.

To the best of our knowledge, items inspected this date are in accordance with approved plans and specifications.

Yes ☒ No ☐ Preliminary Inspection ☐

NONCONFORMING CONDITIONS/CORRECTIVE ACTION TAKEN:

MAYES
TESTING ENGINEERS, INC.
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Tacoma, WA 98499
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FIELD DENSITY TEST REPORT
Per ASTM D-2922

Project Weyerhaeuser
Job No. _____ Date 1-25-99
Page _____ of _____
Permit No. _____
Inspector: Mike Mattix

Test No.	Location	Depth or Elevation (feet)	Laboratory Maximum Dry Density	Laboratory OMC %	Field Dry Density	Field Moisture Content %	Field Compaction %	Soil Type Description
1	Barrier Wall Panel # 226 OUTSIDE	0-1' Below	106.6	11.4	100.3	7.8	94	clean gray dredged Sand
2	205 INSIDE	grade	↓	↓	103.5	16.3	97	↓
3	196 OUT Barrier	Wall			101.0	10.4	95	
4	184 IN				95.5	9.4	90	
5	172 OUT				102.1	9.8	96	
6	160 IN		↓	↓	106.3	12.2	100	↓

Specification Compaction & Material: 90% Co

☒ ASTM D-1557 (MODIFIED PROCTOR) 95 PROVIDED BY CONTRACTOR
☐ ASTM D-698 (STANDARD PROCTOR)

Type and Number of earth moving units: _____
Type and Number of compaction units: _____
Number of Passes _____ thickness of lift _____
Method of adding moisture: _____
Remarks or Comments: _____
CAMPBELL #11A

☐ In our opinion, fill generally meets specifications as indicated by test no's: _____

☐ In our opinion, fill does not meet specifications as indicated by test no's: _____

and should be removed or reworked.

☒ Fill test meets specifications
☒ Contractor Advised
☐ Full time observation ☒ Part time observation

Mayes 002

WEYERHAEUSER SITE REDEMPTION
Cecon Corp.

Page 4

PERMIT: # INSPECTION REPORTS PROJECT: # E9016

2/5/99

Reported to site to perform density tests on dredged sand placed and compacted along barrier panels. Tests taken at panel nos. 123, 237, 248. All above 90% minimum requirements.

To the best of our knowledge, items inspected this date are in accordance with approved plans and specifications.

INSPECTOR: Mike Mattox

REVIEWED BY: _____

TESTING ENGINEERS, INC.
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Tacoma, WA 98499
PH. (253) 584-3720
FAX (253) 584-3707

FIELD DENSITY TEST REPORT
Per ASTM D-2922

E9016 Job No. [illegible] Date 9-5-97

Page 1 of 1

Permit No.

Inspector: Mike Mattox

Test No.	Location	Depth or Elevation (feet)	Laboratory Maximum Dry Density	Laboratory OMC %	Field Dry Density	Field Moisture Content %	Field Compaction %	Soil Type Description
1	Barrier panel # 123 inside	5.9..	106.0	11.0	98.8	15.5	93	dredged Sand
2	outside 231	↓	↓	↓	96.9	14.6	91	
3	inside 248	↓	↓	↓	99.3	14.3	93	↓

Specification Compaction & Material: 90% Min.

☒ ASTM D-1557 (MODIFIED PROCTOR)

☐ ASTM D-698 (STANDARD PROCTOR)

Type and Number of earth moving units: _____

Type and Number of compaction units: _____

Number of Passes _____ thickness of lift _____

Method of adding moisture: _____

Remarks or Comments: Proctor Value furnished by Roxler #14 3.111 contractor

☐ In our opinion, fill generally meets specifications as indicated by test no's: _____

☐ In our opinion, fill does not meet specifications as indicated by test no's: _____

and should be removed or reworked.

☒ Fill test meets specifications

☒ Contractor Advised

☐ Full time observation ☒ Part time observation

Mayes 002

MAYES
TESTING ENGINEERS, INC.
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Tacoma, WA 98499
PH. (253) 584-3720
FAX (253) 584-3707

JOB NUMBER: E6083 DATE: 7-16-99 Page ___ of ___

INSPECTOR: Mike Mattix

SITE TIME: ___ TO: ___

TRAVEL TIME: ___ HOURS

SAMPLES: 0

SUMMARY:

PERMIT #:	WEATHER: Rain
PROJECT:	Weyerhaeuser Site clean up
OWNER:	"
ARCHITECT:	
ENGINEER:	
CONTRACTOR:	CE Corp Corp
TYPE OF INSPECTION:	Soils

Reported to Site to perform Density tests of placed DREDGED Sand @ STA 7+94, 8+44 & 12+70 @ Area where concrete foundation was REMOVED.

Also tested -5/8 crushed @ Pond #6

Found all tests above 90% Requirement.

Proctor VALUES were supplied By contractor.

To the best of our knowledge, items inspected this date are in accordance with approved plans and specifications.
Yes ☒ No ☐ Preliminary Inspection ☐

NONCONFORMING CONDITIONS/CORRECTIVE ACTION TAKEN:

Mayes 004 Rev 8-97

MAYES
TESTING ENGINEERS, INC.
917-134th St. S.W. • Suite A-1
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Tacoma, WA 98499
PH. (253) 584-3720
FAX (253) 584-3707

FIELD DENSITY TEST REPORT
Per ASTM D-2922

Project
Job No. E8083 Date 6-16-99
Page 1 of 1
Permit No.
Inspector: MMATTOX

Test No.	Location	Depth or Elevation (feet)	Laboratory Maximum Dry Density	Laboratory OMC %	Field Dry Density	Field Moisture Content %	Field Compaction %	Soil Type Description
1	BOG INFILL STA 7+94	S.G.	106.6	11.0	99.2	19.5	93	DREDGED SAND
2	STA 8+44	↓	↓	↓	105.9	14.0	99	↓
3	STA 2+70 12' EAST OF	↓	↓	↓	102.3	12.4	96	↓
4	BARRIER, AREA FILLED AFTER EX. CONCRETE REMOVED	-8"	↓	↓	108	14.8	100	↓
5	PANEL #6	S.G.	134.6	6.6	135.9	9.2	100	-5/8 CRUSHED

Specification Compaction & Material: 90% Min.

☒ ASTM D-1557 (MODIFIED PROCTOR)

☐ ASTM D-698 (STANDARD PROCTOR)

Type and Number of earth moving units:

Type and Number of compaction units:

Number of Passes _____ thickness of lift

Method of adding moisture:

Remarks or Comments: PROCTOR VALUES SUPPLIED BY CONTRACTOR.

☐ In our opinion, fill generally meets specifications as indicated by test no's:

☐ In our opinion, fill does not meet specifications as indicated by test no's:

and should be removed or reworked.

☒ Fill test meets specifications

☒ Contractor Advised

☐ Full time observation

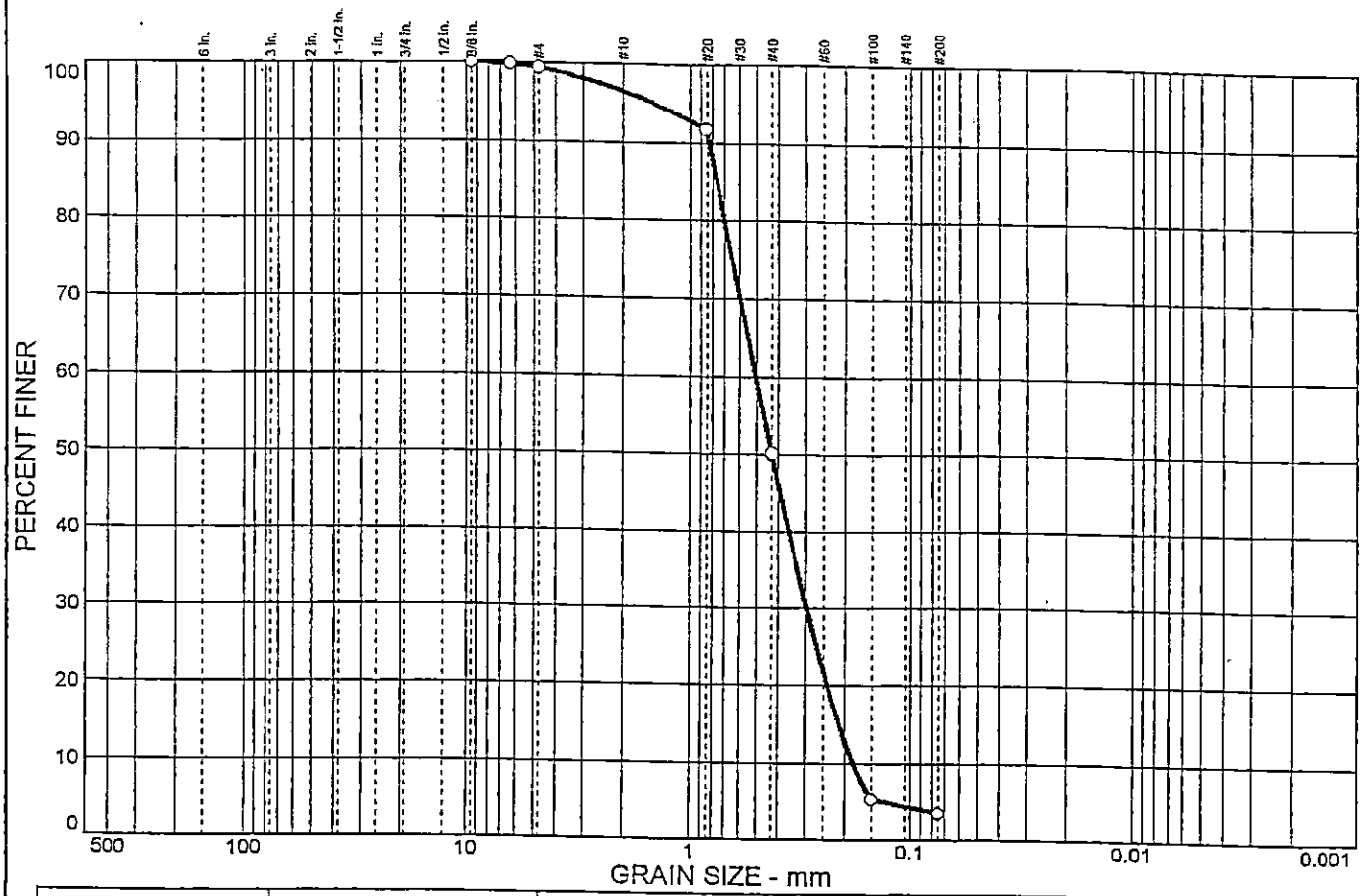
☒ Part time observation

Mayes 002

APPENDIX C.3

REFERENCE MOISTURE/DENSITY CURVES

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.6	2.9	46.4	46.6	3.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
1/4 in.	99.9		
#4	99.4		
#20	91.7		
#40	50.1		
#100	5.3		
#200	3.5		

* (no specification provided)

Soil Description

GRAY CLEAN SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.761 D_{60}= 0.503 D_{50}= 0.424
D_{30}= 0.295 D_{15}= 0.211 D_{10}= 0.182
C_u= 2.76 C_c= 0.95

Classification

USCS= AASHTO=

Remarks

CLEAN SAND
F.M.=0.95

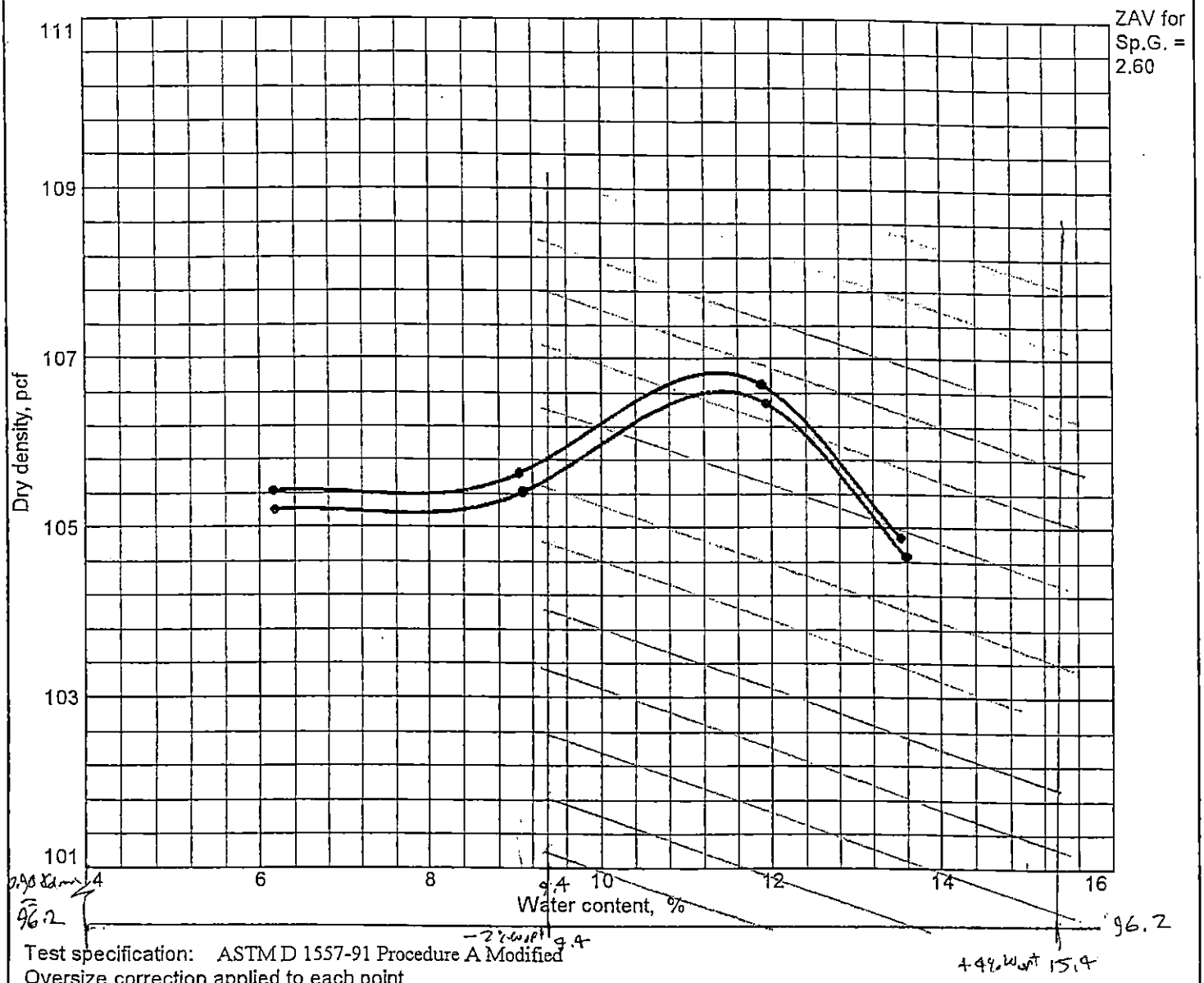
Sample No.: FR: 1276 (B) Source of Sample: Date: 11/25/98
Location: Elev./Depth:

PROFESSIONAL SERVICE INDUSTRIES

Client: EMCON
Project:

Project No: 744-80231 Plate

COMPACTION TEST REPORT



Test specification: ASTM D 1557-91 Procedure A Modified
Oversize correction applied to each point

Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
USCS	AASHTO						
			2.60			0.6	3.5

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 106.8 pcf	106.6 pcf	GRAY CLEAN SAND
Optimum moisture = 11.4 %	11.4 %	

File No. 744-80231 Report No. FR 1276 (B)
Client: EMCON
Source: Sample No.: FR: 1276 (B)
Date: 12/23/98

COMPACTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES

Remarks:
FR 1276 (B)

Tested by: EMD
Date: 11/30
Checked by: SAM
Date: 12/03/98

Plate

5/8" minus crushed surfacing top course "CSTC" S. Everett Pit D-47 WSDOT approv.

CSR West, Asssociated
6300 Glenwood Avenue
Everett, WA 98203
USA
(206)348-6391

Tabular Results of 5/8" Top Cs (E)

AGGREGATE DESCRIPTION

5/8" Top Cs (E) ---------- 1/ 3/91

Class : Interm Shape : Cubical
Type : Crushed Geology : Other

Maximum aggregate size : # 6 -- 3/4 "

Source : Everett Pit #D-47

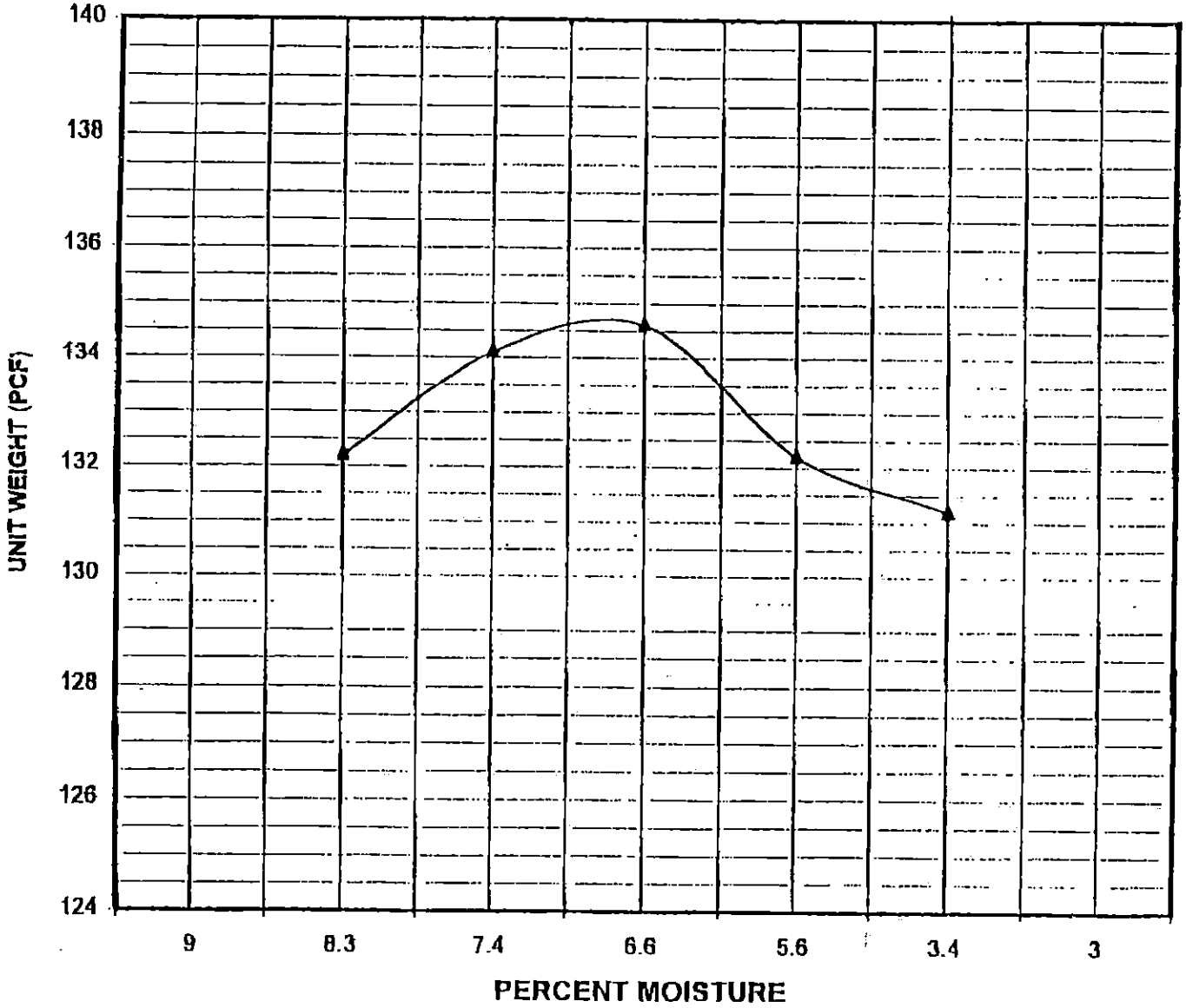
SPECIFICATION

WSDOT 5/8" TC ---------- 1/ 1/93

Wa. State 5/8" Crushed Top Course

	Ind % Pass 3/4 "	Ind % Pass 1/4 "	Ind % Pass # 40	Ind % Pass # 200	Sand Equiv %	
Low	100.0	55.0	8.0	0.0	40.0	
High	100.0	75.0	24.0	10.0	100.0	
Sample ID / Sample Date	Ind % Pass 3/4 "	Ind % Pass 1/4 "	Ind % Pass # 40	Ind % Pass # 200	Sand Equiv %	Moist %
970010 7/22/97	100.0	67.0	16.4	5.1	72.0	5.3
970011 8/11/97	100.0	67.7	12.2	3.9	72.0	5.3
Count	2	2	2	2	2	2
Average	100.0	67.3	14.3	4.5	72.0	5.3
Standard Deviation	-	0.5	3.0	0.8	-	-
Range	100.0	67.0	12.2	3.9	72.0	5.3
	100.0	67.7	16.4	5.1	72.0	5.3
Coefficient of Variation	-	0.8	20.9	18.0	-	-

MOISTURE DENSITY RELATIONS REPORT



MATERIAL TYPE:
5/8" TOP COARSE

MATERIAL SOURCE:
EVERETT D-47

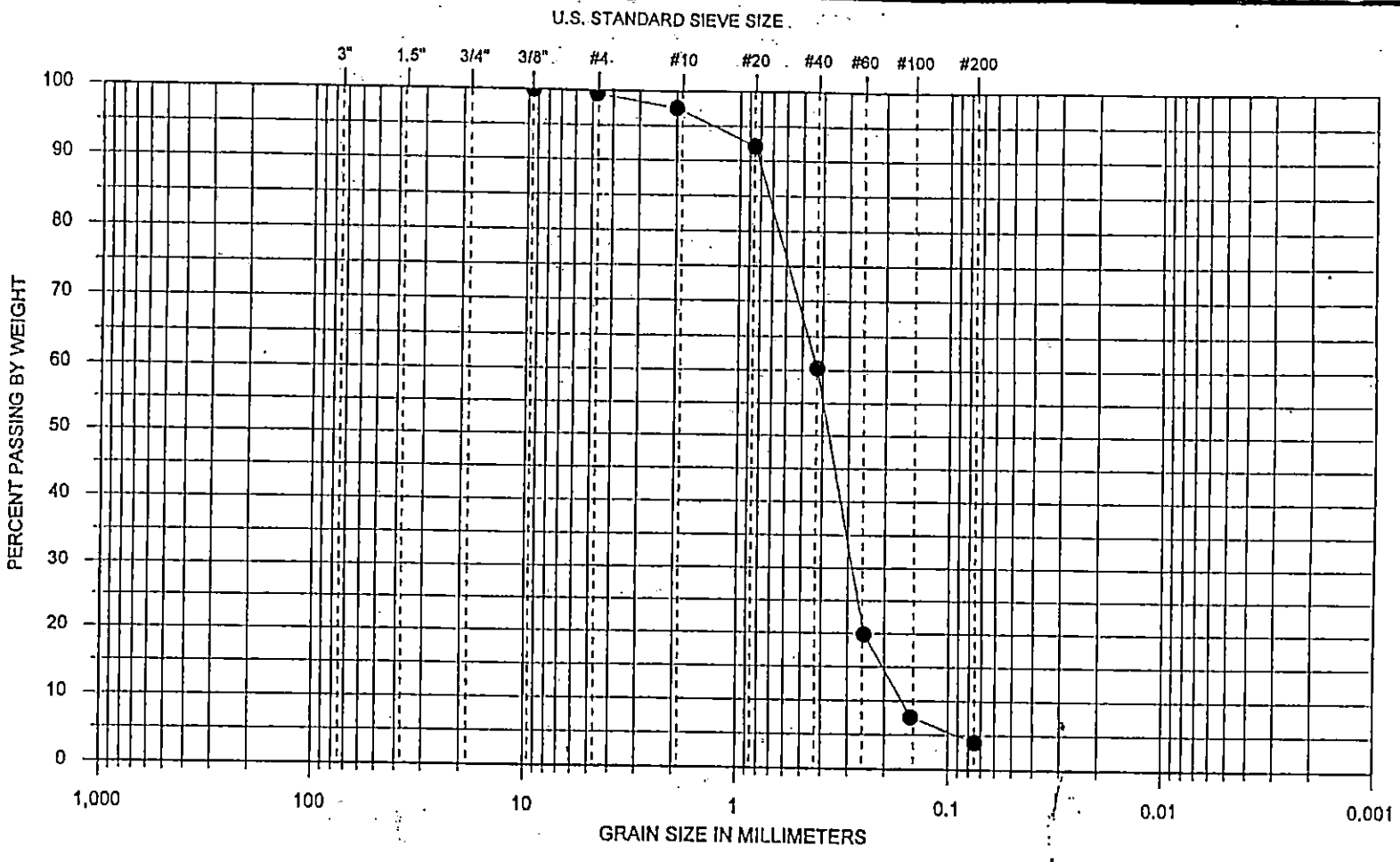
TEST METHOD:
ASTM-1557 (C)

PROJECT: AS&G

MAX. DENSITY:
134.6# PCF

OPT. MOISTURE:
6.6%

Geo Engineers

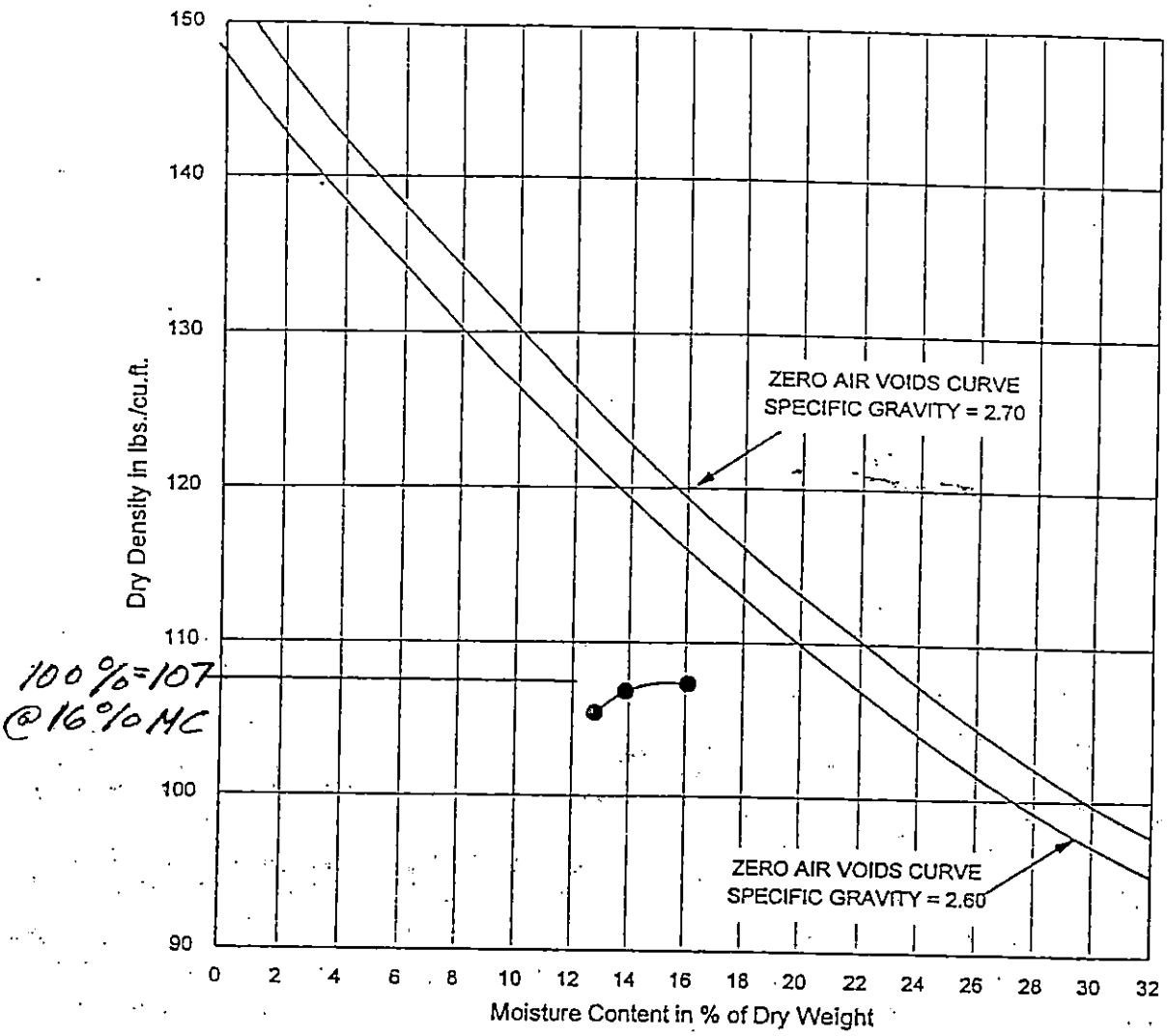


COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	EXPLORATION NUMBER	SAMPLE DEPTH (FEET)	SOIL DESCRIPTION
●	Grab sample		Fine to medium sand (dredge sand) (SP) FROM SNOHOMISH RIVER

FIGURE B-6

GRADATION CURVES



SYMBOL	EXPLORATION NUMBER	SAMPLE DEPTH (feet)	SOIL DESCRIPTION	OPTIMUM MOISTURE CONTENT (%)	MAXIMUM DRY DENSITY (pcf)
●	Grab sample		Gray fine to medium sand and a trace of gravel (SP) DREDGED FROM SNOHOMISH RIVER	13.9 12.8 16.1	106.8 105.4 107.3

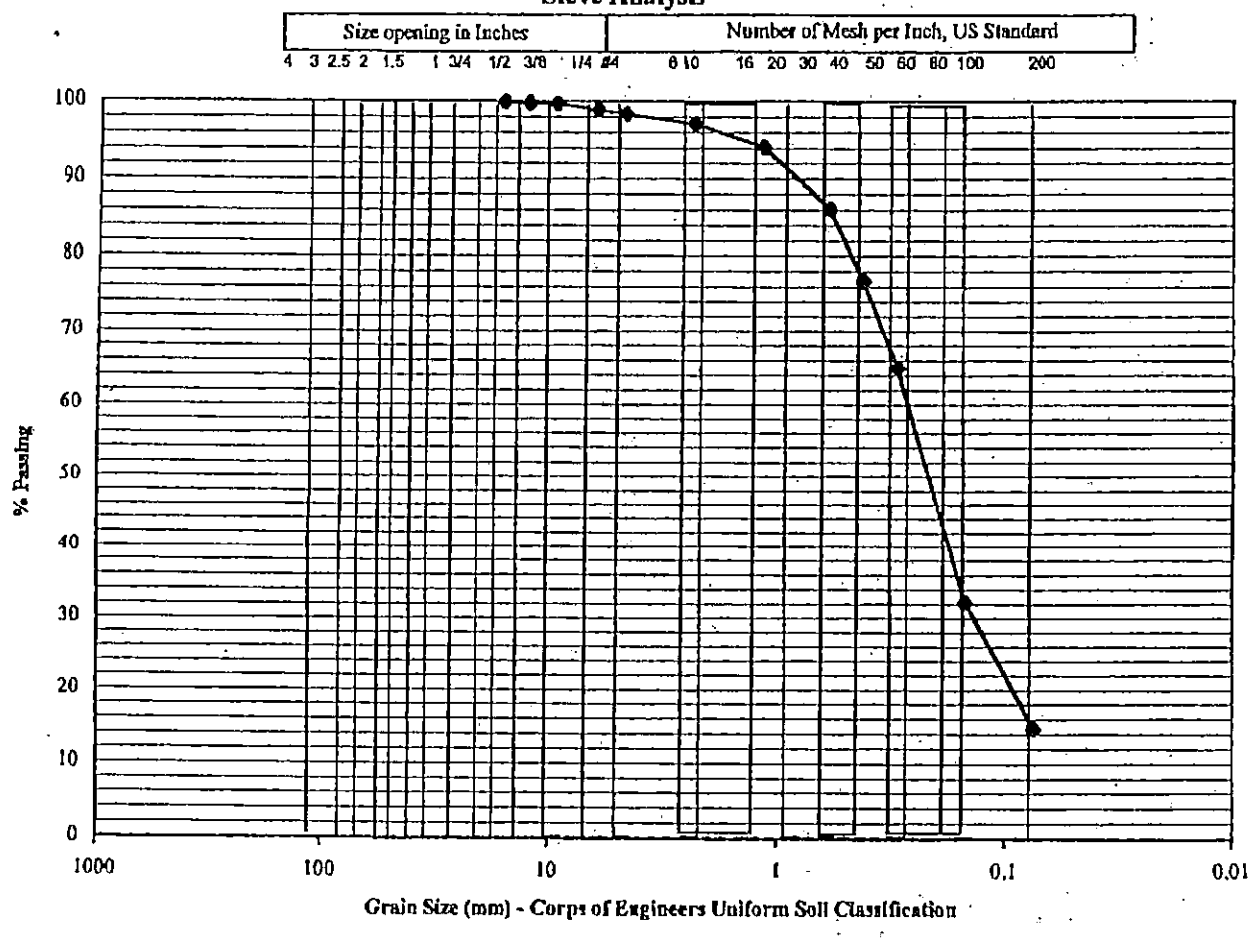
NOTE: TEST PERFORMED IN ACCORDANCE WITH ASTM D-1557 OR AASHTO T180, AS INDICATED.

Geo Engineers

COMPACTION TEST RESULTS

FIGURE B-7

Sieve Analysis



Sieve Analysis

Sieve Size	% Passing	Specs * min	Specs * max
5/8"	100		
1/2"	100		
3/8"	100		
1/4"	99		
#4	98		
#8	97		
#16	94		
#30	86		
#40	77		
#50	65		
#100	32		
#200	14.8		

*

Sample Number	Depth (ft)	Classification	Nat. W.C.	L.L.	P.I.
3833		Poorly graded sand with silt, SP-SM			

Material:	Dark grey fine sand (Dredged sand)
Source:	Port of Everett PORT GARDNER BAY
Project:	Everett Access Ramp
Project #:	E8083
Date Rec'd	6/24/98

Reviewed by:

MAYES TESTING ENGINEERS

"We Make a Difference"

Moisture Density Relationship Test

3/3

Client	Weyerhauser	Date	6/22/98
Project	Everett Access Ramp	Project Number	E8083
Test Method	ASTM D1557 Method B / ASTM C 127	Lab Number	3813

Wet Preparation	X	Hand Tamper	X
Dry Preparartion		Mechanical	

Date Received 6/17/98 PORT GARDNER BAY

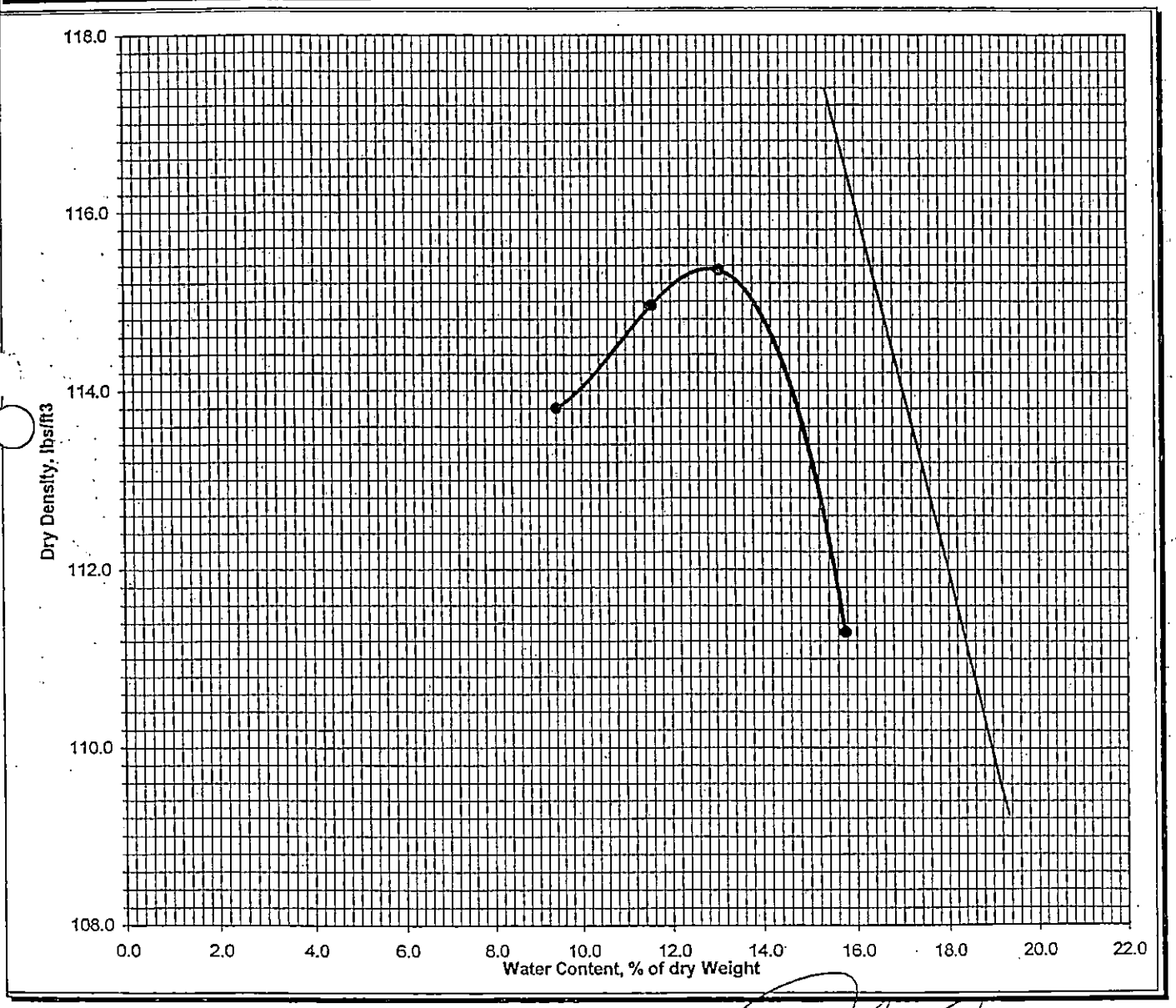
Source of Sample: Dredge from ~~Snohomish River~~ - Stockpiled

Description of Sample: Dark grey fine sand

Test Results	
Optimum Water Content %	13.0
Max Dry Density Corr. lbs/ft³	116.0

Sieve Analysis	
Sieve Size	Percent Retained
3/4	2
3/8	4
#4	6

Zero Void line plotted at SpG 2.65
Max. Density Uncorrected 116.0



Reviewed By:

MAYES TESTING ENGINEERS

"We Make a Difference"

January 5, 1999
Project No. 744-80231

Mr. Kent. Wiken
EMCON
18912 N. Creek Parkway Suite 200
Bothell, WA 98011

Subject: Mill E/Koppers Site Remediation

Dear Mr. Wiken:

As requested and agreed, Professional Services Industries (PSI) analyzed the material supplied by the client for proctor and sieve analysis. Material testing was performed in accordance to ASTM C136-95a, D1140-92, D2216-90, D1557-91. Test results conform to applicable specifications unless otherwise noted. Please refer to Table 1 and 2 on Page 2 for test results.

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Thank you for using PSI. If you have any questions, or if we can be of further assistance to you, please contact us at (425) 485-4244.

Sincerely,

Stephen L. McDuffee,
Branch Manager

SLM/le

EMCON
Project No. 744-80231
January 5, 1999

OK
KWD
1/7/99

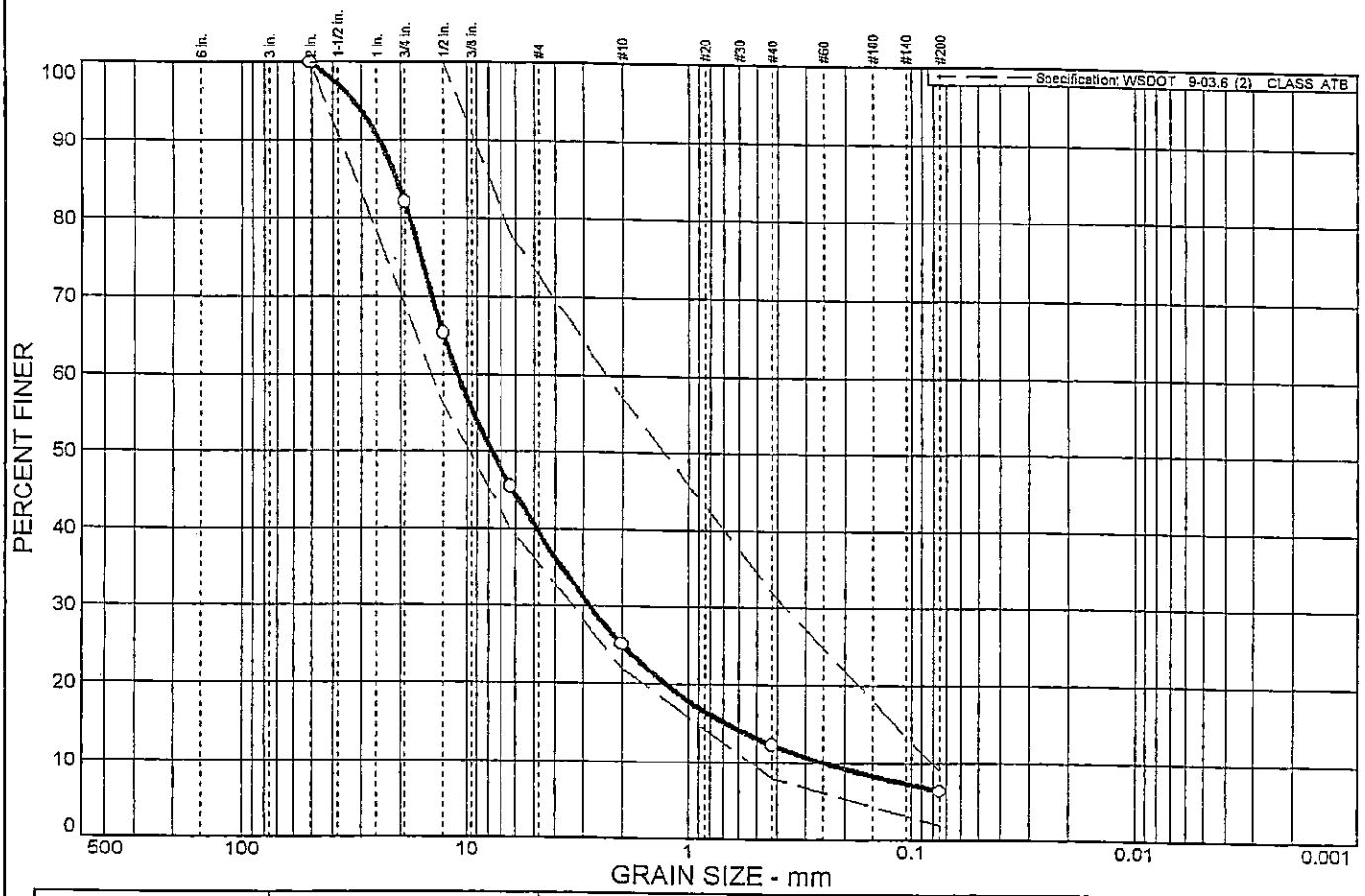
Table 1 Test Results

Sample ID	FR 1276 (A)	SPEC PERCENT
Sample Description	ATB Aggregate	WSDOT 9-03.6 (2)
Sample Location		
% Pass 2 inch	100.0	100.0-100.0
% Pass ½ inch	65.2	56.0-100.0
% Pass ¼ Inch	45.6	40.0-78.0
% Pass #10	25.2	22.0-57.0
% Pass #40	12.3	8.0-32.0
% Pass #200	6.4	2.0-9.0
Maximum Dry Density	133.9 pcf	
Optimum % Moisture	6.2 %	

Table 2 Test Results

Sample ID	FR 1276 (b)
Sample Description	Gray clean sand
Sample Location	
% Pass 3/8 inch	100.0
% Pass ¼ inch	99.9
% Pass #4	99.4
% Pass #20	91.7
% Pass #40	50.1
% Pass #100	5.3
% Pass #200	3.5
Maximum Dry Density	106.8 pcf
Optimum % Moisture	11.4 %

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	17.9	42.5	14.4	12.9	5.9	6.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2 in.	100.0	100.0 - 100.0	
3/4 in.	82.1		
1/2 in.	65.2	56.0 - 100.0	
1/4 in.	45.6	40.0 - 78.0	
#10	25.2	22.0 - 57.0	
#40	12.3	8.0 - 32.0	
#200	6.4	2.0 - 9.0	

* WSDOT 9-03.6 (2) CLASS ATB

Soil Description

ATB AGGREGATE

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 20.7 D_{60}= 11.0 D_{50}= 7.72
D_{30}= 2.78 D_{15}= 0.687 D_{10}= 0.248
C_u= 44.47 C_c= 2.83

Classification

USCS= AASHTO=

Remarks

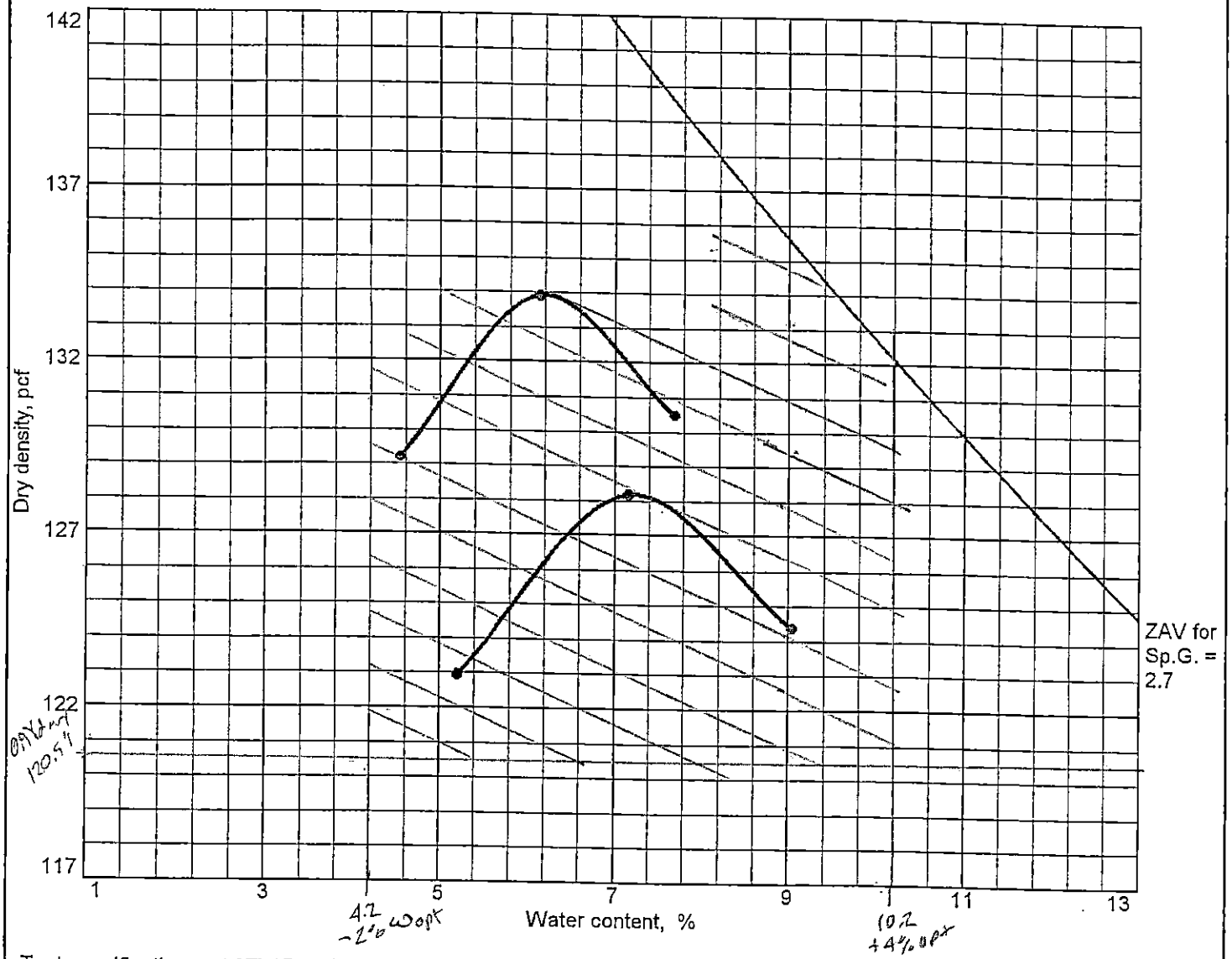
ID#1276 (A)
F.M.=0.18

Sample No.: FR : 1276 (A) **Source of Sample:** **Date:** 11/25/98
Location: **Elev./Depth:**

PROFESSIONAL SERVICE INDUSTRIES

Client: EMCON
Project:
Project No: 744-80231 **Plate**

COMPACTION TEST REPORT



Test specification: ASTM D 1557-91 Procedure C Modified
Oversize correction applied to each point

Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
USCS	AASHTO						
			2.7			17.9	6.4

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 133.9 pcf	128.2 pcf	ATB AGGREGATE
Optimum moisture = 6.2 %	7.2 %	

File No. 744-80231 Report No. 1376(A)
Client: EMCON
◆ Source: Sample No.: FR : 1276 (A)
Date: 12/23/98

Remarks:
FR; 1276(A)

Tested by: EMD
Date: 12-02-98
Checked by: SAM
Date: 12-03-98

COMPACTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES

Plate

PSI Information To Build On
Engineering • Consulting • Testing

FEB 4 1999

February 2, 1999
Project No. 744-80231

Mr. Pete Seybert
EMCON
18912 North Creek Parkway
Bothell, WA 98011

Subject: Mille/Kppers Site Remediation

Dear Mr. Olsson:

As requested and agreed, Professional Services Industries (PSI) analyzed the material sampled by a representative of PSI for sieve analysis. Material testing was performed in accordance to ASTM C136-96a, D2216-90 and D1140-92. Results conform to applicable specifications unless otherwise noted. Please refer to Table 1 on Page 2 for test results.

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Thank you for using PSI. If you have any questions, or if we can be of further assistance to you, please contact us at (425) 485-4244.

Sincerely,

Stephen L. McDuffee,
Branch Manager

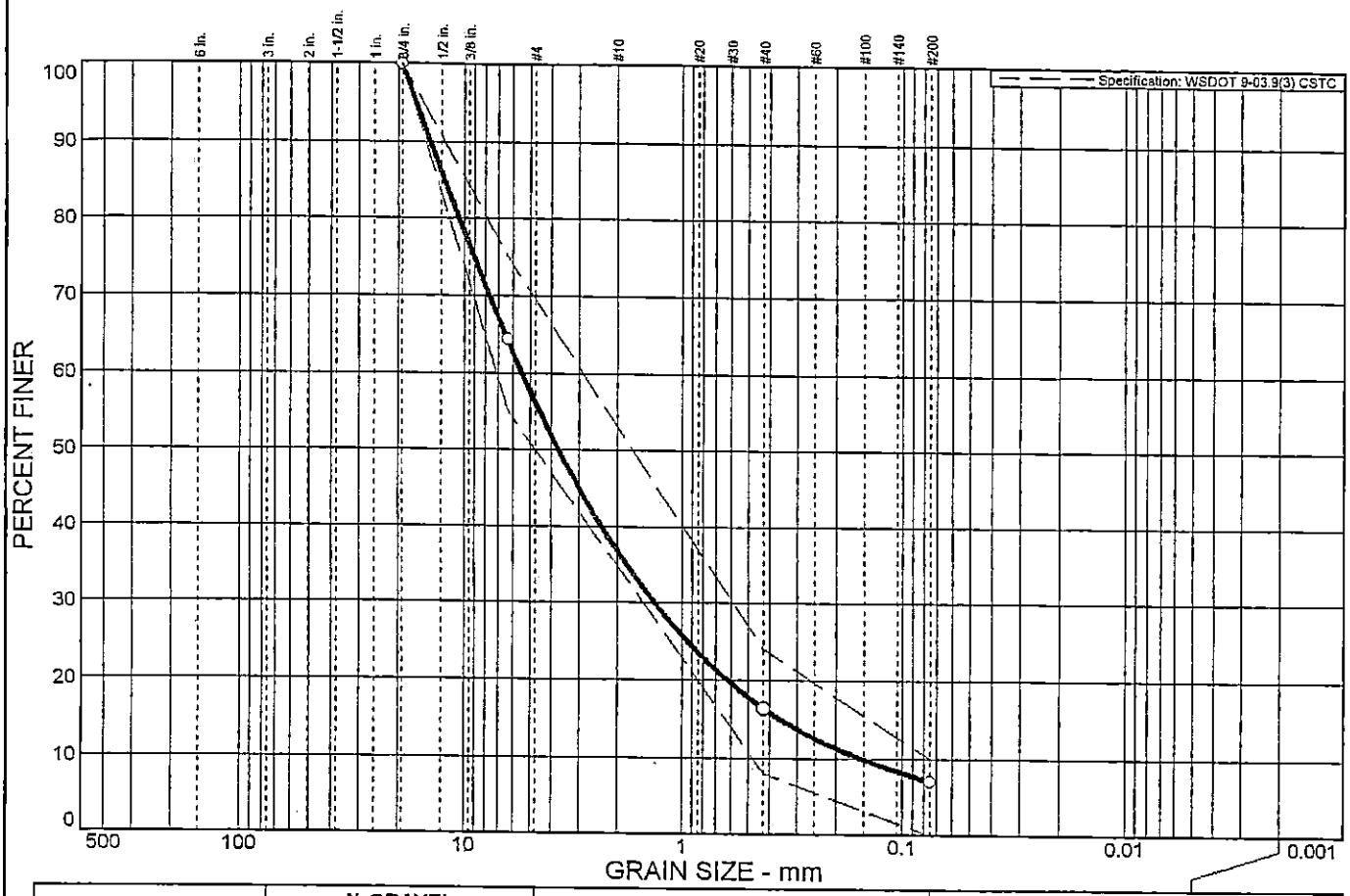
SLM/le

EMCON
Project No. 744-80231
February 2, 1999

Table 1 Test Results

Sample ID	FR 5124	SPECIFICATION
Sample Description	5/8" Crushed -- CSTC	WSDOT 9-03.9(3) CSTC
Sample Location	Mille/Koppers Site Remediation	
% Pass ¾ inch	100.0	100.0-100.0
% Pass ¼ inch	64.3	55.0-75.0
% Pass # 40	16.4	8.0-24.0
% Pass # 200	7.0	0.0-10.0
Maximum Dry Density	138.7 pcf	
Optimum moisture	6.5%	

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	43.7	19.3	20.6	9.4	7.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0	100.0 - 100.0	
1/4 in.	64.3	55.0 - 75.0	
#40	16.4	8.0 - 24.0	
#200	7.0	0.0 - 10.0	

* WSDOT 9-03.9(3) CSTC

Soil Description

5/8" CRUSHED - CSTC

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 12.3 D_{60}= 5.45 D_{50}= 3.69
D_{30}= 1.33 D_{15}= 0.357 D_{10}= 0.155
C_u= 35.25 C_c= 2.10

Classification

USCS= AASHTO=

Remarks

ID#: FR5124
ASTM C136/D1140/D2216

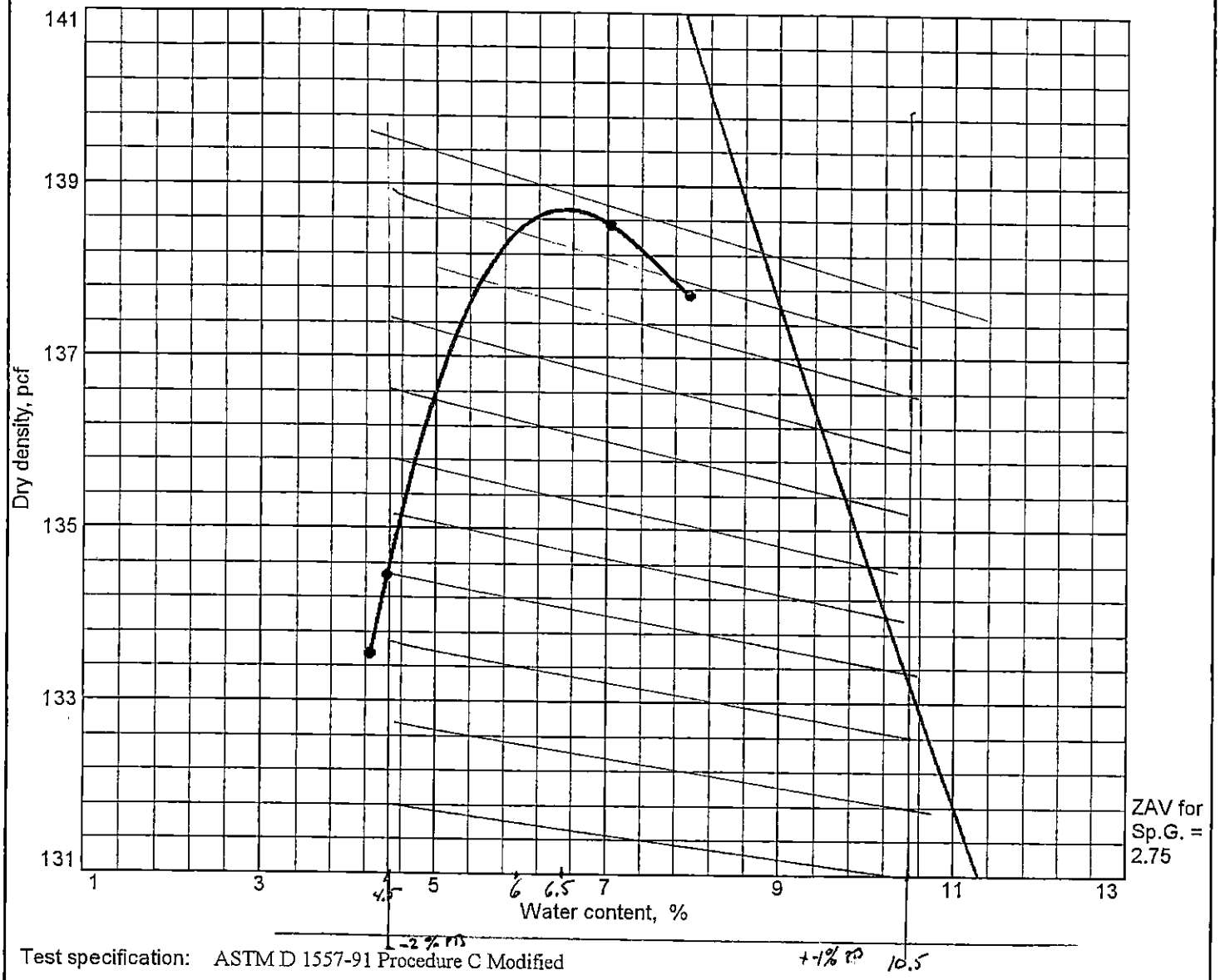
Sample No.: FR5124 **Source of Sample:** **Date:** 2/01/99
Location: MILL E/KOPPERS SITE REMEDIATION **Elev./Depth:**

PROFESSIONAL SERVICE INDUSTRIES

Client: EMCON
Project:

Project No: 744-80231 **Plate**

COMPACTION TEST REPORT



Test specification: ASTM D 1557-91 Procedure C Modified

Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
USCS	AASHTO						
			2.75			0.0	7.0

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 138.7 pcf	138.7 pcf	5/8" CRUSHED - CSTC
Optimum moisture = 6.5 %	6.5 %	

File No. 744-80213 **Report No.** FR5124
Client: EMCON
◆ **Location:** MILL E/KOPPERS SITE REMEDIATION
Date: 2/1/99

Remarks:
ID#: FR5124

Tested by: DP/AH
Date: 2/01/99
Checked by: SAM
Date: 2/01/99

COMPACTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES

Plate

APPENDIX D

SUMMARY OF BARRIER WALL SUBMITTALS AND TEST DATA

APPENDIX D.1

SUBMITTALS

GSE HD*

HDPE Geomembrane

GSE HD is a high quality, high density polyethylene (HDPE) geomembrane produced from a specially formulated, proprietary virgin polyethylene resin. This polyethylene resin is designed specifically for flexible geomembrane applications. GSE HD contains approximately 97.5% polyethylene, 2.5% carbon black and trace amounts of antioxidants and heat stabilizers; no other additives, fillers or extenders are used. GSE HD has outstanding chemical resistance, mechanical properties, environmental stress crack resistance, dimensional stability and thermal aging characteristics. GSE HD has excellent resistance to UV radiation and is suitable for exposed conditions.

TESTED PROPERTY	TEST METHOD	MINIMUM VALUES				
Thickness, mils (mm)	ASTM D 751/1593/5199	27 (0.68)	36 (0.90)	54 (1.35)	72 (1.80)	90 (2.25)
Density, g/cm^3	ASTM D 792/1505	0.94	0.94	0.94	0.94	0.94
Tensile Properties (each direction)	ASTM D 638, Type IV					
Strength at Break, lb/in-width (N/mm)	Dumbell, 2 ipm	122 (21)	162 (28)	243 (43)	324 (57)	405 (71)
Strength at Yield, lb/in-width (N/mm)		65 (11)	86 (15)	130 (23)	173 (30)	216 (38)
Elongation at Break, %	G.L. 2.5 in (64 mm)	560	560	560	560	560
Elongation at Yield, %	G.L. 1.3 in (33 mm)	13	13	13	13	13
Tear Resistance, lb (N)	ASTM D 1004	22 (98)	30 (133)	45 (200)	60 (267)	75 (334)
Puncture Resistance, lb (N)	FTMS 101, Method 2065	39 (174)	52 (231)	80 (356)	105 (467)	130 (579)
Carbon Black Content, %	ASTM D 1603	2.0	2.0	2.0	2.0	2.0
Environmental Stress Crack Resistance, hr	ASTM D 1693, Cond. B	1500	1500	1500	1500	1500

REFERENCE PROPERTY	TEST METHOD	NOMINAL VALUES				
Thickness, mils (mm)	ASTM D 751/1593/5199	30 (0.75)	40 (1.0)	60 (1.5)	80 (2.0)	100 (2.5)
Roll Length** (approximate), ft (m)		952 (290)	650 (198)	420 (128)	320 (98)	250 (76)
Low Temperature Brittleness, °F (°C)	ASTM D 746, Cond. B	<-107 (<-77)	<-107 (<-77)	<-107 (<-77)	<-107 (<-77)	<-107 (<-77)
Oxidative Induction Time, minutes	ASTM D 3895, 200 °C Pure O_2, 1 atm	100	100	100	100	100
Water Absorption, % wt. change	ASTM D 570	<0.01	<0.01	<0.01	<0.01	<0.01
Moisture Vapor Transmission, g/m^{2}day	ASTM E 96	<0.001	<0.001	<0.001	<0.001	<0.001
Carbon Black Dispersion	ASTM D 3015	A1,A2,B1	A1,A2,B1	A1,A2,B1	A1,A2,B1	A1,A2,B1
Dimensional Stability (each direction), %	ASTM D 1204, 100 °C, 1 hr	±2	±2	±2	±2	±2
Melt Flow Index, g/10 minutes	ASTM D 1238, Cond.190/2.16	≤1.0	≤1.0	≤1.0	≤1.0	≤1.0

10 °C
374 °F

GSE HD is available in rolls approximately 22.5 ft (6.9 m) and 34.5 ft (10.5 m) wide and weighing about 2,900 lb (1,315 kg) and 4,400 lb (1,995 kg) respectively. Other material thicknesses are available upon request.

** Roll lengths correspond to the 22.5 ft (6.9 m) wide roll goods.

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

GSE Lining Technology, Inc.
Corporate Headquarters
19103 Gundle Road
Houston, Texas 77073
USA
800-435-2008
281-443-8564
FAX: 281-875-6010

GSE Lining Technology GmbH
European Headquarters
Buxtehuder Straße 112
D-21073 Hamburg
Germany
49-40-767-420
FAX: 49-40-767-42-33

Sales/Installation Offices
Australia
Egypt
Singapore
United Arab Emirates
United Kingdom

Represented by:

For environmental lining solutions...the world comes to GSE.*

A Gundle/SLT Environmental, Inc. Company

Product Specifications

Minimum Average Roll Values (MARV) Except When Designated Minimum, Maximum or Range of Values.

Gundline® HD
Gundline® HDW
Gundline® HDC

(Smooth Surfaced High Density Polyethylene Liner with Co-extruded White-Surfaced and Conductive-Surfaced Options)[1]

Gundle Lining Systems Inc.

Gundle®

	Property	Test Method	Unit	Gauge (Nominal) 30 mil (.75 mm)	40 mil (1.0 mm)	60 mil (1.5 mm)	80 mil (2.0 mm)	100 mil (2.5 mm)
Routine Gundle Tests	Density	ASTM D1505 (374°F)	g/cc	0.94 min.	0.94 min.	0.94 min.	0.94 min.	0.94 min.
	Melt Flow Index	ASTM D1238, Condition E (190°C, 2.16 kg.)	g/10 minutes	0.3 max.	0.3 max.	0.3 max.	0.3 max.	0.3 max.
	Tensile Properties:	ASTM D638						
	Strength at Yield	Type IV, gauge length	PPI (N/mm)*	63 (11)	92 (17)	140 (25)	184 (32)	230 (40)
	Strength at Break	2 in. (50 mm) break, 1.3 in. (33 mm) yield	PPI (N/mm)*	120 (21)	160 (28)	240 (42)	320 (56)	400 (70)
	Elongation at Yield	Dumb-bell @ 2 ipm (50 mmpm)	%	13	13	13	13	13
	Elongation at Break		%	700	700	700	700	700
	Carbon Black Content **	ASTM D1603	%	2-3	2-3	2-3	2-3	2-3
	Carbon Black Dispersion	ASTM D3015	Rating	A-1, A-2, B-1	A-1, A-2, B-1	A-1, A-2, B-1	A-1, A-2, B-1	A-1, A-2, B-1
	Tear Resistance	ASTM D1004, Die C	Pounds (N)	22 (98)	30 (134)	45 (200)	60 (267)	75 (334)
	Puncture Resistance	FTMS 101B, Method 2065	Pounds (N)	39 (174)	52 (231)	80 (356)	105 (467)	130 (579)
	Dimensional Stability	ASTM D1204, 100°C, 1 Hr.	% change	± 2 max.	± 2 max.	± 2 max.	± 2 max.	± 2 max.
Reference Properties Only	Seam Strengths:	ASTM D4437						
	Peel Strength (wedge)		PPI (N/cm)	49 (86)	67 (117)	98 (172)	115 (201)	143 (250)
	Peel Strength (extrusion)		PPI (N/cm)	35 (61)	48 (84)	70 (123)	92 (161)	115 (201)
	Shear Strength		PPI (N/cm)	63 (110)	86 (151)	126 (221)	166 (291)	207 (362)
	Low Temperature Brittleness	ASTM D746, Procedure B	Degree F (°C)	-107 (-77) max.	-107 (-77) max.	-107 (-77) max.	-107 (-77) max.	-107 (-77) max.
	Coefficient of Linear Thermal Expansion	ASTM D696	x 10^{-4} cm/cm°C	2.0 max.	2.0 max.	2.0 max.	2.0 max.	2.0 max.
	Water Absorption	ASTM D570	%	0.1 max.	0.1 max.	0.1 max.	0.1 max.	0.1 max.
	Hydrostatic Resistance	ASTM D751	PSI (kPa)	150 (1035)	200 (1380)	400 (2760)	500 (3450)	600 (4140)
	Water Vapor Transmission	ASTM E96	g/m²/day	0.1 max.	0.1 max.	0.1 max.	0.1 max.	0.1 max.

* Approximate corresponding stress specifications are: Yield, 2300 psi (16 N/mm²); Break, 4000 psi (28 N/mm²).

** Note: Gundline® HDC may have an overall carbon black percentage above 3.0% due to the high carbon black loadings in the conductive layer.

[1] HDWC

Key to Co-extruded Products

HD = High Density Polyethylene (HDPE)
W = White Surface
C = Conductive Undersurface

Minimum Average Roll Values (MARV) Definition: Two standard deviations below the statistical mean (average) value for that test. MARV has become the standardized minimum for many roll goods, including geosynthetics.

Explanation for Not Including Certain Properties: There are many plastics tests for extruded film but Gundle chooses to include those which are relevant to the application of geomembranes and/or those which truly evaluate manufactured quality of the material.

Product Description

Gundline® HD, HDW and HDC are high quality formulations of High Density Polyethylene containing approximately 97.5% polymer and 2.5% of carbon black, anti-oxidants and heat stabilizers. The products are designed for exposed conditions. They contain no additives or fillers which can leach out and cause embrittlement over time.

Gundle geomembranes are rolled on 6 in. (15 cm) I.D. hollow cores.

Each roll is provided with 2 slings to aid handling on site.

Dimensions and weights are approximate.

Custom lengths and/or mil thickness available.

Gundline® HD, HDW and HDC

Composition and Thickness of Off-White Surface

The reflective surface of Gundle's white-surfaced sheet is a minimum of 3 mils (0.075 mm) thick. The heat/light reflective off-white surface is produced by a high quality titanium oxide pigment and is stabilized with a high performance Hindered Amine Light Stabilizer (HALS) to resist UV degradation.

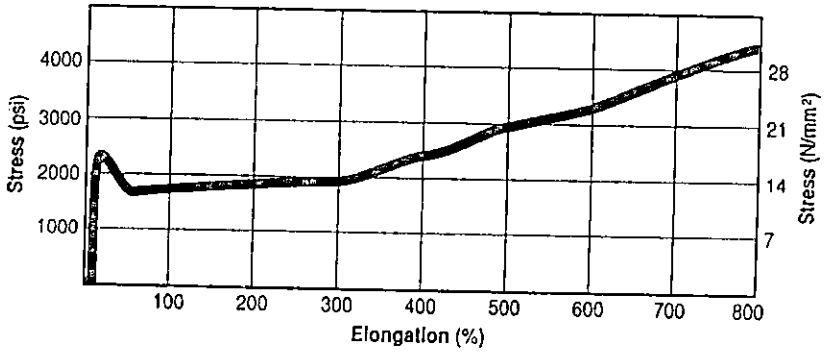
Composition and Thickness of Conductive Layer

The electrically conductive layer is a minimum of 2 mils (0.05 mm) thick and is made conductive by incorporating 12-15% of a very high purity carbon black.

Standard Roll Dimensions

Thickness		Width		Length		Area		Roll Weight	
mil	mm	ft	m	ft	m	ft²	m²	lb	kg
30	0.75	22.5	6.86	840	256	18,900	1756	2800	1272
40	1.0	22.5	6.86	650	198	14,625	1359	2800	1272
60	1.5	22.5	6.86	420	128	9,450	878	2800	1272
80	2.0	22.5	6.86	320	98	7,200	669	2800	1272
100	2.5	22.5	6.86	250	76	5,625	523	2800	1272
30	0.75	34.5	10.5	840	256	28,980	2692	4400	2000
40	1.0	34.5	10.5	650	198	22,425	2083	4400	2000
60	1.5	34.5	10.5	420	128	14,490	1346	4400	2000
80	2.0	34.5	10.5	320	98	11,040	1026	4400	2000
100	2.5	34.5	10.5	250	76	8,625	801	4400	2000

Typical Stress/Strain Performance



Gundle Lining Systems Inc.

Gundle®

Gundle Lining Systems, Inc.
19103 Gundle Road
Houston, Texas 77073 U.S.A.

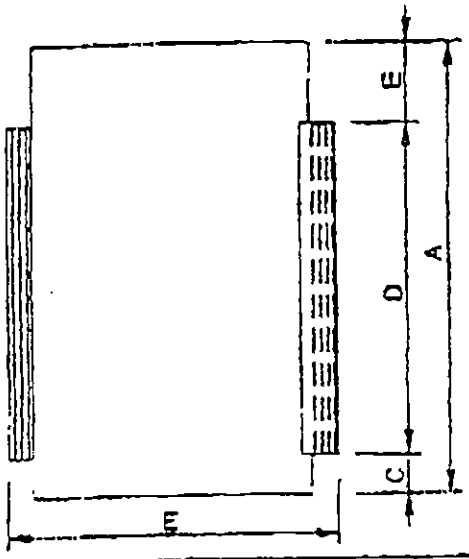
Phone: (713) 443-8564
Toll Free: (800) 435-2008
Telex: 166657 Gundle Hou
Fax: (713) 875-6010

PLEASE CIRCLE THE CORRECT ORIENTATION OF INTERLOCKS.

26-98 01:48P GSE Lining Fab Dept 800 435 2008 8/8

GSE CurtainWall® Panel Fabrication Details

Job Name & Location: Weyerhaeuser, Everett, WA
Ordered By: WESTERN GEO-CONSTRUCTORS, INC.
Date Submitted 11-3-98



A = Total Panel Length
B = Length of Top Flap (Liner only)
C = Length of Bottom Flap (Liner only)
D = Length if InterLock
E = Width of Panel (C. to C. of interlock)

	Size 1	Size 2	Size 3	Size 4	Size 5
Number of Panels	266	1			
Sheet Mil Thickness	80 mil	80 mil			
Anchors (Yes/No)	YES	YES			
Dim A	SEE PRINT	SEE PRINT			
Dim B	"	"			
Dim C	-0-	-0-			
Dim D	SEE PRINT	SEE PRINT			
Dim E	6'	4'			

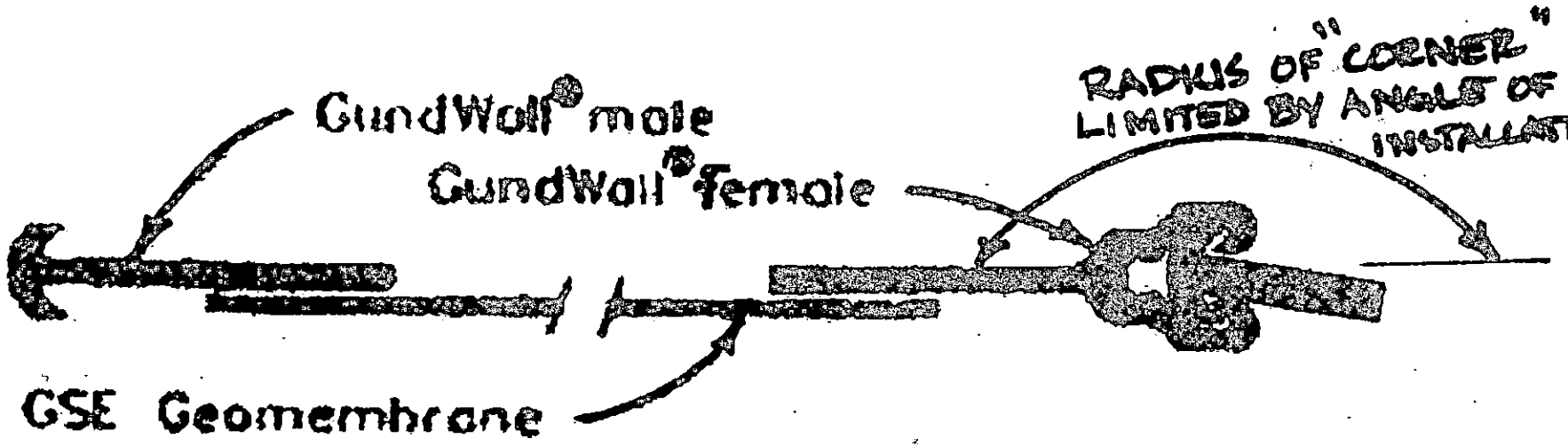
Questions

1.) Are CurtainWall InterLocks The same or opposing directions? SEE PRINT OUT

2.) If the CurtainWall Panels include anchors, please draw the orientation of the anchor to the InterLocks.
ONE - 6' WIDE PER EXAMPLE # 4
265 - 6' WIDE PER EXAMPLE # 1
ONE - 4' WIDE PER EXAMPLE # 3
Please detail the orientation of the InterLock and anchor lengths (Top view of inserted panel in ground)

SEE PRINT OUT

SUBMITTAL A.5



Submittal A.5

Detail @ "Corners"

"Corners" are to be installed by making a radius to providedirection change.

RADIUS IS 15' TYPICAL

WRS
Infrastructure & Environment, Inc.

4120 South 500 West, #2
Salt Lake City, UT 84123
Phone: (801) 265-2323
Fax: (801) 265-2397

LETTER OF TRANSMITTAL

To: **Stuart Triolo, Project Manager**

Company: Weyerhaeuser Company
Address: 101 East Marine View Drive
Everett, WA 98201

Phone: (425) 399-2871
Fax: (425) 399-2786

Date: 9/1/99
Transmittal No.: **Informational-005**
Project Name: Mill E/Koppers Site
Everett, WA
Client's Ref. #: 98-00094 (10/12/98)
Contractor: WRS I & E, Inc.
WRS Job #: 99-6028
Pages (w/ cover): 5

From: **Randall W. Richardson, WRS Project Manager**

Signature: Randall W. Richardson

We are sending: ☒ Attached ☐ Under Sep. Cover ☐ Remarks (below)

Via: ☐ U.S. Mail ☐ Hand Delivery ☐ Express Delivery ☒ Facsimile

The following:

☐ Correspondence	☐ Plans	☐ Progress Payments	☐
☐ Drawings	☐ Samples	☐ Specifications	☐
☒ Submittal	☒ Change Order	☐ Subcontractor	☐
☐ Certified Payroll	☐ Schedule	☐ _____	

Items list:

Dated	Ref. #	Pages	Description	Specifications Reference
90 MSDS	1	4	Hydrophilic seal product information - "Swellseal"	Sec. 02179, Part 1.4(A.1)

Transmitted For:

☐ Your Approval	☐ Your Review/Comment	☐ Approval As Qualified	
☐ Your Use	☐ As Requested	☐ Approval As Submitted	
☒ Your File	☐ Corrections Resubmittal	☐ Corrections As Noted	

Remarks:

Specifically requested by Kent Wiken on 8/31/99.

cc: Kent Wiken, P.E.; EMCON (ENGINEER)

Receipt-only signature: _____ (please sign and return/fax) Date: _____

Received Time Sep. 1. 3:15PM

de neef
Construction Chemicals (U.S.) Inc.

Chemical Resistance SWELLSEAL #8 and SWELLSEAL R .....

The lab results are based on tests performed on strips of materials, immersed in respective liquids and weighed at 20°C and evaluated after 7 days:

Results: Increase in weight in % of liquid

Liquid	Swellseal #8 & Swellseal R	Swellseal #2
Aliphatic Hydro Carbons (Decene)	42	79
Halogenated Hydro Carbons (per)	60	382
Aromatic Hydro Carbons (Toluene)	240	327
Alcohols (Butanol)	6	12
Glycols (DEG)	-3	1
Ketons (MEK)	26	38
Water	416	73
Anorganic acids (HC1)	26	60
Organic acids (HOAc)	40	120
Alkali (NaOH)	187	56

ATTN: Randall
Fx (801) 265-3397

P.O. Box 1219 • WALLER, TEXAS 77484-1219 • FAX 409 372-8897 • TELEPHONE 409 372-9165

dry de neef
Construction Chemicals (U.S.) Inc.

WATER EXPANSIBLE SEALING MATERIAL FOR CALKING GROOVE SEAL TAPE

—Type : SWELLSEAL R

—Shape :

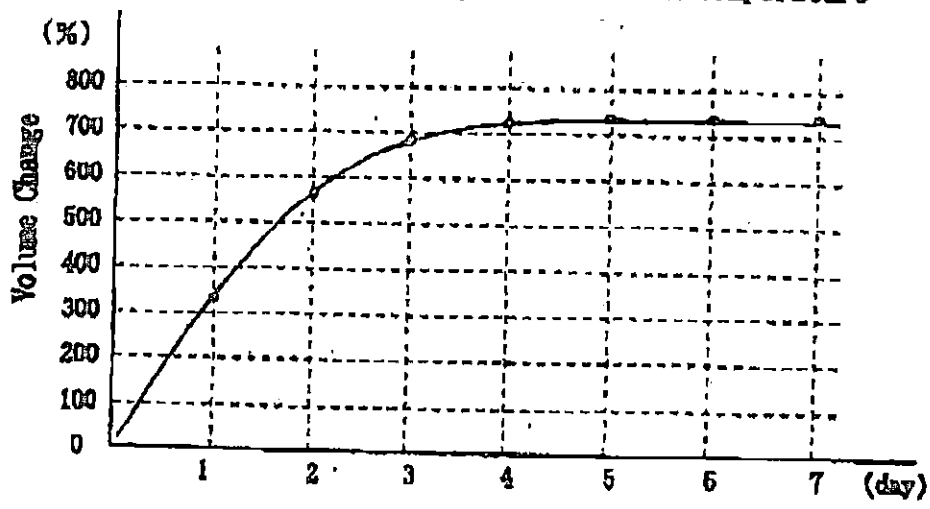
—Physical properties

Test method : JIS K6301

Test items	8 V
Hardness (JIS A)	40
Tensile Strength (kgf/cm²)	78
Elongation (%)	620
Specific Gravity	1.26

—Water Expansion Properties

Condition of Immersion : in city water at room temperature



P O Box 1219 • WALLER, TEXAS 77484-1219 • FAX 409 372-8897 • TELEPHONE 409 372-9185

DE NEEF Material Safety Data Sheet

SECTION I: PRODUCT IDENTIFICATION

Commercial Name: **SWELLSEAL R**

DE NEEF CONSTRUCTION CHEMICALS (U.S.), INC.
18314 Mathis Road
Waller, Texas 77484

EMERGENCY RESPONSE - CHEMTREC @ (800) 424-9300

SECTION II: INGREDIENTS

	C.A.S. No.	P.E.L.	Percent
Water-swelling rubber	Not Applicable	Not Applicable	Not Applicable

This product contains the following toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR part 372:

SECTION III: PHYSICAL DATA

Boiling Point:	Not Applicable	Viscosity:	Not Applicable
Melting Point:	Not Applicable	Odour Threshold:	Not Applicable
Density:	Not Applicable	Vapour Threshold:	Not Applicable
pH:	Not Applicable	V.O.C:	Not Applicable
Solubility in water @ 68°F:	Insoluable	Vapour Density:	Not Applicable
Appearance:	Solid	Evaporation Rate:	Not Applicable

SECTION IV: FIRE & EXPLOSION DATA

Flashpoint:	Not Applicable
Autoignition:	±750°F
Extinguishing media:	CO_2, foam, dry powder or halon
Special fire fighting procedures:	Full protective clothing; face shield and self-contained breathing apparatus
Special precautions:	At combustion - smoke, carbondioxide and nitrogenoxides will develop. Damps spread horizontally at ground level.

SECTION V: REACTIVITY DATA

☒ Stable ☐ Unstable

Conditions to avoid: Storage of open or sealed containers in moist or wet environment.
Materials to avoid: Water - which is catalyst for material.
Packaging to avoid: Open containers - moisture will catalyze material.

EMERGENCY RESPONSE - CHEMTREC (800) 424-9300

SECTION VI: TOXICOLOGICAL PROPERTIES

- ☐ Flammable
- ☒ Nonflammable
- ☐ Toxic
- ☒ Oxidizing
- ☐ Irritating
- ☐ Harmful
- ☐ Corrosive
- ☐ Carcinogenic
- ☒ Non-toxic
- ☐ Other

SECTON VII: PREVENTIVE MEASURES

Inorganic vapor mask in confined space, rubber gloves and impact/splash guard goggles.

- ☐ Mask (when insufficient ventilation)
- ☒ Goggles with splash guards
- ☐ Butyl rubber gloves
- ☐ Appropriate long sleeved protective clothing

Disposal: Material may be buried in sanitary landfill. All state and local regulations must be followed when disposing of waste.

SECTION VIII: EMERGENCY & FIRST AID PROCEDURES

EYES:	Holding eyes open, flush immediately with plenty of water. Consult an ophthalmologist.
SKIN:	Not Applicable
INGESTION:	Consult a physician.
INHALATION:	Not Applicable

SECTION IX: PREPARATION DATE OF MSDS

Prepared by:	Technical Services Department
Date:	October 10, 1996
Phone Number:	(409) 372-9185

EMERGENCY RESPONSE - CHEMTREC (800) 424-9300

Received Time Sep. 1. 3:15PM

2. Each panel's installation location relative to the stationing shown on the Drawings.

3. Each panel's vertical location relative to the existing ground surface and the silt foundation layer.

4. Identify each panel with a unique and sequential number.

5. Details for the interlock at angles in the wall.

B. Submit description of installation techniques and proposed equipment

C. Submit instructions and a work plan for the installation.

D. Submit example fabrication warrantee.

E. Submit example installation warrantee.

1.6 QUALITY ASSURANCE

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified techniques, equipment and methods proposed for performance of the barrier wall installation.

1.7 PERMITS

A. Comply with City of Everett Public Works Permit dated 7/1/98, permit # 98/192, approved for construction on 7/14/98.

1.8 CONTRACT CLOSE OUT

A. Accurately locate installed horizontal and vertical location of barrier wall on as-built Drawings.

1.9 DELIVERY STORAGE AND HANDLING

A. Ship barrier wall panels on dedicated modes of transportation with lifting straps attached.

B. Lift off of transportation vehicles using straps and place on a smooth surface that is free of rocks or other protrusions.

C. Cover to protect.

D. Store hydrophilic seal in their original boxes in a dry location protected from moisture.

1.10 SEQUENCING AND SCHEDULING.

A. Complete excavation of contaminated soil prior to beginning work in this section.

1.11 WARRANTY

A. Manufacturer: Provide manufacturer's warranty for barrier wall materials in compliance with provisions of the conditions of the contract. Provide a minimum 20-year, pro rata warranty for the material against deterioration due to exposure to the elements, either exposed or buried. The warranty for material must cover costs of material replacement and installation; assuming the site is rendered in a clean and unencumbered condition. In the event the area cannot be rendered as such, compensation for defective

material will be provided to the OWNER on a pro rata basis for the estimated cost to the OWNER at that time of supplying and installing material to a clean, and unencumbered condition by a third party.

B. Installation: Provide an installation warranty for barrier wall material in compliance with the conditions of the contract. Provide a minimum of 1-year, non-pro rata warranty for the installation against defects.

PART 2 PRODUCTS

2.1 MANUFACTURES

A. Approved manufacturer: GSE Lining Technology, Inc., 19103 Gundle Road, Houston, TX. Contact Chris Trevino, 1-800-435-2008, 281-230-8618, fax 281-230-8616.

B. Approved vertical barrier wall: GSE Gundwall HPDE.

2.2 GEOMEMBRANE PROPERTIES

Properties for 80-mil HDPE Geomembrane

Test	Test Designation	Requirements
Sheet Thickness	ASTM D 1593	80 mils minus 10% for any measurement and the average of all measurements for any roll, not less than 72 mils
Sheet Density	ASTM D 792 or D1505	0.940 - 0.950 g/cm2
Oxidation Induction Time of Polyolefins	ASTM D 3895, 200°C, 1 atm	Min. 100 minutes
Tensile Strength Yield	ASTM D 638	Min. 173 lb. per in. width
Elongation at Yield	ASTM D 638	Min. 13%
Elongation at Break	ASTM D 638	Min. 560% each sample
Strain at Break	GRI-GM-4	Min. 13%
Tear Resistance	ASTM D 1004, Die C	Min. 60 lb.
Puncture Resistance	FTMS-101B, Method 2065	Min. 105 lb.
Dimensional Stability (each direction)	ASTM D 1204, 212°F, 15 min.	2% max. change
Notched Constant Tensile Load Test	ASTM D5397	>200 hours @30% of yield stress
Low Temperature Brittleness	ASTM D-746, Procedure B	Minus 100°F
Carbon Black Content	ASTM D 1603	2 to 3%
Carbon Black Dispersion	ASTM D 3015-85 as modified by NSF Annex	A-1, A-2, B-1

A. Manufacturer Source Quality Control.

1. Perform the following manufacturer quality control tests on geomembrane products manufactured specifically for the barrier wall panels.

APPENDIX D.2

CONFORMANCE TEST DATA FOR THE BARRIER WALL

GSE

Roll Test Data Report

ROLL NO. AK-8118

ROLL DIMENSIONS ≈ ± 1%

ROLL NUMBER:	AK-8118	
PROD DATE:	10/17/98	
SHEET AREA:	8474	sq.ft.
	788	sq. meters
LENGTH:	355	feet
	108	meters
WIDTH:	23.87	feet
	7.3	meters
WEIGHT:	3411	pounds
	1547	kilograms

RESIN LOT INFORMATION

LOT NUMBER Z-61668
RESIN TYPE 600 SERIES

PROPERTY	UNITS	METHOD	RESULT
DENSITY	g/cc	D1505	0.935
MOISTURE	%	D570	< 0.09
BRITTLENESS	°C	D746	<-70
MELT INDEX	g/10 min.	D1238	0.610

PROPERTY	ASTM METHOD	ORDER MINIMUMS ENGLISH		ORDER MINIMUMS METRIC		ACTUAL TEST VALUES ENGLISH		ACTUAL TEST VALUES METRIC	
TENSILE YIELD STRENGTH	D638								
CD -		173	lb/in	31	kg/cm	199	lb/in	36	kg/cm
MD -		173		31		198		35	
YIELD ELONGATION	D638								
CD -		13	%			22	%		
MD -		13				19			
TENSILE BREAK STRENGTH	D638								
CD -		324	lb/in	59	kg/cm	470	lb/in	84	kg/cm
MD -		324		59		459		82	
ELONGATION	D638								
CD -		560	%			881	%		
MD -		560				821			
INITIAL TEARING STRENGTH	D1004								
CD -		60	lb	27	kg	65	lb	30	kg
MD -		60		27		66		30	
PUNCTURE STRENGTH	FTMS 101C/2065	105	lb	48	kg	130	lb	59	kg
SHRINKAGE	D1204								
CD -	(1 HR @ 100C)	+/-2.00	%			0.1	%		
MD -		+/-2.00				0.2			
CARBON BLACK DISPERSION	D3015	A2				A2			
CARBON BLACK CONTENT	D1603	2.00	%			2.52	%		
GEOMEMBRANE DENSITY	D1505			0.940	g/cc			0.945	g/cc
ESCR	D1693-B	1500	hours			Start 10/23/98			
THICKNESS	D1593/D751								
NOMINAL		80	mil	2.03	mm	80	mil	2.03	mm
MINIMUM		72		1.82		79		1.99	
AVG. THICKNESS						80		2.04	

TEST NOTES: MD=MACHINE DIRECTION CD=CROSS DIRECTION ESCR START DATE IS GIVEN
-FOR TENSILE ELONGATION TEST GAUGE LENGTH=1.3 ON YIELD, 2.5 ON BREAK
ALL STRENGTH VALUES BASED ON NOMINAL THICKNESS

APPROVED #3 10-18-98 QA

CUSTOMER:
JOB NO.
COMMENTS
20082028

DATE SHIPPED

STAR... Safety Through Accountability and Recognition

Mobil Polyethylene
Certificate of Analysis

"QUALITY PEOPLE MAKING QUALITY PRODUCTS"

DENISE ADAMS
GSE LINING TECHNOLOGY INC
19103 GUNDLE ROAD
HOUSTON, TX 77073

10/02/1998

Mobil Chemical, a major supplier of quality polyethylene, has shipped a lot of material to your facility. The lot identification and analyses are listed below. This data has been supplied by our Quality Control Laboratory located here in Beaumont. If you should need further information or another copy of this report, please call your sales office in EDISON, NJ Phone: (908)321-6000.

Resin Identification		Resin Analysis Test	Lot Data
Product Type	HDA601	Density (gms/cc)	0.935
Lot Number	Z-61668	Melt Index (gm/10 min)I2	0.61
Hopper Car Number	MBLX-053097		
Quantity Shipped	177,850 LB		
Date Manufactured	08/30/1998		
Delivery Note	0080040805		
Location Shipped To ALDINE, TX			

Thank you for your business. If you need additional assistance, please do not hesitate to contact our Sales Representative in your area.

CC: MP-EDISON

Fax To: (281) 230-2510 DENISE ADAMS
(281) 847-3885 JD
(281) 230-2510 DON BOHAC

Page 1 of 1

GSE

Roll Test Data Report

ROLL NO. AK-8620

ROLL DIMENSIONS ≈ ± 1%

ROLL NUMBER:	AK-8620	
PROD DATE:	11/01/98	
SHEET AREA:	8474	sq.ft.
	788	sq. meters
LENGTH:	355	feet
	108	meters
WIDTH:	23.87	feet
	7.3	meters
WEIGHT:	3405	pounds
	1544	kilograms

RESIN LOT INFORMATION

LOT NUMBER Z-61676
RESIN TYPE 600 SERIES

PROPERTY	UNITS	METHOD	RESULT
DENSITY	g/cc	D1505	0.934
MOISTURE	%	D570	< 0.09
BRITTLENESS	°C	D746	<-70
MELT INDEX	g/10 min.	D1238	0.610

PROPERTY	ASTM METHOD	ORDER MINIMUMS ENGLISH		METRIC		ACTUAL TEST VALUES ENGLISH		METRIC	
TENSILE YIELD STRENGTH	D638								
CD -		173	lb/in	31	kg/cm	195	lb/in	35	kg/cm
MD -		173		31		196		35	
YIELD ELONGATION	D638								
CD -		13	%			22	%		
MD -		13				20			
TENSILE BREAK STRENGTH	D638								
CD -		324	lb/in	59	kg/cm	376	lb/in	67	kg/cm
MD -		324		59		458		82	
'AK ELONGATION	D638								
CD -		560	%			618	%		
MD -		560				754			
INITIAL TEARING STRENGTH	D1004								
CD -		60	lb	27	kg	73	lb	33	kg
MD -		60		27		70		32	
PUNCTURE STRENGTH	FTMS 101C/2065	105	lb	48	kg	137	lb	62	kg
SHRINKAGE	D1204								
CD -	(1 HR @ 100C)	+/- 2.00	%			0.3	%		
MD -		+/- 2.00				0.2			
CARBON BLACK DISPERSION	D3015	A2				A2			
CARBON BLACK CONTENT	D1603	2.00	%			2.25	%		
GEOMEMBRANE DENSITY	D1505			0.940	g/cc			0.943	g/cc
ESCR	D1693-B	1500	hours	Start 11/06/98					
THICKNESS	D1593/D751								
NOMINAL		80	mil	2.03	mm	80	mil	2.03	mm
MINIMUM		72		1.82		77		1.95	
AVG. THICKNESS						80		2.02	

TEST NOTES: MD=MACHINE DIRECTION CD=CROSS DIRECTION ESCR START DATE IS GIVEN
-FOR TENSILE ELONGATION TEST GAUGE LENGTH=1.3 ON YIELD, 2.5 ON BREAK
ALL STRENGTH VALUES BASED ON NOMINAL THICKNESS

APPROVED WS #8 11·1·98 QA

STOMER:
JOB NO.
COMMENTS

DATE SHIPPED

20082111

GSE

Roll Test Data Report

ROLL NO. AK-8621

ROLL DIMENSIONS ≈ ± 1%

ROLL NUMBER:	AK-8621	
PROD DATE:	11/01/98	
SHEET AREA:	8474	sq.ft.
	788	sq. meters
LENGTH:	355	feet
	108	meters
WIDTH:	23.87	feet
	7.3	meters
WEIGHT:	3402	pounds
	1543	kilograms

RESIN LOT INFORMATION

LOT NUMBER Z-61676
RESIN TYPE 600 SERIES

PROPERTY	UNITS	METHOD	RESULT
DENSITY	g/cc	D1505	0.934
MOISTURE	%	D570	< 0.09
BRITTLENESS	°C	D746	<-70
MELT INDEX	g/10 min.	D1238	0.610

PROPERTY	ASTM METHOD	ORDER MINIMUMS ENGLISH	ORDER MINIMUMS METRIC	ACTUAL TEST VALUES ENGLISH	ACTUAL TEST VALUES METRIC
TENSILE YIELD STRENGTH	D638				
CD -		173 lb/in	31 kg/cm	199 lb/in	36 kg/cm
MD -		173	31	197	35
YIELD ELONGATION	D638				
CD -		13 %		23 %	
MD -		13		20	
TENSILE BREAK STRENGTH	D638				
CD -		324 lb/in	59 kg/cm	403 lb/in	72 kg/cm
MD -		324	59	458	82
:AK ELONGATION	D638				
CD -		560 %		660 %	
MD -		560		762	
INITIAL TEARING STRENGTH	D1004				
CD -		60 lb	27 kg	73 lb	33 kg
MD -		60	27	71	32
PUNCTURE STRENGTH	FTMS 101C/2065	105 lb	48 kg	138 lb	63 kg
SHRINKAGE	D1204				
CD -	(1 HR @ 100C)	+/-2.00 %		0.3 %	
MD -		+/-2.00		0.2	
CARBON BLACK DISPERSION	D3015	A2		A2	
CARBON BLACK CONTENT	D1603	2.00 %		2.25 %	
GEOMEMBRANE DENSITY	D1505		0.940 g/cc		0.943 g/cc
ESCR	D1693-B	1500 hours		Start 11/06/98	
THICKNESS	D1593/D751				
NOMINAL		80 mil	2.03 mm	80 mil	2.03 mm
MINIMUM		72	1.82	78	1.97
AVG. THICKNESS				80	2.02

TEST NOTES: MD=MACHINE DIRECTION CD=CROSS DIRECTION ESCR START DATE IS GIVEN
-FOR TENSILE ELONGATION TEST GAUGE LENGTH=1.3 ON YIELD, 2.5 ON BREAK
ALL STRENGTH VALUES BASED ON NOMINAL THICKNESS

APPROVED WS #8 11-1-98 QA

STOMER:
JOB NO.
COMMENTS

DATE SHIPPED

20082111

STAR... Safety through Accountability and Recognition

Mobil Polyethylene

Certificate of Analysis

"QUALITY PEOPLE MAKING QUALITY PRODUCTS"

DENISE ADAMS
GSE LINING TECHNOLOGY INC
19103 GUNDLE ROAD
HOUSTON, TX 77073

10/13/1998

Mobil Chemical, a major supplier of quality polyethylene, has shipped a lot of material to your facility. The lot identification and analyses are listed below. This data has been supplied by our Quality Control Laboratory located here in Beaumont. If you should need further information or another copy of this report, please call your sales office in EDISON, NJ Phone: (908)321-6000.

Resin Identification		Resin Analysis Test	Lot Data
Product Type	HDA601	Density (gms/cc)	0.934
Lot Number	Z-61676	Melt Index (gm/10 min) I2	0.61
Hopper Car Number	MBLX-053498		
Quantity Shipped	191,200 LB		
Date Manufactured	08/31/1998		
Delivery Note	0080041539		
Location Shipped To	ALDINE, TX		

Thank you for your business. If you need additional assistance, please do not hesitate to contact our Sales Representative in your area.

CC: MP-EDISON

Fax To: (281) 230-2510 DENISE ADAMS
(281) 847-3885 JD
(281) 230-2510 DCN BCHAC

Rcvd. 12/4/98

WRS
Infrastructure & Environment, Inc.

12833 NE Airport Way
Portland, OR 97230
(503) 252-0277
Fax: (503) 252-0312

LETTER OF TRANSMITTAL

To: Stuart Triolo, Project Manager
Weyerhaeuser Company
101 East Marine View Drive
Everett, WA 98201
Phone: 425-339-2871
Fax: 425-339-2786

From: Alex Soo, Program Manager
Alex Soo 12/3/98

Date: December 3, 1998
Transmittal No. **Technical-010A**
Project Name: Weyerhaeuser Mill E/Koppers Site, Everett, WA
Client's Ref. #: 98-00094
Contractor: WRS Infrastructure & Environment, Inc.
WRS Job #: 4412-98-4057
Subcontractor: Western Geo-Constructors, Inc.
Supplier: GSE Lining Technology, Inc.

We are sending: ☑ Attached ☐ Under Separate Cover
Via: ☐ U.S. Mail ☐ Express Delivery ☑ Facsimile Page 1 of 2

The following:
☐ Correspondence ☐ Plans ☐ Progress Payments
☐ Drawings ☐ Samples ☐ Specifications
☑ Submittal ☐ Change Order ☐ Subcontractor
☐ Schedule ☐ _____ ☐ _____

Dated	Quantity	Description	Ref. Section
12/3/98	1 fax copy	Oxidative Induction Time (OIT) test results for the resins used in the production of the GSE 80 mil Gundwall and 40 mil HDPE geomembrane.	02179, Barrier Well and 02771, Geomembrane.

These are transmitted:

☑ For Approval ☐ For Review and Comment ☑ As Requested
☐ For Your Use ☐ Approved As Noted ☐ Returned For Corrections
☑ For Your File ☐ Approved As Submitted ☐ Returned With Corrections

Remarks:

cc: Brian O'Neal, P.E., EMCON Project Coordinator
Randy Richardson, WRS Site Manager
WRS Job File

REVIEW OF SUBMITTALS
☒ NO EXCEPTIONS TAKEN
☐ NOTE MARKINGS
☐ REVISE & RESUBMIT
By Stuart Triolo Date 12/14/98
Weyerhaeuser Construction Co.

GSE Lining Technology, Inc.

Report Date
03-Dec-98

Oxidative Induction Time (OIT)
ASTM D 3895 (200°C, 1 ATM)

MR#: 4398-01
Job#: G03139

Roll No.	Railcar No.	Product Code	Results [minutes]
MBLX53097	Z61668	HDA601	>150
MBLX53498	Z61676	HDA601	>150
PSPX6350	7181215	TR400GS	>140

APPROVED
#21
12/3/98
QA

TOTAL P.02

Recd. 12/4/98

WRS
Infrastructure & Environment, Inc.

12833 NE Airport Way
Portland, OR 97230
(503) 252-0277
Fax: (503) 252-0312

LETTER OF TRANSMITTAL

To: Stuart Triolo, Project Manager
Weyerhaeuser Company
101 East Marine View Drive
Everett, WA 98201
Phone: 425-339-2871
Fax: 425-339-2786

From: Alex Soo, Program Manager
Alex Soo, 12/4/98

Date: December 4, 1998
Transmittal No. Technical-010B
Project Name: Weyerhaeuser Mill E/Koppers Site, Everett, WA
Client's Ref. #: 98-00094
Contractor: WRS Infrastructure & Environment, Inc.
WRS Job #. 4412-98-4057
Subcontractor: Western Geo-Constructors, Inc.
Supplier: GSE Lining Technology, Inc.

We are sending: ☑ Attached ☐ Under Separate Cover
Via: ☐ U.S. Mail ☐ Express Delivery ☑ Facsimile Page 1 of 2

The following:

☐ Correspondence	☐ Plans	☐ Progress Payments
☐ Drawings	☐ Samples	☐ Specifications
☑ Submittal	☐ Change Order	☐ Subcontractor
☐ Schedule	☐ _____	☐ _____

Dated	Quantity	Description	Ref. Section
12/4/98	1 fax copy	GSE's letter confirming "welding compatibilities" of the 40 mil HD (Geomembrane) and 80 mil HyperFlex (Gundwall/Barrier Wall).	02179, Barrier Wall and 02771, Geomembrane

These are transmitted:

☑ For Approval	☑ For Review and Comment	☑ As Requested
☐ For Your Use	☐ Approved As Noted	☐ Returned For Corrections
☐ For Your File	☐ Approved As Submitted	☐ Returned With Corrections

Remarks:
GSE HD (HDPE Geomembrane) and GSE HyperFlex (Premium Grade HDPE Geomembrane) are trademarks of GSE Lining Technology, Inc.

cc: Brian O'Neal, P.E., EMCON Project Coordinator
Randy Richardson, WRS Site Manager
WRS Job File

REVIEW OF SUBMITTALS
☒ NO EXCEPTIONS TAKEN
☐ NOTE MARKINGS
☐ REVISE & RESUBMIT
By Stuart Triolo Date 12/14/98
Weyerhaeuser Construction Co.

GSE Lining Technology, Inc.

18103 Gundle Road
Houston, Texas 77073
800-435-2008
281-443-8564
Fax: 281-230-8650

December 4, 1998

Westinghouse Remediation Service
12833 N.E. Airport Way
Portland, OR 97230

Attn: Alex Soo
RE: Welding compatibilities

The welding of GSE HD to GSE HyperFlex is an acceptable procedure and adequate welding values can be expected under proper welding parameters.

If there are any further questions, please do not hesitate to contact myself or Chris Trevino.

Regards,

David M. Camp
Technical Support

281/230-6789
davec@gseworld.com

APPENDIX D.3

GEOMEMBRANE FLAP TESTING

GSE®

Quality Control Certificate

RAILCAR : 7181215
MATERIAL : HDPE 040 MIL
BATCH # : 100298
ROLL # : 06032693

MANF. DATE : 10/02/1998
PROJECT NAME : GSE FABRICATION
MR NUMBER : 8990-31 PROJECT # : G03038
LOCATION : HOUSTON TX 001

TEST PARAMETER	TESTING FREQUENCY	TYPICAL SPECIFICATIONS	TEST RESULTS	ASTM METHOD
Average Thickness (mil)	EVERY ROLL	40.0 min	40.0	D 751 NSF 54 Mod.
Carbon Black (%)	5TH ROLL	2.0 to 3.0	2.4	D 1603
Carbon Black Dispersion	5TH ROLL	A-1/A-2/B-1	A-2	D 3015
Density (g/cc)	5TH ROLL	0.940 min	0.948	D 1505 (Meth.A)
Tensile Properties:				
Yield Strength (ppi)	EVERY ROLL	86	118	
Break Strength (ppi)	EVERY ROLL	162	212	D 638 Type IV
Elongation @ Yield	EVERY ROLL	13	17	
Break Elongation (%)	EVERY ROLL	560	628	NSF 54 Mod.
Puncture Resistance (lb)	EVERY ROLL	52	81	FTMS 101, Meth. 2065
Tear Resistance (lb)	EVERY ROLL	30	34	D 1004
Dimensional Stability (%)	EVERY ROLL	-2.00 to 2.00	-0.50	D 1204 (1 hr, 100C)
ESCR (hrs)	EVERY ROLL	1500 min	Pending	D 1693 NSF MOD.

APPROVED CM #23 11-25-98 QA

RC

PHILLIPS CHEMICAL COMPANY
A DIVISION OF PHILLIPS PETROLEUM COMPANY
BOX 792 • PHONE: 713 475-3666
PASADENA, TEXAS 77501-0792

PHILLIPS PLASTICS RESINS
Houston Chemical Complex

September 03, 1998

JHV# 19515-98

FAX: 281-230-2510

GSE Lining Technology, Inc.
19103 Gundle Road
Houston, TX 77073

Rick Schaefer

A shipment of Marlex* resin was recently sent to you by Phillips Chemical Company. Data on the shipment are listed below.

Type:	HHM TR-400GS
Lot Number:	7181215
P.O. Number:	STOCK
Date Shipped:	09/02/98
Package:	PSPX 6350
Quantity:	190650 LBS.
Melt Index, ASTM D1238:	.070 G/10 MIN
HLMI Flow Rate,ASTM D1238:	12.4 G/10 MIN
Density, ASTM D1505:	.937 G/CC
HLMI/MI Ratio:	177.
Production Date:	08/31/98
ESCR, F/50, Cond. B:	1500 HOURS **
Brittleness Temperature:	<-70 C **
Color:	141.000

205307

J. H. Vaden
Quality Assurance Manager

For COA questions call Sharon Robinette, 713-475-3625

* Reg. U.S. Pat. Off.
** Nominal Value (not tested on each lot)

cc: QA-File-RC

EMCON

Conformance Sample Test Results

Project: WEYERHAUSER MILL-E/KOPPERS Proj. No. 40141.037.123

Client: EMCON NW Date: 12-4-98

Sample ID: 400 MR#4398-01 Material: 40 ML SMOOTH HDPE

Test	Readings					Average
Thickness (mils) ASTM D5994	42.25	40.25	41.35	42.55	40.60	
	43.95	42.80	41.70	42.10	44.35	42.19

Density (g/cm3) ASTM D792	Specimen 1	Specimen 2	Specimen 3	Average
	0.9513	0.9537	0.9509	0.9520

Tensile Properties: ASTM D638		Specimen 1	Specimen 2	Specimen 3	Specimen 4	Specimen 5	Average
Tensile Strength							
Yield (ppi)	Direction A	122.7	124.7	118.2	121.5	122.5	121.9
	Direction B	113.7	113.7	112.5	111.7	104.7	111.3
Break (ppi)	Direction A	226.0	208.2	192.7	219.5	211.7	211.6
	Direction B	202.2	223.0	214.7	203.7	202.2	209.2
Elongation							
Yield %	Direction A	15.8	16.5	16.5	14.3	16.5	15.9
	Direction B	18.8	17.3	17.3	17.3	16.5	17.4
Break %	Direction A	860.0	795.0	745.0	830.0	805.0	807.0
	Direction B	750.0	805.0	800.0	770.0	780.0	781.0

Carbon Black, % ASTM D1603	Specimen 1	Specimen 2	Specimen 3	Average
	2.669	2.610	2.561	2.613

Carbon Black Dispersion ASTM D3015/D2663	Specimen 1	Specimen 2	Specimen 3	Specimen 4	Specimen 5	Specimen 6
	A-1	A-1	A-1	A-1	A-2	A-1

Remarks: Tensile Properties:

1. Grip separation of 2.5".
2. Assumed gauge length of 1.3" and 2.0" for yield and break elongations, as instructed.
3. Direction A = Machine Direction
   Direction B = Cross-Machine Direction

Tested by: KH/NB
Entered by: KH
Checked by: RSA

Weld Temperatures & Strength Test

Date	Time	Operator	Welder #	Temperatures (F) Barrel	Nozzle	Panel	Peel (ppi)	Shear (ppi)	Notes
3/31	0830	Pete /TW2	40	400°	355°	60°	116	116	80-40 TW-2
3/31	08:42	Danny /TW3	40	400°	358°	60°	80	94	TW-3
3/31	08:55	Pete / TW4	40	400°	355°	60°	106	93	40-40 40-40
3/31	~~1030~~ 9:50	Pete	40	425°	375°	62°			DS-1
3/31	10:30		40	475°	445°	60°			
3/31	12:45		40	450°	405°	60°			
3/31	12:45	Pete TW5	40	450°	405°	60°	94	93	80-40
3/31	12:45	Danny TW6	40	425°	380°	60°	90	96	40-40
3/31	2:45		40	425°	390	62°			
4/1	0755		40	375°	330°	48°			
4/1	0800	Danny / TW7	40	400°	380°	48°	Failed	103	40-80
4/1	0805	Danny /TW8	40	400°	380°	48°	96	105	40-4
4/1	0930	Danny / TW9	40	450°	405°	60°	83	106	40-80
4/1	1030		40	410°	315°	66°			
4/1	1230		40	380°	305°	68°			
4/1	12:50	Pete / TW-10	40	400°	320°	68°	77	85	40-40
4/1	12:55	Danny / TW-11	40	400°	320°	68°	67	108	40-80
4/1	230		40	405°	330°	68°			
4/2	0730		40	450°	405°	48°			
4/2	0730	Danny / TW12	40	450°	405°	46°	108	115	40-80
4/2	0740	Pete / TW-13	40	400°	360°	48°	92	104	40-40
4/2	0945		40	360°	320°	62°			
4/2	12:30	Pete M. TW-14	40	400°	360°	60°	100	104	40-40
	12:40	D. Collins TW-15	40	405°	380°	60°	105	125	40-80
4/2	2:40	P. [illegible]	40	300°	29[illegible]°	58°			
4/5	0800		40	330°	300°	48°			
4/5	0800	Pete / TW16	40	330°	300°	48°	110	95	40-40
4/5	0805	Danny /TW-17	40	360°	330°	48°	121	117	40-80
4/5	1000		40	340°	310°	58°			
4/5	12:30	Danny /TW-18	40	320°	300°	68	100 AD	125	40-40
4/5	12:50	Danny TW-19	40	340°	320°	68	Failed ~~AD~~	132	40-80
4/5	1:30	Danny TW-19	40	340°	320°	68	117	100	40-80
4/5	3:30		40	360°	330°	64			
4/6	0740	Pete /TW-20	40	360°	330°	46°	67 Fail AD	127	40-80
4/6	0745	Danny / TW-21	40	360°	380°	46°	80	120	40-40
4/6	0820	Pete / TW-20A	40	350°	330°	48°	124	121	40-80
4/6	1030		40	370°	340°	56°			
4/6	1250	Pete / TW-22	40	375°	350°	64°	128	106	40-80
4/6	1250	Danny / TW-23	40	375°	350°	64°	93	109	40-40
4/6	3:30		40	375°	340°	60°			
4/6	5:30		40	340°	310°	58°			
4/7	0725		40	375°	350°	48°			
4/7	0730	Pete /TW-24	40	375°	350°	48	Failed		40-80
4/7	0740	Danny TW-25	40	350°	330°	48	Failed		40-40
4/7	0820	Pete / TW-24A	40	400°	380°	48	120	122	40-80
4/7	0830	Danny / TW-25A	40	400°	380°	48	104	101	40-40
4/8	1045	Danny / TW-26	40	400°	370°	48°	107	115	40-80
~~4/8~~	~~10:50~~	~~Pete / TW-27~~	~~40~~	~~400~~	~~370~~	~~46°~~	~~Not Needed~~		

Weld Temperatures & Strength Test

Date	Time	Operator	Welder #	Temperatures (F)			HDPE	Strength Test	
				Barrel	Nozzle	Panel	Types	Peel (ppi)	Shear (ppi)
4/8	12:30		40	425°	380°	58°			
4/8	2:30		40	400°	360°	56°			
4/8	4:30		40	off-site					
4/9	0730		40	400°	370°	48°			
4/9	0730	Danny/TW-27	40	400°	370°	48°	40-80	114	122
4/9	0740	Danny/TW-29	40	400°	370°	48°	40-40	118	114
4/9	0930		40	380°	350°	52°			
4/9	1120		40	410°	390°	54°			
4/9	1:00	Danny/TW-29	40	380°	350°	58°	40-80	115	131
4/9	1:00	Danny/TW-30	40	380°	350°	58°	40-40	95	123
4/12	0800	Pete/TW-31	40	380°	360°	48°	40-40	AD-2	120
4/12	0815	Danny/TW32	1364	360°	355°	48°	40-80	122	144
4/12	0820	Pete/TW-33	1364	380°	355°	48°	40-40	106	110
4/12	0830	Danny/TW-31A	40	360°	340°	48°	40-40	92	137
4/12	10:30		1364	360°	340°	46°			
4/12	12:45	Danny/TW-34	1364	360°	340°	52°	40-80	116	119
4/12	1:50	Pete/TW-35	40	400°	370°	52°	40-80	128	134
4/12	3:50		40	380°	360°	52°			
4/12	5:00		40	350°	320°	52°			
4/13	0730	Pete/TW-36	40	400°	380°	48°	40-80	140	141
4/13	0800	Danny/TW-37	1364	410°	390°	48	40-40	61/AD-1	
4/13	0900	Danny/TW-37A	40	360°	340°	50°	40-40	93	112
4/13	1100		40	360°	350°	52°			
4/13	1:00	Pete/TW38	40	390°	360°	74°	40-80	108	125
4/13	1:10	Danny/TW-39	40	390°	360°	74°	40-40	89	107
4/13	3:00		40	350°	330°	76°			
4/13	4:45		40	360°	335°	76°			
4/14	0730	Pete/TW-40	1364	410°	390°	48°	40-80	138	125
4/14	0730	Pete/TW-41	1364	410°	390°	48°	40-40	99	129
4/14	0745	Danny/TW-42	40	500°	480°	48°	40-80	128	130
4/14	0800	Danny/TW-43	40	450°	430°	48°	40-80	94	119
4/14	0900	Pete/DS-2	1364	498°	460°	52°	40-80	123	107
4/14	10:30		40	380°	360°	72°			
4/14	11:00		1364	450°	430°	72°			
4/14	12:45	DC/TW145	1364	490°	460°	72°	40-80	102	99
4/14	1:00	DC/TW144	40	500°	475°	72°	40-40	87	104
4/14	3:00		1364	497°	450°	72°			
4/14	3:05		40	501°	460°	72°			
4/15	7:20	Pete/TW-46	1364	415°	390°	54°	40-80	118	96
4/15	7:30	Danny/TW-47	40	400°	380°	54°	40-40	79	99
4/15	9:30		1364	425°	390°	64°			
4/15	11:15		1364	415	390°	72°			

Weld Temperatures & Strength Test

Date	Time	Operator	Welder #	Temperatures (F)			Peel (ppi)	Shear (ppi)	
				Barrel	Nozzle	Panel			
4/15	11:15		40	410°	370°	72°			
4/15	1:00	DE / TW-48	40	400	375°	72°	91 AD-1		
4/15	1:20	DE / TW-48A	40	425°	400°	72°	88	90	
4/15	3:20		40	435°	410°	78°			
4/16	7:20	DE/ TW-50	40	375°	350°	52°	86	93	40-50
4/16	7:30	Pete. TW-49	1364	400°	380°	52°	95	101	40-40
4/16	9:30		40	400°	360°	68°			
4/16	9:30		1364	390°	370°	68°			
4/16	11:30		40	400°	370°	74°			
4/16	1:30	Pete TW/51	1364	450°	430°	86°	83	89	40-80
4/16	1:30	DE TW/52	40	400°	380°	86°	77	80	40-40
4/16	3:30		40	375°	360°	86°			
4/16	3:30		1364	410°	390°	86°			
4/17	8:00	PJM TW/53	1364	420°	390°	69°	88	99	40/40
~~4/17~~	~~8:00~~								
4/17	12:45	PJM TW/54	1364	390°	370°	85°	73	72	40/40
4/19	7:30	TW-55	1364	←			88		40/40
4/20	7:5	TW-56	1364	(No 40/80 welds performed) failed					40/80 mix sent
4/20	8:	TW-56A	1364	called out early					
				No welds performed on 4/20 - too windy					

Weld Temperatures & Strength Test

Date	Time	Operator	Welder #	Temperatures (F)			Peel (ppi)	Shear (ppi)
				Barrel	Nozzle	Panel		
4-21-99 TW-57	7:~~15~~	RJW TW-57	1364	400	380	48	#88	106
-21 TW-58	7:40	DC TW-58	40	450	430	48	117	114
4-21-99	9:30	RJW	1364	410	390	68	—	—
4-21-99	9:30	DC	40	430	400	68	—	—

APPENDIX D.4

GCL FLAP TESTING

MEMORANDUM

TO: Stuart Triolo
Weyerhaeuser

DATE: May 19, 1999
PROJECT: 40141-037.123

FROM: Kent Wiken, P.E.
EMCON

Via Facsimile - 6 pages (425)339-2786

RE: Approval of Geosynthetic Clay Liner (GCL)
Weyerhaeuser Mill E/Koppers Site Remediation

I have reviewed the preconstruction submittals for the provided by CECon on 4/28/99 (54pages) and reviewed our independent laboratory testing results of the GCL delivered to the site (attached). Based on the submittals and test results, the GCL delivered to the site meets or exceeds the project specifications and therefore is approved for use on the project.

Please do not hesitate to call if you have any questions.

cc: Brian O'Neal, Pete Seybert, Russell Stolsen - EMCON.

B\K:\MILLEGCL.DOC-95\ kwiken:1

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 428 • Lovell, Wyoming 82431
(307) 548-6521 • Fax (307) 548-6413

27-Oct

Mr. Steve Gordner,
Northwest Linings & Geotextile Prod. Inc.
21000 77th. Ave. South
Kent, WA. 98032
253-872-0244

Dear Mr. Steve Gordner,

Please find enclosed the MQA/MQC Data Package for BENTOMAT DN shipments to Northwest Linings & Geotextile Prod. Inc.. These shipments left our CETCO - Lovell, Wy. plant on 10/26.

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Moses Briseno @ 800-322-1149 (Ext: 421).

Sincerely,

Noe Garcia
Quality Assurance

BENTOMAT DN

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: Cedar Hills Landfill

CUSTOMER P.O.: C-15

JOB NUMBER:

PREPARED FOR: Northwest Linings & Geotextile Prod. Inc.
21000 77th. Ave. South
Kent, WA. 98032

Telephone # : 253-872-0244

PREPARED BY:

Noe Garcia
Quality Assurance
CETCO
P.O. Box 428
92 Hwy. 37
Lovell, Wy. 82431

Telephone #: 800-322-1149 (Ext. 423)
Fax #: (307)548-6927, (307)548-6413
E-Mail: cetco3@trib.com

BENTOMAT DN

DAILY MANUFACTURING QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	Cedar Hills Landfill
Prepared For:	Northwest Linings & Geotextile Prod. Inc.
Job Number:	
Customer PO:	C-15
Order Number:	89991, 96035
Ship Date:	10/26

CONTENTS:

DAILY BENTOMAT DN PRODUCTION
PRODUCTION CERTIFICATION

BENTOMAT DN
MANUFACTURING CERTIFICATION

Project Name:	Cedar Hills Landfill
Prepared For:	Northwest Linings & Geotextile Prod. Inc.
Job Number:	
Customer PO:	C-15
Order Number:	89991, 96035
Ship Date:	26-Oct

Colloid Environmental Technologies Company (CETCO) hereby affirms and certifies that all of the BENTOMAT DN manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheet.

Steve Wilkerson
Production Coordinator

Subscribed and sworn to before me this 27th day of Oct. 1998.

Susie Finke
Notary-Public

SUSIE FINKE - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-20-2001

NEEDLE DETECTION CERTIFICATION

CERTIFICATION STATEMENT

Project Name:	Cedar Hills Landfill
Prepared For:	Northwest Linings & Geotextile Prod. Inc.
Job Number:	
Customer PO:	C-15
Order Number:	89991, 96035
Ship Date:	26-Oct

This statement is to certify that all components of the BENTOMAT DN manufactured for the above project have been inspected continually for the presence of broken needles through the use of a magnetic removal system.

COLLOID ENVIRONMENTAL TECHNOLOGIES CO. (CETCO)

Subscribed and sworn to before me this 27th day of Oct. 1990.

NOTARY PUBLIC

SUSIE FINK NOTARY PUBLIC
COUNTY OF BIG HORN STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

BENTONITE CLAY CERTIFICATIONS

TECHNICAL DATA SHEET

ORIGIN INFORMATION

BENTONITE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

Facility: **Colloid Environmental Technologies Co.**
92 HWY. 37
Lovell, WY 82431

Contact: Jay Bischoff (800)-322-1159

Brand Name: CG-50

NON-WOVEN GEOTEXTILE MANUFACTURER'S CERTIFICATION

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Northwest Linings & Geotextile Prod. Inc.** DATE: **8/27/98**

ATTN: **Mr. Steve Gordner,**

Dear Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO**, Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **082798B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**27.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.4**
Moisture	ASTM D 2216	12.0 % (MAX)	**9.0**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.7**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures.
Product made in the U.S.A.

Tests Conducted By: **R.P., S.F., M.G.**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
89991, 96035

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: Northwest Linings & Geotextile Prod. Inc. DATE: 9/9/98

ATTN: Mr. Steve Gordner,

Dear Customer:
The BENTONITE that is used to produce our GCL is CG 50 from CETCO, Order Number See Below

A sample of the CG 50 was tested from Lot Number 090998B and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**27.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**13.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.7**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: R.P., S.F., M.G.

Approved By: Noe Garcia

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
89991, 96035

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Northwest Linings & Geotextile Prod. Inc.**

DATE: **9/9/98**

ATTN: **Mr. Steve Gordner,**

Dear Customer:

The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO**, Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **090998B1** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**25.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**12.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**6.8**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.8**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: **R.P., S.F., M.G.**

Approved By: **Noe Garcia**

any correspondence regarding this shipment, please refer to our Order Numbers listed below.

89991, 96035

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: Northwest Linings & Geotextile Prod. Inc.

DATE: 9/11/98

ATTN: Mr. Steve Gordner,

Dear Customer:

The BENTONITE that is used to produce our GCL is CG 50 from CETCO, Order Number See Below

A sample of the CG 50 was tested from Lot Number 091198B and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	0
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	27.0
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	15.6
Moisture	ASTM D 2216	12.0 % (MAX)	8.2
Passing 200 Mesh	ASTM D 421	1 % (Max)	0.4

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: R.P., S.F., M.G.

Approved By: Noe Garcia

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
89991, 96035

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **Northwest Linings & Geotextile Prod. Inc.** DATE: **9/11/98**

ATTN: **Mr. Steve Gordner,**

Dear Customer:
The BENTONITE that is used to produce our GCL is **CG 50** from **CETCO,** Order Number **See Below**

A sample of the CG 50 was tested from Lot Number **091198B1** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Results ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Free Swell	ASTM D 5890	24 MLS. / 2g MIN.	**26.0**
Fluid Loss	ASTM D 5891	18.0 MLS (MAX)	**14.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.4**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.6**

We hereby certify that the results shown above represent this shipment. Tests were conducted using American Standard Test Methods and/or customer approved laboratory procedures. Product made in the U.S.A.

Tests Conducted By: R.P., S.F., M.G.

Approved By: Noe Garcia

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
89991, 96035

TECHNICAL DATA SHEET

ORIGIN INFORMATION

NON-WOVEN GEOTEXTILE

Manufacturer: **Synthetic Industries Inc.**

PRODUCTION

Facility: **Synthetic Industries**
4019 Industry Drive
Chattanooga, TN. 37416

Contact: Sid Weiser

Brand Name: Geotex 651

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

August 28, 1998

Cetco WY
Noe Garcia
PO BOX 428
Lovell, WY 82431
BoL; 624916 PO 77348

This is to certify that Product GEOTEX™ 651, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level. This geotextile has been continuously inspected for the presence of needles and none were detected.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS	S.I. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2	200 g/m^2
Thickness	ASTM D-5199	80 mils	2.0 mm
Tensile Strength	ASTM D-4632	170 lbs	755 N
Elongation	ASTM D-4632	50 %	50 %
Trapezoidal Tear	ASTM D-4533	70 lbs	310 N
Mullen Burst	ASTM D-3786	330 psi	2275 Kpa
Puncture Strength	ASTM D-4833	110 lbs	485 N
AOS	ASTM D-4751	70 US Standard Sieve	0.212 mm
Permittivity	ASTM D-4491	1.3 sec^{-1}	1.3 sec^{-1}
Permeability	ASTM D-4491	0.24 cm/sec	0.24 cm/sec
Flow Rate	ASTM D-4491	110 gpm/ft^2	4480 lpm/m^2
U V Resistance	ASTM D-4355	70 %	70 %

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely,

Sid Weiser

Sid Weiser
Technical Manager
Performance Nonwovens Division

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

09/02/98

Synthetic Industries
Individual Roll Data
Bill of Lading:624916

12:42 Page 1

Roll Number	Style	Mass/ Unit Osy D5261	Lab Thick mils D5199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
6056367A	651	6.7	93	205	219	65	69	108	119	401	131
6056371A	651	6.8	95	217	224	65	74	106	115	384	114
6056375A	651	7.0	95	219		65		114		381	123
6056388A	651	6.8	89	249	234	67	70	115	125	359	125
6056400A	651	6.6	89	221	208	65	71	113	130	384	125
6056404A	651	6.5	87	214	216	62	72	121	116	391	114
6056409A	651	6.2	92	190		61		83		347	
6056412A	651	7.1	97	224		65		106		436	120

Sid Wessin

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include data from rolls which were not shipped. However, the data provided is from the same production run as the rolls actually shipped on this bill of lading.

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

August 28, 1998

Cetco WY
Noe Garcia
PO BOX 428
Lovell, WY 82431
Bol.; 624903 PO R-77353

This is to certify that Product GEOTEX™ 651, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level. This geotextile has been continuously inspected for the presence of needles and none were detected.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS	S.I. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2	200 g/m^2
Thickness	ASTM D-5199	80 mils	2.0 mm
Tensile Strength	ASTM D-4632	170 lbs	755 N
Elongation	ASTM D-4632	50 %	50 %
Trapezoidal Tear	ASTM D-4533	70 lbs	310 N
Mullen Burst	ASTM D-3786	330 psi	2275 Kpa
Puncture Strength	ASTM D-4833	110 lbs	485 N
AOS	ASTM D-4751	70 US Standard Sieve	0.212 mm
Permittivity	ASTM D-4491	1.3 sec^{-1}	1.3 sec^{-1}
Permeability	ASTM D-4491	0.24 cm/sec	0.24 cm/sec
Flow Rate	ASTM D-4491	110 gpm/ft^2	4480 lpm/m^2
U V Resistance	ASTM D-4355	70 %	70 %

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely,

Sid Weiser

Sid Weiser
Technical Manager
Performance Nonwovens Division

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

Synthetic Industries
Individual Roll Data
Bill of Lading:624903

Roll Number	Style	Mass/ Unit Osy D5261	Lab Thick mils D5199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap Tear (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
6056384A	651	6.5	87	228	219	64	71	108	133	356	117
6056421A	651	6.4	91	216	216	63	74	97	109	371	112
6056424A	651	6.5	93	212	212	62	68	91	113	403	117
6056428A	651	6.8	89	219	226	64	69	107	124	383	113
6056432A	651	7.0	91	223	239	63	68	110	128	419	127
6056461A	651	6.4	93	222	218	63	71	98	119	360	126

Sid Wesson

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include data from rolls which were not shipped. However, the data provided is from the same production run as the rolls actually shipped on this bill of lading.

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

September 2, 1998

Cetco WY
Noe Garcia
PO BOX 428
Lovell, WY 82431
BoL; 624924 PO 77348

This is to certify that Product GEOTEX™ 651, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level. This geotextile has been continuously inspected for the presence of needles and none were detected.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS	S.I. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2	200 g/m^2
Thickness	ASTM D-5199	80 mils	2.0 mm
Tensile Strength	ASTM D-4632	170 lbs	755 N
Elongation	ASTM D-4632	50 %	50 %
Trapezoidal Tear	ASTM D-4533	70 lbs	310 N
Mullen Burst	ASTM D-3786	330 psi	2275 Kpa
Puncture Strength	ASTM D-4833	110 lbs	485 N
AOS	ASTM D-4751	70 US Standard Sieve	0.212 mm
Permittivity	ASTM D-4491	1.3 sec^{-1}	1.3 sec^{-1}
Permeability	ASTM D-4491	0.24 cm/sec	0.24 cm/sec
Flow Rate	ASTM D-4491	110 gpm/ft^2	4480 lpm/m^2
U V Resistance	ASTM D-4355	70 %	70 %

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely,

Sid Weiser

Sid Weiser
Technical Manager
Performance Nonwovens Division

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

Synthetic Industries
Individual Roll Data
Bill of Lading:624924

Roll Number	Style	Mass/ Unit Osy D5261	Lab Thick mils D5199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap Tear (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
6056314A	651	6.2	89	195		61		101		346	112
6056333A	651	6.1	83	207		61		105		350	112
6056348A	651	6.9	90	216	237	62	69	118	136	396	
6056359A	651	6.6	85	230		63		103		367	128
6056379A	651	6.6	88	212		65		110		387	121
6056392A	651	7.1	92	224		67		114		369	131

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include data from rolls which were not shipped. However, the data provided is from the same production run as the rolls actually shipped on this bill of lading.

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

August 24, 1998

Cetco WY
Noe Garcia
PO BOX 428
Lovell, WY 82431
BoL: 624793 PO 77348

This is to certify that Product GEOTEX™ 651, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level. This geotextile has been continuously inspected for the presence of needles and none were detected.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS	S.I. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2	200 g/m^2
Thickness	ASTM D-5199	80 mils	2.0 mm
Tensile Strength	ASTM D-4632	170 lbs	755 N
Elongation	ASTM D-4632	50 %	50 %
Trapezoidal Tear	ASTM D-4533	70 lbs	310 N
Mullen Burst	ASTM D-3786	330 psi	2275 Kpa
Puncture Strength	ASTM D-4833	110 lbs	485 N
AOS	ASTM D-4751	70 US Standard Sieve	0.212 mm
Permittivity	ASTM D-4491	1.3 sec^{-1}	1.3 sec^{-1}
Permeability	ASTM D-4491	0.24 cm/sec	0.24 cm/sec
Flow Rate	ASTM D-4491	110 gpm/ft^2	4480 lpm/m^2
U V Resistance	ASTM D-4355	70 %	70 %

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely,

Sid Weiser

Technical Manager
Performance Nonwovens Division

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

08/24/98 16:41 Page 1

Synthetic Industries
Individual Roll Data
Bill of Lading:624793

Roll Number	Style	Batch Number	Mass/ Area Osy D5261	Lab Thick mils D5199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap Tear (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833	AOS mm D4751	Permit sec-1 D4491
6056464A	651	60270	6.7	93	236	237	63	72	113	128	396	179		
6056527A	651	60270	6.8	95	254	248	62	73	104	118	399	135		
6056560A	651	60271	7.0	101	223	254	63	74	107	136	419	133		
6056572A	651	60271	6.4	94	196	221	67	70	106	118	382	126		
6056576A	651	60271	6.6	100	208	223	64	70	98	126	383	125		
6056580A	651	60271	7.0	96	231	247	65	68	110	137	391	137		
6056584A	651	60271	6.5	95	210	235	59	66	95	126	389	111		

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include data from rolls which were not shipped. However, the data provided is from the same production run as the rolls actually shipped on this bill of lading.

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

August 28, 1998

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
BoL 624850 PO 77349

This is to certify that Product GEOTEX™ 651, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level. This geotextile has been continuously inspected for the presence of needles and none were detected.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS	S.I. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2	200 g/m^2
Thickness	ASTM D-5199	80 mils	2.0 mm
Tensile Strength	ASTM D-4632	170 lbs	755 N
Elongation	ASTM D-4632	50 %	50 %
Trapezoidal Tear	ASTM D-4533	70 lbs	310 N
Mullen Burst	ASTM D-3786	330 psi	2275 Kpa
Puncture Strength	ASTM D-4833	110 lbs	485 N
AOS	ASTM D-4751	70 US Standard Sieve	0.212 mm
Permittivity	ASTM D-4491	1.3 sec^{-1}	1.3 sec^{-1}
Permeability	ASTM D-4491	0.24 cm/sec	0.24 cm/sec
Flow Rate	ASTM D-4491	110 gpm/ft^2	4480 lpm/m^2
U V Resistance	ASTM D-4355	70 %	70 %

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely,

Sid Weiser

Technical Manager
Performance Nonwovens Division

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

Synthetic Industries
Individual Roll Data
Bill of Lading:624850

Roll Number	Style	Mass/ Unit Osy D5261	Lab Thick mils D5199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap Tear (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
6056447A	651	7.0	97	233	244	64	73	109	129	366	133
6056452A	651	6.6	91	212	219	61	71	94	119	350	111

Sid Wessin

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include data from rolls which were not shipped. However, the data provided is from the same production run as the rolls actually shipped on this bill of lading.

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

September 2, 1998

Cetco WY
Noe Garcia
PO BOX 428
Lovell, WY 82431
BoL; 624930 624931 PO R-77354

This is to certify that Product GEOTEX™ 651, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level. This geotextile has been continuously inspected for the presence of needles and none were detected.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS	S.I. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2	200 g/m^2
Thickness	ASTM D-5199	80 mils	2.0 mm
Tensile Strength	ASTM D-4632	170 lbs	755 N
Elongation	ASTM D-4632	50 %	50 %
Trapezoidal Tear	ASTM D-4533	70 lbs	310 N
Mullen Burst	ASTM D-3786	330 psi	2275 Kpa
Puncture Strength	ASTM D-4833	110 lbs	485 N
AOS	ASTM D-4751	70 US Standard Sieve	0.212 mm
Permittivity	ASTM D-4491	1.3 sec^{-1}	1.3 sec^{-1}
Permeability	ASTM D-4491	0.24 cm/sec	0.24 cm/sec
Flow Rate	ASTM D-4491	110 gpm/ft^2	4480 lpm/m^2
U V Resistance	ASTM D-4355	70 %	70 %

Strength Retained After 500 hours exposure in Xenon Arc Weatherometer

Sincerely,

Sid Weiser

Sid Weiser
Technical Manager
Performance Nonwovens Division

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-821-0444

Synthetic Industries
Individual Roll Data
Bill of Lading: 624910

Roll Number	Style	Mass/ Unit Osy D5261	Lab Thick mils D5199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap Tear (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
6056318A	651	6.5	89	218		60		95		396	126
6056324A	651	6.9		224		64					
6056328A	651	6.9	91	210	238	62	69	106	126	376	126
6056337A	651	6.7	86	216	221	65	71	103	135	377	135
6056548A	651	6.7	98	213	238	66	74	112	124	396	127
6056552A	651	6.7	95	226	223	65	69	107	121	374	127
6056564A	651	7.0	96	210	240	67	74	106	120	368	127

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include data from rolls which were not shipped. However, the data provided is from the same production run as the rolls actually shipped on this bill of lading.

Synthetic Industries
Individual Roll Data
Bill of Lading:624931

Roll Number	Style	Mass/ Unit Osy D5261	Lab Thick mils D5199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap Tear (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
6056492A	651	6.4	89	210	209	60	73	109	110	379	111
6056523A	651	7.2	101	240	250	67	71	106	124	361	133
6056531A	651	6.6	88	209	224	57	67	96	119	381	113
6056535A	651	6.4	84	202	214	57	67	95	114	371	148
6056568A	651	6.5	93	199	226	62	73	98	119	343	120

Sid Wessin

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include data from rolls which were not shipped. However, the data provided is from the same production run as the rolls actually shipped on this bill of lading.

NON-WOVEN GEOTEXTILE MANUFACTURER'S CERTIFICATION

TECHNICAL DATA SHEET

ORIGIN INFORMATION

NON-WOVEN GEOTEXTILE

Manufacturer: **Synthetic Industries Inc.**

PRODUCTION
FACILITY: **Synthetic Industries**
4019 Industry Drive
Chattanooga, TN. 37416

CONTACT: Sid Weiser

BRAND NAME: Geotex 650

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

September 4, 1998

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
BoL; 624984 624987 624989 624943 624950 624963 PO R77354

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd²
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser

Sid Weiser
Technical Manager
Performance Nonwovens Division

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7819 • 1-800-621-0444

Synthetic Industries
Individual Roll Data
Bill of Lading:624963

Roll Number	Style	Mass/ Unit Osy D5261	Lab Thick mils D5199	Tensile (MD) lbs D4632	(XMD) lbs D4632	Elongation (MD) % D4632	(XMD) % D4632	Trap Tear (MD) lbs D4533	(XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
S145590A	650	7.6	141	111	159	116	128	67	61	249	87
S145599A	650	7.0	129	81	133	111	128	42	44	233	66
B800283A	650	6.9	141	91	127	121	129	45	53	216	62
B800387A	650	7.2	151	100	145	108	127	51	44	211	86

Sid Wessin

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

Once rolls of nonwoven geotextiles are produced, inspected and the test results from the frequency stated above indicates that materials produced during the production run meets our published minimum average roll values, approved rolls are shipped for storage until an order requires the material to be shipped. Since rolls are loaded at the warehouse independent of production sequence test results listed above may include data from rolls which were not shipped. However, the data provided is from the same production run as the rolls actually shipped on this bill of lading.

Synthetic Industries
Individual Roll Data
Bill of Lading:624950

Roll Number	Style	Mass/ Unit Oxy D5261	Lab Thick mils D5199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap Tear (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
5143785A	650	6.2	124	69	90	113	128	39	50	206	55
B801071A	650	6.6	130	98	132	113	163	48	45	209	70
B801083A	650	6.8	130	99		92		47		206	65
B801088A	650	6.9	127	112	129	99	101	51	42	229	79

Sid Wesson

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

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Synthetic Industries
Individual Roll Data
Bill of Lading:624943

Roll Number	Style	Mass/ Unit Oay DS261	Lab Thick mils DS199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap Tear (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
B801073A	650	6.5	123	99	115	113	161	50	43	209	67
B801100A	650	6.5	126	97	115	96	121	50	46	204	79

Sid Wesson

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

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Synthetic Industries
Individual Roll Data
Bill of Lading:624989

Roll Number	Style	Mass/ Unit Oay D5261	Lab Thick mils D5199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap Tear (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
S145512A	150	6.4	133	77	100	116	121	40	30	199	61

Sid Wasan

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permitivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

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Synthetic Industries
Individual Roll Data
Bill of Lading:624987

Roll Number	Style	Mass/ Unit Oay D5261	Lab Thick mils D5199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap Tear (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
B800303A	650	7.2	135								
B800329A	650	6.9	139	87	148	110	139	46	43	241	75
B800341A	650	6.8	162	92	107	105	120	45	42	251	72

Sid Wesson

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotex is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index prope for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permitivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

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SYNTHETIC INDUSTRIES

Geosynthetic Products Division

September 10, 1998

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
BoL; 625028 625047 625048 625052 PO 77356

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd²
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser

Sid Weiser
Technical Manager
Performance Nonwovens Division

Seller makes no warranty, express or implied, concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND, TO THE EXTENT THAT IT IS CONTRARY TO THE FOREGOING SENTENCE ANY IMPLIED WARRANTY OF MERCHANTABILITY IS EXPRESSLY EXCLUDED. Any recommendations made by the Seller concerning uses or applications of said product are believed reliable and Seller makes no warranty of results to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before installing the product, then Synthetic Industries will replace the product without charge or refund the purchase price. This Data Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 02/1997.

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

09/10/98 09:44 Page 1

Synthetic Industries
Individual Roll Data
Bill of Lading:625028

Roll Number	Style	Mass/ Unit Osy D5261	Lab Thick mils D5199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap Tear (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
S145570A	650	7.1	141	84	119	113	129	47	45	237	76
S145580A	650	7.0	130	88	131	112	137	42	39	223	54

Sid Wesser

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

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09/10/98 09:48 Page 1

Synthetic Industries
Individual Roll Data
Bill of Lading:625048

Roll Number	Style	Mass/ Unit Oay D5261	Lab Thick mils D5199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap Tear (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
S145468A	650	6.5	136	76	109	98	117	43	35	239	68
S145506A	650	6.7	137	91	106	112	122	43	40	241	69
S145521A	650	7.1	140	85	128	107	120	48	41	226	74
S145535A	650	6.5	134	83	107	94	112	37	27	219	70
S145549A	650	6.9	143	87	128	101	118	44	51	254	79
S145552A	650	6.5	138	83	109	97	114	35	34	238	71
R800261A	650	7.0	136								

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

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09/10/98

Synthetic Industries
Individual Roll Data
Bill of Lading:625062

09:49 Page 1

Roll Number	Style	Mass/ Unit Osy D5261	Lab Thick mils D5199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap Tear (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
5145486A	650	6.7	138	80	109	108	119	40	32	213	68
5145492A	650	7.0	129	73	97	100	127	41	28	196	63
5145524A	650	6.8	138	69	107	107	116	35	33	227	72
5145527A	650	6.6	136	79	98	105	122	39	38	227	66
5145532A	650	7.2									

Sid Wessin

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

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SYNTHETIC INDUSTRIES

Geosynthetic Products Division

September 10, 1998

American Colliod/WY-Cetco
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
Bol.; 625004 625005 PO R77354

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser

Sid Weiser
Technical Manager
Performance Nonwovens Division

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

09/10/98

Synthetic Industries
Individual Roll Data
Bill of Lading:625004

10:03 Page 1

Roll Number	Style	Mass/ Unit Oay D5261	Lab Thick mils D5199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap Tear (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
B800312A	650	6.6	128	97		117		45		234	61
B800320A	650	6.9	136	90	122	119	138	48	43	240	59
B800326A	650	6.9	138	99	129	111	130	48	40	229	74

Sid Wessi

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

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09/10/98

Synthetic Industries
Individual Roll Data
Bill of Lading:625005

10:04 Page 1

Roll Number	Style	Mass/ Unit Oay D5261	Lab Thick mils D5199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap Tear (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
5145509A	650	7.3	142	96	137	115	127	46	56	251	64
5145515A	650	7.0	141	81	139	103	126	42	37	221	62
5145586A	650	7.4	135	95	159	118	138	54	51	235	78

Sid Wessi

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

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SYNTHETIC INDUSTRIES

Geosynthetic Products Division

August 26, 1998

American Colliod/WY-Ceteo
Lovell WY Plant
Noe Garcia
PO Box 428
Lovell WY 82431
Bol; 624826, 624839 PO 77349, 624812 PO 77348

This is to certify that Product GEOTEX™ 650, a nonwoven polypropylene geotextile produced by Synthetic Industries will meet the following certifiable minimum average roll values when tested in accordance with the proper ASTM test methods. A minimum average roll value is calculated as the mean minus two standard deviations, yielding a 97.5 percent confidence level.

PHYSICAL PROPERTY	TEST METHOD	U.S. UNITS
Weight	ASTM D-5261	6.0 oz/yd^2
Thickness	ASTM D-5199	120 mils
Tensile Strength	ASTM D-4632	45 lbs
Elongation	ASTM D-4632	90 %
Trapezoidal Tear	ASTM D-4533	25 lbs
Mullen Burst	ASTM D-3786	190 psi
Puncture Strength	ASTM D-4833	50 lbs

Sincerely,

Sid Weiser

Sid Weiser
Technical Manager
Performance Nonwovens Division

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

08/25/98 11:48 Page 1

Synthetic Industries
Individual Roll Data
Bill of Lading:624826

Roll Number	Style	Mass/ Unit Osy D5261	Lab Thick mils D5199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap Tear (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
5143798A	650	7.1	135	99		94		59		233	64
5143815A	650	6.0	120	64	75	96	120	33	30	227	76

Sid Wessin

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

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08/25/98

Synthetic Industries
Individual Roll Data
Bill of Lading:624812

11:48 Page 1

Roll Number	Style	Mass/ Unit Oay D5261	Lab Thick Mils D5199	Tensile (MD) lbs D4632	Tensile (XMD) lbs D4632	Elongation (MD) % D4632	Elongation (XMD) % D4632	Trap Tear (MD) lbs D4533	Trap Tear (XMD) lbs D4533	Mullen Burst psi D3786	Punct Resist lbs D4833
5143788A	650	6.8	136	70	90	106	131	31	39	261	74
5143971A	650	7.4	143	108	140	104	116	47	48	271	87

Sid Wessi

Synthetic Industries' current standard manufacturing quality control (MQC) testing frequency for GEOTEX nonwoven geotextiles is one (1) test per 90,000 sf (8,360 sm) for index properties (mass per unit area, thickness, grab tensile and elongation, trapezoidal tear, mullen burst and puncture resistance) for styles heavier than 601 and one (1) test per 162,000 sf (15,000 sm) for index properties for style 601 and lighter. Although we strive to test our nonwoven geotextiles for apparent opening size (AOS) and Permittivity/permeability/water flow rate approximately once every 540,000 sf (50,160 sm), the actual frequency of testing for performance properties will vary depending upon production schedules, product availability, customer requirements, job specifications or other agreements arranged with Synthetic Industries prior to the time of purchase. If additional testing is needed to meet higher frequencies required by the project specifications, it is the purchaser's responsibility to notify Synthetic Industries and ask for assistance in calculating the costs for the additional tests.

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BENTOMAT DN
QUALITY TEST RESULTS

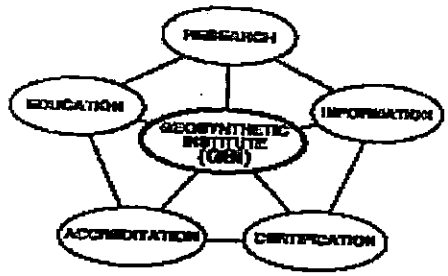
BENTOMAT DN
MANUFACTURING CERTIFICATION

Project Name:	Cedar Hills Landfill
Prepared For:	Northwest Linings & Geotextile Prod. Inc.
Job Number:	
Customer PO:	C-15
Order Number:	89991, 96035
Ship Date:	26-Oct

CETCO hereby affirms and certifies that the BENTOMAT DN material supplied to this project will meet the physical and chemical criteria listed below:

PROPERTY	TEST METHOD		MINIMUM VALUE
Bentonite Mass / Area	ASTM D 5993	*	.75 lb/sq.ft. (Min.)
Grab Strength	ASTM D 4632		150 Lbs.
Grab Elongation	ASTM D 4632		10 Percent Typical
Peel Strength	ASTM D 4632		15 Lbs.
Index Flux	ASTM D 5887		1.0 x 10 (-8) m(3)/m(2)/sec. (max.)
Permeability	ASTM D 5084		5 x 10 (-9) cm/sec. (Max)
Puncture Resistance	ASTM D 4833		60 Lbs. (Min.)

*** Reported at 0 % moisture content.**
GAI Lab Accredited Test Methods were followed during conformance testing for:
ASTM D 4632 - Grab Strength and Grab Elongation.
ASTM D 5887 - Index Flux.
ASTM D 5993 - Bentonite Mass/Area.



Colloid Environmental Technologies Co. (CETCO)

Subscribed and sworn to before me this 27th day of Oct. 1998.

Notary Public

SUSAN FUNK - NOTARY PUBLIC
COUNTY OF BIG HORN
STATE OF WYOMING
MY COMMISSION EXPIRES 1-21-2001

QCG#FT2 QCT#FT2
10/27/98 11:13:05

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL
PO BOX 428
LOVELL WY 82431

SHIP TO: CEDAR HILLS LANDFILL
16645 228TH AVE., SW
MAPLE VALLEY WA

O R D E R # 000089991

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 150lbs marv ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632	THICKNESS (mm) ASTM D 5199-91
020-BENTOMAT DN	199837020	00003317	.99	260.10	25.90	9.60
020-BENTOMAT DN	199837020	00003316	.99	260.10	25.90	9.60
020-BENTOMAT DN	199837020	00003315	.99	260.10	25.90	9.60
020-BENTOMAT DN	199837020	00003313	.99	260.10	25.90	9.60
020-BENTOMAT DN	199837020	00003311	.99	260.10	25.90	9.60
020-BENTOMAT DN	199837020	00003251	.97	317.00	21.00	8.60
020-BENTOMAT DN	199837020	00003245	.97	317.00	21.00	8.60
020-BENTOMAT DN	199837020	00003240	.97	317.00	21.00	8.60
020-BENTOMAT DN	199837020	00003238	.97	317.00	21.00	8.60
020-BENTOMAT DN	199835020	00002795	.98	263.90	44.20	8.90
020-BENTOMAT DN	199835020	00002794	.98	263.90	44.20	8.90
020-BENTOMAT DN	199835020	00002793	.98	263.90	44.20	8.90
020-BENTOMAT DN	199835020	00002788	.98	263.90	44.20	8.90
020-BENTOMAT DN	199835020	00002787	.98	263.90	44.20	8.90
020-BENTOMAT DN	199835020	00002786	.98	263.90	44.20	8.90
020-BENTOMAT DN	199835020	00002777	.98	263.90	44.20	8.90

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested.
If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture cont ent.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

QCG#FT2 QCT#FT2
10/27/98 11:14:34

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL
PO BOX 428
LOVELL WY 82431

SHIP TO: CEDAR HILLS LANDFILL
16645 228TH AVE., SW
MAPLE VALLEY WA

O R D E R # 000096035

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 150lbs marv ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632	THICKNESS (mm) ASTM D 5199-91
020-BENTOMAT DN	199837020	00003314	.99	260.10	25.90	9.60
020-BENTOMAT DN	199837020	00003310	.99*	260.10	25.90*	9.60*
020-BENTOMAT DN	199837020	00003250	.97	317.00	21.00	8.60
020-BENTOMAT DN	199837020	00003249	.97	317.00	21.00	8.60
020-BENTOMAT DN	199837020	00003246	.97	317.00	21.00	8.60
020-BENTOMAT DN	199837020	00003244	.97	317.00	21.00	8.60
020-BENTOMAT DN	199837020	00003243	.97	317.00	21.00	8.60
020-BENTOMAT DN	199837020	00003242	.97	317.00	21.00	8.60
020-BENTOMAT DN	199837020	00003241	.97	317.00	21.00	8.60
020-BENTOMAT DN	199837020	00003236	.97*	317.00*	21.00*	8.60*
020-BENTOMAT DN	199835020	00002833	.96	263.90	58.00	9.40
020-BENTOMAT DN	199835020	00002832	.96*	263.90	58.00*	9.40*
020-BENTOMAT DN	199835020	00002791	.98	263.90	44.20	8.90
020-BENTOMAT DN	199835020	00002790	.98	263.90	44.20	8.90
020-BENTOMAT DN	199835020	00002783	.98	263.90	44.20	8.90
020-BENTOMAT DN	199835020	00002779	.98	263.90	44.20	8.90

NOTE:

An asterisk indicates the actual test done on the roll and the roll tested.
If an asterisk is not present, test results are based on the previous roll tested.
Mass/Area and Moisture content are tested a minimum of every 40,000sf.
Grab Strength is tested a minimum of every 200,000sf.
Peel Strength is tested a minimum of every 40,000sf.
Bentonite Mass/Area is reported at 0% moisture cont ent.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

BENTOMAT DN
MQA TRACKING FORMS

QCG#TF1 QCT#TF1
10/27/98 11:13:05

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: CEDAR HILLS LANDFILL
16645 228TH AVE., SW
MAPLE VALLEY WA

ORDER NUMBER 000089991

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199835020									
00002777	020-BENTOMAT DN	140	1960	2870	6056562A		B800315A		082798B
00002786	020-BENTOMAT DN	140	1960	2813	6056551A		B800325A		082798B
00002787	020-BENTOMAT DN	140	1960	2808	6056551A		B800325A		082798B
00002788	020-BENTOMAT DN	140	1960	2831	6056551A		B800325A		082798B
00002793	020-BENTOMAT DN	140	1960	2797	6056462A		B800335A		082798B
00002794	020-BENTOMAT DN	140	1960	2793	6056462A		B800335A		082798B
00002795	020-BENTOMAT DN	140	1960	2821	6056459A		B800335A		082798B
LOT# 199837020									
00003238	020-BENTOMAT DN	160	2240	3169	6056383A		5145512A		0909988
00003240	020-BENTOMAT DN	160	2240	3168	6056394A		5145512A		0909988
00003245	020-BENTOMAT DN	160	2240	3096	6056398A		B800319A		0909988
00003251	020-BENTOMAT DN	160	2240	3105	6056426A		B800313A		09099881
00003311	020-BENTOMAT DN	125	1750	2448	6056375A		5145523A		09119881
00003313	020-BENTOMAT DN	125	1750	2446	6056375A		5145523A		09119881
00003315	020-BENTOMAT DN	125	1750	2443	6056375A		5145523A		09119881
00003316	020-BENTOMAT DN	125	1750	2450	6056375A		5145521A		09119881
0003317	020-BENTOMAT DN	125	1750	2450	6056411A		5145521A		09119881

TOTAL SQUARE FEET..... 31,430

TOTAL PAGES 1

QCG#TF1 QCT#TF1
10/27/98 11:14:34

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

CETCO LOVELL PLANT
PO BOX 428
LOVELL WY 82431

SHIP TO: CEDAR HILLS LANDFILL
16645 228TH AVE., SW
MAPLE VALLEY WA

ORDER NUMBER 000096035

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOSYNTHETIC TOP LOT#	GEOSYNTHETIC TOP ROLL#	GEOSYNTHETIC BOTTOM LOT#	GEOSYNTHETIC BOTTOM ROLL#	CLAY LOT#
LOT# 199835020									
00002779	020-BENTOMAT DN	140	1960	2857	6056562A		B800315A		082798B
00002783	020-BENTOMAT DN	140	1960	2825	6056551A		B800325A		082798B
00002790	020-BENTOMAT DN	140	1960	2806	6056462A		B800325A		082798B
00002791	020-BENTOMAT DN	140	1960	2798	6056462A		B800325A		082798B
00002832	020-BENTOMAT DN	115	1610	2346	6056581A		5143788A		082798B
00002833	020-BENTOMAT DN	115	1610	2315	6056581A		5143788A		082798B
LOT# 199837020									
00003236	020-BENTOMAT DN	160	2240	3128	6056383A		5145512A		090998B
00003241	020-BENTOMAT DN	160	2240	3161	6056394A		5145512A		090998B
00003242	020-BENTOMAT DN	160	2240	3130	6056394A		5145512A		090998B
00003243	020-BENTOMAT DN	160	2240	3111	6056394A		B800319A		090998B
00003244	020-BENTOMAT DN	160	2240	3108	6056394A		B800319A		090998B
00003246	020-BENTOMAT DN	160	2240	3102	6056398A		B800319A		090998B
00003249	020-BENTOMAT DN	160	2240	3072	6056398A		B800319A		090998B
00003250	020-BENTOMAT DN	160	2240	3057	6056398A		B800319A		090998B1
00003310	020-BENTOMAT DN	125	1750	2491	6056375A		5145523A		091198B
00003314	020-BENTOMAT DN	125	1750	2448	6056375A		5145523A		091198B1

TOTAL SQUARE FEET..... 32,480

TOTAL PAGES 1

EMCON

Project: WEYERHAEUSER MILL-E/KOPPERS

Proj. No. 40141.037.123

Client: EMCON NW

Date: 5-4-99

Sample Identification: GCL S#600
R#2791
L#

MOISTURE CONTENT
ASTM D2216

Moisture Content (%)	Specimen 1	Specimen 2	Specimen 3	Specimen 4	Specimen 5	Average
	18.46	20.47	19.73	19.68	17.53	19.17

OK KWW 5/19/99

Remarks: Oven dried

MASS PER UNIT AREA
ASTM D5261

Oven Dry Wt. (lbs./sq.ft.)	Specimen 1	Specimen 2	Specimen 3	Specimen 4	Specimen 5	Average
Bentonite	0.82	0.81	0.77	0.85	0.83	0.82

OK KWW 5/19/99

Remarks: Assumed Weight of Geotextile: .0833 #/sq.ft.

GRAB BREAKING LOAD & ELONGATION
ASTM D4632

Specimen	Machine Direction		Cross Machine Direction	
	Breaking Load #'s	Apparent Elongation %	Breaking Load #'s	Apparent Elongation %
1	141.43	26.0	187.56	30.0
2	131.62	21.7	168.56	30.0
3	136.25	21.7	174.50	33.0
4	148.56	22.7	167.12	28.3
5	144.56	22.0	165.23	27.7
Average	140.48	22.8	172.59	29.8

OK KWW 5/19/99

PERMEABILITY TEST
(Constant Head Method)
ASTM D5084

Average Permeability:	4.596E-09 cm/sec		
Test Duration:	4-29-99 to 5-3-99		
Test Monitored:	5-3-99		
Back Pressure:	40 psi	Effective Conf. Pressure:	10 psi
Head Pressure:	3.9 psi		

OK KWW 5/19/99

Tested By: N.B./K.H. Entered By: K.H. Checked By: R.S.A.

EM\NY-GL\GEOSYNTH\GCLCONF\WYR-600.XLS

EMCON

Project: WEYERHAEUSER MILL-E/KOPPERS Proj. No. 40141.037.123

Client: EMCON NW Date: 5-3-99

Sample Identification: GCL S#601
R#2240
L#199837020

MOISTURE CONTENT
ASTM D2216

	Specimen 1	Specimen 2	Specimen 3	Specimen 4	Specimen 5	Average
Moisture Content (%)	26.35	16.08	21.79	39.62	24.32	25.63

OK reviewed 5/19/99

Remarks: Oven dried

MASS PER UNIT AREA
ASTM D5261

Oven Dry Wt. (lbs./sq.ft.)	Specimen 1	Specimen 2	Specimen 3	Specimen 4	Specimen 5	Average
Bentonite	1.09	1.11	0.88	1.03	1.10	1.04

OK reviewed 5/19/99

Remarks: Assumed Weight of Geotextile: .0833 #/sq.ft.

GRAB BREAKING LOAD & ELONGATION
ASTM D4632

	Machine Direction		Cross Machine Direction	
Specimen	Breaking Load #'s	Apparent Elongation %	Breaking Load #'s	Apparent Elongation %
1	548.80	89.3	413.30	86.0
2	392.20	100.0	592.50	77.7
3	397.10	88.3	479.50	92.7
4	444.06	88.3	419.30	91.7
5	525.30	76.7	537.30	80.3
Average	461.49	88.5	488.38	85.7

OK reviewed 5/19/99

PERMEABILITY TEST
(Constant Head Method)
ASTM D5084

Average Permeability:	4.806E-09 cm/sec		
Test Duration:	4-28-99 to 4-30-99		
Test Monitored:	4-30-99		
Back Pressure:	40 psi	Effective Conf. Pressure:	10 psi
Head Pressure:	3.9 psi		

OK reviewed 5/19/99

Tested By: N.B./K.H. Entered By: K.H. Checked By: R.S.A.

EM\NY-GL\GEOSYNTH\GCLCONF\WYR-601.XLS

EMCON

Project: WEYERHAEUSER MILL-E/KOPPERS Proj. No. 40141.037.123

Client: EMCON NW Date: 5-3-99

Sample Identification: GCL S#602
R#2791
L#199835020

MOISTURE CONTENT
. ASTM D2216

	Specimen 1	Specimen 2	Specimen 3	Specimen 4	Specimen 5	Average
Moisture Content (%)	21.92	24.05	19.79	17.15	20.35	20.65

OK (KWW 5/19/99)

Remarks: Oven dried

MASS PER UNIT AREA
ASTM D5261

Oven Dry Wt. (lbs./sq.ft.)	Specimen 1	Specimen 2	Specimen 3	Specimen 4	Specimen 5	Average
Bentonite	1.05	0.93	0.99	0.79	0.96	0.94

OK (KWW 5/19/99)

Remarks: Assumed Weight of Geotextile: .0833 #/sq.ft.

GRAB BREAKING LOAD & ELONGATION
ASTM D4632

	Machine Direction		Cross Machine Direction	
Specimen	Breaking Load #'s	Apparent Elongation %	Breaking Load #'s	Apparent Elongation %
1	489.10	81.7	411.00	73.3
2	462.30	78.3	448.20	72.7
3	489.00	86.0	440.10	70.0
4	403.10	68.3	423.20	81.7
5	455.10	85.3	464.70	85.0
Average	459.72	79.9	437.44	76.5

OK (KWW 5/19/99)

PERMEABILITY TEST
(Constant Head Method)
ASTM D5084

Average Permeability:	3.120E-09 cm/sec		
Test Duration:	4-28-99 to 4-30-99		
Test Monitored:	4-30-99		
Back Pressure:	40 psi	Effective Conf. Pressure:	10 psi
Head Pressure:	3.9 psi		

OK (KWW 5/19/99)

Tested By: N.B./K.H. Entered By: K.H. Checked By: R.S.A.

APPENDIX E

SUMMARY OF ASPHALT CAP SUBMITTALS AND TEST DATA

APPENDIX E.1

SUBMITTALS

Rcvd 12/1/98

WRS
Infrastructure & Environment, Inc.

12833 NE Airport Way
Portland, OR 97230
(503) 252-0277
Fax: (503) 252-0312

LETTER OF TRANSMITTAL

To: Stuart Triolo, Project Manager
Weyerhaeuser Company
101 East Marine View Drive
Everett, WA 98201
Phone: 425-339-2871
Fax: 425-339-2786

From: Alex Soo, Program Manager
Alex Soo 12/1/98

Date: December 1, 1998
Transmittal No. Technical-012
Project Name: Weyerhaeuser Mill E/Koppers Site, Everett, WA
Client's Ref. #: 98-00094
Contractor: WRS Infrastructure & Environment, Inc.
WRS Job #: 4412-98-4057
Subcontractor: CSR Associated
Supplier: Chevron (Richmond Beach), WA

We are sending: ☑ Attached ☐ Under Separate Cover
Via: ☐ U.S. Mail ☐ Express Delivery ☑ Facsimile Page 1 of 3

The following:

☐ Correspondence	☐ Plans	☐ Progress Payments
☐ Drawings	☐ Samples	☐ Specifications
☐ Submittal	☐ Change Order	☐ Subcontractor
☐ Schedule	☐ _____	☐ _____

Dated	Quantity	Description	Ref. Section
11/5/98	1 fax copy	AR4000 for Tack Coat for use with Geotextile from CSR Associated. (Product Information for tackcoat used with pavement overlay geotextile)	02511, Low Permeability Asphalt Cap, Part 1.5C

These are transmitted:

☑ For Approval	☑ For Review and Comment	☐ As Requested
☐ For Your Use	☐ Approved As Noted	☐ Returned For Corrections
☐ For Your File	☐ Approved As Submitted	☐ Returned With Corrections

Remarks:

cc: Brian O'Neal, P.E., EMCON Project Coordinator
Randy Richardson, WRS Site Manager
WRS Job File

REVIEW OF SUBMITTALS
☒ NO EXCEPTIONS TAKEN
☐ NOTE MARKINGS
☐ REVISE & RESUBMIT
By _____ Date 12/14/98
Weyerhauser Construction Co.

Washington State Department of Transportation

REQUEST FOR APPROVAL OF MATERIALS SOURCES

CONTRACT: ( ) : F.A. NUMBER ; SR - DATE 11-5-98
For PE Use

SECTION Weyerhaeuser Mill East : COUNTY Snohomish

CONTRACTOR CSR Associated SUBMITTED BY
Signature

See Section 1-06.1 of Std. Spec. and reverse side for instructions.

CONTRACT BID ITEM		SOURCE		For WSDOT Use		
BID NO.	MATERIAL OR MANUFACTURER'S PRODUCT/TYPE	NAME OF MANUFACTURER/FABRICATOR OR PIT NUMBER	SPECIFICATION REFERENCE	P.E. APPR'L CODE	HQTR. APPR'L CODE	FILE NO.
	AR4000 for Tack Coat for use with Geotextile	Chevron Richmond Beach WA	9-02.1(4)	A		

PROJECT ENGINEER | DATE | HQ's MATERIALS ENGINEER | DATE

Approval Action Codes for use by Project Engineer and HQ Materials Laboratory

1. Source Approved: Acceptance based upon 'Satisfactory' Test Report for samples of materials to be incorporated into project..
2. Source Approved: Submit Mfg. Cert. of Compliance for 'Approval' prior to use of material.
3. Source Approved: Submit Catalog Cuts for 'Approval' prior to use of material.
4. Source Approved: Submit Shop Drawings for 'Approval' prior to fabrication of material.
5. Source Approved: Only materials identified 'Approved for Shipment' by WSDOT Fabrication Inspection Office *prior to shipment* to be used.
6. Source Approved: Materials to be certified as either 100% American manufacturer or identification of foreign manufacturer and materials cost within the permissible limits for the project (See Special Provisions).
7. Approval Pending: Request Transmitted to Hdqtr. Lab. for Approval Action.
8. Source Approved:

REMARKS:

Approval Action Codes for Headquarters Laboratory use - only

9. Source Approved: Approval of Change of source must be secured from Headquarters Materials Engineer *per* Std. Specifications.
10. Approval Withheld: Submit samples for preliminary evaluation.
11. Approval Withheld:

12.

REMARKS:

PROJECT ENGINEER DISTRIBUTION
Contractor ✓
Dist. Admin. ✓
Dist. Mats ✓
HQ. Mats Lab (Docum) ✓
( ) Mandatory Distribution

HEADQUARTERS MATERIALS ENGINEER DISTRIBUTION
HQ Mats Lab (General File) ✓
HQ Mats Lab (Elec) (all E & S Codes)
HQ Mats Lab (Asphalt) (all B codes)
Seattle Insp. Office (all 5 codes)
Project Engineer
Other

DOT 350-071 Revised 3/90

Supersedes Previous Editions

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
QUALIFIED PRODUCTS LIST

July, 1997

Contractor: Contract No:

Sub Contractor: Date:

Specification Reference - Material Category	File No	Acceptance Code	Minor Qty	MQ Code	Last Update
9-02.1(2,3) Cut-Back Liquid Asphalt					
Albina Fuel - Portland, OR *Bid Items:*					
Cut-Back Liquid Asphalts Medium Cure(MC) grades 70, 250, 800, 3000. Uses base asphalt from Cenex and Sinclair. See Note: (1)	96-005	CA	1030	15 TONS 15 Tonnes	3001	9/19/94
Chevron (Richmond Beach) - Seattle, WA *Bid Items:*					
Cut-Back Liquid Asphalts Rapid Cure(RC) & Medium Cure(MC) grades 70, 250, 800, 3000. See Note: (1)	96-025	CA	2148	15 TONS 15 Tonnes	3001	9/19/94
Chevron (Willbridge) - Portland, OR *Bid Items:*					
Cut-Back Liquid Asphalts Rapid Cure(RC) & Medium Cure(MC) grades 70, 250, 800, 3000. See Note: (1)	96-030	CA	2148	15 TONS 15 Tonnes	3001	9/19/94
Idaho Asphalt Supply, Inc. - Post Falls, ID *Bid Items:*					
Cut-Back Liquid Asphalts Rapid Cure(RC) & Medium Cure(MC) grades 70, 250, 800, 3000. See Note: (1)	96-071	CA	2148	15 TONS 15 Tonnes	3001	9/19/94
Koch Asphalt Co. - Spokane, WA *Bid Items:*					
Cut-Back Liquid Asphalts Medium Cure(MC) grades 70, 250, 800, 3000. Uses Exxon asphalt. May be distributed from Spokane or Pasco. See Note: (1)	96-081	CA	2148	15 TONS 15 Tonnes	3001	9/19/94
Sound Refining - Tacoma, WA *Bid Items:*					
Cut-Back Liquid Asphalts Rapid Cure(RC) grades 70, 250, 800, 3000 and Medium Cure(MC) grades 250, 800. See Note: (1)	96-146	CA	2148	15 TONS 15 Tonnes	3001	9/19/94
TAK Petroleum - Spokane, WA *Bid Items:*					
Cut-Back Liquid Asphalts Medium Cure(MC) grades 70, 250, 800, 3000. Uses asphalt from Exxon, US Oil or Sound Refining. See Note: (1)	96-160	CA	2148	15 TONS 15 Tonnes	3001	9/19/94
U.S. Oil Refinery Company - Tacoma, WA *Bid Items:*					
Cut-Back Liquid Asphalts Medium Cure(MC) grades 70, 250, 800, 3000. See Note: (1)	96-174	CA	2148	15 TONS 15 Tonnes	3001	9/19/94
9-02.1(4)A Paving Asphalt					
Albina Fuel - Portland, OR *Bid Items:*					
Paving Asphalt AR-2000W, AR-4000W & PBA-6 grades. See Note: (1)	96-006	CA	2148	15 TONS 15 Tonnes	3001	9/19/94
Chevron (Richmond Beach) - Seattle, WA *Bid Items:*					
Paving Asphalt AR-2000W, AR-4000W & PBA-6 grades. See Note: (1)	96-027	CA	2148	15 TONS 15 Tonnes	3001	9/19/94

Washington State Department of Transportation

REQUEST FOR APPROVAL OF MATERIALS SOURCES

CONTRACT: _____ (_____): F.A. NUMBER _____ ; SR - _____ DATE 11-5-98
For PE Use

SECTION Weyerhaeuser Mill East ; COUNTY Snohomish

CONTRACTOR CSR Associated SUBMITTED BY _____
Signature

See Section 1-06.1 of Std. Spec. and reverse side for instructions.

CONTRACT BID ITEM		SOURCE		For WSDOT Use		
BID NO.	MATERIAL OR MANUFACTURER'S PRODUCT/TYPE	NAME OF MANUFACTURER/FABRICATOR OR PIT NUMBER	SPECIFICATION REFERENCE	P.E. APPR'L CODE	HDTR. APPR'L CODE	DUE NO.
	AR4000 for Tack Coat for use with Geotextile	Chevron Richmond Beach WA	9-02.1(4	A		

PROJECT ENGINEER	DATE	HQ's MATERIALS ENGINEER	DATE

Approval Action Codes for use by Project Engineer and HQ Materials Laboratory

1. Source Approved: Acceptance based upon 'Satisfactory' Test Report for samples of materials to be incorporated into project..
2. Source Approved: Submit Mfg. Cert. of Compliance for 'Approval' prior to use of material.
3. Source Approved: Submit Catalog Cuts for 'Approval' prior to use of material.
4. Source Approved: Submit Shop Drawings for 'Approval' prior to fabrication of material.
5. Source Approved: Only materials identified 'Approved for Shipment' by WSDOT Fabrication Inspection Office *prior to shipment* to be used.
6. Source Approved: Materials to be certified as either 100% American manufacturer or identification of foreign manufacturer and materials cost within the permissible limits for the project (See Special Provisions).
7. Approval Pending: Request Transmitted to Hdqtr. Lab. for Approval Action.
8. Source Approved:

REMARKS:

Approval Action Codes for Headquarters Laboratory use - only

9. Source Approved: Approval of Change of source must be secured from Headquarters Materials Engineer per Std. Specifications.
10. Approval Withheld: Submit samples for preliminary evaluation.
11. Approval Withheld:
12.

REMARKS:

PROJECT ENGINEER DISTRIBUTION
Contractor ✓
Dist. Admin. ✓
Dist. Mats ✓
HQ. Mats Lab (Docum) ✓
( ) Mandatory Distribution

HEADQUARTERS MATERIALS ENGINEER DISTRIBUTION
HQ Mats Lab (General File) ✓
HQ Mats Lab (Elec) (all E & S Codes) _____
HQ Mats Lab (Asphalt) (all B codes) _____
Seattle Insp. Office (all 5 codes) _____
Project Engineer _____

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

July, 1997

QUALIFIED PRODUCTS LIST

Contractor: **Contract No:**

Sub Contractor: **Date:**

Specification Reference - Material Category	File No	Acceptance Code	Minor Qty	MQ Code	Last Update
9-02.1(2,3) Cut-Back Liquid Asphalt					
Albina Fuel - Portland, OR *Bid Items:*					
Cut-Back Liquid Asphalts Medium Cure(MC) grades 70, 250, 800, 3000. Uses base asphalt from Cenex and Sinclair. See Note: (1)	96-005	CA 1030	15 TONS 15 Tonnes	3001	9/19/94
Chevron (Richmond Beach) - Seattle, WA *Bid Items:*					
Cut-Back Liquid Asphalts Rapid Cure(RC) & Medium Cure(MC) grades 70, 250, 800, 3000. See Note: (1)	96-025	CA 2148	15 TONS 15 Tonnes	3001	9/19/94
Chevron (Willbridge) - Portland, OR *Bid Items:*					
Cut-Back Liquid Asphalts Rapid Cure(RC) & Medium Cure(MC) grades 70, 250, 800, 3000. See Note: (1)	96-030	CA 2148	15 TONS 15 Tonnes	3001	9/19/94
Idaho Asphalt Supply, Inc. - Post Falls, ID *Bid Items:*					
Cut-Back Liquid Asphalts Rapid Cure(RC) & Medium Cure(MC) grades 70, 250, 800, 3000. See Note: (1)	96-071	CA 2148	15 TONS 15 Tonnes	3001	9/19/94
Koch Asphalt Co. - Spokane, WA *Bid Items:*					
Cut-Back Liquid Asphalts Medium Cure(MC) grades 70, 250, 800, 3000. Uses Exxon asphalt. May be distributed from Spokane or Pasco. See Note: (1)	96-081	CA 2148	15 TONS 15 Tonnes	3001	9/19/94
Sound Refining - Tacoma, WA *Bid Items:*					
Cut-Back Liquid Asphalts Rapid Cure(RC) grades 70, 250, 800, 3000 and Medium Cure(MC) grades 250, 800. See Note: (1)	96-146	CA 2148	15 TONS 15 Tonnes	3001	9/19/94
TAK Petroleum - Spokane, WA *Bid Items:*					
Cut-Back Liquid Asphalts Medium Cure(MC) grades 70, 250, 800, 3000. Uses asphalt from Exxon, US Oil or Sound Refining. See Note: (1)	96-160	CA 2148	15 TONS 15 Tonnes	3001	9/19/94
U.S. Oil Refinery Company - Tacoma, WA *Bid Items:*					
Cut-Back Liquid Asphalts Medium Cure(MC) grades 70, 250, 800, 3000. See Note: (1)	96-174	CA 2148	15 TONS 15 Tonnes	3001	9/19/94
9-02.1(4)A Paving Asphalt					
Albina Fuel - Portland, OR *Bid Items:*					
Paving Asphalt AR-2000W, AR-4000W & PBA-6 grades. See Note: (1)	96-006	CA 2148	15 TONS 15 Tonnes	3001	9/19/94
Chevron (Richmond Beach) - Seattle, WA *Bid Items:*					
Paving Asphalt AR-2000W, AR-4000W & PBA-6 grades. See Note: (1)	96-027	CA 2148	15 TONS 15 Tonnes	3001	9/19/94

PO Box 47365 Olympia / 1655 S 2nd Ave Tumwater / WA 98504-7365

BITUMINOUS SECTION TEST REPORT

WORK ORDER NO: 004944
LAB ID NO: 0000201401
TRANSMITTAL NO: 142820
MIX ID NO: G8562
BID ITEM NO:

TEST OF: A.C.P. JOB MIX DESIGN CLASS A AND B
DATE SAMPLED: 02/04/98
DATE RECVD HQS: 02/06/98
SR NO: 405
SECTION: WOODINVILLE INTERCHANGE HOV WIDENING

CONTRACTOR'S PROPOSAL

Mat'l:	MIN. AGG.	MIN. AGG.	BL. SAND		Combined	Specifications	
Source:	B-335	B-335	B-335				
Ratio:	22.0 %	73.0 %	5.0 %		100%		
---	100.0	100.0	100.0		100		
3/4	100.0	100.0	100.0		100	100	
1/2	80.7	100.0	100.0		95	90-100	
3/8	31.3	99.4	100.0		84	78-90	
1/4	3.3	85.6	100.0		68	55-75	
10	0.8	42.1	92.0		35	30-42	
40	0.5	18.8	51.0		16	11-24	
200	0.30	7.80	0.70		5.8	3-7	

LABORATORY ANALYSIS

Asph % by Wt of Total Mix:	4.3	4.8	5.2	5.7	6.1	6.5
Stabilometer "S" Value:	41	37	36	28	20	17
Cohesiometer "C" Value:	176	154	176	174	167	129
Density (lbs/cf):	149.6	150.0	151.4	152.1	151.5	151.4
% Voids - Volume in Mix:	4.5	3.6	2.0	0.8	0.6	
% Voids in Mineral Agg:	14.8	15.0	14.6	14.6	15.4	15.8
Max Density from Rice:	157.0	155.9	154.9			

LOTTMAN STRIPPING EVALUATION

		0%	1/4%	1/2%	3/4%	1%
CHEVRON	Visual Appearance:	NONE	NONE	NONE	NONE	NONE
	% Retained Strength:	79	91	104	102	111
U.S.OIL	Visual Appearance	NONE	NONE	NONE	NONE	NONE
	% Retained Strength	82	91	112	105	106

RECOMMENDATIONS

Supplier	CHEVRON RICHMOND BEACH	U.S.OIL U.S.OIL
% Asphalt (by total mix)	4.8	4.8
Grade of Asphalt	AR4000W	AR4000W
% Anti Strip (by wt asph)	0.25	0.00
Type of Anti Strip	ARR-MAZ	
Max. Density lbs/cf	155.9	155.9

Ignition Furnace Correction Factor: 0.67
MIX ID NUMBER: 8562 8562
Remarks:

Headquarters:
Materials File_____X
General File_____X
Bituminous Section_____X
Region: Northwest
Administrator_____41 X
Materials Engr_____41 X
PE: R. ERICKSON x(2)

T160-1
T166-
T172-1
T175-

Dennis C. Jackson, P.E.
Materials Engineer
By: Dennis M. Duffy, P.E.
(360) 709-5420
Date: 5/6/98

MAR-18-1998 14:25 P.03

Amoco Fabrics and Fibers Company
Suite 550
900 Circle 75 Parkway
Atlanta, Georgia 30339
(770) 955-9025

January 29, 1999
c990072*

Charles R. Watts Company
4121 6th Avenue NW
Seattle WA 98107

B/L #16609
Shipper #047135

Amoco Fabrics & Fibers hereby certifies that CEF Style 4596 shipped to you 10-27-98, on AFFC order #8044713501, meets the following minimum average roll values:

Property	Test Method	Minimum Average Roll Value (English)	Minimum Average Roll Value (Metric)
Unit Weight	ASTM D-5261	3.5 oz/yd^2	115 g/m^2
Elongation	ASTM D-4632	50%	50%
Tensile Strength	ASTM D-4632	80 lbs	.355 kN
Trapezoid Tear	ASTM D-4533	25 lbs	.111 kN
Mullen Burst	ASTM D-3786	165 psi	1130 kPA
Asphalt Retention	Task Force 25	0.20 gal/yd^2	0.90 L/m^2
UV Stability	ASTM D-4355	70%/150 hrs	70%/150 hrs
Melting Point		320° F	160° C

Amoco Fabrics & Fibers Company manufactures all the nonwoven geotextile fabric certified above. The values are a result of testing conducted in on-site laboratories at the time of production. All test methods used are ASTM or industry standards. Test data is retained in the Quality Control files at Amoco's production facility.

K. W. Burgess
Quality Manager

PROGRAM: OE90129C
DATE : 10/27/98
TIME : 19:44

AMOCO FABRICS AND FIBERS COMPANY
PACKING LIST
SENECA MILLS DIVISION
320 SHILOH ROAD
SENECA SC. 29679

PA

SHIP TO: CHARLES R WATTS COMPANY
4121 6TH AVE NW
SEATTLE, WA 98107

CUST NO: 29101

GROSS WEIGHT: 22787
VIA: 0080004157-BENNY WHITE
TRAILER NO: 97550
B/L NO: 16609
DELIVERY NOTE: 0080447135
SHIP DATE: 98/10/27
STOP NO: 00

SOLD TO: CHARLES R WATTS COMPANY
4121 6TH AVE NW
SEATTLE, WA 98107

CUST NO: 29101

ITEM #	PCCT	STYLE	WIDTH	GRD	COLOR	FB	BATCH	UNITS	P O NUMBER	AFFC	MATERIAL	CUST SE
51-0319836	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319837	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319839	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319846	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319849	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319855	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319857	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319858	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319859	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319860	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319861	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319862	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319863	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319864	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319865	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319866	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319867	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319868	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319878	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319879	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0319880	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0536738	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0536740	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0536741	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0536742	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0536743	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0536744	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0536745	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0536746	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0536747	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0536748	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0536750	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0536751	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0536752	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0536753	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0536754	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0536755	00.00	4545	180.0000	10	0007	00		100	187715		42802	
51-0536756	00.00	4545	180.0000	10	0007	00		100	187715		42802	
TOTALS							38 ITEMS *	3,800	YD *	19,000	YD2 *	
51-0443700	00.00	4596	150.0000	10	0007	00		120	187715		42947	
51-0443746	00.00	4596	150.0000	10	0007	00		120	187715		42947	
51-0443747	00.00	4596	150.0000	10	0007	00		120	187715		42947	
51-0443748	00.00	4596	150.0000	10	0007	00		120	187715		42947	
51-0443749	00.00	4596	150.0000	10	0007	00		120	187715		42947	

[illegible] MILLS DIVISION
320 [illegible]ILOH ROAD
SEN[illegible]A SC. 29679

SHIP TO: CHARLES R WATTS COMPANY
4121 6TH AVE NW
SEATTLE, WA 98107

CUST NO: 29101

SOLD TO: CHARLES R WATTS COMPANY
4121 6TH AVE NW
SEATTLE, WA 98107

CUST NO: 29101

GROSS WEIGHT: 22787
VIA: 0080004157-BENNY WHITE
TRAILER NO: 97550
B/L NO: 16609
DELIVERY NOTE: 0080447135
SHIP DATE: 98/10/27
STOP NO: 00

ITEM #	PCCT	STYLE	WIDTH	GRD	COLOR	PB	BATCH	UNITS	P O NUMBER	AFFC	MATERIAL	CUST SP
-0443750	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443751	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443752	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443753	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443754	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443755	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443756	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443757	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443770	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443771	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443772	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443773	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443774	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443775	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443776	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443777	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443778	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443779	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443787	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443788	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443789	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443790	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443791	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443792	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443942	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443943	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443947	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443948	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443949	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443950	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443954	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443955	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443956	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443957	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0443958	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0530225	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0530345	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0530346	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0530347	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0674690	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0674691	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0674692	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0683202	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0683203	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0683204	00.00	4596	150.0000	10	0007	00		120	187715		42947	

: 18:44

PACKING LIST
SE[illegible]A MILLS DIVISION
320 SHILON ROAD
SENECA SC. 29679

SHIP TO: CHARLES R WATTS COMPANY
4121 6TH AVE NW
SEATTLE, WA 98107
CUST NO: 29101

SOLD TO: CHARLES R WATTS COMPANY
4121 6TH AVE NW
SEATTLE, WA 98107
CUST NO: 29101

GROSS WEIGHT: 22787
VIA: 0080004157-BENNY WHIT
TRAILER NO: 97550
B/L NO: 16609
DELIVERY NOTE: 0080447135
SHIP DATE: 98/10/27
STOP NO: 00

ITEM #	PCCT	STYLE	WIDTH	GRD	COLOR	PB	BATCH	UNITS	P O NUMBER	AFFC	MATERIAL	CUST S
[illegible]-0683205	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0683206	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0683209	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0683210	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0683211	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0683214	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0683215	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0683216	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0683217	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0683218	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0683219	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0683220	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0683221	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0683222	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0683239	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0683240	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0683241	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0683242	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0683243	00.00	4596	150.0000	10	0007	00		120	187715		42947	
.-0684203	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0684206	00.00	4596	150.0000	10	0007	00		120	187715		42947	
.-0684208	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0684209	00.00	4596	150.0000	10	0007	00		120	187715		42947	
.-0684214	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0684215	00.00	4596	150.0000	10	0007	00		120	187715		42947	
.-0684216	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0684217	00.00	4596	150.0000	10	0007	00		120	187715		42947	
.-0684218	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0684219	00.00	4596	150.0000	10	0007	00		120	187715		42947	
.-0684220	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0684221	00.00	4596	150.0000	10	0007	00		120	187715		42947	
.-0684226	00.00	4596	150.0000	10	0007	00		120	187715		42947	
[illegible]-0684227	00.00	4596	150.0000	10	0007	00		120	187715		42947	
.-0684228	00.00	4596	150.0000	10	0007	00		120	187715		42947	
.-0684229	00.00	4596	150.0000	10	0007	00		120	187715		42947	
.-0684230	00.00	4596	150.0000	10	0007	00		120	187715		42947	
.-0684231	00.00	4596	150.0000	10	0007	00		120	187715		42947	
.-0684232	00.00	4596	150.0000	10	0007	00		120	187715		42947	
.-0684233	00.00	4596	150.0000	10	0007	00		120	187715		42947	
.-0684234	00.00	4596	150.0000	10	0007	00		120	187715		42947	
.-0684235	00.00	4596	150.0000	10	0007	00		120	187715		42947	
.-0684236	00.00	4596	150.0000	10	0007	00		120	187715		42947	
.-0684237	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0684238	00.00	4596	150.0000	10	0007	00		120	187715		42947	
.-0684239	00.00	4596	150.0000	10	0007	00		120	187715		42947	

SE[illegible]A SC. 29679

SHIP TO: CHARLES R WATTS COMPANY
4121 6TH AVE NW
SEATTLE, WA 98107

CUST NO: 29101

GROSS WEIGHT: 22787
VIA: 0080004157-BENNY WHITE
TRAILER NO: 97550
B/L NO: 16609
DELIVERY NOTE: 0080447135
SHIP DATE: 98/10/27
STOP NO: 00

LD TO: CHARLES R WATTS COMPANY
4121 6TH AVE NW
SEATTLE, WA 98107

CUST NO: 29101

ITEM #	FCCT	STYLE	WIDTH	GRD	COLOR	PB	BATCH	UNITS	P O NUMBER	AFFC	MATERIAL	CUST SH
-0684240	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0684241	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0684242	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0684243	00.00	4596	150.0000	10	0007	00		120	187715		42947	
-0684244	00.00	4596	150.0000	10	0007	00		120	187715		42947	
TOTALS							100 ITEMS *	12,000	YD *	50,000	YD2 *	
-0181520	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0181521	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0181522	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0181523	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0181524	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0181525	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0181526	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0181527	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0181528	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0181529	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0385709	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0385711	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0385712	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0385721	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0652842	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0652843	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0652844	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0652853	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0684928	00.00	4599	150.0000	10	0007	00		120	187715		43010	
-0684929	00.00	4599	150.0000	10	0007	00		120	187715		43010	
TOTALS							20 ITEMS *	2,400	YD *	10,000	YD2 *	
							158 ITEMS **	18,200	YD **	79,000	YD2 **	

Amoco Fabrics and Fibers Company
Suite 550
900 Circle 75 Parkway
Atlanta, Georgia 30339
(770) 956-9025

January 28, 1999
C990064

Charles R. Watts Company
4121 6th Avenue NW
Seattle WA 98107

B/L #16346
Shipper #032013

Amoco Fabrics & Fibers hereby certifies that CEF Style 4596 shipped to you 09-28-98, on AFFC order #8043201301, meets the following minimum average roll values:

Property	Test Method	Minimum Average Roll Value (English)	Minimum Average Roll Value (Metric)
Unit Weight	ASTM D-5261	3.5 oz/yd^2	115 g/m^2
Elongation	ASTM D-4632	50%	50%
Tensile Strength	ASTM D-4632	80 lbs	.355 kN
Trapezoid Tear	ASTM D-4533	25 lbs	.111 kN
Mullen Burst	ASTM D-3786	165 psi	1130 kPA
Asphalt Retention	Task Force 25	0.20 gal/yd^2	0.90 L/m^2
UV Stability	ASTM D-4355	70%/150 hrs	70%/150 hrs
Melting Point		320°	160°

Amoco Fabrics & Fibers Company manufactures all the nonwoven geotextile fabric certified above. The values are a result of testing conducted in on-site laboratories at the time of production. All test methods used are ASTM or industry standards. Test data is retained in the Quality Control files at Amoco's production facility.

K. W. Burgess
Quality Manager

PROGRAM: OE90129C
DATE : 09/29/98
TIME : 09:13

AMOCO FABRICS AND [illegible]S COMPANY
PACKING LIST
SENECA MILLS DIVISION
520 SHILOH ROAD
SENECA SC. 29679

SHIP TO: CHARLES R WATTS COMPANY
4121 6TH AVE NW
SEATTLE, WA
98107
CUST NO: 29101

SOLD TO: CHARLES R WATTS COMPANY
4121 6TH AVE NW
SEATTLE, WA
98107
CUST NO: 29101

GROSS WEIGHT: 3905
VIA: 0080004157-BENNY WHITEHEAD INC
TRAILER NO: 97640
B/L NO: 16346
DELIVERY NOTE: 0080432013
SHIP DATE: 98/09/28
STOP NO: 00

ITEM #	PCCT	STYLE	WIDTH	GRD	COLOR	PB	BATCH	UNITS	P O NUMBER	AFTC MATERIAL CUST SKU	LN SUB
51-0227692	01.00	4596	150.0000	10	0007	00		120	172506	42947	01C-00
51-0443433	01.00	4596	150.0000	10	0007	00		120	172506	42947	01C-00
51-0443434	01.00	4596	150.0000	10	0007	00		120	172506	42947	01C-00
51-0443441	01.00	4596	150.0000	10	0007	00		120	172506	42947	01C-00
51-0443442	01.00	4596	150.0000	10	0007	00		120	172506	42947	01C-00
51-0443444	01.00	4596	150.0000	10	0007	00		120	172506	42947	01C-00
51-0683641	01.00	4596	150.0000	10	0007	00		120	172506	42947	01C-00
51-0683647	01.00	4596	150.0000	10	0007	00		120	172506	42947	01C-00
51-0683649	01.00	4596	150.0000	10	0007	00		120	172506	42947	01C-00
51-0683651	01.00	4596	150.0000	10	0007	00		120	172506	42947	01C-00
51-0683652	01.00	4596	150.0000	10	0007	00		120	172506	42947	01C-00
51-0683654	01.00	4596	150.0000	10	0007	00		120	172506	42947	01C-00
51 0683657	01.00	4596	150.0000	10	0007	00		120	172506	42947	01C-00
51-0683659	01.00	4596	150.0000	10	0007	00		120	172506	42947	01C-00
51-0683665	01.00	4596	150.0000	10	0007	00		120	172506	42947	01C-00
TOTALS							15 ITEMS *	1,800	YD *	7,500 YD2 *	
51-0239537	01.00	4599	120.0000	10	0007	00		120	172506	43003	03C-00
51-0239538	01.00	4599	120.0000	10	0007	00		120	172506	43003	03C-00
51-0239540	01.00	4599	120.0000	10	0007	00		120	172506	43003	03C-00
51-0239541	01.00	4599	120.0000	10	0007	00		120	172506	43003	03C-00
51-0239542	01.00	4599	120.0000	10	0007	00		120	172506	43003	03C-00
51-0239547	01.00	4599	120.0000	10	0007	00		120	172506	43003	03C-00
51-0239548	01.00	4599	120.0000	10	0007	00		120	172506	43003	03C-00
51-0239556	01.00	4599	120.0000	10	0007	00		120	172506	43003	03C-00
51-0239557	01.00	4599	120.0000	10	0007	00		120	172506	43003	03C-00
51-0239560	01.00	4599	120.0000	10	0007	00		120	172506	43003	03C-00
51-0239992	01.00	4599	120.0000	10	0007	00		120	172506	43003	03C-00
51-0239993	01.00	4599	120.0000	10	0007	00		120	172506	43003	03C-00
51-0239994	01.00	4599	120.0000	10	0007	00		120	172506	43003	03C-00
51-0239996	01.00	4599	120.0000	10	0007	00		120	172506	43003	03C-00
51-0240005	01.00	4599	120.0000	10	0007	00		120	172506	43003	03C-00
TOTALS							15 ITEMS *	1,800	YD *	6,000 YD2 *	
							30 ITEMS **	3,600	YD **	13,500 YD2 **	

APPENDIX E.2

CONFORMANCE TEST DATA

WRS Infrastructure
& Environment, Inc.

South 500 West
Salt Lake City, UT 84123
Phone: (801) 265-2323
Fax: (801) 265-2397

LETTER OF TRANSMITTAL

To: Stuart Triolo, Project Coordinator
Weyerhaeuser, Company
101 East Marine View Drive
Everette, WA 98201
Phone : 425-339-2871
Fax: : 425-339-2786

Date: 6/2/98
Transmittal No.: Informational-004
Project Name: Mill E/Koppers Site
Everett, WA
Client's Ref. #: 98-00094 (10/12/98)
Contractor: WRS I & E, Inc.
WRS Job #: 99-6028

From: Randall W. Richardson, WRS Project manger
Signature: _____

We are sending:
Via:

- ☐ Attached
- ☐ U.S. Mail
- ☐ Under Separate Cover
- ☒ Express Delivery
- ☒ Facsimile (sent to EMCON)

The following:

- ☐ Correspondence
- ☐ Drawings
- ☒ Submittal
- ☐ Certified Payroll
- ☐ Plans
- ☐ Samples
- ☐ Change Order
- ☐ Schedule
- ☐ Progress Payments
- ☐ Specifications
- ☐ Subcontractor
- ☐ Notification

Dated	Copies	Pages	Description
5/24/99	1	1	Asphalt Treated Base Coarse ("ATB") Compaction/Density Test Results
/28/99	1	1	Asphalt Pavement (top coarse) Compaction/Density Test Results

These are transmitted:

- ☐ For Approval
- ☐ For Your Use
- ☒ For Your File
- ☐ For Review And Comment
- ☐ Approved As Noted
- ☐ Approved As Submitted
- ☒ As Requested
- ☐ Returned For Corrections
- ☐ Returned With Corrections

Remarks: (Correction in underlined bold print below)

cc: Kent Wiken (EMCON), WRS job file.
File: c:\98-work\Weyerhsr\transmtl.xlw

ceipt signature: _____ (please sign and fax back) Date: _____

CSR Associated

In-Place Density Tests
(Bituminous)

Project: Weyerhaeuser Parking Lot Date: 5/28/99

A. B

Test #	General Location	A.C. Temp (F)	# of Passes	Roller Type	Vib. or Static	Time	PCF	Rice Density	Corr. factor	% density
1	MIDDLE QUADRANT	180°	2S/1V	SD	S/V	9:00	139.6	154.5	—	90.3
2	" RETEST	180	2	SD	V	9:01	141.6		—	91.6
3	MID quadrant flow	"	1V	SD	V	9:05	142.5		—	92.2
4	" " +15'	179	2V	SD	V	9:10	142.7		—	92.2

Notes: Arrived @ 7:00am 1st test @ 9:00. CORRECTION FACTOR NOT APPLIED TO FINAL % DENSITY @ THIS TIME

S=Sakai
R=rubber tire
SD=steel Drum

Tested By:

CSR Associated

In-Place Density Tests
(Bituminous)

Project: WEYERHAUSER MILL E/KOPPERS

Date: 5/24/99

Test #	General Location	A.C. Temp (F)	# of Passes	Roller Type	Vib. or Static	Time	PCF	Rice Density	Corr. factor	% density
1	NW EDGE +15'	287	4	SD	V	2'30	147.8	158.0	—	93.5
2	SW CORNER	182	4	"	V/S	"	146.0	158.0	—	92.4
3	MIDDLE PAD	184	3	SD	S	"	143.3	158.0		90.7
4	NW QUADRANT	222	2	SD	V	"	140.8	"		90.0
5	N CORNER	—	4	SD	S	"	145.3	"		92.0

Notes: All tests meet minimum compaction requirement.

S=Sakai
R=rubber tire
SD=steel Drum

Tested By:

PSI *Information To Build On*
Engineering • Consulting • Testing

March 30, 1999

Mr. Sam Bautista
EMCON
18912 North Creek Parkway, Ste. 200
Bothell, WA 98011-8016

Subject: Laboratory Testing of Geotextile
PSI Project No. 578-9T031.2

Dear Mr. Bautista:

On March 9, 1999, the Chemistry Department of Professional Service Industries, Inc. received one sample of geotextile material for testing. As you requested, the geotextile was tested for fiber melting point and asphalt retention. Results from these tests are summarized in the following tables. No additional testing or consulting was requested.

The melting point of the geotextile was determined in accordance with ASTM D276-87 (Reapproved 1993) *Identification of Fibers in Textiles* Sections 26-30 Fiber Melting Point. The geotextile was tested on a laboratory hotplate by laying several fibers between cover glasses and increasing the temperature of the hotplate incrementally until the geotextile was observed to melt. A magnifying glass was used to aid in the identification of the melting point. Results from this test are summarized in Table 1.

Asphalt retention was determined in accordance with a modified ASTM D6140 – 97 *Method to Determine Asphalt Retention of Paving Fabric Used in Asphalt Paving for Full Width Applications*. The modification was the substitution of asphalt 6422 for AC 20. The distributor/manufacturer of asphalt recommended 6422 as a substitution. The method called for the average of values from specimens cut in the "machine" direction and the "cross-machine" direction. No obvious warp or weave pattern was apparent in the geotextile, so specimens were cut perpendicular to one another. Results are presented as averages of four specimens from each direction as well as an average of all eight specimens. Results from this test are summarized in Table 2.

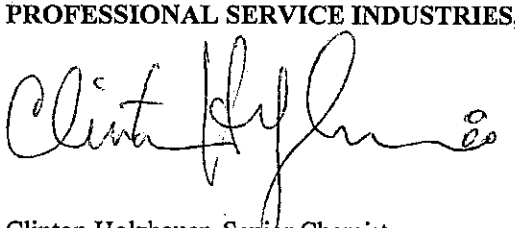
These tests were made and reported based on the specific sample provided to us by EMCON. We assume no responsibility for variations in the quality of a sample made by persons or under conditions over which we have no control.

This report is provided for the information of Sam Bautista and EMCON only. If this report is reproduced and/or transmitted to a third party, it must be reproduced and/or transmitted in its entirety. Any exceptions will be made only with the written permission of PSI.

Thank you for using PSI. If you have any questions, or if we can be of further assistance, please contact us at (206) 282-0666.

Sincerely,

PROFESSIONAL SERVICE INDUSTRIES, INC.



Clinton Holzhauer, Senior Chemist

Reviewed by: Jeffrey S. Thompson, Manager
Environmental and Chemistry Department

Sample Received: 03/09/99
Sample Tested: 03/11/99

Table 1
RESULTS FROM THE TESTING OF GEOMEMBRANE FOR
FIBER MELTING POINT
ASTM D276 – 87 (REAPPROVED 1993)
Results Presented in Degrees C

Sample ID	Melting Point (Average)
Geotextile	160 ° C

Sample Received: 03/09/99
Sample Tested: 03/12/99

Table 2
RESULTS FROM THE TESTING OF GEOTEXTILE FOR
ASPHALT RETENTION
MODIFIED ASTM D6140 – 97
Results Reported as Ounces per Square Foot (oz/ft^2) & Gallons per Square Yard (g/al/yd^2)

Sample ID0	Results (Average oz/ft2)	Results (Average gal/yd^2)
Geotextile Machine Direction	4.66	0.31
Geotextile Cross-Machine Direction	3.25	0.21
Geotextile Total Average	3.96	0.26

APPENDIX F

SUMMARY OF EROSION CONTROL SUBMITTALS

APPENDIX F.1

SEPARATION GEOTEXTILE (BETWEEN DRAINAGE DITCH RIPRAP AND SUBGRADE) CONFORMANCE TESTING

SYNTHETIC INDUSTRIES
Geosynthetic Products Division
Smart Solutions in Synthetics®

GEOTEX™ 801 Nonwoven Geotextile

GEOTEX 801 is a polypropylene, staple fiber, needlepunched nonwoven geotextile manufactured at one of Synthetic Industries' facilities that has achieved ISO-9002 certification for its systematic approach to quality. The fibers are needled to form a stable network that retain dimensional stability relative to each other. The geotextile is resistant to ultraviolet degradation and to biological and chemical environments normally found in soils. GEOTEX 801 conforms to the property values listed below[1] which have been derived from quality control testing performed by one of Synthetic Industries' GAI-LAP accredited laboratories:

PROPERTY	TEST METHOD	MINIMUM AVERAGE ROLL VALUES[2] *English*	*Metric*
Mechanical			
Grab Tensile Strength	ASTM D4632	205 lbs	900 N
Grab Elongation	ASTM D4632	50%	50%
Puncture Strength	ASTM D4833	105 lbs	465 N
Mullen Burst	ASTM D3786	350 psi	2410 kPa
Trapezoidal Tear	ASTM D4533	85 lbs	375 N
Hydraulic			
Apparent Opening Size (AOS)	ASTM D4751	80 US Std Sieve	0.180 mm
Permittivity	ASTM D4491	1.50 sec^{-1}	1.50 sec^{-1}
Permeability	ASTM D4491	0.38 cm/sec	0.38 cm/sec
Water Flow Rate	ASTM D4491	110 gpm/ft^2	4480 $l/min/m^2$
Endurance			
UV Resistance (% retained after 500 hours)	ASTM D4355	70%	70%

NOTES:

OK Keller 6/1/99

1. The property values listed below are effective 4/28/97 and are subject to change without notice.
2. Values shown are in weaker principal direction. Minimum average roll values are calculated as the typical minus two standard deviations. Statistically, it yields a 97.7% degree of confidence that any samples taken from quality assurance testing will exceed the value reported.

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7619 • 1-800-621-0444

APPENDIX F.2

SEEDING SUBMITTALS

MEMORANDUM

TO: Stuart Triolo
Weyerhaeuser

DATE: May 19,1999
PROJECT: 40141-037.123

FROM: Kent Wiken, P.E.
EMCON

Via Facsimile - 4 pages (425)339-2786

RE: Followup Memorandum
Technical Transmittal Number 15A
Seeding Requirements
Weyerhaeuser Mill E/Koppers Site Remediation

In regard to my memo of May 18, I have now received and reviewed the remaining items for the seeding submittal (these items are also attached):

1. The revised hydroseed mix certification letter with respect to the non-phosphorous fertilizer proposed at a rate of 200 lb. /acre.

2. The manufacturers certification sheet on the fertilizer

3. The certification letter that the wood fiber mulch proposed is free from weeds and foreign matter detrimental to plant life.

Based on this information, the proposed seeding products are acceptable for use on this project. Ms. Davis indicated that there would be no change in the bid price. The non-phosphorous fertilizer was more expensive per pound; however, requires only 200 lb./acre vs. 400 lb./acre (as previously proposed).

Please do not hesitate to call if you have any questions.

cc: Brian O'Neal, Pete Seybert, Russell Stolsen - EMCON.

Leaders in
Hydroseeding Technology

Cecon Corporation
PO Box 1514
Tacoma, WA 98401

May 19, 1999

Re: Weyerhaeuser Mill Everett (Revised)

Dear Butch:

Briargreen, Inc. will supply the hydroseeding as specified on the above mentioned project. Our applications rates are as follows:

Per Acre

1200#	Wood Fiber
120#	Seed (40% Per Rye, 40% Creeping Red Fescue, 10% Highland Bent, 10% Clover)
200#	Fertilizer (25-0-15)

If we can be of additional assistance, please call me at 1-800-635-TURF.

Sincerely,

Card Davis
General Manager
Briargreen, Inc.

Briargreen, Inc.
P.O. Box 6639
Kent, Wa. 98064

(800) 635-8873
(253) 630-5024
Fax (253) 630-9124
e-mail phil@briargreen.com
www.briargreen.com

Fiber Marketing International Inc. fmi

To:

CERTIFICATE OF COMPLIANCE for ECOFIBRE Wood Fiber Mulch.

ECOFIBRE is manufactured to meet the following specifications:

ECOFIBRE is a virgin wood fiber mulch manufactured from 100% whole wood chips. ECOFIBRE is produced by a thermo-mechanical defibrating process and manufactured to contain a specified range of fibers averaging 0.15 inches or longer and with 50% or more retained on a 28-mesh screen (a Tyler Ro-Tap method). The manufacturing process of pressurized disc refining separates the solid wood into its individual fibers and fiber bundles.

ECOFIBRE disperses rapidly in water and remains in uniform suspension under agitation. It blends with seed, fertilizer and other approved and specified materials to form a homogeneous slurry. When applied with hydraulic planting equipment, the fibers form a strong moisture holding mat while allowing good percolation and favorable micro-climate for seed germination and growth.

The fibers are colored green with a water-soluble non-toxic dye to help the operator apply ECOFIBRE uniformly. The green color also gives a temporary grass-like appearance to the covered area. The dye will not stain masonry, concrete, asphalt or painted surface.

ECOFIBRE specifications are monitored by the Canfor Technical Services group. Tests are conducted using scientifically sound and reliable methods. Other test methods may produce slightly different results.

Moisture Content (total weight basis)	12%±3%
Organic Matter (oven dry weight basis)	99.2%±0.2%
Ash Content (oven dry weight basis)	0.8%±0.2%
pH at 3% consistency in water	4.5 ±0.5
Moisture holding capacity (grams of water per 100 gms oven dry fiber)	min.1,250

Representative

United Horticultural Supply

25-0-15
With UHS 2002

PROFESSIONAL TURF PRODUCTS

25-0-15

GUARANTEED ANALYSIS

Total Nitrogen (N)	25.00%
5.00% Ammoniacal Nitrogen	
20.00% Urea Nitrogen*	
Soluble Potash (K_2O)	15.00%
Sulfur (S)	6.01%
Iron (Fe)	2.00%

Plant Nutrient Sources
Potassium Chloride, Urea, Ammonium Sulfate, Polymer Coated Urea, Iron Oxide.

*12.53% Slowly available Urea Nitrogen derived from Polymer Coated Urea.

APPLICATIONS

TURFGRASSES: Apply to dry foliage and water in after application. Apply prior to or during favorable turfgrass growing conditions. Wash, brush, or blow off any non-target areas to alleviate any staining or unwanted effects.

RATES:

To Achieve:	Apply Product At:	
1.0 lbs. N/1000 sq.ft.	174.24 lbs./acre	4.00 lbs./1000 sq.ft.
0.5 lbs. N/1000 sq.ft.	87.12 lbs./acre	2.00 lbs./1000 sq.ft.

Age and condition of spreader may cause variations in application rates.
Blend Code #14499

Net Wt. 50 Lbs. / 22.7 Kgs.

SEE PREPRINTED BAG FOR PRECAUTIONARY STATEMENTS, FIRST AID STATEMENTS, CONTAINER DISPOSAL INSTRUCTION AND LIMITS OF WARRANTY.

Formulated for

United Horticultural Supply
150 SO. MAIN STREET
BELMONT, NEBRASKA 68026-5697

ESN is a trademark of Viridian

ESN Standard

Attn: Kent Wiken

APPENDIX F.3

CITY OF EVERETT SITE GRADING PERMIT

Application For
PUBLIC WORKS PERMIT

PUBLIC WORKS DEPARTMENT
3200 Cedar Street
Everett, WA 98201 259-8810

Date 7/1/98 1

Public Works Permit # 98/192

Building Permit # ___

Public Works Fee $ 226.00

TYPE OR PRINT ONLY

Owner	Mailing Address	City	Zip	Phone
Weyerhaeuser	101 East Marine View Drive,	Everett, WA	98201	339-2871

Applicant	Mailing Address	City	Zip	Phone
Same				

Describe Proposed Work Excavate about 1500 yd³ of contaminated soils from former mill E/Koppers Site, backfill excavations with sand presently on site. Fill, grade, pave portion of 9 Acre site with sand on-site. Work to be performed with Ecology Consent Decree/oversight.

PROJECT ADDRESS (if known) Same as above.

Attach four (4) copies of plans for proposed work - Draw to scale and note the following if applicable:

- Property Lines
- Outline and dimensions of all existing and proposed structures on the lot
- Existing and proposed utilities
- Centerline of street
- Indicate North
- Show any proposed grading changes
- Show measurements

POST ON JOB SITE

DO NOT WRITE BELOW THIS LINE

PERMIT CONDITIONS:

1. All calls for inspection shall be made 24 hours in advance - phone 259-8810.
2. All work shall be performed in accordance with this permit and current City of Everett Design and Construction Standards and Specifications.
3. Call Location Underground Service 48 hrs. before you dig. **TOLL FREE NUMBER 1-800-424-5555.**
4. Install silt Fence as proposed
5. Protect storm drains with filter/fabric or haybails as proposed.
6. Keep city Streets clean at all times

07-21-98 11:38AM
9815_
OTHER 100.00
OTHER 126.00
TOTAL 226.00
CHEK 226.0
A 0M7189

Approved for Construction KB [signature] Date 7/14/98

FINAL INSPECTION Approved as Constructed [signature] Date 12-2-98

ACKNOWLEDGEMENT OF CONDITIONS

The undersigned owner/applicant hereby agrees to hold and save harmless the City of Everett from any and all claims for damages, costs, expenses, or causes of action that may arise because of installation and maintenance of the improvement or other right-of-way use hereto applied for and further agrees to remove same upon notice from the City and to replace public property damaged thereby.

Signature of Applicant Stuart Triolo Date 7/1/98

WORK AUTHORIZED BY THIS PERMIT MUST BE STARTED WITHIN 180 DAYS OF DATE PERMIT IS ISSUED AND THEREAFTER IS TO BE DILIGENTLY PURSUED TO

APPENDIX G

SUMMARY OF PIEZOMETER INSTALLATION DETAILS

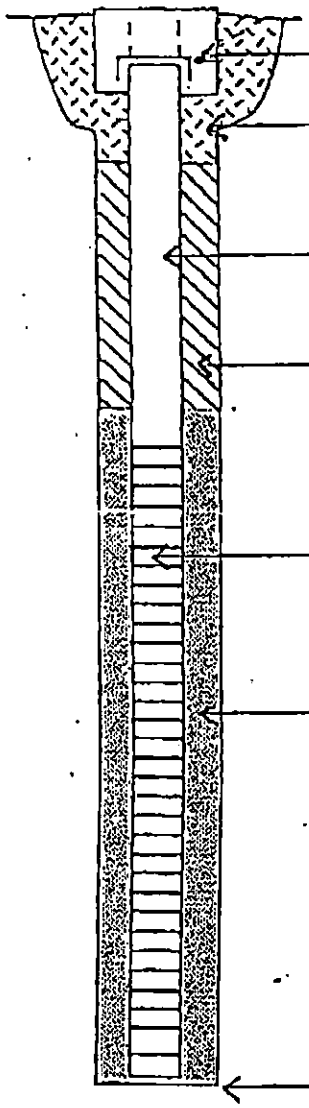
RESOURCE PROTECTION WELL REPORT

START CARD NO. R039901

PROJECT NAME: Weyerhauser Mill
WELL IDENTIFICATION NO. AEM 337/P2-1A
DRILLING METHOD: HSA
DRILLER: Brian G. Gose
FIRM: Cascade Drilling, Inc.
SIGNATURE: [signature]
CONSULTING FIRM: WRS
REPRESENTATIVE: Randy Richardson
9033

COUNTY: Snohomish
LOCATION SW¼ NW¼ Sec 8 Twn 29N R 5E
STREET ADDRESS OF WELL: 101 E. Marine View Dr. Everett
WATER LEVEL ELEVATION: 3'
GROUND SURFACE ELEVATION: N/A
INSTALLED: 1/26/99
DEVELOPED: No

AS-BUILT



WELL DATA

SURFACE (@ THAT TIME) APPROX. 7.75' stick up
WELL COVER
CONCRETE SURFACE SEAL
DEPTH = 1/ft
PVC BLANK 2 "x 2'
BACKFILL 1 ft.
TYPE: bent. Chips
PVC SCREEN 2 "x 3.6"
SLOT SIZE: .010
GRAVEL PACK 4 ft.
MATERIAL: 10/20 colo.
WELL DEPTH 5.6 "

FORMATION DESCRIPTION

0 - 5.6 ft.
brown / black sand

- ft.

- ft.

SCALE: 1" = _____ PAGE _____ OF _____

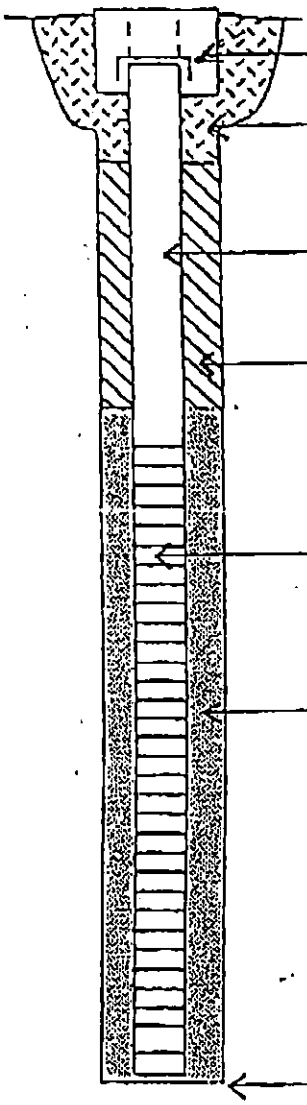
ECY 050-12 (Rev. 11/09)

RESOURCE PROTECTION WELL REPORT

START CARD NO. R039901

PROJECT NAME: Weyerhaeuser Mill
WELL IDENTIFICATION NO. AEM 336 / PZ 1B
DRILLING METHOD: HSA
DRILLER: Brian G. Gose
FIRM: Cascade Drilling, Inc.
SIGNATURE: B
CONSULTING FIRM: WRS
REPRESENTATIVE: Randy Richardson
9033

COUNTY: Snohomish
LOCATION SW¼ NW¼ Sec 8 Twn 29N R 5E
STREET ADDRESS OF WELL: 101 E. Marine View Dr. Everett
WATER LEVEL ELEVATION: 3'
GROUND SURFACE ELEVATION: N/A
INSTALLED: 1/26/99
DEVELOPED: No

AS-BUILT	WELL DATA	FORMATION DESCRIPTION
	SURFACE (@ THAT TIME) APPROX. 6.95' ~ RVR WELL COVER CONCRETE SURFACE SEAL DEPTH = 1/ft PVC BLANK 2 "x 3', 6" BACKFILL 3' ft. TYPE: bent. Chips PVC SCREEN 2 "x 3', 6" SLOT SIZE: .010 GRAVEL PACK 4 ft. MATERIAL: 10/20 colo. WELL DEPTH 7 ' "	0 - 7 ft. brown / black sand - ft. - ft.

SCALE: 1" = _____ PAGE _____ OF _____

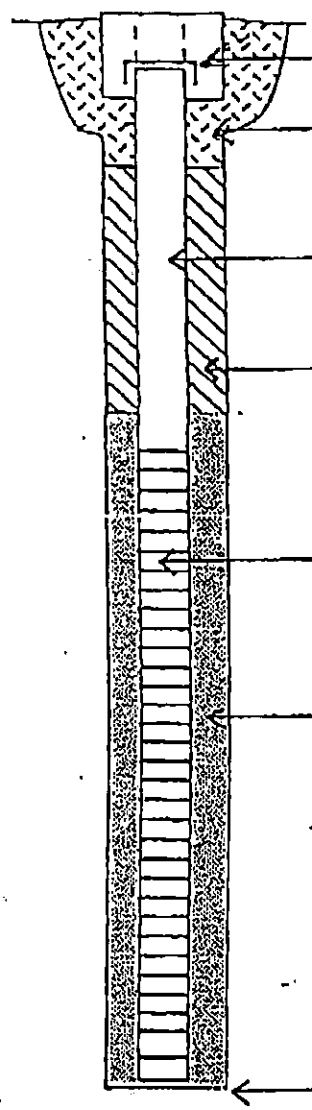
ECY 050-12 (Rev. 11/99)

RESOURCE PROTECTION WELL REPORT

START CARD NO. R039901

PROJECT NAME: Weyerhaeuser Mill
WELL IDENTIFICATION NO. AEM 338 / PZ-2A
DRILLING METHOD: HSA
DRILLER: Brian G. Gose
FIRM: Cascade Drilling, Inc.
SIGNATURE: [signature]
CONSULTING FIRM: WRS
REPRESENTATIVE: Randy Richardson
9033

COUNTY: Snohomish
LOCATION SW¼ NW¼ Sec 8 TWP 29N R 5E
STREET ADDRESS OF WELL: 101 E. Marine View Dr, Everett
WATER LEVEL ELEVATION: 3'
GROUND SURFACE ELEVATION: N/A
INSTALLED: 1/26/99
DEVELOPED: No

AS-BUILT	WELL DATA	FORMATION DESCRIPTION
	SURFACE (AT THAT TIME) APPROX 7.8'	RWR 0 - 8 ft. brown/black sand
	WELL COVER	
	CONCRETE SURFACE SEAL DEPTH = 1/ft	
	PVC BLANK 2 "x 3 '	- ft.
	BACKFILL 2.6' " ft. TYPE: bent. Chips	- ft.
	PVC SCREEN 2 "x 5 ' SLOT SIZE: .010	
	GRAVEL PACK 5'.6" ft. MATERIAL: 10/20 sand	
	WELL DEPTH 8 ' "	

SCALE: 1" = _____ PAGE _____ OF _____

ECY 050-12 (Rev. 11/09)

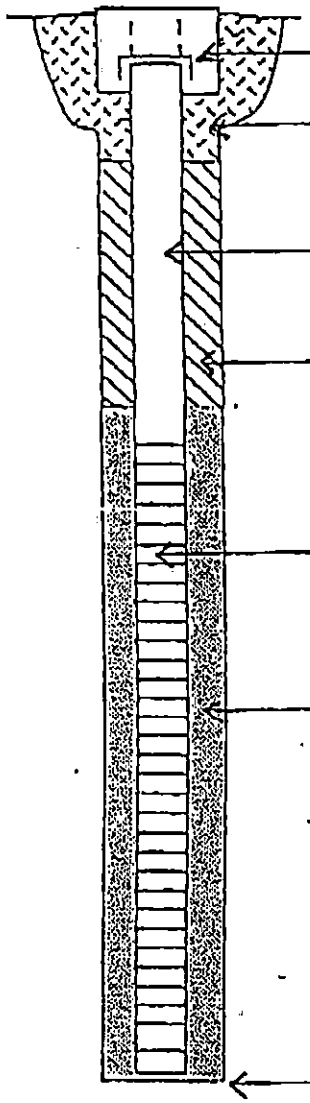
RESOURCE PROTECTION WELL REPORT

START CARD NO. R039901

PROJECT NAME: Weyerhaeuser Mill
WELL IDENTIFICATION NO. AEM 339/PZ-2B
DRILLING METHOD: HSA
DRILLER: Brian G. Gose
FIRM: Cascade Drilling, Inc.
SIGNATURE: Br
CONSULTING FIRM: WRS
REPRESENTATIVE: Randy Richardson

COUNTY: Snohomish
LOCATION SW¼ NW¼ Sec 8 Twp 29N R 5E
STREET ADDRESS OF WELL: 101 E. Marine View Dr. Everett
WATER LEVEL ELEVATION: 3'
GROUND SURFACE ELEVATION: N/A
INSTALLED: 1/26/99
DEVELOPED: No

9033

AS-BUILT	WELL DATA	FORMATION DESCRIPTION
	SURFACE (AT THAT TIME) APPROX. 7.7' WELL COVER CONCRETE SURFACE SEAL DEPTH = 1/ft PVC BLANK 2 "x 2'.6" BACKFILL 2 ft. TYPE: bent. Chips PVC SCREEN 2 "x 5 ' SLOT SIZE: .010 GRAVEL PACK 5'.6" ft. MATERIAL: 10/20 sand WELL DEPTH 7 . 6 "	RAWR 0 - 7.'6" ft. brown / black sand - ft. - ft.

SCALE: 1" = _____ PAGE _____ OF _____

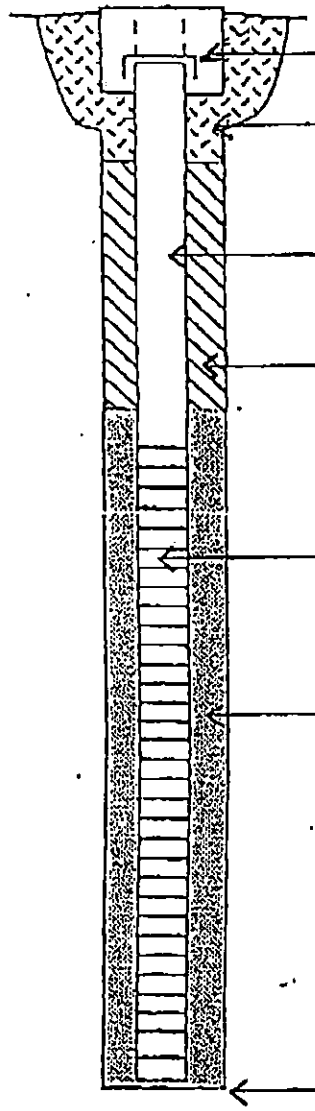
ECY 050-12 (Rev. 11/09)

RESOURCE PROTECTION WELL REPORT

START CARD NO. R039901

PROJECT NAME: Weyerhaeuser Mill
WELL IDENTIFICATION NO. AEM 335 / PZ-3A
DRILLING METHOD: HSA
DRILLER: Brian G. Gose
FIRM: Cascade Drilling, Inc.
SIGNATURE: Brian
CONSULTING FIRM: WRS
REPRESENTATIVE: Randy Richardson 9033

COUNTY: Snohomish
LOCATION SW¼ NW¼ Sec 8 Twp 29N R 5E
STREET ADDRESS OF WELL: 101 E. Marine View Dr. Everett
WATER LEVEL ELEVATION: 3'
GROUND SURFACE ELEVATION: N/A
INSTALLED: 1/26/99
DEVELOPED: No



AS-BUILT	WELL DATA	FORMATION DESCRIPTION
	SURFACE (@ THAT TIME) APPROX. 7.75'	Rock 0 - 6'6" ft. brown / black sand
	WELL COVER	- ft.
	CONCRETE SURFACE SEAL DEPTH = 1/ft	
	PVC BLANK 2 "x 2'6"	
	BACKFILL 2 ft. TYPE: bent. Chips	- ft.
	PVC SCREEN 2 "x 4' SLOT SIZE: .010	
	GRAVEL PACK 4'6" ft. MATERIAL: 10/20 colo.	
	WELL DEPTH 6'6"	

SCALE: 1" = _____ PAGE _____ OF _____

ECY 050-12 (Rev. 11/09)

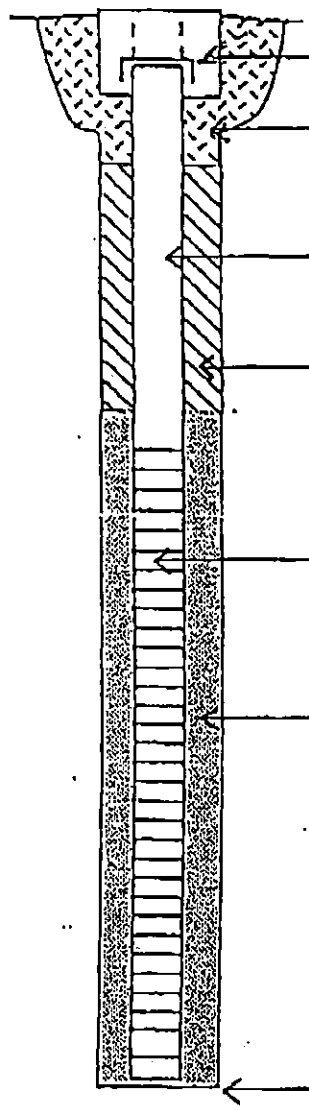
RESOURCE PROTECTION WELL REPORT

START CARD NO. R039901

PROJECT NAME: Weyerhaeuser Mill
WELL IDENTIFICATION NO. AEM334 / PZ-3B
DRILLING METHOD: HSA
DRILLER: Brian G. Gose
FIRM: Cascade Drilling, Inc.
SIGNATURE: [signature]
CONSULTING FIRM: WRS
REPRESENTATIVE: Randy Richardson 9033

COUNTY: Snohomish
LOCATION SW¼ NW¼ Sec 8 Twn 29N R 5E
STREET ADDRESS OF WELL: 101 E. Marine View Dr, Everett
WATER LEVEL ELEVATION: 3'
GROUND SURFACE ELEVATION: N/A
INSTALLED: 1/26/99
DEVELOPED: NO

AS-BUILT



WELL DATA

SURFACE (@ THAT TIME) APPROX. 8' SRNR
WELL COVER
CONCRETE SURFACE SEAL
DEPTH = 1/ft
PVC BLANK 2 "x 3 '
BACKFILL 1 ft.
TYPE: bent. Chips
PVC SCREEN 2 "x 3 '
SLOT SIZE: .010
GRAVEL PACK 3.5 ft.
MATERIAL: 10/20 colo.
WELL DEPTH 6 ' "

FORMATION DESCRIPTION

0 - 6 ft.
brown / black Sand

- ft.

- ft.

Post-it® Fax Note 7671
To Randy
Co./Dept.
Phone #
Fax #
Date
# of pages ▶
From Mike Calbert (Cascade drilling)
Co. Cascade
Phone # 425-485-8508
Fax #

SCALE: 1" = _____ PAGE _____ OF _____

ECY 050-12 (Rev. 11/99)

Ref. Item #6

WRS
Infrastructure & Environment, Inc.

12833 NE Airport Way
Portland, OR 97230
(503) 252-0277
Fax: (503) 252-0312

DEC 7 1998

LETTER OF TRANSMITTAL

To: Stuart Triolo, Project Manager
Weyerhaeuser Company
101 East Marine View Drive
Everett, WA 98201
Phone: 425-339-2871
Fax: 425-339-2786

From: Alex Soo, Program Manager
Alex Soo 12/4/98

Date: December 4, 1998
Transmittal No. **Technical-013**
Project Name: Weyerhaeuser Mill E/Koppers Site, Everett, WA
Client's Ref. #: 98-00094
Contractor: WRS Infrastructure & Environment, Inc.
WRS Job #. 4412-98-4057
Subcontractor: Cascade Drilling, Inc.
Supplier: Various Suppliers

We are sending: ☑ Attached ☐ Under Separate Cover
Via: ☑ U.S. Mail ☐ Express Delivery ☐ Facsimile

The following:

☐ Correspondence	☐ Plans	☐ Progress Payments
☐ Drawings	☐ Samples	☐ Specifications
☑ Submittal	☐ Change Order	☐ Subcontractor
☐ Schedule	☐ _____	☐ _____

Dated	Quantity	Description	Ref. Section
Various	1 set (12 pages)	Data on proposed casing and backfill materials; shop drawing for a flush mount water tight vault (pre-assembled unit) and installation instructions	02671, Piezometer Installation, Part 1.3
Various	1 set (3 pages)	Proof of state license -- WA water well construction operator's licenses	02671, Piezometer Installation, Part 1.5 C

These are transmitted:

☑ For Approval	☑ For Review and Comment	☐ As Requested
☐ For Your Use	☐ Approved As Noted	☐ Returned For Corrections
☐ For Your File	☐ Approved As Submitted	☐ Returned With Corrections

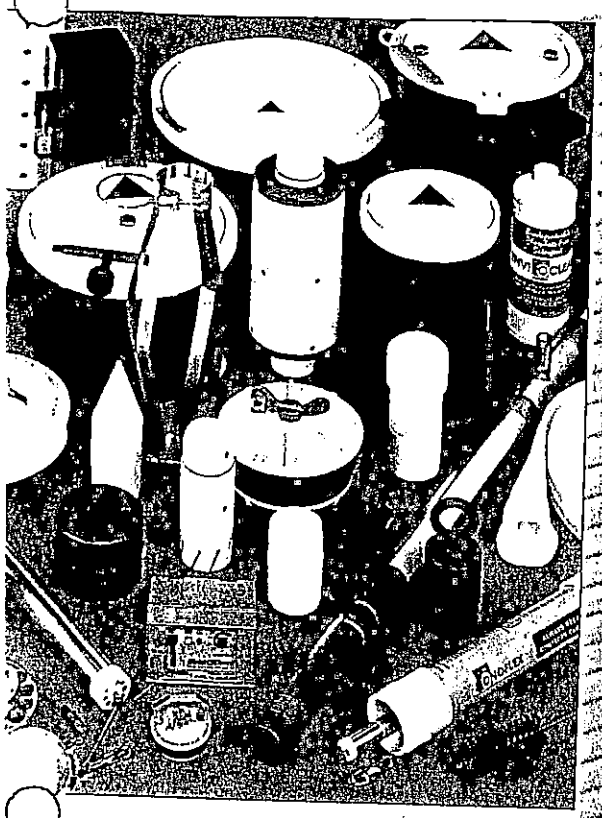
Remarks:

In reference to Part 1.5 B regarding the minimum 3 years documented experience of the drilling firm, WRS has previously submitted this information. The proposed drilling firm (Cascade Drilling, Inc.) has also been previously approved.

cc: Brian O'Neal, P.E., EMCON Project Coordinator
Randy Richardson, WRS Site Manager
WRS Job File

ORIGINAL IS IN PROJECT FILING

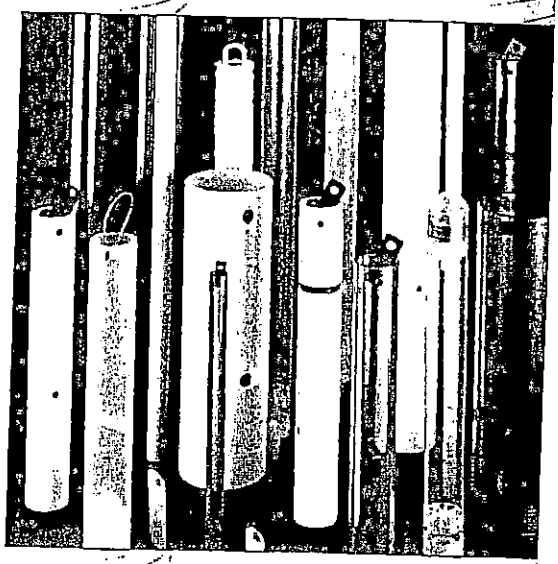
Campbell



WELL SCREEN
& CASING

ENVIRONMENTAL
ENGINEERING &
REMEDIATION
PRODUCTS

BAILERS &
ACCESSORIES



ENGINEERING SPECIFICATIONS

PVC FLUSH THREAD MONITOR WELL SCREENS AND CASINGS

1. All PVC well screens and casings used on this project shall be manufactured by Monoflex and conform to ASTM F-480: "Standard Specification for Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80."
2. PVC materials used to produce the raw PVC pipe shall meet ASTM Standard D-1784: "Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds for PVC Normal Impact, Type I Grade I (1120), cell classification 12454-B."
3. The finished schedules 40, 80, and 120 raw pipe shall meet the requirements of ASTM Standard D-1785: "Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120." In addition, both the raw material and the finished raw pipe shall be approved by the National Sanitation Foundation (NSF) for use in potable water applications.
4. The PVC pipe used to produce the well screens and casings shall be made from virgin plastic produced by the original compounder.
5. The pipe shall be homogeneous throughout and essentially uniform in color, opacity and density. The inside and outside surfaces shall be glossy in appearance and free of chalking, sticky or tacky material and visually free of oils, grease, dust and marks imparted as a result of the manufacturing process. In addition the pipe walls shall be free of cracks, holes, blisters, voids, foreign inclusion, or other defects that are visible to the naked eye and that may affect the wall integrity. Machined slots or holes deliberately placed in the pipe are acceptable.
6. The outside diameters, wall thicknesses and out of roundness tolerances shall fall within the guidelines of Tables 1 & 2 of the ASTM F-480 Standard Specification when measured in accordance with Test Method D-2122.
7. All flush thread materials must be slotted and threaded without the use of any type of liquid coolant. Air is the only acceptable coolant.
8. Well screens ½" through 4 ½" are to be slotted on ⅛" spacing. Well screens 5" and larger are to be slotted on ¼" spacing unless otherwise specified. ALL well screens .040 slot and larger will be slotted on ¼" spacing unless otherwise specified.
9. All screens and casings shall be nominal length except for 2" and 4" schedule 40 which shall be laying length. The term "laying length" refers to the overall length less the length required to complete the assembly. Nominal length + the length of the exposed male thread (pin) = laying length.
10. The threads per inch for the various diameters and schedules of flush thread materials shall be the same as that produced by Monoflex, Largo, Florida or approved equal.
11. All screens and casings shall be supplied in individual polyethylene bags hermetically sealed at BOTH ends. Said products shall be shipped in cardboard boxes with heavy multi-folded cardboard ends stapled in place. Each box shall display a color coded label containing a full description of the product inside. Said label must indicate the number pieces per box, the threads per inch, the date of packaging, the signatures of the packer and QC inspector and show a drawing of the product.

NL BAROID ENVIRONMENTAL, SAFETY AND TRANSPORTATION DATA SHEET

BEST Sheet

GENERAL INFORMATION

1507

I PRODUCT IDENTIFICATION

SUPPLIER NL BAROID/NL INDUSTRIES, INC.	REGULAR TELEPHONE NO. EMERGENCY TELEPHONE NO. 713/527-1447
ADDRESS P.O. BOX 1675 HOUSTON, TEXAS 77001	
TRADE NAME BENSEAL™ a.k.a. Bentonite	
GENERIC DESCRIPTION WESTERN BENTONITE, SODIUM MONTMORILLONITE	

II HAZARDOUS INGREDIENTS

MATERIAL OR COMPONENT	%	HAZARD DATA
NONE		

III PHYSICAL DATA

BOILING POINT (°F) NA	MELTING POINT	FREEZING POINT
SPECIFIC GRAVITY (H_2O = 1) 2.5	VAPOR PRESSURE (mm Hg) NA	
VAPOR DENSITY (AIR = 1) NA	SOLUBILITY IN H_2O, % BY WT. NA	
% VOLATILES BY VOL NA	EVAPORATION RATE (BUTYL ACETATE = 1) NA	
APPEARANCE AND ODOR TAN POWDER, ODORLESS	Density @ 20° C:	
pH		

N/A = Not Applicable N/D = Not Determined

BENSEAL™

HEALTH HAZARD	0
FLAMMABILITY	0
REACTIVITY	0

Hazards based on NFPA 491M "Identification System for Occupationally Hazardous Materials" (1974)

IV FIRE AND EXPLOSION DATA

BENSEAL WILL NOT SUPPORT COMBUSTION.

V HEALTH HAZARD INFORMATION

ACUTE ORAL LD_{50}	ACUTE DERMAL LD_{50}	AQUATIC TOXICITY (LC_{50})
		10,000 mg/l

ROUTES OF EXPOSURE AND EFFECTS

TLV — 2 mg/m³ (RESPIRABLE DUST)

PROLONGED INHALATION MAY CAUSE LUNG INJURY.

TYPICAL ANALYSIS OF HEAVY METALS

As	1.5 ppm
Cd	0.25 ppm
Cr	1.0 ppm
Co	1.8 ppm
Pb	21.0 ppm
Hg	0.04 ppm
Ni	<1.0 ppm

EMERGENCY AND FIRST AID PROCEDURES

NO PROCEDURES REQUIRED BEYOND NORMAL PERSONAL HYGIENE.

BEST Sheet

VI REACTIVITY DATA

CONDITIONS CONTRIBUTING TO INSTABILITY

NONE

INCOMPATIBILITY

NONE

HAZARDOUS DECOMPOSITION PRODUCTS

NONE

CONDITIONS CONTRIBUTING TO HAZARDOUS POLYMERIZATION

NONE

VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

NORMAL HOUSEKEEPING; CAUSES SLIPPERY SURFACES WHEN WET.

NEUTRALIZING CHEMICALS

—

WASTE DISPOSAL METHOD

GENERAL LANDFILL

VIII INDUSTRIAL HYGIENE CONTROL MEASURES

VENTILATION REQUIREMENTS

MECHANICAL, GENERAL ROOM VENTILATION.

SPECIFIC PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY

USE A NIOSH APPROVED, MECHANICAL FILTER RESPIRATOR FOR NONTOXIC DUSTS.

EYE

NONE REQUIRED

GLOVES

NONE REQUIRED

OTHER CLOTHING AND EQUIPMENT

IX SPECIAL PRECAUTIONS

PRECAUTIONARY STATEMENTS

RECOMMENDED LABELING:

FRONT PANEL: CAUTION

SEE BACK PANEL FOR CAUTION BEFORE USE

BACK PANEL: CAUTION

THIS PRODUCT CONTAINS FREE SILICA. PROLONGED INHALATION OF THE POWDER MAY RESULT IN LUNG DISEASE. AVOID CREATING DUSTY CONDITIONS AND USE A NIOSH APPROVED DUST RESPIRATOR.

OTHER HANDLING AND STORAGE REQUIREMENTS

NONE

DEPARTMENT OF TRANSPORTATION INFORMATION

PROPER SHIPPING NAME:

HAZARD CLASS: NOT HAZARDOUS

HAZARDOUS SUBSTANCE:

LABEL: NONE REQUIRED

PREPARED BY NL Barold
MARKETING TECHNOLOGY

DATE JANUARY 26, 1982

LONE STAR NORTHWEST

5975 E. MARGINAL WAY SOUTH
P.O. BOX 1730
SEATTLE, WASHINGTON 98111
(206) 764-3000

MATERIAL SAFETY DATA SHEET

Identity: Natural, Fine and Coarse Aggregate (Gravel, Sand, Concrete and Mortar Mixes).

SECTION I

Manufacturer's Name
Lone Star Northwest Inc.

Address
5975 E. Marginal Way S
P.O. Box 1730
Seattle, WA 98111

Emergency Telephone Number
(206) 764-3107
Paul Frederick

Telephone Number for Information
(206) 764-3000

Date Prepared
January 27, 1993

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Hazardous Components: Silica, Crystalline Quartz (respirable)

Specific Chemical Identity: Silicon Dioxide SiO_2 (CAS 14808-60-7)

Common Names: Silica, Flint, Sand, Crystalline Free Silica, Quartz, Ground Silica, trade names (see Page 4).

OSHA PEL: Exposure to airborne crystalline silica shall not exceed an 8-hour time-weighted average limit as stated in 29 CFR 1910.1000 Table Z-1-A, Air Contaminants, specifically;

Silica, Crystalline Quartz (respirable) 0.1 mg/M^3

ACGIH TLV: Crystalline Quartz
TLV-TWA = 0.1 mg/M^3 (respirable Dust)
See Threshold Limit Value and Biological Exposure Indices for 1991-1992 American Conference of Governmental Industrial Hygienists.

Other Limits Recommended: National Institute for Occupational Safety and Health (NIOSH). Recommended Standard maximum permissible concentration = 0.05 mg/M^3 (respirable free silica) as determined by a full-shift sample up to 10-hour working day, 40-hour work week. See NIOSH Criteria for Recommended Standard Occupational Exposure to Crystalline Silica.

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point:	Not Tested	Specific Gravity (H_2O = 1):	Not Tested
Vapor Pressure (mm Hg.):	None	Melting Point:	Not Tested
Vapor Density (AIR = 1):	None	Evaporation Rate: (Butyl Acetate = 1)	None

Solubility in Water: Insoluble in water

Physical/Chemical Characteristics: A solid with a size up to a maximum of 3/8" for fine aggregate and plus 3/8" for coarse aggregate. As a solid, the properties of boiling point, vapor pressure, vapor density, and evaporation rate are not applicable.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): Non-flammable

Flammable Limits: None LEL: None UEL: None

Extinguishing Media: None required; Sand may be used as extinguishing media.

Special Fire Fighting Procedures: N/A

Unusual Fire and Explosion Hazards: None of the listed products present a fire nor an explosion hazard. Crystalline silica sand may be used to put out Class A and B fires.

SECTION V - REACTIVITY DATA

Stability: Unstable: Stable: X Conditions to Avoid: None

Hazardous Decomposition or Byproducts:

Silica will dissolve in Hydrofluoric Acid and produce a corrosive gas - silicon tetrafluoride.

Hazardous Polymerization: May Occur: Will Not Occur: X Conditions to Avoid: None

SECTION VI - HEALTH HAZARD DATA

Route(s) of Entry:

Inhalation? Yes Skin? No Ingestion? No

Health Hazards (Acute and Chronic):

Prolonged exposure to respirable crystalline quartz may cause delayed (chronic) lung injury (silicosis). Acute or rapidly developing silicosis may occur in a short period of time in heavy exposure in certain occupations such as sandblasters. Silicosis is a form of disabling pulmonary fibrosis which can be progressive and may lead to death.

Carcinogenicity:

NTP? Yes

The National Toxicology Program (NTP) published its Sixth Annual Report on Carcinogens which concludes that "silica, crystalline (respirable)" may reasonably be anticipated to be a carcinogen. The NTP conclusion is based on sufficient evidence for the carcinogenicity of respirable crystalline silica in experimental animals and limited evidence in humans.

IARC Monographs? Yes

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans (volume 42, 1987) concludes that there is sufficient evidence for the carcinogenicity of crystalline silica to experimental animals, and that there is limited evidence of the carcinogenicity of crystalline silica to humans. IARC Class 2A.

Signs and Symptoms of Exposure:

Undue breathlessness, wheezing, cough and sputum production.

Medical Conditions Generally Aggravated by Exposure:

Pulmonary functions may be reduced by inhalation of respirable crystalline silica. Also lung scarring produced by such inhalation may lead to a progressive massive fibrosis of the lung which may aggravate other pulmonary conditions and diseases and which increases susceptibility to pulmonary tuberculosis. Progressive massive fibrosis may be accompanied by right heart enlargement, heart failure, and pulmonary failure. Smoking aggravates the effects of exposure.

Emergency and First Aid Procedures:

For sand in eyes, wash immediately with water. If irritation persists, seek medical attention. For gross inhalation, remove person immediately to fresh air, give artificial respiration as needed, seek medical attention as needed.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to Be Taken in Case Material is Released or Spilled:

Spills: Use dustless methods (vacuum) and place into closable container for disposal, or flush with water. Do not dry sweep. Wear protective equipment specified below.

Waste Disposal Method: Dispose in accordance with Federal, State, and Local regulations.

Precautions To Be Taken In Handling and Storing:
Avoid breakage of bagged material or spills of bulk material. See control measures in Section VIII.

Other Precautions:
Use dustless systems for handling, storage, and clean up so that airborne dust does not exceed the PEL. Use adequate ventilation and dust collection. Practice good housekeeping. Do not permit dust to collect on walls, floors, sills, ledges, machinery, or equipment. Maintain, clean, and fit test respirators in accordance with OSHA regulations. Maintain and test ventilation and dust collection equipment. Wash or vacuum clothing which has become dusty. Drilling, grinding, sanding, and/or sawing of hardened concrete products may release Crystalline Silica. See also control measures in Section VIII.

See OSHA Hazard Communication Rule 29 CFR Sections 1910.1200, 1915.99, 1917.28, 1918.90, 1926.59, and 1928.21, and state and local worker or community "right to know" laws and regulations. We recommend that smoking be prohibited in all areas where respirators must be used. WARN YOUR EMPLOYEES (AND YOUR CUSTOMERS-USERS IN CASE OF RESALE) BY POSTING AND OTHER MEANS OF THE HAZARD AND OSHA PRECAUTIONS TO BE USED. PROVIDE TRAINING FOR YOUR EMPLOYEES ABOUT THE OSHA PRECAUTIONS.

See also American Society for Testing Materials (ASTM) standard practice E 1132-86, "Standard Practice for Health Requirements Relating to Occupational Exposure to Quartz Dust."

SECTION VIII - CONTROL MEASURES

Respiratory Protection

The following chart specifies the types of respirators which may provide respiratory protection for crystalline silica.

RESPIRATORY PROTECTION FOR CRYSTALLINE SILICA

CONDITION	MINIMUM RESPIRATORY PROTECTION*
Particulate Concentration Up to 5 x PEL	Any dust respirator.
Up to 10 x PEL	Any dust respirator, except single-use or quarter-mask respirator. Any fume respirator or high efficiency particulate filter respirator. Any supplied-air respirator. Any self-contained breathing apparatus.
Up to 50 x PEL	A high efficiency particulate filter respirator with a full face piece. Any supplied-air respirator with a full face piece, helmet, or hood. Any self-contained breathing apparatus with a full face piece.
Up to 500 x PEL	A powered air-purifying respirator with a high efficiency particulate filter. A Type C supplied-air respirator operated in a pressure-demand or other positive pressure or continuous-flow mode.
Greater than 500 x PEL or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full face piece operated in pressure-demand or other positive pressure mode. A combination respirator which includes a Type C supplied-air respirator with a full face piece operated in pressure-demand or other positive pressure continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Abrasive Blasting	Any Type CE, supplied-air respirator with a full face piece, hood, or helmet, operated in a positive-pressure mode. (See 29 CFR 1910.94 (a)).

Only NIOSH-approved or MSHA-approved equipment should be used. (See 29 CFR 1910.134).

See also ANSI standard Z88.2-1980 "Practices for Respiratory Protection," and standard Z9.4-1984 "Ventilation and Safe Practices of Abrasive Blasting Operations."

Ventilation:

Local Exhaust: Use sufficient local exhaust to reduce the level of respirable dust to the PEL. See ACGIH "Industrial Ventilation, A Manual of Recommended Practice," the latest edition.

Mechanical
See "Other Precautions" under Section VII.

Other
See "Other Precautions" under Section VII.

Protective Gloves
Optional

Eye Protection
Wear protective shield (safety glasses) when exposed to dust particles.

Other Protective Clothing or Equipment
Optional

Work/Hygienic Practices
Avoid creating and breathing dust. See "Other Precautions" under Section VII.

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, express or implied, is made with respect to the information contained herein. We accept no responsibility and disclaim all liability for any harmful health effects which may be caused by purchase, resale, use or exposure to our product. Customers-users of products containing silica must comply with all applicable health and safety laws, regulations and orders.

LONE STAR NORTHWEST INC. TRADE NAMES

TRU-MIX CONCRETE MIX

TRU-MIX TOPPING MIX

TRU-MIX PEA GRAVEL

TRU-MIX 7/8" GRAVEL

POST MIX

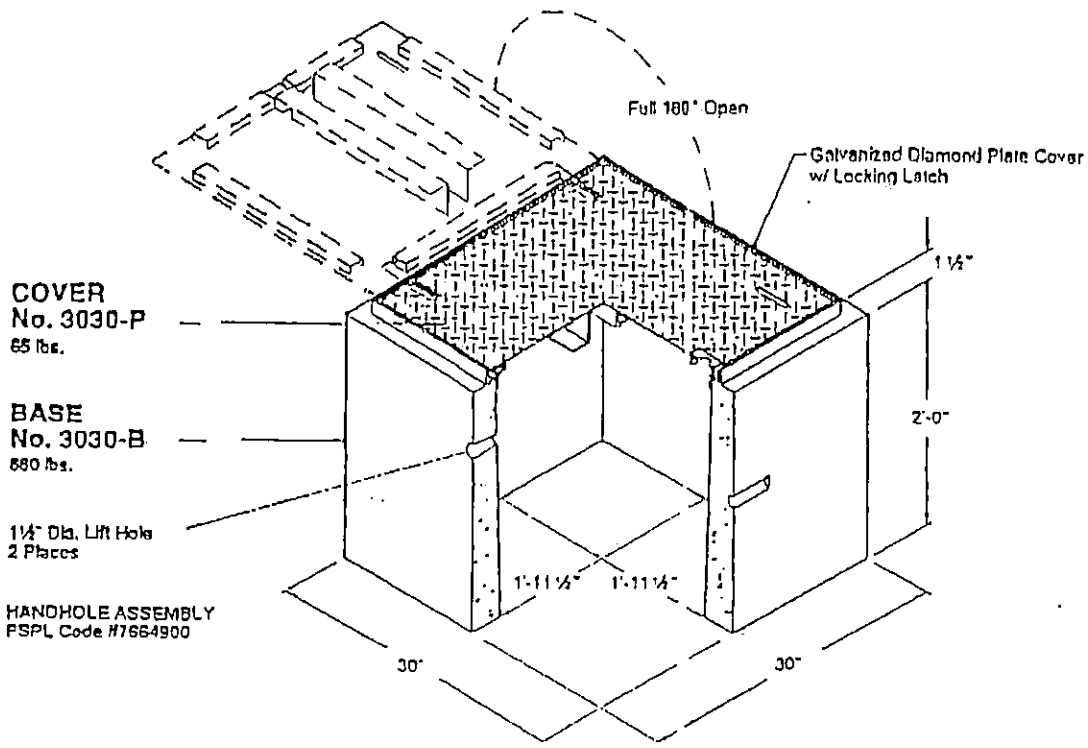
TRU-MIX MORTOR MIX

TRU-MIX #1 SAND

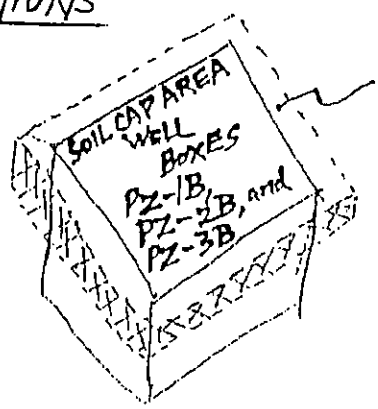
TRU-MIX #2 SAND

TRU-MIX #3 SAND

3030-LA



INSTRUCTIONS



CONCRETE "COLLAR" 4" WIDE X 8" THICK (SOIL CAP AREA) ONLY.

BE SURE THE BOTTOM OF THE BOX REMAINS OPEN. THE CONTRACTOR MUST NOT PLACE CONCRETE, RUBBLE OR COBBLES UNDER THE OPEN BOTTOM.

ASPHALT WILL BE PAVED RIGHT NEXT TO WELL BOXES PZ-1A, PZ-2A, AND PZ-3A WHICH ARE LOCATED WITHIN THE ASPHALT CAP AREA.

UTILITY VAULT COMPANY
P.O. BOX 589 Phone (206) 939-3500
Auburn, Washington 98071-0589 Fax (206) 735-4201

* ITEMS SHOWN ARE SUBJECT TO CHANGE WITHOUT NOTICE.

Issue: January, 1998

WASHINGTON WATER WELL CONSTRUCTION
OPERATOR'S LICENSE

This license is issued by the Director of the Department of Ecology in compliance with WAC 173-162 to:

JAMES GOBLE

The licensee is authorized to operate water well construction equipment in the State of Washington:

RESOURCE PROTECTION

DATE ISSUED	DATE EXPIRES
12 MAY 98	12 MAY 00
LICENSE NUMBER	DIRECTOR
2440	

ECY 050-1-23

Signature

WASHINGTON WATER WELL CONSTRUCTION
OPERATOR'S LICENSE

This license is issued by the Director of the Department of Ecology in compliance with WAC 173-162 to:

SCOTT KRUEGER

The licensee is authorized to operate water well construction equipment in the State of Washington:

WATER/RESOURCE PROTECTION

DATE ISSUED	DATE EXPIRES
31 AUG 92	31 AUG 00
LICENSE NUMBER	DIRECTOR
2073	

ECY 050-1-23

Signature

WASHINGTON WATER WELL CONSTRUCTION
OPERATOR'S LICENSE

This license is issued by the Director of the Department of Ecology in compliance with WAC 173-162 to:

BRYAN GOSE

The licensee is authorized to operate water well

CABLE, ROTARY, AUGER

construction equipment in the State of Washington.

DATE ISSUED	DATE EXPIRES
18 DEC 95	31 DEC 98
LICENSE NUMBER	DIRECTOR
2330	

ECY 050-1-23

Signature

Oregon Monitor Well Constructor's License*

This license, issued by the Water Resources Director, provides that:

GOSE, BRIAN MWC 10406

may construct, alter or abandon monitor wells in Oregon, for another Monitor Well Constructor who holds an Oregon license in good standing and whose official Monitor Well Constructor's license file contains the $4,000 surety bond required by ORS 537.753.

Director

This license becomes effective: 7-1-96

This license expires on: 6-30-2001

IDAHO
WELL RIG OPERATOR'S PERMIT

BRIAN G. GOSE

Bothell, Washington

is hereby qualified to operate a well drilling rig under provision of IDAHO CODE § 42-238(2) for the drilling firm of:

CASCADE DRILLING INC.

Woodinville, Washington

under license No. 551

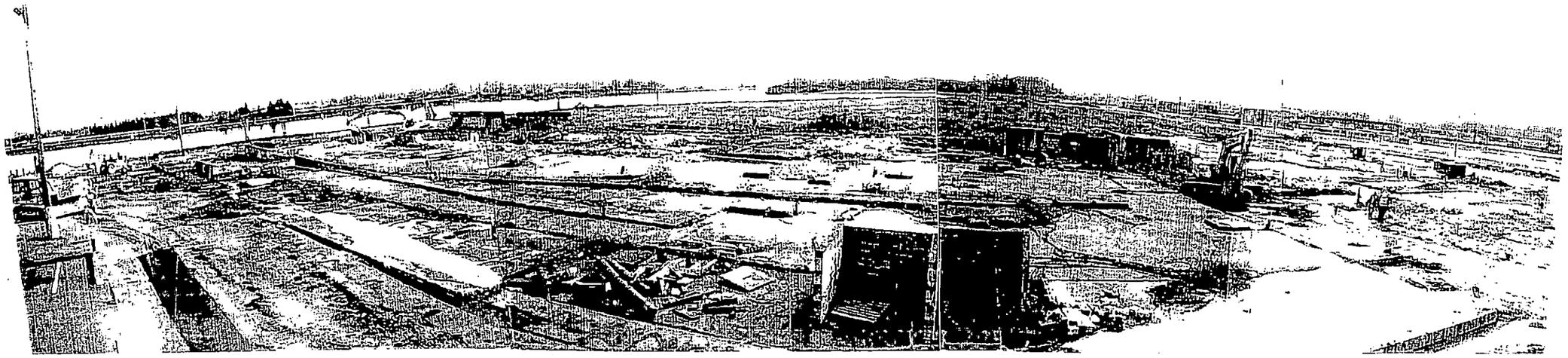
to be surrendered upon termination of employment with the above firm.

EXPIRES March 31, 1999

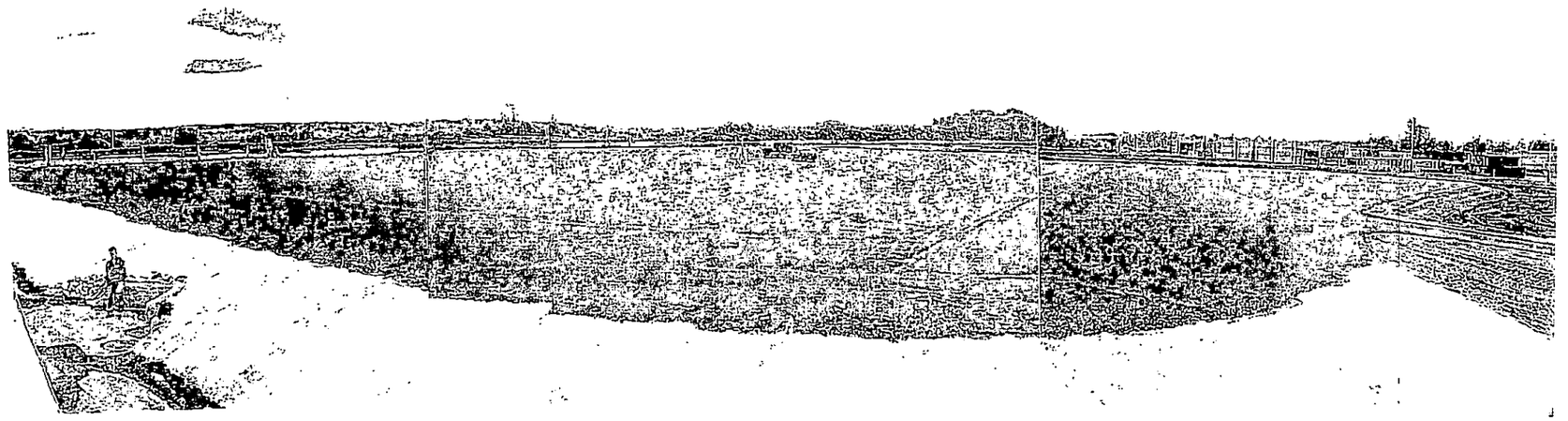
Director

APPENDIX H

PHOTOGRAPHS

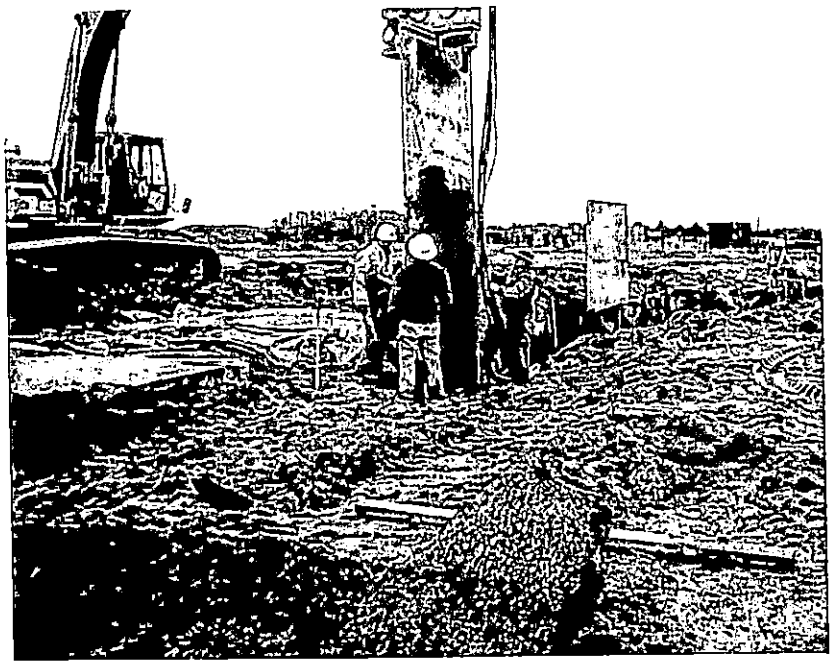


11-17-98 Initial site setting at the start of constructiion.

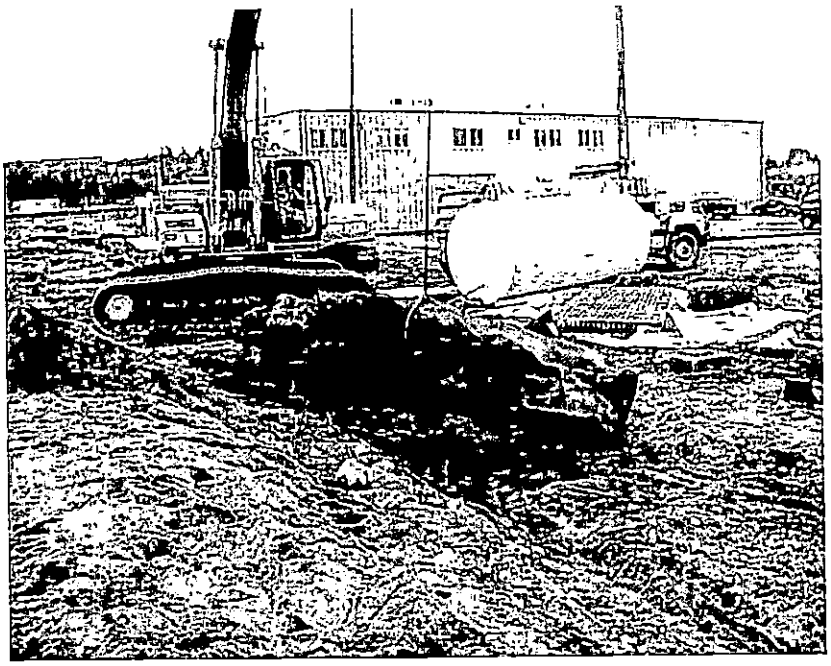


6-10-99 Final construction (without grass seed application).

1-11-99 Successfully installed pannel #s 193 through 199.
Excavation to remove obstruction at 12+00 to 12+06.



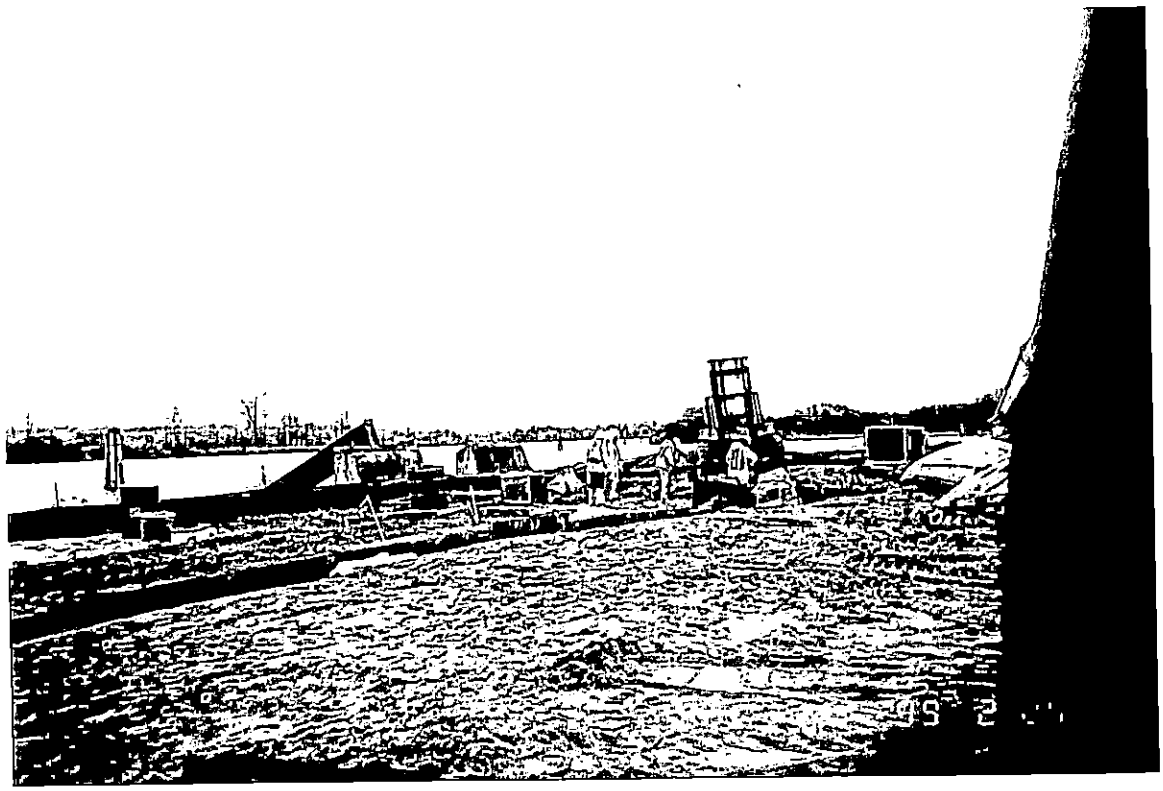
1-11-99 Removing Panel 202.
Background - Successfully installed panes



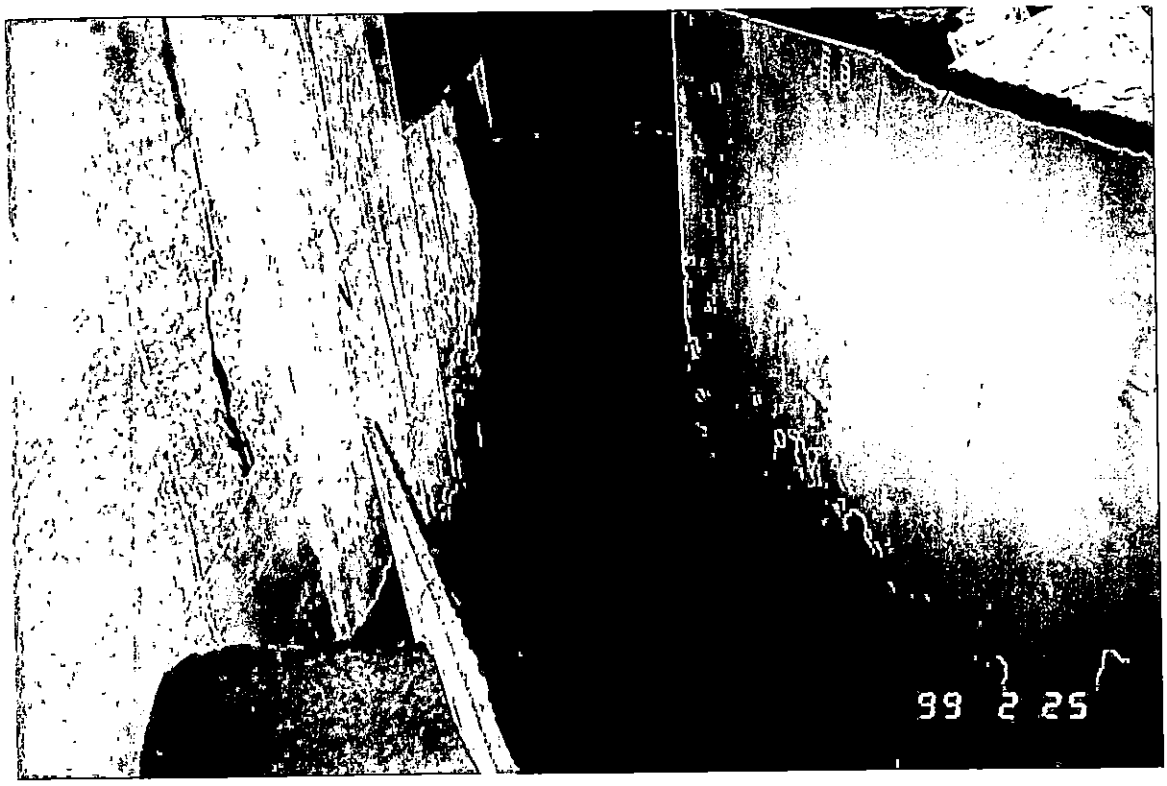
1-25-99 Log excavated from alignment at 14+27.

1-27-99 6-inch diameter steel pipe excavated from alignment at 14+45.

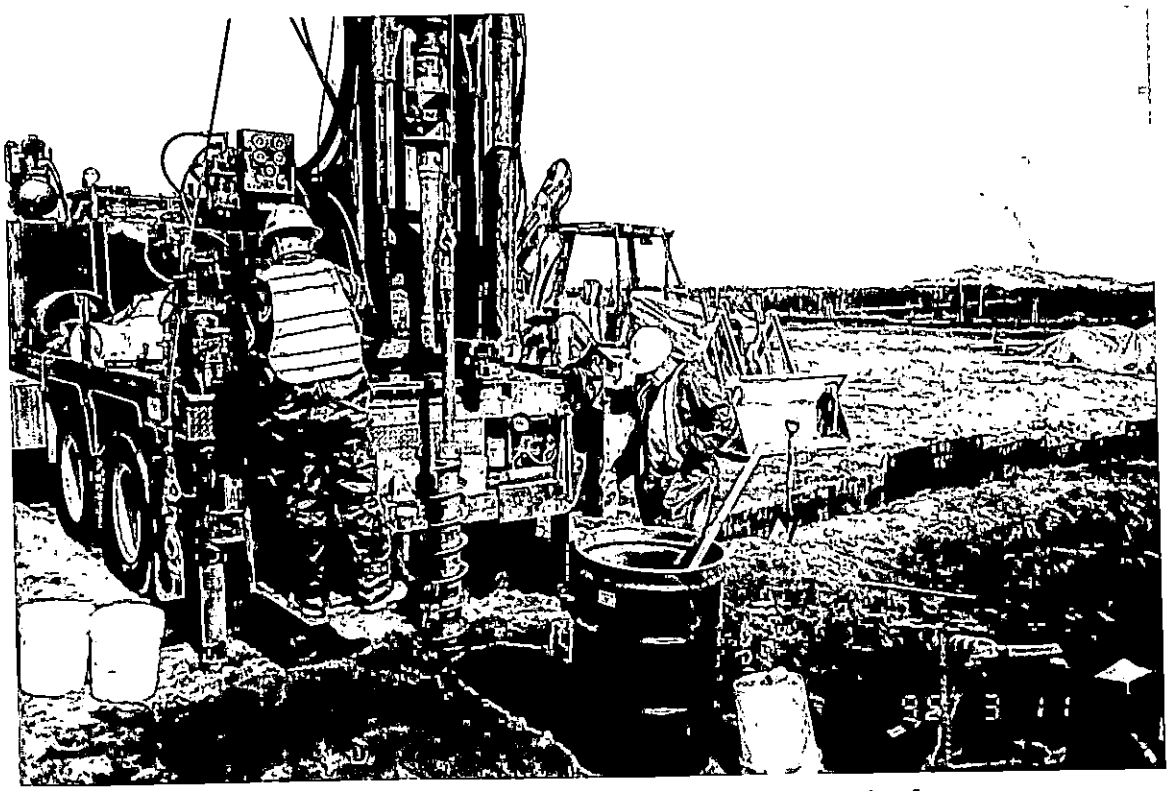
2-4-99 Adding bentonite to repair silt layer.



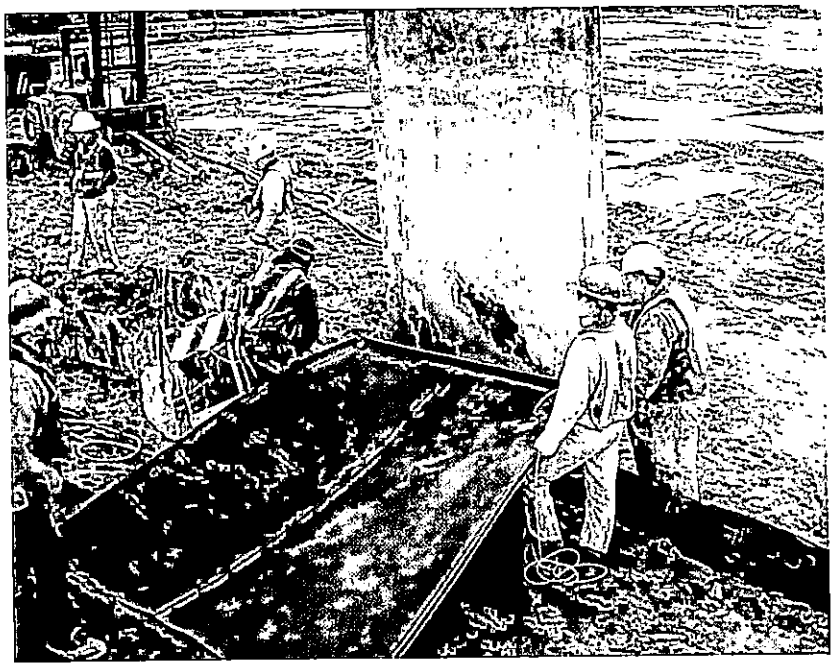
2-25-99 Wall panel installation along river front from 2+00 to 3+00.



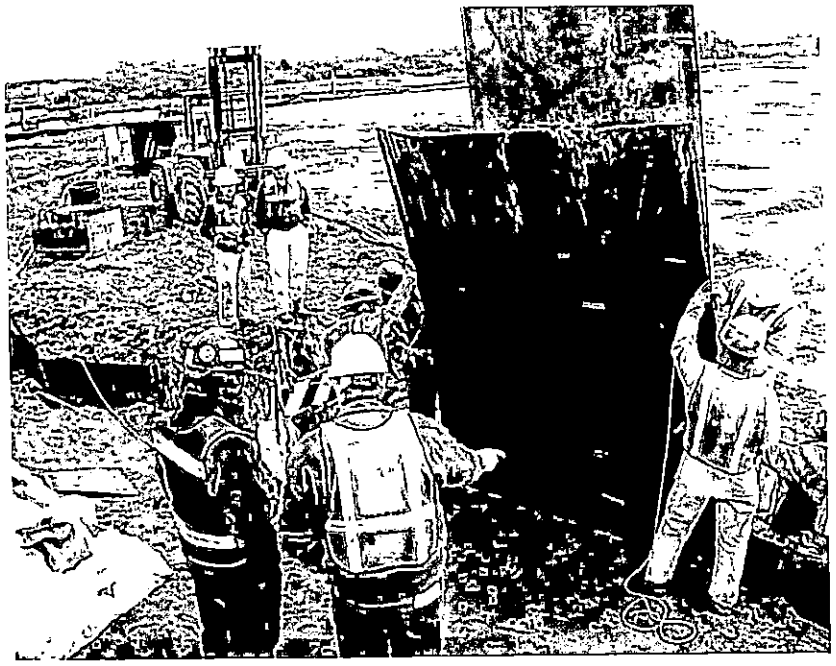
2-25-99 Excavation activities near log dump area.
note: Road plates used to contain saturated soils.



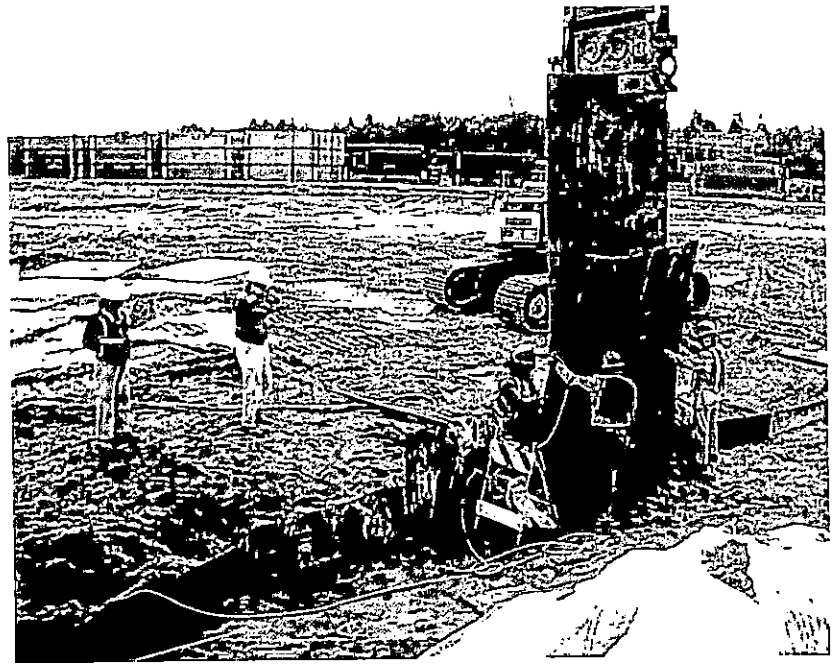
3-11-99 Installation of soil borings to confirm placement of vertical panels with respect to the silt layer.



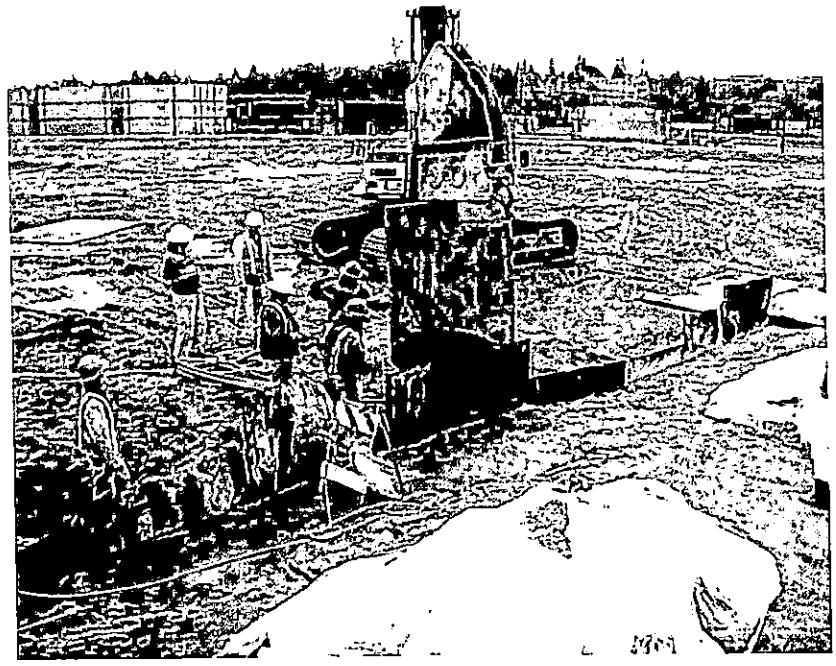
3-25-99 Last panel # 005 installation setup at 6+42 (note weld in middle of panel).



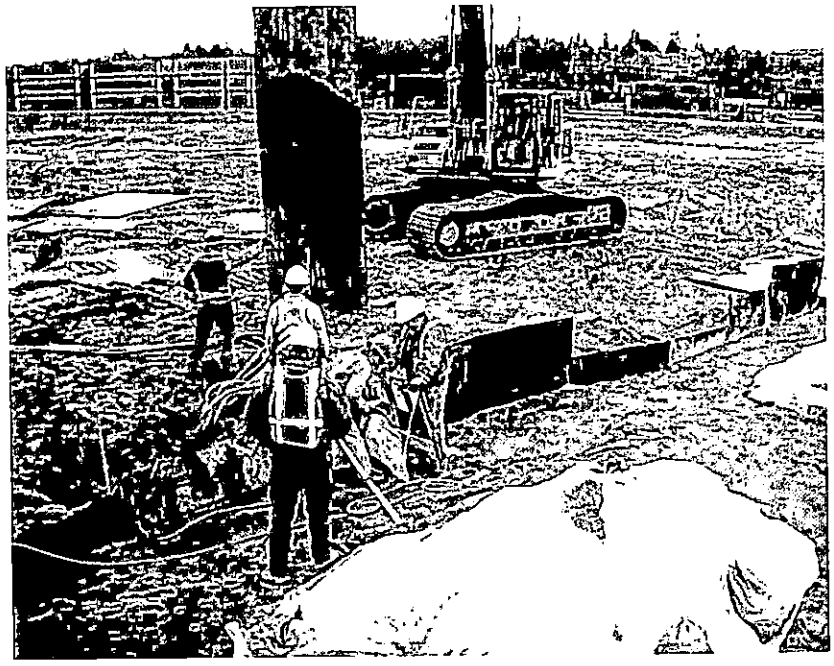
3-25-99 Last panel installation.



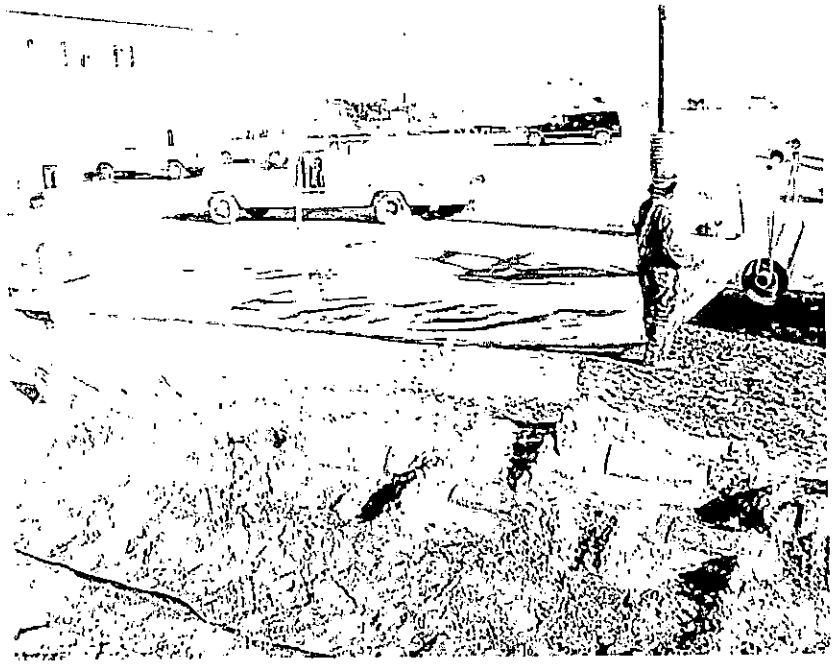
3-25-99 Last panel installation.



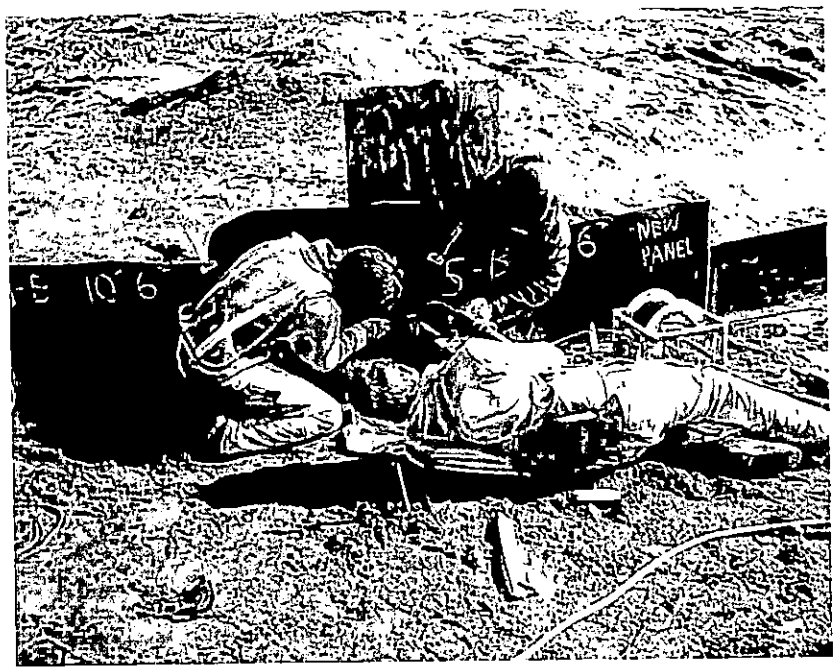
3-25-99 Removing drive plate from successfully installed last panel.



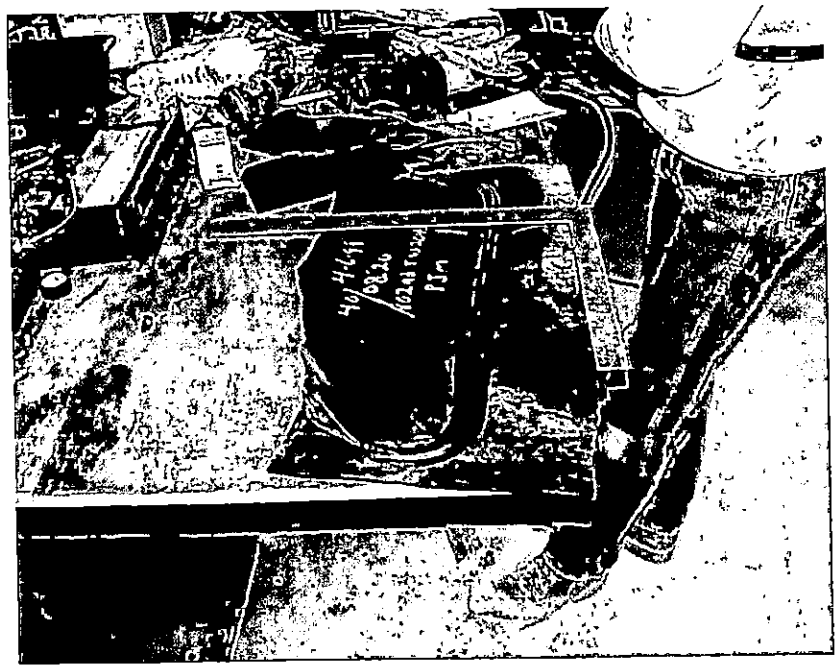
3-25-99 Drive plate removed from the last fully installed panel.



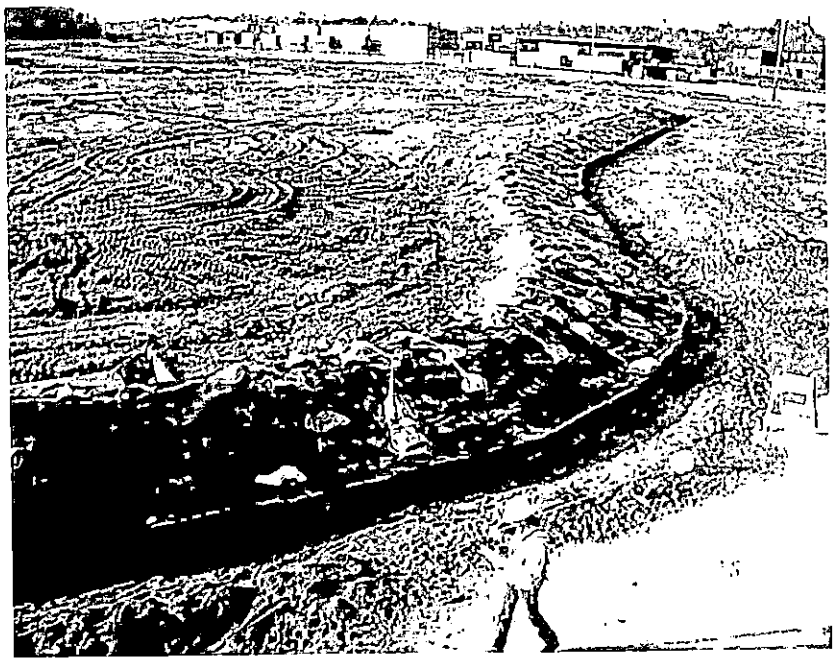
3-30-99 40-mil HDPE deployment.



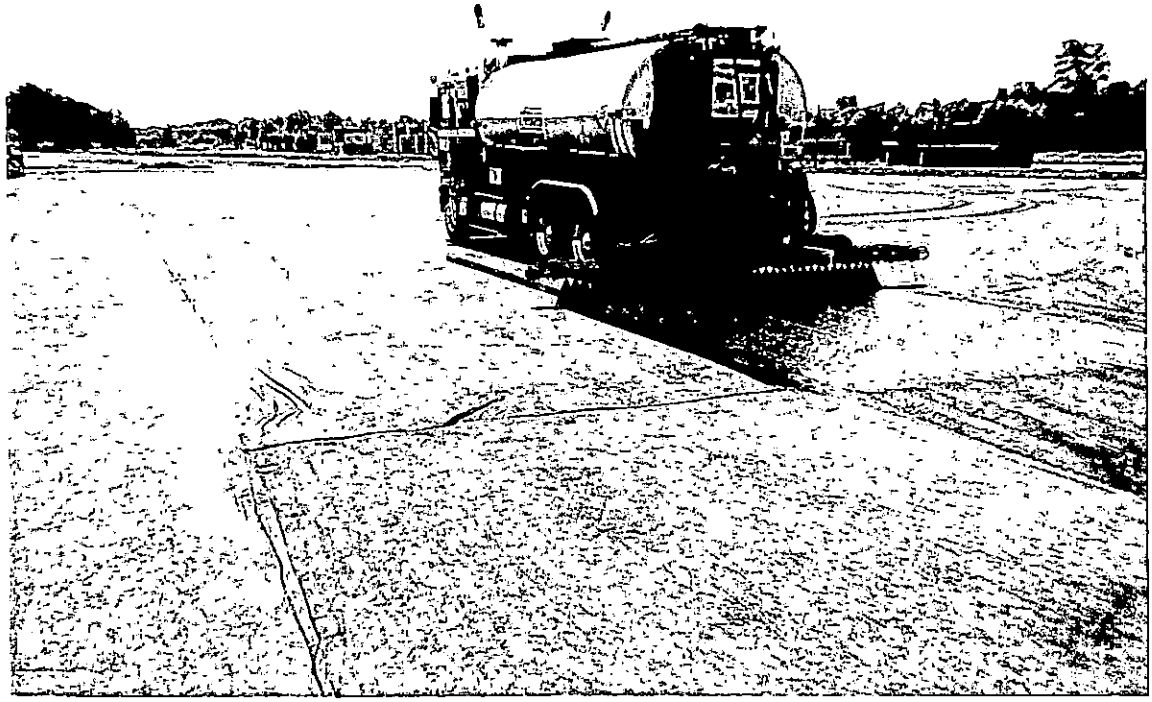
3-31-99 Welding the 40- to 80- mil HDPE materials along a barrier wall interlock at the first destructive test panel location.



4-6-99 Daily test weld sampling.



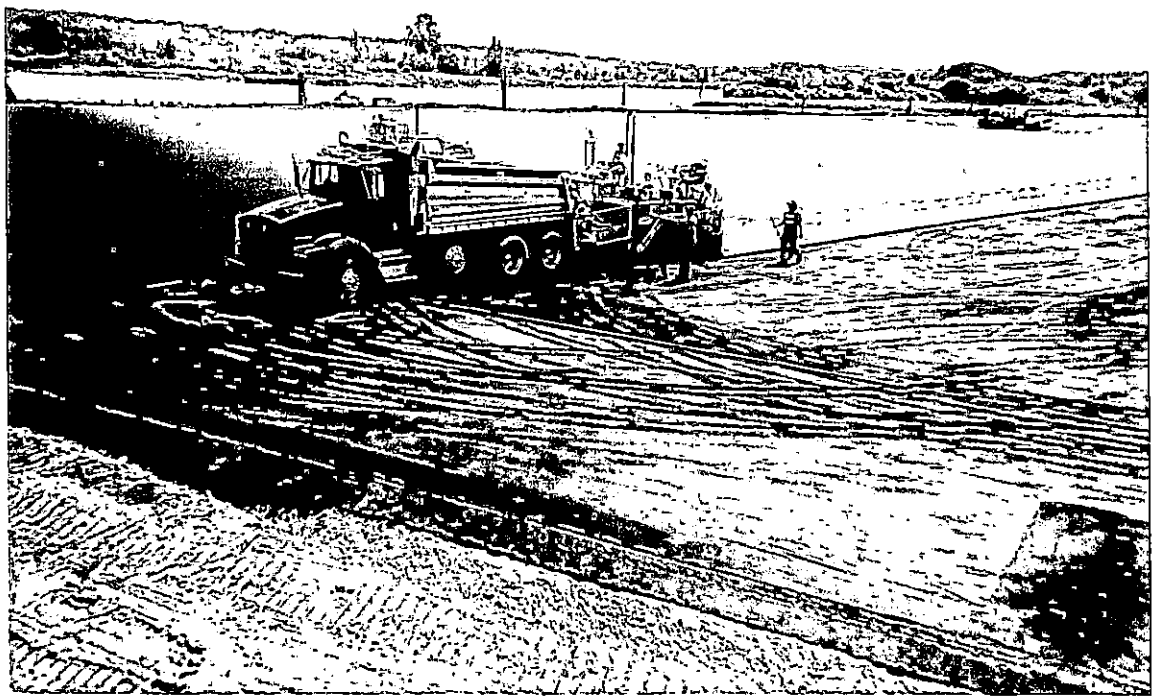
4-21-99 Installed 40-mil HDPE.
Location: Station 13+24 to 10+20.



5-27-99 Tack coat deployment for geotextile.

5-27-99 Geotextile layer deployment.

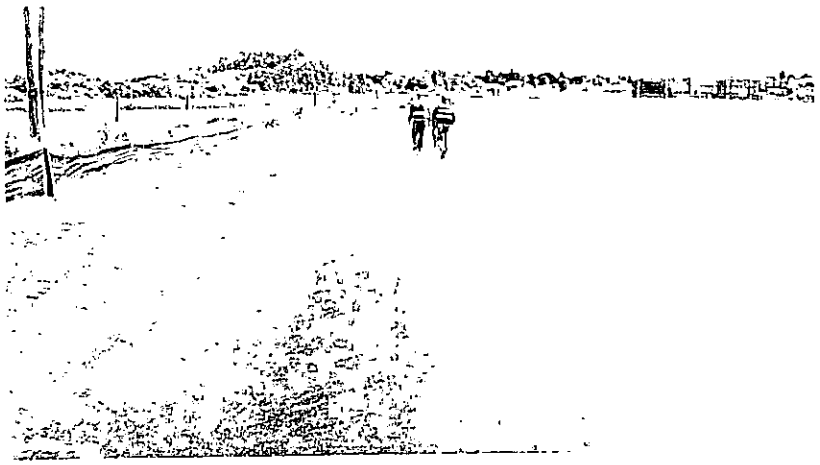
5-27-99 Final asphalt layer and geotextile layer deployment.



5-27-99 Final asphalt layer deployment over geotextile.

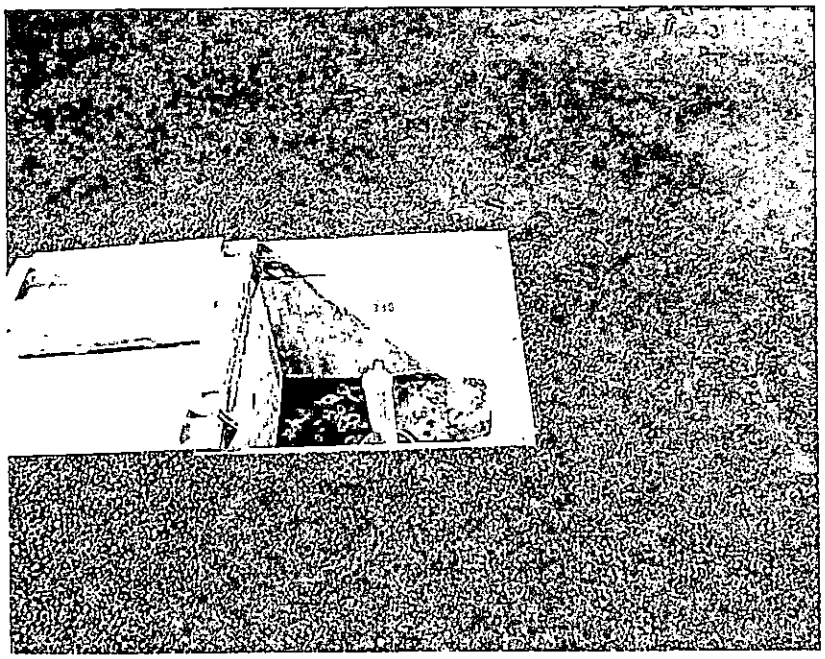
5-27-99 QC east edge drainage trench.
note: Background; filling/forming drainage trench with asphalt.

5-27-99 QC drainage trench at SE corner.

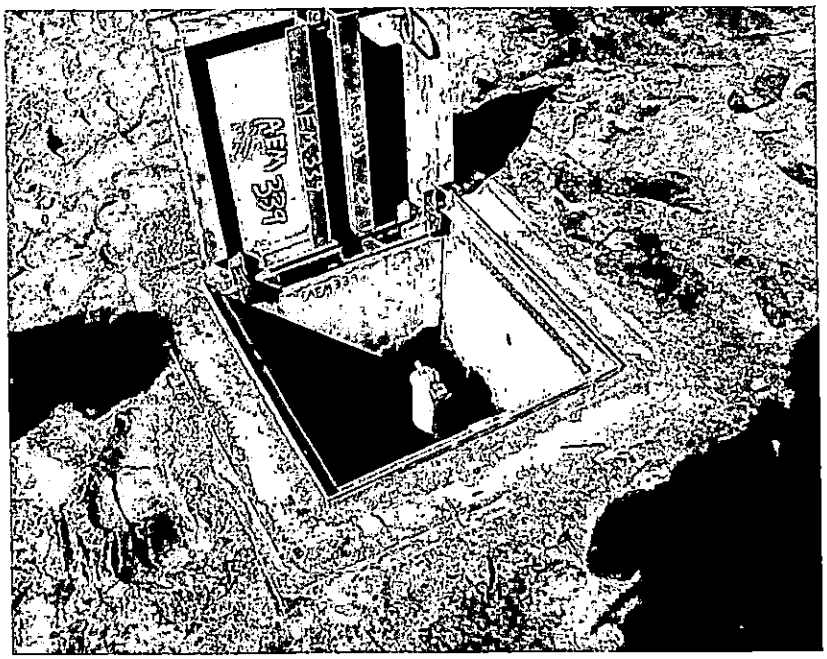


6-10-99 Finished asphalt cap on east side.

6-10-99 Main drainage outfall to the Snohomish River.



6-10-99 Typical piezometer vault inside alignment (PZ-2A).



6-10-99 Typical piezometer vault outside alignment (PZ-2B).