94-01

RMT Integrated Environmental Solutions

100 Verdae Blvd. 29607-3825
P.O. Box 16778 29606-6778
Greenville, SC
Telephone: 864-281-0030
Fax: 864-281-0288

APPROVED
DIVISION OF SOLID WASTE MANAGEMENT
DATE 12/15/2000 BY

December 12, 2000

DEC 2000 Received Solid Waste Section

Mr. Jim Barber
NC DENR
Division of Waste Management, Solid Waste Section
401 Oberlin Road, Suite 150
Raleigh, NC 27605

Subject: Permit to Operate, Weyerhaeuser Landfill No. 3,
Plymouth, North Carolina
RMT Project No. 00-05101.18

Carmen Johnson
Fac/Perm/Co ID # 94-01 | Date 5/10/12 | Doc ID# | DIN

Dear Jim:

Thanks very much for your timely review of the Construction Documentation Report for the subject project. We received your faxed memorandum yesterday which included items that need to be addressed prior to your issuing the Permit to Operate. These issues and our response are as follows:

Issue -- 1. Field destructive samples were required every 500 feet of welded seam. According to the information in the CQA document and information shown on the field seam as-built, only 42 field destruct samples were taken. Based on amount of welded seams (both wedge and extrusion) it would appear that minimum total of destruct samples would be on the order of 48 to meet the minimum criteria for the project. RMT needs to provide a response and clarification as to the discrepancy of the minimum number of destruct samples taken.

Response -- Based on the surveyed panel layout, RMT has digitally computed a total of 20,700 lineal feet of seam. This number was confirmed with hand scaling the as-built drawing as well. For that lineal footage a minimum of 42 destruct samples were required according to the approved specifications. This number did not include the 11 cap strips that were extrusion welded or any other repairs or patches.

Issue 2 – Based on the information provided in the report (and as shown on the as-built drawing by GSI dated 17 October 2000) detailing the installation of the GCL, eleven cap strips were installed on the south slope of Phase 1, due to cutting the first eleven panels to correct installation issues on the GCL. None of the extrusion welds used to seam the panels, along with extrusion welds for the eleven cap strips were sampled per the destructive sampling program. RMT needs to address the following issues:

A. *It appears according to the specifications that approximately three destructive samples should/could have been taken in the repair area (cap strip) on the south slope. Why weren't these seams sampled?*

   Response – All seams on the south slope were extrusion welded and submitted to nondestructive testing. Our first destructive test of the seams was also in this area (DT1). After the geomembrane was deployed, welded and seams tested, it was

discovered that the underlying GCL had not received bentonite powder in some of the seams. The geomembrane was then cut at eleven locations to expose the GCL seams. Since the GCL panels are narrower than the geomembrane panels, none of the cut locations coincided with the original seam locations. The original seams, therefore, remained intact.

The cap repairs were made at the very end of the project and vacuum box tested. By that time the seaming and welding techniques had been well verified and documented. Not a single seam failure had been experienced, and in our professional judgement, having to patch a patch presented the greater risk of liner leakage potential. It is our practice to not cut the liner any more than what is absolutely necessary to confirm what has also been demonstrated through visual observations, trial seams and non-destructive tests. I was personally on site at the time of some of the cap repairs, I certify that, to the best of my knowledge, the cap repairs were made in accordance with accepted standards of practice and in a workmanship-like manner.

B. *Approximately 700 feet of extrusion weld was used to re-seam the first eleven panels located on the south slope of the site. Based on the specifications, a minimum of one destructive sample and possibly two destructive samples should have been taken. Why were these extrusion welds not sampled?*

Response – As stated above, the repair of the affected geomembrane panels (there were 7 total) did not require any re-seaming. The original seaming was intact and did not require repair. Only the cap repair required additional extrusion welding, and this was not tested for the reasons mentioned above.

We trust this provides you with the information needed at this time. Please feel free to contact this office (864-281-0030) if we can provide you with anything else.

Sincerely,
RMT North Carolina, Inc.

R. Kent Nilsson, P.E.
Project Manager

cc: Joe Kloeker, Bill Morris, Andy Sweatt, Chad Rolstad – Weyerhaeuser
Bruce Urban - RMT
Central Files – 00-05101.18

WEYERHAEUSER LANDFILL, LOCATED IN THE TOWN OF PLYMOUTH, WASHINGTON COUNTY, NORTH CAROLINA. SITE VISIT WITH BILL MORRIS, OF WEYERHAEUSER, ON 18 OCT. 2000.

APPROVED
DIVISION OF SOLID WASTE MANAGEMENT
DATE _____ BY _____

D-6H LGP(LOW GROUND PRESSURE) WORKING DOWN-SLOPE ON CELL FLOOR SPREADING 78M STONE FOR PROTECTIVE COVER/LEACHATE COLLECTION SYSTEM.

D-6H LGP WORKING DOWN-SLOPE, TOWARD LEACHATE PIPE SPREADING 78M STONE. WRINKLES VISIBLE IN GEOTEXTILE FABRIC AND SOME WRINKLING OF HDPE UNDERNEATH FABRIC. DIRECTLY BEHIND D-6H(IN THIS PHOTO) IN THE MIDDLE OF THE CELL, MORE PROMINANT WRINKLES(APPROX. 4" TO 6") WERE OBSERVED IN THE FABRIC AND HDPE. UPON ARRIVAL TO THE CELL RMT REP. WAS AT ANOTHER PART OF THE PROJECT. RMT REP. ARRIVED APPROX. 15 MINUTES AFTER SWS AND WEYERHAEUSER REP'S. ARRIVED AND WALKED ACCROSS THE CELL.

D-3 WORKING CROSS-SLOPE SPREADING 78M STONE FOR PROTECTIVE COVER/LEACHATE COLLECTION SYSTEM.

D-3 WORKING UP-SLOPE SPREADING 78M STONE. SOME SMALL WRINKLES VISIBLE IN GEOTEXTILE FABRIC. WITH ANCHOR TRENCH FILLED AND COMPACTED, CONTRACTOR UNABLE TO RUN-OUT WRINKLES IF THEY EXIST IN 60 MIL HDPE.

ANCHOR TRENCH FILLED AND COMPACTED PRIOR TO PROTECTIVE COVER PLACEMENT. ACCORDING TO RMT REP. THIS IS THE SEQUENCE OF CONSTRUCTION SPELLED OUT IN CQA PLAN.

OPPOSITE SIDE WALL RISER ELEVATED OFF OF CELL FLOOR. RMT REP. STATED THAT PIPES WILL BE CUT AND ADDITIONAL PIPE WELDED ON TO EXTEND PIPES SO THEY WILL MAKE CONTACT WITH CELL FLOOR.

WEYERHAEUSER-PLYMOUTH LANDFILL: SLUDGE CONVEYOR SYSTEM FROM DEWATERING FACILITY TO EDGE OF CELL.

SURVEYOR VERIFYING LEACHATE COLLECTION SYSTEM/PROTECTIVE COVER THICKNESS ON 78M WASHED STONE. NOTE SIDE WALL RISER IN BACKGROUND FROM SUMP AREA(ANOTHER LOCATED ON OPPOSITE SIDE OF CELL FROM WHERE PHOTO TAKEN).

PHOTO SEQUENCE OF CELL CONSTRUCTION TAKEN FROM THE NORTHEAST CORNER OF THE CELL, AT THE SUMP AREA WITH MANHOLE/SIDE WALL RISERS IN FOREGROUND. ALONG THE TOE OF THE EAST BERM(ANCHOR TRENCH IN PHOTOS) AN AREA OF TRAMPOLINING WAS NOTED WHEN WALKING UP THE BERM AFTER CROSSING THE CELL. THIS ISSUE WAS POINTED OUT TO THE RMT REP. ON-SITE; SO THIS AREA IS LOOKED AT PRIOR TO STONE PROTECTIVE COVER BEING PLACED. DUE TO ANCHOR TRENCH BEING BACKFILLED AND COMPACTED, LINER UNABLE TO EXPAND AND CONTRACT FREELY.

10 18 '00
10 18 '00

CENTRAL FILE

NCDENR

JAMES B. HUNT JR.
GOVERNOR

BILL HOLMAN
SECRETARY

WILLIAM L. MEYER
DIRECTOR

NORTH CAROLINA DEPARTMENT OF
ENVIRONMENT AND NATURAL RESOURCES

DIVISION OF WASTE MANAGEMENT

MEMORANDUM

TO: Sherri Coghill

FROM: JIM BARBER
EASTERN AREA ENGINEER

DATE: 08 December 2000

SUBJECT: Weyerhaeuser Company-Plymouth, North Carolina: Solid Waste Management Facility 94-01; Landfill #3 PHASE 1A CQA REVIEW

THE FOLLOWING DOCUMENTS HAVE BEEN REVIEWED FOR THE REFERENCED FACILITY AS DOCUMENTATION FOR THE ISSUANCE OF A PERMIT TO OPERATE:

1. CONSTRUCTION DOCUMENTATION REPORT FOR THE NEW LANDFILL NO. 3 - PHASE 1A; MODULE 1 (SECTIONS 1 THROUGH 8) AND MODULE 2 (SECTIONS 9 AND 10) DATED NOVEMBER 2000, CERTIFIED 6 NOVEMBER 2000 AND RECEIVED 13 NOVEMBER 2000;

2. CONSTRUCTION DOCUMENTATION REPORT FOR THE NEW LANDFILL NO. 3 - PHASE 1A; APPENDICES A - U: DATED NOVEMBER 2000, CERTIFIED 6 NOVEMBER 2000 AND RECEIVED 13 NOVEMBER 2000;

3. ADDENDUM DATED 1 DECEMBER 2000 2000 AND RECEIVED 4 DECEMBER 2000 THAT CONTAINED THE FOLLOWING:

A. REPORT THAT DOCUMENTS THE CONSTRUCTION OF THE LEACHATE COLLECTION SYSTEM AND REMAINING ELEMENTS [SECTIONS 9 AND 10, PHOTOGRAPHS 23 - 34 FOR APPENDIX C(PAGES 16 - 24) AND APPENDIX U];

B. ONE COMPLETE SET OF RECORD DRAWINGS(AS-BUILTS);

C. REPLACEMENT PAGES FOR MODULE 1 TO INCLUDE
TABLE OF CONTENTS(VOLUME 1, PAGES i through iv)
CERTIFICATION PAGES(SECTION 1, PAGES 1 AND 2)
FIGURE 4 - TOP OF PREPARED SUBGRADE ELEVATIONS(SECTION 5, PAGE 20)

1646 MAIL SERVICE CENTER, RALEIGH, NORTH CAROLINA 27699-1646
401 OBERLIN ROAD, SUITE 150, RALEIGH, NC 27605
PHONE 919-733-4996 FAX 919-715-3605
AN EQUAL OPPORTUNITY / AFFIRMATIVE ACTION EMPLOYER - 50% RECYCLED/10% POST-CONSUMER PAPER

THE REVIEW OF ALL INTERIM DOCUMENTATION ASSOCIATED WITH THIS CELL WAS COMPLETED ON 5 DECEMBER 2000. THE FOLLOWING ITEMS AND ISSUES ARE RELATED MODULE 1 - SECTION 7 - GEOMEMBRANE TESTING PAGE 30. THE FOLLOWING, NEED TO BE ADDRESSED PRIOR TO A PERMIT OF OPERATE IS ISSUED:

1. FIELD DESTRUCTIVE SAMPLES WHERE REQUIRED EVERY 500 FEET OF WELDED SEAM. ACCORDING TO THE INFORMATION IN THE CQA DOCUMENT AND INFO. SHOWN ON THE FIELD SEAM AS-BUILT, ONLY 42 FIELD DESTRUCT SAMPLES WERE TAKEN. BASED ON AMOUNT OF WELDED SEAMS(BOTH WEDGE WELD AND EXTRUSION) IT WOULD APPEAR THAT A MINIMUM TOTAL OF DESTRUCT SAMPLES WOULD BE ON THE ORDER OF 48 TO MEET THE MINIMUM CRITERIA FOR THE PROJECT. RMT NEEDS TO PROVIDE A RESPONSE AND CLARIFICATION AS TO THE DISCREPANCY OF THE MINIMUM NUMBER OF DESTRUCT SAMPLES TAKEN.

2. BASED ON THE INFORMATION PROVIDED IN THE REPORT(AND AS SHOWN ON THE AS-BUILT DRAWING BY GSI DATED 17 OCTOBER 2000) DETAILING THE INSTALLATION OF THE GCL; ELEVEN CAP STRIPS WERE INSTALLED ON THE SOUTH SLOPE OF PHASE 1, DUE TO CUTTING THE FIRST ELEVEN PANELS TO CORRECT INSTALLATION ISSUES ON THE GCL. NONE OF THE EXTRUSION WELDS USED TO SEAM THE PANELS, ALONG WITH THE EXTRUSION WELDS FOR THE ELEVEN CAP STRIPS, WERE SAMPLED PER THE DESTRUCTIVE SAMPLING PROGRAM. RMT NEEDS TO ADDRESS THE FOLLOWING ISSUES:

   A. IT APPEARS ACCORDING TO THE SPECIFICATIONS THAT APPROX. THREE DESTRUCTIVE SAMPLES SHOULD/COULD HAVE BEEN TAKEN IN THE REPAIR AREA(CAP STRIP) ON THE SOUTH SLOPE. WHY WEREN'T THESE SEAMS SAMPLED?

   B. APPROX. 700 FEET OF EXTUSION WELD WAS USED TO RE-SEAM THE FIRST ELEVEN PANELS LOCATED ON THE SOUTH SLOPE OF THE SITE. BASED ON THE SPECIFICATIONS, A MINIMUM OF ONE DESTRUCTIVE SAMPLE AND POSSIBLY TWO DESTRUCTIVE SAMPLES SHOULD HAVE BEEN TAKEN. WHY WERE THESE EXTUSION WELDS NOT SAMPLED?

THE FOLLOWING ITEMS HAVE NOT BEEN REVIEWED FOR APPROVAL BY THE REGIONAL ENGINEER DURING THIS REVIEW PERIOD FOR PHASE 1A:

[ ] VERIFY FINANCIAL ASSURANCE FOR PHASE 1A;

[ ] PRE-OPERATIONS SITE VISIT BY THE WASTE MANAGEMENT SPECIALIST;

[ ] GROUND WATER MONITORING WELL CONSTRUCTION RECORDS TO INCLUDE SOIL BORING LOGS, WELL CONSTRUCTION RECORDS AND SURVEY OF HORIZONTAL AND VERTICAL CONTROL;

[ ] PIEZOMETER ABANDONMENT RECORDS;

[ ] PROJECT HYDROGEOLOGIST SUBGRADE CERTIFICATION.

[] A REVISED OVERALL CERTIFICATION LETTER/PAGE FOR THE FINAL DOCUMENTS ONCE THE ABOVE ITEMS ON PAGE 2 AND PAGE 3 ARE ADDRESSED AND COMPLETED.

Carmen Johnson
Fac/Perm/Co ID#
94-01
Date
5/10/12
Doc ID#
DIN

Weyerhaeuser

Construction Documentation Report For The New Landfill No. 3 - Phase 1A Appendices A - U

Weyerhaeuser Company
Plymouth, North Carolina

Prepared By RMT North Carolina, Inc.

November 2000

APPROVED
DIVISION OF SOLID WASTE MANAGEMENT
DATE 12/14/2000 BY SLC

Volume II

Integrated
Environmental
Solutions

100 Verdae Blvd. 29607-3825
P.O. Box 16778 29606-6778
Greenville, SC
Telephone: 864-281-0030
Fax: 864-281-0288

NOV 2000
Received
Solid Waste
Section

CONSTRUCTION DOCUMENTATION REPORT FOR THE NEW LANDFILL NO. 3 - PHASE 1A APPENDICES

WEYERHAEUSER COMPANY
PLYMOUTH, NORTH CAROLINA

PREPARED BY RMT NORTH CAROLINA, INC.

November 2000

© 2000 RMT, Inc.
All Rights Reserved

List of Appendices

Appendix A	Construction Specifications
Appendix B	Construction Quality Assurance Plan
Appendix C	Construction Documentation Photographs
Appendix D	Bulk Material Laboratory Results
Appendix E	Subgrade Inspection Report
Appendix F	Field Density and Moisture Content Results
Appendix G	Prepared Subgrade Laboratory Test Results
Appendix H	Low Permeability Soil Test Results
Appendix I	Subgrade Acceptance Forms
Appendix J	Geosynthetic Clay Liner Submittals
Appendix K	Geosynthetic Clay Liner and Geomembrane Material Inventory Forms
Appendix L	Geomembrane Panel Placement Forms
Appendix M	Trial Seam Information Forms
Appendix N	Geomembrane Production Seaming Forms
Appendix O	Geomembrane Seam and Panel Repair Logs
Appendix P	Nondestructive Testing Logs
Appendix Q	Geomembrane Submittals
Appendix R	Field Destructive Seam Test Logs
Appendix S	Destructive Seam Laboratory Results
Appendix T	Geotextile Submittals
Appendix U	Drainage Layer Materials Laboratory Results

Appendix A
Construction Specifications

TECHNICAL SPECIFICATIONS

CONSTRUCTION SPECIFICATIONS FOR LANDFILL NO. 3 PHASE 1

WEYERHAEUSER COMPANY
PLYMOUTH, NORTH CAROLINA

PREPARED BY RMT NORTH CAROLINA, INC.

March 2000

© 2000 RMT, Inc.
All Rights Reserved

Specifications
Table of Contents

Section 01010	Summary of Work
Section 01330	Submittals
Section 01410	Regulatory Requirements
Section 01420	Reference Standards
Section 01450	Quality Control
Section 01452	Testing Laboratory Services
Section 01520	Construction Facilities and Temporary Controls
Section 01570	Temporary Controls
Section 01574	Temporary Water Control
Section 01600	Material and Equipment
Section 01720	Field Engineering
Section 01760	Monitoring Well Protection
Section 01770	Contract Closeout
Section 02070	High Density Polyethylene (HDPE) Geomembrane
Section 02075	Geosynthetic Clay Liner (GCL)
Section 02076	Geotextiles
Section 02232	Clearing and Grubbing
Section 02250	Soil Compaction Control and Test
Section 02315	Excavation
Section 02317	Trenching, Backfilling, and Compaction
Section 02320	Fill

Section	02372	Riprap
Section	02374	Sediment Control Fence
Section	02376	Erosion Control and Revegetation Mat
Section	02618	High Density Polyethylene (HDPE) Pipe and Fittings
Section	02720	Aggregate Base Course
Section	02911	Topsoil
Section	02921	Seeding
Section	02923	Fertilizing

Section 01010
Summary of Work

PART 1. GENERAL

1.1. REQUIREMENTS INCLUDED

A. Title of work, and type of Contract

B. Description of work

C. CONTRACTOR use of premises

D. OWNER occupancy

E. Materials and Equipment

F. Sequence of Construction

1.2. WORK COVERED BY CONTRACT DOCUMENTS

A. Work of this contract is generally comprised of Work to perform the installation of erosion controls; clearing and grubbing; site preparation; stripping and staging of topsoil; earthwork cut and fill; subgrade preparation; placement and compaction of on-site borrow materials to the required contours; borrow area access road installations; electrical installation; installation of storm water controls; installation of leachate collection piping and manholes; installation of leachate piping appurtenances; installation of the force main piping system; installation of the membrane liner system; placement of granular and aggregate drainage layers; seeding; and site restoration.

B. Work of this contract shall include, unless otherwise specified, the furnishing of all labor, supervision, equipment, tools, materials, and incidentals to perform the outlined work.

C. The CONTRACTOR shall be required to transport from storage, uncrate, erect, and install any specified OWNER-furnished and non-OWNER furnished equipment.

D. The CONTRACTOR shall be required to complete all work in strict accordance with any applicable drawings, with the Summary of Work, and with applicable Weyerhaeuser standards and specifications.

E. The CONTRACTOR shall obtain all permits required by Weyerhaeuser, by federal authorities, by state authorities, and by local authorities.

F. It is the CONTRACTOR's responsibility to perform all work in accordance with applicable codes, including but not limited to American Concrete Institute, American Society for Mechanical Engineers Boiler and Pressure Vessel Code, American Institute for Steel Construction, Standard Building Code, American Petroleum Institute, American National Standards Institute, American Society of Mechanical Engineers, and the Structural Welding Code.

G. It is the CONTRACTOR's responsibility to adhere to all pertinent local, state, federal, OSHA, and Weyerhaeuser safety regulations including, but not limited to, lockout/tagout and confined space entry. In the area where work is to be conducted, care should be taken by the CONTRACTOR to ensure the safety of all personnel, including but not limited to, Weyerhaeuser employees, contract employees, and vendors.

1.3. ASSIGNMENT OF WORK

A. It is the CONTRACTOR's responsibility to assign the required work to the proper crafts in accordance with national and/or local jurisdiction agreements, if applicable.

1.4. STORAGE AREA AND DEBRIS DISPOSAL

A. All debris and rubbish resulting from the work on this contract shall be removed from the OWNER's property unless otherwise directed by the OWNER. All equipment and material so designated to be placed in storage shall be taken to an area assigned by the OWNER.

1.5. SUBSTANDARD WORK

A. All substandard work that does not meet applicable codes, specifications, drawing requirements, etc. shall be repaired at the CONTRACTOR's expense.

1.6. SPECIAL WORKING CONDITIONS

A. The work may be performed simultaneously with the work of other contracts at the site. Construction work shall not interfere with the OWNER's operation, with the work of other Weyerhaeuser employees, or with the work of the other contractors.

1.7. CONTRACT METHOD

A. Complete the work under a lump-sum contract unless otherwise noted.

B. Compensation is full payment for furnishing all materials, supervision, labor, equipment, tools, incidentals, overhead, and profit necessary to complete the Work.

1.8. DESCRIPTION OF PAYMENT ITEMS

CONTRACTOR shall develop an accounting system with Daily Reports to reflect the payment items listed below and shall submit Applications for Payment which reflect charges according to this accounting system with all of the Daily Reports attached. All Work in these payment items shall be conducted in strict accordance with the Contract Documents.

1. Initial Mobilization

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision, and incidentals for the furnishing and movement of personnel, office, and storage trailers, vehicles, equipment, supplies, and incidentals to the site; furnishing of all required permits, bonds and insurance; submittal and maintenance of a detailed, operational, site-specific critical path schedule; other required submittals; attendance and participation in the pre-construction meeting; all in accordance with the drawings and specifications. Payment for this item shall be reflected on the Bid Form as a lump-sum price.

2. Site Preparation

2.1 Clearing and Grubbing

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision, and incidentals for the clearing and grubbing of all trees, shrubs, and vegetation in the landfill and borrow areas in accordance with the drawings and specifications. Payment for this item shall be reflected on the Bid Form as a lump-sum price.

2.2 Strip and Stage Topsoil

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for the stripping and on site staging of suitable topsoil from the landfill footprint and borrow area to the designated topsoil stockpile location in accordance with the drawings and specifications. Payment for this item shall be reflected on the Bid Form as a lump-sum price.

3. Erosion Control

3.1 Silt Fencing

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, supervision, materials, and incidentals for the complete installation of silt fencing in accordance with the drawings and specifications. The cost of this Work shall be reflected on the Bid Form as a lump-sum price.

3.2 Hay Bales

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, supervision, materials, and incidentals for the complete installation of hay bales in accordance with the drawings and specifications. The cost of this Work shall be reflected on the Bid Form as a lump-sum price.

3.3 Riprap

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, supervision, materials, and incidentals for the complete installation of riprap in accordance with the drawings and specifications. The cost of this Work shall be reflected on the Bid Form as a lump-sum price.

3.4 Sediment Traps

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision, and incidentals for the complete installation of two sediment traps in accordance with the drawings and specifications. The cost for this Work shall be reflected on the Bid Form as a lump-sum price.

3.5 Temporary Diversion Ditches

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision, and incidentals for the complete installation of temporary diversion ditches in accordance with the drawings and specifications. The cost for this Work shall be reflected on the Bid Form as a lump-sum price.

4. Construction of Subgrade and Perimeter Berm

4.1 Excavate, Place and Compact Soil for Subgrade and Berm

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for loading, transporting, placing, spreading, and compacting of suitable materials from within the footprint of the landfill onto the landfill subgrade in accordance with the drawings and specifications. Proof rolling before placement of material shall

be included. This item includes all work necessary to install the one foot of prepared subgrade as indicated on the drawings. Payment of this item shall be reflected on the Bid Form as a lump-sum price.

4.2 Excavate, Place and Compact soil for Subgrade and Berm (Borrow Area)

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for loading, transporting, placing, spreading, and compacting of suitable materials from the borrow area onto the landfill subgrade in accordance with the drawings and specifications. Proof rolling before placement of material shall be included. This item includes all work necessary to install the one foot of prepared subgrade as indicated on the drawings. Payment of this item shall be reflected on the Bid Form as a lump-sum price.

4.3 Haul, Place, and Compact Low Permeability Soil (Clay Lined Sumps)

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for loading, transporting, placing, spreading, and compacting of suitable materials from the borrow area onto the clay lined sumps within the landfill subgrade in accordance with the drawings and specifications. Proof rolling before placement of material shall be included. Payment of this item shall be reflected on the Bid Form as a lump-sum price.

4.4 Haul, Place, and Compact Topsoil on Exterior Face of Berms

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for loading, transporting, placing, spreading, and compacting of topsoil from the topsoil stockpile onto the exterior face of the landfill berms in accordance with the drawings and specifications. Payment of this item shall be reflected on the Bid Form as a lump-sum price.

4.5 Revegetation

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision, and incidentals for the final grading, revegetation/seeding and fertilizing of the regraded site and on-site borrow areas, and areas disturbed by construction operations in accordance with the drawings and specifications. Payment of this item shall be reflected on the Bid Form as a lump-sum price.

5. Leachate Forcemain System

5.1 Leachator Pumping System

The Leachator Pumping System will be a separate contract between Weyerhaeuser and Leachator in the form of a Purchase Order. The CONTRACTOR is not to include any monies for this item. Installation of the Leachator Pumping System will be provided by Leachator.

5.2 6 Foot Diameter HDPE Manholes

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for the complete installation of the 6-foot diameter HDPE manholes, covers, and interior piping and appurtenances in accordance with the drawings and specifications. The concrete base; internal piping, couplings, valves, fittings, supports, etc.; and all associated excavation, backfill, and compaction shall be included. Payment for this item shall be reflected on the Bid Form as a lump-sum price.

5.3 18-Inch HDPE Riser Pipes

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision, and incidentals for the complete installation of the 18-inch HDPE riser pipes in accordance with the drawings and specifications. Payment of this item shall be reflected on the Bid Form as a lump-sum price.

5.4 6-Inch/10-Inch HDPE Dual Containment Piping

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision, and incidentals for the complete installation of the 6-inch/10-inch HDPE dual containment piping in accordance with the drawings and specifications. The installation of all 45s, Y-branches, thrust blocks, and pipe plugs shall be included. Payment of this item shall be reflected on the Bid Form as a lump-sum price.

5.5 3-Inch/6-Inch HDPE Dual Containment Piping

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision, and incidentals for the complete installation of the 3-inch/6-inch HDPE dual containment piping in accordance with the drawings and specifications. The installation of all 45s, Y-branches, thrust blocks, and pipe plugs shall be included. Payment of this item shall be reflected on the Bid Form as a lump-sum price.

6. Liner System

6.1 Geosynthetic Clay Liner

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for the complete installation of geosynthetic clay liner material in accordance with the drawings and specifications and the CQA Plan. Excavation and backfill of the anchor trench shall be included in this item. Payment of this item shall be reflected on the Bid Form as a lump-sum price.

6.2 60-mil HDPE (smooth on bottom, textured on side slopes)

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for the complete installation of smooth and textured 60-mil HDPE liner material in accordance with the drawings and specifications and the CQA Plan. Payment for this item shall be reflected on the Bid Form as a lump-sum price.

6.3 Geocushion (32 oz)

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for the complete installation of 32 oz Geocushion in accordance with the drawings and specifications and the CQA Plan. Payment for this item shall be reflected on the Bid Form as a lump-sum price.

6.4 Plywood

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for the complete installation of plywood in accordance with the drawings and specifications and the CQA Plan. Payment for this item shall be reflected on the Bid Form as a lump-sum price.

7. Leachate Collection System

7.1 6-inch Diameter Perforated HDPE Pipe

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for the complete installation of the placement of 6-inch diameter perforated HDPE pipe in the landfill area in accordance with the drawings and specifications. Payment for this item shall be reflected on the Bid Form as a lump-sum price.

7.2 18-inch Diameter Perforated HDPE Pipe

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for the complete installation of the placement of 18-inch diameter solid perforated HDPE pipe in the landfill area in accordance with the drawings and specifications. Payment for this item shall be reflected on the Bid Form as a lump-sum price.

7.3 6-inch Diameter Solid HDPE Pipe

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for the complete installation of the placement of 6-inch diameter solid perforated HDPE pipe in the landfill area in accordance with the drawings and specifications. Payment for this item shall be reflected on the Bid Form as a lump-sum price.

7.4 Graded Aggregate Fill

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for the complete installation of the placement of graded aggregate fill in the landfill area in accordance with the drawings and specifications. All loading, transporting, placing, and compacting of graded aggregate fill from an off site borrow source shall be included. Payment for this item shall be reflected on the Bid Form as a lump-sum price.

7.5. Select Granular Fill

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for the complete installation of the placement of select granular fill in the landfill area in accordance with the drawings and specifications. All loading, transporting, placing, and compacting of select granular fill from an off site borrow source shall be included. Payment for this item shall be reflected on the Bid Form as a lump-sum price.

8. Stormwater Controls

8.1 12-Inch Reinforced Concrete Pipe:

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for the complete installation of a 12-inch reinforced concrete piping in accordance with the drawings and specifications. The construction of headwalls, associated riprap, and necessary grading and contouring are included in this item. Payment for this item shall be reflected on the Bid Form as a lump-sum price.

8.2 18-Inch Corrugated Metal Pipe:

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for the complete installation of a 18-inch corrugated metal piping in accordance with the drawings and specifications. All grading and contouring necessary for this installation is included in this item. Payment for this item shall be reflected on the Bid Form as a lump-sum price.

8.3 Sediment Pond No. #3

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, supervision, materials, and incidentals for the complete installation of Sediment Pond #3 in accordance with the drawings and specifications. This work includes construction of the perimeter berms, emergency spillway, outlet structure, and associated riprap. The outlet structure shall consist of the 24-inch CMP, headwall, associated riprap, concrete base, coarse aggregate, anti-leak collars, and riser pipe. The cost of this Work shall be reflected on the Bid Form as a lump-sum price.

9. Borrow Area

9.1 Borrow Area Outlet Berm

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, supervision, materials, and incidentals for the complete installation of the borrow area outlet berm in accordance with the drawings and specifications. The cost of this Work shall be reflected on the Bid Form as a lump-sum price.

9.2 Borrow Area Outlet Structure

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, supervision, materials, and incidentals for the complete installation of the borrow area outlet structure in accordance with the drawings and specifications. Work in this item includes installation of the 24-inch CMP, headwall, associated riprap, concrete base, coarse aggregate, anti-leak collars, and riser pipe. The cost of this Work shall be reflected on the Bid Form as a lump-sum price.

9.3 Borrow Area Haul Road

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision, and incidentals for the complete installation of the borrow area haul road in accordance with the drawings and specifications. Work under this section includes the culvert and ditch upgrades

as shown on the contract drawings. Payment for this item shall be reflected on the Bid Form as a lump-sum price.

10. Electrical

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for the complete installation of the electrical transformers, electrical cables, electrical conduit, ground rods, ground wires, warning tape, and all trenching not associated with the leachate force main trench in accordance with the drawings and specifications. The cost of this Work shall be reflected on the Bid Form as a lump-sum price.

11. Landfill Roadways

11.1 Landfill Perimeter Roadway and Turnaround

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for the complete installation of the landfill perimeter road and turnaround in accordance with the drawings and specifications. All grading, geotextiles, and compaction shall be included. The cost of this Work shall be reflected on the Bid Form as a lump-sum price.

11.2 Unimproved Access Roads

Work included under this item consists of, but is not limited to, furnishing all labor, equipment, materials, supervision and incidentals for the modification and upgrade of unimproved access roads. **Modification and upgrade shall be at the sole discretion of the CONTRACTOR and any costs for such upgrades shall not be reimbursed by the OWNER.**

12. Surveying

Work included under this item consists of, but not limited to field engineering and surveying services necessary to layout, locate and document work as it progresses. Work includes all items called out in Section 01050 – Field Engineering of the Contract Specification. The cost of this Work shall be reflected on the Bid Form as a lump-sum price.

13 Final Demobilization

Work included under this item consists of, but is not limited to, participation in Pre-final and Final inspections, complete site restoration, and final movement of personnel, vehicles, equipment, supplies, and incidentals from the site to the CONTRACTOR'S designated operations facility at project completion; completion of all final submittals, including the record survey drawings of the final graded areas and site improvements;

and completion of contract close-out; all in accordance with the Contract Documents. The cost of this Work shall be reflected on the Bid Form as a lump-sum price.

1.9. CONTRACTOR USE OF PREMISES

A. CONTRACTOR shall limit use of premises for Work, for storage, access, OWNER occupancy, OWNER's operations, and Work by other contractors.

B. Limit access to site as directed by OWNER.

C. Fully comply with OWNER's facility requirements throughout the duration of Work.

D. Coordinate use of premises under direction of OWNER.

E. Assume full responsibility for protection and safekeeping of products and materials under this contract.

F. Obtain and pay for use of additional storage or work areas needed for operations under this contract.

1.10. OWNER OCCUPANCY

A. OWNER will occupy premises during entire construction period for conduct of his normal operations. Cooperate with OWNER and ENGINEER in scheduling operations to minimize conflict and to facilitate OWNER usage.

1.11. ALTERNATES

A. Alternates quoted on Bid Forms will be exercised as OWNER option only. Accepted alternates will be listed in the Contract Agreement.

B. Coordinate related Work and modify surrounding work affected by accepted alternates as required to complete the Work.

PART 2. PRODUCTS

2.1. GENERAL

A. All materials and equipment shall be in accordance with the drawings and technical provisions of these specifications, and shall be new, unless otherwise specified.

2.2. RECEIVING, INSPECTING, WAREHOUSING

A. It is the CONTRACTOR's responsibility to receive at the job site and to store all OWNER-furnished material and equipment.

B. All OWNER-furnished equipment and material shall be transferred to the CONTRACTOR. Upon receipt, the CONTRACTOR shall immediately inspect the material to ensure it conforms to all applicable specifications and is in proper working order. If the material or equipment is deficient, the OWNER should be notified immediately.

C. Acceptable material and equipment shall become the responsibility of the CONTRACTOR.

D. All material and equipment handling charges shall be borne by the CONTRACTOR.

2.3. CONTRACTOR-FURNISHED MATERIAL AND EQUIPMENT

A. The CONTRACTOR shall furnish, receive, and store all material and equipment not specifically identified as being furnished by the OWNER.

B. All costs of unloading, transporting and storing CONTRACTOR-furnished material shall be borne by the CONTRACTOR.

C. CONTRACTOR-furnished items left over after the installation is complete will belong to the CONTRACTOR, and shall be removed from the job by the CONTRACTOR within 5 days.

D. The CONTRACTOR is responsible for furnishing all hand and machine tools, scaffolding, staging, platforms, personnel safety equipment, etc. The use or rental cost of these items shall be borne by the CONTRACTOR.

2.4. USE OF OWNER'S TOOLS, EQUIPMENT AND STOREROOM

A. The OWNER's shop facilities will not be available for CONTRACTOR use.

B. The OWNER's storeroom will not be available for CONTRACTOR use unless specifically directed by the OWNER. The cost of any material removed from the storeroom to expedite the contract work will be deducted from the CONTRACTOR's bid price.

2.5. OWNER-FURNISHED MATERIAL AND EQUIPMENT

The OWNER will furnish at no cost to the CONTRACTOR:

A. Material and equipment identified as OWNER furnished on the contract drawings.

B. Items of material and equipment specifically listed herein as OWNER-furnished.

C. OWNER furnished items remaining after the installation is complete shall be returned to the owner and placed in the OWNER's designated location. The costs of all non-returned or damaged OWNER-furnished items will be deducted from the contract price.

D. All material specified as OWNER-furnished will be verified as to existence, correct material and correct size and quantity. Any discrepancies will be brought to the attention of the OWNER when the discrepancies are discovered.

2.6. SCRAP MATERIALS

A. All materials designated as scrap by the OWNER's REPRESENTATIVE will be removed from the job site at the CONTRACTOR's expense and disposed of at an approved site. The CONTRACTOR will arrange for a disposal site at the CONTRACTOR's expense provided such scrap resulted from any portion of this project.

2.7. MISCELLANEOUS

A. Work shall be coordinated and executed to the satisfaction of the Weyerhaeuser Project Engineer and/or his field representative.

B. All work shall be performed in accordance with the specifications and drawings. Deviations must be approved by the Weyerhaeuser Project Engineer and/or his representative.

PART 3. EXECUTION

3.1. SEQUENCE OF CONSTRUCTION

CONTRACTOR shall complete the following work in strict accordance with the following Sequence of Construction, unless otherwise approved and directed by the OWNER and ENGINEER.

A. Phase 1 Construction

1. Fence installation, site preparations and erosion controls.
2. Topsoil stripping and staging.
3. Installation of storm water controls.
4. Earthwork cut and fill.
5. Proof rolling and patching the subgrade.
6. Subgrade scarification and re-compaction.
7. Borrow Area Preperation
8. Placement and compaction of on-site borrow materials to the required contours.
9. Installation of geocushion.
10. Installation of leachate collection system.
11. Placement of aggregate and granular drainage layers.
12. Installation of force main system.
13. Installation of landfill perimeter road.
14. Grassing and site restoration.
15. Other work as required and approved by OWNER.

END OF SECTION

RMT

Section 01330
Submittals

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Procedures.

B. Construction Progress Schedules.

C. Shop Drawings.

D. Product Data.

E. Manufacturer's Instructions

F. CONTRACTOR Review

1.2. PROCEDURES

A. Deliver submittals to OWNER and ENGINEER, as required.

B. Identify Project, CONTRACTOR, subcontractor, major supplier; identify pertinent drawing sheet and detail number, and Specification Section number, as appropriate. Identify deviations from Contract Documents.

C. Comply with progress schedule for submittals related to Work progress. Coordinate submittal of related items.

D. After ENGINEER reviews submittal, revise and resubmit as required; identify changes made since previous submittal.

E. Distribute copies of reviewed submittals to concerned persons. Instruct recipients to promptly report any inability to comply with provisions.

1.3. PROGRESS SCHEDULE

A. Submit horizontal bar chart to OWNER and ENGINEER for approval prior to Initial Mobilization to the site with separate bar for each major trade, subcontractor, activity or operation, identifying first work day of each week. Continually update and submit to OWNER and ENGINEER throughout the

progress of Work if any progress schedule changes or modifications are prevalent.

B. Show complete sequence of Work by sequential activity, identifying work of separate stages and other logically grouped activities. Show projected percentage of completion of each item of Work and submit with each Application for Progress Payment.

1.4. SHOP DRAWINGS

A. Submit the number of opaque reproductions which CONTRACTOR requires, plus two copies which will be retained by ENGINEER.

1.5. PRODUCT DATA

A. Mark each copy to identify applicable product, models, options, and other data; supplement manufacturer's standard data to provide information unique to the Work.

B. Submit the number of copies that CONTRACTOR requires plus two copies, which will be retained by ENGINEER.

1.6. MANUFACTURER'S INSTRUCTIONS

A. When required by an individual Specification Section, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for product data.

1.7. CONTRACTOR REVIEW

A. Review submittals prior to transmittal; determine and verify field measurements, field construction criteria, manufacturer's catalog numbers, and conformance of submittal with requirements.

B. Coordinate submittals with requirements of Work and of Contract Documents.

C. Notify ENGINEER in writing at time of submittal of any deviations from requirements of Contract Documents.

D. Do not fabricate products or begin work, which requires submittals until return of submittal with ENGINEER's acceptance.

PART 2. PRODUCTS

Not used.

PART 3. EXECUTION

Not used.

END OF SECTION

Section 01410
Regulatory Requirements

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Description.

B. Permits.

C. Taxes.

1.2. DESCRIPTION

A. Give all notices; observe and comply with all laws, rules, regulations, and ordinances applicable to the Work.

B. Notify area utility companies before beginning Work, in accordance with state and local regulations.

1.3. PERMITS

A. Obtain and pay for all construction permits and licenses and pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of CONTRACTOR's Bid.

B. OWNER will assist CONTRACTOR, when necessary, in obtaining such permits and licenses.

1.4. TAXES

A. Pay all sales, consumer, use, and other similar taxes required to be paid in accordance with the law of the place where the Work is to be performed.

END OF SECTION

Section 01420
Reference Standards

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Applicability of Reference Standards.

B. Provision of Reference Standards at site.

1.2. QUALITY ASSURANCE

A. Comply with requirements of the standard for products or workmanship specified by association, trade, or federal standards, except when more rigid requirements are specified or are required by applicable codes.

B. Except when a specific date is specified, the date of the standard is that in effect as of the Bid date, or date of the OWNER-CONTRACTOR Agreement when there are no bids.

C. When required by individual Specifications Section, obtain copy of standard. Maintain copy at job site during submittals, planning, and progress of the specific Work, until Substantial Completion.

END OF SECTION

Section 01450
Quality Control

PART 1. GENERAL

1.1. SECTION INCLUDES

A. General Quality Control.

B. Workmanship.

1.2. QUALITY CONTROL, GENERAL

A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce work of specified quality.

1.3. WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

END OF SECTION

Section 01452
Testing Laboratory Services

PART 1. GENERAL

1.1. SECTION INCLUDES

A. References.

B. Selection and Payment.

C. Quality Assurance.

D. Contractor Submittals.

E. Laboratory Responsibilities.

F. Laboratory Reports.

G. Limits on Testing Laboratory Authority.

H. CONTRACTOR Responsibilities.

1.2. REFERENCES

A. ANSI/ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

B. ANSI/ASTM E329 - Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

C. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils: Sieve Analysis and Hydrometer.

D. ASTM D4318 – Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils: Atterberg Limits.

E. ASTM D5084 – Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter: Falling Head Permeability Test.

F. ASTM D698 - Standard Test Methods for Moisture-Density Relations of Soils & Soil-Aggregate Mixtures Using 5.5-pound Rammer and 12-inch Drop: Standard Proctor.

G. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth): Nuclear Density Test.

H. ASTM D3017 - Standard Test Method for Moisture - Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth): Nuclear Moisture Content.

I. Construction Quality Assurance Plan

1.3. SELECTION AND PAYMENT

A. OWNER shall employ and pay for services of an independent testing laboratory to perform specified inspection and testing.

B. Employment of testing laboratory shall in no way relieve CONTRACTOR of obligation to perform Work in accordance with requirements of Contract Documents.

1.4. QUALITY ASSURANCE

A. Comply with requirements of ANSI/ASTM E329 and ANSI/ASTM D3740.

B. Laboratory shall maintain a full-time, registered Engineer on staff to review services.

C. Laboratory shall be authorized to operate in State in which Project is located.

D. Testing equipment shall be calibrated at reasonable intervals with devices of an accuracy traceable to either NBS Standards or accepted values of natural physical constants.

1.5. CONTRACTOR SUBMITTALS

A. Prior to start of Work, submit to ENGINEER testing laboratory name, address, and telephone number, and names of full-time, registered Engineer and responsible officer.

B. Submit copy of report of laboratory facilities inspection made by materials. Reference Laboratory of National Bureau of "Standards during most recent tour of inspection, with memorandum of remedies of any difficulties reported by the inspection."

1.6. LABORATORY RESPONSIBILITIES

A. Test samples of materials submitted by CONTRACTOR.

B. Provide qualified personnel at site after due notice; cooperate with ENGINEER, OWNER's SITE MANAGER, and CONTRACTOR in performance of services.

C. Perform specified inspection, and sampling and testing of products in accordance with specified standards.

D. Determine compliance of materials with requirements of Contract Documents.

E. Promptly notify OWNER's SITE MANAGER, ENGINEER, and CONTRACTOR of observed irregularities or non-conformance of Work or products.

F. Perform additional inspections and tests until compliance is achieved or as required by ENGINEER.

G. Attend preconstruction conference and progress meetings as required.

1.7. LABORATORY REPORTS

A. After each inspection and test, promptly submit two copies of laboratory report to OWNER's SITE MANAGER, ENGINEER, and to CONTRACTOR. Include: Date issued, Project Title and number, name of inspector, date and time of sampling or inspection, identification of product and Specifications section, location in the Project, type of inspection or test, date of test, results of test, and conformance with Contract Documents. When requested by OWNER's SITE MANAGER, ENGINEER, or CONTRACTOR provide interpretation of test results.

1.8. LIMITS ON TESTING LABORATORY AUTHORITY

A. Laboratory may not release, revoke, alter, or enlarge on the requirements of Contract Documents.

B. Laboratory may not approve or accept any portion of the Work.

C. Laboratory may not assume any duties of CONTRACTOR.

D. Laboratory has no authority to stop Work.

1.9. CONTRACTOR RESPONSIBILITIES

A. Deliver to laboratory at designated location adequate samples of materials proposed to be used which require testing.

B. Cooperate with laboratory personnel, and provide access to Work.

C. Provide incidental labor and facilities to provide access to Work to be tested, to obtain and handle samples at the site or at the source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.

D. Notify laboratory of operations requiring inspection and testing services 24 hours before services are needed.

E. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest until compliance is achieved at no additional cost to the OWNER.

PART 2. PRODUCTS

Not used.

PART 3. EXECUTION

Not used.

END OF SECTION

Section 01520
Construction Facilities and Temporary Controls

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Electricity, Lighting.

B. Water.

C. Sanitary Facilities.

D. Barriers.

E. Protection of Work.

F. Security.

G. Cleaning During Work.

H. Field Offices and Sheds.

I. Removal.

1.2. ELECTRICITY, LIGHTING

A. Provide service disconnect and electrical feeder from existing service to field office. Take measures to conserve energy. OWNER will pay for energy used.

1.3. WATER

A. Connect to existing facilities; extend branch piping with outlets located so that water is available by use of hoses. OWNER will pay for water used.

1.4. SANITARY FACILITIES

A. Provide and maintain enclosed, portable, self-contained sanitary facilities. OWNER's facilities ***will not*** be available for CONTRACTOR.

1.5. BARRIERS

A. Provide as required for OWNER's use of site, to prevent public entry to construction areas and to protect existing facilities and adjacent properties from damage.

1.6. PROTECTION OF WORK

A. Provide temporary protection for Work in progress and items installed.

B. Control traffic in construction area to minimize damage to completed Work.

1.7. SECURITY

A. Provide security program and facilities to protect Work, existing facilities, and OWNER's operations from unauthorized entry, vandalism and theft. Coordinate with OWNER's security program.

1.8. CLEANING DURING WORK

A. Control accumulation of waste materials and rubbish; periodically dispose of off site.

B. Maintain site in a clean and orderly condition.

1.9. FIELD OFFICES AND SHEDS

A. Office: Weather-tight, equipped with lighting, electrical outlets, heating, cooling, and ventilating equipment, telephone, telephone answering machine, and furniture. Provide separate private office including these items listed above for use of ENGINEER or OWNER's SITE MANAGER. Offices to be located at the landfill area.

B. Storage Sheds for Tools, Materials and Equipment: Weather-tight, with adequate space for organized storage and access, and lighting for inspection of stored materials.

1.10. REMOVAL

A. Remove temporary materials, equipment, services, and construction prior to final inspection.

B. Restore existing facilities used during construction to specified, or to original, condition.

PART 2. PRODUCTS

Not used.

PART 3. EXECUTION

Not used.

END OF SECTION

Section 01570
Temporary Controls

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Dust Control.

B. Erosion and Sediment Control.

C. Noise Control.

D. Pollution Control.

1.2. DUST CONTROL

A. Execute Work by methods to minimize raising dust from construction operations.

B. Provide positive means to prevent airborne dust from dispersing into atmosphere.

C. Do not use oils, bitumens, or chlorides for dust control.

D. Do not track or spill mud, clay, gravel, or other material into adjacent streets or off site. If dirt tracked onto adjacent streets is not cleaned up to OWNER's satisfaction within 24 hours, OWNER will have clean-up completed and bill CONTRACTOR.

1.3. EROSION AND SEDIMENT CONTROL

A. Minimize amount of bare soil exposed at one time.

B. Plan and execute construction to control surface drainage from cuts and fills, and from borrow and waste disposal areas. Prevent erosion and sedimentation.

C. Keep duration of exposure of construction materials before final finishing or cover as short as practical.

D. Conduct operations to avoid washing or deposition of materials into waterways or off site.

E. Do not track or spill mud, clay, gravel, or other materials onto adjacent streets or off site. Clean off inadvertent tracking and spills immediately.

F. Periodically inspect earthwork for evidence of erosion and sedimentation; promptly apply corrective measures.

1.4. NOISE CONTROL

A. Limit the operation of heavy equipment and machinery to daylight hours.

1.5. POLLUTION CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

END OF SECTION

Section 01574
Temporary Water Control

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Control of surface water and groundwater during construction.

1.2. WATER CONTROL

A. Rough grade site to prevent standing water and to direct surface water drainage away from Work area.

B. Maintain or relocate existing ditches and spillways.

C. Do not stockpile material such that it restricts surface drainage.

D. If it is necessary to interrupt existing surface water drainage, provide and maintain temporary piping or ditching until permanent drainage is provided.

E. Maintain excavations and trenches free of water. Provide and operate pumping equipment of a capacity to control water flow out of excavations and trenches.

F. Provide piping to handle discharge to prevent erosion or deposit of silt. Remove equipment when no longer needed for temporary water control.

G. Provide erosion control as shown on the Drawings or as deemed necessary to prevent migration of sediment beyond the Work area.

END OF SECTION

Section 01600
Material and Equipment

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Products.

B. Transportation and Handling.

C. Storage and Protection.

D. Disposal.

E. Product Options.

F. Products List.

G. Substitutions.

H. Systems Demonstration.

1.2. PRODUCTS

A. Products include material, equipment, and systems. Products may also include existing materials or components required for reuse.

B. Do not use materials and equipment removed from existing structure or system, except as specifically required, or allowed by Contract Documents.

C. Comply with Specifications and referenced standards as minimum requirements.

D. Provide components of the same manufacturer, for interchangeable components.

E. Provide components that are "year 2000 compatible."

1.3. TRANSPORTATION AND HANDLING

A. Transport products by methods which prevent product damage; deliver in undamaged, dry condition in manufacturer's unopened containers or packing.

B. Provide equipment and personnel to handle products by methods which prevent soiling or damage.

C. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

1.4. STORAGE AND PROTECTION

A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

B. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to prevent condensation.

C. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.

D. Arrange storage to provide access for inspection. Periodically inspect to ensure products are undamaged, and are maintained under required conditions.

1.5. DISPOSAL

A. Submit to OWNER the disposal site location for excess materials, which may not be disposed on site before beginning Work.

B. Dispose of excess materials off site in an appropriate manner.

1.6. PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description only: Any product meeting those standards may be used.

B. Products Specified by Naming one or more Manufacturers with a provision for substitutions: Submit a request for substitution for any manufacturer not specifically named.

C. Products Specified by Naming Several Manufacturers: Products of named manufacturers meeting specifications: No options, no substitutions allowed.

D. Products Specified by Naming Only One Manufacturer: No options, no substitutions allowed.

1.7. PRODUCTS LIST

A. Within 15 days after Notice to Proceed, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

1.8. SUBSTITUTIONS

A. ENGINEER will consider CONTRACTOR's request for substitutions only within 15 days after Notice to Proceed. Subsequently, substitutions will be considered only when a product becomes unavailable through no fault of CONTRACTOR.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

C. Request constitutes a representation that CONTRACTOR:

1. Has investigated proposed product and determined that it meets or exceeds, in all respects, specified product.

2. Will provide the same warranty for substitution as for the specified product.

3. Will coordinate installation and make other changes which may be required for Work to be complete in all respects.

4. Waives claims for additional costs which may subsequently become apparent.

D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals without separate written request, or when acceptance will require substantial revision of Contract Documents.

E. ENGINEER will determine acceptability of proposed substitution, and will notify CONTRACTOR of acceptance or rejection in writing within a reasonable time.

F. Only one request for substitution will be considered for each product. When substitution is not accepted, provide specified product.

1.9. SYSTEMS DEMONSTRATION

A. Prior to final walk-through demonstrate operation of each system to ENGINEER and OWNER.

B. Instruct OWNER's personnel in operation, adjustment, and maintenance of equipment and systems, using the operation and maintenance data as the basis of instruction.

END OF SECTION

Section 01720
Field Engineering

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Surveying and Field Engineering Services.

B. CONTRACTOR Survey Requirements.

1.2. SUBMITTALS

A. On request, submit data demonstrating qualifications of persons providing services.

B. On request, submit documentation verifying accuracy of survey Work.

C. Maintain complete, accurate log of control and survey Work as it progresses. Submit Record Documents under provisions of Section 01770. Record documents shall reflect all actual coordinate locations, elevations, and dimensions of all final aboveground and underground installations.

1.3. QUALITY ASSURANCE

A. Use skilled persons, trained and experienced in the necessary tasks and techniques, for the proper performance of this Work.

B. Verify locations of survey control points prior to starting Work. Promptly notify ENGINEER of any discrepancies discovered.

1.4. PROTECTION

A. Locate and protect from disturbance or destruction control points, benchmarks, permanent reference points, monuments, and property corner before starting Work.

B. Do not change or relocate reference points or lines without specific approval from ENGINEER.

C. Promptly inform ENGINEER when a reference point is lost or destroyed, or requires relocation.

D. Any such point disturbed or destroyed shall be immediately replaced by qualified surveyors at no expense to the OWNER. Documentation of any such relocation shall be given to OWNER.

PART 2. PRODUCTS

Not used.

PART 3. EXECUTION

3.1. CONTRACTOR SURVEY REQUIREMENTS

A. Establish and maintain lines and levels.

B. Set lath on a 100-foot grid pattern for OWNER's SITE MANAGER use in documenting Work.

C. Locate and lay out Work by instrumentation and similar appropriate means.

D. Periodically verify layouts.

END OF SECTION

RMT

Section 01760
Monitoring Well Protection

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Protecting monitoring wells.

B. Grading resulting adjustments of wells.

C. Repairing damage to wells.

PART 2. PRODUCTS

2.1. Well casing will be Schedule 40 PVC pipe of the same size as the well requiring adjustment. Pipe material shall be Class 12454-B Polyvinyl Chloride conforming to ASTM D1781. Pipe shall conform to requirements of ASTM D1785.

2.2. Concrete shall be 3,000 psi (28 day strength) cast-in-place.

PART 3. EXECUTION

3.1. PROTECTION

A. Preserve and protect existing monitoring wells from damage.

B. Protect well casing and boring from infiltration of surface water, other water, soil, and any foreign materials.

C. Use hand equipment when excavating, filling, or conducting other operations around monitoring wells.

D. Notify ENGINEER and OWNER's SITE MANAGER of necessary alterations or damage to monitoring wells.

3.2. ADJUSTMENT

A. When the grade at an existing monitoring well is changed, adjust well to the new grade.

B. Adjust protective casing so that the top is 2.5 to 3 feet above final grade. Cut or extend the PVC well casing and end cap, so that it is one inch below the top of the protective casing. Place a 2-foot diameter seal of mortar, two parts sand to one part Portland cement, around the well extending 2 feet below final grade.

C. Lowering Grade: Carefully excavate around the well; remove protective casing without damage to the PVC well casing. Cut PVC well casing perpendicular to centerline axis.

D. Raising Grade: Extend PVC well casing using a threaded coupling if possible or slip coupling. Attach the slip coupling to the existing PVC with four screws. The screws should not extend into the inside of the well casing.

3.3. REPAIR

A. Repair any well damaged by CONTRACTOR's operations by excavating to below the broken casing, extending PVC to previous grade, and replacing protective casing and top seal as specified for adjustment.

B. ENGINEER or OWNER's SITE MANAGER will observe the repaired well to determine if further repair or replacement is needed. Repair and replacement shall be done at no expense to OWNER.

END OF SECTION

Section 01770
Contract Closeout

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Closeout Procedures.

B. Final Cleaning.

C. Project Record Documents.

1.2. CLOSEOUT PROCEDURES

A. Comply with procedures stated in General Conditions of the Contract for issuance of Certificate of Substantial Completion.

B. In addition to submittals required by Conditions of the Contract, provide submittals required by governing authorities, and submit a final statement of accounting giving total adjusted Contract Sum, previous payments, and sum remaining due.

C. Complete to the satisfaction of the ENGINEER all deficient and incomplete Work as determined by the OWNER and ENGINEER during the Final Inspection as reflected on the punchlist.

1.3. FINAL CLEANING

A. Execute prior to final walk-through.

B. Completely clean the site as approved by the ENGINEER and OWNER, and restore all drainage ditches and systems.

1.4. PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of the following project record documents; record actual revisions of the Work:

1. Contract Drawings.

2. Specifications.

3. Addenda.

4. Change Orders and other modifications to the contract.

5. Reviewed shop drawings, product data, and samples.

B. Store project record documents separately from construction documents.

C. Keep documents current; do not permanently conceal any Work until required information has been recorded.

D. At contract closeout, submit documents with transmittal letter containing date, Project title, CONTRACTOR's name and address, list of documents, and signature of CONTRACTOR.

PART 2. PRODUCTS

Not used.

PART 3. EXECUTION

Not used.

END OF SECTION

Section 02070
High Density Polyethylene (HDPE) Geomembrane

PART 1. GENERAL

1.1. WORK INCLUDED

A. Providing high-density polyethylene (HDPE) geomembrane textured and nontextured in accordance with the Drawings and these Specifications including, but not limited to, excavating and backfilling anchor trench, deploying geomembrane, seaming, performing repairs, testing, and all necessary and incidental items required to complete the Work.

1.2. Reference Standards

A. ASTM D638 (as modified by NSF 54) - Test Method for Tensile Properties of Plastics.

B. ASTM D792 - Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.

C. ASTM D1004C - Test Method for Initial Tear Resistance of Plastic Film and Sheeting.

D. ASTM D1204 (as modified by NSF 54) - Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature.

E. ASTM D1238 - Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.

F. ASTM D1248 - Specification for Polyethylene Plastics Molding and Extrusion Materials.

G. ASTM D1505 - Test Method for Density of Plastics by the Density-Gradient Technique.

H. ASTM 4218 - Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.

I. ASTM D4437 - Standard Test Methods for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes.

J. ASTM D5199 - Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes.

K. ASTM D5397 - Standard Test Method for Single-Point Notched Constant Load Test.

L. ASTM D5596 - Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics.

M. GRI GM6 - Standard Practice for Pressurized Air Channel Test for Dual Seamed Geomembranes.

N. GRI GM13 - Test Properties, Testing Frequency, and Recommended Warrant for High Density Polyethylene (HDPE) Smooth and Textured Geomembrane.

O. Construction Quality Assurance (CQA) Plan.

1.3. DEFINITIONS

A. Installer - Installer is CONTRACTOR or organization hired by CONTRACTOR to install the Geomembrane (and if applicable, other geosynthetic components).

B. Manufacturer - Company hired by CONTRACTOR to provide the geomembrane.

C. Resin Supplier - Company selected by the manufacturer to furnish the polyethylene resin used to manufacture the geomembrane.

D. Geomembrane - A relatively impermeable thin sheet of polyethylene used as a barrier liner or cover to prevent liquid or vapor migration into or from liquid or solid storage facilities.

E. Textured Geomembrane - Geomembrane with roughened, high-friction surfaces created by co-extrusion, extrusion coating, or spray coating.

F. Installation Field Crew - Individuals employed by installer to coordinate deployment of geomembrane panels and perform field-screening, nondestructive testing, and other critical operations.

G. Fusion Weld - A bond between two polyethylene geomembrane surfaces achieved by fusing both polyethylene surfaces into a homogeneous bond using a power-driven apparatus capable of heating and compressing the overlapped portions of the geomembrane sheets at a specified rate of speed.

H. Extrusion Weld - A bond between two polyethylene materials achieved by extruding a bead of molten polyethylene over leading edge of the seam between upper and lower sheet, or rigid polyethylene piping or plating, using a hand-held apparatus.

I. ENGINEER - Official representative of the OWNER. ENGINEER or designated Construction Quality Control Officer (CQA Officer) will be responsible for observing and documenting that activities related to quality assurance of the construction conform to the plans and specifications.

1.4. QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: At least 5 years of continuous experience in manufacturing of HDPE geomembrane and have produced 10,000,000 square feet (minimum) of HDPE geomembrane with at least 8,000,000 square feet installed.

2. Installer:

a. At least 5 years of continuous experience in installing polyethylene geomembranes and have installed a minimum of 10,000,000 square feet (minimum) of polyethylene geomembrane for at least 10 completed facilities.

b. Personnel performing seaming operations shall be qualified by experience or by successfully passing seaming tests. At least one seamer shall have experience seaming 5,000,000 square feet (minimum) of polyethylene geomembrane using same type of seaming apparatus to be used on this project. The most experienced seamer, called the "master seamer," shall provide direct supervision, as required, over less experienced seamers.

B. Quality Assurance Program: Manufacturer/Installer shall agree to participate in and conform with quality assurance program as outlined in this Specification.

1.5. SUBMITTALS

Items A through E must be submitted no later than 45 days prior to start of geomembrane installation or 15 days prior to delivery of first geomembrane shipment, whichever is sooner.

A. Raw Materials:

1. Resin supplier name, production plant(s) location(s), and the resin brand name and product number.

2. Copy of quality control certificates issued by HDPE resin suppliers.

3. HDPE resin production date(s).

4. Test results conducted manufacturer and resin supplier. Results shall conform with requirements in Part 2.2(A).

5. Statement by manufacturer that no reclaimed polymer is added to resin during geomembrane manufacturing.

B. Manufacturer's Certification: Manufacturer shall certify that supplied geomembrane meets Standards of the Construction Quality Assurance Plan.

C. Geomembrane Manufacturer/Production Information:

1. Corporate background information.

2. Manufacturing Quality Control (MQC) Plan

3. Quality control certificates for geomembrane rolls and welding rod indicating compliance with requirements of Part 2.

D. Geomembrane Installers Information:

1. Corporate background information.

2. Construction Quality Control (CQC) Plan

3. A list of at least 10 completed facilities, totaling 10,000,000 square feet minimum for which the Installer has completed installing polyethylene geomembrane. Include facility name, location, installation date, geomembrane type, and quantity installed.

4. List of field crew personnel along with pertinent project experience information.

E. Installation panel layout diagram identifying placement of geomembrane panels and seams and variances or additional details, which deviate from engineering drawings. Following approval, installer may not change the layout without permission from ENGINEER.

F. Submittals during installation:

1. Daily records/logs prepared by the installer documenting work performed (*i.e.*, productivity), personnel involved, general working conditions, and any problems encountered or anticipated on the project.

2. Subgrade acceptance forms prepared by installer.

3. Quality control documentation (*i.e.*, trial seam tests, destructive tests, nondestructive tests).

G. Submittals after completion of installation:

1. Geomembrane installation certification.

2. As-built panel layout diagram.

3. Warranty from manufacturer/installer

1.6. DELIVERY, STORAGE, AND HANDLING

A. Shipping: Geomembrane liner shall be shipped rolled onto cores that allow for easy handling and deployment.

B. Transportation: Unload and handle geomembrane rolls by appropriate means to prevent damage.

C. On-site Storage: Protect from direct sunlight and heat to prevent degradation of material.

D. On-site Handling: Use appropriate handling equipment when moving geomembrane rolls from one place to another. Instructions for moving shall be given by manufacturer.

1.7. WARRANTIES

A. Manufacturer/installer shall provide written 2-year warranties from date of substantial completion. Warranties shall address quality of material and workmanship.

PART 2. PRODUCTS

2.1. MANUFACTURERS

A. HDPE Geomembranes

National Seal Company
1245 Corporate Boulevard, Suite 300
Aurora, IL 60504
(800) 323-3820

Serrot Corporation
125 Cassia Way
Henderson, NV 89014
(800) 237-1777

GSE, Lining Technology, Inc.
19103 Gundle Road
Houston, TX 77073
(800) 435-2008

Poly-Flex, Inc.
2000 West Marshall Drive
Grand Prairie, TX 75051
(800) 527-3322

B. Substitutions: Submit request to ENGINEER and OWNER with complete supporting technical information under provisions of Section 01600.

2.2. MATERIALS

A. Polyethylene Geomembrane Resin

1.	Specific Gravity/Density	ASTM D792, Method A or ASTM D1505	0.932 minimum
2.	Melt Index	ASTM D1238 (190°C & 2.16 kg)	1.0 g/10 maximum

3. Resin shall be virgin material with no more than 10 percent rework (by weight). Rework material must be same formulation as parent material. No post-consumer resin shall be added to formulation.

B. HDPE Geomembrane

1. Manufactured from first quality resin.

2. No more than 1 percent (by weight) of additives, fillers, or extenders, excluding carbon black.

3. Free of holes and have no undispersed raw materials, striations, scratches, or blemishes on geomembrane surface.

4. Carbon black for ultraviolet protection shall be added during manufacture of geomembrane.

5. Textured geomembrane will have a uniform textured appearance.

C. Fabrication

1. Supply geomembrane in factory-produced rolls. ***No factory seams may be used to prepare larger geomembrane panels for delivery to the site.***

2. Label each geomembrane roll with the following information:

a. Name of manufacturer;

b. Product type and identification number (if any);

c. Batch (lot) number;

d. Nominal product thickness;

e. Roll number and dimensions.

2.3. ACCEPTANCE TESTING REQUIREMENTS

Geomembrane rolls will be tested and evaluated prior to acceptance. In general, geomembrane testing shall be conducted by the manufacturer. ENGINEER or a designated, independent geosynthetics laboratory may perform additional testing (*i.e.*, conformance testing) to verify that HDPE geomembrane meets the specifications. Testing requirements are detailed in following subsections:

A. Manufacturer's Quality Control Testing

Manufacturer, at a minimum, shall perform tests on HDPE geomembrane at frequencies given in Table 02070-1 prior to shipping.

Submit test results to ENGINEER prior to shipping geomembrane rolls. Submit single-point constant tensile load test results to ENGINEER within 14 days of shipping. ENGINEER shall evaluate test results as discussed in Subsection 2.3(C).

B. Conformance Test Samples

Samples will be collected by the CQA Officer at a minimum rate of one sample per 100,000 square feet of geomembrane delivered to the site. At least one sample shall also be obtained from geomembrane rolls representing each resin production batch.

Samples shall be 3 feet long by full width of roll and shall not include the first 3 feet of any roll. Table 02070-1 lists conformance tests and test methods that may be performed on geomembrane roll samples. ENGINEER shall perform testing through use of a recognized testing laboratory. ENGINEER shall evaluate test results as discussed in Subsection 2.3(C).

OWNER will bear the cost for conformance testing. Cost for retesting samples required due to failing test results shall be paid by CONTRACTOR.

C. Procedures for Determining Geomembrane Roll Test Failures

Table 02070-2 lists the acceptance Specifications for tests listed in Table 02070-1. For tests results reported in both machine and cross direction, results from each direction will be compared to listed Specifications to determine acceptance. For test methods requiring multiple specimens, criteria in Table 02070-2 shall be met based on average results of multiple specimen tests. The following procedures will be used for interpreting results:

1. If the test result values meet stated Specifications, then roll and batch, and entire shipment, if applicable, will be accepted; and

2. If test results do not meet Specifications, then roll and batch will be retested at CONTRACTOR's expense using specimens from the original roll sample or from another sample collected by the CQA Officer. For retesting, two additional tests will be performed for failed test procedure.

   If both retest values meet Specifications, then roll and batch will be accepted; if one additional test fails, then roll and batch will be rejected without further recourse. CQA Officer may obtain samples from other rolls in batch. On the basis of testing these samples, the CQA Officer may choose to accept a portion of batch while rejecting remainder.

   If retesting does not result in passing test results as defined above, or if there is any other nonconformity with the material Specifications, then geomembrane rolls shall be withdrawn from the site. Once withdrawn, same rolls shall not be resubmitted for use. CONTRACTOR shall be responsible for removing rejected geomembrane from the site and replacing with acceptable geomembrane.

Table 02070-1
HDPE Geomembrane Tests and Test Methods

PROPERTY	TEST METHOD	MINIMUM TESTING FREQUENCY(1)
Carbon Black Content	ASTM D1603	1/50,000 sf
Carbon Black Dispersion	ASTM D3015	1/50,000 sf
Density	ASTM D792	1/50,000 sf
Tear Resistance(2)	ASTM D1004	1/100,000 sf
Puncture Resistance	FTMS 101, Method 2065	1/100,000 sf
Tensile Properties(2) Yield Stress Yield Elongation Break Stress Break Elongation	ASTM D638, Type IV specimen at 2 inches/minute	1/50,000 sf
Thickness	ASTM D751 (smooth) ASTM D1593 (textured)	10 times/roll

(1) Manufacturer to perform quality control testing at the specified frequencies (minimum) on geomembrane rolls to be supplied to this project.

(2) These tests will be performed and results reported for both machine and cross direction.

Table 02070-2
60-mil HDPE Geomembrane Acceptance Specifications

PROPERTY	UNITS	TYPE OF CRITERION	ACCEPTABLE VALUE[1]
Carbon Black Content	% by weight	Range	2 - 3
Carbon Black Dispersion	NA	Range	A1, A2, or B1[2]
Density	NA	Minimum	0.940
Tear Resistance[4]	lb	Minimum	39
Puncture Resistance	lb	Minimum	72
Tensile Properties[4]			
Yield Stress	ppi	Minimum	126
Yield Elongation	%	Minimum	12
Break Stress	ppi	Minimum	228 (90)[4]
Break Elongation	%	Minimum	560
ESCR	hours	Minimum	1,500
Thickness (Lowest individual)[5]	mils	Minimum	54 (51)[6]
Thickness (minimum average)	mils	Average	60

(1) Values from Tables 1a and 2a of GRI-GM 13 Standards.
(2) Eight of 10 views Category 1 or 2, and 10 of 10 views Category 1, 2, or 3.
(3) Test performed in both machine and cross direction.
(4) Parenthetical values are for textured geomembrane.
(5) For smooth geomembrane, lowest individual value of 10 values; for textured geomembrane, lowest individual value for 8 of 10 values.
(6) For textured geomembrane, lowest individual value for any of the 10 values.

PART 3. EXECUTION

3.1. EARTHWORK PREPARATION

A. Prepare foundation and complete subgrade surface that will support geosynthetic liner system.

B. Excavate, backfill, and compact the anchor trenches to dimensions and at locations shown on Drawings.

C. Prior to liner system deployment, visually examine subgrade surface to confirm suitability for deployment of the geosynthetic liner system thereon. Examination shall verify that subgrade is firm, smooth, and uniform; and free of excessive moisture, abrupt changes in grade, cracking, protruding stones and clay clods (greater than 1/2 inch), vegetation, and other deleterious debris. Subgrade surface found to be unsuitable for deployment of the geosynthetic liner system shall be refinished. Provide ENGINEER with written acceptance of the subgrade surface over which panels are to be deployed for each day of panel deployment.

D. Deploy geosynthetic liner system over prepared and acceptable subgrade surface.

3.2. INSTALLATION - PANEL DEPLOYMENT

A. Install geomembrane according to approved layout drawing. Notify ENGINEER of revisions or modifications to approved plan prior to installing the geomembrane. Upon placement, identify each panel by roll number and panel number.

B. Do not place geomembrane during precipitation, in areas of ponded water, or during excessive winds. CQA Officer may order the suspension of work during such conditions.

C. Maintain documentation of above conditions in the daily installation records, and provide such documentation to ENGINEER. Inform ENGINEER if above conditions are not met.

D. Verify the following:

1. Equipment does not damage geomembrane;

2. Prepared surface underlying geomembrane has not deteriorated since previous acceptance, and is still acceptable at time of geomembrane placement;

3. Personnel working on geomembrane do not smoke, wear damaging footwear or clothing, or engage in activities which could damage the geomembrane;

4. Methods and equipment used to unroll and seam geomembrane do not cause scratches, crimps, or gauges in geomembrane;

5. Method used to place the rolls minimizes wrinkles (especially wrinkles between adjacent panels);

6. Adequate temporary loading or anchoring (continuously placed, if necessary) does not damage geomembrane; and

7. No vehicular traffic operates directly over geomembrane, except for balloon-tire all-terrain vehicles (ATVs) when approved by the ENGINEER.

Immediately notify ENGINEER if these conditions are, or have been, violated and take immediate steps to mitigate any damage.

E. Examine each roll for damage after placement and prior to seaming. Inform ENGINEER as to which rolls, or portions of rolls, should be rejected or repaired. Mark and remove from site damaged rolls or portions of rolls which have been rejected, at no risk, cost or expense to OWNER. Notify ENGINEER when such removal occurs.

3.3. INSTALLATION - FIELD SEAMS

A. Seam Layout:

1. Orient seams parallel to the line of maximum slope. Do not orient seams across slopes steeper than 6:1 (horizontal to vertical). In corners and at other odd-shaped geometric intersections, the number of seams should be minimized.

2. No horizontal seams should be located within 5 feet of the toe of slopes steeper than 6:1 (horizontal to vertical).

3. Use a seam numbering system comparable to, and compatible with, the geomembrane panel numbering system.

B. Seaming Processes/Equipment

1. Approved processes for field seaming (welding) are extrusion welds and dual hot wedge fusion welds. Other processes require written authorization from ENGINEER.

2. One spare, operable extrusion seaming device and one spare, operable fusion seaming device shall be maintained on site during seaming operations. Once the spare seaming device is put into use, provide another spare immediately.

3. Comply with the following requirements regarding use, availability, and cleaning of ***extrusion welding*** equipment:

   a. Equip welding apparatus with operational thermocouples to continuously monitor temperature in barrel and at nozzle;

   b. Extruder shall be cleaned and purged prior to beginning seaming until heat-degraded extrudate has been removed from the barrel;

   c. Check vital mechanical components (*i.e.*, teflon shoes, brushes, and thermostats) daily;

   d. Place electric generator for equipment on a smooth base such that no damage occurs to the geomembrane; and

   e. Place a smooth insulating plate or fabric beneath hot equipment after usage to protect geomembrane.

4. Comply with the following requirements regarding use, availability, and cleaning of ***dual hot wedge fusion welding*** equipment:

   a. Equip welding apparatus to continuously monitor applicable temperatures. Verify and document temperatures daily.

   b. Ground edge of cross seams to a smooth incline (top and bottom) prior to welding. Cross seams shall be patched after welding.

   c. Place electric generator for equipment on a smooth base such that no damage occurs to the geomembrane.

   d. Place a smooth insulating plate or fabric beneath hot equipment after usage to protect geomembrane.

C. Seaming Requirements/Procedures

1. Weather Conditions under which geomembrane seaming can be performed are as follows:

   a. Unless authorized in writing by ENGINEER, no seaming shall be attempted or performed at an ambient temperature below 32°F (5°C) or above 104°F (40°C). Temperatures shall be measured 1 to 2 feet above the geomembrane surface using a conventional mercury thermometer;

   b. Geomembrane shall be dry; and

   c. Seaming shall not be performed in areas where ponded water has collected above or below surface of geomembrane.

2. For seaming at ambient temperatures below 32°F or above 104°F, demonstrate to CQA Officer that the methods and techniques used to perform the seaming produce seams which are entirely equivalent to seams produced at temperatures above 32°F and below 104°F, and that overall quality of geomembrane is not adversely affected. CQA Officer may, at his/her sole discretion, deny approval for use of proposed technique regardless of demonstration results.

3. Overlapping and temporary bonding procedures are as follows:

   a. Provide sufficient overlap between geomembrane panels to perform extrusion or fusion welding, in accordance with manufacturer's recommendation, and allow peel tests to be performed on seam. Seam shall be capped if there is insufficient overlap.

   b. Solvents or adhesives shall not be used on geomembranes unless product has been approved in writing by ENGINEER based upon samples and data sheets submitted to ENGINEER for testing and evaluation.

   c. Procedures used to temporarily bond adjacent geomembrane rolls shall not damage the geomembrane; in particular, the nozzle temperature of spot welding apparatus shall be controlled to protect geomembrane from potential damage. Spot welding shall be kept to a minimum. Spot welding shall be subject to weather restrictions listed above and shall be performed only by approved seaming personnel pursuant to Subsection 1.4 of this specification.

4. Trial seams shall be made on non-deployed geomembrane seams at the beginning of each seaming period and at least once every 4 hours during continuous operation with each welding device in use. Trial seams shall be made under the same conditions as actual seams. Trial seams are also required for welding equipment for which the power supply has been interrupted. Seaming personnel shall make at least one satisfactory trial seam each day to demonstrate satisfactory abilities. Satisfactory trial seams shall pass the inspection and testing described below.

   a. Trial seam samples shall be at least 3 feet long by 1 foot wide after seaming, with seam centered along its length.

   b. Inspect trial seams for proper squeeze-out, footprint pressure, and general appearance. If general appearance is acceptable, then cut two specimens, 1 inch in width from each end of trial seam sample. Remainder of trial seam shall be given to CQA Officer.

   c. Subject two specimens to a shear test and two specimens to a peel test (one peel test and one shear test form each end). If test specimens exhibit a film-tear bond and meet acceptance specifications listed in Subsection 3.5 (Table 02070-3), then the trial seam is satisfactory.

   d. If trial seam fails field test or inspection, then a second trial seam (either with or without adjustments in the seaming techniques) shall be made, inspected and tested. If no inspection or test on the second trial seam fails, then trial seam is satisfactory. If second trial seam fails, then seaming apparatus or seaming technique shall be adjusted as necessary until two consecutive, satisfactory trial seams are obtained.

5. Seam Preparation:

   a. Seam area shall be clean and free of moisture, dust, dirt, debris, and foreign material prior to seaming;

   b. Seams shall be aligned so as to minimize the number of wrinkles and "fishmouths;" and

   c. If seam overlap grinding is required, complete grinding process according to manufacturer's instructions within one (1) hour of seaming operation. Grinding shall not damage geomembrane or cause excessive striation on geomembrane surface.

Table 02070-3
60-mil HDPE Geomembrane Acceptance Specifications

PROPERTY	TEST METHOD	UNITS	MINIMUM AVERAGE VALUE	
			NON-TEXTURED	TEXTURED[1]
Shear Strength[2]	ASTM D4437	ppi	126	113
Shear Elongation[2]	--	percent	50	50
Peel Strength[3],[4] - Fusion	ASTM D4437	ppi	90	82
Peel Strength[3],[4] - Extrusion	ASTM D4437	ppi	78	63
Peel Separation[5]	--	percent	10	10

(1) If the lengthwise edges of the textured geomembrane panels are non-textured, then the non-textured specifications shall apply for the testing of seams made along these edges. For textured to nontextured seams, use the textured specifications.

(2) Five out of the five test specimens must meet these requirements. In addition, failure type must be film-tear bond (FTB) for all five specimens.

(3) Four out of the five specimens must meet the three requirements. The fifth specimen shall achieve *90* percent of the listed peel strength.

(4) Failure type must be film-tear bond (FTB) for four out of five test specimens.

(5) Maximum Acceptance Value for four out of five test specimens. The fifth specimen shall have no more than 50 percent peel separation.

6. General Seaming Procedures:

a. Use dual hot wedge fusion welding wherever possible;

b. Extend welded seam to outside edge of geomembrane panels placed in anchor trenches;

c. Whenever possible, start field seaming from top of slope down to minimize development of wrinkles. Use hot air only when making tack welds; no double sided tape, glue, or other method are permitted;

d. Completed liner shall not exhibit "bridging" or "trampolining" when protective cover or other materials are placed over geomembrane;

e. "Walk out" fishmouths or wrinkles at seam overlaps if possible or cut along ridge of wrinkle in order to achieve a flat overlap, then weld along overlap and patch each end;

f. Provide adequate illumination when seaming operations are to be conducted at night;

g. When restarting an extrusion seam, grind end of existing extrusion bead and start new seam with less than a 2-inch overlap of existing bead;

3.4. NONDESTRUCTIVE TESTING

A. Nondestructively test each field seam over its full length using one of the methods described in this section. Nondestructive testing shall progress concurrently with seaming and shall not await completion of the project's seaming. Air pressure testing is only applicable to dual hot wedge fusion seams. Vacuum box testing on dual wedge fusion seams shall be conducted with the air space between the tracks open to the atmosphere at one or both ends of the seam.

B. Vacuum Box Testing

1. Vacuum box testing equipment:

a. Open bottom vacuum box with clear viewing panel on top and a pliable gasket attached to the bottom;

b. Steel vacuum tank and pump assembly equipped with pressure controller and pipe connections capable of achieving a vacuum of 10 psig;

c. Vacuum gauge on tank with an operating range of 0 to 10 psig and a vacuum gauge on vacuum box with an operating range of vacuum pressures from 0 to 10 psig; and

d. Nonalkaline soapy solution and means to apply.

2. Vacuum box test procedures:

a. Seams shall be clean and relatively free from soil or foreign objects;

b. Energize vacuum pump and create a vacuum in tank of 5 to 10 psig;

c. Wet seam approximately twice the length of the vacuum box with soapy solution;

d. Center vacuum box with gasket in contact with the geomembrane surface over wetted area of seam;

e. Applying normal force to top of vacuum box, close bleed valve and open vacuum valve. (Check a tight seal is created between the geomembrane and vacuum box.)

f. Examine the geomembrane seam through the viewing panel for bubbles for a period of not less than 10 seconds;

g. Remove vacuum box by closing the vacuum valve and opening bleed valve. Proceed to Step (h) if bubbles appeared in Step (f). If no bubbles appeared in Step (f), move vacuum box over the next adjoining area with a minimum 3-inch overlap and repeat the process.

h. If bubbles appeared through the geomembrane, the defective area shall then be marked with an appropriate device for repair according to the provisions of Subsection 3.6(C).

C. Air Pressure Testing

1. Air pressure testing equipment:

a. Air compressor with pressure gauge and regulator capable of producing and sustaining a pressure between 25 and 30 psig;

b. Fittings, rubber hose, valves, etc., to operate the equipment and a sharp hollow needle, or other pressure feed device, if approved by CQA Officer.

2. Air pressure testing procedures:

   a. Seal both ends of the seam to be tested;

   b. Insert needle into air channel of dual hot wedge seam;

   c. Inflate air space with compressor to a pressure of approximately 30 psig, close valve and monitor pressure in the air channel for approximately 7 minutes;

   d. Record pressure at the end of 2 minutes and again at the end of 7 minutes;

   e. If pressure difference between the 2-minute and 7-minute readings exceeds 3 psi, or if the pressure does not stabilize within the 7-minute period, one more 5-minute pressure monitoring interval shall be allowed;

   f. If the pressure loss over both 5-minute intervals exceeds 3 psig or if the pressure does not stabilize, then the seam fails the test;

   g. If the pressure loss over either 5-minute interval does not exceed 3 psig, then the seam may be deemed by the installer to have passed the test; and

   h. Cut the end of the tested seam interval opposite the pressure gauge to verify that air channel tested was not obstructed by noting a release of air pressure.

3. For seam intervals failing the air pressure nondestructive test, perform additional nondestructive testing or visual inspection to identify, if possible, the faulty area of the seam. Repair and retest the faulty area. If the faulty area cannot be identified, then the entire seam shall be repaired and retested.

D. Nondestructive Seam Test Failures

Seams failing nondestructive testing shall be repaired according to Subsection 3.6(C) and shall be subsequently nondestructively retested according to Subsection 3.4.

3.5. DESTRUCTIVE TESTING

ENGINEER, under agreement with OWNER will contract to have the seam samples laboratory tested at OWNER's expense. Field destructive seam testing shall be performed by installer and shall conform to the Construction Quality Assurance Plan.

A. Location and Sampling Frequency

1. CQA Officer will select locations where laboratory seam samples shall be cut by installer for destructive testing.

2. Laboratory destructive samples will be collected at a frequency of not less than one per every 500 lineal feet of seam length. CQA Officer may direct that additional samples be cut.

B. Sampling Procedure

1. For each sample location, CQA Officer will:

   a. Assign a sample number and mark accordingly;

   b. Record sample location on layout drawing;

   c. Record pertinent information including date, time, number of seaming unit, and name of seamer.

2. Cut two specimens, each 1 inch wide by 12 inches long with the seam centered parallel to the width, for qualitative and quantitative field testing prior to the removal of each laboratory sample. The two samples shall be 42 inches apart measured from inside edge to inside edge. If both samples pass the field tensiometer test described in Subsection 3.5(C), then cut the laboratory sample as described below.

3. Destructive samples shall be at least 12 inches wide (at least 5 inches on each side of the seam) by 42 inches long. Cut samples into three parts and distribute as follows:

   a. A 12-inch by 12-inch portion shall be cut and retained. Perform testing of this sample for quality control purposes if desired.);

   b. A 12-inch by 12-inch portion shall be cut and given to CQA Officer for record storage; and

   c. The remaining 18-inch by 12-inch portion shall be given to CQA Officer for testing as described in Subsection 3.5(D).

4. Repair holes cut into the geomembrane resulting from destructive seam sampling in accordance with Subsection 3.6(C). Nondestructively test repair area in accordance with Subsection 3.4(B).

C. Field Testing

1. Field-test the two 1-inch–wide samples (described above under Sampling Procedure) for both peel and shear. Testing shall be performed using a field tensiometer or equivalent device.

2. Record quantitative and qualitative test results and evaluate against acceptance specifications listed in Table 02070-3.

3. Implement the procedures of Subsection 3.5(E) if any sample fails the field tensiometer test.

D. Laboratory Testing

1. Test destructive seam samples in general accordance with the methodology of ASTM D4437. Peel testing for dual hot wedge fusion welds shall be performed on the outside track whenever possible.

2. Perform the following tests on each destructive seam sample:

   a. Shear strength, expressed in pounds per inch width (ppi), when tested in general accordance with ASTM D4437.

   b. Peel strength, expressed in pounds per inch width (ppi), recorded during the peel test in general accordance with ASTM D4437.

3. Shear test gauge length shall be 2 inches between each edge of the seam and the adjacent grip. Crosshead speed shall be 2 inches per minute. Parameters monitored during the test will be load and crosshead displacement.

4. Peel test grips shall be no closer than 1 inch to the edge of the seam unless there is insufficient material to allow insertion at this setting. Crosshead speed shall be 2 inches per minute.

5. Report the following values, along with mean and standard deviation where appropriate for each specimen tested in shear:

   a. Maximum tension in pounds per square inch;

   b. Elongation at break (up to a tested maximum of 100 percent);

   c. The locus of failure.

6. Report the following values, along with mean and standard deviation where appropriate for each specimen tested in peel:

   a. Maximum tension in pounds per square inch;

   b. Seam separation (expressed as percent of original seam area);

   c. Locus of failure.

7. Retesting of seams, because of failure to meet any or all of the specifications, may be performed at the sole discretion of ENGINEER.

E. Destructive Seam Test Failure

1. Evaluate results from the shear and peel tests against the criteria tabulated in Table 02070-3. All of the Table 02070-3 criteria shall be met for the seam to be considered acceptable. A $400 penalty will be assessed for each destructive seam sample test failure.

2. Determine the repair boundary whenever a seam has failed the destructive testing following one of two options:

   a. Reconstruct the seam between any two previously tested and passed destructive sample locations; or

   b. Trace the welding path to an intermediate location at least ten feet from the point of the failed test in each direction and obtain destructive test samples at these intermediate locations. If the destructive tests on these samples are acceptable, then reconstruct the seam between these intermediate locations. If either sample fails, then repeat the process until an acceptable seam test has been performed on both sides of the original failed sample. If a passing sample is not found on one (or both) sides of the original failed sample, then extend seam repair to the end(s) of the seam. Continue to track the failing seam, as necessary and as appropriate, past the end(s) and onto the prior seam and following seam made with the same welding equipment. Retesting of seams, according to this procedure, shall use the sampling methodology described in Subsection 3.5(B).

   c. An additional sample taken from the reconstructed zone must pass destructive seam testing, if destructive sample failure(s) cause the reconstruction and the length of the reconstructed seam is greater than 150 feet.

3.6. DEFECTS AND REPAIRS

A. Examine all seam and non-seam areas of the geomembrane for identification of defects, holes, blisters, undispersed raw materials, and signs of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of examination. Groom and wash geomembrane surface if the amount of dust or mud inhibits examination. Provide a water truck, an operator, water and hoses as reasonably necessary to assist such washing.

B. Evaluation

1. Mark each location requiring repair due to failure of the nondestructive test, observations, examinations, or destructive tests.

2. Do not cover locations which have been repaired or replaced until these locations are examined by CQA Officer and testing results indicate passing values.

C. Repair or replace portions of the geomembrane exhibiting a flaw, or failing a destructive or nondestructive test. Several procedures exist for the repair of these areas, including:

1. Patching—for repair of large holes, tears, undispersed raw materials, contamination by foreign matter, holes resulting from destructive sampling, and locations where the seam overlap is insufficient;

2. Spot welding or seaming—for repair of small tears, pinholes, or other minor, localized flaws;

3. Capping—for repair of large lengths of failed seams;

4. Removal and replacement—used to replace nonconforming or damaged panels or portions thereof; and

5. Additional procedures if agreed upon by CQA Officer.

D. Extend patches and caps at least 6 inches beyond the edge of the defect. Round the corners of patches and caps. In addition, satisfy the following provisions:

1. Abrade surfaces of the geomembrane which are to be repaired no more than 1 hour prior to the repair if extrusion welding techniques are used;

2. Geomembrane surfaces must be clean and dry at the time of repair; and

3. The repair procedures, equipment, materials, and techniques shall be approved by ENGINEER prior to the repair.

E. Log the repair date, time, location, description, and personnel involved for each repair. Nondestructively test each repair. Passing tests indicate adequate repair. Large caps may be of sufficient extent to require destructive test sampling at the discretion of CQA Officer.

F. Failing nondestructive tests indicate inadequate repair. Reconstruct repair and retest until a passing result is obtained.

G. Cut and seam wrinkles which may adversely affect the long-term integrity of the geomembrane, hinder subsequent construction of the overlying layers, or impede drainage off the geomembrane after it is covered by soil. The seaming shall be done in accordance with the equipment and procedures described in Subsections 3.3(B) and 3.3(C), respectively, and it shall be subject to the test provisions of Subsections 3.4 (nondestructive testing) and 3.5 (destructive testing).

3.7. MATERIAL IN CONTACT WITH GEOMEMBRANES

A. Pipe Penetrations and Appurtenances - Verify that the following requirements are met:

1. Seaming performed on and pipe penetrations, and other appurtenances will be non-destructively tested according to one of the following methods: (1) vacuum box method as discussed in Section 3.4; (2) spark testing according to manufacturer's recommended procedures; (3) factory testing, along with certification, of prefabricated seams (*i.e.*, pipe boots); or (4) capping with a second geomembrane layer where nondestructive testing is not possible due to space limitations.

2. The geomembrane has not been visibly damaged while making connection to sumps and appurtenances; and

3. Installation of the geomembrane in the area of the pipe penetrations and connections of the geomembrane to these structures and appurtenances have been made according to the approved engineering plans and shop drawings.

B. Fill - Requirements for placement of fill are described in Section 02320. Apply the following general criteria for Work on a geomembrane or a geosynthetic liner system (*i.e.*, a composite liner consisting of a Geocushion™, geomembrane, and GCL):

1. Do not place fill on the geomembrane at an ambient temperature below 41°F, (0°C) nor above 104°F (40°C), unless otherwise specified.

2. Do not drive equipment used for placing the material or fill directly on the geomembrane.

3. A minimum thickness of 1 foot of fill is specified between a low ground pressure dozer (maximum contact pressure of 5 psi) and the geomembrane or the geosynthetic liner system.

4. A minimum thickness of 2.0 feet of fill is specified between tracked vehicles or flotation-tire–equipped vehicles and the geomembrane or the geosynthetic liner system.

5. A minimum thickness of 3.0 feet of fill is specified between rubber-tired vehicles and the geomembrane or the geosynthetic liner system, including areas of heavy traffic.

6. On slopes steeper than 6:1, place overlying fill from bottom to top.

3.8. Geotextile/Geosynthetic Clay Liner (GCL) – Requirements for installation of the GCL and the Geotextile are described in Sections 02075 and 02076, respectively.

END OF SECTION

Section 02075
Geosynthetic Clay Liner (GCL)

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Providing GCL in accordance with the Drawings and the Specifications, including, but not limited to, excavating and backfilling anchor trench, GCL panel layout, seaming, patching, testing, and all necessary and incidental items required to complete the work.

1.2. REFERENCE STANDARDS

A. GRI GCL2 - Permeability of Geosynthetic Clay Liners.

B. ASTM D5321 - Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method.

C. ASTM D5886 - Test Method for Measurement of Index Flux through Geosynthetic Clay Liner Specimens using Flexible Wall Permeameter.

D. ASTM D5888 - Practice for Storage and Handling of Geosynthetic Clay Liners.

E. ASTM D5890 - Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners.

F. ASTM D5891 - Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners.

G. ASTM D5993 - Test Method for Measuring the Mass per Unit Area of Geosynthetic Clay Liners.

H. ASTM E946 - Standard Test Method for Water Absorption of Bentonite by Porous Plate Method.

I. CQA Plan

1.3. DEFINITIONS

A. INSTALLER - Organization hired by CONTRACTOR to install the GCL.

B. MANUFACTURER - Company hired by CONTRACTOR to provide the GCL.

C. ENGINEER - Official representative of OWNER. ENGINEER or designated CQA Officer (CQA Officer) will be responsible for observing and documenting that activities related to the quality assurance of the construction conform to the Plans and Specifications.

D. Installation field crew - Group of individuals employed by INSTALLER to coordinate deployment of GCL panels, and to perform field seaming and other critical operations.

E. Geosynthetic Clay Liner - Factory-manufactured hydraulic barriers typically consisting of bentonite clay or other very low–permeability clay materials, supported by geotextiles and/or geomembranes, which are held together by needling, stitching, and/or chemical adhesives.

1.4. QUALITY ASSURANCE

A. Qualifications

1. MANUFACTURER shall have at least 3 years of continuous experience in the manufacturing of GCLs and shall have produced a minimum of 10,000,000 square feet of GCL with at least 8,000,000 square feet installed.

2. INSTALLER shall have at least 5 years of continuous experience in the installation of GCLs and shall have installed a minimum of 1,000,000 square feet of GCL for at least 10 completed facilities, or must provide to ENGINEER satisfactory evidence, through similar experience in the installation of other types of geosynthetics, that the GCL will be installed in a competent, professional manner.

B. Manufacturer's Quality Control Plan (MQCP) - The manufacturer of each component of the GCL and the GCL itself shall have an established MQCP to ensure that their product meets all of the stated minimum properties.

1.5. MANUFACTURERS' QUALITY CONTROL PLANS (MQCP)

A. Bentonite Supplier

1. The bentonite supplier shall have a MQCP that is adhered to in the bentonite manufacturing process. This plan shall include, at a minimum, the following provisions:

   a. Testing or procedures to verify that the bentonite is sodium bentonite

   b. Testing or procedures to verify that the bentonite meets specified gradation requirements

   c. Testing or procedures to verify that the bentonite meets specified index test requirements

   d. Testing or procedures to verify that the bentonite has not been treated with synthetic chemicals or polymers

B. Geotextile/Geomembrane Supplier

1. The geotextile membrane supplier shall have a MQCP that is adhered to in the geotextile membrane manufacturing process. This plan shall include, at a minimum, the following provisions:

   a. Certification that the material is made of specified polymeric material.

   b. Certification that the material meets certain minimum average roll values

C. GCL Manufacturer

1. Manufacturer shall have a MQCP that describes the procedures for accomplishing quality in the final product. At a minimum, the tests shown in Table 02075 shall be performed by manufacturer (or an independent laboratory hired by manufacturer).

2. The MQCP shall also dictate that

   a. overlap alignment lines are to be marked along the roll edges;

   b. completed rolls are to be securely wrapped in plastic;

   c. completed rolls are to be stored indoors, and provisions are to be in place to prevent rolls from being stacked too high, damaged during handling, and from becoming wet; and

d. Quality Control certificates shall be provided for each GCL roll.

Table 02075
GCL Material Tests, Test Methods, and Acceptance Specifications

	PROPERTY	TEST METHOD	UNITS	VALUE
Bentonite properties	Free swell Fluid loss	USP-NF-XVII API. 13A	mL/2g mL	24 (MARV)(1) 18
Hydraulic properties	Flux (2),(3)	ASTM D5886	m/s	1×10^{-8}
Physical GCL properties	Bentonite mass per unit area	ASTM D5993	lb/sqf	0.75 (MARV)(1)

(1) Minimum average roll value (MARV).
(2) Flux is defined as "flow rate/unit area" which can be converted to permeability using the equation:
permeability = flux/hydraulic gradient
(3) Report results at a maximum confining stress of 34 Kpa (5 psi) and 14 Kpa (2 psi) head pressure.

1.6. SUBMITTALS

A. Submittals prior to shipment and installation

1. GCL Manufacturer/Production Information:

a. Corporate background information.

b. MQCPs for bentonite, geotextile, and GCL Manufacturers.

c. Project reference list consisting of the principal details of at least 10 projects totaling at least 8 million square feet of GCL installation.

d. Test results conducted by the bentonite supplier and geotextile/geomembrane supplier to document the quality of the materials used to manufacture the GCL rolls assigned to this project.

e. Copy of quality control certificates, signed by a responsible entity of MANUFACTURER. Each quality control certificate shall include roll identification numbers, and the results of quality control tests.

f. MANUFACTURER'S written certification that the GCL meets the project specifications, that the GCL has continuously been inspected and found to be needle free, and that the bentonite will not shift during transportation or installation.

2. GCL INSTALLER Information:

a. Corporate background information.

b. Project reference list consisting of the principal details of at least 10 projects totaling at least 1 million square feet.

c. List of personnel performing field operations, along with pertinent experience information and NICET certificates.

3. Proposed panel layout diagram identifying placement of GCL panels and seams, as well as any variance or additional details that deviate from engineering Drawings. Layout shall be drawn to scale and shall be adequate for use as a construction plan and shall include information such as dimensions and details.

4. Installation schedule as part of construction progress schedule.

B. Submittals during installation:

1. Daily records/logs prepared by INSTALLER documenting work performed, personnel involved, general working conditions, and any problems encountered or anticipated on the project, to be submitted at a minimum, on a weekly basis.

2. Copy of subgrade acceptance forms by INSTALLER.

3. Quality control documentation.

C. Submittals after completion of installation:

1. Installation Certification certifying that the GCL was installed in accordance with the plans and specifications and the CQA Plan.

2. As-built panel layout diagram identifying the placement of panels and seams. The numbering sequence shall be agreed upon between the CQA Officer and INSTALLER prior to commencing installation.

3. Copy of warranty obtained from manufacturer/INSTALLER.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver all GCL rolls to the job site at least 2 weeks prior to installation to allow for conformance testing.

B. Transportation: Unload and handle GCL rolls by appropriate means as recommended by MANUFACTURER so as to cause no damage. Inspect each

roll as it is unloaded to identify if the packaging has been damaged. Rolls with damaged packaging shall be marked and set aside for further inspection. Repair packaging before being placed in storage.

C. On-site Storage:

1. Protect from direct sunlight, moisture, and heat.

2. Use wooden pallets for aboveground storage of the GCL rolls.

3. Use heavy waterproof tarps for protecting all GCL rolls.

D. On-site Handling:

1. Use appropriate handling equipment when moving rolls of GCL from one place to another. Provide instructions for moving.

2. Use a forklift, front-end loader, crane, or other similar equipment. The selected piece of equipment shall not be used in a manner that will cause damage to the subgrade, such as rutting. Verify in the presence of the CQA Officer or ENGINEER that the selected piece of equipment does not damage the subgrade.

3. Use a spreader bar to prevent slings from damaging the ends of the rolls.

Insert a pipe, in accordance with manufacturer's recommendations, into the core of the roll for lifting.

1.8. WARRANTY

A. Provide written 5-year warranty from date of substantial completion. Warranty shall address quality of material and workmanship.

PART 2. PRODUCTS

2.1. MANUFACTURERS

A. Geosynthetic Clay Liners:

Fluid Systems
1245 Corporate Blvd.
Suite 300
Aurora, IL 60504
(800) 346-9107

Colloid Environmental Technologies Company
1350 West Shure Drive
Arlington Heights, IL 60004
1 (800) 527-9948

GSE Lining Technology, Inc.
19103 Gundle Road
Houston, TX 77073
(713) 443-8564

B. Substitutions: Submit request to ENGINEER and OWNER with complete supporting technical information under provisions of Section 01600.

2.2. MATERIALS

A. The GCL shall meet the material specifications as shown in Table 02075 and the minimum requirements of the MQCP.

B. The GCL shall consist of a layer of pure sodium bentonite encapsulated between two geotextiles or attached to a 20-mil High-Density Polyethylene geomembrane, and shall comply with all of the manufacturing processes and physical/chemical criteria listed in this Section.

C. The bentonite utilized in the manufacture of the GCL, as well as any accessory bentonite provided for seaming and detail work, shall meet manufacturer's minimum requirements, as specified in the MQCP.

D. The geotextile/geomembrane components of the GCL shall meet the minimum requirements of the MQCP.

E. Fabrication

1. GCL panels shall be supplied to the site in factory-produced rolls. manufacturer shall supply GCL panels to the job site in standard factory roll dimensions.

2. Each roll of GCL supplied to the site shall be labeled with the following information:

a. Name of manufacturer

b. Product type and identification number (if any)

c. Lot (Batch) number

d. Date of manufacture

e. Roll number and dimensions

2.3. ACCEPTANCE TESTING REQUIREMENTS

The GCL rolls shall be tested and evaluated prior to acceptance. In general, testing of the GCL shall be conducted by manufacturer. ENGINEER or a designated, independent geosynthetics laboratory may perform additional testing (*i.e.*, conformance testing), as required by these detailed Specifications or as required in the judgment of ENGINEER to verify that the GCL meets the specifications. Testing requirements are detailed in the following subsections:

A. Manufacturer's Quality Control Testing

Manufacturer is required to submit a MQCP, as discussed in Section 1.5. Test results shall be submitted to ENGINEER prior to shipping the rolls. ENGINEER shall evaluate the results as discussed in Section 2.3(D).

B. Conformance Test Samples

Samples shall be collected by CONTRACTOR under the direction of CQA Officer at a rate of one sample per 100,000 square feet of GCL delivered to the site. Hydraulic conductivity test samples shall be collected at a rate of one sample per 750,0000 square feet of GCL delivered to the site. At least one sample shall also be obtained from each GCL production batch in each shipment. Samples shall be at least 3 feet long by the full width of the roll and shall not include the first 3 feet of any roll.

Table 02075 lists the conformance tests and the test methods that may be performed on GCL roll samples. The Specifications and methods used in evaluating the conformance test results are discussed in Subsection 2.3(D).

C. Role of Testing Laboratories

CONTRACTOR shall be responsible for acquiring the samples described in Section 2.3(B) and for providing the samples to CQA Officer. ENGINEER shall perform the required testing through the use of a recognized testing laboratory. OWNER shall bear the cost for this conformance testing. Any costs for retesting of samples required due to test results not meeting the acceptance specification criteria shall be paid by CONTRACTOR.

D. Procedures for Determining GCL Roll Test Failures

Table 02075 lists the acceptance Specifications. For any referenced test method that requires the testing of multiple specimens, the criteria in Table 02075 shall be met based on the average results of the multiple specimen tests. The following procedure shall be used for interpreting results:

1. If the test result value meets the stated Specification, then the roll, the batch, and, if applicable, the entire shipment shall be considered to have passed this particular acceptance test.

2. If the result does not meet the Specification, then the roll and the batch shall be retested at CONTRACTOR's expense using specimens either from the original roll sample or from another sample collected by CQA Officer. For retesting, two additional tests shall be performed for the failed test procedure. (Each additional test shall consist of multiple specimen tests if multiple specimens are called for in the failed test procedure.) If both of the retests are acceptable, then the roll and batch shall be considered to have passed this particular acceptance test; if either of the two additional tests fail, then the roll and batch shall be considered unsuitable without further recourse. CQA Officer may obtain samples from other rolls in the batch. On the basis of testing these samples, ENGINEER may choose to accept a portion of the batch while rejecting the remainder.

   If retesting does not result in passing test results as defined in the preceding paragraph, or if there is any other nonconformity with the material Specifications, then CONTRACTOR shall withdraw the rolls from use in the project at CONTRACTOR's sole risk, cost, and expense. Once withdrawn, the same rolls shall not be resubmitted for use. Cost and expense for removing this GCL from the site and replacing it with acceptable GCL shall be the sole risk and responsibility of CONTRACTOR.

PART 3. EXECUTION

3.1. SUBGRADE PREPARATION

A. Prepare the foundation and complete the subgrade surface that will support the GCL.

B. Roll smooth the top of the subgrade layer to facilitate placement of the GCL.

C. Remove protruding rocks, stones, sticks, and other foreign objects and replace with fill soil in accordance with Section 02320.

D. Excavate and backfill anchor trenches as shown on the Drawings.

E. Prior to the deployment of the GCL, visually inspect the receiving subgrade surface to confirm that it is suitable for GCL deployment. The inspection shall verify that the subgrade is firm, smooth, and uniform; and that it is free of excessive moisture, abrupt changes in grade, cracking, large (greater than 0.5-inch) stones and clay clods, vegetation, and all other deleterious debris. If the subgrade surface is found to be unsuitable for the GCL deployment, refinish the surface. For each day of deployment, provide CQA Officer with written acceptance of the subgrade surface over which the panels will be deployed.

F. Deploy GCL over the subgrade surface as soon as practicable after the subgrade has been completed and deemed suitable for deployment.

3.2. INSTALLATION - PANEL DEPLOYMENT

A. Supply a panel layout drawing for approval by ENGINEER prior to construction. Install the GCL according to the layout drawing as approved. Notify ENGINEER of any revisions or modifications of the approved plan prior to installing the GCL in the area of the revision. Immediately upon placement, document the panel placement locations and identify each panel by roll number.

B. Do not place GCL during precipitation, in the presence of excessive moisture, in any area of ponded water, or during excessive winds. CQA Officer may order the suspension of work during such conditions. Failure to do so shall not be construed to relieve INSTALLER of the responsibility to meet this specification and properly perform the work, or the responsibility for personnel safety.

C. Maintain construction progress documentation in the daily installation records, and provide such documentation to ENGINEER. The documentation shall verify that the above conditions are fulfilled. Inform ENGINEER if any of the above conditions are not met.

D. Use sandbags to temporarily secure the GCL panels prior to placement of the overlying material.

E. Verify the following:

1. The equipment used does not damage the GCL by handling, excessive heat, leakage of hydrocarbons, or by other means.

2. The prepared surface underlying the GCL has not deteriorated since previous acceptance, and that it is still acceptable at the time of GCL placement.

3. Personnel working on the GCL do not smoke, wear damaging clothing, or engage in other activities that could damage the GCL.

4. The method used to unroll the GCL does not cause damage to the GCL, and/or the subgrade.

5. The method used to place the rolls minimizes wrinkles (especially wrinkles between adjacent panels).

   Immediately notify ENGINEER if any of these conditions are being, or have been, violated, and take immediate steps to mitigate any damage.

6. Examine each roll for damage after placement and prior to seaming. Inform ENGINEER as to which rolls, or portions of rolls, should be rejected or repaired. Mark and remove from the site damaged rolls or portions of rolls that have been rejected , at no risk, cost, or expense to OWNER. Notify ENGINEER when such removal occurs.

3.3. INSTALLATION - PANEL SEAMING

A. Provide 6-inch to 9-inch overlap at seam locations. Use the line(s) printed on the panels to assist in obtaining this overlap. Adjust the edges of the GCL panels to smooth out any wrinkles, creases, or "fishmouths" to maximize contact with the underlying panel.

B. After the overlying panel is placed, pull back its edge to expose the overlap zone. Remove any soil or debris present in the overlap zone or entrapped in the GCL or its individual components. Place a layer of granular bentonite in the overlap zone as per MANUFACTURER's recommendations.

3.4. DEFECTS AND REPAIRS

A. Examine and document all seam and non-seam areas of the GCL for identification of defects, holes, and any signs of contamination by any foreign matter. The surface of the GCL shall be clean at the time of examination.

B. Do not proceed with work with any materials that will cover locations that have been repaired or replaced until these locations are examined by ENGINEER.

C. Identify and repair any damage in the form of cuts or tears in the GCL by cutting a patch from unused GCL and placing it over the damaged area. Clear all dirt and debris from the damaged area. Extend the patch a minimum of 12 inches in all directions beyond the damaged area. Place a layer of granular bentonite in the overlap zone in accordance with manufacturer's recommendations. Use an epoxy-based adhesive or alternative method of securing the patch as approved by ENGINEER to keep the patch in position during backfill operations.

D. Include documentation of defects and repairs in daily records/logs.

3.5. MATERIAL IN CONTACT WITH GEOSYNTHETIC CLAY LINER

A. Geosynthetics - When covering the GCL with a geomembrane or other geosynthetic, take precautions to prevent damage to the GCL by restricting heavy equipment traffic. If a textured geomembrane is to be placed over the GCL, place a slip sheet (such as 20-mil smooth HDPE) over the GCL to allow the textured geomembrane to slide into its proper position. Remove slip sheet after geomembrane is in place.

B. Fill - Requirements for placement of fill are described in Section 02320. Apply the following general criteria for Work on a GCL or a geosynthetic liner system (*i.e.*, a composite liner consisting of a Geocushion™, geomembrane, and a GCL):

1. Do not drive equipment used for placing material or fill directly on the GCL.

2. A minimum thickness of 1 foot of fill is specified between a light dozer (*i.e.*, maximum contact pressure of 8 lb/sq. inch) and the GCL or the geosynthetic liner system.

3. A minimum thickness of 3 feet of fill or waste material is specified between rubber-tired vehicles and the GCL or the geosynthetic liner system.

C. Waterproof Sheet - Protect the leading edge of the GCL panels left uncovered at the end of the working day with a waterproof sheet that is adequately secured with sandbags or other ballast.

END OF SECTION

Section 02076
Geotextiles

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Furnish all labor, materials, tools, supervision, transportation, and installation equipment necessary for the installation of geotextiles, as specified herein, and as shown on the Drawings, and also in accordance with the Construction Quality Assurance (CQA) Plan.

1.2. REFERENCE STANDARDS

A. ASTM D3786 - Standard Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabric - Diaphragm Bursting Strength Tester Method.

B. ASTM D4491 - Standard Test Method for Water Permeability of Geotextiles by Permittivity.

C. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.

D. ASTM D4595 - Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.

E. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

F. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.

G. ASTM D4833 - Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.

H. ASTM D5261 - Standard Test Method for Measuring Mass Per Unit Area of Geotextiles (Geocushion).

1.3. QUALITY ASSURANCE

A. Responsibilities and Qualifications:

1. Provide and accept and retain full responsibility for all services of a geotextile manufacturer and installer who meet the following qualifications.

a. Manufacturer: Shall be responsible for the production and delivery of geotextile rolls and shall be a well-established firm with more than 2 years experience in the manufacture of geotextiles. Shall submit a statement listing certified minimum average roll values of the proposed geotextile and the tests used to determine those properties.

b. Installer: Shall be responsible for field handling, storing, deploying, seaming or connecting, anchoring, and other site aspects of the geotextiles. Shall be trained and qualified to install geotextiles.

B. Quality Assurance Program: Agree to participate in, and conform with, all items and requirements of the quality assurance program as outlined in this Specification and in the CQA Plan.

1.4. SUBMITTALS

A. Submit the following information no later than 5 days prior to delivery of first shipment.

1. A copy of the quality control certificate for each roll of geotextile used. The quality control certificate shall include lot, batch, or roll numbers and identification.

2. The results of the quality control tests. The results shall include sampling frequencies and test methods used.

B. Manufacturer's Certification

On the basis of the results of the tests performed by either the manufacturer's laboratory or another outside laboratory with which manufacturer has contracted at its sole cost and expense, manufacturer shall provide a written certification that the supplied geotextile meets the requirements outlined in this specification.

1.5. DELIVERY, STORAGE AND HANDLING

A. Unload and handle geotextiles so as to cause no damage.

B. Protect geotextiles from sunlight, moisture, mud, dirt, and dust, excessive heat or cold, puncture, or other damaging conditions.

C. Handle with care so as not to rupture or puncture geotextiles.

PART 2. PRODUCTS

2.1. Materials

A. The geotextile shall consist of nonwoven polyester or polypropylene. Nonwoven fabric may be needle punched, heat bonded, resin bonded, or combinations thereof. Slit file woven fabrics shall not be used for this Work.

B. Unless otherwise noted on the Drawings, furnish materials with Minimum Average Roll Values (MARV) that meet or exceed the criteria specified in Tables 02076-1 through 02076-3. Provide test results for these procedures, as well as certification that the materials' properties meet or exceed the specified values.

C. MARV shall be based on Manufacturer's data and shall be calculated as the mean value of the property of interest plus or minus two standard deviations, as appropriate. Where material proprieties vary among the machine and cross-machine directions, the MARV shall apply to the direction providing the lowest value when a minimum value is specified or the highest value when a maximum value is specified.

2.2. ACCEPTANCE TESTING REQUIREMENTS

A. General Requirements: The geotextile rolls will be tested and evaluated prior to acceptance. In general, testing of the geotextile will be conducted by manufacturer. ENGINEER or a designated, independent geosynthetics laboratory may perform additional testing (*i.e.*, conformance testing) as determined necessary by ENGINEER to verify that the geotextile meets the specifications.

B. Manufacturing Quality Control

1. Sampling and testing of the geotextile material will be conducted by manufacturer to demonstrate that the material conforms to the requirements in Part 2.1 of this Section. Submit test results in accordance with the submittal requirement of Part 1.4 of this Section and the CQA Plan.

2. Sampling shall, in general, be performed on sacrificial portions of the material, such that repair of the material is not required.

3. Samples that do not meet the specified properties shall result in rejection of the applicable rolls.

4. At manufacturer's discretion and expense, additional testing of individual rolls may be performed to more closely identify the noncomplying rolls and/or to qualify individual rolls.

Table 02076-1
Type C Geotextile – Beneath Riprap

PROPERTIES AND REQUIREMENTS	QUALIFIER	UNITS	SPECIFIED VALUES (1)	TEST METHOD
Type	--	--	Nonwoven	--
Polymer composition	Minimum	Percent	95 percent polypropylene or polyester by weight	--
Permittivity	Minimum	1/sec	1.2	ASTM D4491
Apparent opening size (AOS)	Maximum	US Sieve Number	70	ASTM D4751
Grab strength (2)	Minimum	lb	200	ASTM D4632
Tear strength (2)	Minimum	lb	65	ASTM D4533
Puncture strength (3)	Minimum	lb	80	ASTM D4833
Burst strength	Minimum	psi	400	ASTM D3786

Notes:
(1) All values represent minimum average roll values (*i.e.*, all rolls in a lot shall meet or exceed the values in this table).
(2) Minimum value measured in machine and cross machine direction.
(3) Tension testing machine with a 1.75-inch–diameter ring clamp, the steel ball being replaced with a 0.31-inch–diameter solid steel cylinder with a flat tip centered within the ring clamp.

Table 02076-2
Type C Geotextile – Access Roads

PROPERTIES AND REQUIREMENTS	QUALIFIER	UNITS	SPECIFIED VALUES (1)	TEST METHOD
Type	--	--	Nonwoven	--
Polymer composition	Minimum	Percent	95 percent polypropylene or polyester by weight	--
Permittivity	Minimum	1/sec	1.2	ASTM D4491
Apparent opening size (AOS)	Range	US Sieve Number	70-100	ASTM D4751
Grab strength (2)	Minimum	lb	200	ASTM D4632
Tear strength (2)	Minimum	lb	65	ASTM D4533
Puncture strength (3)	Minimum	lb	80	ASTM D4833
Burst strength	Minimum	psi	360	ASTM D3786

Notes:
(1) All values represent minimum average roll values (*i.e.*, all rolls in a lot shall meet or exceed the values in this table).
(2) Minimum value measured in machine and cross machine direction.
(3) Tension testing machine with a 1.75-inch–diameter ring clamp, the steel ball being replaced with a 0.31-inch–diameter solid steel cylinder with a flat tip centered within the ring clamp.

Table 02076-3
Type Geotextile – Geocushion Over Geomembrane

PROPERTIES AND REQUIREMENTS	QUALIFIER	UNITS	SPECIFIED VALUES (1)	TEST METHOD
Type	--	--	Nonwoven	--
Polymer composition	Minimum	Percent	95 percent polypropylene or polyester by weight	
Mass per unit area	Minimum	oz/yd^2	32	ASTM D5261
Thickness	Minimum	in.	0.3	--
Tapered pin puncture	Minimum	lb	400	--
Truncated Cone Puncture	Minimum	psi	32	--

Notes:
(1) All values represent minimum average roll values (*i.e.*, all rolls in a lot shall meet or exceed the values in this table).

PART 3. EXECUTION

3.1. PREPARATION

A. Grade the area smooth; and remove all stones, roots, sticks, or other foreign material that would interfere with the geotextile being completely in contact with the soil prior to placing the geotextile.

3.2. HANDLING AND PLACEMENT

A. Handle all geotextiles in such a manner as to ensure they are not damaged in any way.

B. Take any necessary precautions to prevent damage to underlying layers during placement of the geotextile. After deployment of the geotextile, the geotextile shall not be left exposed for a period in excess of 20 days unless a longer exposure period is approved by ENGINEER, based on a formal demonstration by Manufacturer that the geotextile is stabilized against U.V. degradation for the proposed period of exposure.

C. Take care not to entrap stones, excessive dust, or moisture in the geotextile during placement.

D. Secure all geotextiles with sandbags, or equivalent. Such sandbags shall be installed during placement and shall remain until overlying protective soil cover or other components of the liner system are in place. Sandbags shall not be left in place without prior approval from ENGINEER.

E. Examine the entire geotextile surface after installation to ensure that no potentially harmful foreign objects are present. Remove any such foreign objects, and replace any damaged geotextile in accordance with Subsection 3.4.

F. Place all soil and geosynthetic materials on top of a geotextile as shown on the Drawings, in such a manner as to ensure that

1. the geotextile and underlying materials are not damaged;

2. minimum slippage occurs between the geotextile and underlying layers; and

3. excess stresses are not produced in the geotextile.

3.3. SEAMS AND OVERLAPS

A. Continuously sew all geotextiles (i.e., spot sewing is not allowed). Overlap geotextiles a minimum of 12 inches prior to seaming. No horizontal seams shall be allowed on slopes steeper than 10 horizontal to 1 vertical (*i.e.*, seams shall be along, not across, the slopes).

B. For all sewing, use polymeric thread, with chemical resistance properties equal to or exceeding those of the geotextile. Sew the seams using a 401 lock stitch conforming with Federal Standard Type SSA-2 (double flat "prayer" seam).

3.4. REPAIR

A. Repair any holes or tears in the geotextile as follows:

1. On slopes steeper than 5 horizontal to 1 vertical, double-seam a patch made from the same geotextile into place (with each seam 0.5 inch apart and no closer than 2 inches from any edge). Should any tear exceed 10 percent of the width of the roll, remove that roll from the slope and replace it with new material.

2. On slopes flatter than or equal to 5 horizontal to one vertical, spot-seam a patch made from the same geotextile in place with a minimum of a 1-foot overlap in all directions.

B. Take care to remove any soil or other material that may have penetrated the torn geotextiles.

3.5. PLACEMENT OF AGGREGATE MATERIAL OVER GEOTEXTILE

A. Geotextile/geocushion placed over the geomembrane on the base shall be completely covered with a minimum 12-inch thick layer of aggregate fill within 14 days of installing geotextile.

B. Installer shall place fill located on top of geotextile in such a manner as to ensure

1. no damage of geotextile,

2. minimal slippage of geotextile on underlying layers, and

3. no excess tensile stresses in geotextile.

C. Place aggregate fill over geotextile by pushing material out over geotextile ahead of equipment with an initial minimum lift thickness of 12 inches. Equipment used to install aggregate fill over the geotextile shall be low ground pressure vehicles and have a maximum contact pressure of 8 lb/sq. inch on earthern material. Thickness of aggregate fill over geotextile shall be 12 inches or more before equipment used to place aggregate fill shall be permitted to cross areas where geotextile has been installed. Thickness of cover material over geotextile shall be a minimum of 2.5 foot before vehicles with contact pressure greater than 8 lb/sq. inch shall be permitted to cross areas where geotextile has been installed.

END OF SECTION

RMT

Section 02232
Clearing and Grubbing

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Clearing, stripping, grubbing, removing, and disposing of the trees, shrubs, brush, logs, stumps, roots, windfalls, and other plant life, including dead and decayed matter, that exists within the construction areas and which are not specifically designated to remain.

PART 2. PRODUCTS

Not used.

PART 3. EXECUTION

3.1. PROTECTION

A. Existing utilities which are not specifically included in the clearing work shall be protected.

B. All benchmarks, baseline monuments, property corners, and survey control points shall be protected from destruction or disturbance. Any such point destroyed or disturbed shall be accurately and immediately replaced or relocated by qualified surveyors. Relocated points rendered inaccessible shall be maintained by at least two (2) witness points. All relocations and witness points shall be documented to the OWNER's SITE MANAGER.

C. Erosion and sediment control measures shall be provided in accordance with applicable state and local regulations and as shown on the drawings. All erosion control features shall be in place prior to removal of existing vegetation and shall be maintained throughout the duration of the earthwork operation. Obtain all necessary permits for site grading operations.

D. Any materials designated to remain within the limits of construction shall be protected from injury, defacement, or disturbance. Any materials so disturbed shall be reported to the OWNER's SITE MANAGER immediately for documentation.

E. Paint any cut or scarred trees and shrubs with asphaltum base tree paint.

3.2. CLEARING AND GRUBBING

A. Limits of clearing and grubbing shall be as shown on the drawings. All such removal materials having value to the OWNER or to the project or are otherwise designated salvageable for possible reuse in the scope of work proposed shall be properly stockpiled and protected as required on site.

B. Clearing: Remove all trees, brush, and other objectionable material, as defined herein, resting on or protruding aboveground within the limits of work. Material cleared from the site shall be either burned on site or completely removed from the site. Burning of refuse at the site will be permitted only upon written approval of OWNER and at a location approved by OWNER.

C. Grubbing: Remove all stumps, roots and objectionable material as defined herein, within the limits of work. Stumps shall be removed entirely. Roots and matted roots shall be grubbed out at least 24 inches below the existing surface.

D. Depressions made by these clearing operations shall be filled with suitable material and compacted to the appropriate density (as defined in Section 02320 and Section 02250), depending on the intended use for the particular area, and left free draining.

3.3. DISPOSAL

A. Remove all debris and spoil within 30 days of accumulation and dispose.

B. All removal materials having no value to the OWNER or to the project shall be legally disposed of either off site or on site as directed by the OWNER's SITE MANAGER.

END OF SECTION

RMT

Section 02250
Soil Compaction Control and Test

PART 1. GENERAL

1.1. SECTION INCLUDES

A. The Work includes, without limitation, furnishing all labor, materials, equipment and incidentals required to perform Testing Services and inspections as the OWNER's SITE MANAGER may direct and as specified herein.

1.2. REFERENCE STANDARDS

A. ANSI/ASTM D 3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

B. ANSI/ASTM E 329 - Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

C. ASTM D 422 - Standard Test Method for Particle-Size Analysis of Soils: Sieve Analysis and Hydrometer.

D. ASTM D 423 - Standard Method of Test for Liquid Limit of Soils

E. ASTM D 424 - Standard Method of Test for Plastic Limit and Plasticity Index of Soils

F. ASTM D 1140 - Standard Test Method for Amount of Material in Soils Finer than the No. 200 Sieve: P200 Content.

G. ASTM D 4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils: Atterberg Limits.

H. ASTM D 2216 - Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures: Natural Moisture Content.

I. ASTM D 698 - Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb. Rammer and 12 inch Drop: Standard Proctor.

J. ASTM D 1557 - Standard Test Methods for Moisture-Density Relations of Soils & Soil-Aggregate Mixtures Using 10 lb. Rammer and 18 inch Drop: Modified Proctor.

K. ASTM D 1556 - Standard Test Method for Density of Soil In Place by the Sand-Cone Method: Sand Cone Density Test.

L. ASTM D 5084 - Standard Test Method for Falling Head Hydraulic Conductivity of Soil using a Flexible Wall Permeameter: Permeability Testing of Fine Grain Soils.

M. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth): Nuclear Density Test.

N. ASTM D 3017 - Standard Test Method for Moisture Content of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth): Nuclear Moisture Content.

O. ASTM D 2937 - Standard Test Method for Density of Soil in Place by the Drive Cylinder Method: Drive Cylinder Density Test.

1.3. CONSTRUCTION QUALITY ASSURANCE

A. All soil compaction and testing activities shall be performed as specified and as outlined in the CQA Plan.

B. The CONTRACTOR shall be aware of the activities outlined in the CQA Plan and shall account for these CQA activities in the project schedule.

1.4. TESTING AND INSPECTION SERVICES

A. A qualified Consultant/Testing Laboratory will be retained, by OWNER, to furnish services, and make tests specified for soils testing and inspection required for the work.

B. To ensure compliance with requirements of the Contract, CONTRACTOR may employ an independent laboratory and/or competent qualified personnel for services which CONTRACTOR may require.

C. CONTRACTOR shall cooperate with Testing Laboratory and its representatives in performance of its Work, assist in taking of samples, making tests, and shall furnish access to all areas and portions of the Work.

1.5. CLASSIFICATION AND COMPACTION TESTS

A. Plasticity characteristics shall be defined in accordance with ASTM D4318 or ASTM D423 and ASTM D424.

B. Gradation characteristics for backfill material shall be defined in accordance with ASTM D422.

C. Compaction Tests. The moisture density relationship for fill and backfill soils shall be determined in accordance with ASTM D698.

D. Fill Density. The frequency of in-place density tests of compacted backfill shall be as specified in the Construction Quality Assurance Plan.

The number of tests shall be increased if a visual inspection determines that the moisture content is not uniform or the compacting effort is variable and not considered sufficient to attain the specified density. Density and moisture content can be determined by the drive cylinder method for cohesive fills and sand cone method for cohesionless fills. A nuclear density-moisture meter may also be used provided the unit is properly calibrated and check tests using one of the other methods are performed.

E. Specific Field Test Procedures are:

1. Sand Cone - ASTM D1556

2. Drive Cylinder - ASTM D2937

3. Nuclear Density - ASTM D2922 and ASTM D3017

All instruments used that require calibration shall be furnished with a certificate of calibration.

1.6. SUBMITTALS

A. Formal reports of all tests and inspection will be submitted to the OWNER's SITE MANAGER. Copies of test and inspection reports, if any, will be furnished to CONTRACTOR. Consultant/Testing Laboratory and its representatives will be instructed to promptly call to the attention of CONTRACTOR's representatives, any instances of noncompliance with requirements of the Contract; however, failure to so notify CONTRACTOR shall not relieve CONTRACTOR of any responsibilities for compliance, or to remedy workmanship or materials which are not in compliance.

B. Reports shall include, but not be limited to the following:

1. Location of test, number, date, inspector's name.

2. Description of soil.

3. Maximum dry density and moisture content of the lab sample which best matches the field sample in color, texture, grain size and maximum dry density.

4. Ratio of field dry density to maximum lab dry density expressed as a percentage.

5. Comments concerning the field density and moisture content passing or failing the specified limits.

6. Comments about recompaction or moisture adjustment, if required.

PART 2. PRODUCTS

2.1. Terms

A. Where the terms "approved," "suitable," and "unsuitable," and similar terminology are used in sections pertaining to earthwork, the earth or materials so designated by the consultant are "approved," "suitable," or "unsuitable" for their intended use.

B. Subgrade

Subgrade is defined as the portion of earth surface prepared for a superimposed load.

PART 3. EXECUTION

3.1. CONTRACTOR RESPONSIBILITIES

A. Cooperate with laboratory personnel, and provide access to work.

B. Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at the source of products to be tested, and to facilitate test and inspections.

C. Notify OWNER's SITE MANAGER and Geotechnical Consultant/laboratory of operations requiring inspection and testing services 24 hours before services are needed.

D. If tests indicate work does not meet specified requirements, remove work, replace, and retest until compliance is achieved at no cost to the OWNER.

3.2. SOILS TESTING

A. Field density tests shall be systematically performed throughout the backfilling operation as defined in the Construction Quality Assurance Plan. A minimum of one (1) test will be made for each work operation in areas where there is a question about the degree of compaction. The quantity and location will be determined by the Geotechnical Consultant.

END OF SECTION

D. If tests indicate work does not meet specified requirements, remove work, replace, and retest until compliance is achieved at no cost to the OWNER.

3.2. SOILS TESTING

A. Field density tests shall be systematically performed throughout the backfilling operation to access the adequacy and uniformity of compaction. A minimum of one (1) test will be made per lift with a minimum of one (1) test made for each work operation in areas where there is a question about the degree of compaction. The quantity and location will be determined by the Geotechnical Consultant.

END OF SECTION

Section 02315
Excavation

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Digging, segregating, moving, and stockpiling of on-site clay, prepared subgrade fill, topsoil, and general fill, including finish grading to the extent and elevations shown on the Drawings.

B. Stripping, segregating, moving, and stockpiling soil at the borrow site. Finish grading of stockpile.

C. Any work required to complete excavation operations required for this project.

D. Constructing perimeter drainage ditches and/or diversion berms for drainage.

E. Excavating and restoring the borrow site.

F. Measurement based on the method of average end areas.

1.2. REFERENCE SECTION

A. OSHA 29 CFR Part 1926, Occupational Safety and Health Standards – Excavation

B. North Carolina Department of Transportation Standard Specifications for Roads and Structures, 1995 Edition, (NC DOT).

PART 2. PRODUCTS

Not used.

PART 3. EXECUTION

3.1. PREPARATION

A. Remove ice and snow before excavation.

B. Identify required construction survey control lines and datum.

C. Before beginning any Work specified in this section, ensure that all soil erosion and sediment control specifications are complied with and the proper state, county, or local authorities have been duly informed of the construction schedule. All erosion control features shall be installed prior to commencing earthwork operation and maintained throughout the duration of the Work.

3.2. PROTECTION

A. Notify all area utility companies prior to commencing work in accordance with state and local regulations.

B. Locate, identify, and protect existing utilities from damage.

C. Protect benchmarks, survey monuments, monitoring wells, existing structures, fences and gates, sidewalks, paving, and curbs or any structure designated to remain from damage by excavation equipment and vehicular traffic.

D. Protect excavations by shoring, bracing, sheet piling, or other methods required to prevent cave-in or loose soil from falling into excavation.

E. Underpin adjacent structures, which may be damaged by excavation Work, including service utilities and piping.

F. Do not remove or disturb any materials outside the Construction Limits.

G. Provide and maintain proper drainage for the working area limits.

H. Keep excavations free from water by pumping or constructing diversion berms and/or ditches to divert water.

I. Protect and preserve or provide temporary services during Work if it is necessary to interrupt existing surface drainage or utilities.

J. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

3.3. EXCAVATION

A. Grade perimeter of excavation to prevent surface water drainage into excavation.

B. Notify OWNER's SITE MANAGER of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

C. Identify material within the indicated borrow areas as select general fill, select prepared subgrade fill, select clay fill, topsoil, or unsuitable soils.

D. Stockpile excavated material in designated areas approved by the OWNER's SITE MANAGER. Grade to provide positive drainage.

E. Remove unsuitable excess excavated material from the landfill site to a location approved by the OWNER.

F. Perform excavation of every description regardless of material encountered within the grading limits of the project to the line and grades indicated on the Drawings.

G. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 feet in excavations for structures, and extending a sufficient distance from the foundations to permit the placing and removal of concrete formwork, installation of services, other construction, and for inspection. In excavating for foundations, take care not to disturb the bottom of the excavation. Excavate by hand to the final grade just before the concrete reinforcement is placed.

H. Retain excavated materials removed from borrow operations and classified as unsuitable for select clay fill, select general fill, select prepared subgrade fill, or topsoil within the limits of the borrow area for use in the final grading of the borrow areas.

I. Utilize unsuitable soils encountered in excavating the borrow area to facilitate positive drainage and erosion control.

J. Transport excavated material suitable for its intended use and place in fill areas within limits of the work. In the event water is encountered during excavation, all necessary measures to control groundwater shall be implemented.

K. Strip and retain excavated material classified as topsoil to be spread as part of the revegetation operation of the exterior sideslopes and the borrow area.

L. Use excavated material classified as general fill in construction of embankments, or fills, and as backfill or similar purposes indicated on the Drawings. Excess excavated material suitable for general fill shall remain in the borrow area until used in the final grading operation or stockpiled for future use.

M. Use excavated materials classified as select clay fill for the construction of the liner in the sump area of the landfill. Excess material classified as select clay fill shall remain in the borrow area for future use.

N. Use excavated materials classified as select prepared subgrade fill for the construction of the prepared subgrade layer beneath the geosynthetic composite liner in the landfill. Excess material classified as select prepared subgrade fill shall remain in the borrow area for future use.

O. Should excavations extend below design depths, backfill these excavations in accordance with this specification without extra cost to the OWNER.

3.4. FINISHING

A. Blend slopes with existing landscape features, at the intersection of cuts and fills; provide gradual slope between new and existing construction.

B. Finish to elevations shown within 0.10 foot tolerance.

END OF SECTION

Section 02317
Trenching, Backfilling, and Compaction

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Excavating trenches, backfilling, and compacting for installation of piped utilities.

B. Dewatering, protection and maintenance of trench, support of existing structures, sheeting and shoring, hauling and disposal of excess excavated materials and fill.

1.2. REFERENCES

A. OSHA 29 CFR Part 1926, Occupational Safety and Health Standards - Excavations.

B. ASTM D698 – Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort: Standard Proctor.

C. North Carolina Department of Transportation, Standard Specifications for Roads and Structures, 1995 Edition (NC DOT).

1.3. SUBMITTALS

A. Comply with OWNER's General and Special Conditions

B. Submit confirmation to the OWNER that the pipe manufacturers concur with the specified bedding materials and compaction requirements.

C. Before placement, verify to the OWNER that the bedding materials conform to the specifications, or to any alternate materials recommended by the pipe manufacturer and approved by the OWNER.

PART 2. PRODUCTS

2.1. BACKFILL MATERIALS

A. Backfill: Select Fill complying with Section 02320.

2.2. BEDDING MATERIALS

A. Bedding material for the slotted HDPE leachate collection pipe shall be aggregate fill, as specified in Section 02320 – Fill, and placed as shown on the Drawings.

B. Bedding material for solid wall HDPE pipe to a level of one foot above the top of the pipe shall be coarse aggregate that conforms to ASTM C33, gradation #67.

C. Bedding material for metal pipe to a level of one foot above the top of the pipe shall be coarse aggregate conforming to the requirements of ASTM C33, gradation #67.

D. The backfill material in trenches above the bedding material (more than one foot above the top of the pipe) for all pipe, except perforated pipe, shall be general fill, free from rock, frozen material, large clods of earth, broken concrete, boulders, chunks of wood, any material with a dimension larger than 6 inches in size, or other material determined by the OWNER's SITE MANAGER to be unsuitable for its intended use, except that under roads and structures backfill shall be well graded granular material conforming to ASTM C33, gradation #67.

E. Aggregate fill for slotted or perforated leachate collection pipe shall be granite or other rock type that is free of limestone and dolomite and approved by the OWNER.

PART 3. EXECUTION

3.1. PREPARATION AND RESTORATION

A. Remove sod, topsoil, and other surface treatment and restore to original condition or better upon completion of the Work.

3.2. PROTECTION

A. Protect excavations by shoring, bracing, sheet piling, or other methods required to prevent cave-in or loose soil from falling into excavation.

B. Place excavated and other material 2 feet minimum back from edge of trench excavation.

C. Minimum trench excavation slope to be 1.5:1.

D. Underpin adjacent structures which may be damaged by excavation Work, including utilities and piping.

E. Notify OWNER's SITE MANAGER immediately of unexpected subsurface conditions.

F. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

G. All work shall be in compliance with local, state, and federal rules and regulations.

3.3. TRENCHING

A. Excavate to the required alignment and grade. Elevations of pipes subject to revisions as necessary to fit field conditions.

B. No adjustment in compensation will be made for grade adjustments not in excess of one foot above or below the plan elevations.

C. Maximum trench width at pipe level to be outside pipe diameter plus 24 inches.

D. Remove water which may accumulate in trench, and construct ditches, flumes, and dams to direct water away from excavation.

E. OWNER's SITE MANAGER may limit the amount of open trench where field conditions or plant operations require.

F. OWNER's SITE MANAGER may order additional excavation where unsuitable soil conditions are encountered.

G. Promptly dispose of excess excavation off-site or in area designated on Drawings.

H. Trenching for underground lines shall be excavated to a minimum depth of 4 inches or $^1/_6$ the outside diameter of the pipe (whichever is greater) below the required elevation of the bottom of the pipe.

I. Trenches for underground lines to be installed in waste material within the limits of the landfill shall be overexcavated to at least 2 feet below the proposed elevation of the bottom of the pipe and backfilled as described below.

J. Wherever the grades are overexcavated, refill all overexcavated areas with well graded granular material confirming the requirements of ASTM C33, gradation #67, and compacted.

K. Trenches in fill areas shall be excavated after the fill has been placed and compacted to at least 2 feet above the proposed elevation of the top of pipe or conduit. Backfill shall be as specified above.

3.4. PIPE BEDDING

A. Minimum bedding requirements: Install bedding material as indicated on the plans, no less than 3 inches below pipe to at least 6 inches above pipe.

B. Minimum depth of pipe embedment in bedding: One-third outside pipe diameter.

C. Carefully prepare bedding so that the pipe after installation will be true to line and grade.

D. The bedding material beneath the pipe shall be graded to provide a uniform and continuous support beneath the pipe at all points between pipe joints.

E. After each pipe has been brought to grade, aligned, and placed in final position, deposit and compact sufficient bedding material under the pipe haunches and on each side of the pipe to hold the pipe in proper position during subsequent pipe jointing, bedding, and backfilling operations. Deposit bedding material uniformly in layers not exceeding 6 inches in compacted depth and simultaneously on each side of the pipe to prevent lateral displacement.

F. Mechanically compact bedding.

G. The equipment used for compaction shall be the best suited to obtain the specified density: 95 percent of maximum dry density as defined by ASTM D698.

3.5. BACKFILLING

A. Backfill immediately following completion of pipe installation.

B. Take necessary precautions with backfill and construction operations to protect completed utility system from damage.

C. Backfill with care around structures and cleanouts.

D. Backfill to the original ground elevation unless shown otherwise on Drawings.

3.6. COMPACTING

A. Compact backfills to at least 95 percent of the Standard Proctor (ASTM D698) maximum dry density in horizontal layers not exceeding 6 inches (loose) in thickness.

3.7. FIELD QUALITY CONTROL

A. Compaction testing will be performed under provisions of Section 02320 and Section 02250.

B. Perform one compaction test for every 100 lineal feet of trench backfilled under provisions of Section 02250 and Section 02320.

C. Backfill to within 0.10 feet of grades shown.

D. In the event that inadequate compaction is indicated, the backfill material shall be reworked until a passing test is obtained. All cost of the additional testing will be the responsibility of the CONTRACTOR.

END OF SECTION

RMT

Section 02320
Fill

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Moving or providing, placing, and compacting fill materials in accordance with the lines, grades, thicknesses, and typical sections shown on the Drawings.

1.2. REFERENCE STANDARDS

A. AASHTO Designation T96 - Percentage of Wear, Los Angeles abrasion test.

B. AASHTO Designation T104 - Sodium Sulfate soundness test, 5 cycles.

C. ASTM C136 - Test Method for Sieve Analysis of Fine and Coarse Aggregates.

D. ASTM D422 - Test Method for Particle-Size Analysis of Soils.

E. ASTM D698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort: Standard Proctor.

F. ASTM D1140 - Standard Test Method for Amount of Material in Soils Finer than the No. 200 Sieve.

G. ASTM D1556 - Test Method for Density and Unit Weight of Soil In Place by the Sand-Cone Method.

H. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristic of Soil Using Modified Effort: Modified Proctor.

I. ASTM D2216 - Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock.

J. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).

K. ASTM D2487 - Classification of Soils for Engineering Purposes (Unified Soil Classification System).

L. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth).

M. ASTM D2937 - Standard Test Method for Density of Soil In Place by the Drive-Cylinder Method.

N. ASTM D3017 - Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

O. ASTM D4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

P. ASTM D4643 - Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method.

Q. ASTM D5084 - Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Material Using a Flexible Wall Permeameter.

1.3. SUBMITTALS

A. Comply with OWNER's General and Special Conditions.

B. Verify to the OWNER in writing, before placement, that the select granular fill and select aggregate fill conform to specifications.

C. Verify to the OWNER in writing, before placement, that the select clay borrow and the select prepared subgrade fill conform to the specifications.

D. Submit material testing documentation of select granular fill, select aggregate fill, select prepared subgrade fill, and select clay fill as described in Part 3 of this specification.

E. Submit sequence of prepared subgrade installation and select clay fill placement in the sump areas with project schedule under provisions of Section 01330.

F. Compaction conditions require submittal of specific equipment proposed for use prior to intended field use:

1. Earth fills in open areas.

2. Earth fills in confined areas, such as trenches.

1.4. GEOTECHNICAL ENGINEER

A. A qualified geotechnical engineer/soils engineer will be retained by the OWNER to determine the suitability or unsuitability of soils encountered during earthwork operations, conduct tests, and make recommendations. All earthwork

shall be observed by the OWNER's soils engineer for conformance to the specifications. The CONTRACTOR shall provide assistance to the soils engineer as required and shall inform him when he is ready for tests.

1.5. FIELD ENGINEERING

A. The CONTRACTOR shall establish all lines and grades necessary to accomplish the Work.

1.6. SCHEDULE

A. The CONTRACTOR shall examine the site and the plans thoroughly to determine the existing conditions and the difficulty of the Work to be performed and to establish a schedule for the grading operations. Schedule to be approved by OWNER.

PART 2. PRODUCTS

2.1. GENERAL FILL

A. Nonwaste material free from organic matter, frozen material, refuse, masonry, concrete, metal, sharp objects, demolition material, boulders, or any material designated as unsuitable shall be used for general fill material.

B. No solid material larger than 2 inches in its largest dimension.

C. General fill shall have a plasticity index of less than 30 and a maximum dry density of at least 90 pounds per cubic foot.

2.2. SELECT GRANULAR FILL (SAND)

A. Sieve size and percent passing by weight

SIEVE SIZE	% PASSING BY WEIGHT
½	100
3/8	97-100
#4	85-100
#10	62-90
#16	15-80
#20	0-70
#40	0-32
#60	0-23
#200	0-5

B. A minimum hydraulic conductivity of 1×10^{-3} cm/s at the dry density and moisture content achieved during placement.

C. Limestone or dolomite shall not be used for the select granular fill for the leachate collection system.

D. Select granular fill shall be furnished by the CONTRACTOR.

2.3. SELECT AGGREGATE FILL (CRUSHED STONE)

A. North Carolina DOT No. 67 – Coarse Aggregate

SIEVE SIZE	% PASSING BY WEIGHT
1	100
¾	90-100
3/8	20-55
#4	0-10
#8	0-5

B. A minimum hydraulic conductivity of at least 1 cm/s at the dry density and moisture content achieved during placement.

C. Limestone or dolomite shall not be used for select aggregate fill for the leachate collection system.

D. Select aggregate fill shall be furnished by the CONTRACTOR.

2.4. SELECT CLAY FILL (SUMP AREAS)

A. Materials classified as CL, CH, or MH according to the Unified Soil Classification System.

B. Maximum clump size of 8 inches and capable of being broken down with normal construction equipment to a size of 2 to 3 inches prior to compaction.

C. Sixty percent or more of the soil particles by weight pass the Number 200 sieve.

D. Twenty percent or more of the soil particles by weight constitute the clay size fraction. Clay size is defined as those particles less than or equal to 0.005 mm in diameter in accordance with the Unified Soil Classification System.

E. Liquid Limit (LL) greater than or equal to 30.

F. Plasticity Index (PI) greater than or equal to 15.

G. Maximum hydraulic conductivity of 1×10^{-7} cm/s at a dry density of 95 percent Standard Proctor maximum dry density at +2 percent of the optimum moisture control

H. Maximum 5 percent gravel or crushed stone with a maximum particle size of 0.5 inch.

I. Select clay fill shall be obtained from the OWNER's on-site borrow source.

2.5. PREPARED SUBGRADE FILL

A. Maximum hydraulic conductivity of 4.2×10^{-4} cm/sec at a dry density of 95 percent Standard Proctor maximum dry density at +2 percent of the optimum moisture control

B. Soil meeting the requirements of general fill and classified as CL, CH, ML, MH, SC, or SM according to the Unified Soil Classification System.

C. Maximum clump size of 8 inches and capable of being broken down with normal construction equipment to a size of 2 to 3 inches prior to compaction.

D. Maximum 5 percent gravel or crushed stone with a maximum particle size of 0.5 inch.

E. Select prepared subgrade fill shall be obtained on site if available or from the OWNER's on-site borrow source.

PART 3. EXECUTION

3.1. PROTECTION

A. Existing facilities, services, and pipelines, on, above, or under the surface of the area where earthwork operations are to be performed and which are not designated for abandonment, relocation or removal shall be protected from damage during construction operations. If such facilities are damaged, they shall be repaired to the satisfaction of the OWNER and at no expense to the OWNER.

B. All benchmarks, permanent monuments and property corners shall be protected from disturbance or destruction. Any such point disturbed or destroyed shall be immediately be replaced by qualified surveyors at no expense to the OWNER. Documentation of any such relocation shall be given to the OWNER.

C. Protect from any movement, damage, or settlement all existing or new construction, utilities, piping, monitoring wells, conduit, or any other structure designated to remain. Provide bracing, sheeting, shoring, underpinning, or other retaining structures necessary to provide proper protection.

D. Filling operations shall be performed in a manner and sequence that will provide adequate drainage at all times. When required, provide temporary drains, ditches, pumps, drainage lines, or other equipment to intercept, diver, or remove water which may affect the execution or condition of the Work. Water shall be satisfactorily removed from the site. The operation of earthwork shall be suspended at any time when satisfactory results cannot be obtained because inclement weather, or other unsatisfactory conditions in the field. At all times provide and maintain proper drainage for the working area limits.

E. Before beginning any Work specified in this section, ensure that all soil erosion and sediment control specifications are complied with and the proper state, county, or local authorities have been duly informed of the construction schedule. All erosion control features shall be installed prior to commencing earthwork operations and maintained throughout the duration of the work.

F. If it is necessary during the execution of the work to interrupt existing surface drainage or utilities, all necessary precautions to protect and preserve or provide temporary services for same shall be taken.

3.2. STOCKPILE

A. Stockpile materials on site at locations indicated on Drawings

B. Stockpile Fill in sufficient quantities to meet project schedule and requirements.

C. Maintain stockpiles during construction. Grade stockpiles to provide positive drainage to prevent erosion or deterioration of materials. Provide erosion control around stockpile.

D. Regrade and restore stockpile areas, after borrow excavation is complete or at completion of the project.

3.3. PREPARATION AND RESTORATION

A. Remove ice and snow before placing fill. Do not place fill on frozen subgrade.

B. Proof-roll subgrade before placing fill.

C. Qualified geotechnical ENGINEER representing the OWNER will observe proofrolling and document surface conditions of subbase fill layer prior to placement of fill.

D. Cut out soft areas of unsuitable subgrade per geotechnical ENGINEER's recommendations.

E. Prepared surfaces on which compacted fill is to be placed shall be wetted or dried, as may be required to obtain the compacted specified herein.

F. Existing sloped ground surfaces steeper than 4 horizontal to 1 vertical on which fill is to be placed shall be plowed, stepped, or benched as shown on the Drawings in such a manner that the fill material will bond with the existing surface.

3.4. PLACEMENT AND COMPACTION OF GENERAL FILL

A. Construct compacted fills, backfills, and embankments at the locations and to the lines and grades indicated on the Drawings.

B. Use approved material in the construction of fills, embankments, and backfills.

C. Place soil for compacted fills, backfills, and embankments in successive horizontal layers not exceeding 8 inches (loose) for the full width of the fill.

D. Compact the soil by a method that will meet the compaction specificaiton.

E. Construct each lift for the compacted embankments at least two feet beyond the slope line and cut back to line and grade after completion.

F. Spread each layer uniformly on a prepared surface (*i.e.*, a soil surface that has been moistened or aerated as necessary to maintain the percentage of optimum moisture contents as specified herein and scarified) or otherwise broken up in such a manner that the fill will bond with the surface on which it is being placed.

G. Compact general fill to 95 percent of the maximum dry density as determined by Standard Proctor (ASTM D698), at ±3 percent of the optimum moisture content.

H. Provide sufficient water to obtain and maintain the specified moisture content. Material with an excessive moisture content shall be dried prior to compaction operations.

I. Compact backfill around headwalls and other drainage structures by hand or small compactor within 4 feet of the structure, to a density of 95 percent of maximum dry density based on the Standard Proctor Test (ASTM D698 or ASHTO T99) at ±3 percent of the optimum moisture content.

3.5. PLACEMENT OF SELECT GRANULAR FILL

A. Place the select granular fill over the select aggregate fill on the entire bottom of the landfill as indicated on the plans. Place the granular fill on the sideslopes just prior to placement of the select waste layer.

B. Do not compact select granular fill. Place loosely and avoid excessive traffic compaction.

C. Remove and replace select granular fill which does not meet specified material testing requirements at no additional cost to OWNER.

3.6. PLACEMENT AND COMPACTION OF SELECT AGGREGATE FILL

A. Place select aggregate fill over the geocushion by pushing material out over the geocushion ahead of the equipment with an initial minimum lift thickness of 12 inches.

B. Use low ground pressure bulldozers to push the select aggregate fill out over the geocushion covered liner.

C. Do not compact select aggregate fill. Place and spread select aggregate fill in maximum lift thicknesses of 12 inches after placement. Place loosely and avoid excessive traffic compaction.

D. Remove and replace select aggregate fill which does not meet specified material testing requirements at no additional cost to OWNER.

3.7. PLACEMENT AND COMPACTION OF SELECT CLAY FILL (SUMP AREAS)

A. Construct the clay liner at the locations and to the lines and grades indicated on the Drawings and as specified herein.

B. Use approved material.

C. Compact the select clay fill in loose lift thicknesses of 8 inches or less by a method that will meet the compaction specifications.

D. Compact it with multiple passes using appropriate compaction equipment as approved by the OWNER's SITE MANAGER.

E. Spread each layer uniformly on a prepared surface, (*i.e.*, a soil surface that has been moistened or aerated as necessary to maintain the percentage of moisture content as specified herein and scarified) or otherwise broken up in such a manner that the fill will bond with the surface on which it is being placed.

F. Place and compact the select clay fill to a minimum of 95 percent of the maximum dry density as determined by the Standard Proctor (ASTM D698), at moisture contents within an "acceptable zone" defined by the relationship between moisture, dry density, and permeability.

The "acceptable" zone would allow for a greater area of acceptance than 95 percent compaction at +2 percent over the optimum moisture content. The moisture contents within the acceptable zone are defined by relationships between moisture content, dry density, and permeability. The acceptable moisture contents are typically located in a zone bounded by the zero air voids curve on the right, a line at 95 percent of the Standard Proctor (ASTM D698) maximum dry density on the bottom, and a curve representing 85 percent saturation on the left. An acceptable zone shall be established for each soil type.

G. Provide sufficient water to obtain and maintain the specified moisture content. Moisture shall be uniformly distributed by tilling, plowing, or a method approved by the OWNER's SITE MANAGER. Dry material with excessive moisture content prior to compaction operations.

H. Remove and replace select clay fill that does not meet specified material testing requirements, at no additional cost to OWNER.

I. Place overburden material as soon as practical after completion of select clay fill placement to avoid drying and desiccation of select clay fill.

J. Scarify select clay fill to a minimum depth of 2 inches between lifts when previous lift has dried out or been smooth drum-rolled. Add water as required to maintain specified moisture content.

3.8. PLACEMENT AND COMPACTION OF PREPARED SUBGRADE FILL

A. Construct the prepared subgrade at the locations and to the lines and grades indicated on the Drawings and as specified herein.

B. Use approved *in-situ* soils if available or soils from the OWNER's on-site borrow source meeting the requirements for prepared subgrade fill.

C. Compact the prepared subgrade fill in loose lift thicknesses of 8 inches or less by a method that will meet the compaction specifications.

D. Compact each lift with multiple passes using appropriate compaction equipment as approved by the OWNER's SITE MANAGER.

E. Spread each layer uniformly on a prepared surface, (*i.e.*, a soil surface that has been moistened or aerated as necessary to maintain the percentage of moisture content as specified herein and scarified) or otherwise broken up in such a manner that the fill will bond with the surface on which it is being placed.

F. Place and compact the prepared subgrade fill to a minimum of 95 percent of the maximum dry density as determined by the Standard Proctor (ASTM D698), at moisture contents within an "acceptable zone" defined by the relationship between moisture, dry density, and permeability.

The "acceptable" zone would allow for a greater area of acceptance than 95 percent compaction at +2 percent over the optimum moisture content. The moisture contents within the acceptable zone are defined by relationships between moisture content, dry density, and permeability. The acceptable moisture contents are typically located in a zone bounded by the zero air voids curve on the right, a line at 95 percent of the Standard Proctor (ASTM D698) maximum dry density on the bottom, and a curve representing 85 percent saturation on the left. An acceptable zone shall be established for each soil type.

G. Provide sufficient water to obtain and maintain the specified moisture content. Moisture shall be uniformly distributed by tilling, plowing, or a method approved by the OWNER's SITE MANAGER. Dry material with excessive moisture content prior to compaction operations.

H. Remove and replace prepared subgrade fill that does not meet specified material testing requirements, at no additional cost to OWNER.

I. Place geosynthetic composite liner as soon as practical after completion of prepared subgrade placement to avoid drying and desiccation of clayey soils in the prepared subgrade.

J. Scarify prepared subgrade fill to a minimum depth of 2 inches between lifts when previous lift has dried out or been smooth drum-rolled. Add water as required to maintain specified moisture content.

3.9. STANDARD COMPACTION

A. Provide each layer of fill to the degree that no further appreciable consolidation is evidence under the action of the compaction equipment. ENGINEER will require the compaction of the material to a dry density of at least 95 percent of the maximum dry density as determined by the Standard Proctor test.

3.10. TRENCH BACKFILLING

A. Backfill immediately following completion of pipe installation and documentation in accordance with Section 02317.

B. Take necessary precautions with backfill and construction operations to protect completed utility system from damage.

C. Backfill with care around structures and cleanouts.

D. Backfill to the original ground elevation unless shown otherwise on Drawings.

3.11. FIELD QUALITY CONTROL OF SELECT GRANULAR FILL

A. The following tests will be performed under provisions of Section 01452 and Section 02250.

Select Granular Fill

1. For every 1,000 cubic yards placed: sieve analysis (ASTM C136).

2. For every 2,500 cubic yards placed: a remolded constant head hydraulic conductivity test (ASTM D2434). The dry density and moisture content will be reported.

3.12. FIELD QUALITY CONTROL SELECT AGGREGATE FILL

A. The following tests will be performed under provisions of Section 01452 and Section 02250.

Select Aggregate Fill

1. For every 1,000 cubic yards placed: sieve analysis (ASTM C136).

2. For every 2,500 cubic yards placed: a remolded constant head hydraulic conductivity test (ASTM D2434). The dry density and moisture content will be reported.

3.13. FIELD QUALITY CONTROL OF SELECT GENERAL FILL

A. The following tests will be performed under provisions of Section 01452 and Section 02250

Select General Fill

1. One field density test will be performed for every 500 cubic yards of fill placed, but not less than three tests, under provisions of Section 02250.

2. Representative soil samples will be collected for every 10,000 cubic yards of fill placed and when noticeable material changes occur. One P200 grain size test (ASTM D1140), one Atterberg limits test (ASTM D4318), and one moisture content determination (ASTM D2216) shall be performed on each sample obtained. Moisture/density relationships for each sample will be established using Standard Proctor Compaction (ASTM D698).

3.14. FIELD QUALITY CONTROL OF SELECT CLAY FILL (SUMP AREAS)

A. The following tests will be performed under provisions of Section 01452 and Section 02250.

Compacted Clay Fill:

1. One field density (ASTM D2922) and one moisture (ASTM D3017) test will be performed on an approximate 100 feet by 100 feet (10,000 square feet) grid pattern for each compacted lift, but not less than 1 test per lift for each work area.

2. Initially representative soil samples will be collected from the select clay borrow source and analyzed to determine if the soil meets the requirement of a select clay borrow source. Additional representative soil samples will also be collected for every 4,000 cubic yards of select clay or when a visually identifiable material change has occurred. Each sample will be analyzed for Atterberg limits (ASTM D4318), grain-size, and hydrometer (ASTM D422), moisture-density relationship using Standard Proctor compaction (ASTM D698), moisture content (ASTM D4643).

3. If no material change has occurred based on these index test results, one hydraulic conductivity test (ASTM D5084) will be performed on a remolded sample for every 8,000 cubic yards of select clay. The sample

will be remolded to 95 percent of its Standard Proctor maximum dry density at 2 percent over its optimum moisture content.

4. If a material change has occurred based on the index test results, a hydraulic conductivity test will be performed on the sample remolded to 95 percent of its Standard Proctor maximum dry density at 2 percent over its optimum moisture content to confirm that the soil still meets the requirements of a select clay borrow source.

5. At least two additional hydraulic conductivity tests (ASTM D5084) shall be performed on each type of select clay borrow source material. Hydraulic conductivity tests will be performed on the sample remolded to cover a range of moisture contents and densities specified by the ENGINEER, based on the Standard Proctor data. The moisture content and density of the specimens subjected to permeability testing shall be plotted on the Proctor graph, with the corresponding permeability results.

   From these graphs an "acceptable zone" of density and moisture to ensure the required permeability will be determined for each sample, and a range of moisture content in the "acceptable zone" proposed be used in construction shall be established by the ENGINEER. The range shall be selected to meet the permeability requirements and provide a workable material for field placement. Samples will also be performed when noticeable material change occurs in the clay from the borrow source.

6. One hydraulic conductivity test (ASTM D5085) will be performed on an undisturbed Shelby tube sample obtained from each acre (43,560 square feet) per lift of compacted select clay placed (at least 1 test per lift). In addition, one P200 grain size test (ASTM D1140), one Atterberg limits test (ASTM D4518) and one moisture-dry density determination, will be performed on a sample obtained from each acre per lift of select clay placed.

B. Grade and finish to within 0.10 foot of grades shown. Top and bottom of clay shall be surveyed for each sump area.

3.15. FIELD QUALITY CONTROL OF PREPARED SUBGRADE FILL

A. The following tests will be performed under provisions of Section 02250 and the Contract Documents.

Prepared Subgrade Fill:

1. One field density (ASTM D2922) and one moisture (ASTM D3017) test will be performed on an approximate 100 feet by 100 feet (10,000 square feet) grid pattern for each compacted lift.

2. Initially representative soil samples will be collected from the prepared subgrade fill borrow source and analyzed to determine if the soil meets the requirement for a prepared subgrade. Additional representative soil samples will also be collected for every 4,000 cubic yards of soil or when a visually identifiable material change has occurred. Each sample will be analyzed for Atterberg limits (ASTM D4318), grain-size, and hydrometer (ASTM D422), moisture-density relationship using Standard Proctor compaction (ASTM D698), moisture content (ASTM D4643).

3. If no material change has occurred based on these index test results, one hydraulic conductivity test (ASTM D5084) will be performed on a remolded sample for every 8,000 cubic yards of soil. The sample will be remolded to 95 percent of its Standard Proctor maximum dry density at 2 percent over its optimum moisture content.

4. If a material change has occurred based on the index test results, a hydraulic conductivity test will be performed on the sample remolded to 95 percent of its Standard Proctor maximum dry density at 2 percent over its optimum moisture content to confirm that the soil still meets the requirements for a prepared subgrade source.

5. One hydraulic conductivity test (ASTM D5085) will be performed on an undisturbed Shelby tube sample obtained from each acre (43,560 square feet) per lift of prepared subgrade installed (at least 1 test per lift). In addition, one P200 grain size test (ASTM D1140), one Atterberg limits test (ASTM D4518) and one moisture-dry density determination, will be performed on a sample obtained from each acre per lift of prepared subgrade installed

B. Grade and finish to within 0.10 foot of grades shown. Top and bottom of clay shall be surveyed for each sump area.

3.16. BORROW SOURCE FOR SELECT FILL

A. Strip topsoil from area of select fill excavation. Leave topsoil stockpiled on site at borrow source until completion of work.

B. Bury cobbles removed from select fill.

C. Grade borrow area to provide positive drainage.

D. Replace topsoil, seed, fertilize, and mulch borrow area.

END OF SECTION

Section 02372
Riprap

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Furnishing and placing riprap in accordance with the locations and thicknesses shown on the Drawings and in correlation with the CQA Plan.

1.2. REFERENCE STANDARD

A. North Carolina Department of Transportation Standard Specifications for Roads and Structures, 1995 Edition (NC DOT).

PART 2. PRODUCTS

2.1. MATERIALS

A. Riprap shall conform to NC DOT Section 868 and Section 1042, as specified on the Drawings.

B. Durable field or quarry stone that is sound, hard, dense, resistant to action of air and water, and free from seams, cracks, or other structural defects. Need a class 2 stone.

C. Quality stone percent of wear is not more than 30 (as determined by AASHTO T-96, Los Angeles Abrasion Test).

D. Riprap shall be well graded with at least 50 percent of gradation between maximum stone size and median stone size. Unless indicated otherwise on the plans, the riprap shall be classified as follows:

STONE	CLASS 2
Maximum stone size	11 inches
Median stone size	7 inches
Minimum layer thickness	16 inches

PART 3. EXECUTION

3.1. PREPARATION

A. Excavate to the lines and grades required for placement of the riprap.

B. Place Geotextile Filter over areas to receive riprap in accordance with Section 02076.

3.2. PLACEMENT

A. Minimum thickness of riprap layer is 16 inches measured perpendicular to the slope.

B. Place riprap to the limits shown on the plans, and to within a 3-inch tolerance for thickness.

C. Place riprap with care so no damage is done to Geotextile Filter. Do not drop riprap from a height greater than 12 inches.

D. Place riprap from the base of the slope upward. Place smaller sized stones to fill voids between the larger sized stones.

END OF SECTION

RMT

Section 02374
Sediment Control Fence

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Providing and maintaining sediment control fencing.

1.2. PURPOSE

A. During construction, sediment control fences shall be placed downhill of construction activities to prevent silt/sediment-laden waters from leaving the construction site.

PART 2. PRODUCTS

2.1. MATERIALS

A. Envirofence 100x, manufactured by:
Mirafi Civil Engineering Fabrics
PO Box 240967
Charlotte, NC 28224

B. Substitutions: Other acceptable fabrics for sediment control fences will have the following specifications.

Sediment Control Fence Filter Fabric Acceptance Specifications

PHYSICAL PROPERTIES	UNITS	TEST METHOD(S)	VALUE	CRITERION
Grab Tensile	lbs	ASTM D 4632	W95, F80	Min (1)
Grab Elongation	%	ASTM D 4632	10	Min
Mullen Burst	psi	ASTM D 3786	210	Min
Puncture	lbs	ASTM D 4833	30	Min
Trapezoidal Tear	lbs	ASTM D 4533	60	Min
UV Resistance	%	ASTM D 4355	70	Min
US Sieve Number		ASTM D 4751	20	Min
Permittivity	gal/min/ft^2	ASTM D 4491	20	Min

(1) All values are minimum average roll values.

C. Materials provided for the installation of erosion control measures and practices shall be subject to the approval of the OWNER's SITE MANAGER.

PART 3. EXECUTION

3.1. INSTALLATION

A. Install hardwood posts 2 feet below grade, at maximum 8-foot spacing.

B. Anchor bottom 6 inches of fence netting below grade to create a continuous toe-in structure along fence installation.

C. Install fence in areas designated on the Drawings.

3.2. MAINTENANCE

A. Sediment control fencing shall be monitored and maintained on a regular basis to ensure maximum efficiency in containing sediments within the property during and after earthwork operations until completion of all construction.

END OF SECTION

RMT

Section 02376
Erosion Control and Revegetation Mat

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Providing Erosion Control and Revegetation Mat for lining ditches or slope protection to hold soil in place until suitable vegetative root system can be established.

1.2. REFERENCE STANDARDS

A. North Carolina Department of Transportation Standard Specifications for Roads and Structures; 1995 Edition (NC DOT).

B. North Carolina Department of Environment and Natural Resources and Sediment Control Planning and Design Manual, 1998 Edition (NC DENR).

1.3. DELIVERY, STORAGE, AND HANDLING

A. Erosion control matting should be delivered with a wrap that will protect the mat from moisture, abrasion, and ultraviolet rediation.

B. Store out of direct sunlight, dust, and debris.

C. Inspect material prior to deployment and indicate in writing any deficiencies to the OWNER's SITE MANAGER.

D. Handle with care not to damage mat.

E. Label mat and/or its container with the manufacturer's name, brand name, roll or lot number, and quantity.

PART 2. PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS

A. American Enka Company: Enkamat 7010.

B. North American Green: NAG SC 150

C. Substitutions: Under provisions of Section 01600.

2.2. MATERIALS

A. The mat shall have a minimum longevity of 15 months.

B. The mat shall consist of straw with reinforcement of polypropolyne netting containing ultraviolet additives to resist breakdown.

C. Enkamat 7010 or North American Green SC150 or approved equivalent under provisions of Section 01600.

D. Anchors: Use anchors specified by the erosion control mat manufacturer.

PART 3. EXECUTION

3.1. PREPARATION

A. Grade area, remove sharp objects and other unsuitable materials prior to placement.

3.2. INSTALLATION

A. Apply lime, fertilizer, and seed before laying the mat.

B. Install in accordance with the manufacturer's instructions, NC DENR Section 6.14, and NC DOT Section 1631.

C. In the presence of wind, erosion control mat shall be weighted with sandbags or equivalent. Such sandbags shall be installed during placement and shall remain until mat can be secured per manufacturer's specifications.

D. Overlap roll ends a minimum of 3 feet, with upslope mat on top.

E. Overlap adjacent edges a minimum of 4 inches.

F. Anchor edges in a trench no less than 6 inches deep.

G. At a minimum interval of 25 feet and at terminal ends, anchor mat in a minimum of 4- by 12-inch transverse trench.

H. Stake mat at 3- to 5-foot intervals. Stake mat at 18-inch intervals in 4- by 12-inch trenches. Stake mat at 3-foot intervals in 4- by 4-inch trenches.

I. Backfill all trenches with topsoil and compact.

3.3. MAINTENANCE

A. Examination of erosion control matting after installation shall be conducted to ensure that no potentially harmful foreign objects are present. Any objects encountered shall be removed.

END OF SECTION

Section 02618
High Density Polyethylene (HDPE) Pipe and Fittings

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Leachate collection piping (solid, perforated, and slotted)

B. HDPE dual containment piping

C. HDPE Fittings

D. HDPE Cleanouts

E. HDPE Manholes

F. Valves

G. Submersible Pumps

1.2. REFERENCES

A. ASTM D638 - Test Method for Tensile Properties of Plastics

B. ASTM D790 - Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

C. ASTM D1239 - Test Method for Flow Rates of Thermal Plastics by Extrusion Plastometer

D. ASTM D1248 - Specification for Polyethylene Plastics Molding and Extrusion Materials

E. ASTM D1505 - Test Method for Density of Plastics by the Density Gradient Technique

F. ASTM D1599 - Test Method for Short Time Hydraulic Failure Pressure of Plastic Pipe, Tubing and Fittings

G. ASTM D1693 - Test Method for Environmental Stress Cracking of Ethylene Plastics

H. ASTM D2122 - Method for Determining Dimensions of Thermal Plastic Pipe and Fittings

I. ASTM D2837 - Method for Obtaining Hydrostatic Design basis for Thermal Plastic Pipe Materials

J. ASTM D3350 - Specification for Polyethylene Plastics Pipe and Fittings Material

K. ASTM F1248 - Determination of Environmental Stress Crack Resistance (ESCR) of Polyethylene Pipe

L. ASTM D4219 - Test Method of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique

M. ASTM F714 - Standard Specification for Polyethylene Plastic Pipe Based on Outside Diameter

N. AASHTO M252 – Standard Specification for Corrugated Polyethylene Drainage Tubing

1.3. DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Section 01600 - Material and Equipment.

B. Protect pipe from sun, elements, and weather changes.

C. Store pipe in areas that are safe from construction activities.

D. Handle pipe to prevent scratches or mars. No rocks or other materials which scratch or gouge pipe shall be in storage area.

1.4. SUBMITTALS

A. Submit product data under provisions of Section 01330.

B. Include calculations, specifications, shop drawings, dimensions, joint details, design and installation details, and descriptive literature on pipe materials, manholes, pipe fittings, and accessories.

C. Submit "flat sketches" of the piping systems and components.

D. Verify to OWNER's SITE MANAGER that the specified pipe bedding and backfill materials and requirements are acceptable to the pipe manufacture, or submit alternative installation recommendations from the pipe manufacturer.

E. Inspect material a minimum of 7 days prior to installation, and indicate in writing any deficiencies to OWNER's SITE MANAGER.

PART 2. PRODUCTS

2.1. GENERAL REQUIREMENTS

Piping and accessories shall be high quality, durable materials manufactured and installed with good commercial practices that conform to the manufacturer's "Design and Installation Guidelines". It is not the intent of the drawings and specifications to give every detail needed for a complete piping system, or that may be recommended for the project by experienced piping vendors. However, the CONTRACTOR shall furnish and install the piping system with every detail needed for the work to be free from faults and defects. Any design modifications or additions to any part of the piping system recommended by the CONTRACTOR to prevent faults or defects under the intended use shown on the drawings shall be submitted to the OWNER in writing before the Agreement is executed.

2.2. ACCEPTABLE MANUFACTURERS/SUPPLIERS

A. HDPE Materials:

1. Fluid Controls, Inc.
   3435 Stanwood Blvd.
   Huntsville, AL 35811
   (800) 462-0860

2. Plastic Fusion Fabricators, Inc.
   2455 Stanwood Blvd.
   Huntsville, AL 35811
   (205) 852-0378

3. Poly Pipe Industries, Inc.
   Drawer HH
   Gainesville, TX 76240
   (800) 433-5632

4. Plexco/Spirolite
   Chevron Chemical CO.
   1050 Busse Highway, Suite 200
   Bensenville, IL 60106
   (708) 350-3700

5. Phillips Driscopipe, Inc.
2929 North Central Expressway
Richardson, TX 75083
(800) 527-0662

6. Advance Drainage Systems, Inc.
3933 Morrisfield Drive
Charlotte, NC 28208
(704) 391-7595

B. Valves:

1. ASAHI/AMERICA
425 Riverside Avenue
Medford, MA 02155

2. Hayward Industrial Products
900 Fairmount Avenue
Elizabeth, NJ 07207

C. Pumps:

1. EPG Companies, Inc.
PO Box 224
9060 Zachary Lane North
Suite 115
Maple Grove, MN 55369

D. Substitutions: Under provisions of Section 01600.

2.3. HIGH DENSITY POLYETHYLENE PIPE (LEACHATE COLLECTION PIPE)

A. Material Physical Properties: Materials used for the manufacture of polyethylene pipe and fittings for the leachate collection system shall meet the following physical property requirements:

PROPERTY	UNIT	TEST PROCEDURE	EXTRUDED PIPE TYPICAL VALUE
Material Designation	-	PPI/ASTM D-2837	PE 3408
Hydrostatic Design Basis	-	PPI TR-4	800 psi
Material Classification	-	ASTM D-1248	III C 5 P34
Cell Classification	-	ASTM D-3350	345434C
Density (3)	g/cm^3	ASTM D-1505	0.955
Melt Index (4)	g/10 min	ASTM D-1238	0.11
Flexural Modulus (5)	psi	ASTM D-790	133,000
Tensile Strength (4)	psi	ASTM D-638	3200 - 3500
EXCR (3)	fail % hr.	ASTM D-1693	for > 5000
HDB (4)	psi	ASTM D-2837	1600 (23°C)
UV Stabilizer (C)	% Carbon Black	ASTM D-1603	2 to 3
Elastic Modulus	psi	ASTM D-638	110,000 to 159,000
Brittleness Temperature	°F	ASTM D-746	<- 180
Vicat Softening Temperature	°F	ASTM D-1525	+255
Thermal Expansion	in/in/°F	ASTM D-696	8×10^{-5}
Hardness	Shore D	ASTM D-2240	64

B. Material Testing, Certification, and Listing: The pipe and fitting manufacturer shall certify that samples of his production pipe have undergone stress regression testing, evaluation, and validation in accordance with ASTM D 2837 and PPI TR-3. Under these procedures, the minimum hydrostatic design basis shall be certified by the pipe and fitting manufacturer to be 1,600 psi at 73.4°F and 800 psi at 140°F.

Material shall be Listed in the name of the pipe and fitting manufacturer by the Plastics Pipe Institute (PPI) in PPI TR-4 with the following Standard Grade ratings:

	73.4°F	140°F
Hydrostatic Design Basis (HDB)	1,600 psi	800 psi
Hydrostatic Design Stress (HDS)	800 psi	400 psi

C. Pipe and Fittings. Pipe and fittings shall be the same manufacturer from identical materials meeting the requirements of this specification.

Pipe and fittings shall be pressure rated to meet the service pressure requirements specified by the OWNER. Whether molded or fabricated, fittings shall be fully pressure rated to at least the same service pressure rating as the pipe to which joining is intended.

Molded fittings shall meet the requirements of ASTM D 3261 and this specification. Fittings shall be molded unless otherwise approved by the OWNER. At the point of fusion, the outside diameter and minimum wall thickness of fitting butt fusion outlets shall meet the diameter and wall thickness specifications of the mating system pipe. Fitting markings shall include a production code from which the location and date of manufacture can be determined. Upon request, the manufacturer shall provide an explanation of his production code.

Fittings shall be manufactured in facilities designed for that purpose. Field fabricated fittings are not allowed.

Outside diameter controlled pipe shall be manufactured in accordance with ASTM F 714 or ASTM D 3035. Inside diameter controlled pipe shall be manufactured to ASTM F 894 and the specifications provided by the manufacturer. Printline markings shall include a production code from which the location and date of manufacture can be identified. Upon request, the manufacturer shall provide an explanation of his production code.

D. Pipe Perforations (Perforated Leachate Collection Pipe)

The perforated HDPE pipe shall be manufactured with 0.5 inch (maximum) diameter perforations in accordance with the requirements of ASTM F810. Piping shall have 2 or more rows of equal spaced holes, 5 inches center to center. Rows and spacings are to be parallel to the axis of the pipe 120°±5° apart.

E. Dual Containment Piping

The carrier pipe shall be with full round centralizers welded to the carrier pipe. Centralizer support spacing shall be in accordance with Plastic Piping Institute standards.

Force Transfer Couplings® as manufactured by Fluid Controls, Inc., or equivalent shall be used to anchor differential and the total forces from thermal expansion/contraction. The Force Transfer Coupling® or equivalent shall be a

mass anchor machined from solid HDPE pipe grade resin. The coupling shall anchor the inner carrier pipe and the outer containment pipe to an external anchor point. Force Transfer Couplings® or equivalent shall be used to protect fittings from thermal expansion as required by the manufacturers thermal analysis of the system based on the standards outlined in this specification.

End termination/Force Transfer Couplings® as manufactured by Fluid Controls, Inc., or equivalent, shall be used to seal the system at both ends. The coupling shall be simultaneously but fused to the carrier and containment pipe to seal the annual space. No other closure or termination will be allowed. This fitting will also provide any transition to a single wall pipe.

F. Standard Dimension Ratio (SDR). The maximum SDRs shall be as follows:

PIPE INSIDE DIAMETER (inches)	SDR
3	17
6 (Carrier)	17
6 (Solid and Perforated)	17
10 (Containment)	17
18	17

G. Pipe Marking: During extrusion production, the HDPE pipe shall be continuously marked with durable printing on the pipe outside surface following this format:

1.	Nominal Size	6 inches
2.	Dimension Ratio	SDR 17
3.	Pressure Rating	100 psi
4.	Type	(Trade Name)
5.	Material Classification	PE3408
6.	Certification Bases	ASTM F714
7.	Blank Position for NSF/FM Use	NSF-PW
8.	Pipe Test Category	C3
9.	Plant	**P . . . for Pryor**
10.	Extruder Number	#5

11.	Date	06 Oct 89
12.	Operator Number	55
13.	Shift Letter	A
14.	Resin Supplier Code	P

Example: 10" IPS SDR 15.5 110 psi (Trade Name) PE 3408
ASTM F-714 NSF-pw C3 P5 06FEB89 55A P

H. Manufacturer's Quality Control. The pipe and fitting manufacturer shall have an established quality control program responsible for inspecting incoming and outgoing materials. At minimum, incoming polyethylene materials shall be inspected for density per ASTM D 1505, melt flow rate per ASTM D 1238, and contamination. All incoming polyethylene materials shall be certified by the supplier. Certifications shall be verified by Quality Control. Incoming materials shall be approved by Quality Control before processing into finished goods.

The pipe shall be produced with the nominal physical properties outlined in Section A, and to the dimensions and tolerances specified in ASTM F-714. Additionally, the pipe shall be inspected per industry accepted manufacturer standards for:

- Diameter
- Wall Thickness
- Concentricity
- Quick Burst Pressure and Ductability
- Joint Length
- Straightness
- Ovality
- Toe-In
- Overall Workmanship Inspection on ID & OD
- Print Line

I. Manufacturer's Quality Assurance. The pipe and fitting manufacturer shall have an established quality assurance program responsible for assuring the long-term performance of materials and products. Representative samples of polyethylene materials shall be tested against the physical property requirements of this specification.

Tests required on pipe samples for this section are:

▪	Compressed Ring (Pipe) ASTM F-1248	F50, Hr >1,000
▪	Slow Crack Growth Battelle method Days to failure	Fo >32
▪	Hydrostatic Design Basis ASTM D 2837-90	psi 800 psi

(Manufacturer to provide certification that the stress regression testing has been performed on the specific product.)

J. Quality Control and Quality Assurance Records. The pipe and fittings manufacturer shall maintain QA/QC records for a minimum of one year from date of production.

K. Manufacturer's Certification of Materials and Products. If requested by the OWNER or OWNER's SITE MANAGER, the pipe and fitting manufacturer shall provide certified copies of the quality control data taken during product manufacture.

L. Joining and Fusion Training. Pipe and fittings shall be butt fusion joined in accordance with the manufacturer's recommended procedure. The CONTRACTOR must have a factory trained fusion technician to fuse pipe. If the CONTRACTOR elects to fuse pipe with his operators, training from an authorized representative, trained by the manufacturer, must be obtained for at least two days on site regardless of prior job experience. Training must be provided by a factory trained and authorized representative of the manufacturer.

M. Flange Connections. Where flange connections are used, the manufacturer's procedure for tightening flanges must be followed. In general, the bolts will be tightened on one day and retightened on the following day. A written copy of this procedure will be required and approved prior to starting the job.

N. Handling, Construction, and Installation. The pipe and fitting manufacturer shall package products for shipment in a manner suitable for safe transport by commercial carrier. When delivered, a receiving inspection shall be performed, and any shipping damage reported to the pipe and fitting manufacturer within 7 days. Pipe and fittings shall be handled, installed, and tested in accordance with manufacturer's recommendations, and the requirements of this specification.

O. Field Testing Of Pressure Piping

1. Test Restrictions. Test pressure shall be 90 psi. The CONTRACTOR shall provide temporary plugs at open pipe ends, or other locations at the CONTRACTOR's expense.

   Every effort shall be made to keep lines clean during installation. Flush pipelines prior to a pressure test lines shall be flushed by partially opening and closing valves and hydrants several times under expected line pressure, with flow velocities adequate to flush foreign material out of the valves and hydrants.

Joints shall not be backfilled until after the pressure test is completed.

2. Test Procedure. The test procedure shall consist of initial expansion and test phases. For the initial expansion phase, add makeup water as required to maintain the test pressure for three hours. For the test phase, reduce the test pressure by 10 psi. If the pressure remains steady (within 5 percent of the initial value) for an hour, the test will be satisfactory.

3. Pressurization. After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to the specified hydrostatic pressure. Each valved section of pipe shall be slowly filled with water, and the specified test pressure, based on the elevation of the highest point of the supply and return lines or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the OWNER. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. Allow the system to stabilize at the test pressure before conducting the test.

4. Air Removal. Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the CONTRACTOR shall install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged or left in place at the discretion of the OWNER's SITE MANAGER.

5. Examination. Any exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure test shall be repaired or replaced with sound material, and the test shall be repeated until it is satisfactory to the OWNER's SITE MANAGER.

6. All visible leaks are to be repaired, regardless of the amount of leakage.

2.4. CORRUGATED SLOTTED POLYETHYLENE PIPE (ALTERNATE LEACHATE COLLECTION PIPE)

Corrugated polyethylene pipe (10 inch diameter or less) and fittings for the leachate collection system shall meet the requirements of AASHTO M252 (latest edition) Type SP, Class 2, $^1/_8$-inch slotted perforations.

Pipe supplier shall provide documentation and/or calculations demonstrating that the pipe can withstand design loads.

2.5. HIGH DENSITY POLYETHYLENE MANHOLES AND INSERTS

A. General

1. This specification covers the requirements of solid wall HDPE manholes, valve box, and inserts as indicated on the drawings.

2. Manhole Design: The manhole shall be manufactured by the fabrication of HDPE as defined in Subsection 2.4. The pipe used to make the structure shall be made to the requirements of ASTM F-714. An SDR 32.5 shall be used for the manhole body. The inlet and outlet piping shall be the same as the inlet and outlet piping.

3. The bottom of the manhole shall be made of 1-inch sheet for manholes and valve boxes 36 inches or smaller. For manholes or valve boxes larger than 36 inches, 1.5-inch sheet shall be used for the bottom.

B. Basic Materials

1. As indicated above, the high density polyethylene used for fabricated structures shall meet the requirements of ASTM D1248 as Type III, Class C, Category 5, Grade P34, and Class C.

C. Requirements

1. The pipe and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions, or other defects. The pipe shall be uniform as commercially practical in color, opacity, density, and other physical properties.

2. As indicated in ASTM F714, the pipe shall be made to a constant OD. The SDR used shall be a function of the load requirements. Manholes shall have a minimum SDR of 32.5.

3. Manhole stubouts and internal fittings shall be shop installed and inspected. Alignment and dimensions shall be checked before shipment. All pipe welds shall be butt fusion. Inlets, outlets, and sheet shall be joined using extrusion welding.

4. Inlets and outlets shall be reinforced with plate gussets. Shop drawings will show locations of gussets. Manholes provided without gussets will be returned to the manufacturer at his expense for modification.

5. Tops will be as indicated on the drawings. Where flanged tops are specified, 1-inch sheet will be used. Twelve bolts will be required for rain tight tops. Bolts shall be galvanized and of the size normally used for size of pipe.

D. Inspection and Testing

1. Access: The OWNER shall have free access to the inspection area of the manufacturer's plant. The manufacturer shall make available to the inspector, without charge, all reasonable facilities for determining whether the manhole meets the requirements of this specification.

2. Submittal data: Shop drawings of the structures shall be submitted for approval. Shop drawings will show all critical dimensions, wall thickness of materials, and types of welds.

   Typical physical properties of the pipe and sheet used to make the manhole or valve box will be provided.

2.6. VALVES AND APPURTENANCES

A. True Union Ball Valves: 3-inch valves shall consist of PVC body with a true union design with 2-way blocking capability. Valves shall be compatible with SDR 17 HDPE pipe. Valves shall be of a 1-piece capsule with both socket and threaded end connectors. Valves shall have Teflon seats with elastomeric backing cushions of the same material as the valve seals. Valves shall be satisfactory for applications involving both frequent and infrequent operation.

B. Check Valves: 3-inch valves in Leachate Transfer manholes, corrosion resistant thermoplastic swing check valve, equipped with Viton seats and seals, compatible with SDR 17 HDPE pipe.

2.7. SUBMERSIBLE PUMPS

Each lift station will be equipped with alternating duplex Myles Industries LEACHATOR Model LPS-7900 wheeled aluminum pumps, impeller code 330. Pumps are 2.5-HP, 3 phase, 460 volt with jacketed motor lead, submersible level sensors with lead and ¼-inch stainless steel suspension cables with clamps. OWNER shall provide 80 feet of power cable for service. Pump system and controls shall be furnished by the OWNER. Pumps will have 3-inch thermoplastic vinyl nitrile (VNBR) tube covered 100% polyester helical wire reinforcement discharge pipe pressure rated for 250 PSI. Pump discharge designed to operate between 50 gpm at 70-feet total head and 100 gpm at 50-feet total head.

The CONTRACTOR shall be responsible for furnishing and installing 18-inch diameter HDPE riser pipe. CONTRACTOR shall be responsible for providing power to the lift station control panel.

2.8. SUBMERSIBLE PUMP CONTROLLER

OWNER shall provide controller for submersible pump motor, capable of detecting overload or runout-underload condition on running pump motor. Controller function shall be based on actual current used. Provide instruments, controls, and associated wiring required to automatically stop the pump motor in the event that the pump begins to run dry or is pumping at an unacceptable point near the pump's shutoff head where equipment damage may result. Controls shall also be provided to alternate the pumps between typical operations. Pumps shall operate on a lead-lag scenario in the event of greater than 1-foot of liquid above the pumps.

PART 3. EXECUTION

3.1. TRENCH, EXCAVATION, BEDDING, BACKFILLING AND COMPACTION

Unless otherwise specified or indicated, trench excavation, pipe bedding, trench backfilling, and compaction shall be accomplished in accordance with Section 02317.

3.2. INSPECTION

A. Inspect pipe, fittings, and other appurtenances before installation to verify quality of material.

B. Bends to be fabricated in the field, prefabricated, or made by straight sections of pipe.

3.3. PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove dirt and foreign material, inside and outside, from pipe and fitting materials before assembly.

C. Make straight field cuts without chipping or cracking pipe.

D. Prepare all manholes, fittings, and pipe for standard commercial shipment.

3.4. INSTALLATION

A. Make heat butt fusion joints in accordance with manufacturer's specifications.

B. Install pipe and fittings to the line and grade specified on the drawings in accordance with the manufacturer's recommendations.

C. Install manholes to the line and grade specified on the drawings in accordance with the manufacturer's recommendations.

D. Lay pipe from the low end toward the high point. Provide continuous smooth invert.

E. The maximum allowable tolerance for grade is 0.05 foot.

F. Install bedding and backfill material with care to avoid damage to pipe. Minimize traffic and turning of traffic over pipe.

G. Provide a yellow warming ribbon and 12 gauge metallic tracing wire in all pipe trenches.

3.5. FIELD QUALITY CONTROL

A. Follow supplied manufacturer's directions and procedures for heat jointing pipes and fittings when fusing joints and fittings.

B. Observe piping prior to backfilling.

C. Provide testing of the manhole structure to determine if it is leak free. Ultrasound testing will be acceptable.

END OF SECTION

Section 02720
Aggregate Base Course

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Constructing a dense compacted Aggregate Base Course for temporary access roads. The aggregate base course will serve as the final surface for the temporary access roads.

1.2. REFERENCE STANDARD

A. State of North Carolina Department of Transportation, Standard Specifications for Roads and Structures, 1995 Edition (NC DOT).

B. AASHTO T180 Test Method of Laboratory Compaction Characteristics of Soil using Modified Effort: Modified Proctor.

C. AASHTO Designation T96 - Percentage of Wear, Los Angeles abrasion test.

1.3. SUBMITTALS

A. Submit test results under provisions of Section 01330, indicating that the Aggregate Base Course meets the required specifications.

B. Crushed or recycled concrete or bituminous pavement may be an acceptable ingredient in the production of Aggregate Base Course. Submit source of supply and test results from an accredited testing laboratory under provisions of Section 01452. Submit request for substitution under provisions of Section 01600.

PART 2. PRODUCTS

2.1. MATERIALS

2.2. Aggregate Base Course

Aggregate shall conform to NC DOT Section 520, Type A or Type B.

Percentage of wear: Not more than 50 percent as determined by AASHTO Designation T96.

Portion of aggregate passing No. 40 sieve shall be as follows:

Liquid Limit: Not more than 30 determined by ASTM D4318

Plastic Index: Not more than 6 determined by ASTM D4318

At least 50 percent by count of the number of particles of aggregate retained on No. 4 sieve to have at least one fractured surface or face resulting from the mechanical crushing operations of the aggregate.

Sample and test in accordance with AASHTO Standard Method

PART 3. EXECUTION

3.1. INSPECTION

A. ENGINEER to observe and approve subgrade prior to base course placement.

3.2. PREPARATION

A. Apply water to dry subgrade before placement, and rework or recompact as necessary.

B. Place geotextile on the area to receive the aggregate surface as shown on the plans.

3.3. INSTALLATION

A. Install and test aggregate base course in accordance with NC DOT Section 520.

B. Aggregate base course: Deposit base course material on the subgrade in a manner to minimize segregation and facilitate spreading to a uniform uncompacted layer not less than 5 inches in depth. Construct the temporary access roads aggregate base course in two or more layers where the required compacted thickness is more than 8 inches.

C. Add water as necessary to assist compaction. If excess water is apparent, aerate aggregate base course material to reduce the moisture content.

D. Compact each layer of aggregate base course material to the degree that no further appreciable consolidation or movement of the base is evidenced under action of the compaction equipment (100 percent of (AASHTO T180) maximum density). Compaction will be based on weight per cubic foot of material passing the ¾ inch sieve.

E. Regrade and repair existing access road by using an aggregate base course material. Types, depths, and limits of the base course layers to be determined by ENGINEER.

3.4. FIELD QUALITY CONTROL

The following tests will be performed under the provisions of Section 01452 and Section 02250.

A. One field density test will be performed for every 2,500 square feet of aggregate surface course placed, but not less than three tests, under provisions of Section 02250.

B. One field density test will be performed when the OWNER's SITE MANAGER questions the quality of moisture control or effectiveness of compaction.

C. Rework or remove and replace soft or yielding areas as required until proper compaction is obtained. The cost of such reworking or removal and replacement shall be at CONTRACTOR's expense.

3.5. SURFACE TOLERANCES

A. Finished aggregate surface course shall not be lower than indicated or higher than 0.1-foot above that indicated.

B. Correct any deviation in excess of this amount by loosening, adding, or removing material, reshaping, watering, and compacting as requested by the OWNER's SITE MANAGER.

END OF SECTION

RMT

Section 02831
Chain Link and Woven Wire Fences and Gates

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Fence framework, fabric, and accessories.

B. Installation of posts, including excavation for post bases, concrete foundation for posts, and center drop for gates.

C. Manual gates and related hardware.

1.2. REFERENCES

A.	ANSI/ASTM A123	Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
B.	ANSI/ASTM F567	Installation of Chain-Link Fence.
C.	ASTM A116	Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric.
D.	ASTM A120	Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses
E.	ASTM A121	Zinc-Coated (Galvanized) Steel Barbed Wire.
F.	ASTM A153	Zinc-Coated (Hot-Dip) on Iron and Steel Hardware.
G.	ASTM A392	Zinc-Coated Steel Chain-Link Fence Fabric.
H.	ASTM A428	Weight of Coating on Aluminum-Coated Iron or Steel Articles.
I.	ASTM A491	Aluminum-Coated Steel Chain Link Fence Fabric.
J.	ASTM A569	Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip Commercial Quality.
K.	ASTM 585	Aluminum-Coated Steel Barbed Wire.
L.	ASTM C94	Ready-mixed Concrete.

M. ASTM F1083 Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.

N. AASHTO M181 Standard Specification for Chain Link Fence.

O. Chain-Link Fence Manufacturers Institute (CLFMI) - Product Manual.

P. FS RR-F-191 Fencing, Wire and Post Metal (and Gates, Chain-Link Fence Fabric, and Accessories).

1.3. CHAIN LINK FENCE SYSTEM DESCRIPTION

A. Fence Height: 8 feet nominal

B. Fabric Height: 8 feet

C. Extension Arm: vertical with 3 strands of barbed wire

D. Line Post Spacing: at intervals not exceeding 10 feet

1.4. WOVEN WIRE FENCE SYSTEM DESCRIPTION

A. Fence Height: 4 feet nominal

B. Fabric Height: 4 feet

C. Extension Arm: vertical with 3 strands of barbed wire

D. Line Post Spacing: at intervals not exceeding 14 feet

1.5. SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.

C. Product Data. Provide data on fabric, posts, accessories, fittings and hardware.

D. Samples. Submit two samples of each fence fabric, 12 x 12 inch in size illustrating construction and finish.

E. Manufacturer's Installation Instructions. Indicate installation requirements.

1.6. QUALITY ASSURANCE

A. Perform work in accordance with manufacturer's instructions.

1.7. RECORD KEEPING

Maintain one copy of document on site.

1.8. QUALIFICATIONS

Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

1.9. FIELD MEASUREMENTS

Verify that field measurements are as indicated.

PART 2. PRODUCTS

2.1. CHAIN LINK FENCE MATERIALS

Chain link fencing materials shall conform to NC DOT Section 1050, except as stated herein.

A. Framing (zinc-coated steel): ASTM F1083; Schedule 40 zinc-coated steel pipe, standard weight, one-piece without joints.

B. Fabric Wire (aluminum-coated steel): ASTM A491 aluminum-coated steel chain link fence fabric 0.4 oz/sq ft.

C. Barbed wire (aluminum-coated steel): ASTM A585, 12.5 gage aluminum-coated steel wire with 4 point barbs at 5-inch o/c., barbs being 14 gage aluminum-coated steel.

D. Concrete: ASTM C94: Normal Portland Cement, 3000 psi strength at 28 days, 3-inch slump; ¾-inch nominal sized coarse aggregate

2.2. CHAIN LINK FENCE COMPONENTS

A. Line Posts: 2.375-inch diameter, Schedule 40 zinc-coated steel pipe

B. Corner and Terminal Posts: 2.875-inch diameter, Schedule 40 zinc-coated steel pipe

C. Gate Posts: 4.0-inch diameter, Schedule 40 zinc-coated steel pipe

D. Gates: 24-foot wide gate opening consisting of two substantial 12-foot swing gates -180 degree hinges, with full length plunger bars.

E. Brace Rail: 1.66-inch diameter, Schedule 40 zinc-coated steel pipe

F. Gate Frame: 1.90-inch diameter, Schedule 40 zinc-coated steel pipe for fittings and truss rod fabrication.

G. Fabric: 2-inch square mesh interwoven wire, 9 gage thick, top selvage twisted tight, bottom selvage knuckle end closed.

H. Tension Wire: Aluminum-coated steel wire meeting the requirements of AASHTO M181; 7 gage thick; single strand at top and bottom of fabric

I. Tie Wire: Aluminum wire, 9 gage thick

2.3. CHAIN LINK FENCE ACCESSORIES

A. Caps: Cast zinc coated steel; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, hog rings, rail ends, tension bars, fasteners and fittings; zinc coated steel

C. Extension Arms: Zinc coated pressed steel; to accommodate 3 strands of barbwire, single arm, vertical.

D. Gate Hardware: Burglar-resistant padlock and $^{9}/_{32}$ inch heat treated, plated, polycoated, cut-proof security chain, welded or otherwise attached to the gate to prevent loss and sized to be snug when padlocked.

2.4. CHAIN LINK FENCE FINISHES

A. Components: Galvanized to ASTM A491; 1.5 oz./square foot.

B. Hardware: Galvanized to ASTM A428; 1.8 oz./square foot

2.5. WOVEN WIRE FENCE MATERIALS

Woven wire fencing materials shall conform to NC DOT Section 1050, except as stated herein.

A. Posts (timber): Treated southern pine, standard G2 posts, in accordance with NC DOT Sections 1050 and 1082.

B. Fabric wires (zinc coated steel): ASTM A116 zinc coated (galvanized) steel woven wire fence fabric

C. Barbed wire (galvanized steel): ASTM A121, 15.5 gage galvanized steel wire with Class 3 coating on the barbs and wire, 4 point barbs at 5-inch o/c., 3 strands of barbwire.

D. Concrete: ASTM C94: Normal Portland Cement, 3,000 psi strength at 28 days, 3-inch slump; ¾-inch nominal sized coarse aggregate

2.6. WOVEN WIRE FENCE COMPONENTS

A. Line Posts: 4-inch to 5-inch diameter by 7.5-foot length

B. Approach, Corner, and Terminal Posts: 5-inch diameter by 8-foot length

C. Gate Posts: 4.0-inch diameter, ASTM F1083, Schedule 40 zinc coated steel pipe, standard weight, one piece without joints

D. Gates: 24-foot wide gate opening consisting of two substantial 12-foot chain link swing gates -180 degree hinges, with full-length plunger bars.

E. Brace Rail: 1.66-inch diameter, Schedule 40 zinc-coated steel pipe.

F. Gate Frame: 2-inch outer diameter with double truss rod, Schedule 40 zinc-coated steel pipe.

G. Fabric: Style 1047-6-9, Grade 60, all strands 9 gage with Class 3 zinc-coating/ galvanized.

H. Tension Wire: 9 gage galvanized steel tension wire.

2.7. WOVEN WIRE FENCE FINISHES

A. Components: Galvanized to ASTM A116

B. Hardware: Galvanized to ASTM A153

PART 3. EXECUTION

3.1. CHAIN LINK FENCE INSTALLATION

A. Install framework, fabric, accessories, and gates in accordance with manufacturer's instructions or NC DOT Section 866.

B. Set intermediate, terminal and gate posts plumb, in concrete footings with top of footing at finish grade. Slope top of concrete for water runoff.

C. Let concrete anchors cure at least 3 days prior to applying any load to them (*i.e.*, installing fencing fabric).

D. Line Post Footing Depth Below Finish Grade: 3.25 feet.

E. Corner, Gate, and Terminal Post Footing Depth Below Finish Grade: 3.25 feet.

F. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail, one bay from end and gate posts.

G. Provide rail through line post tops and splice with 6 inch long rail sleeves.

H. Install center brace rail on corner gate leaves.

I. Stretch fabric between terminal posts or at intervals of 100 feet (30 m) maximum, whichever is less.

J. Position bottom of fabric to be flush with the finished grade.

K. Adjust fence height when there is an object adjacent to the fence that could assist in access or the ground level requires it.

L. Fasten fabric to rails, line posts, and braces wire with tie wires at maximum spacing of 24 inches on center for rails and bracing and 12 inches on center for line posts.

M. Fasten fabric to tension wire with hog rings at maximum spacing of 24 inches on center.

N. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

O. Connect fabric joints with hog rings passing completely around fabric joint.

P. Install bottom tension wire stretched taut between terminal posts.

Q. Install support arms vertical and attach barbed wire; tension and secure.

R. Install gate with fabric and vertical barbed wire to match fence. Install three hinges per leaf, latch, catches, drop bolt.

S. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

T. Install 4 bumper block guard posts at the entrance to each gate.

3.2. WOVEN WIRE FENCE INSTALLATION

A. Install posts, fabric, and gates in accordance with manufacturer's instructions or NC DOT Section 866.

B. Install line posts plumb using a mechanical post driver.

C. Line and Approach Post Driver Depth Below Finish Grade: 2 feet.

D. Corner, Gate and Pull Post Footing Depth Below Finish Grade: 3.5 feet.

E. Stretch woven wire fence taunt and securely attach to each post with a stable in each line of wire using as many staples necessary to firmly secure the wire at the loactions and elevation shown.

F. Use at least 5 clips to secure woven wire fence to metal posts. Fasten the individual strands of wire to the post, except where wrapping of the strand around the post is required.

G. Cut out the vertical wire and wrap each horizontal strand of wire around the post and securely fasten by winding the end around the strand of wire near the post at each end post, gate post, corner post, and center post in each line brace.

H. Splicing of fabric between post of a brace post assembly will not be permitted. Splicing between other posts will not be permitted unless the ENGINEER has approved the splicing sleeves.

I. Attach barbed wire, tension and securely attach to each post by same method previously described for woven wire fence.

J. Splicing of barbed wire between posts shall not be permitted.

K. Brace each end or corner post as shown on the plans.

L. Install brace rail and tension wire as shown on the plans.

M. Position bottom of fabric 2 inches above finished grade.

N. Install chain link fence gate with fabric and vertical barbed wire to match fence. Install three hinges per leaf, latch, catches, drop bolt.

O. Let concrete anchors for chainlink fence gate cure at least 3 days prior to applying any load to them (*i.e.*, installing fencing fabric).

P. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

3.3. ERECTION TOLERANCES

A. Maximum Variation From Plumb: ¼ inch.

B. Maximum Offset From True Position: 1 inch.

C. Components shall not infringe adjacent property lines

END OF SECTION

Section 02911
Topsoil

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Stripping and placing Topsoil for use as part of the revegatation operation of the landfill side slopes, the borrow areas, and in the vegetative zone in the landfill cap for Phase 1.

PART 2. PRODUCTS

2.1. MATERIALS

A. Friable, fertile, loamy soil containing an amount of organic matter normal to the region, capable of sustaining healthy plant life.

B. Free from refuse, subsoils, materials toxic to plant growth, and foreign objects.

PART 3. EXECUTION

3.1. PREPARATION

A. Remove vegetation, foreign materials, unsatisfactory or contaminated soils, obstructions, and matter harmful to plant growth from ground surface before placement.

B. Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

C. Scarify subsoil to a depth of 3 inches where Topsoil is to be placed. Repeat cultivation in areas where equipment used for hauling and spreading Topsoil has compacted subsoil.

3.2. STRIPPING AND STOCKPILING

A. Strip Topsoil from the site and borrow site and stockpile in Topsoil Stockpile Area.

B. Strip Topsoil to the available depth, taking care not to incorporate subgrade soils.

3.3. PLACEMENT

A. Place Topsoil to a uniform depth of 6 inches.

B. Finish grade to within 0.10 foot of elevations shown on Drawings.

C. Break down clods and lumps.

END OF SECTION

RMT

Section 02921
Seeding

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Preparing the Topsoil.

B. Seeding.

C. Hydroseeding.

D. Mulching.

1.2. REFERENCE STANDARDS

A. North Carolina Department of Transportation Standard Specifications for Roads and Structures, 1995 Edition (NC DOT)

B. North Carolina Department of Environment and Natural Resources, Erosion and Sediment Control Planning and Design Manual, 1998 Edition (NC DENR)

1.3. DEFINITIONS

A. Weeds: Includes, but is not limited to, Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.4. QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.5. DELIVERY, STORAGE AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

B. Seed which is wet, moldy, or otherwise damaged is not acceptable.

1.6. UNIT PRICES

A. Measure and pay for Seedings by the acre.

PART 2. PRODUCTS

2.1. SEED MIXTURE

Seed mixture shall conform to NC DOT Section 1060-4 and NC DENR Section 6.10 and Section 6.11.

A. Temporary Seeding

SEED MIXTURE	APPLICATION RATE (lb/acre)	SEEDING DATES
Rye (Grain)	120	December 1 to April 15
Annual Lespedezo (Kobe)	50	
German Millet	40	April 15 to August 15
Rye (Grain)	120	August 15 to December 30

B. Permanent Seeding

SEED MIXTURE	APPLICATION RATE (lb/acre)	SEEDING DATES
Pensacola Bahiagrass	50	April 1 to July 15
Sericea Lespedeza	30	
Common Bermuda Grass	10	
German Millet	10	

2.2. ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

PART 3. EXECUTION

3.1. INSPECTION

A. Verify that prepared soil base is ready to be seeded.

3.2. PREPARATION OF TOPSOIL

A. Grade Topsoil to finish grades to ensure positive drainage.

B. Remove stones or objects over 2 inches in diameter, foreign materials, weeds, and undesirable plants and their roots. Remove contaminated topsoil.

C. Apply fertilizer and lime immediately before seeding in accordance with Section 02923.

3.3. HYDROSEEDING

A. Reference NC DOT Section 1060 and Section 1660 and NC DENR Section 6.10 and Section 6.11

B. A hydroseeder may be used if deemed more appropriate for seeding, particularly for slopes. If used, the hydroseeder shall have continuous agitating action that keeps the seed uniformly mixed in the slurry until pumped from the tank.

3.4. MULCHING

A. Reference NC DOT Section 1060 and Section 1660 and NC DENR Section 6.10, Section 6.11, and Section 6.14.

B. Immediately following mulching, roll mulched area. On large areas, a cultipacker may be used to roll and cover the seed.

C. Apply 4,000 lb/acre grain straw or equivalent cover of another suitable mulch.

3.5. WATERING

A. Apply water with a fine spray immediately after each area has been mulched. Saturate soil to a depth of 4 inches.

B. Keep the surface layer of soil damp by frequent light watering with a fine spray during the germination period when rainfall is insufficient.

END OF SECTION

Section 02923
Fertilizing

PART 1. GENERAL

1.1. SECTION INCLUDES

A. Provide fertilizer and lime.

B. Apply fertilizer and lime.

1.2. REFERENCE STANDARDS

A. North Carolina Department of Transportation Standard Specifications for Roads and Structures, 1995 Edition (NC DOT)

B. North Carolina Department of Environment and Natural Resources, Erosion and Sediment Control Planning and Design Manual, 1998 Edition (NC DENR)

1.3. REGULATORY REQUIREMENTS

A. Comply with regulatory agency's requirements for fertilizer composition.

1.4. DELIVERY, STORAGE, AND HANDLING

A. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

B. Fertilizer that is wet, contains foreign debris, or is otherwise damaged is not acceptable.

1.5. UNIT PRICES

A. Fertilizing is incidental to the cost of seeding.

PART 2. PRODUCTS

2.1. FERTILIZER MIXTURE

A. Fertilizer shall conform to NC DOT Section 1060 and NC DENR Section 6.11 except as given herein. Fertilizer shall be 10-10-10, uniform composition, free-flowing and suitable for application with approved equipment, delivered to the site in bags or other convenient containers, each fully labeled, including the

following information: Name and address of manufacturer; name bound or trademark; number of net pounds of ready mix material in the package; chemical composition of analysis and guarantee of analysis. Use of liquid fertilizer is subject to approval of the ENGINEER.

B. Lime shall conform to NC DOT Section 1060 and Section 1660 and NC DENR Section 6.11.

PART 3. EXECUTION

3.1. INSPECTION

A. Verify that area is ready to receive the work of this Section.

B. ENGINEER must accept existing site conditions before beginning installation.

3.2. APPLICATION OF FERTILIZER AND LIME

A. Apply fertilizer immediately before seeding.

B. Apply fertilizer in accordance with the manufacturer's instructions at the rate of 1,000 lbs/acre.

C. Apply lime at a rate of 4,000 lbs/acre.

D. Apply after topsoil is raked smooth and prior to roller compaction.

E. Do not apply fertilizer at same time or with same machine that will be used to apply seed.

F. Mix thoroughly into upper 3 inches of topsoil.

G. Lightly water to aid the dispersion of fertilizer.

END OF SECTION

Appendix B
Construction Quality Assurance Plan

TECHNICAL SPECIFICATIONS

CONSTRUCTION QUALITY ASSURANCE PLAN
PHASE 1 CONSTRUCTION LANDFILL NO. 3

WEYERHAEUSER COMPANY
PLYMOUTH, NORTH CAROLINA

PREPARED BY RMT NORTH CAROLINA, INC.

March 2000

© 2000 RMT, Inc.
All Rights Reserved

Table of Contents

1. Introduction 1-1
   - 1.1 Project Background 1-1
   - 1.2 Purpose and Scope 1-1

2. Roles, Responsibilities, and Qualifications 2-1
   - 2.1 CQA Officer 2-1
   - 2.2 Resident Project Representative 2-1
   - 2.3 Soils Testing Laboratory 2-2
   - 2.4 Geosynthetics Testing Laboratory 2-2
   - 2.5 Construction Contractor 2-2
   - 2.6 Geosynthetic Installers 2-2

3. Preconstruction 3-1
   - 3.1 Preconstruction Meeting 3-1

4. General Construction Inspection and Documentation 4-1
   - 4.1 Daily Reports 4-1
   - 4.2 Forms, Checklists, and Data Sheets 4-2
   - 4.3 Problem/Deficiency Identification and Corrective Action 4-2
   - 4.4 Photographic Documentation 4-3
   - 4.5 Surveying 4-3

5. Compacted Select Clay Fill 5-1
   - 5.1 Procedures and Observation 5-1
   - 5.2 Sampling Requirements and Acceptance Criteria 5-2
   - 5.3 Field Testing and Sampling 5-3
     - 5.3.1 Field Testing Acceptance Criteria 5-3
     - 5.3.2 Laboratory Testing 5-4
     - 5.3.3 Undisturbed Sample Analysis 5-4
     - 5.3.4 Representative Sample Analysis 5-4
     - 5.3.5 Laboratory Testing Acceptance Criteria 5-5
     - 5.3.6 Typical Index Properties Recommended for Achieving Hydraulic Conductivities of 1×10^{-7} cm/s or Less 5-5
   - 5.4 Thickness Documentation 5-5

6. Granular Materials 6-1
6.1 Procedures and Observation 6-1
6.2 Sampling Requirements and Acceptance Criteria 6-2
6.2.1 Field Testing 6-2
6.2.2 Laboratory Testing 6-2
6.3 Thickness Documentation 6-3

7. Geotextiles and Geocushion™ 7-1
7.1 Pre-Installation 7-1
7.1.1 Manufacturing 7-1
7.1.2 Delivery, Handling, and Storage of Geotextile and Geocushion™ Rolls 7-2
7.2 Installation 7-4
7.2.1 Placement 7-4
7.2.2 Seams and Overlaps 7-4
7.3 Post-Installation 7-5
7.3.1 Final Examination 7-5
7.3.2 Placement of Soil Materials 7-5

8. Geomembranes 8-1
8.1 Pre-Installation 8-1
8.1.1 Manufacturing 8-2
8.1.2 Delivery, Handling, and Storage of Geomembrane Rolls 8-3
8.2 Installation 8-4
8.2.1 Testing Requirements 8-5
8.2.2 Earthwork 8-7
8.2.3 Placement 8-7
8.2.4 Defects and Repairs 8-9
8.3 Field Seaming 8-11
8.3.1 Seam Layout 8-11
8.3.2 Seaming Equipment 8-11
8.3.3 Initial Requirements 8-13
8.3.4 Nondestructive Testing 8-16
8.3.5 Destructive Seam Testing 8-19
8.4 Post-Construction 8-24

9. Geonets 9-1
9.1 Pre-Installation 9-1
9.1.1 Manufacturing 9-1
9.1.2 Delivery, Handling, and Storage of Geonet Rolls 9-3
9.2 Installation 9-4
9.2.1 Placement 9-4
9.2.2 Stacking and Joining 9-5
9.2.3 Repairs 9-5
9.3 Post-Installation 9-6
9.3.1 Final Examination 9-6

10. Geosynthetic Clay Liner 10-1
10.1 Introduction 10-1
10.2 Pre-installation 10-1
10.2.1 Manufacturer's Quality Control Plan 10-1
10.2.2 Materials 10-2
10.2.3 GCL Delivery, Handling, and Storage 10-2
10.2.4 Submittals 10-4
10.3 Installation 10-5
10.3.1 Testing Requirements 10-5
10.3.2 Required Equipment 10-7
10.3.3 Surface/Subgrade Preparation 10-7
10.3.4 Deployment 10-8
10.3.5 Seaming 10-9
10.3.6 Patches/Repairs 10-9
10.3.7 Penetration Seals 10-10
10.3.8 Covering GCL 10-10
10.3.9 Construction Quality Assurance 10-11
10.3.10 Submittals 10-12
10.4 Post-Installation 10-12
10.4.1 Final Examination 10-12
10.4.2 Submittals 10-12

11. Geocomposites 11-1
11.1 Pre-Installation 11-1
11.1.1 Manufacturing 11-1
11.1.2 Delivery, Handling, and Storage of Geocomposite Rolls 11-2
11.2 Installation 11-3
11.2.1 Testing Requirements 11-3
11.2.2 Placement 11-5
11.2.3 Overlaps and Joining 11-5
11.2.4 Repairs 11-6
11.3 Post-Installation 11-6
11.3.1 Final Examination 11-6
11.3.2 Placement of Soil Materials 11-6

12. Select Ash Fill 12-1
12.1 Procedures and Observations 12-1
12.2 Field and Laboratory Testing 12-1
12.3 Thickness Documentation 12-1

13. Piping 13-1
13.1 Pre-Installation 13-1
13.1.1 Manufacturing 13-1
13.1.2 Delivery, Handling, and Storage of Piping 13-2
13.2 Installation 13-4
13.2.1 Pipe Seams 13-4
13.2.2 Placement Requirements 13-4
13.2.3 Pipe Boots 13-5
13.2.4 Damages 13-5
13.3 Post-Installation 13-5

14. Compacted Prepared Subgrade Fill 14-1
14.1 Procedures and Observation 14-1
14.2 Sampling Requirements and Acceptance Criteria 14-2
14.3 Field Testing and Sampling 14-3
14.3.1 Field Testing Acceptance Criteria 14-3
14.3.2 Laboratory Testing 14-3
14.3.3 Undisturbed Sample Analysis 14-4
14.3.4 Representative Sample Analysis 14-4
14.3.5 Laboratory Testing Acceptance Criteria 14-4
14.4 Thickness Documentation 14-5

List of Tables

Table 5-1	Summary of Quality Assurance Testing for the Select Clay/ Bentonite-Amended Soil Liner	5-6
Table 7-1	Geotextile Tests and Test Methods	7-6
Table 7-2	Geocushion™ Tests And Test Methods	7-6
Table 7-3	Geotextile Acceptance Specifications	7-7
Table 7-4	Geocushion™ Acceptance Specifications	7-7
Table 8-1	Number Of Units To Be Selected As Lot Sample—Specification Conformance	8-26
Table 8-2	HDPE Geomembrane Tests And Test Methods	8-27
Table 8-3	VFPE Geomembrane Tests and Test Methods	8-28
Table 8-4	HDPE Geomembrane 60-Mil Acceptance Specifications	8-29
Table 8-5	VFPE Geomembrane 40-Mil Acceptance Specifications	8-30
Table 8-6	60-Mil Smooth or Textured HDPE Geomembrane Seam Acceptable Specifications	8-31
Table 8-7	40-Mil VFPE Smooth or Textured Geomembrane Seam Acceptable Specifications	8-32
Table 9-1	Geonet Properties	9-7
Table 10-1	Summary of Specifications and Quality Control Testing	10-13
Table 10-2	Collection of Field Acceptance Samples	10-14
Table 11-1	Geotextile Component of Geocomposite Acceptance Specifications	11-8
Table 14-1	Summary of Quality Assurance Testing for the Prepared Subgrade Layer	14-6

RMT

Section 1
Introduction

1.1 Project Background

This report presents the CQA Plan for specific components of the composite liner and final cover for the Weyerhaeuser Plymouth Landfill. The liner and cover area cover approximately 95 acres and will be developed on Weyerhaeuser property located in Plymouth, North Carolina.

This plan addresses CQA requirements for modified liner and cover components of the landfill. Design-related aspects of the components mentioned above are addressed in the Construction Plan Application. This CQA Plan is a "working" document, which will be updated as necessary to reflect changes in specific materials used, in installation practices, or in tests and test methods.

1.2 Purpose and Scope

The purpose of this CQA Plan is to provide procedures that will confirm that the landfill liner and cover are constructed and documented consistent with the Construction Plan Application approved by NC DENR, and the Construction Drawings and Specifications.

The scope of this report includes general CQA requirements concerning roles, responsibilities, and qualifications of parties involved; the preconstruction meeting; and general inspection and documentation procedures. Specific CQA requirements for each liner component address construction procedures and observation, field and laboratory testing frequency and methods, and acceptance criteria. Geomembrane testing and acceptance criteria are based on the National Sanitation Foundation Standard Number 54 (NSF 54) *Flexible Membrane Liners*, and the Geosynthetics Research Institute (GRI).

The general CQA requirements (Sections 2, 3, and 4) pertain to all liner components. The following report sections pertain to the landfill components as shown:

REPORT SECTION		LANDFILL COMPONENT
Section 5	Compacted Select Clay Fill	Clay soil liner (sump areas)
Section 6	Granular Materials	Leachate drainage blanket Pipe bedding material
Section 7	Geotextiles and Geocushion	Leachate collection bedding cushion Component of Geocomposites

REPORT SECTION		LANDFILL COMPONENT
Section 8	Geomembranes	Geomembrane liner (landfill base and cap)
Section 9	Geonets	Component of Geocomposite
Section 10	Geosynthetic Clay Liner	GCL liner (landfill base)
Section 11	Geocomposites	Drainage layer (final cover)
Section 12	Select Ash Fill	Protection layer (landfill base) Levelling course (final cover)
Section 13	Piping	Leachate collection and transfer piping Gas Collection piping
Section 14	Compacted Prepared Subgrade Fill	Prepared subgrade for landfill base liner

RMT

Section 2
Roles, Responsibilities, and Qualifications

2.1 CQA Officer

The CQA Officer shall supervise and be responsible for all inspections, testing, and related construction documentation as described in this CQA Plan. The CQA Officer will be responsible for preparation of the construction documentation report to certify substantial compliance with the engineering design. The CQA Officer shall be a North Carolina Registered Professional Engineer.

The CQA Officer may delegate daily inspection, testing, and sampling duties to a qualified technician with experience in the assigned aspect of construction who will serve as the Resident Project Representative (RPR). Although these duties may be delegated, the CQA Officer will retain the responsibility for these activities.

When an RPR is designated, the CQA Officer shall visit the construction site biweekly (every 2 weeks) at a minimum during active periods of construction to personally observe the construction and documentation procedures. Also, at a minimum, the CQA Officer shall personally observe, on at least one occasion, each of the major elements of construction including the prepared subgrade, the GCL, the geomembrane liner, and the leachate drainage layer. The CQA Officer shall be readily available for consultation, as needed.

2.2 Resident Project Representative

The RPR will carry out daily inspection, testing, and sampling duties under the direct supervision of the CQA Officer. The RPR shall be a qualified technician with experience in the assigned aspect of construction. The RPR will observe and document construction and installation procedures. The RPR will prepare daily summary and inspection reports and transmit these routinely to the CQA Officer. The RPR will immediately notify the CQA Officer of problems or deviations from the CQA Plan or design plans and specifications. Reporting, documentation, and resolution of problems and deficiencies shall be carried out as described in Subsection 4.3. The RPR will ***not*** have authority to approve design or specification changes without the consent of the CQA Officer.

2.3 Soils Testing Laboratory

The Soils Testing Laboratory retained will be experienced in landfill construction soils testing in accordance with the American Society of Testing and Materials (ASTM) Standards and other applicable standards. The selected laboratory will be required to be responsive to the project needs by providing test results within reasonable time frames. This shall include providing verbal communication on the status of ongoing tests and immediate communication of test results as needed to facilitate ongoing construction. Such information may include hydraulic conductivity test data, proctor values, and borrow source characterization data. Final laboratory reports will be certified by the soils testing laboratory and submitted to the CQA Officer.

2.4 Geosynthetics Testing Laboratory

The Geosynthetics Testing Laboratory will have experience in testing geosynthetics in accordance with standards developed by ASTM, National Sanitation Foundation (NSF), Geosynthetic Research Institute (GRI), and other applicable test standards. The selected laboratory will be required to be responsive to the project needs by providing test results within reasonable time frames. Final laboratory reports will be certified by the geosynthetics testing laboratory and submitted to the CQA Officer.

2.5 Construction Contractor

The Construction Contractor's role will be performed by a construction firm retained by the Owner to furnish earthwork and piping construction. The Construction Contractor will be experienced in solid waste landfill construction, knowledgeable about clay liner construction techniques, and familiar with geosynthetic construction.

2.6 Geosynthetic Installers

The Geosynthetic Installers are the companies hired by the Contractor to install the geosynthetic components referenced in this manual and to perform the nondestructive seam testing of the geomembranes required by this plan. The term "Installer" is used throughout this plan when reference is made to the tasks and responsibilities of a Geosynthetic Installer.

The Installer will be trained and qualified to install the various geosynthetic components covered by this plan. The Installer of the geomembranes will be approved and/or licensed by the Manufacturer. A copy of the approval letter or license will be submitted by the Installer to the CQA Officer.

Prior to confirmation of any contractual agreements, the Contractor shall obtain from the Installer of the geomembrane the following written information, which must be approved by the CQA Officer:

1. Corporate background and information
2. Installation capabilities
   - Information on equipment and personnel
   - Daily anticipated production
   - Quality control (QC) manual for installation
   - Samples of field seams and certified test results
3. A list of at least 10 completed facilities, totalling a minimum of 2,000,000 ft^2 for which the Installer has completed the installation of a polyethylene geomembrane.

For each installation, the following information will be provided:

1. Name and purpose of facility, its location, and date of installation
2. Name of owner, project manager, designer, manufacturer, and fabricator (if any)
3. Name and qualifications of the supervisor(s) of the Installer's crew(s)
4. Thickness of the geomembrane and the surface area of the installed geomembrane
5. Type of seaming and type of seaming apparatus used

All personnel performing geomembrane seaming operations will be qualified by experience or by successfully passing seaming tests for the seaming methods to be used. At least one seamer will have experience seaming a minimum of 1,000,000 ft^2 of polyethylene geomembrane using the same type of seaming apparatus in use at the site. The most experienced seamer, the "master seamer," will provide direct supervision, as required, over less experienced seamers. No field seaming will take place without an experienced seamer (meeting the seaming criteria stated above) being present.

The Contractor shall require the Installer to provide a list of proposed seaming personnel and their professional records. This document will be reviewed by the CQA Officer. Any proposed seaming personnel deemed insufficiently experienced will not be accepted by the CQA Officer or will be asked to pass a seaming test. Any changes in the list of seaming personnel shall be brought to the attention of the CQA Officer.

The Installer will designate one representative as the Superintendent, who will represent the Installer at all site meetings and be responsible for acting as the Installer's spokesperson on site. This superintendent should be pre-qualified for this role, on the basis of experience, management ability, and authority. The appointment must be approved by the CQA Officer.

RMT

Section 3
Preconstruction

3.1 Preconstruction Meeting

Prior to construction commencing at the landfill facility, a preconstruction meeting shall be held. This meeting will include the parties involved in the construction, including the CQA Officer, RPR, Construction and/or Installation Contractor, and Owner.

The objectives of this meeting include construction planning and coordination of tasks; identification of potential problems that might cause difficulties and delays in construction; and proper interpretation of design intent by contractor(s). It is important that the rules regarding testing, repair, etc., be known and accepted by each party to this plan.

Specific topics considered for this meeting include the following:

- Review general safety requirements of the Owner and specific safety issues associated with the construction activities.
- Review critical design details of the project, including the plans and specifications.
- Review measures for surface water runoff and runon diversion control including sump locations, siltation control, and pumping requirements.
- Make appropriate modifications to the CQA Plan; develop project-specific addendums (if necessary).
- Review the responsibilities of each party.
- Review lines of authority and communication.
- Review methods for documenting and reporting and for distributing documents and reports.
- Review requirements of the Soils Testing Laboratory and the Geosynthetics Testing Laboratory regarding sample sizes, methods of collection, and shipment. Also review turnaround times for sample data and implications on construction schedule pending receipt of acceptance data.
- Review the number and locations of the testing requirements for soils and geosynthetic components.
- Review precautions to be taken to maximize bonding between lifts of compacted clay.
- Review the method for splicing segments of compacted clay soil liner.
- Review precautions to be taken to minimize desiccation of clay soil surfaces.

- Review methods of subgrade surface preparation and approval prior to geosynthetic placement.
- Establish rules for writing on the geomembrane (*i.e.*, who is authorized to write, what can be written, and in which color); outline procedures for packaging and storing archive samples.
- Review the time schedule for all operations and workforce logistical issues.
- Establish procedures for deployment of materials over completed geomembranes emphasizing protection of the membrane. Specific discussion shall address deployment of select granular fill on sidewalls.
- Observe where the site survey benchmarks are located, and review methods for maintaining vertical and horizontal control.
- Review permit documentation requirements.
- Review the survey documentation tables and plans that identify the locations where survey documentation information is required.
- Conduct a site walk-around to review material storage locations and general conditions relative to construction.
- Review geomembrane panel and seam layout drawings and numbering systems.
- Establish procedures for use of the geomembrane welding apparatus, if applicable.
- Establish appropriate intervals for seamers to record operating and ambient data.
- Finalize field cutout sample sizes.
- Review liner penetration procedures.
- Review repair procedures.

The meeting will be documented by the CQA Officer, and minutes will be distributed to all parties involved in the construction project.

Section 4
General Construction Inspection and Documentation

This section describes general documentation procedures to be implemented including use of forms, identification and resolution of problems or deficiencies, and photographic documentation.

4.1 Daily Reports

A daily summary report shall be prepared by the CQA Officer or the RPR under direct supervision of the CQA Officer, for each day of activity containing the following information:

1. Date, project name, location, and report preparer's name. Name of RPR on site performing CQA under the supervision of the CQA Officer.
2. Time work starts and ends each construction work day. Also, the duration and reason for work stoppages (*i.e.*, weather delay, equipment shortage, labor shortage, unanticipated conditions encountered, *etc.*).
3. Data on weather conditions including temperature, humidity, wind speed and direction, cloud cover, and precipitation.
4. Construction Contractor's work force, equipment in use, and materials delivered to or removed from job site.
5. Chronological description of work in progress including locations and type of work performed.
6. Summary of meetings held and attendees.
7. A description of materials used, and references or results of testing and documentation.
8. Discussion of problems/deficiencies identified and corrective actions taken as described in Subsection 4.3 (Problem/Deficiency Identification and Corrective Action).
9. Identification/list of laboratory samples collected, marked, and delivered to laboratories, or clear reference to the document containing such information if samples were obtained.
10. An accurate record of calibrations, recalibrations, or standardizations performed on field testing equipment, including actions taken as a result of recalibrations. In addition, the results of other data recording such as geomembrane seam barrel temperature, or a clear reference to the document containing such information, if applicable.
11. Copies of each RPR's daily field data sheets.

Field data sheets shall be prepared for each work day by each RPR containing the following information:

1. Test or sample location and elevation.
2. Type of inspection.
3. The procedures used.
4. Test data (*i.e.*, proctor value, *etc.*).
5. Results.
6. Personnel involved in the inspection and sampling activities.
7. Signature of the RPR.

4.2 Forms, Checklists, and Data Sheets

Additional forms may be developed during the course of the project to provide specific needs such as geomembrane inspections or simply to improve efficiency of data collection. New forms shall be approved by the CQA Officer prior to their use.

4.3 Problem/Deficiency Identification and Corrective Action

Problem or deficiency identification and corrective action will be documented in the Daily Summary Report when a construction material or activity is observed or tested that does not meet the requirements set forth in this plan and in the construction specifications. The Summary Report should clearly reference other reports, photographs, or forms that contain data or observations leading to the determination of a problem or deficiency.
Problem/deficiency identification and corrective action documentation may include the following information:

1. A description of the problem or deficiency, including reference to supplemental data or observations responsible for determining the problem or deficiency.
2. Location of the problem or deficiency, including how and when the problem or deficiency was discovered. In addition, an estimate of how long the problem or deficiency has existed.
3. An opinion as to the probable cause of the problem or deficiency.
4. A recommended corrective action for resolving the problem or deficiency. If the corrective action has already been implemented, then the observations and documentation to show that the problem or deficiency has been resolved. If the problem or deficiency has not been resolved by the end of the day upon which it was discovered, then the report will clearly state that it is an unresolved problem or deficiency. Subsequent Daily Reports shall indicate the status of problems or deficiencies until resolved.

If the problem or deficiency has not been resolved, the CQA Officer and the preparer will discuss the necessary corrective actions. The CQA Officer will work with the Owner and Construction Contractor to implement actions as necessary to resolve the problem or deficiency. A description of such problems or deficiencies and corrective actions implemented shall be provided in the Construction Documentation Report.

The CQA Officer, working with the Owner and Construction Contractor, will determine if the problem or deficiency is an indication of a situation that might require changes to the plans and specifications and/or the CQA Plan. Revisions to the plans or specifications or the CQA Plan must be approved by the CQA Officer and the site Owner after consultation with NC DENR. Documentation of the Department's concurrence and/or conditions regarding proposed changes shall be incorporated into the Construction Documentation Report.

4.4 Photographic Documentation

Photographs will be taken to document observations, problems, deficiencies, corrective actions, and work in progress. Photographs will be in 35-mm print format and will be filed in chronological order in a permanent protective file by the CQA Officer, or the RPR.

The following information should be documented in the daily report or a log book for each photograph:

1. Date and time.
2. Location where photograph was taken, including information regarding the orientation of the photograph itself for proper viewing (*i.e.*, looking south).
3. Description of the subject matter.
4. Unique identifying number for reference in other reports.
5. Name and signature of photographer.

4.5 Surveying

Surveying documentation requirements for each liner component are described in their respective plan sections. Required surveying will be performed by a North Carolina registered surveyor experienced in construction surveying. Surveying will be conducted under the supervision of the CQA Officer. Surveys will be based on survey control monuments shown on the drawings prepared as part of the Construction Plan Application. Elevations will be based on MSL datum, and coordinates will be based on the North Carolina State Plane Coordinate System. The location of field tests and samples will be recorded. Generally, these locations can be determined by reference to nearby construction stakes or markings; however, if such

convenient reference is not readily available, the CQA Officer or the designated RPR is responsible to provide or request survey control.

RMT

Section 5
Compacted Select Clay Fill

Select clay fill refers to the compacted clay in the leachate sump area beneath the composite liner. The select clay fill shall be either bentonite-amended soil or a natural clay that can be compacted to a permeability of 1.0×10^{-7} cm/s or less. On-site clay soils are proposed. A clay borrow investigation report will be made available to the Contractor. If clay soil from the on-site borrow source is not used, a bentonite-amended soil is proposed.

5.1 Procedures and Observation

The Installer will be responsible for means and methods to implement the work. The RPR will observe the compacted clay liner and clay cover construction activities and document relevant observations to support certification of the following requirements:

1. The RPR will confirm the uniformity of the bentonite-amended soil/clay borrow soils. Soil excavation, proportioning, mixing, and placement will be monitored for segregation and removal of unsuitable material and for changes in soil type, color, texture, and moisture content.
2. The construction contractor will segregate and/or remove unsuitable materials such as soils not meeting acceptance criteria (boulders, cobbles, and organic material).
3. The RPR will measure field densities and moisture contents, using methods described in Subsection 5.2 (Sampling Requirements and Acceptance Criteria), to document that the compacted liner is in substantial conformance with the placement specifications and that soil placement has been conducted in a manner to achieve a uniform, homogeneous clay mass.
4. Voids created by nuclear density gauge testing or retrieval of Shelby tube samples will be backfilled with sodium bentonite.
5. The bentonite-amended soil/clay shall be placed in loose lift thicknesses not exceeding 8 inches. Each loose lift shall be compacted with multiple passes using appropriate compaction equipment. If the soil is deposited in thickness exceeding 8 inches, dozers will be used to spread the soil to an 8-inch thickness prior to compaction. This will ensure adequate reduction of clod size and provide a thin layer to achieve required compaction throughout the lift.
6. Areas of unacceptable hydraulic conductivity, compaction density, or moisture content, as defined by Subsection 5.2 (Sampling Requirements and Acceptance Criteria), will be documented by the RPR. Corrective action will consist of moisture-conditioning of the soil or additional compactive effort as necessary. Methods for moisture-conditioning soils are described in Item 7 below. Following corrective actions, such areas will be retested.

7. If necessary, surfaces of liner to receive successive lifts of bentonite-amended soil/clay will be moisture-conditioned either by scarification and addition of water where desiccated, or by disking and air drying where saturated to promote effective bonding of lifts. Following scarification, water will be applied with a spray bar applicator or equivalent methods to achieve uniform distribution.

8. Bentonite-amended soil/clay compaction will be performed in a manner to achieve continuous and complete keying together of soil liner construction areas. Stepped joints will be utilized to connect lateral segments of the soil liner construction.

9. No frozen soils will be used for clay liner construction. Frozen soils in the compaction work area will be removed.

10. Stones that are larger than 0.5 inch in diameter shall be removed from the surface of the final lift of the clay liner to avoid potential for puncturing the geosynthetic clay liner. The method to detect and remove stones requires an initial overfill of compacted clay liner soils approximately 1 inch above designed liner grades. A grader will then blade the liner surface to obtain uniform liner grades and design elevations. Stones present will be exposed and loosened by the grading. The RPR shall inspect the liner during this process and document removal of stones by the Contractor. Voids made by removal of stones shall be filled with clay soil, and then the entire liner surface shall be rolled with a smooth drum compactor.

11. Preconstruction planning will be undertaken to sequence construction activities to minimize the length of time any completed clay liner surfaces are exposed prior to receiving protective cover. Protective cover will be provided by installation of the geosynthetic clay liner and the geomembrane.

12. Preconstruction planning will be undertaken to minimize the need for traffic over the completed bentonite-amended soil/clay surface. Heavy trucking of materials (ingress or egress) and cleated equipment will not be allowed directly on completed clay surfaces. If this is unavoidable, an evaluation will be made upon termination of the haul route to determine if the liner should be reconstructed or repaired in such areas. Flotation-type all-terrain vehicles will be used to assist in deployment of the geosynthetic clay liner to avoid disruption of the completed earth liner surface.

5.2 Sampling Requirements and Acceptance Criteria

Field and laboratory sampling frequencies are based on proportionate sampling of construction areas or volume of material placed as specified below. This section describes required analysis, methods, sample frequency, and acceptance limits. Table 5-1 summarizes the minimum quality assurance (QA) testing recommended in Subsection 5.3. The RPR will perform field tests and collect soil samples for laboratory analysis.

5.3 Field Testing and Sampling

The following field testing and sampling methods and frequencies will be used by the RPR during construction of the bentonite-amended soil/clay liner and final cover.

- One field density and as-placed moisture content test (ASTM D 3017 and ASTM D 2922 Method B) will be performed for each compacted lift on an approximate 100-foot grid pattern.
- Representative (grab) soil samples of the liner and cover soils will be collected from the initial clay borrow source or from the on-site amended source and submitted to the Soils Testing Laboratory for testing described in Subsection 5.3.4. Additional samples will be collected every 4,000 cubic yards for each major soil type utilized. A sample will also be collected when changes in the physical appearance or soil characteristics are observed.
- A minimum of one undisturbed Shelby tube sample will be obtained for each acre (43,560 ft^2) or less for every lift of bentonite-amended soil/clay placed. A minimum of one test per lift will be performed in each of the leachate sump areas. Samples will be submitted to the Soils Testing Laboratory for testing described in Subsection 5.3.3.
- At a minimum, at least one field density/moisture content test will be conducted per lift and at least one test per day of compacted bentonite-amended soil/clay construction. In confined areas where compaction equipment is hindered or hand compaction is necessary, a minimum of two field density/moisture content tests will be performed for each lift of soil liner placed.

A nuclear density-moisture gauge (NDG) may be used for field moisture and density determination. The calibration of NDGs used for documentation shall be initially checked and adjusted (if necessary) according to the manufacturer's guidelines. Initial calibration shall be made with a one of the alternate test methods identified in the construction specifications for field density and moisture content.

5.3.1 Field Testing Acceptance Criteria

Acceptance criteria for field density will require soil compaction to a minimum of 95 percent of the Standard Proctor (ASTM D 698) maximum dry density. Specific moisture content requirements will be identified in the construction specifications. The acceptable range will be based on Proctor moisture-density relationships and compaction versus permeability relationships.

5.3.2 Laboratory Testing

Routine laboratory testing of the compacted liner soils will be performed on samples from the clay borrow area or samples from the disking operation and on the in-place soils collected by the RPR. Samples for determining in-place properties will be collected by pushing Shelby tubes. Soil characteristics will be determined from representative samples and from Shelby tube samples.

5.3.3 Undisturbed Sample Analysis

The following analysis will be performed on ***all*** undisturbed samples obtained:

PARAMETER	TEST METHOD
Hydraulic Conductivity	ASTM D 5084 or SW 846-USEPA Method 9100
Moisture Content and Dry Density	ASTM D 2216
Atterberg Limits	ASTM D 4318
Grain-size Analysis (P200)	ASTM D 422 (1)

(1) Percentage of soil finer than the No. 200 sieve (*i.e.*, soil finer than 0.075 mm).

5.3.4 Representative Sample Analysis

The following laboratory analyses will be performed on ***all*** representative samples obtained, except where noted:

PARAMETER	TEST METHOD
Moisture-Density Relationship using Standard Proctor Compaction	ASTM D 698 (1, 2)
Atterberg Limits	ASTM D 4318
Grain-size Analysis (sieve and hydrometer)	ASTM D 422 (3)
Moisture Content	ASTM D 2216
Hydraulic Conductivity (4)	ASTM D 5084 or SW 846-USEPA Method 9100

(1) A five-point Proctor analysis is required for first and second sampling criteria.

(2) A one-point Proctor analysis may be utilized for representative samples collected for the third sampling criteria (apparent changes in soil quality) to verify applicability of previously analyzed moisture-density relationships. If the result does not verify applicability, a five-point analysis will be performed in accordance with the first sampling criteria.

(3) Distribution shall be reported through the 0.002-mm particle size.

(4) For every 8,000 cubic yards of soil extracted from the borrow source, perform one set of hydraulic conductivity tests. A set typically consists of four hydraulic conductivity tests run on a sample of soil remolded to four different moistures and dry densities.

5.3.5 Laboratory Testing Acceptance Criteria

1. A saturated hydraulic conductivity of 1×10^{-7} cm/s or less

5.3.6 Typical Index Properties Recommended for Achieving Hydraulic Conductivities of 1×10^{-7} cm/s or Less

1. A liquid limit of 30 percent or greater
2. A plasticity index of 15 percent or greater
3. A percentage of fines (*i.e.*, material finer than the No. 200 sieve or 0.075 mm) 60 percent or greater.
4. A percentage of clay (*i.e.*, material finer than 0.002 mm) 20 percent or greater.

5.4 Thickness Documentation

The top of clay liner grades will be surveyed at a minimum on the same 50-foot grid pattern, as other locations surveyed for subbase grades. Clay thickness at slope breaks will be surveyed. The clay liner thickness will be determined at surveyed locations and reported in table fashion. The minimum acceptable bentonite-amended soil/select clay liner thickness will be 2-foot vertical to the bottom or to the slope. The location and elevation of samples requiring surveying will be recorded.

Table 5-1
Summary of Quality Assurance Testing for the Select Clay/Bentonite-Amended Soil Liner

TEST	FREQUENCY	COMMENT
Atterberg Limits Test [ASTM D 4318]	One every 4,000 cubic yards and material changes	Source Material: Clay/ Bentonite-amended soil
Grain-size analyses (sieve and hydrometer) [ASTM D 422]	One every 4,000 cubic yards and material changes	Source Material: Clay/ Bentonite-amended soil
Moisture Content [ASTM D 2216]	One every 4,000 cubic yards and material changes	Source Material: Clay/ Bentonite-amended soil
Density/Moisture (Standard Proctor) [ASTM D 698]	One every 4,000 cubic yards and material changes	Source Material: Clay/ Bentonite-amended soil
Permability Testing (Falling Head) [ASTM D 5084 or SW846-USEPA Method 9100]	Four tests on one sample obtained every 8,000 cubic yards and material changes	Source Material: Clay/ Bentonite-amended soil (on remolded source material)
Proofroll	All surfaces prior to liner placement	Subgrades for liner construction
Density/Moisture Content [ASTM D 2922 and ASTM D 3017] or [ASTM D 1556] or [ASTM D 2937]	One per 10,000 square feet per lift (approximate 100-foot grid pattern)	Liner: Clay/Bentonite-amended soil
Permability Testing (Falling Head) [ASTM D 5084 or SW 846-USEPA Method 9110]	One per acre (43,560 square feet) per lift	Source Material: Clay/ Bentonite-amended soil (on tube samples obtained from the *in-situ* liner)
Atterberg Limits Test [ASTM D 4318]	One per acre (43,560 square feet) per lift	Source Material: Clay/ Bentonite-amended soil (on tube samples obtained from the *in-situ* liner)
Grain-size analyses (P200) [ASTM D 422]	One per acre (43,560 square feet) per lift	Source Material: Clay/ Bentonite-amended soil (on tube samples obtained from the *in-situ* liner)
Density/Moisture [ASTM D 2216]	One per acre (43,560 square feet) per lift	Source Material: Clay/ Bentonite-amended soil (on tube samples obtained from the *in-situ* liner and subgrade)

RMT

Section 6
Granular Materials

Granular materials include "granular fill," "aggregate fill," and other granular materials shown or specified for pipe bedding and backfill material. The aggregate fill drainage layer overlies the geomembrane liner between the leachate drainage blanket and the protection layer of select waste (ash). The granular fill covers the aggregate fill drainage layer and acts as a filtration layer. Granular materials refers to pipe-bedded material to be used for structural support of leachate collection pipes. Limestone and dolomite stone shall not be used in the leachate collection system unless no other suitable material is reasonably available. The aggregate fill should be rounded to subangular.

Refer to details on the drawings prepared as part of the Construction Plan Application for specific details regarding the leachate drainage blanket and leachate collection pipe trench.

6.1 Procedures and Observation

The RPR will observe granular material placement activities and document relevant observations to support certification of the following requirements:

1. The RPR shall periodically observe aggregate fill material used for pipe bedding material, and granular fill for general conformance to material specifications and may randomly sample loads. The RPR will perform routine conformance sampling as defined in Subsection 6.2.
2. No trucks or heavy equipment shall travel directly on the geomembrane. Only low-contact-pressure equipment may operate over the geomembrane when there is a minimum 12-inch-thick layer of granular fill in-place. Procedures for deployment of pipe, aggregate fill, and/or geotextiles overlying geomembranes will be planned at the Pre-Construction Meeting. Special requirements for geomembrane protection and equipment necessary to deploy materials must be approved by the CQA Officer.
3. Care shall be exercised during placement of pipe bedding material to prevent undue damage to pipes, geomembrane, and geotextiles. Stone shall not be dropped from a height greater than 3 feet above the bottom of the pipe trench.
4. A geotextile cushion (Geocushion) shall be placed between the geomembrane and the leachate collection/pipe bedding material.
5. A minimum of 3 inches of bedding material shall be placed under leachate collection pipes prior to pipe placement, and a minimum of 6 inches of bedding material shall be placed over the top of leachate collection pipes.

6. A minimum 18-inch-thick granular fill shall be placed between the top of the composite liner and the layer of select waste (ash).

7. If granular fill is stockpiled on site prior to use, measures should be taken to minimize contamination by fines such as wind-blown particles and surface soils during loading operations.

6.2 Sampling Requirements and Acceptance Criteria

Field sampling and laboratory testing frequencies are based on proportionate sampling of construction areas or volume of material placed as specified below. This section describes the required analysis, methods, sampling frequency, and acceptance limits. The RPR will collect granular material samples for laboratory analysis.

6.2.1 Field Testing

No field testing will be required for pipe bedding material or granular fill. However, as stated in Subsection 6.1 above, the RPR will perform visual inspection of these materials for conformance to material specifications and may randomly sample deliveries.

6.2.2 Laboratory Testing

Representative (grab) samples will be obtained from the proposed bedding material, and graded granular fill sources prior to delivery of the material. The source sampling frequency will be dependent on the apparent uniformity of the source and must be approved by the CQA Officer.

Grab samples of pipe bedding material, and graded fill soils placed will be collected and analyzed as follows:

SOIL TYPE	FREQUENCY	PARAMETER	TEST METHOD
Granular Fill	1/1,000 CY (1, 2)	Grain-size	ASTM D 422 (3)
Granular Fill	1/2,500 CY (2, 4)	Remolded hydraulic conductivity	ASTM D 2434
Pipe Bedding Material	1/1,000 L.F. of Trench (5)	Grain-size	ASTM D 422 (3)
Pipe Bedding Material	1/2,000 L.F. of Trench	Remolded hydraulic conductivity	ASTM D 2434

(1) For lesser volumes, a minimum of four samples shall be tested.
(2) This frequency may be reduced for uniform sources. Proposed reductions will be submitted for NC DENR approval prior to implementation.
(3) Testing shall be required only to the #200 sieve.
(4) For lesser volumes, a minimum of two samples shall be tested.
(5) For documentation areas with less than 3,000 feet of pipe trench, a minimum of three samples shall be tested.

Laboratory Testing Acceptance Criteria

Pipe bedding material shall have a uniformity coefficient less than 4, contain no more than 5 percent by weight passing the #4 sieve, have a maximum particle diameter of ¾ inch, have a remolded hydraulic conductivity of 1 cm/s or greater, and have a rounded to subangular particle shape. Granular fill materials shall meet the grain-size distribution criteria specified in the construction plans and specifications.

6.3 Thickness Documentation

Granular fill in the leachate collection layer, and placed along collection pipe alignments will be surveyed for elevation. Granular materials in the leachate drainage blanket will be surveyed on a 50-foot grid. Pipe bedding material will also be surveyed prior to pipe placement and following pipe backfilling at 50-foot intervals to document the thickness of aggregate fill placed below pipe inverts and above the top of pipe. The minimum acceptable stone thickness will be 3 inches below and 6 inches above the leachate collection piping.

Section 7
Geotextiles and Geocushion™

This section of the CQA Plan applies to non-woven geotextiles used for soil separation/ filtration in roadways and riprap channels, and for protection of the geomembrane. The geotextiles used in the geocomposites will meet the applicable requirements of this section. Geocomposites are discussed in Section 11. A Geocushion™ will be placed over the geomembrane. The Geocushion™ will meet the applicable requirements of this section.

This section is divided into three major subheadings, which cover the QA requirements for Pre-Installation (includes geotextile manufacturers), Installation, and Post-Installation (includes the final examination of the geotextiles prior to placing the appropriate material above the geotextile). The terms Pre-Installation, Installation, and Post-Installation are applicable only to the geotextile installation and do not apply to the overall construction of the landfill facility.

7.1 Pre-Installation

7.1.1 Manufacturing

Material Specifications

The geotextile or Geocushion™ will be supplied to the site in factory rolls.

Quality Control Requirements

Prior to the delivery of any geotextile or Geocushion™ rolls to the site, the geotextile or Geocushion™ manufacturer will provide to the CQA Officer the manufacturer's QC Plan used for production of the geotextile rolls.

Every roll of geotextile for delivery to the site must be manufactured and inspected by the geotextile or Geocushion™ manufacturer, according to the following requirements:

1. The geotextile or Geocushion™ must contain no needles used for punching.
2. The geotextile or Geocushion™ must be free of holes and any other sign of contamination by foreign matter.

Manufacturer's Certification

The geotextile manufacturer will provide certification, based on tests performed in accordance with the methods listed in Table 7-1, that the geotextile supplied under this plan will meet the material specifications listed in Table 7-3. The Geocushion™ manufacturer will provide certification based on tests performed in accordance with the methods and frequency listed in Table 7-2 that the Geocushion™ supplied under this plan will meet the material specifications listed in Table 7-4. These tests may be performed by the geotextile or Geocushion™ manufacturer's laboratory or a laboratory contracted by the manufacturer. Additionally, the manufacturer shall provide certification that the manufacturer's QC Plan was fully implemented for the geotextile or Geocushion™ materials supplied under this Plan. The manufacturer shall provide documentation to verify the results of the manufacturer's QC Plan implementation if required by the CQA Officer.

7.1.2 Delivery, Handling, and Storage of Geotextile and Geocushion™ Rolls

(Note: ASTM Standard D4873 titled *Standard Guide for Identification, Storage and Handling of geotextiles* was used in preparing these guidelines.)

Each geotextile or Geocushion™ roll, for use at the landfill facility, will be marked by the geotextile or Geocushion™ manufacturer with the following information and in the following manner:

1. When fabric is rolled on a core, identify each roll with a durable gummed label, or an equivalent, on the inside of the core and on the outside of the protective wrapping for the roll.
2. Each roll label will contain the following information at a minimum:
   - Name of manufacturer (or supplier)
   - Style and type number
   - Unit weight (ounces per square yard)
   - Roll length and width
   - Batch (or lot) number
   - Nominal product thickness
   - Date of manufacture
   - Direction for unrolling
   - Roll number

3. On the outside of the wrapping, all lettering should be a minimum ½ inch high, and on the inside of the core, the lettering should be at least ¼ inch high.

The geotextile or Geocushion™ manufacturer will use the following guidelines in packaging, wrapping, and preparing all geotextile rolls for shipment:

1. When cores are required, use those that have a crushing strength sufficient to avoid collapse or other damage while in use.
2. Cover each roll with a wrapping material that will protect the geotextile from damage due to shipment, water, sunlight, or contaminants.

The following practices should be used as a minimum in receiving and storing geotextile rolls in the designated storage area at the job site:

1. While unloading or transferring the geotextile rolls from one location to another, prevent damage to the wrapping or to the geotextile itself. If practicable, the Installer may use forklift trucks fitted with poles that can be inserted into the cores of rolls. Be sure that the poles are at least $^2/_3$ the length of the rolls to avoid breaking the cores and possibly damaging the geotextile. Do not drag rolls.
2. Store the geotextile rolls to ensure that they are adequately protected from the following:
   - Precipitation
   - Ultraviolet radiation, including sunlight
   - Strong oxidizing chemicals, acids, or bases
   - Flames, including welding sparks
   - Temperatures in excess of 160°F
   - Soiling

The RPR will observe and document, throughout the pre-installation, installation, and post-installation periods, that the Installer provides adequate handling equipment used for moving geotextile or Geocushion™ rolls and the equipment and that the handling methods used do not pose unnecessary risk of damage. The Installer is responsible for means and methods to implement the work.

The Installer will be responsible for ensuring that all materials installed meet specifications (*i.e.*, the roll marking label information indicates required specifications and properly represents materials). The RPR will maintain a log of geotextile or Geocushion™ roll deliveries. The following information, at a minimum, will be recorded on the log for each shipment received at the job site:

1. Date of shipment from geotextile or Geocushion™ manufacturer

2. Date of receipt of delivery at job site
3. For each geotextile roll, the following information will be noted:
   - Roll number
   - Batch (lot) number

7.2 Installation

This section describes the QA requirements applicable to the installation of geotextiles. This section describes installation, observation, and documentation of geotextiles or Geocushion™.

7.2.1 Placement

The Installer will install all geotextiles or Geocushion™ in such a manner to ensure that they are not damaged and in a manner that complies with the following:

1. On sideslopes, the geotextiles will be securely anchored and then rolled down the slope in such a manner as to continually keep the geotextile or Geocushion™ in tension.
2. In the presence of winds, all geotextiles or Geocushion™ will be secured by other suitable methods. The temporary weighted material will be left in place until replaced with cover material as shown on the design plans and specifications.
3. In-place geotextiles or Geocushion™ will be cut with special care to protect other materials from damage that could be caused by the cutting of the geotextiles.
4. The Installer will take necessary precautions to prevent damage to any underlying layers during placement of the geotextile or Geocushion™ .
5. During placement of geotextiles, care will be taken not to entrap in the geotextile or Geocushion™ any stones, excessive dust, or moisture that could damage the geotextile or Geocushion™, or generate clogging of drains or filters.
6. A visual examination of the geotextile or Geocushion™ will be carried out over the entire surface after installation by the Installer to ensure that no potentially harmful foreign objects, such as needles, are present.

7.2.2 Seams and Overlaps

The Geocushion™ manufacturer's requirements for seaming and overlapping of Geocushion™ rolls will be met. The following requirements will be met with regard to seaming and overlapping of geotextile rolls:

1. A minimum 12-inch fabric overlap will be required to form geotextile seams.
2. No horizontal seams will be allowed on slopes steeper than 10-horizontal to 1-vertical (*i.e.*, seams will be along, not across, the slope), except as part of a

geotextile repair. Horizontal repair seams on such slopes will be sewn or thermally bonded.

3. The Installer will pay particular attention to seams to ensure that no earthen materials could be inadvertently trapped beneath the geotextile.
4. Sewing (if required per item 2 above) will be performed with thread made from the same base material as the geotextile, or suitable equivalent.

The RPR will be responsible for observing and documenting that the above provisions are performed by the Installer in an acceptable manner.

7.3 Post-Installation

7.3.1 Final Examination

The RPR will perform a final geotextile or Geocushion™ examination after installation of each geotextile or Geocushion™ layer has been completed. The objectives of the final examination are as follows:

1. Examine for presence of holes, tears, or other deterioration.
2. Examine geotextile or Geocushion™ for excessive tension due to stretching of the fabric during installation.

If there will be an extended time delay between completion of the geotextile or Geocushion™ and the start of the installation of any overlying cover, then the Installer will make provisions, by temporarily covering or using other suitable methods, to protect the geotextile against exposure to sunlight and ultraviolet radiation.

7.3.2 Placement of Soil Materials

The construction contractor will place all soil materials located on top of a geotextile or Geocushion™ in such a manner as to minimize the following:

1. Damage of the geotextile or Geocushion™
2. Slippage of the geotextile or Geocushion™ on underlying layers
3. Excessive tensile stresses imposed on the geotextile or Geocushion™

Table 7-1
Geotextile Tests and Test Methods

PROPERTY	TEST METHODS	MINIMUM FREQUENCY OF TESTING
Apparent Opening Size	ASTM D 4751	1 per 100,000 square feet
Grab Tensile Properties Tensile Strength Break Elongation	ASTM D 4632	1 per 100,000 square feet
Mass Per Unit Area	ASTM D 3776	1 per 100,000 square feet
Permitivity	ASTM D 4491	1 per 100,000 square feet
Puncture Resistance	ASTM D 4833	1 per 100,000 square feet
Trapezoidal Tear	ASTM D 4533	1 per 100,000 square feet
Mullen Burst	ASTM D 2210	1 per 100,000 square feet

Table 7-2
Geocushion™ Tests And Test Methods

PROPERTY	TEST METHODS	MINIMUM FREQUENCY OF TESTING
Mass Per Unit Area	ASTM D 3776	1 per 100,000 square feet
Thickness	ASTM D 1777	1 per 100,000 square feet
Tapered Pin Puncture	FTM 101C-M2065	1 per 100,000 square feet
Truncated Cone Puncture	GRI-GM3 2 inch (50 mm) cone height	1 per 100,000 square feet

Table 7-3
Geotextile Acceptance Specifications

TEST	TYPE A FINAL COVER SYSTEM AND UNDER RIPRAP	TYPE B USED UNDER ROADWAYS	CRITERION
Apparent Opening Size (US Sieve Number)	70	70-100	Maximum
Grab Tensile Properties (1) Tensile Strength (lbs)	200	200	Minimum
Grab Tensile Properties (1) Break Elongation (%)	50	50	Minimum
Permitivity (1/sec)	1.2	1.2	Minimum
Puncture Resistance (lbs)	80	80	Minimum
Mullen Burst (psi)	400	360	Minimum
Trapezoidal Tear (lb)	65	65	Minimum

(1) These tests will be performed and results will be reported in both the machine and cross directions.

Table 7-4
Geocushion™ Acceptance Specifications

TEST	GEOCUSHION™ 32R	CRITERION
Mass/Area	32 oz/yd^2 (1,080 g/m^2)	Minimum
Thickness	0.3 in. (7.5 mm)	Minimum
Tapered Pin Puncture	400 lb. (1,780 N)	Minimum
Truncated Cone Puncture	32 psi (220 kPa)	Minimum

RMT

Section 8
Geomembranes

This section of the CQA Plan applies to the HDPE geomembrane used in the landfill base composite liner and the VFPE geomembrane used in the cap composite liner.

The geomembrane will be supplied to the site in factory rolls. ***No factory seams will be used to prepare larger panels of geomembrane for delivery to the site.*** This plan, therefore, does not contain any QA/QC requirements for factory seaming.

This section is divided into four major subheadings, which cover the QA requirements for the Pre-Installation (includes Resin Manufacturers and Geomembrane Manufacturers), Installation, Field Seaming, and Post-Installation (includes the final examination of the geomembranes prior to placing the appropriate material above the geomembrane). These terms Pre-Installation, Installation, Field Seaming, and Post-Installation are applicable only to the geomembrane installation and do not apply to the overall construction of the landfill facility.

8.1 Pre-Installation

This section describes the QC measures that are applicable to the polyethylene (PE) Resin Manufacturers, Geomembrane Manufacturers, and finished geomembrane roll delivery to the site prior to installation.

The geomembranes must be fabricated from polyethylene resin, and the fabricated HDPE geomembrane must be classified as Type III, Class C, Category 4 or 5 as defined by ASTM D 1248. The fabricated VFPE membrane must be classified as Type III, Class C, Category 3 or 4 per ASTM D 1248. (Note: the classifications are based on tests performed on the finished product, ***not*** the polyethylene resin used to fabricate the geomembrane.)

In the event that during the course of construction, geomembrane materials are obtained from a different manufacturer or are made from different resins, seam samples formed by joining the original and the proposed geomembrane shall be tested to confirm the construction compatibility of the two geomembrane materials. Prior to the use of the new geomembrane material, a minimum of two seamed samples (as described above) shall be submitted to the geosynthetics laboratory for nondestructive and destructive seam testing as described in Subsections 8.3.4 and 8.3.5. The CQA officer shall review the testing results prior to authorizing the use of the new geomembrane material.

8.1.1 Manufacturing

Material Specifications

The following list specifies the required membrane materials for liner construction:

LINER	MEMBRANE MATERIALS
Base liner	60-mil HDPE (textured on slide slopes)
Final cover side slopes and cap	40-mil VFPE-textured

Quality Control Requirements

Prior to the delivery of any geomembrane rolls to the site, the Geomembrane Manufacturer will provide the CQA Officer with the following information:

1. The resin supplier, location of supplier's production plant(s), and resin brand name and product number.
2. Any test results conducted by the Geomembrane Manufacturer and/or the Resin Manufacturer testing laboratories to document the quality of the resin used in fabricating the geomembrane.
3. The QC Plan that the Geomembrane Manufacturer will be using for the geomembrane being supplied.

Every roll of geomembrane for delivery to the site must be manufactured and inspected by the Geomembrane Manufacturer according to the following requirements:

1. First quality polyethylene resin must be used.
2. The geomembrane must contain no more than a maximum of 1 percent by weight of additives, fillers, or extenders, excluding carbon black.
3. The geomembrane must have no striations, roughness (except for where the textured geomembrane is specified), or bubbles on the surface.
4. The geomembrane must be free of holes, blisters, undispersed raw materials, or any other sign of contamination by foreign matter.

The Geomembrane Manufacturer will routinely perform the following test program on the raw resin and will report the results on a periodic basis to the CQA Officer:

1. Collect and test a minimum of one sample for the parameters in Item #2 below for every 50,000 pounds of resin received.

2. Perform carbon black content, carbon black dispersion, specific gravity, melt flow, and moisture content. Moisture content can be performed by any approved method. All other test methods are listed in Table 8-2.

Manufacturer's Certification

The Geomembrane Manufacturer will provide certification, based on tests performed by either the Geomembrane Manufacturer's laboratory or other outside laboratory contracted by the Geomembrane Manufacturer, that the geomembrane supplied under this plan will meet the specifications of the National Sanitation Foundation (NSF) Standard 54 titled *Flexible Membrane Liners*, Table 4 (revised 1993), except as noted in Subsection 8.2.1 under Procedures for Determining Geomembrane Roll Test Failures. Additionally, the manufacturer shall provide certification that the manufacturer's QC Plan was fully implemented for the geomembrane material supplied under this plan. The manufacturer shall provide documentation to verify results of the manufacturer's QC Plan implementation if requested by the CQA officer.

8.1.2 Delivery, Handling, and Storage of Geomembrane Rolls

The geomembrane will be protected during shipment from excessive heat or cold, puncture, cutting, or other damaging or deleterious conditions. The geomembrane rolls will be stored on site in a designated area and will be protected from long-term ultraviolet exposure prior to actual installation.

Each geomembrane roll will be marked by the Geomembrane Manufacturer with the following information (on a durable gummed label, or equivalent, on the inside of the core):

1. Name of manufacturer
2. Product type and identification number (if any)
3. Roll length and width
4. Batch (or lot) number
5. Nominal product thickness
6. Date of manufacture
7. Roll (or field panel) number

When cores are required for preparing geomembranes for shipment, the manufacturer shall use cores with sufficient crushing strength to avoid collapse or other damage while in use.

The following practices should be used as a minimum in receiving and storing geomembrane rolls in the designated storage area at the job site:

1. While unloading or transferring the geomembrane rolls from one location to another, prevent damage to the geomembrane itself. The preferred method involves use of a spreader-bar, straps, and a loader. Do not drag rolls.
2. Store the geomembrane rolls to ensure that they are adequately protected from the following:
   - Equipment damage
   - Strong oxidizing chemicals, acids, or bases
   - Flames including welding sparks
   - Temperatures in excess of 160°F
   - Soiling

The RPR will observe and document, throughout the pre-installation, installation, and post-installation periods that the Installer provides adequate handling equipment for moving geomembrane rolls and that the equipment and the handling methods used do not pose unnecessary risk of damage. The Installer is responsible for means and methods to implement the work.

The Installer will be responsible for ensuring that all materials installed meet specifications (*i.e.*, that the roll marking label information indicates required specifications and properly represents materials). The RPR will maintain a log of geomembrane roll deliveries. The following information, at a minimum, will be recorded on the log for each shipment received at the job site:

1. Date of shipment from Geomembrane Manufacturer
2. Date of receipt of delivery at job site
3. For each geomembrane roll, the following information will be noted:
   - Roll number
   - Batch (lot) number

8.2 Installation

This section includes discussions of geomembrane roll testing requirements, earthwork required for geomembrane placement, placement of the geomembrane, defects and repairs of geomembranes, and requirements applicable to other materials in contact with the geomembranes. Subsection 8.3 describes the installation and testing requirements for geomembrane seams.

All parties involved in the installation of the geomembrane should be familiar with geomembranes and should emphasize protection of the geomembrane from damage during construction activities.

8.2.1 Testing Requirements

This subsection describes the test methods, including sampling procedures and frequencies, and the role of the Geosynthetic Testing Laboratory in testing the geomembrane roll samples. Subsection 8.1.1, under QC Requirements, describes the test methods that are performed on an infrequent basis to demonstrate the uniformity of resin used to fabricate geomembranes shipped to the job site. Seam testing is described in Subsections 8.3.4 and 8.3.5.

Test Methods

Geomembrane roll samples will be collected by the RPR. Sample frequency will be based on ASTM D 4354 Procedure A where the number of units per lot is defined as the number of rolls for a specified lot (using batch or lot numbers) delivered to the job site in one shipment or one test per 100,000 square yards of material delivered to the site, whichever is less. Required sampling frequencies are shown in Table 8-1.

Samples will be 3 feet long by the full width of the roll and will not include the first 3 feet of any roll. Since machine direction for geomembrane rolls is the direction that the material comes off the roll, machine direction for any sample will always be along the 3-foot-length dimension of the sample.

Table 8-2 and Table 8-3 list the tests and the test methods to be performed on the HDPE and VFPE geomembrane roll samples, respectively. The specifications and methods used in evaluating the results are discussed below under Procedures for Determining Geomembrane Roll Test Failures. Unless specified otherwise, preparation of sample specimens will be performed in accordance with the referenced test method. Results for tear resistance and each of the tensile property tests will be reported for both the machine and cross direction.

Role of Testing Laboratory

The Geosynthetic Testing Laboratory will be responsible for performing the tests on samples submitted to them as described above under Test Methods. Results of tests performed will be reported to the CQA Officer and the RPR.

Retesting of geomembrane rolls for QA purposes, because of failure to meet any or all of the acceptance specifications listed in Table 8-2 and Table 8-3, can only be authorized by the CQA Officer.

The Geomembrane Manufacturer and/or Installer may perform their own tests according to the methods and procedures defined in Table 8-2 and Table 8-3; however, the results will only be applicable to their own QC needs. These results will not be substituted for the QA testing described herein.

Procedures for Determining Geomembrane Roll Test Failures

Table 8-4 and Table 8-5 list the acceptance specifications for the HDPE and VFPE geomembranes, respectively. These tables apply to both textured and nontextured geomembranes. For those tests where results are reported for both machine and cross direction, each result will be compared to the listed specification to determine acceptance.

The HDPE membrane values listed in the acceptance specifications of Table 8-4 are from Table 4 of NSF 54, Flexible Membrane Liners (revised 1993), except for the property of melt flow index, which is based on current acceptable industry practice. Currently, no industry-accepted standard specifications exist for textured geomembranes. Therefore, textured HDPE geomembranes will be required to meet the same specifications listed for nontextured geomembranes in Table 8-4.

NSF is currently developing material property standards for VLDPE membranes; however, these standards are not final. Therefore, the acceptance values listed in Table 8-5 are based on current acceptable industry practice and manufacturer's minimum specifications for textured VLDPE geomembranes.

The following procedure will be used for interpreting results:

1. If the test values meet the stated specifications in Table 8-4 and Table 8-5, then the roll and the lot will be accepted for use at the job site. If the sample represents all rolls from an entire shipment, then the entire shipment will also be considered accepted.
2. If the results do not meet the specifications, then the roll, the lot, and the entire shipment, if applicable, will be considered unsuitable for use in the liners at the site. The Geomembrane Manufacturer can request, however, retesting of samples from either the original roll sample or another sample collected by the RPR and forwarded to the Geosynthetic Testing Laboratory. For retesting, *two* additional tests must be performed for the

failed test procedure. If both of the retests are acceptable, then the roll and lot will be considered acceptable; if either of the two additional tests fail, then the roll and lot are unsuitable without further recourse and will be immediately marked for removal from the site.

8.2.2 Earthwork

The Construction Contractor will be responsible for preparing the supporting soil according to the plans and specifications and Section 5 and Section 14 of this plan. For installation of any of the geomembranes, the Installer will certify in writing that the surface on which the geomembrane will be installed is acceptable. This certification of acceptance will be reported by the Installer prior to the start of geomembrane installation in the area under consideration. Unacceptable areas noted by the Installer will be immediately reported to the RPR.

The soil surface will also be examined by the RPR to evaluate any areas softened by precipitation or cracked due to desiccation. The daily observation will be documented in the daily report. Areas determined to be unacceptable will be reworked by the Construction Contractor until acceptable.

8.2.3 Placement

Location and Layout Drawing

A layout drawing for the geomembrane installation covered by this plan will be prepared by the Installer prior to installation and submitted to the CQA Officer, showing the location of geomembrane panels to be installed. Geomembrane panels will be identified by the RPR by the corresponding geomembrane roll number on the layout drawing as they are installed.

Installation Techniques

Geomembrane panels will be installed using one of the techniques described below. The Installer will determine the method that best suits the conditions at the time of installation considering factors such as schedule and weather conditions.

1. All geomembrane panels are placed prior to field seaming, in order to protect the underlying soil from rain, *etc.* Seams may be tack-welded or sand-bagged to prevent the geomembrane panels from shifting and to maintain proper overlap for eventual seaming.

2. Geomembrane rolls are placed one at a time, and each panel is seamed immediately after placement.
3. Any combination of the above two techniques.

If a decision is reached to place all panels prior to field seaming, care should be taken to facilitate drainage in the event of precipitation. Scheduling decisions must be made during placement in accordance with varying conditions. The RPR will evaluate changes in the schedule if proposed by the Installer and will advise the CQA Officer on the acceptability of the changes. The RPR will document that the condition of the supporting soil has not changed detrimentally during installation.

The RPR will record the roll number, location, and date of each geomembrane panel installed.

The Installer shall take the following precautions while installing the geomembrane:

1. Equipment used does not damage the geomembrane by handling, excessive heat, leakage of hydrocarbons, or by other means.
2. Personnel working on the geomembrane do not smoke, wear damaging clothing, or engage in other activities that could damage the geomembrane.
3. Method used to unroll the geomembrane does not cause scratches or crimps in the geomembrane and does not damage the supporting soil.
4. Method used to place the rolls minimizes wrinkles (especially differential wrinkles between adjacent panels).
5. Adequate temporary loading or anchoring (continuously placed, if necessary), which will not damage the geomembrane, will be placed to prevent uplift by the wind.
6. Direct contact with the geomembrane will be minimized. The geomembrane will be protected by geotextiles, extra geomembrane, or other suitable materials, in areas where excessive traffic may be expected.

Weather Conditions

Geomembrane placement will not be performed in an area of ponded water, during precipitation events, or in the presence of excessive winds. The RPR will document that this condition is fulfilled. The CQA Officer will cause to cease or postpone the geomembrane placement when conditions are unacceptable.

Damages

The RPR will examine each panel for damage after placement and determine which panels, or panel portions, should be rejected, repaired, or accepted. Damaged panels or panel portions that have been rejected will be marked, and their removal from the site will be recorded by the RPR. Panel repairs will be made according to the procedures described in Subsection 8.2.4.

8.2.4 Defects and Repairs

This section applies to all defects and repairs resulting from examinations, tests, or visual observations performed on the geomembrane material itself and on the seams used in joining rolls in the field.

Identification

All seam and non-seam areas of the geomembranes will be examined and documented by the RPR for identification of defects, holes, blisters, undispersed raw materials, and any signs of contamination by any foreign matter. Because light reflected by the geomembrane helps to detect defects, the surface of the geomembrane will be clean at the time of examination. The smooth nonconductive geomembrane surface will be swept with a broom and/or washed by the Installer if the amount of dust or mud inhibits examination. The textured conductive backed HDPE will be spark tested in accordance with technical specifications and manufacturer's recommended procedure. Spark testing will be performed in addition to destructive and nondestructive seam testing.

Evaluation

Each suspect area identified will be nondestructively tested using the vacuum box test method described in Subsection 8.3.4. Each location that fails the nondestructive tests will be marked by the RPR and repaired by the Installer.

Repair Procedures

Any portion of the geomembrane exhibiting a flaw or failing a destructive or nondestructive test will be repaired. Several procedures exist for the repair of these areas. The procedures available include the following:

1. Patching—used to repair large holes, tears, undispersed raw materials, and contamination by foreign matter.
2. Grinding and rewelding—used to repair small sections of extruded seams.

3. Spot welding or seaming—used to repair small tears, pinholes, or other minor, localized flaws.
4. Capping—used to repair large lengths of failed seams.
5. Topping—used to repair areas of inadequate seams that have an exposed edge.
6. Removing the bad seam and replacing with a strip of new material welded into place—used for repairing large lengths of fusion seams.
7. Others may be used at the recommendation of the Installer if agreed upon by the CQA Officer and the RPR.

The repair procedures, materials, and techniques will be approved in advance of the specific repair by the CQA Officer, RPR, and Installer. At a minimum, the following provisions will be satisfied:

1. Patches or caps will extend at least 6 inches beyond the edge of the defect, and all corners of patches will be rounded with a radius of at least 3 inches.
2. The geomembrane below large caps should be appropriately cut to avoid water or gas collection between the two sheets.

Examination of Repairs

Each repair will be numbered and logged by the RPR. Each repair will be nondestructively tested according to Subsection 8.3.4. Repairs that pass the above testing will be considered to be adequately repaired, except that large caps may be of sufficient extent to require destructive seam sampling and testing, at the discretion of the RPR, according to the provisions of Subsection 8.3.5.

Failed tests indicate that the repair was inadequate and will be redone and retested until a passing result is obtained. The RPR will document that all repairs have been subjected to nondestructive testing and will record the number of each repair, the date, and the test outcome.

Large Wrinkles

When seaming of the geomembrane is completed, the RPR will examine the geomembrane for wrinkles and determine which wrinkles should be cut and seamed by the Installer. The wrinkle repair will be done in accordance with the equipment and procedures described in Subsections 8.3.2 and 8.3.3 (General Seaming Procedures), respectively, and it will be nondestructively tested using the vacuum box test method described in Section 8.3.4.

8.3 Field Seaming

This section covers the QA procedures on seams used to join the rolls of geomembrane into a continuous layer. The installation of each of the geomembranes at the landfill facility will include 100 percent nondestructive testing of all field seams for joining adjacent rolls of geomembranes to determine openings or gaps between geomembrane sheets. In addition, destructive testing will be performed at a routine interval for determining the strength and mode of failure of field seams in both the shear and peel modes.

The allowable field seam methods, equipment, personnel qualifications, and destructive and nondestructive testing methods are described in this section.

8.3.1 Seam Layout

The Installer will provide the CQA Officer and the RPR with seam layout drawings for each of the geomembrane installations covered by this plan showing each expected seam. The CQA Officer will review the seam layout drawing and document that it is consistent with accepted practice and the design plans and specifications.

No horizontal seams will be allowed on slopes greater than 5- horizontal to 1- vertical. In corners and at other odd-shaped geometric intersections, the number of seams should be minimized. A seam numbering system comparable and compatible with the geomembrane roll numbering system will be agreed upon at the Preconstruction Meeting.

8.3.2 Seaming Equipment

The approved process for production field seaming (roll to roll) are the dual hot wedge (fusion-type) seam method and the extrusion fillet weld process. Specialty seams and repair seams (non-production) will be done by the extrusion fillet weld process. No other processes can be used without prior written authorization from the CQA Officer and the RPR. Only equipment that has been specifically approved by make and model will be used.

Dual Hot Wedge Process

The Installer will meet the following requirements regarding the use, availability, and cleaning of the equipment to be used at the job site:

1. An automated self-propelled type of apparatus will be used.
2. The welding apparatus will be equipped to continuously monitor applicable temperatures.

3. One spare operable seaming device will be maintained on site at all times.
4. Equipment used for seaming should not damage the geomembrane.
5. The geomembrane should be protected in areas of heavy traffic to prevent damage as discussed in Subsection 8.2.3.
6. For cross seams, the edge of the cross seams will be ground to a smooth incline (top and bottom) prior to welding.
7. For cross seams, the intersecting dual hot wedge seam must be patched using the extrusion fillet process described below.
8. The electric generator for the equipment will be placed on a smooth base in such a way that no damage occurs to the geomembrane. Similarly, a smooth insulating plate or fabric will be placed beneath the hot equipment after usage.

The Installer will keep records for each seamer performing dual hot wedge seaming, including welding machine I.D. number, ambient air temperature, geomembrane surface temperature, and machine operating pressures and temperatures. This data will be recorded at intervals as agreed to at the Preconstruction Meeting.

Extrusion Fillet Process

The Installer will meet the following requirements regarding the use, availability, and cleaning of extrusion welding equipment to be used at the job site:

1. The welding apparatus will be equipped to continuously monitor temperature at the nozzle.
2. One spare operable seaming device will be maintained on site at all times.
3. Equipment used for seaming should not damage the geomembrane.
4. The geomembrane should be protected in areas of heavy traffic to prevent damage.
5. The extruder will be cleaned and purged prior to beginning seaming, and at any time that seaming operations are stopped, until all heat-degraded extrudate has been removed from the barrel.
6. The electric generator for the equipment will be placed on a smooth base in such a way that no damage occurs to the geomembrane. Similarly, a smooth insulating plate or fabric will be placed beneath the hot equipment after usage.
7. Grinding geomembrane surfaces for welding preparation shall not be performed more than 1 hour prior to seaming.

The Installer and, if applicable, the Geomembrane Manufacturer will provide documentation to the CQA Officer regarding the quality of the extrudate used in the welding apparatus. At a minimum, the extrudate should be compatible with the base liner material and contain the same grade and quality of polyethylene resin as used in the base material.

The Installer will keep records for each seamer performing extrusion weld seaming, including welding machine I.D. number, extrudate, ambient air, and geomembrane surface temperatures. This data will be recorded at intervals as agreed to at the Preconstruction Meeting.

8.3.3 Initial Requirements

All personnel performing seaming operations will be qualified by experience or by successfully passing seaming tests for the type of seaming equipment to be used. At least one seamer will have experience seaming a minimum of 1,000,000 ft^2 of polyethylene geomembrane using the same type of seaming apparatus to be used at the landfill facility. The most experienced seamer, the "master seamer," will have direct supervisory responsibility at the job site over less experienced seamers.

The Installer will provide a list of proposed seaming personnel and their experience records to the CQA Officer and the RPR for their review and approval.

Weather Conditions

The range of weather conditions under which geomembrane seaming can be performed are as follows:

1. Unless otherwise authorized in writing by the CQA Officer, no seaming will be attempted or performed at an ambient temperature below 32°F (0°C) or above 104°F (40°C).
2. Between ambient temperatures of 32°F (0°C) and 50°F (10°C), seaming will be performed only if the geomembrane is preheated by either sun or a hot air device to a temperature provided by the manufacturer, provided there is no excessive ambient cooling resulting from high winds.
3. Above 50°F (10°C), no preheating of the geomembrane is required.
4. Geomembrane will be dry and protected from the wind.
5. Seaming will not be performed during any precipitation event unless the Installer erects satisfactory shelter to protect the geomembrane areas for seaming from water and/or moisture.

6. Seaming will not be performed in areas where ponded water has collected below the surface of the geomembrane.

If the Installer wishes to use methods that may allow seaming at ambient temperatures below 32°F or above 104°F, the Installer will demonstrate and certify that the methods and techniques used to perform the seaming produce seams that are entirely equivalent to seams produced at temperatures above 50°F and below 104°F, and that the overall quality of the geomembrane is not adversely affected.

The RPR will document the following items:

1. Ambient temperature at which seaming is performed.
2. Any precipitation events occurring at the site, including the time of such occurrences, the intensity, and the amount of the event.

The RPR will inform the CQA Officer if any of the weather conditions are not being fulfilled. The CQA Officer will cause to cease or postpone the geomembrane seaming when weather conditions are unacceptable.

Overlapping and Temporary Bond

The Installer will be responsible for the following:

1. Panels of geomembranes have a finished overlap of a minimum of 3 inches for extrusion welding and 4 inches for fusion welding; but, in any event, sufficient overlap will be provided to allow peel tests to be performed on the seam.
2. No solvents or adhesives will be used on the geomembranes unless the product has been approved in writing by the CQA Officer. Approval can only be obtained by submitting samples and data sheets to the CQA Officer for testing and evaluation.
3. Procedures used to temporarily bond adjacent geomembrane rolls must not damage the geomembrane; in particular, the temperature of the hot air at the nozzle of any spot welding apparatus must be controlled such that the geomembrane is protected at all times against potential damage.

Trial Seams

Trial seams will be made on fragment pieces of geomembrane to document that seaming conditions are adequate. Such trial seams will be made at the beginning of each seaming period, and at least once every 4 hours thereafter, for each seaming apparatus used that day. Also, each seamer will make at least

one trial seam each day. Trial seams will be made under the same conditions as actual seams.

The trial seams will be examined by the Installer for squeeze-out, foot pressure applied by seaming equipment, and general appearance. If the seam fails any of these examinations, it will be repeated until satisfactory seams are obtained.

The trial seam samples will be at least 3 feet long by 1 foot wide after seaming, with the seam centered lengthwise. Seam overlap will be as indicated above, under Overlapping and Temporary Bond.

Two specimens, each 1-inch wide, will be cut from opposite ends of the trial seam sample by the Installer. The specimens will be tested respectively in shear and peel using a field tensiometer provided by the Installer, and they should not fail in the seam. If a specimen fails, the entire test will be repeated using two additional specimens cut from the trial seam sample or a new trial seam sample shall be made (with or without adjustments in the seaming process) and specimens cut for testing. If the second set of specimens also fails, the seaming apparatus and seamer will not be accepted and will not be used for seaming until the deficiencies are corrected and two consecutive successful trial seams are achieved.

The remainder of the trial seam sample will be identified and marked by the RPR as follows:

1. An assigned sample number, welding apparatus used, and seamer name
2. The date, time, applicable welding equipment operating temperatures, and ambient temperature at the time of seaming
3. Whether the sample passes or fails

The RPR may randomly select trial field samples for destructive testing by the Geosynthetic Testing Laboratory according to the test procedures described in Subsection 8.3.5 under Field Test Methods. The frequency for trial seam laboratory testing will be at the discretion of the RPR.

If a trial seam sample fails a destructive test performed by the Geosynthetic Testing Laboratory according to the acceptance criteria stated in Subsection 8.3.5, then a destructive test seam sample(s) will be taken from each of the seams completed by the seamer during the shift related to the failed trial seam test. These samples will be forwarded by the RPR to the Geosynthetic Testing Laboratory and, if any of them fails the tests, the procedures described

in Subsection 8.3.5 will apply. The conditions of this paragraph will be considered met if a destructive seam test sample, collected and tested according to the provisions under Location and Sampling Frequency and Sampling Procedure of Subsection 8.3.5, has already been taken and passed.

Seam Preparation

The Installer will meet the following conditions for each of the geomembrane installations covered by this plan:

1. Prior to seaming, the seam area is clean and free of moisture, dust, dirt, debris of any kind, and foreign material.
2. If seam overlap grinding is required, the grinding process will be completed according to the Geomembrane Manufacturer's instructions within 1 hour of the seaming operation, and in a way that will not damage the geomembrane or cause excessive striation of the geomembrane surface.
3. Seams will be aligned so as to minimize the number of wrinkles and "fishmouths."

General Seaming Procedures

Unless otherwise specified, the general seaming procedures to be used by the Installer for each of the geomembrane installations covered by this plan, and observed by the RPR, will be as follows:

1. A firm substrate will be provided to achieve proper support for seaming.
2. Fishmouths or wrinkles at the seam overlaps will be cut along the ridge of the wrinkle in order to achieve a flat overlap. The cut fishmouths or wrinkles will be seamed, and any portion where the overlap is inadequate will then be patched with an oval or patch of the same geomembrane (including thickness) extending a minimum of 6 inches beyond the cut in all directions.
3. If seaming operations are to be conducted at night, adequate illumination will be provided.

8.3.4 Nondestructive Testing

Each field seam will be nondestructively tested over its full length using one of the methods described in this section. The purpose of nondestructive testing is to determine the continuity of the seams. Nondestructive testing, at this stage of development, does not provide any information on the strength of seams. Seam strengths will be determined by destructive testing methods that are described in Subsection 8.3.5.

Failure of any of the nondestructive or destructive tests will require the repair of the failed section according to the procedures contained in Subsection 8.3.5.

Nondestructive testing as described in this section will be performed on seams for every geomembrane installation covered by this plan. The recommended test methods for conducting the nondestructive seam testing are the air pressure test for dual hot wedge seams and the vacuum box test for extrusion fillet welds. These two nondestructive testing methods are described below.

The RPR will perform the following:

1. Observe all nondestructive seam testing, and examine all seams for squeeze-out, foot pressure, and general appearance. Failure of these criteria based on the RPR's judgement will be considered as failure of the seam, and repair or reconstruction will be required.
2. Document location, date, test unit number, name of tester, and outcome of all testing.
3. Inform the Installer and CQA Officer of any required repairs.
4. Document that appropriate repairs are made and that the repairs are retested nondestructively with passing results.

Air Pressure Testing

The following test procedures are applicable only to dual hot wedge seams. The equipment for performing the test should meet the following minimum requirements:

1. An air compressor or hand pump equipped with a pressure gauge and regulator capable of producing and sustaining a pressure between 25 to 30 psig and mounted on a cushion to protect the geomembrane surface.
2. Fittings, rubber hose, valves, *etc.*, to operate the equipment, and a sharp hollow needle or other approved pressure feed device.

Air pressure testing will be performed according to the following procedure:

1. Seal both ends of the seam to be tested.
2. Insert needle or other approved pressure feed device into the air space at one end of the dual hot wedge seam.
3. Energize the air compressor or hand pump to a pressure of 25 to 30 psig. Close the valve and observe the pressure response in the seam air space for approximately 7 minutes. The pressure should stabilize within the first 2 minutes and then remain essentially constant.

4. Record the pressure in the seam at the end of 2 minutes and again at the end of 7 minutes.
5. If the subsequent pressure loss exceeds 2 psig over the last 5-minute period or if the pressure does not stabilize, then the seam fails, and the defect must be located, repaired, and retested nondestructively.
6. If pressure loss does not exceed 2 psig over the last 5-minute period, then the seam is considered to have passed the nondestructive test provided the Installer has verified that the air channel tested was not obstructed by noting a release of air pressure at the end of the tested seam interval opposite the pressure gauge.

Vacuum Box Test

Vacuum box testing is to be used on those seams made by the extrusion fillet process, to locate precisely the defects identified from air pressure testing, or to evaluate suspect seam and non-seam areas as discussed in Subsection 8.2.4.

Vacuum box testing equipment must meet the following minimum standards:

1. A five-sided vacuum box with an open bottom, a clear viewing panel on top, and a pliable gasket attached to the bottom.
2. A steel vacuum tank and pump assembly equipped with a pressure controller and pipe connections capable of achieving a vacuum of 10 psig.
3. A vacuum gauge on the tank with an operating range of 0 to 10 psig, and a vacuum gauge on the vacuum box with an operating range from 0 to 10 psig.

The following procedures will be used in performing the vacuum box test:

1. Ensure seams to be tested are clean and relatively free from soil or foreign objects that might prohibit a good seal from being formed between the vacuum chamber and the geomembrane.
2. Energize the vacuum pump and create a vacuum in the tank of 5 to 10 psig.
3. Wet a strip of geomembrane approximately twice the size of the vacuum box with the soapy solution.
4. Place and center the vacuum box with the gasket in contact with the geomembrane surface over the wetted area of the seam.
5. Applying a normal force to the top of the vacuum box, close the bleed valve, and open the vacuum valve. Check to make certain that a tight seal is created between the geomembrane and the vacuum box. A minimum vacuum of 5 psig should be used for testing with the maximum allowable testing pressure never exceeding 10 psig of vacuum.

6. With the vacuum drawn, use the viewing panel to examine the geomembrane seam for bubbles resulting from the flow of air through the seam. Continue this examination for not less than 10 seconds.
7. Remove the vacuum box by first closing the vacuum valve and opening the bleed valve. Proceed to step 8 if bubbles appear in Step 6. If no bubbles appear in step 6, then proceed directly to Step 9.
8. If bubbles appear through the geomembrane, mark the defective area for repair according to the provisions of Subsection 8.2.4. All repairs must be tested with passing nondestructive results.
9. Move the vacuum box along the seam to be tested, overlapping the previously tested area by no less than 3 inches.

8.3.5 Destructive Seam Testing

Destructive seam testing will be performed on the geomembrane seams covered by this plan. Destructive seam testing is performed to determine the strength of the seam in both shear and peel failure modes. Destructive seam testing will be performed within 48 hours of sampling either in an on-site laboratory by personnel under the direction of the CQA Officer or at the Geosynthetic Testing Laboratory.

Location and Sampling Frequency

The RPR will select locations where seam samples will be cut out for the destructive testing. Test locations will be determined during seaming at the RPR's discretion. Selection of such locations may be prompted by suspicion of excess crystallinity, contamination, offset welds, or any other potential causes of an imperfect seam. The Installer will not be informed in advance of any location where seam samples will be taken.

The minimum frequency of sample collection will be one test location per every 500 linear feet of seam length. This minimum frequency is to be taken as an average for the entire installation area.

Sampling Procedure

Samples will be cut under the direction of the RPR as the seaming progresses. For each sample location, information will be documented as follows:

1. Assign a sample number and mark accordingly.
2. Record sample location on the layout drawing.

3. By sample number, record the reason for collecting the sample (*e.g.*, as part of statistical testing program, suspicious seam, *etc.*).
4. Note on the sample, for the peel test, which geomembrane is the top and which is the bottom with respect to seams performed using dual hot wedge (fusion) weld techniques.
5. Record pertinent information including date, time, seaming unit number, and name of seamer.

Specimens for qualitative field testing will be taken prior to removal of the laboratory sample. Samples for field tensiometer testing will be 1 inch wide by 16 inches long with the seam centered parallel to the width. The distance between the two samples should be 42 inches measured from inside edge to inside edge. If both samples pass the field tensiometer test described below under Field Test Methods, then the sample for laboratory testing will be taken according to the procedure described below.

The sample for laboratory testing will be located between the two samples used for field testing. Therefore, the laboratory sample will be 12 inches wide by 42 inches long with the seam centered lengthwise. The sample will be cut by the RPR into three parts and distributed as follows:

1. A 12-inch-by-16-inch sample will be given to the Installer for testing if so desired.
2. A 12-inch-by-16-inch sample will be given to the Owner for record storage.
3. An 8-inch-by-16-inch sample will be transmitted to the Geosynthetic Testing Laboratory or on-site testing laboratory by the RPR.

The RPR will make periodic reports to the Installer detailing the locations of samples taken that must be repaired.

All holes cut into the geomembrane resulting from destructive seam sampling will be immediately repaired by the Installer in accordance with the repair procedures described in Subsection 8.2.4. The repaired area will be nondestructively tested in accordance with the requirements of Subsection 8.3.4.

Field Test Methods

The two 1-inch-wide samples described above under Sampling Procedure will be field tested for both peel and shear. Testing will be performed using a field tensiometer or equivalent device to qualitatively determine the mode of failure. The seam will be considered as passing if the failure in both peel and shear does not occur with the seam. If the samples fail the field tensiometer test, then the repair procedures of Subsection 8.2.4 for the holes left by the cut-out samples, and seam reconstruction procedures for the repair of the defective seam, discussed later in this subsection, must be implemented.

Laboratory Test Methods

Laboratory testing of the destructive seam samples will be performed by the Geosynthetic Testing Laboratory or on-site testing laboratory under the direction of the CQA Officer. All destructive seam tests, whether performed on trial seam samples (as described above) or on samples cut out from production seams, will be performed in general accordance with the methodology of ASTM D 4437, which stipulates that at least five specimens should be tested in shear and five in peel. Samples will be cut in alternating order (*e.g.*, shear and peel, peel and shear) and should be tested in the order of cutting, to determine if any trend in seam quality along the length of the sample exists. All specimens will be cut as 1-inch-wide strips to ensure that the seam does not exceed the test gauge length of the specimen.

The following tests will be performed on each seam sample submitted for laboratory testing:

1. *Shear and peel maximum tension* is the maximum load per unit width of a 1-inch-wide specimen expressed in pounds per inch of width in both the shear and peel mode, according to ASTM D 4437 as modified by NSF Standard 54.
2. *Shear elongation at break* is the extension at break expressed as a percentage of the initial distance between the edge of the fused track and the nearer grip. This distance should be the same on both sides of the seam and is usually 1 inch. No referenced ASTM test exists for this procedure as defined. The value that failure occurred will be noted on the results.
3. *Peel seam separation* estimates the area of seam interface separation expressed as a percentage of the original area.

Also, for both the seam shear and peel tension tests, an indication will be given for each specimen tested that defines the locus of the failure. The loci will be defined by using Figure A-4 and Figure A-6 from Part 5, Annex A of NSF 54.

For the seam shear tests, specimens should be inserted in the test machine with minimum gauge lengths of ½ inch between each edge of the seam and the adjacent grip. The crosshead speed will be 2 inches per minute for HDPE and 20 inches per minute for VFPE. Parameters monitored during the test will be load and crosshead displacement.

For the peel tests, specimens will be inserted in the tensile machine so the grips are no closer than 1 inch to the edge of the seam. The grips may be closer than 1 inch only if there is insufficient material to allow insertion at this setting. Seam peel specimens will be tested at 2 inches per minute crosshead speed for HDPE and 20 inches per minute for VFPE.

For shear tests, the following values will be reported for each specimen tested:

1. Maximum tension in pounds per inch
2. Elongation at break indicating at what percentage the specimen failed
3. The locus of failure using the above designations

For peel tests, the following values will be reported for each specimen tested:

1. Maximum tension in pounds per inch
2. Seam separation expressed as percent of original seam area
3. Locus of failure

For each set of five specimens, the mean and standard deviation will be calculated and reported for shear maximum tension and peel maximum tension.

Role of Testing Laboratory

The Geosynthetic Testing Laboratory or on-site testing laboratory will be responsible for performing the tests on samples submitted to them as described above. Results of tests performed will be reported to the CQA Officer and the RPR. Retesting of seams, because of failure to meet any or all of the specifications listed below, can only be authorized by the CQA Officer.

The Geomembrane Manufacturer and/or Installer may perform their own QC testing in accordance with the methods and procedures defined above under Laboratory Test Methods; however, the results, if substantially different from those obtained by the Geosynthetic Testing Laboratory or on-site laboratory, may only be used to request a retesting by the Geosynthetic Testing Laboratory or on-site testing laboratory. All QA test results from the Geosynthetic Testing Laboratory or on-site laboratory govern, over any test results from the Geomembrane Manufacturer of Installer. Only the CQA Officer is authorized to approve a retesting request.

Procedures for Determining Destructive Seam Test Failures

The procedures described in this section apply to the destructive testing procedures defined above under Field Test Methods and Laboratory Test Methods. Specifications for destructive seam testing are shown in Table 8-7 and Table 8-8. Procedures for repairing failed seams are given in Subsection 8.2.4 of this plan.

Results from the shear and peel tests for the HDPE geomembrane will be evaluated by criteria, which are based on the values for material properties for yield stress (Note: yield stress of the base geomembrane is considered a more representative criterion than bonded seam strength) from Table 4 (HDPE Geomembranes) of NSF Standard 54 titled *Flexible Membrane Liners* (revised 1993).

Results from the shear and peel tests for the VLDPE will be evaluated by the following criteria:

1. Minimum acceptable individual specimen shear elongation values will be no less than 50 percent.
2. Maximum allowable individual specimen peel separation value will be 10 percent.
3. Failure type in peel must be film-tear bond (FTB) for 4 out of 5 test specimens.

The Installer has the following two options in determining the repair boundary whenever a seam has failed: either the field tensiometer testing or laboratory destructive testing:

1. The seam can be reconstructed between any two previously tested and passed destructive seam test locations.

2. The Installer can trace the welding path to an intermediate location (at a 10-foot minimum from the point of the failed test in each direction) and request that field tensiometer tests be performed at these intermediate locations. If the field tensiometer sample results are acceptable, then full laboratory samples are taken and tested. If the laboratory tests are acceptable, then the seam is reconstructed between these intermediate locations. If either sample fails, then the process is repeated until acceptable destructive seam tests have been performed in both directions away from the original failed sample location. All retesting of seams, according to this procedure, will use the sampling methodology described above under Sampling Procedure.

For all seams reconstructed due to a failing destructive seam sample, an additional sample taken from the reconstructed zone must pass destructive seam testing.

The RPR will be responsible for documenting all actions, including test results submitted by the Geosynthetic Testing Laboratory, taken in conjunction with seam testing. The RPR will also be responsible for keeping the CQA Officer informed on seam testing results and seaming progress.

8.4 Post-Construction

Each geomembrane covered by this plan will be examined by the RPR. Any defects, whether due to failed seams, pinholes, or other penetrations, will be repaired. In addition, a stress crack examination will be performed along the seams of all the geomembrane installations covered by the plan.

This examination, by experienced personnel, will utilize the procedures described in the USEPA Field Inspector's Manual titled *Stress Cracking of Flexible Membrane Liner Seams*. This document identifies three levels of stress crack development with Level #1 being those that can be observed only under a microscope, Level #2 being those that are barely visible to the eye, and Level #3 being those that are complete fractures.

The geomembranes covered by this plan will be examined for Level #2 and Level #3 stress cracks according to the procedure described in the Field Inspector's Manual under the heading "Field Inspection Recommendations." This examination will be performed by experienced personnel only. Any Level #2 or Level #3 stress cracks found will be immediately marked by the RPR and will be repaired according to the provisions of Subsection 8.2.4.

Placement of the Geocushion™ drainage layer material shall proceed as soon as practical following the RPR's testing and acceptance of completed geomembrane areas. The granular layer will provide ultraviolet protection, thermal insulation, and protection from physical damage.

Table 8-1
Number Of Units To Be Selected As Lot Sample—
Specification Conformance

NUMBER OF UNITS IN LOT	NUMBER OF UNITS SELECTED
1 to 2	1
3 to 8	2
9 to 27	3
28 to 64	4
65 to 125	5
126 to 216	6
217 to 343	7
344 to 512	8
513 to 729	9
730 to 1,000	10
1,001 or more	11

Table 8-2
HDPE Geomembrane Tests And Test Methods

PROPERTY	TEST METHOD
Carbon Black Content	ASTM D 1603
Carbon Black Dispersion	ASTM D 3015 (1)
Dimensional Stability (2)	ASTM D 1204, 1 Hour at 100°C
Melt Flow Index	ASTM D 1238 with load of 2.16 kg at 190°C
Density	ASTM D 792
Tear Resistance (2)	ASTM D 1004
Puncture Resistance	FTMS 101, Method 2065
Tensile Properties(2) Yield Stress Yield Elongation Break Stress Break Elongation	ASTM D 638 (1), Type IV specimen at 2 inches/minute
Thickness	ASTM D 751 (3,4) (nontextured) ASTM D 1593 (5) (textured
Coefficient of Friction	ASTM D 5321

(1) Test method as modified in Annex A of NSF Standard 54.
(2) These tests will be performed and results reported for both machine and cross direction.
(3) Use ASTM test method as modified by NSF Standard 54, Flexible Membrane Liners (revised November 1993).
(4) In the absence of a standard test method for the thickness of textured geomembranes, this test method will be used; however, it may not be applicable for some geomembranes, depending on the manufacturing process.
(5) ASTM D 751 shall be used for textured geomembranes manufactured during impingement or lamination texturing processes.

Table 8-3
VFPE Geomembrane Tests and Test Methods

PROPERTY	TEST METHOD
Carbon Black Content	ASTM D 1603
Carbon Black Dispersion	ASTM D 3015 (2)
Melt Flow Index	ASTM D 1238 with load of 2.16 kg at 190°C
Density	ASTM D 792, Method A; or ASTM D 1505
Tear Resistance (1)	ASTM D 1004
Puncture Resistance	FTMS 101, Method 2065
Tensile Properties (1) Yield Stress Yield Elongation Break Stress Break Elongation	ASTM D 638 (2), Type IV specimen at 2 inches/minute
Environmental Stress Crack Resistance (ESCR)	ASTM D 1693 (2)
Thickness	ASTM D 751 (2) (nontextured) ASTM D 1593 (4) (textured)
Coefficient of Friction	ASTM D 5321

(1) These tests will be performed and results reported for both machine and cross direction.
(2) Use ASTM test method as modified by NSF Standard 54, Flexible Membrane Liners (revised November 1993).
(3) In the absence of a standard test method for the thickness of textured geomembranes, this test method will be used; however, it may not be applicable for some geomembranes depending on the manufacturing process.
(4) ASTM D 751 shall be used for textured geomembranes manufactured using impingement or lamination texturing process.

Table 8-4
HDPE Geomembrane 60-Mil Acceptance Specifications

PROPERTY	UNITS	TYPE OF CRITERION	ACCEPTABLE VALUE (1, 2)
Carbon Black Content	% by weight	Range	2 - 3
Carbon Black Dispersion	N/A	Range	A1, A2, or B1
Dimensional Stability	% change	Range	± 2.0
Melt Flow Index	g/10 min	Maximum	0.3 (3)
Density	g/cc	Minimum	0.940
Tear Resistance (4)	lb	Minimum	39
Puncture Resistance	lb	Minimum	72
Tensile Properties			
Yield Stress (3, 4)	ppi	Minimum	126
Yield Elongation (3)	%	Minimum	12
Break Stress (3, 5, 6)	ppi	Minimum	228
Break Elongation (3, 6)	%	Minimum	560
ESCR	hours	Minimum	1,500
Thickness (lowest individual)	mils	Minimum	54
Thickness (minimum average)	mils	Average	60

(1) Values are from Table 4 of NSF Standard 54, Flexible Membrane Liners (revised May 1991), unless otherwise indicated.
(2) Values are based on current acceptable industry practice.
(3) Test is performed in both machine and cross direction.
(4) Values given correspond to a minimum yield stress of 2,100 psi for either machine or cross direction.
(5) Values given correspond to a minimum break stress of 3,800 psi for either machine or cross direction.
(6) Values given apply to nontextured geomembranes only. Refer to manufacturer's specifications for minimum acceptable values of textured geomembranes.

Table 8-5
VFPE Geomembrane 40-Mil Acceptance Specifications

PROPERTY	UNITS	TYPE OF CRITERION	ACCEPTABLE VALUE [1]
Carbon Black Content	% by weight	Range	2 - 3
Carbon Black Dispersion	N/A	Range	A1, A2, or B1
Dimensional Stability	% change	Range	± 3.0
Melt Flow Index	g/10 min	Maximum	0.10 [2]
Density	g/cc	Minimum	0.89 - 0.92
Tear Resistance [3]	lb	Minimum	16
Puncture Resistance	lb	Minimum	52
Tensile Properties [3] Break Stress [4, 5] Break Elongation [5]	 ppi %	 Minimum Minimum	 128 625
ESCR	hours	Minimum	1,500
Thickness (lowest individual)	mils	Minimum	36
Thickness (minimum average)	mils	Average	40

(1) Values are from Table 11 of NSF Standard 54, Flexible Membrane Liners (revised November 1993), unless otherwise noted.
(2) Values are based on current acceptable industry practice.
(3) Test is performed in both machine and cross direction.
(4) Values given correspond to a minimum break stress of 3,200 psi for either machine or cross section.
(5) Values given apply to nontextured geomembranes only. Refer to manufacturer's specifications for minimum acceptable values of textured membranes.

Table 8-6
60-Mil Smooth or Textured HDPE Geomembrane Seam Acceptable Specifications

PROPERTY	TEST METHOD	UNITS	TYPE OF CRITERION	MINIMUM AVERAGE VALUE (1)	
				NONTEXTURED	TEXTURED
Shear Strength (2)	ASTM D 4437 (NSF 54 modified)	ppi	Minimum	126	113
Shear Elongation	--	percent	Minimum	50	50
Peel Strength (2) Fusion	ASTM D 4437 (NSF 54 modified)	ppi	Minimum	90	82
Peel Strength (2) Extrusion	ASTM D 4437 (NSF 54 modified)	ppi	Minimum	78	63
Peel Separation (3)	--	percent	Maximum	10	10

(1) The average of all five specimen test results must meet these requirements. In addition, five out of the five test results must meet these requirements.
(2) Failure type in peel must be film-tear bond (FTB) for four out of five test specimens.
(3) Maximum acceptable value.

Table 8-7
40-Mil VFPE Smooth or Textured Geomembrane Seam Acceptable Specifications

PROPERTY	TEST METHOD	UNITS	MINIMUM AVERAGE VALUE (1)	
			NONTEXTURED	TEXTURED
Shear Strength (2)	ASTM D 4437 (NSF 54 modified)	ppi	44	40
Shear Elongation (2)	—	percent	50	50
Peel Strength (3, 4) Fusion	ASTM D 4437 (NSF 54 modified)	ppi	40	36
Peel Strength (3,4) Extrusion	ASTM D 4437 (NSF 54 modified)	ppi	36	36
Peel Separation (5)	—	percent	10	10

(1) If the lengthwise edges of the textured geomembrane panels are nontextured, then the nontextured specifications shall apply for the testing of seams made along these edges.
(2) Five out of the five test specimens must meet these requirements. In addition, failure type must be FTB for all five specimens.
(3) Four out of the five specimens must meet the three requirements. The fifth specimen shall achieve 90 percent of the listed peel strength.
(4) Failure type must be FTB for four out of five test specimens.
(5) Maximum Acceptance Value for four out of five test specimens. The fifth specimen shall have no more than 50 percent peel separation.

RMT

Section 9
Geonets

Geonets will be part of a geocomposite consisting of a non-woven geotextile heat bonded to the top of the geonet. The geonets used in the geocomposites will meet the applicable requirements of this section. Geocomposites are discussed in Section 11.

As geonets will not be used independently (*i.e.*, only used as a component of the geocomposite), portions of this section are not applicable. Section 9 (Geonets) is included to provide a reference source for geonet material specifications and testing requirements as called for in Section 11.

This section is divided into three major subheadings that cover the QA requirements for Pre-Installation (includes geonet manufacturers), Installation, and Post-Installation (includes the final examination of the geonets prior to placing the appropriate material above the geonet). The terms Pre-Installation, Installation, and Post-Installation are applicable only to the geonet installation and do not apply to the overall construction of the landfill facility.

9.1 Pre-Installation

9.1.1 Manufacturing

Material Specifications

The geonets used must be fabricated from polyethylene resin, and the fabricated geonet must be classified as Type III, Class C, Category 4 or 5 as defined by ASTM D 1248 (Note: this classification is based on tests performed on the finished product, ***not*** the polyethylene resin used to fabricate the geonet).

Quality Control Requirements

Prior to the delivery of any geonet rolls to the site, the Geonet Manufacturer will provide the CQA Officer with the following information:

1. The resin supplier, location of supplier's production plant(s), and resin brand name and product number.
2. Test results obtained by the Geonet Manufacturer and/or the Resin Manufacturer's testing laboratories to document the quality of the resin used in fabricating the geonet.

3. The QC Plan that the Geonet Manufacturer will be using for the geonet being supplied.

Every roll of geonet for delivery to the site must be manufactured and inspected by the Geonet Manufacturer, according to the following requirements:

1. First-quality polyethylene resin must be used.
2. The geonet must contain no more than a maximum of 1 percent by weight of additives, fillers, or extenders, excluding carbon black.
3. The geonet must have no striations, roughness, or cuts on the surface.
4. The geonet must be free of blisters, undispersed raw materials, or any other sign of contamination by foreign matter.

The Geonet Manufacturer will routinely perform the following tests on the raw resin, at the stated frequencies, and will report the results on a periodic basis to the CQA Officer:

1. Collect and test a minimum of one sample for the parameters in Item #2 below for every 50,000 pounds of resin received.
2. Perform carbon black content by ASTM D 1603, carbon black dispersion by ASTM D 2663 Method B, specific gravity by ASTM D 792 Method A, melt flow index by ASTM D 1238 with a load of 2.16 kg and at 190°C, and moisture content by any approved method.

Manufacturer's Certification

The Geonet Manufacturer will provide certification, based on tests performed in accordance with the methods listed in Table 9-1 that the geonet supplied under this plan will meet the material specifications listed in Table 9-1. These tests may be performed at a minimum frequency of 1 per 100,000 square yards of material delivered to the site by the Geonet Manufacturer's laboratory or by a laboratory contracted by the manufacturer. Additionally, the manufacturer shall provide certification that the manufacturer's QC Plan was fully implemented for the geonet materials supplied under this plan. The manufacturer shall provide documentation to verify the results of the manufacturer's CQA Plan implementation if requested by the CQA Officer.

9.1.2 Delivery, Handling, and Storage of Geonet Rolls

Each geonet roll for use at the landfill facility will be marked by the Geonet Manufacturer with the following information and in the following manner:

1. When the net is rolled on a core, identify each roll with a durable gummed label, or an equivalent, on the inside of the core and on the outside of the protective wrapping for the roll.
2. Each roll label will contain the following information at a minimum:
   - Name of manufacturer (or supplier)
   - Style and type number
   - Roll length and width
   - Batch (or lot) number
   - Nominal product thickness
   - Date of manufacture
   - Direction for unrolling
   - Roll number
3. On the outside of the roll, all lettering should be a minimum ½ inch high; and on the inside of the core, the lettering should be at least ¼ inch high.

The Geonet Manufacturer will use the following guidelines in packaging and preparing all geonet rolls for shipment:

1. When cores are required, use those that have a crushing strength sufficient to avoid collapse or other damage while in use.
2. Geonets must be rolled on the cores so that they will unroll in the machine direction. The machine direction is defined as the direction parallel with the longest diagonal in the diamond pattern of the geonet.

The following practices should be used as a minimum in receiving and storing geonet rolls in the designated storage area at the job site:

1. While unloading or transferring the geonet rolls from one location to another, prevent damage to the geonet. If practicable, the Installer may use forklift trucks fitted with poles that can be inserted into the cores of rolls. Be sure that the poles are at least $^{2}/_{3}$ the length of the rolls to avoid breaking the cores and possibly damaging the geonet. Do not drag the rolls.
2. Store the geonet rolls to ensure that they are adequately covered to protect the geonet from the following:
   - Precipitation
   - Ultraviolet radiation, including sunlight

- Strong oxidizing chemicals, acids or bases
- Flames, including welding sparks
- Temperatures in excess of 160°F
- Soiling

The RPR will observe and document throughout the pre-installation, installation, and post-installation periods that the Installer provides adequate handling equipment used for moving geonet rolls and that the equipment and handling methods used do not pose unnecessary risk of damage. The Installer is responsible for means and methods to implement the work.

The Installer will be responsible for ensuring that materials installed meet specifications (*i.e.*, the roll marking label information indicates required specifications and properly represents materials). The RPR will maintain a log of geonet roll deliveries. The following information, at a minimum, will be recorded on the log for each shipment received at the job site:

1. Date of shipment from Geonet Manufacturer
2. Date of receipt of delivery at job site
3. For each geonet roll the following information will be noted:
   - Roll number
   - Batch (lot) number

9.2 Installation

This section describes the QA requirements applicable to the installation of geonets. This section includes installation, observations, and documentation of geonets.

9.2.1 Placement

The Installer will install all geonets in such a manner as to ensure that they are not damaged in any way and in a manner that complies with the following:

1. On sideslopes, the geonets will be securely anchored, then rolled down the slope in such a manner as to continually keep the geonet in tension. If necessary, the geonet will be positioned by hand after being unrolled to minimize wrinkles.
2. In the presence of winds, all geonets will be secured by suitable methods. The temporary weighted material will be left in place until replaced with cover material as shown on the design plans and specifications.
3. Cutting should be done according to manufacturer's recommendations.

4. The Installer will take necessary precautions to prevent damage to underlying layers during placement of the geonet.
5. During placement of geonets, care will be taken not to entrap in the geonet any stones, excessive dust, or moisture that could cause clogging of the drainage system, and/or stones that could damage the adjacent geomembrane. If dirt or excessive dust is entrapped in the geonet, the geonet will be cleaned prior to placement of the next material on top of the geonet.
6. Unless otherwise approved by the CQA Officer, geonets will not be welded or tack welded to the underlying geomembranes.

9.2.2 Stacking and Joining

When several layers of geonets are stacked, care should be taken to prevent strands from one layer from penetrating the channels of the adjacent layer, thereby significantly reducing the transmissivity. This cannot happen if stacked geonets are placed in the same direction. A stacked geonet should not be laid in a perpendicular direction to the underlying layer.

The following guidelines should be used in stacking and joining geonets:

1. Adjacent rolls will be overlapped by a minimum of four (4) inches.
2. These overlaps will be secured by spot-welding to each other or tying.
3. Tying can be achieved by strings, plastic fasteners, or polymer braid. Tying devices will be white or brightly colored for easy identification. Metallic devices will not be used in any circumstances.

9.2.3 Repairs

Any tears or other defects in the geonet will be repaired by placing a patch extending a minimum of 2 feet beyond the edges of the hole or tear. The patch will be secured to the original geonet by spot-welding or tying every 6 inches. If the tear or other defect width is more than 50 percent of the roll width, the damaged area will be cut out and replaced with new geonet. Tying devices as indicated in Subsection 9.2.2 will be used. The RPR will examine and document that the repair of any geonets is performed according to the above procedure.

9.3 Post-Installation

9.3.1 Final Examination

The RPR will perform a final geonet examination after installation of each geonet layer has been completed. The objectives of this step are as follows:

1. Examine for presence of tears or defects.
2. Examine overlaps and tying or spot-welding.

If any portion of the geonet requires repairs due to the above examination, they will be performed according to the procedures in Subsection 9.2.3. The RPR will document the result of the final examination, including any subsequent repairs.

Table 9-1
Geonet Properties

PROPERTY	UNITS	VALUE	TEST	CRITERION
Thickness	mils	225	ASTM D 1777	Minimum
Density	g/cu cm	0.93	ASTM D 1505	Minimum
Melt Flow Index	g/10 min	1.0	ASTM D 1238	Maximum
Carbon Black Content	Percent	2 - 3	ASTM D 1603	Range

RMT

Section 10
Geosynthetic Clay Liner

10.1 Introduction

This section of the CQA Plan applies to the geosynthetic clay liner used in the landfill base composite liner and in the composite final cover. This section is divided into three major subheadings, which cover the quality assurance requirements for pre-installation (includes the GCL manufacturer), installation, and post-installation (includes the final examination of GCL prior to the placement of the geomembrane). The terms pre-installation, installation, and post-installation are applicable only to the GCL installation and do not apply to the overall construction of the landfill facility.

10.2 Pre-installation

Pre-installation activities are designed to help ensure that a high-quality product is being manufactured and that it is properly delivered, handled, and stored to maintain its quality.

10.2.1 Manufacturer's Quality Control Plan

The manufacturer of each component of the GCL and the GCL itself will have a Manufacturer's Quality Control Plan (MQCP) to ensure that their product meets all of the stated minimum properties. These manufacturers include the Bentonite Supplier, the Geotextile Manufacturer, and the GCL Manufacturer.

Bentonite Supplier

The Bentonite Supplier will have a MQCP that will be adhered to in the manufacturing process. This plan will include the following information:

1. Documentation that the bentonite is sodium bentonite
2. Testing that demonstrates that the bentonite meets specified gradation requirements
3. Testing that demonstrates that the bentonite meets specified index test requirements
4. Testing that demonstrates that the bentonite has not been treated with synthetic chemicals or polymers

Geotextile Manufacturer

The Geotextile Manufacturer will have a MQCP that will be adhered to in their manufacturing process. This plan will include the following provisions:

1. Testing that demonstrates that the product is made of specified polymers
2. Testing that demonstrates that the product meets certain minimum average roll values for geotextiles

GCL Manufacturer

The GCL manufacturer will have a MQCP that describes the procedures for accomplishing quality in the final product. At a minimum, the tests shown in Table 10-1 shall be performed by the Manufacturer.

This MQCP will also dictate the following requirements:

- Overlap alignment lines are to be marked on the edges.
- Completed rolls are to be securely wrapped in plastic.
- Completed rolls are to be stored indoors, and provisions are to be in place to prevent rolls from being stacked too high, to ensure that they are kept dry, and to prevent damage during handling.
- QC certificates are to be provided.

10.2.2 Materials

The GCL will consist of a layer of pure sodium bentonite clay encapsulated between two geotextiles, and will comply with all of the manufacturing processes and physical/chemical criteria listed in this Section.

The bentonite clay utilized in the manufacture of the GCL, as well as any accessory bentonite clay (*i.e.*, Volclay® granular sodium bentonite or approved equivalent) provided for seaming and detail work, will meet the manufacturer's minimum requirements, as specified in the MQCP.

The geotextile components of the GCL, and the GCL itself, will meet the minimum requirements of the respective MQCPs.

10.2.3 GCL Delivery, Handling, and Storage

The GCL panels will be supplied to the site in factory-produced rolls, which are of standard factory roll dimensions.

Each roll of GCL supplied to the site will be labeled with the following information:

1. Name of manufacturer
2. Product type and identification number (if any)
3. Lot (Batch) number
4. Date of manufacture
5. Roll number and dimensions

The GCL Manufacturer will ensure that the crushing strength of all GCL roll cores will be sufficient to avoid collapse or other damage while in use.

The rolls of GCL will be carefully unloaded by the Contractor upon arrival at the site. At a minimum, the following practices will be followed in receiving and storing GCL rolls in the covered storage area at the job site:

1. While unloading or transferring the GCL rolls from one location to another, precautions will be taken to prevent damage to the GCL.
2. For standard rolls, a 3-inch Schedule 120 steel support pipe will be inserted through the cardboard roll core. The slings or lifting chains will be attached at one end to the support pipe and at the other end to the bucket of a front-end loader or lifting device. A spreader bar will be used to support and spread the slings. The bar and support pipe must be long enough to prevent damage to the edges of the GCL during hoisting.
3. Alternatively, forklift trucks can be modified to lift the rolls with a 3-inch Schedule 120 steel bar, securely attached to the forklift and inserted into the roll core. At no time will the rolls be lifted by sliding the forks under the roll.
4. The rolls of GCL will be stored in their original, unopened, wrapped cover in a clean, dry area. The material will be stored off the ground on pallets or by other suitable techniques that provide continuous support over the entire length of the roll. It will be covered with a heavy, protective tarpaulin or stored beneath a roof. Care will be used to protect the GCL from the following:

- Precipitation
- Ultraviolet radiation, including sunlight
- Strong oxidizing chemicals, acids or bases
- Flames, including welding sparks
- Temperatures in excess of 160°F

The RPR will be responsible throughout the pre-installation, installation, and post-installation periods, for observing and documenting that the Installer provides adequate handling equipment used for moving GCL rolls and that the equipment and handling methods used do not pose any risk of damage.

The RPR will be responsible for making certain that the name of the manufacturer, the type, and the thickness of each roll (as noted on the roll marking label described above) are correct. The RPR will also maintain a log of GCL roll deliveries. The following information, at a minimum, will be recorded on the log for each shipment received at the job site:

1. Date of receipt of delivery at job site
2. For each GCL roll, the following information will be noted:

- Roll number
- Batch (lot) number

10.2.4 Submittals

Submittals will be made prior to installation of the GCL concerning the GCL manufacturer/production information and the GCL installer information.

The GCL Manufacturer/Production Information will include the following:

1. Corporate background and information.
2. MQCP for bentonite, geotextile, and GCL manufacturers.
3. Project reference list consisting of the principal details of at least 10 projects totaling at least 8 million square feet of GCL installation.
4. Results of tests conducted by the Bentonite Supplier and Geotextile Suppliers to document the quality of the materials used to manufacture the GCL rolls assigned to the project.
5. Copy of QC certificates, signed by a responsible entity of the Manufacturer. Each quality control certificate will include roll identification numbers, and the results of quality control tests (refer to Subsection 10.2.1 above for minimum testing requirements).
6. Manufacturer's written certification that the GCL meets the project specifications, that the GCL has been continuously inspected and found to be needle-free, that the bentonite will not shift during transportation or installation, and that the bentonite and geotextile materials meet the Manufacturer's specifications

GCL Installer information will include the following:

1. Corporate background information
2. Project reference list consisting of the principal details of at least five projects totaling at least 1 million square feet
3. List of personnel performing field operations, along with pertinent experience information, if required by the RPR or CQA Officer

The proposed panel layout diagram identifying placement of the GCL panels and seams, as well as any variances or additional details that deviate from the engineering drawings will also be submitted prior to installation. The layout will be drawn to scale, will include information such as dimensions and details, and will be adequate for use as a construction plan.

10.3 Installation

The following installation procedures are designed to ensure the effectiveness of the GCL in meeting its design requirements and to simplify the deployment procedures. These procedures are to be followed by the Installer, unless the Installer proposes alternative procedures in writing and the CQA Officer approves them in writing prior to installation.

10.3.1 Testing Requirements

This subsection describes the test methods, including sampling procedures and frequencies, and the role of the Geosynthetic Testing Laboratory in testing the GCL roll samples. Unless specified otherwise, all sampling procedures will be performed in accordance with the referenced test method defined in this section.

GCL roll samples will be collected by the Contractor at the discretion of, and under the direction of, the RPR, at a rate specified by the RPR.

Samples will be 3 feet long by the full width of the roll and will not include the first 3 feet of any roll.

Table 10-1 lists the tests and the test methods that may be performed on GCL roll samples. The specifications and methods used in evaluating the results are discussed later in this subsection.

Role of Testing Laboratory

The Geosynthetic Testing Laboratory will be responsible for performing the tests on samples submitted to them. The results of tests performed will be reported to the RPR and CQA Officer.

Retesting of GCL rolls for quality assurance purposes, because of failure to meet any or all of the acceptance specifications in this section, can only be authorized by the CQA Officer.

The GCL Manufacturer and/or Installer may perform their own tests according to the methods and procedures defined in Table 10-1; however, the results will only be applicable to their own quality control needs. These results will not be substituted for the quality assurance testing described herein.

Procedure for Determining GCL Roll Test Failures

Table 10-1 lists the specifications that are applicable to the GCL. For any referenced test method that requires the testing of multiple specimens, the criteria in Table 10-1 will be met based on the average results of the multiple specimen tests.

The following procedure will be used for interpreting the results relative to acceptance or rejection of rolls, lots, and shipments of GCL to the site:

1. If the test values meet the stated specifications, then the roll and batch will be accepted for use at the job site. If the sample represents all rolls from an entire shipment, then the entire shipment will also be considered accepted.

2. If the results do not meet the specification, then the roll and the batch will be retested at the Contractor's expense using specimens either from the original roll sample or from another sample collected by the RPR. For retesting, two additional tests will be performed for the failed test procedure. (Each additional test will consist of multiple specimen tests if multiple specimens are called for in the failed test procedure.) If both of the retests are acceptable, then the roll and batch will be considered as having passed this particular acceptance test; if either of the two additional tests fail, then the roll and batch will be considered as being unsuitable without further recourse. The RPR may obtain samples from other rolls in the batch. On the basis of testing these samples, the CQA Officer may choose to accept a portion of the batch while rejecting the remainder.

   If retesting does not result in passing test results as defined in the preceding paragraph, or if there is any other nonconformity with the material specifications, then the Contractor will withdraw the rolls from

use in the project at Contractor's sole risk, cost, and expense. Once withdrawn, the same rolls will not be resubmitted for use. Expenses for removing this GCL from the site and replacing it with acceptable GCL will be the sole risk and responsibility of the Contractor.

10.3.2 Required Equipment

The following installation equipment is required on site:

1. Front-end loader, crane, or other similar equipment. The selected piece of equipment will not cause damage to the subgrade, such as rutting. The Installer will verify in the presence of the RPR that the selected piece of equipment does not damage the subgrade
2. A spreader bar to prevent slings from damaging the ends of the rolls.
3. 3-inch–diameter Schedule 120 steel pipes to be inserted into the roll's core for lifting.
4. Wooden pallets for aboveground storage of the GCL rolls.
5. Heavy waterproof tarps for protecting all GCL rolls.
6. Sandbags for securing the GCL during installation and for securing the tarps.
7. Adhesive or tape for securing patches.
8. Granular bentonite for seams and patches, and for securing around penetrations and structures as shown on the drawings.

10.3.3 Surface/Subgrade Preparation

GCL liner installation will not begin until a proper subbase has been prepared to accept the bentonite liner. Base material will be fine-grained soil free from angular rocks, roots, grass, and vegetation. Foreign materials and protrusions will be removed; all cracks and voids will be filled; and the surface will be made smooth and uniformly sloping. Unless otherwise required by the contract specifications, the prepared surface will be free from excessive moisture, loose earth, rocks or clay clods larger than ½ inch in diameter, rubble, and other foreign matter. The subgrade will be uniformly compacted to ensure against localized settlement and rutting under wheel loads and will be smoothed with a smooth drum roller.

The surface on which the liner is to be placed will be maintained in a firm, clean, and smooth condition, free of standing water, during liner installation.

10.3.4 Deployment

As each roll is moved from the storage area, the labels will be removed by the Installer's Superintendent or RPR for storage in the project file.

The rolls of GCL will be brought to the area to be lined with a front-end loader, and support pipe will be set up such that the roll of liner is fully supported across its length. A spreader bar or similar device will be used to prevent the lifting chains or slings from damaging the edges. Dragging of the GCL liner will be minimized.

The Contractor will ensure, and the RPR will verify, that the following criteria are being met:

1. The equipment used does not damage the GCL by handling, excessive heat, leakage of hydrocarbons, or by other means.
2. The prepared surface underlying the GCL has not deteriorated since previous acceptance, and it is still acceptable at the time of GCL placement.
3. Personnel working on the GCL do not smoke, wear damaging clothing, or engage in other activities that could damage the GCL.
4. The method used to unroll the GCL does not cause damage to the GCL, and/or the subgrade.
5. The method used to place the rolls minimizes wrinkles (especially wrinkles between adjacent panels).

GCL must not be placed during precipitation events, in the presence of excessive moisture, in any area of ponded water, or during excessive winds. The GCL must be dry when installed and must be dry when covered with soil.

The proper side of the GCL, as per the manufacturer's recommendation, will face upward (unless otherwise dictated by project requirements). The liner will be placed over the prepared surface such that material handling will be minimized.

The GCL panels will be placed in a manner that ensures sufficient overlap as described in Subsection 10.3.5. Horizontal seams will not occur on slopes steeper than 7 horizontal: 1 vertical.

The cover material (*i.e.*, geocomposite and soil) will be placed over the bentonite liner during the same day as the placement of the GCL. Only those GCL rolls that can be covered that same day will be unpacked and placed in position.

When wind conditions could affect installation, the GCL liner installation will be started at the upwind side of the project and will proceed downwind. The leading edge of the liner will be secured at all times with sandbags or other means sufficient to hold it down during high winds.

The GCL will be installed in a relaxed condition and will be free of tension or stress upon completion of the installation. Stretching of the liner to fit will not be allowed. Deployed rolls (panels) will be straightened by the installation personnel to smooth out creases or irregularities.

The RPR will visually inspect the geotextile's quality, the bentonite uniformity, and the degree of hydration, if any, of the GCL. Any areas in need of repair will be marked.

10.3.5 Seaming

Once the first panel has been deployed, adjoining panels will be laid with a 6-inch minimum overlap on longitudinal seams, and 24 inches on the panel end seams. Six-inch and 12-inch overlap lines will be marked on the liner to assist in obtaining the proper overlap. All dirt, gravel, or other debris will be removed from the overlap area of the GCL.

Seam overlaps, whenever possible, will be placed such that the direction of flow is from the top panel to the underlying panel to form a shingle effect.

If the GCL requires a granular bentonite seam, then the overlapping panel edge will be pulled back and granular Volclay® (or approved equivalent) sodium bentonite will be poured continuously along all seams and lap areas from the panel edge to the 6-inch lapline, at a minimum application rate of ¼ pound per linear foot.

10.3.6 Patches/Repairs

Irregular shapes, cuts, or tears in the installed GCL will be covered with sufficient liner to provide a 12-inch overlap in all directions beyond the damaged area. A layer of granular bentonite will be placed in the overlap zone in accordance with the Manufacturer's recommendations. An epoxy-based adhesive, or other approved method, will be used to secure the patch during backfill operations. Alternatively, the patch can be placed underneath the defective liner.

Patch repairs should not be allowed on slopes greater than 7 horizontal: 1 vertical, unless a water-soluble adhesive, or other approved method, is used to secure the patch.

10.3.7 Penetration Seals

The GCL will be sealed around penetrations, pipes, and structures in accordance with the recommendations of the GCL Manufacturer.

Pipe penetrations will incorporate a collar of GCL wrapped around the pipe and securely fastened. A bentonite or mastic grout will be placed around the corners for additional protection.

Depending on the location of the pipe penetration, an additional GCL skirt placed over the bentonite grout may be required by the GCL Manufacturer to provide a third level of protection and to prevent the bentonite grout from being displaced.

If the seal requires granular bentonite, then a 1-inch to 2-inch cut will be excavated around the circumference of the pipe, into the subgrade at least 12 inches out from the pipe. Volclay® sodium bentonite (or approved equivalent) will then be packed around the pipe in the subgrade excavation and on adjacent areas so that the pipe is surrounded with granular bentonite.

The GCL panel will then be placed over the pipe by penetrating the GCL with slits in a "pie" configuration where the pipe is to protrude in a manner that will create a snug fit between the GCL and the pipe.

More sodium bentonite will then be spread around the cut edges of the GCL against the pipe and over adjacent areas.

To complete the pipe penetration seal, a collar of GCL will be cut in a manner similar to that made on the main panel and will be fit around the pipe, with additional Volclay® sodium bentonite being applied into any gaps that may remain.

10.3.8 Covering GCL

Only the amount of GCL that can be inspected, repaired, and covered in the same day will be installed. The GCL must be covered the same day on which it is installed.

Geosynthetics

When covering the GCL, precautions will be taken to prevent damage to the GCL by restricting heavy equipment traffic. The following requirements apply to material placement over the GCLs:

1. Equipment used for placing the material must not be driven directly on the GCL.

2. A minimum thickness of 1 foot of fill is specified between a light dozer (*i.e.*, maximum contact pressure of 5 lb/sq. inch) and the composite liner (consisting of a geomembrane overlying a GCL).
3. A minimum thickness of 3 feet of fill is specified between rubber-tired vehicles and the composite liner.

Any leading edge or panels of GCL left unprotected must be covered with a heavy, waterproofing tarp that is secured and protected with sandbags or other ballast.

10.3.9 Construction Quality Assurance

Installer

The Installer will maintain documentation in the daily installation records, and will provide such documentation to the RPR that the above conditions are fulfilled. The RPR will be informed if any of the above conditions are not met.

The GCL will be installed according to the manufacturer's guidelines, the CQA Plan, and the project specifications.

Resident Project Representative

The RPR will be responsible for the following quality assurance duties:

1. Observation of the installation of the GCL for compliance with the manufacturer's guidelines, the CQA Plan, and the project specifications.
2. Collection of the field acceptance samples to be tested as indicated in Table 10-2.
3. Visual inspection of the geotextile quality, bentonite uniformity, and degree of hydration, if any, on the GCL. Any areas in need of repair will be marked.
4. Recording each roll number and lot number as panels are deployed, along with a general description of the location of each panel.
5. Inspection of the overlaps.
6. Inspection of the anchoring and sealing around penetrations.

10.3.10 Submittals

The following will be submitted during installation:

1. Daily records/logs prepared by the Installer documenting work performed, personnel involved, general working conditions, and any problems encountered or expected on the project. These records will be submitted on a weekly basis.
2. Copy of subgrade acceptance forms by the Installer.
3. QC documentation.

10.4 Post-Installation

10.4.1 Final Examination

The RPR will perform a final GCL examination after portions of installation have been completed. The RPR will examine the GCL for the following:

1. Tears or defects
2. Proper overlaps
3. If any portion of the GCL requires repairs based on the above examination, it will be repaired in accordance with the procedures in Subsection 10.3.6.

10.4.2 Submittals

The following will be submitted after installation is completed:

1. Installation certification prepared by the Installer certifying that the GCL was installed in substantial accordance with the specifications and the CQA Plan.
2. An as-built panel layout diagram prepared by the Installer identifying the placement of panels and seams. The numbering sequence will be as agreed upon between the RPR and the Installer prior to commencing installation.
3. A copy of the Warranty obtained from the Manufacturer/Installer.

Table 10-1
Summary of Specifications and Quality Control Testing

	PROPERTY	TEST METHOD[5]	UNITS	VALUE	MIN. TESTING FREQUENCY	TESTED BY
Bentonite properties (bentonite removed from finished product)	Free swell Liquid limit Fluid loss Moisture content [1]	USP-NF-XVII ASTM D 4318 API 13 A ASTM D 4643	mL % mL %	30 (MARV) 500 (MARV) 15 (MAX.A.R.V.) 20 (TYP)	1/20,000 SF	Independent Laboratory
Adhesive	Adhesion	Visual	N/A	Continuous adhesion to backing materials	Periodic	Manufacturer
Physical GCL properties	Thickness	ASTM D 1777	inches	0.2 (TYP)	1/20,000 SF	Manufacturer
	Wide width tensile[2]	ASTM D 4595	ppi	100 (TYP)	Periodic	Independent Laboratory
	Grab tensile[3]	ASTM D 4632	lb	90 (MARV)	Per ASTM D 4354	Manufacturer
	Bentonite unit weight[1] @ 25% moisture	Direct measurement 12 inch x roll width	lb/sqf	0.95 (MARV)	1/20,000 SF	Manufacturer
	Shear resistance (hydrated) Shear resistance (dry)	ASTM D 35.01.81.07 (draft)	psf psf	500 (TYP)[4] 500 (TYP)[4]	Periodic	Independent Laboratory
Hydraulic Properties	Permeability GCL 5 psi effective stress Overlapped GCL 5 psi effective stress	 ASTM 5084 ASTM 5084	 cm/s cm/s	 5×10^{-9} (MAX) 5×10^{-9} (MAX)	 1/750,000 SF 1/750,000 SF	 Manufacturer Manufacturer
	GCL 30 psi effective stress Damaged GCL 3 each, 1 inch holes (5 psi effective stress) After 3 wet-dry cycles (5 psi effective stress) After 5 freeze-thaw cycles (5 psi effective stress)	ASTM 5084 ASTM 5084 ASTM 5084 ASTM 5084	cm/s cm/s cm/s cm/s	$< 5 \times 10^{-10}$ (TYP) $< 5 \times 10^{-9}$ (TYP) $< 5 \times 10^{-9}$ (TYP) $< 5 \times 10^{-9}$ (TYP)	Periodic	Independent Laboratory

(1) D4643 modified to include wet weight as the denominator.
(2) Wide width tensile performed on finished 500SP.
(3) Machine (WARP) direction of primary backing.
(4) Shear resistance of 500SP is independent of normal stress.
(5) Standard test methods modified where appropriate to facilitate testing a GCL.

Table 10-2
Collection of Field Acceptance Samples

PROPERTY	METHOD	MINIMUM ACCEPTABLE VALUE
Fluid loss	API 13 A	15 mL(1)
Free swell	USP-NF-XVII	24 mL at 24 hours(2)
Liquid limit	ASTM D 4318	500%(2)

(1) Maximum Average Roll Value (Max.A.R.V.)
(2) Minimum Average Roll Value (M.A.R.V.)

RMT

Section 11
Geocomposites

A geocomposite will be installed over the barrier layer in the final cover and the barrier layer in the liner on the 3 (horizontal): 1 (vertical) sideslopes to provide drainage.

This section is divided into three major subheadings, which cover the QA requirements for Pre-Installation, Installation, and Post-Installation. The terms Pre-Installation, Installation, and Post-Installation are applicable only to the geocomposite installation and do not apply to the overall construction.

11.1 Pre-Installation

11.1.1 Manufacturing

Material Specifications

Geotextile and geonet suitable for producing the geocomposite to be used in the landfill final cover are based on the material specifications of the geotextile and geonet listed in Subsections 7.1.1 and 9.1.1, respectively.

Quality Control Requirements/Manufacturer's Certification

The Geocomposite Manufacturer (fabricator) will provide the CQA Officer with certification of geotextile and geonet materials used in the fabrication of the geocomposite rolls delivered to the job site. The Geocomposite Manufacturer will also provide the CQA Officer with representative samples of the geotextile used in the fabrication of the geocomposite rolls for conformance testing. Requirements for the manufacturer's certification for geonets are described in Subsection 9.1.1. Requirements for the manufacturer's certification of geotextiles are shown in Table 11-1.

11.1.2 Delivery, Handling, and Storage of Geocomposite Rolls

Each geocomposite roll, for use at the landfill facility, will be marked by the Geocomposite Manufacturer with the following information and in the following manner:

1. When fabric is rolled on a core, identify each roll with a durable gummed label, or an equivalent, on the inside of the core and on the outside of the protective wrapping for the roll.
2. Each roll label will contain the following information at a minimum:
   - Name of manufacturer (or fabricator)
   - Style and type number
   - Roll length and width
   - Batch (or lot) number, if applicable
   - Date of manufacture
   - Direction for unrolling
   - Roll number
3. On the outside of the roll, all lettering should be a minimum of ½ inch high, and on the inside of the core, the lettering should be at least ¼ inch high.

The Geocomposite Manufacturer will use the following guidelines in packaging, wrapping, and preparing all geocomposite rolls for shipment:

1. When cores are required, use those that have a crushing strength sufficient to avoid collapse or other damage while in use.
2. Cover each roll with a wrapping material that will protect the geotextile from damage due to shipment, water, sunlight, or contaminants.

The following practices should be used as a minimum in receiving and storing geocomposite rolls in the designated storage area at the job site:

1. While unloading or transferring the geocomposite rolls from one location to another, prevent damage to the geocomposite. If practicable, the Installer may use forklift trucks fitted with poles that can be inserted into the cores of rolls. Be sure that the poles are at least $^2/_3$ the length of the rolls to avoid breaking the cores and possibly damaging the geocomposite. Do not drag the rolls.
2. Store the geocomposite rolls to ensure that they are adequately covered to protect the geocomposite from the following:
   - Precipitation
   - Ultraviolet radiation, including sunlight

- Strong oxidizing chemicals, acids or bases
- Flames, including welding sparks
- Temperatures in excess of 160°F
- Soiling

The RPR will observe and document throughout the pre-installation, installation, and post-installation periods for observing and documenting that the Installer provides adequate handling equipment used for moving geocomposite rolls and that the equipment and handling methods used do not pose unnecessary risk of damage. The Installer is responsible for means and methods to implement the work.

The Installer will be responsible for ensuring that materials installed meet specifications (*i.e.*, the roll marking label information indicates required specifications and properly represents materials). The RPR will maintain a log of geocomposite roll deliveries. The following information, at a minimum, will be recorded on the log for each shipment received at the job site:

1. Date of shipment from Geocomposite Manufacturer
2. Date of receipt of delivery at job site
3. For each geocomposite roll, the following information will be noted:
   - Roll number
   - Batch (lot) number, if applicable

11.2 Installation

This section describes the QA requirements applicable to the installation and testing of geocomposites. This section includes roll sample testing, installation, observations, and documentation of geocomposites.

11.2.1 Testing Requirements

This subsection describes the test method, including sampling procedures and frequencies, and the role of the Geosynthetic Testing Laboratory in testing the geocomposite roll samples.

Test Method

Unless specified otherwise, all sampling procedures will be performed in accordance with the referenced test method defined in this section.

Geocomposite roll samples will be collected by the RPR. Sample frequency will be based on ASTM D 4354, Procedure A, where the number of units per lot is defined as the number of rolls for a specified lot (using batch or lot numbers) delivered to the job site in one shipment. Required sampling frequencies are shown in Table 8-1.

Samples will be 3 feet long by the full width of the roll and will not include the first 3 feet of any roll. Since machine direction for the geocomposite rolls is the direction that the material comes off the roll, machine direction for any sample will always be along the 3-foot-length dimension of the sample.

Table 11-1 lists the test and the test method to be performed on geocomposite roll samples. The specifications and methods in evaluating the results are discussed below under Procedures for Determining Geocomposite Roll Test Failures.

Results for ply adhesion will be reported for both the machine and cross direction (machine direction will be taken as the direction the geonet is taken off of the rolls).

Role of Testing Laboratory

The Geosynthetic Testing Laboratory will be responsible for performing the test on samples submitted to them as described above. Results of tests performed will be reported to the CQA Officer and the RPR.

Retesting of geocomposite rolls for QA purposes, because of failure to meet any or all of the specifications listed below, can only be authorized by the CQA Officer.

The Geocomposite Manufacturer (fabricator) and/or Installer may perform their own tests according to the methods and procedures defined in Table 11-1; however, the results will only be applicable to their own QC needs. These results will not be substituted for the QA testing described herein.

Procedures for Determining Geocomposite Roll Test Failures

Table 11-1 lists the accepted values that are applicable to geotextile component the geocomposite. The values in Table 11-1 are based on minimum values.

The following procedure will be used for interpreting results relative to acceptance or rejection of rolls and shipments of geocomposites to the site:

1. Test results for the stated specifications in Table 11-1 will be evaluated in accordance with ASTM D 4759 for determining acceptance of roll shipments.
2. The RPR will coordinate and document the conformance testing and the determination of material acceptance or rejection.

11.2.2 Placement

The Installer will install all geocomposites in such a manner as to ensure that they are not damaged in any way and in a manner that complies with the following:

1. On sideslopes, the geocomposites will be securely anchored, then rolled down the slope in such a manner as to continually keep the geocomposite in tension. If necessary, the geocomposite will be positioned by hand after being unrolled to minimize wrinkles.
2. In the presence of winds, all geocomposites will be secured by suitable methods. The temporary weighted material will be left in place until replaced with cover material as shown on the design plans and specifications.
3. Cutting should be done according to manufacturer's recommendations.
4. The Installer will take necessary precautions to prevent damage to underlying layers during placement of the geocomposite.
5. During placement of geocomposites, care will be taken not to entrap any stones, excessive dust, or moisture that could cause clogging of the drainage system.

11.2.3 Overlaps and Joining

The following requirements will be used with regard to overlapping and joining of geocomposite rolls:

1. Adjacent rolls will be overlapped by a minimum of 4 inches.
2. These overlaps may be secured by tying to each other.
3. Tying can be achieved by strings, plastic fasteners, or polymer braid. Tying devices will be black or brightly colored for easy identification. Metallic devices will not be used in any circumstances.

4. No horizontal joints or overlaps will be allowed on slopes greater than 5 horizontal to 1 vertical (*i.e.*, seams will be along, not across, the slope), except as part of a patch.

11.2.4 Repairs

Any tears or other defects in the geocomposite will be repaired by placing a patch extending a minimum of 2 feet beyond the edges of the hole or tear. The patch will be secured to the original geocomposite by tying every 6 inches. If the tear or other defect width is more than 50 percent of the roll width, the damaged area will be cut out and replaced with new geocomposite material. Tying devices will be as indicated in Subsection 11.2.3. The RPR will examine and document that the repair of any geonets is performed according to the above procedure.

11.3 Post-Installation

11.3.1 Final Examination

The RPR will perform a final geocomposite examination after installation of each geocomposite layer has been completed. The objectives of this step are as follows:

1. Examine for presence of tears or defects
2. Examine overlaps to make certain that they are in conformance with the requirements of Subsection 11.2.3.

If any portion of the geocomposite requires repairs due to the above examination, they will be performed according to the procedures in Subsection 11.2.4.

If there will be an extended time delay between completion of the geocomposite and the start of the installation of any overlying cover, the Installer will make provisions by using a temporary covering or other suitable methods, to protect the upper geotextile component against exposure to sunlight and ultraviolet radiation.

11.3.2 Placement of Soil Materials

The construction contractor will place all soil materials located on top of the geocomposite in such a manner as to minimize the following:

1. Damage of the geocomposite
2. Slippage of the geocomposite on underlying layers
3. Excessive tensile stresses imposed on the geocomposite

If portions of the geocomposite are exposed, the RPR will periodically place two (or more, at his discretion) marks on the geocomposite 10 feet apart along the slope and measure the elongation of the geocomposite during the placement of soil.

Table 11-1
Geotextile Component of Geocomposite Acceptance Specifications

PROPERTY	UNITS	ACCEPTABLE VALUE	TEST METHOD	TYPE OF CRITERION
Ply Adhesion - Machine Direction	ppi	1.0	ASTM F904	Minimum
Ply Adhesion - Cross Direction	ppi	1.0	ASTM F904	Minimum
Apparent Opening Size	NA	No. 70	ASTM D 4751	Minimum
Grab Strength	lb	50	ASTM D 4632	Minimum
Grab Strength Elongation	Percent	30	ASTM D 4632	Minimum
Trapezoidal Tear	lb	75	ASTM D 4533	Minimum
Puncture Strength	lb	95	ASTM D 4833	Minimum
Mullen Burst Strength	lb/sq in.	360	ASTM D 2210	Minimum
Permittivity	ga/min/ft^2	110	ASTM D 4491	Minimum

RMT

Section 12
Select Ash Fill

Select ash fill refers to select ash material that will be placed as a protective layer over the granular drainage material, and on the waste as it approaches final grade to provide a levelling course prior to placement of the final cover.

12.1 Procedures and Observations

The RPR will observe select ash fill placement activities and document relevant observations to support certification of the following requirements:

1. Select ash fill material shall be free of cinders and solid impurities capable of puncturing the GCL or the geomembrane.
2. Select ash fill shall be placed in 8-inch loose depth maximum lifts and compacted with a minimum of two passes of the compaction equipment.
3. The completed select ash fill layer shall have a uniform surface.

12.2 Field and Laboratory Testing

Field and laboratory testing of select ash fill material is not required; however, as discussed in Subsection 12.1 above, the RPR will observe and document the consistency of the fill material and placement procedures.

12.3 Thickness Documentation

The top and bottom of the select ash fill layer will be surveyed on a 50-foot grid pattern. The minimum acceptable compacted thickness will be 12 inches vertical in the liner and 12 inches vertical in the cap.

Section 13
Piping

This section of the CQA Plan applies to piping used in the leachate collection and removal system in the landfill liner and in the gas removal system. This section is divided into three major subheadings, which cover the QA requirements for the Pre-installation (which includes resin manufacturers, piping manufacturers, and fabricators), installation, and Post-installation (which includes the final observation and documentation of piping installations prior to installation of other materials over and around the pipe). These terms Pre-installation, Installation, and Post-installation are applicable only to the piping installation and do not apply to the overall construction.

Individual pipe sizes and SDRs to be used for each individual pipe installation are not detailed in this section; rather, the plans and specifications should be used for the determination of correct size and wall thickness.

13.1 Pre-Installation

This section describes the QA measures that are applicable to the polyethylene (PE) resin manufacturers, piping manufacturers, piping fabricator used to perforate the pipe, and finished piping delivery to the site, prior to installation.

13.1.1 Manufacturing

Material Specifications

Any pipe used must be made from extra high molecular weight (EHMW) PE resin, and the manufactured piping must be classified as Type III, Class C, Category 5, Grade P34 material according to ASTM D 1248 and also have a cell classification of 345434C as defined by ASTM D 3350. Pipe shall be free of paint or other surface treatments.

Quality Control Requirements

Prior to the delivery of any piping to the site, the piping manufacturer will provide the CQA Officer with the following information:

1. The resin supplier, location of suppliers production plant(s) and resin brand name and product number.

2. Any test results obtained by the piping manufacturer and/or the pipe manufacturer's testing laboratories to document the quality of the resin used in manufacturing the piping.
3. The QC Plan that the piping manufacturer will be using for the pipe being supplied.

Fabricator

The Piping Fabricator will be responsible for perforating the pipe, delivered by the Piping Manufacturer, according to the plans and specifications. The Piping Fabricator will be responsible for preparing and shipping the perforated pipe to the job site. Marking of the pipe must be performed in accordance with Subsection 13.1.2.

Manufacturer's Certification

The Piping Manufacturer will provide certification, based on tests performed by either the Piping Manufacturer's laboratory or other outside laboratory contracted by the Piping Manufacturer, that the pipe supplied under this plan will meet the following specifications:

1. The finished pipe is classified as Type III, Class C, Category 5, Grade P34 according to the provisions of ASTM D 1248.
2. The finished pipe meets the cell classification of 345434C according to the provisions of ASTM D 3350.
3. The finished pipe has the SDR value specified.

13.1.2 Delivery, Handling, and Storage of Piping

Each bundle of pipe prepared for shipment by the Piping Fabricator will be marked with the following information:

1. Nominal Size
2. Dimension Ratio
3. Pressure Rating
4. Type (Manufacturer)
5. Material Classification
6. Certification Bases
7. Blank Position for NSF/FM Use
8. Pipe Test Category

9. Plant
10. Extruder Number
11. Date
12. Operator Number
13. Shift Letter
14. Resin Supplier Code

Example: 10" IPS SDR 15.5 110 psi (Trade Name) PE 3408 ASTM F-714 NSF-pw C3 P5 06FEB89 55A P

The pipe will be protected, during shipment, from excessive heat or cold, puncture, or other damaging or deleterious conditions. The pipe will be stored on site in a manner suitable to protect it from long-term ultraviolet exposure, prior to actual installation.

The RPR will observe and document throughout the pre-construction, construction, and post-construction periods that the Installer provides adequate handling equipment for moving pipe and that the equipment and handling methods used do not pose unnecessary risk of damage. The Installer is responsible for means and methods to implement the work.

The Installer will be responsible for making certain that the manufacturer, type and size of each pipe is correct. The RPR will maintain a log of pipe deliveries throughout the installation. The following information at a minimum will be recorded on the log for each shipment received at the job site:

1. Date of shipment from piping manufacturer
2. Date of receipt of delivery at job site
3. For each pipe, the following information will be noted:
    - Pipe size and type
    - Batch (lot) number

13.2 Installation

This section describes the requirements applicable to pipe installation. This subsection includes installation, observations, and documentation of piping installations.

13.2.1 Pipe Seams

Unless approved otherwise by the CQA Officer, all pipe seams will be made by the butt fusion procedure as defined by Phillips Driscopipe, Inc. and Plexco Piping Company. Sections of polyethylene pipe should be joined into continuous lengths on the job site above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400°F, alignment, and 75 psi interfacial fusion pressure. Butt fusion joining shall be 100 percent efficient offering a joint weld strength equal to or greater than the tensile strength of the pipe. Socket fusion shall not be used. Extrusion welding or hot gas welding of HDPE shall not be used for pressure pipe applications nor in fabrications where shear or structural strength is important. Flanges, unions, grooved-couplers, transition fittings, and some mechanical couplers may be used to mechanically connect HDPE pipe without butt fusion. Refer to the manufacturer's recommendations. The following procedures will be used regarding butt fusion seams:

1. Seams should be made at the pipe manufacturer's recommended heater plate temperature of approximately 400°F for fusing pipe and fittings.
2. For pipe diameter sizes 4 inches (nominal) and larger seams will be made using the hydraulic fusion machines. For pipe diameters of less than 4 inches, manual fusion equipment can be used.
3. Care will be taken to make certain that adequate pressures are used for fusing pipes and that sufficient cooling periods are allowed prior to testing, bending, or backfilling of pipe sections.

13.2.2 Placement Requirements

Pipe placement will be done in accordance with the following procedures and requirements:

1. Piping placement will not be performed in the presence of excessive moisture. The RPR will document that this condition is fulfilled. Additionally, the RPR will document that the supporting backfill has not been damaged by weather conditions. The RPR will inform the CQA Officer if any of the above conditions are not fulfilled for evaluation of the necessity of corrective action.

2. The prepared surface underlying the piping has not deteriorated since previous acceptance, and it is still acceptable immediately prior to piping placement.
3. Method used to place the piping does not cause damage to the piping and does not disturb the supporting backfill.
4. The RPR will observe and document all pipe installation. Deviations from the plans and specifications will be brought to the attention of the CQA Officer for evaluation of the necessity of corrective action.
5. The RPR will observe and document the placement of geotextile filter to line the trenches and placement of pipe bedding stone around collector pipes according to the plans and specifications and the procedures described in Subsection 7.2.1.
6. Observations and measurements should be made to ensure that the pipes are the specified size, manufactured of the specified material, and that pipe perforations are sized and spaced as specified.
7. All piping should be located as noted in the plans and specifications. Locations, grades, and size requirements are specified on the details of the plan set. Observations and surveying measurements should be made to ensure the pipes are placed at the specified locations and grades, and in the specified configuration. Observations should be made throughout the construction to ensure that backfilling is completed as specified in the plans and specifications and that, in the process, the pipe network is not damaged.

13.2.3 Pipe Boots

Pipe boots shall be installed as shown on approved shop drawings with a continuous extrusion weld joining the pipe to the geomembrane liner. The RPR shall observe all pipe boot installations.

13.2.4 Damages

The RPR will examine each pipe after placement for damage. Damaged pipes or portions of pipes that have been rejected will be marked and removed from the installation area and documented by the RPR.

13.3 Post-Installation

Pipe inverts (or top of pipe elevations) and coordinate locations shall be surveyed at 50-foot intervals and at all tee connection locations. Additional surveying requirements regarding granular soil backfill placement are discussed in Subsection 6.3.

RMT

Section 14
Compacted Prepared Subgrade Fill

Prepared subgrade fill refers to the 1-foot thick compacted subgrade soil beneath the composite liner with permeability of 4.2×10^{-4} cm/s or less. The existing on-site subgrade soils if appropriate and soil from the Owner's on-site borrow source are proposed for the prepared fill subgrade layer. Existing soil data, cross sections, and borrow investigation reports will be made available to the contractor.

14.1 Procedures and Observation

The installer will be responsible for means and methods to implement the work. The RPR will observe the compacted prepared subgrade construction activities and will document relevant observations to support certification of the following requirements:

1. The RPR will confirm the uniformity of the prepared subgrade fill. Soil excavation, proportioning, mixing, and placement will be monitored for segregation and removal of unsuitable material and for changes in soil type, color, texture, and moisture content.
2. The construction contractor will segregate and/or remove unsuitable materials such as soils not meeting acceptance criteria (boulders, cobbles, and organic material).
3. The RPR will measure field densities and moisture contents, using methods described in Subsection 14.2 (Sampling Requirements and Acceptance Criteria), to document that the compacted prepared subgrade is in substantial conformance with the placement specifications and that soil placement has been conducted in a manner to achieve a uniform, homogeneous mass meeting the permeability requirement.
4. Voids created by nuclear density gauge testing or retrieval of Shelby tube samples will be backfilled with sodium bentonite.
5. The prepared subgrade fill shall be placed in two loose lift thicknesses not exceeding 8 inches. Each loose lift shall be compacted with multiple passes using appropriate compaction equipment. If the soil is deposited in thickness exceeding 8 inches, dozers will be used to spread the soil to an 8-inch thickness prior to compaction. This will ensure adequate reduction of clod size and provide a thin layer to achieve required compaction throughout the lift.
6. Areas of unacceptable hydraulic conductivity, compaction density, or moisture content, as defined by Subsection 14.2 (Sampling Requirements and Acceptance Criteria), will be documented by the RPR. Corrective action will consist of moisture conditioning of the soil or additional compactive effort as necessary. Methods for moisture-conditioning soils are described in Item 7 below. Following corrective actions, such areas will be retested.

7. If necessary, surfaces of the prepared subgrade to receive successive lifts of prepared subgrade fill will be moisture-conditioned either by scarification and addition of water where desiccated, or by disking and air drying where saturated to promote effective bonding of lifts. Following scarification, water will be applied with a spray bar applicator or equivalent methods to achieve uniform distribution.

8. Soil compaction will be performed in a manner to achieve continuous and complete keying together of the prepared subgrade construction areas. Stepped joints will be utilized to connect lateral segments of the prepared subgrade construction.

9. No frozen soils will be used for prepared subgrade construction. Frozen soils in the compaction work area will be removed.

10. Stones that are larger than 0.5-inch in diameter shall be removed from the surface of the final lift of the prepared subgrade to avoid potential for puncturing the geosynthetic clay liner. The method to detect and remove stones requires an initial overfill of compacted prepared subgrade soils approximately 1 inch above design grades. A grader will then blade the prepared subgrade surface to obtain uniform subgrades and design elevations. Stones present will be exposed and loosened by the grading. The RPR shall inspect the prepared subgrade during this process and document removal of stones by the contractor. Voids made by removal of stones shall be filled with prepared subgrade soil, and then the entire prepared subgrade surface shall be rolled with a smooth drum compactor.

11. The prepared subgrade surface on which the composite liner will be placed shall be maintained in a firm, clean, and smooth condition, free of standing water, during liner installation.

12. Preconstruction planning will be undertaken to sequence construction activities to minimize the length of time any completed prepared subgrade surfaces are exposed prior to receiving protective cover. Protective cover will be provided by installation of the geosynthetic clay liner and the geomembrane.

13. Preconstruction planning will be undertaken to minimize the need for traffic over the completed prepared subgrade surface. Heavy trucking of materials (ingress or egress) and cleated equipment will not be allowed directly on completed prepared subgrade surfaces. If this is unavoidable, an evaluation will be made upon termination of the haul route to determine if the prepared subgrade should be reconstructed or repaired in such areas. Flotation-type all-terrain vehicles will be used to assist in deployment of the geosynthetic clay liner to avoid disruption of the completed prepared subgrade surface.

14.2 Sampling Requirements and Acceptance Criteria

Field and laboratory sampling frequencies are based on proportionate sampling of construction areas or volume of material placed as specified below. This section describes required analysis, methods, sample frequency, and acceptance limits. Table 14-1 summarizes the minimum QA testing recommended in Subsection 14.3. The RPR will perform field tests and collect soil samples for laboratory analysis.

14.3 Field Testing and Sampling

The following field testing and sampling methods and frequencies will be used by the RPR during construction of the prepared subgrade.

- One field density and as-placed moisture content test (ASTM D 3017 and ASTM D 2922 Method B) will be performed for each compacted lift on an approximate 100-foot grid pattern.
- Initially, a representative (grab) soil sample of the prepared subgrade soils will be collected from the borrow source and submitted to the Soils Testing Laboratory for testing described in Subsection 14.3.4. Additional samples will be collected every 4,000 cubic yards for each major soil type utilized. A sample will also be collected when changes in the physical appearance or soil characteristics are observed.
- A minimum of one undisturbed Shelby tube sample will be obtained for each acre or less for every lift of prepared subgrade placed. Samples will be submitted to the Soils Testing Laboratory for testing described in Subsection 14.3.3.
- At a minimum, at least one field density/moisture content test will be conducted per lift and at least one test per day of compacted prepared subgrade construction.

A NDG may be used for field moisture and density determination. The calibration of NDGs used for documentation shall be initially checked and adjusted (if necessary) according to the manufacturer's guidelines. Initial calibration of the NDG shall be made with one of the alternate test methods identified in Construction Specifications for determining field density and moisture content.

14.3.1 Field Testing Acceptance Criteria

Acceptance criteria for field density will require soil compaction to a minimum of 95 percent of the Standard Proctor (ASTM D 698) maximum dry density. Specific moisture content requirements will be identified in the construction specifications. The acceptable range will be based on Proctor moisture-density relationships and compaction versus permeability relationships.

14.3.2 Laboratory Testing

Routine laboratory testing of the compacted prepared subgrade soils will be performed on samples from the borrow area or samples from the disking operation and on the in-place soils collected by the RPR. Samples for determining in-place properties will be collected by pushing Shelby tubes. Soil characteristics will be determined from representative samples and from Shelby tube samples.

14.3.3 Undisturbed Sample Analysis

The following analysis will be performed on ***all*** undisturbed samples obtained:

PARAMETER	TEST METHOD
Hydraulic Conductivity	ASTM D 5084 or SW 846-USEPA Method 9100
Moisture Content and Dry Density	ASTM D 2216
Atterberg Limits	ASTM D 4318
Grain-size Analysis (P200)	ASTM D 422 (1)

(1) Percentage of soil finer than the No. 200 sieve (*i.e.*, soil finer than 0.075 mm).

14.3.4 Representative Sample Analysis

The following laboratory analyses will be performed on ***all*** representative samples obtained, except where noted:

PARAMETER	TEST METHOD
Moisture-Density Relationship using Standard Proctor Compaction	ASTM D 698 (1, 2)
Atterberg Limits	ASTM D 4318
Grain-size Analysis (sieve and hydrometer)	ASTM D 422 (3)
Moisture Content	ASTM D 2216
Hydraulic Conductivity (4)	ASTM D 5084 or SW 846-USEPA Method 9100

(1) A five-point Proctor analysis is required for first and second sampling criteria.

(2) A one-point Proctor analysis may be utilized for representative samples collected for the third sampling criteria (apparent changes in soil quality) to verify applicability of previously analyzed moisture-density relationships. If the result does not verify applicability, a five-point analysis will be performed in accordance with the first sampling criteria.

(3) Distribution shall be reported through the 0.002-mm particle size.

(4) For every 8,000 cubic yards of soil extracted from the borrow source, perform one hydraulic conductivity test. The hydraulic conductivity test will be run on a sample of soil remolded to 95 percent of its Standard Proctor (ASTM D 698) maximum dry density at 2 percent over its optimum moisture content.

14.3.5 Laboratory Testing Acceptance Criteria

- A saturated hydraulic conductivity of 4.2×10^{-4} cm/s or less

14.4 Thickness Documentation

The top of the prepared subgrade layer will be surveyed at a minimum on the same 50-foot grid pattern as other locations surveyed for bottom of the prepared subgrade layers. Prepared subgrade thicknesses at slope breaks will be surveyed. The prepared subgrade thickness will be determined at surveyed locations and reported in table fashion. The minimum acceptable prepared subgrade liner thickness will be 1-foot vertical to the bottom. The location and elevation of samples requiring surveying will be recorded.

Table 14-1
Summary of Quality Assurance Testing for the Prepared Subgrade Layer

TEST	FREQUENCY	COMMENT
Atterberg Limits Test [ASTM D 4318]	One every 4,000 cubic yards and material changes	Source Material: prepared subgrade
Grain-size analyses (sieve and hydrometer) [ASTM D 422]	One every 4,000 cubic yards and material changes	Source Material: prepared subgrade
Moisture Content [ASTM D 2216]	One every 4,000 cubic yards and material changes	Source Material: prepared subgrade
Density/Moisture (Standard Proctor) [ASTM D 698]	One every 4,000 cubic yards and material changes	Source Material: prepared subgrade
Permability Testing (Falling Head) [ASTM D 5084 or SW846-USEPA Method 9100]	One test on a sample obtained every 8,000 cubic yards and material changes	Remolded Source Material: prepared subgrade
Proofroll	All surfaces prior to prepared subgrade layer placement	Subgrades for prepared subgrade layer construction
Field Density and Moisture Content [ASTM D 2922 and ASTM D 3017] or [ASTM D 1556] or [ASTM D 2937]	One per 10,000 square feet per lift (approximate 200-foot grid pattern)	*In-situ* prepared subgrade
Permability Testing (Falling Head) [ASTM D 5084 or SW 846-USEPA Method 9110]	One per acre(43,560 square feet) per lift	Tube samples obtained from the *in-situ* prepared subgrade
Atterberg Limits Test [ASTM D 4318]	One per acre(43,560 square feet) per lift	Tube samples obtained from the *in-situ* prepared subgrade
Grain-size analyses (P200) [ASTM D 422]	One per acre(43,560 square feet) per lift	Tube samples obtained from the *in-situ* prepared subgrade
Density/Moisture [ASTM D 2216]	One per acre(43,560 square feet) per lift	Tube samples obtained from the *in-situ* prepared subgrade

Appendix C
Construction Documentation Photographs

Photograph 1. Silt fence for sedimentation control in disturbed areas.

Photograph 2. Rough grading of perimeter berm near the northeast corner of the cell.

Photograph 3. Rough grading of landfill Phase 1A footprint.

Photograph 4. Placement of clayey fill for low permeability select subgrade layer.

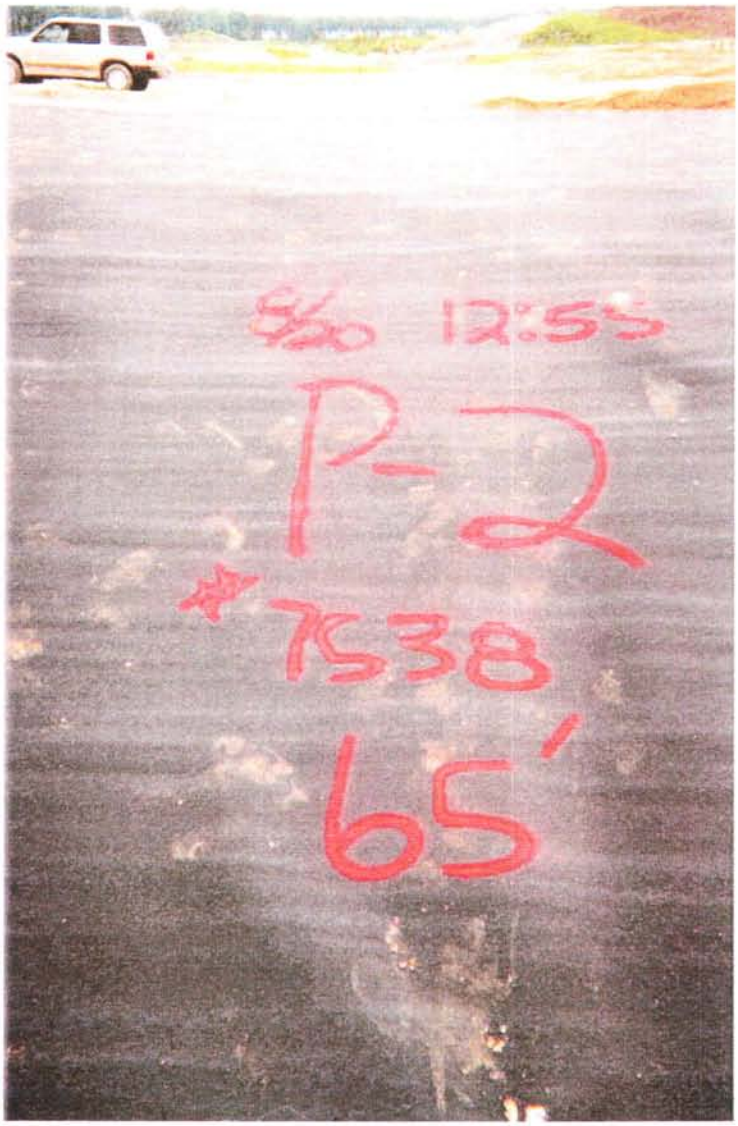
Photograph 5. Compaction of the prepared subgrade layer in the north end of the cell.

Photograph 6. Compaction of prepared subgrade layer using sheeps foot compactor.

Photograph 7. Prepared subgrade layer. Plugging of shelby tube sample hole using bentonite pellets.

Photograph 8. View of geosynthetics under trench in west perimeter berm.

Photograph 9. Placement of bentonite powder in GCL panel seams.



Photograph 10. Panel identification markings showing date and time of deployment, panel number, roll number, and panel length.

Photograph 11. Sequential deployment of GCL and HDPE geomembrane.

Photograph 12. Deployment of 60-mil HDPE geomembrane over GCL already in place.

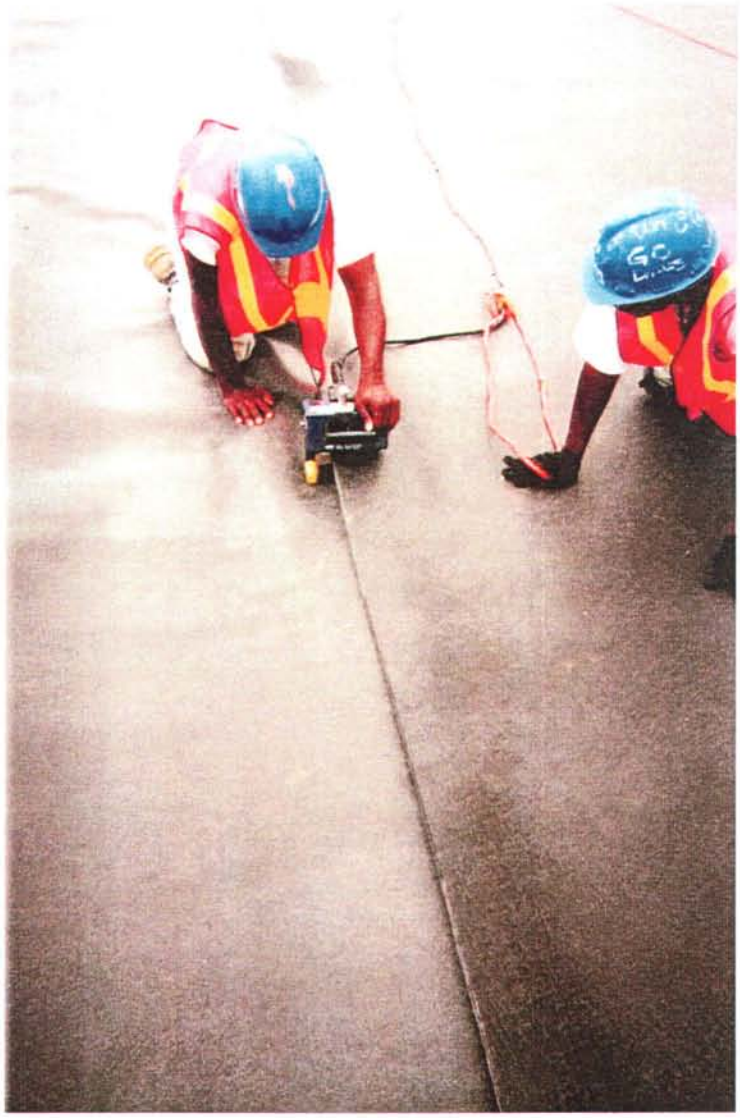
Photograph 13. Geomembrane SEAM welding markings identifying the welder, welding machine, temperature, seaming speed, date, and time.

Photograph 14. Trial seaming of 60 mil HDPE geomembrane.

Photograph 15. Seaming of 60-mil HDPE geomembrane panels using a dual hot wedge welder.

Photograph 16. Nondestructive air pressure testing of geomembrane seam.

Photograph 17. Vacuum box testing of geomembrane patch repair.



Photograph 18. Seaming of 32 oz. Geocushion™ using a dual hot wedge welder.

Photograph 19. Deployment of 32 oz. Geocushion™ near the southeast corner of the cell.

Photograph 20. View of completed liner system and Geocushion™. Northwest sump area in foreground.

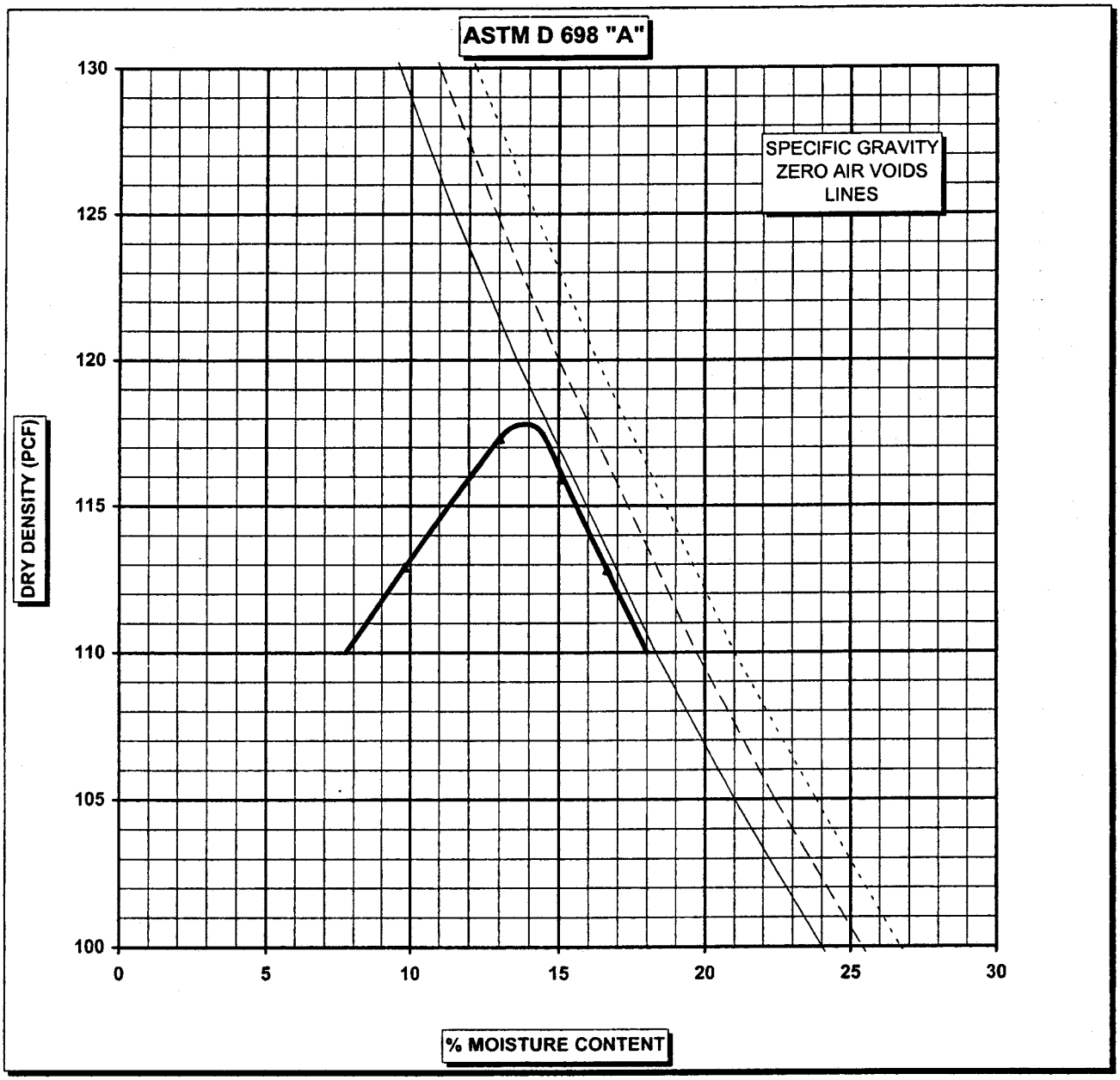
Appendix D
Bulk Material Laboratory Results

S&ME

MOISTURE - DENSITY RELATIONSHIP

PROJECT NUMBER:	1053-00-211	DATE:	6/12/00
PROJECT NAME:	RMT LAB SERVICES	SAMPLE NO.:	Ps- 1
PROJECT LOCATION:		BORING NO.:	Bag
SAMPLE DESCRIPTION:	Brown Clayey SAND (SC)	DEPTH (ft):	0.0-3.0

MAXIMUM DRY DENSITY:	117.8	PCF	LIQUID LIMIT:	
OPT. MOISTURE CONTENT:	14.0	%	PLASTICITY INDEX:	
NATURAL MOIST. CONT.:	16.8	%		
SPECIFIC GRAVITY:	2.69			



Scale: As Shown	Checked By: MLK	Drawn By: MK	Date: 6/13/00

S&ME, Inc. 3109 Spring Forest Road, Raleigh, North Carolina 27604, (919) 872-2660, Fax (919) 876-3958

5101.17

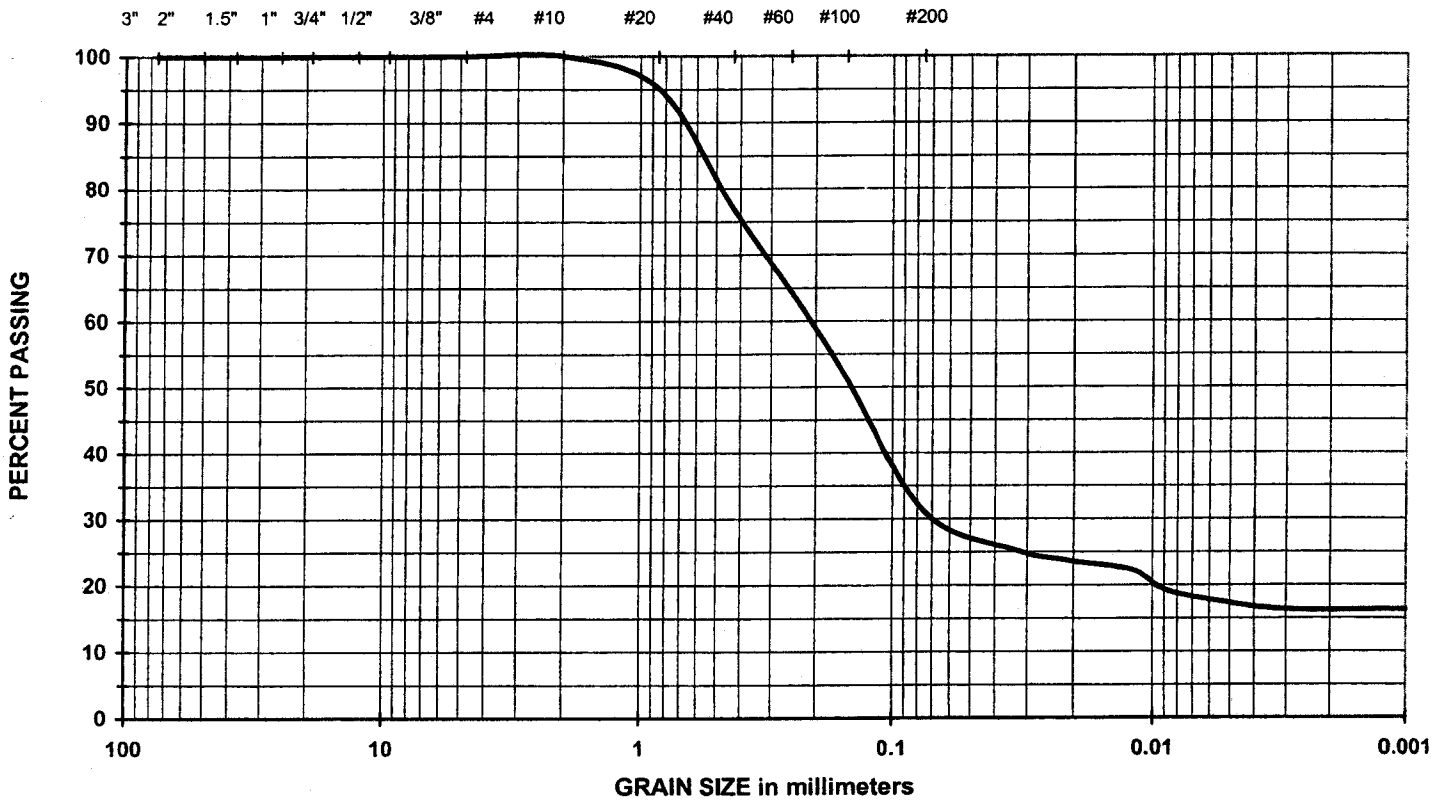
S&ME

GRAIN SIZE DATA SHEET

Project Description: RMT - Lab Services

Project Number: 1053-00-211

GRAIN SIZE DISTRIBUTION CURVE



Gravel	< 75 mm and > 4.75 mm
Coarse Sand	< 4.75 mm and >2.00 mm
Medium Sand	< 2.00 mm and > 0.425 mm

Fine Sand	< 0.425 mm and > 0.075 mm
Silt	< 0.075 and > 0.005 mm
Clay	> 0.005 mm

Boring No.: -- Sample No.: PS - 1 Depth (ft): 0 - 3

Soil Description: **Brown Clayey SAND (SC)**

ATTERBER LIMIT (-#40 MATERIAL)

LIQUID LIMIT	25
PLASTIC LIMIT	17
PLASTICITY INDEX	8
NATURAL MOISTURE (%)	16.8

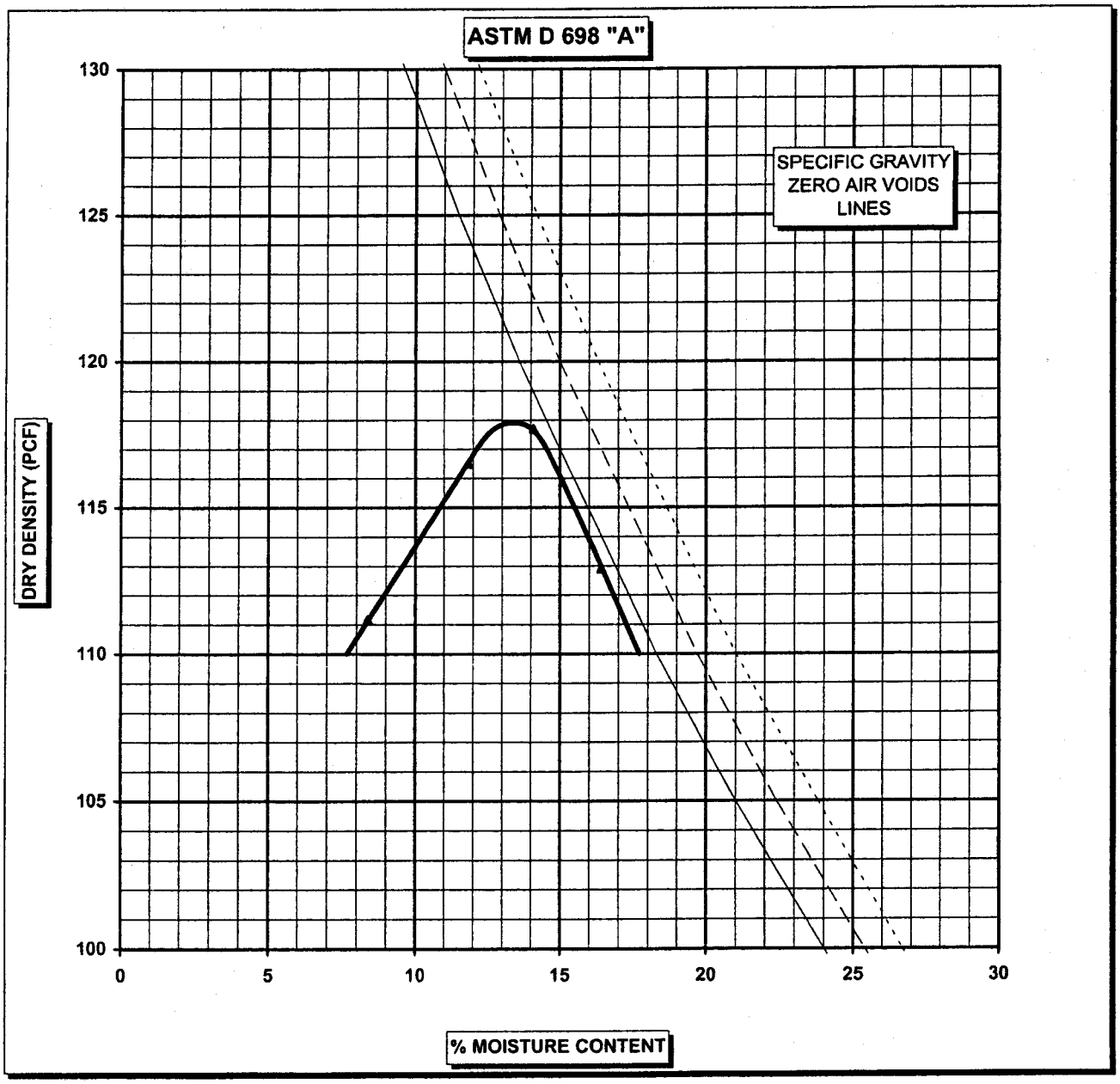
GRAIN SIZE DATA

SAND (%)	69.0
SILT (%)	13.9
CLAY (%)	17.1

MOISTURE - DENSITY RELATIONSHIP

PROJECT NUMBER:	1053-00-211	DATE:	6/12/00
PROJECT NAME:	RMT LAB SERVICES	SAMPLE NO.:	PS - 2
PROJECT LOCATION:		BORING NO.:	Bag
SAMPLE DESCRIPTION:	Brown and Grey Sandy CLAY (CL)	DEPTH (ft):	3.0-6.0

MAXIMUM DRY DENSITY:	117.9	PCF	LIQUID LIMIT:	
OPT. MOISTURE CONTENT:	13.5	%	PLASTICITY INDEX:	
NATURAL MOIST. CONT.:	17.1	%		
SPECIFIC GRAVITY:	2.69			



Scale: As Shown	Checked By: MLK	Drawn By: MK	Date: 6/13/00

S&ME, Inc. 3109 Spring Forest Road, Raleigh, North Carolina 27604, (919) 872-2660, Fax (919) 876-3958

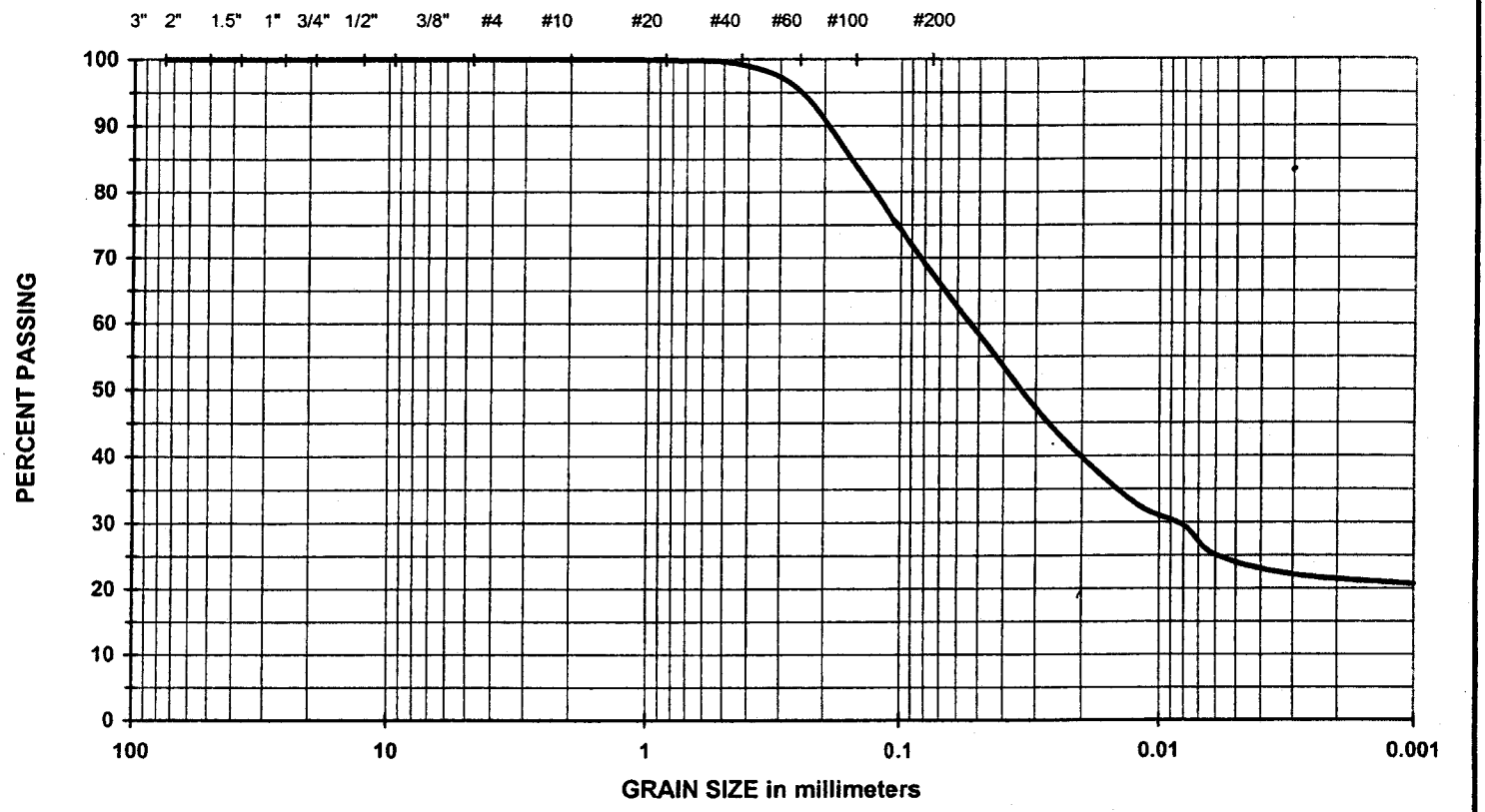
S&ME

GRAIN SIZE DATA SHEET

Project Description: RMT - Lab Services

Project Number: 1053-00-211

GRAIN SIZE DISTRIBUTION CURVE



Gravel	< 75 mm and > 4.75 mm
Coarse Sand	< 4.75 mm and >2.00 mm
Medium Sand	< 2.00 mm and > 0.425 mm

Fine Sand	< 0.425 mm and > 0.075 mm
Silt	< 0.075 and > 0.005 mm
Clay	> 0.005 mm

Boring No.: -- Sample No.: PS-2 Depth (ft): 3 - 6

Soil Description: **Brown And Gray Sandy CLAY (CL)**

ATTERBER LIMIT (-#40 MATERIAL)

LIQUID LIMIT	34
PLASTIC LIMIT	17
PLASTICITY INDEX	17
NATURAL MOISTURE (%)	17.1

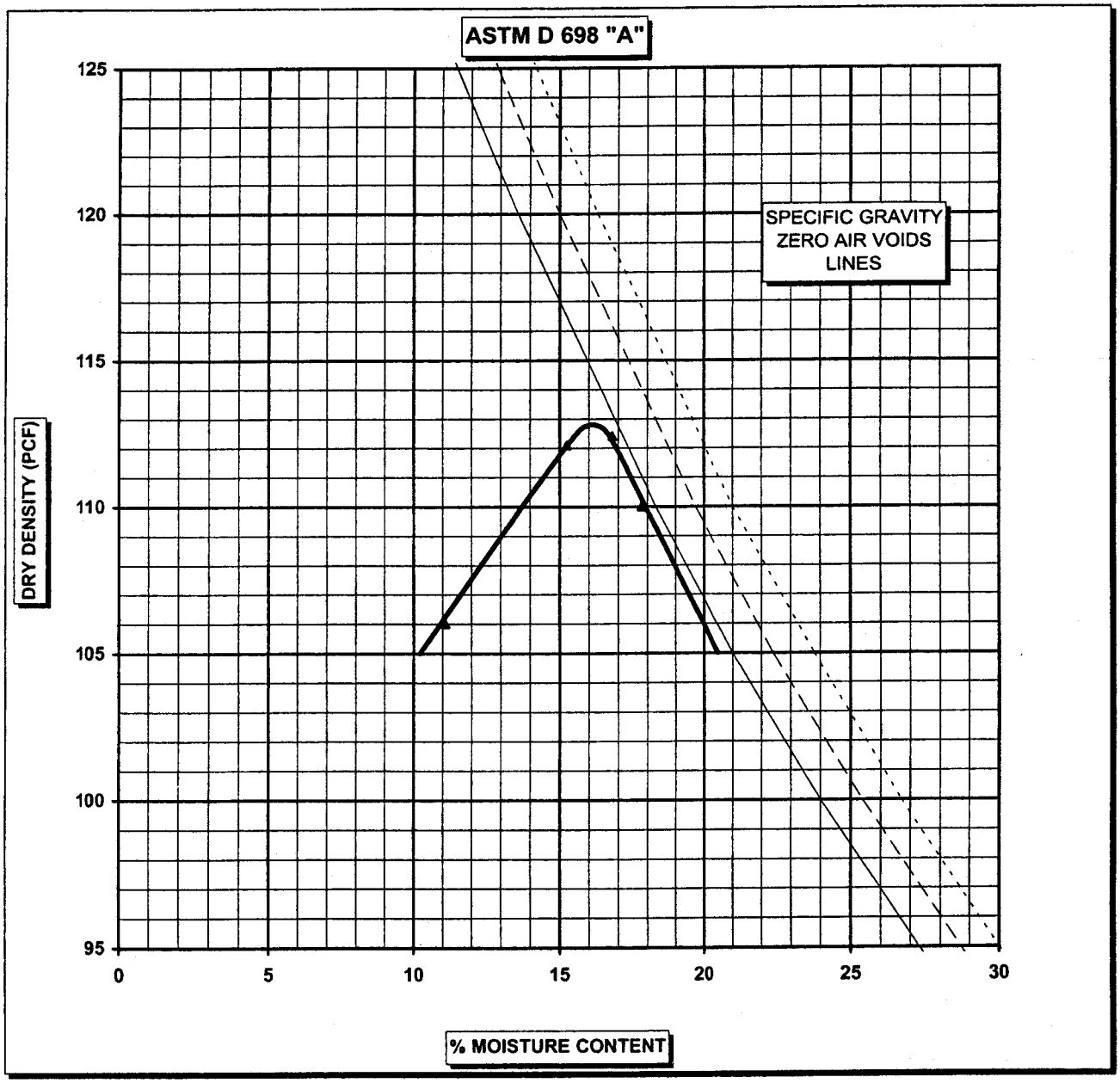
GRAIN SIZE DATA

SAND (%)	32.4
SILT (%)	43.6
CLAY (%)	24.0

MOISTURE - DENSITY RELATIONSHIP

PROJECT NUMBER:	1053-00-211	DATE:	6/12/00
PROJECT NAME:	RMT LAB SERVICES	SAMPLE NO.:	PS - 3
PROJECT LOCATION:		BORING NO.:	Bag
SAMPLE DESCRIPTION:	Brown Clayey SAND (SC)	DEPTH (ft):	0.0-3.0

MAXIMUM DRY DENSITY:	112.8	PCF	LIQUID LIMIT:	
OPT. MOISTURE CONTENT:	16.2	%	PLASTICITY INDEX:	
NATURAL MOIST. CONT.:	16.5	%		
SPECIFIC GRAVITY:	2.69			



Scale: As Shown	Checked By: MLK	Drawn By: MK	Date: 6/13/00

S&ME, Inc. 3109 Spring Forest Road, Raleigh, North Carolina 27604, (919) 872-2660, Fax (919) 876-3958

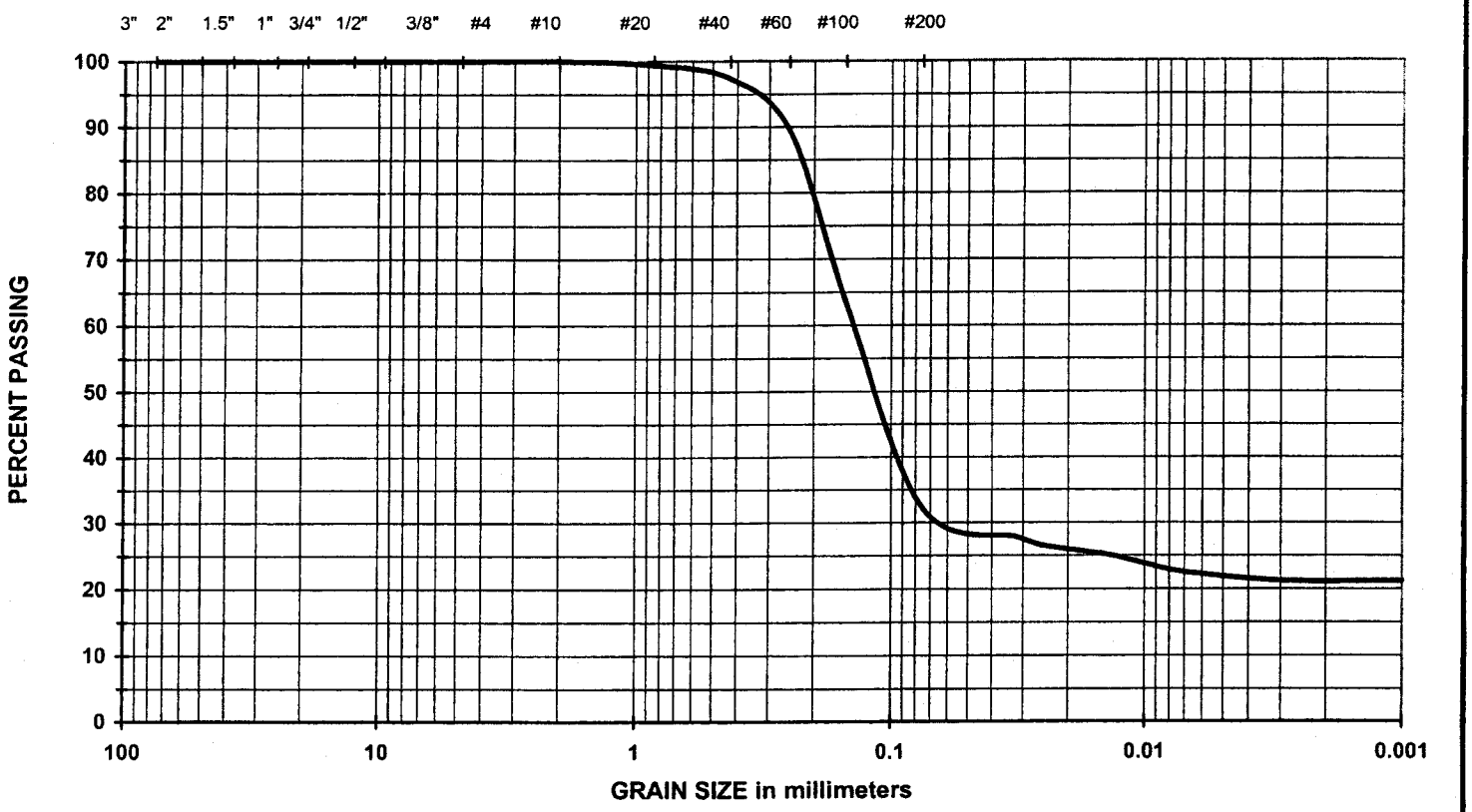
S&ME

GRAIN SIZE DATA SHEET

Project Description: RMT - Lab Services

Project Number: 1053-00-211

GRAIN SIZE DISTRIBUTION CURVE



Gravel	< 75 mm and > 4.75 mm
Coarse Sand	< 4.75 mm and >2.00 mm
Medium Sand	< 2.00 mm and > 0.425 mm

Fine Sand	< 0.425 mm and > 0.075 mm
Silt	< 0.075 and > 0.005 mm
Clay	> 0.005 mm

Boring No.: – Sample No.: PS - 3 Depth (ft): 0 - 3

Soil Description: **Brown Clayey SAND (SC)**

ATTERBER LIMIT (-#40 MATERIAL)

LIQUID LIMIT	37
PLASTIC LIMIT	21
PLASTICITY INDEX	16
NATURAL MOISTURE (%)	16.5

GRAIN SIZE DATA

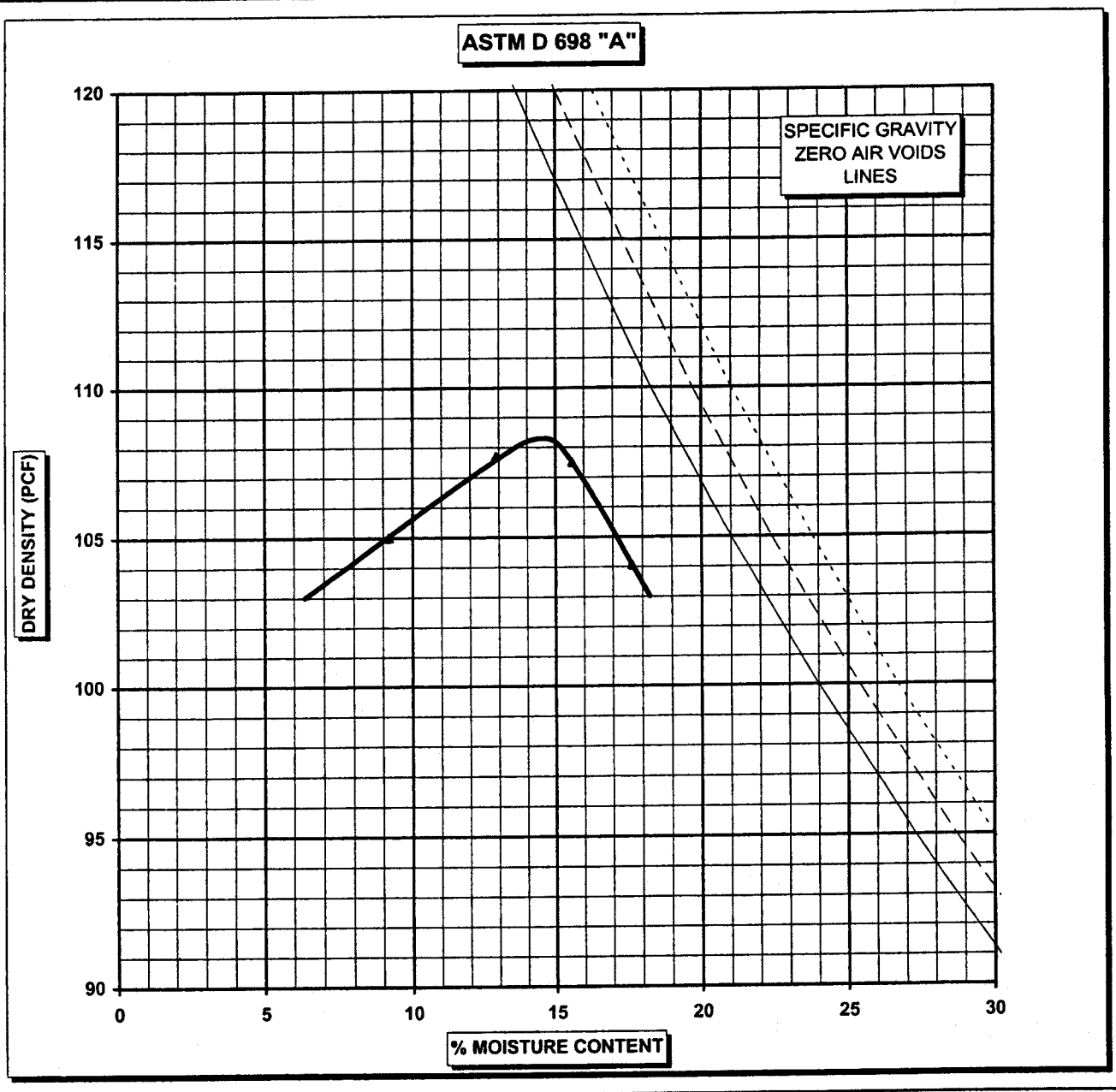
SAND (%)	67.8
SILT (%)	10.2
CLAY (%)	22.0

S&ME

MOISTURE - DENSITY RELATIONSHIP

PROJECT NUMBER:	1053-00-211	DATE:	6/21/00
PROJECT NAME:	RMT LAB SERVICES	SAMPLE NO.:	PS-4
PROJECT LOCATION:	PLYMOUTH, NC	BORING NO.:	Bag
SAMPLE DESCRIPTION:	Tan Clayey SAND (SC)	DEPTH (ft):	

MAXIMUM DRY DENSITY:	108.3	PCF	LIQUID LIMIT:	
OPT. MOISTURE CONTENT:	14.5	%	PLASTICITY INDEX:	N.P.
NATURAL MOIST. CONT.:	13.8	%		
SPECIFIC GRAVITY:	2.62			



Scale: As Shown	Checked By: MLK	Drawn By: MLK	Date: 6/22/00

S&ME, Inc. 3109 Spring Forest Road, Raleigh, North Carolina 27604, (919) 872-2660, Fax (919) 876-3958

5101.17

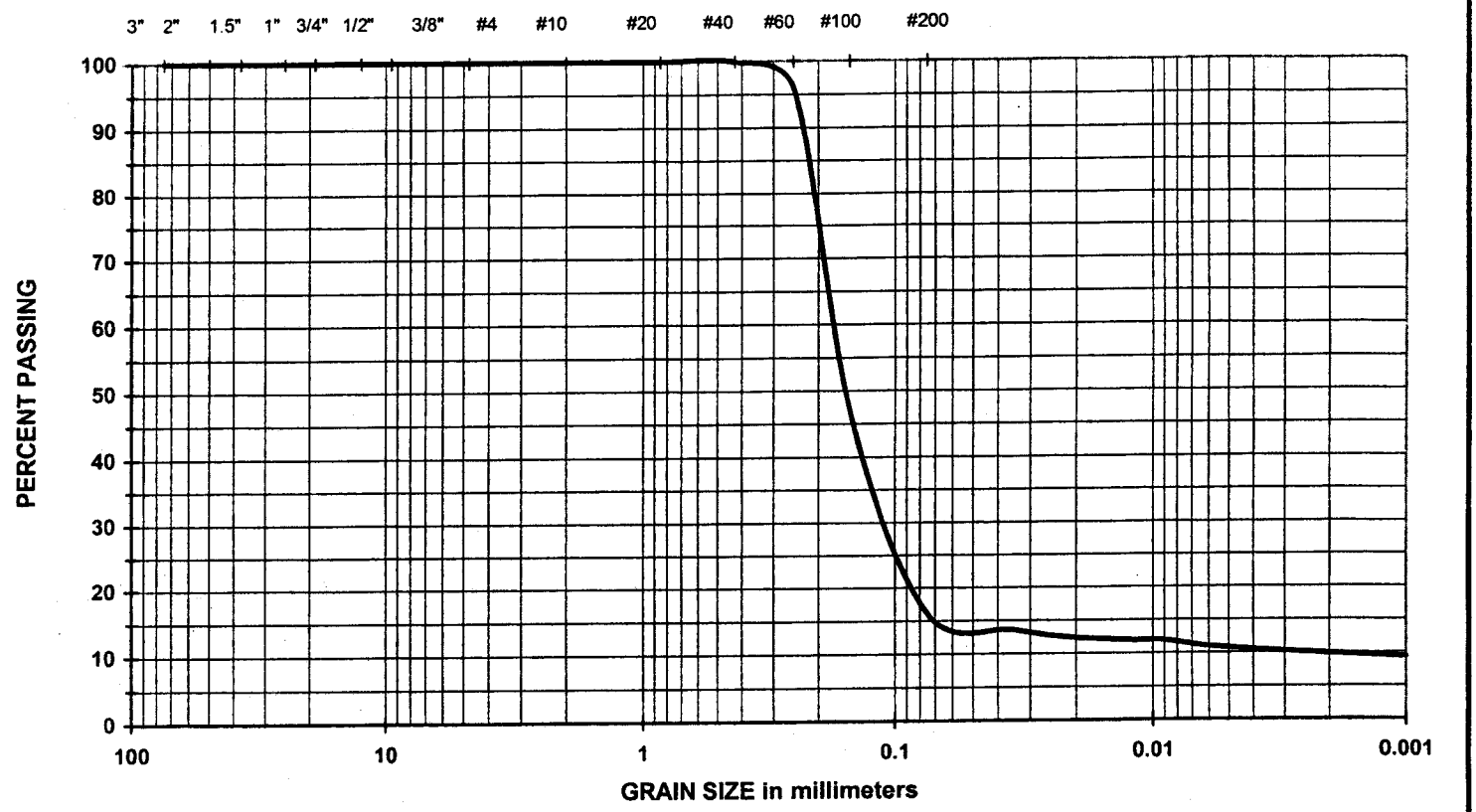
S&ME

GRAIN SIZE DATA SHEET

Project Description: RMT Lab Services

Project Number: 1053-00-211

GRAIN SIZE DISTRIBUTION CURVE



Gravel	< 75 mm and > 4.75 mm
Coarse Sand	< 4.75 mm and >2.00 mm
Medium Sand	< 2.00 mm and > 0.425 mm

Fine Sand	< 0.425 mm and > 0.075 mm
Silt	< 0.075 and > 0.005 mm
Clay	> 0.005 mm

Boring No.: PS-4 Sample No.: 4 Depth (ft): Bag

Soil Description: Tan Clayey SAND (SC)

ATTERBER LIMIT (-#40 MATERIAL)

LIQUID LIMIT	--
PLASTIC LIMIT	--
PLASTICITY INDEX	NP
NATURAL MOISTURE (%)	13.8

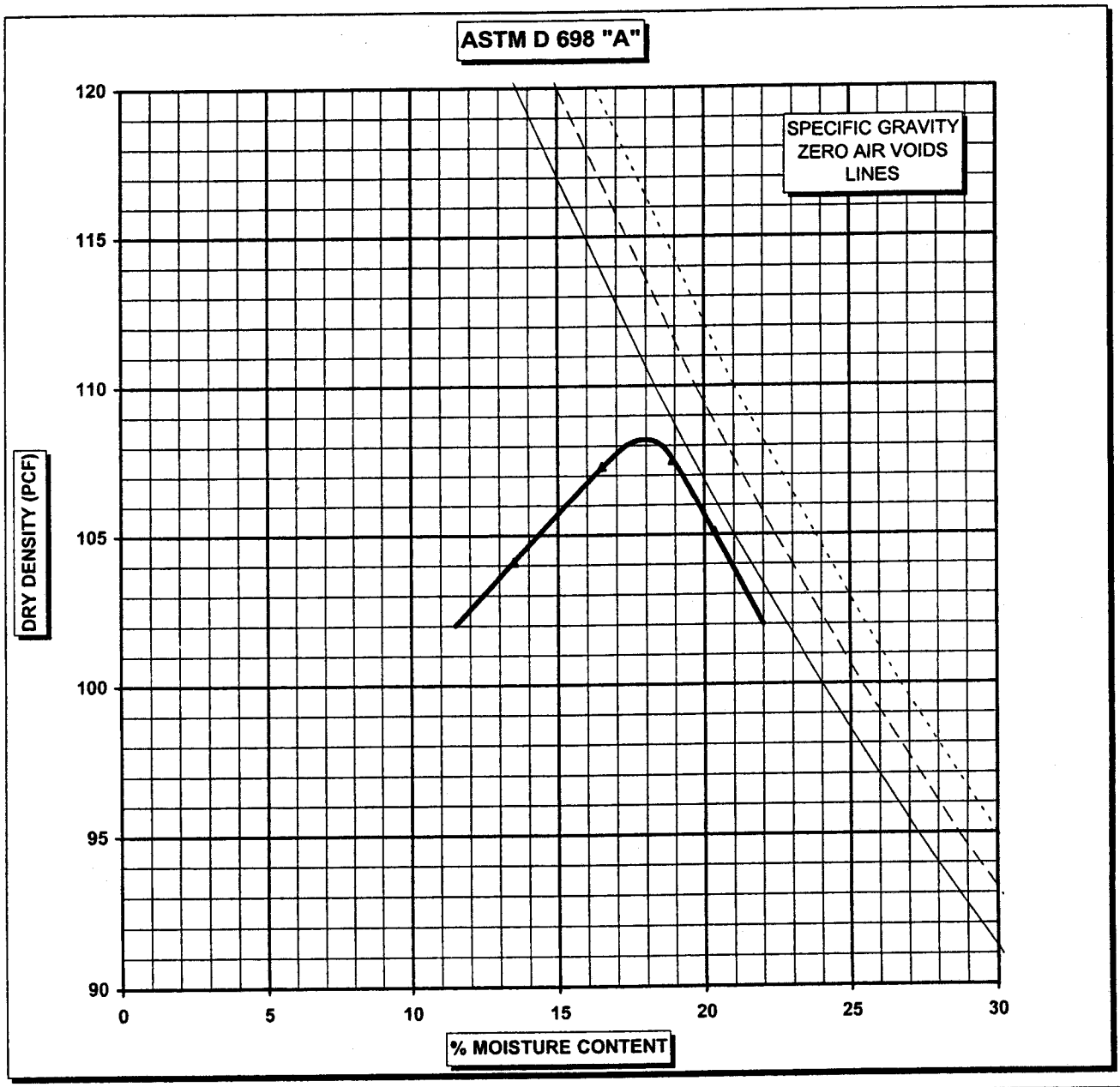
GRAIN SIZE DATA

SAND (%)	85.9
SILT (%)	3.1
CLAY (%)	11.0

MOISTURE - DENSITY RELATIONSHIP

PROJECT NUMBER:	1053-00-211	DATE:	6/21/00
PROJECT NAME:	RMT LAB SERVICES	SAMPLE NO.:	PS-5
PROJECT LOCATION:	PLYMOUTH, NC	BORING NO.:	Bag
SAMPLE DESCRIPTION:	Brown Clayey Fine SAND (SC)	DEPTH (ft):	

MAXIMUM DRY DENSITY:	108.2	PCF	LIQUID LIMIT:	41	
OPT. MOISTURE CONTENT:	18.0	%	PLASTICITY INDEX:	17	
NATURAL MOIST. CONT.:	18.3	%			
SPECIFIC GRAVITY:	2.66				



Scale: As Shown	Checked By: MLK	Drawn By: MLK	Date: 6/22/00

S&ME, Inc. 3109 Spring Forest Road, Raleigh, North Carolina 27604, (919) 872-2660, Fax (919) 876-3958

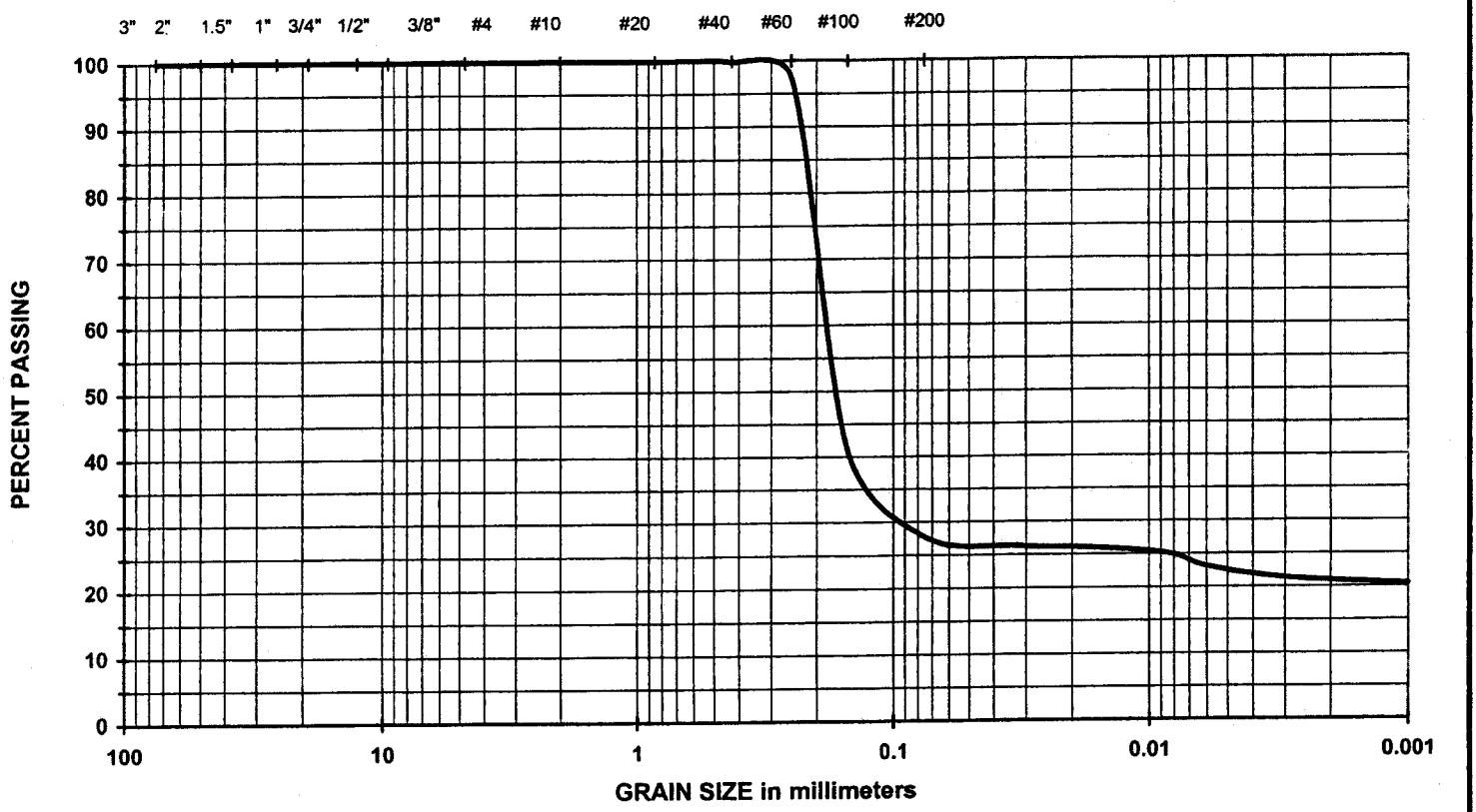
S&ME

GRAIN SIZE DATA SHEET

Project Description: RMT Lab Services

Project Number: 1053-00-211

GRAIN SIZE DISTRIBUTION CURVE



Gravel	< 75 mm and > 4.75 mm
Coarse Sand	< 4.75 mm and >2.00 mm
Medium Sand	< 2.00 mm and > 0.425 mm

Fine Sand	< 0.425 mm and > 0.075 mm
Silt	< 0.075 and > 0.005 mm
Clay	> 0.005 mm

Boring No.: **PS-5** Sample No.: **5** Depth (ft): **Bag**

Soil Description: **Brown Clayey Fine SAND (SC)**

ATTERBER LIMIT (-#40 MATERIAL)

LIQUID LIMIT	**41**
PLASTIC LIMIT	**24**
PLASTICITY INDEX	**17**
NATURAL MOISTURE (%)	**18.3**

GRAIN SIZE DATA

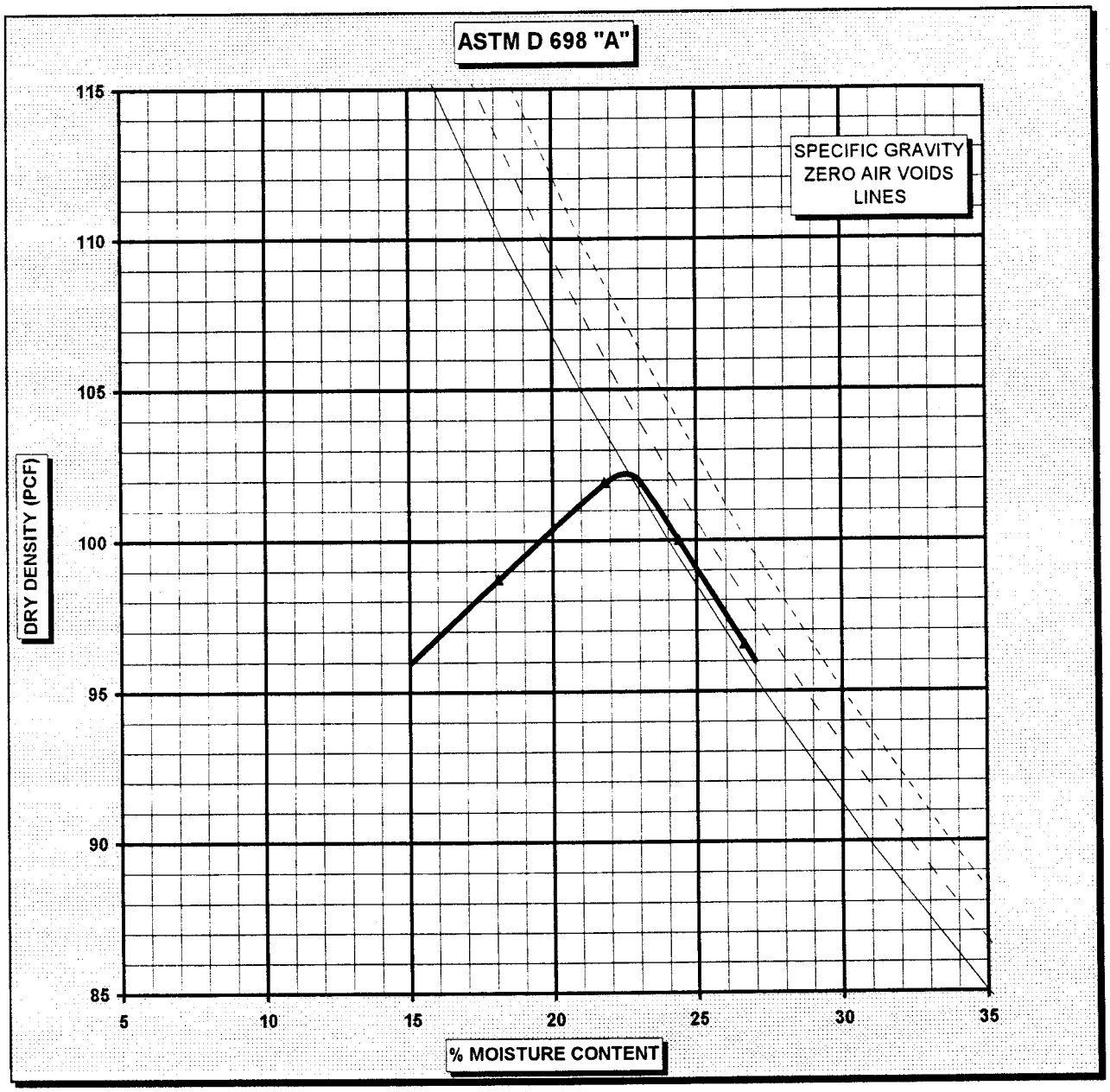
SAND (%)	**73.3**
SILT (%)	**3.7**
CLAY (%)	**23.0**

S&ME

MOISTURE - DENSITY RELATIONSHIP

PROJECT NUMBER:	1053-00-211	DATE:	6/21/00
PROJECT NAME:	RMT LAB SERVICE	SAMPLE NO.:	PS-6
PROJECT LOCATION:	PLYMOUTH, NC	BORING NO.:	Bag
SAMPLE DESCRIPTION:	Brown Fine Sandy CLAY (CH)	DEPTH (ft):	

MAXIMUM DRY DENSITY:	102.2	PCF	LIQUID LIMIT:	58
OPT. MOISTURE CONTENT:	22.5	%	PLASTICITY INDEX:	36
NATURAL MOIST. CONT.:	23.9	%		
SPECIFIC GRAVITY:	2.70			



Scale: As Shown	Checked By: MLK	Drawn By: MLK	Date: 6/22/00

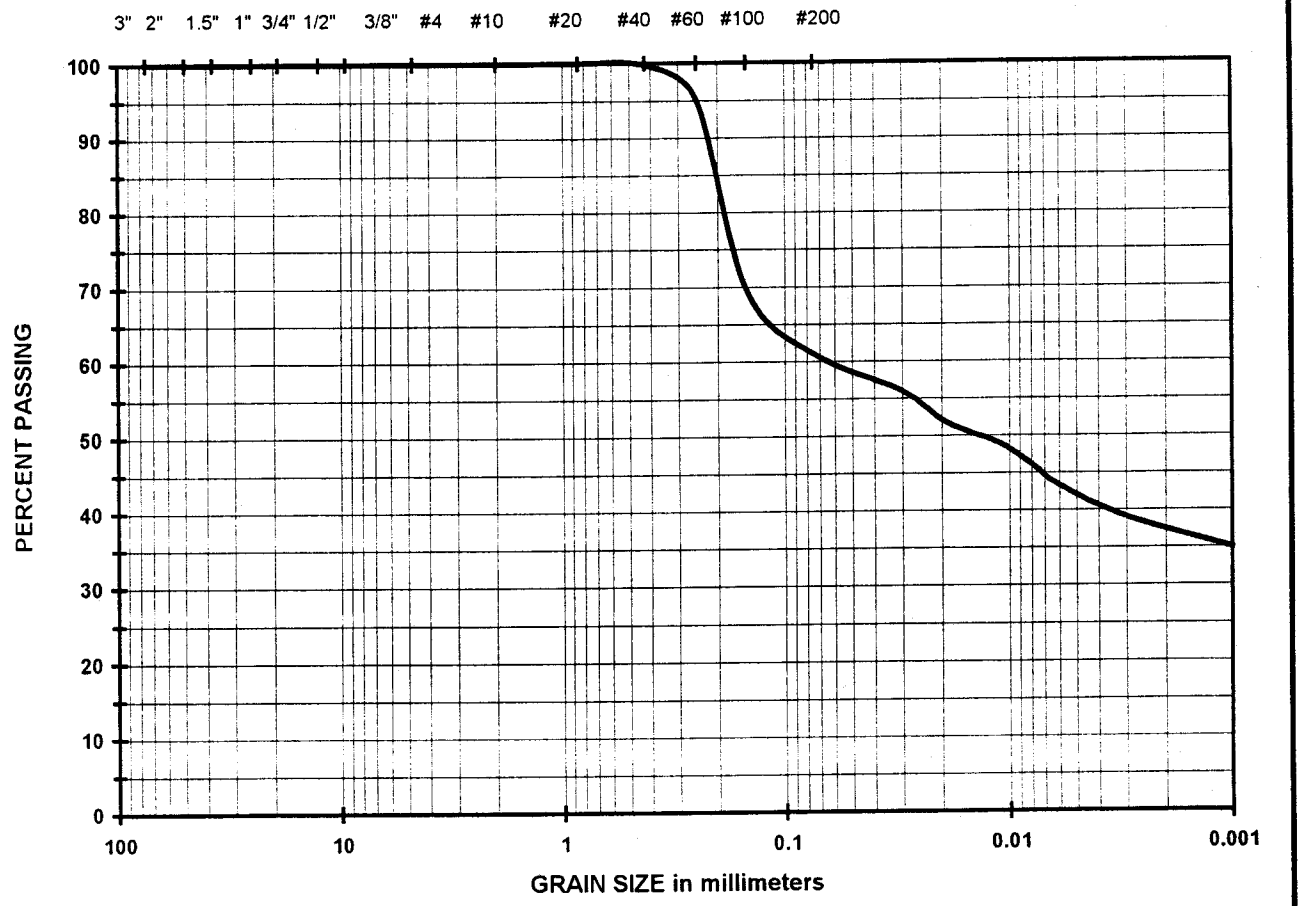
S&ME, Inc. 3109 Spring Forest Road, Raleigh, North Carolina 27604, (919) 872-2660, Fax (919) 876-3958

S&ME GRAIN SIZE DATA SHEET

Project Description: RMT Lab Service

Project Number: 1053-00-211

GRAIN SIZE DISTRIBUTION CURVE



Gravel	< 75 mm and > 4.75 mm
Coarse Sand	< 4.75 mm and >2.00 mm
Medium Sand	< 2.00 mm and > 0.425 mm

Fine Sand	< 0.425 mm and > 0.075 mm
Silt	< 0.075 and > 0.005 mm
Clay	> 0.005 mm

Boring No.: PS-6 Sample No.: Bag Depth (ft): N/A

Soil Description: **Brown Fine Sandy CLAY (CH)**

ATTERBER LIMIT (-#40 MATERIAL)	
LIQUID LIMIT	58
PLASTIC LIMIT	22
PLASTICITY INDEX	36
NATURAL MOISTURE (%)	23.9

GRAIN SIZE DATA	
SAND (%)	39.0
SILT (%)	18.0
CLAY (%)	43.0

S&ME

HYDRAULIC CONDUCTIVITY TEST

(FALLING HEAD\INCREASING TAILWATER)
ASTM D-5084 METHOD (C)

Job No.: 1053-00-211 Job Name: RMT Lab Service

Date Sampled: N/A Date Tested: 7/2/00 Sample No.: PS-6 Boring No. Bag Depth(ft): N/A

Soil Description: Brown Fine Sandy CLAY (CH)

Notes : Test specimen was remolded to 95% @ 2% wet of optimum moisture content ASTM D-698

Undisturbed (x)	Remolded ( )	Standard Proctor
	Max Dry Density	102.2 lbs./cu.ft.
	Optimum Moisture	22.5 %
	% Compaction	95.0 %

Cell Pressure:	73 PSI
Back Pressure:	
Head:	72 PSI
Tail:	70 PSI

Sample Data, Initial.						Sample Data, Final.			
Length	7.50	cm.	Moisture Content	25.0	%	7.50	cm.	26.6	%
Diameter	7.31	cm.	Wet Density	121.2	PCF	7.31	cm.	122.7	PCF
Area	41.97	sq.cm.	Dry Density	96.9	PCF	41.97	sq.cm.	96.9	PCF
Volume	314.76	cu.cm.	Saturation	93.8	%	314.76	cu.cm.	99.8	%
Wet Weight	611.10	grams	B-Parameter	98.3	%	618.92	grams	98.3	%
Dry Weight	488.88	grams	Initial Void Ratio	0.7062		488.88	grams	0.706	
WATER TEMP. (C)	25.0		Porosity	0.414		25.0		0.414	
CORRECTION FACTOR	0.8893		Specific Gravity	2.65		0.8893		2.65	

TEST DATA:

k = (aL/2At) X ln(dt/dh)	k =	HYDRAULIC CONDUCTIVITY	
RATIO = Hv1-Hv2 / Hc2	L =	7.5	cm. Length of Sample
(hv1-hc1=h1)INITIAL LOSS	A =	41.97	sq.cm. Area of Sample
(hv2-hc2=h2)FINAL LOSS	a =	0.196	sq.cm. Area of Burett
i = h2/L	i =	HYDRAULIC GRADIENT	
	t=	Elapsed time of test (second)	

	Burette Readings - cc			Burette Readings - cm		Ratio	
t/sec.	Hv1-tail	Hc2-head	Hv2-tail	Hc2-head	dh	dt	Out/In	H.G.
6000	7.30	5.64	6.48	6.42	149.1	140.9	0.84	18.79
1740	6.48	5.00	6.24	5.28	148.1	145.5	0.85	19.40
960	6.24	5.00	6.10	5.17	146.9	145.3	0.85	19.38
1380	6.10	5.17	5.90	5.36	145.3	143.4	0.84	19.11

1. k =	1.64E-07	cm./sec.	AVERAGE :		
2. k =	1.82E-07	cm./sec.	k =	1.60E-07	cm./sec.
3. k =	1.97E-07	cm./sec.	i =	19.17	
4. k =	1.75E-07	cm./sec.	R=	0.84	

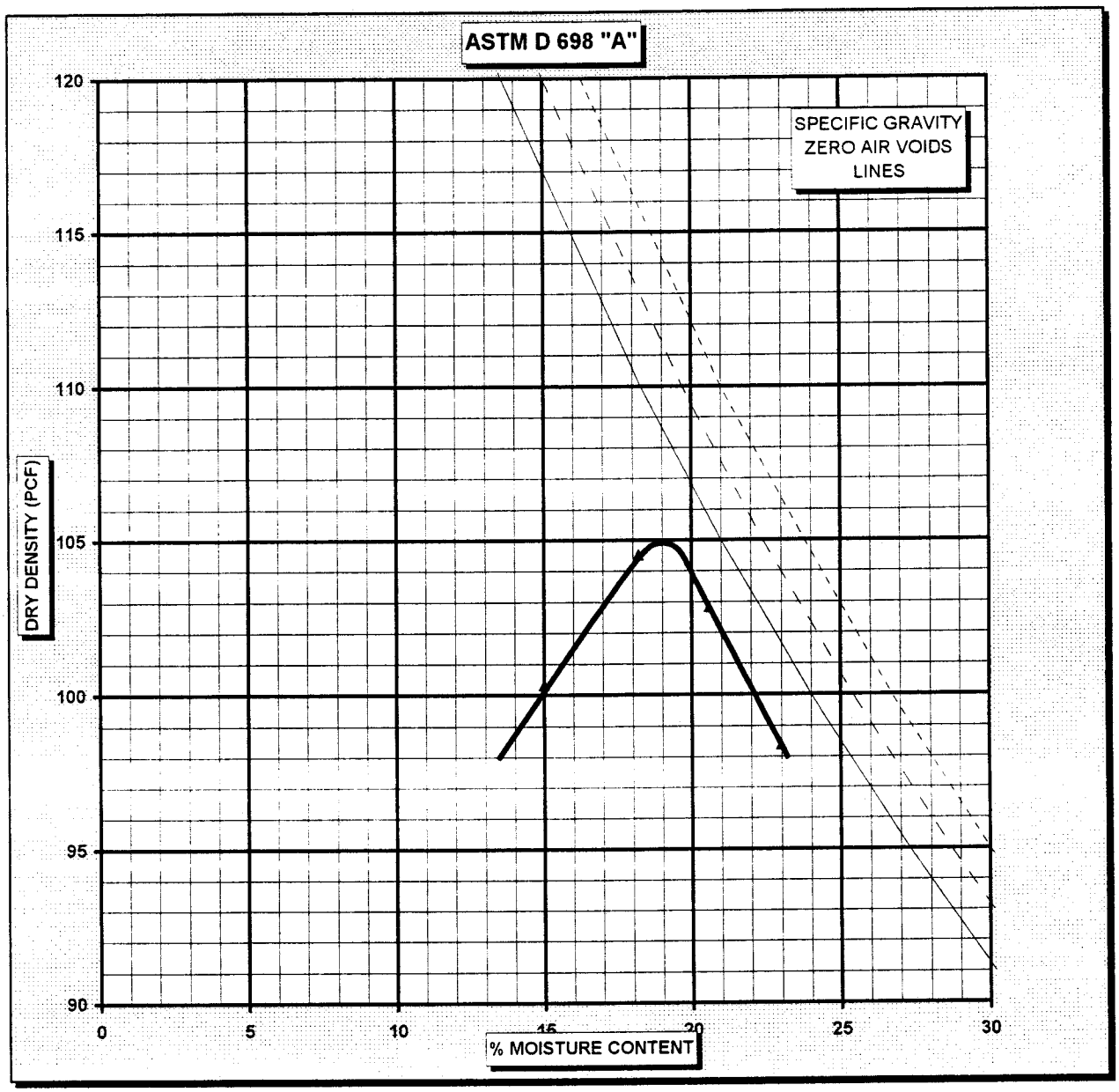
FINAL (k) VALUE AVERAGE WITH WATER TEMPERATURE CORRECTION.

Tested by: G. Sita Checked by: M. Krajan

MOISTURE - DENSITY RELATIONSHIP

PROJECT NUMBER:	1053-00-211	DATE TESTED:	7/6/00
PROJECT NAME:	RMT LAB SERVICE	SAMPLE NO.:	PS-7
PROJECT LOCATION:	PLYMOUTH, NC	BORING NO.:	Bag
SAMPLE DESCRIPTION:	Tan-Orange Fine Sandy CLAY (CL)	DEPTH (ft):	N/A

MAXIMUM DRY DENSITY:	104.9	PCF	LIQUID LIMIT:	45	
OPT. MOISTURE CONTENT:	19.0	%	PLASTICITY INDEX:	24	
NATURAL MOIST. CONT.:	20.5	%			
SPECIFIC GRAVITY:	2.68				



Scale: As Shown	Tested By: CL	Checked By: MK	Drawn By: MK	Date: 7/8/00

S&ME, Inc. 3109 Spring Forest Road, Raleigh, North Carolina 27604, (919) 872-2660, Fax (919) 876-3958

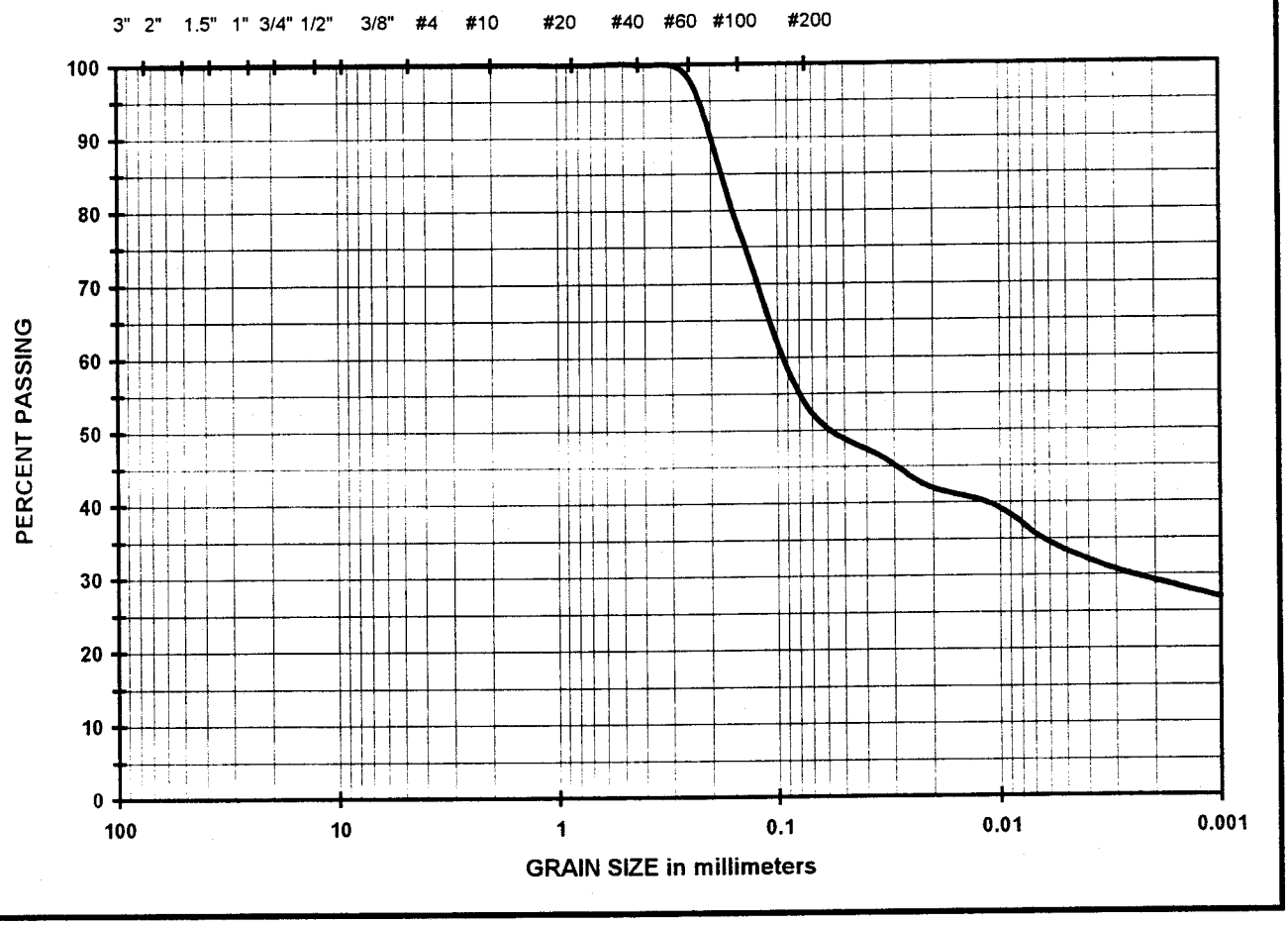
S&ME

GRAIN SIZE DATA SHEET

Project Description: RMT Lab Service

Project Number: 1053-00-211

GRAIN SIZE DISTRIBUTION CURVE



Gravel	< 75 mm and > 4.75 mm
Coarse Sand	< 4.75 mm and >2.00 mm
Medium Sand	< 2.00 mm and > 0.425 mm

Fine Sand	< 0.425 mm and > 0.075 mm
Silt	< 0.075 and > 0.005 mm
Clay	> 0.005 mm

Boring No.: PS - 7 Sample No.: Bag Depth (ft): N/A

Soil Description: **Tan-Orange Fine Sandy CLAY (CL)**

ATTERBER LIMIT (-#40 MATERIAL)	
LIQUID LIMIT	45
PLASTIC LIMIT	21
PLASTICITY INDEX	24
NATURAL MOISTURE (%)	20.5

GRAIN SIZE DATA	
SAND (%)	46.5
SILT (%)	19.7
CLAY (%)	33.8

HYDRAULIC CONDUCTIVITY TEST

(FALLING HEAD\INCREASING TAILWATER)
ASTM D-5084 METHOD (C)

Job No.: 1053-00-211 Job Name: RMT Lab Service

Date Sampled: N/A Date Tested: 7/14/00 Boring No.: PS-7 Sample No.: Bag Depth(ft): N/A

Soil Description: Tan-Orange Fine Sandy CLAY (CL)

Notes : Test specimen was remolded to 95% @ 2.0% wet of optimum moisture content ASTM D-698.

Undisturbed ( )	Remolded (X)	Standard Proctor
	Max Dry Density	104.9 lbs./cu.ft.
	Optimum Moisture	19.0 %
	% Compaction	95.0 %

Cell Pressure:	73 PSI
Back Pressure:	
Head:	70 PSI
Tail:	70 PSI

Sample Data, Initial.						Sample Data, Final.			
Length	7.50	cm.	Moisture Content	20.8	%	7.50	cm.	25.6	%
Diameter	7.31	cm.	Wet Density	120.2	PCF	7.31	cm.	125.0	PCF
Area	41.97	sq.cm.	Dry Density	99.5	PCF	41.97	sq.cm.	99.5	PCF
Volume	314.76	cu.cm.	Saturation	81.8	%	314.76	cu.cm.	100	%
Wet Weight	606.10	grams	B-Parameter	99.2	%	630.18	grams	99.2	%
Dry Weight	501.74	grams	Initial Void Ratio	0.681		501.74	grams	0.681	
WATER TEMP. (C)	25.0		Porosity	0.405		25.0		0.405	
CORRECTION FACTOR	0.8893		Specific Gravity	2.68		0.8893		2.68	

TEST DATA:

k = (aL/2At) X ln(h1/h2)	k =	HYDRAULIC CONDUCTIVITY	
RATIO = Hv1-Hv2 / Hc2	L =	7.50	cm. Length of Sample
(hv1-hc1=h1)INITIAL LOSS	A =	41.97	sq.cm. Area of Sample
(hv2-hc2=h2)FINAL LOSS	a =	0.72	sq.cm. Area of Burett
i = h2/L	i =	HYDRAULIC GRADIENT	
	t=	Elapsed time of test (second)	

t/sec.	Hv1	Hc1	Hv2	Hc2	h1	h2	Out/In	H.G.
1800	30.0	0.0	29.0	1.0	30.0	28.0	1.00	3.73
1680	30.0	0.0	29.1	0.9	30.0	28.2	1.00	3.76
1320	30.0	0.0	29.2	0.7	30.0	28.5	1.14	3.80
1800	30.0	0.0	29.0	1.0	30.0	28.0	1.00	3.73

1. k =	2.47E-06	cm./sec.	AVERAGE :		
2. k =	2.37E-06	cm./sec.	k =	2.18E-06	cm./sec.
3. k =	2.50E-06	cm./sec.	i =	3.76	
4. k =	2.47E-06	cm./sec.	R=	1.04	

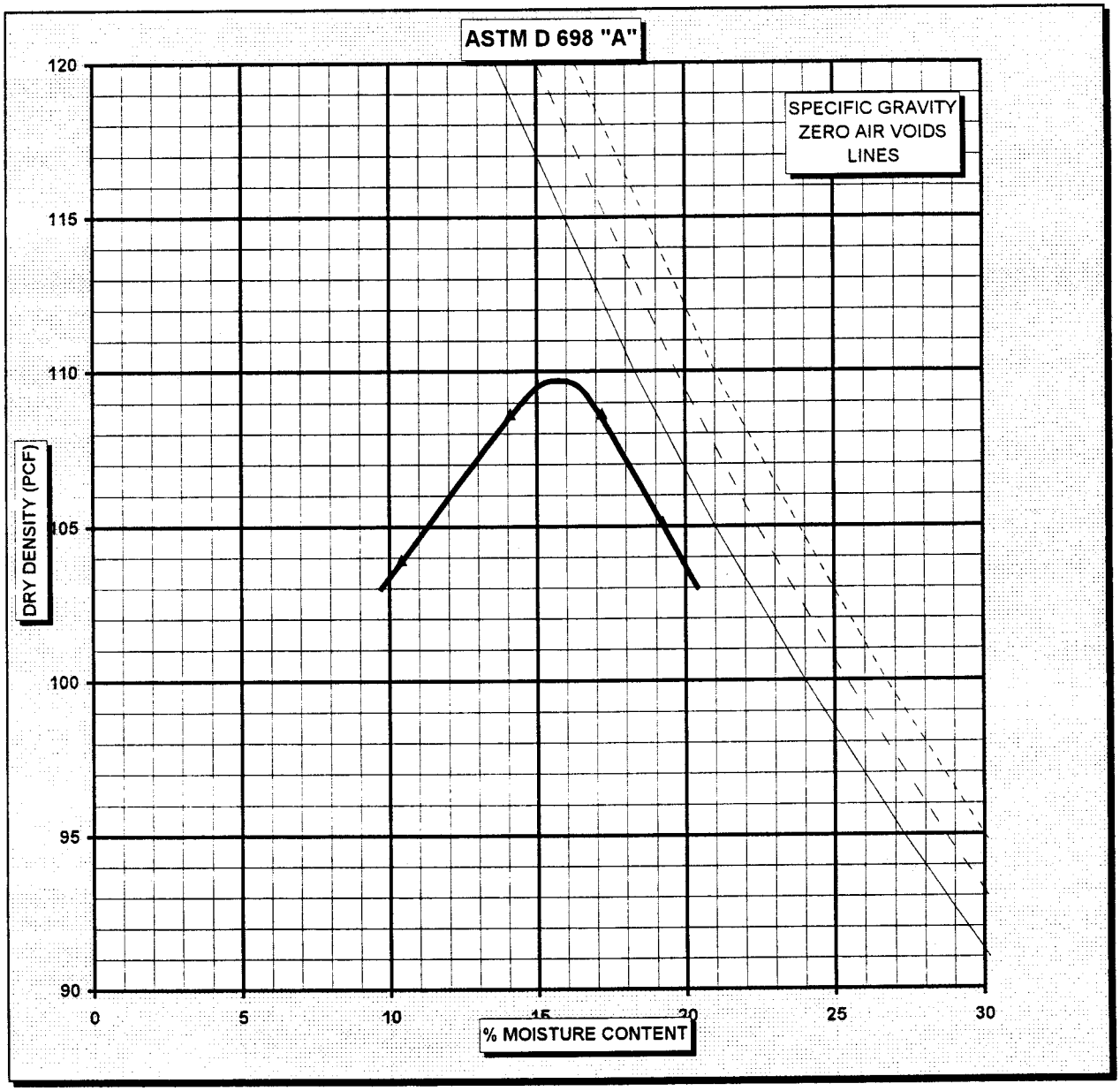
FINAL (k) VALUE AVERAGE WITH WATER TEMPERATURE CORRECTION.

Tested by: G. Sita Checked by: M. Krajan

MOISTURE - DENSITY RELATIONSHIP

PROJECT NUMBER:	1053-00-211	DATE TESTED:	7/10/00
PROJECT NAME:	RMT LAB SERVICE	SAMPLE NO.:	PS-8
PROJECT LOCATION:	PLYMOUTH, NC	BORING NO.:	Bag
SAMPLE DESCRIPTION:	Tan-Orange Clayey Fine SAND (SC)	DEPTH (ft):	N/A

MAXIMUM DRY DENSITY:	109.7	PCF	LIQUID LIMIT:	44	
OPT. MOISTURE CONTENT:	15.6	%	PLASTICITY INDEX:	24	
NATURAL MOIST. CONT.:	16.5	%			
SPECIFIC GRAVITY:	2.67				



Scale: As Shown	Tested By: CL	Checked By: MK	Drawn By: MK	Date: 7/13/00

S&ME, Inc. 3109 Spring Forest Road, Raleigh, North Carolina 27604, (919) 872-2660, Fax (919) 876-3958

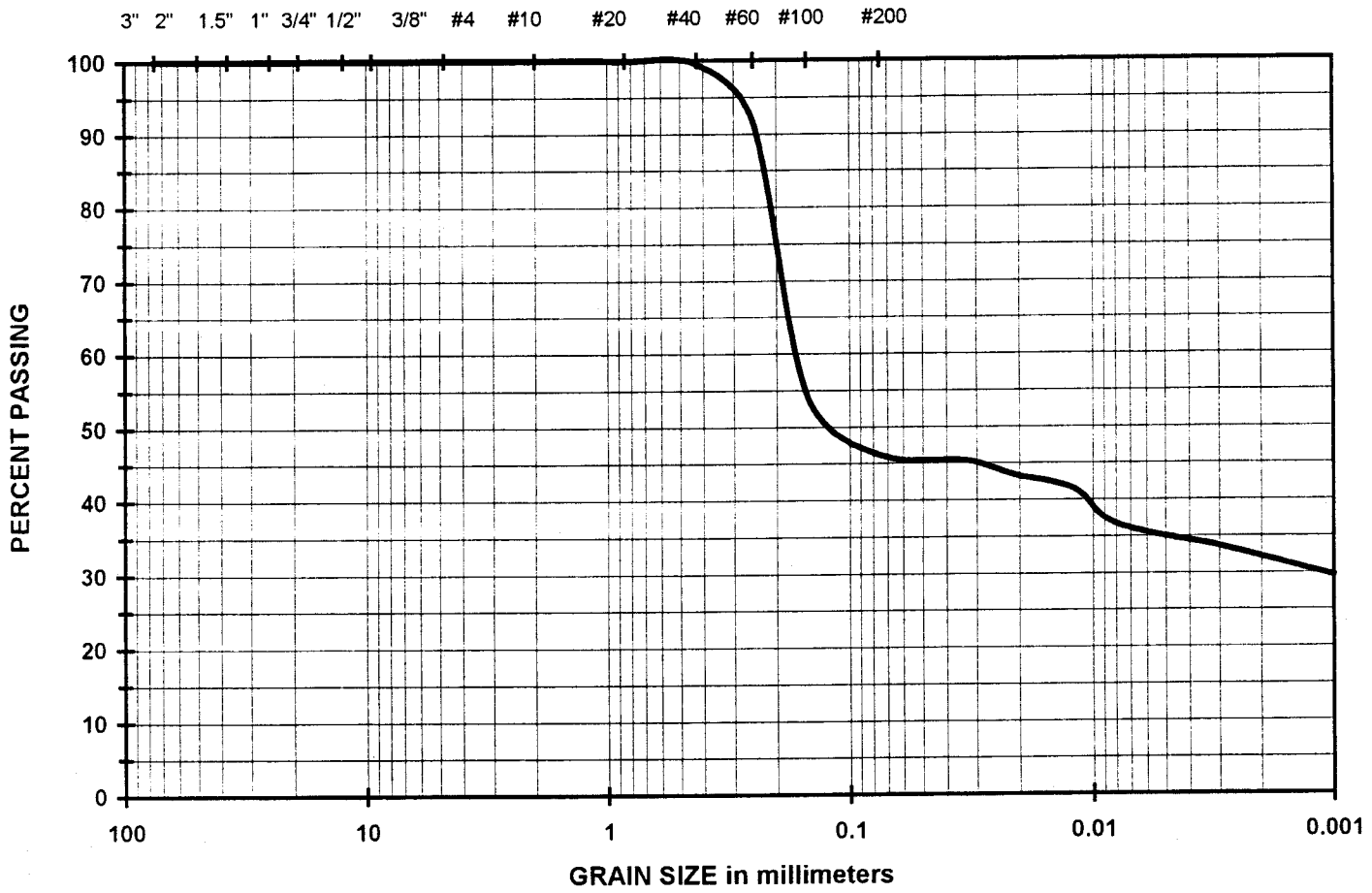
S&ME

GRAIN SIZE DATA SHEET

Project Description: RMT Lab Service

Project Number: 1053-00-211

GRAIN SIZE DISTRIBUTION CURVE



Gravel	< 75 mm and > 4.75 mm
Coarse Sand	< 4.75 mm and >2.00 mm
Medium Sand	< 2.00 mm and > 0.425 mm

Fine Sand	< 0.425 mm and > 0.075 mm
Silt	< 0.075 and > 0.005 mm
Clay	> 0.005 mm

Boring No.: PS - 8 Sample No.: Bag Depth (ft): N/A

Soil Description: Tan-Orange Clayey Fine SAND (SC)

ATTERBER LIMIT (#40 MATERIAL)	
LIQUID LIMIT	44
PLASTIC LIMIT	20
PLASTICITY INDEX	24
NATURAL MOISTURE (%)	16.5

GRAIN SIZE DATA	
SAND (%)	53.9
SILT (%)	11.2
CLAY (%)	34.9

HYDRAULIC CONDUCTIVITY TEST

(FALLING HEAD\INCREASING TAILWATER)
ASTM D-5084 METHOD (C)

Job No.: 1053-00-211 Job Name: RMT Lab Service

Date Sampled: N/A Date Tested: 7/14/00 Boring No.: PS-8 Sample No.: Bag Depth(ft): N/A

Soil Description: Tan-Orange Clayey Fine SAND (SC)

Notes : Test specimen was remolded to 95% @ 2.0% wet of optimum moisture content ASTM D-698.

Undisturbed ( )	Remolded (X)	Standard Proctor
	Max Dry Density	109.7 lbs./cu.ft.
	Optimum Moisture	15.6 %
	% Compaction	95.0 %

Cell Pressure:	73 PSI
Back Pressure:	
Head:	70 PSI
Tail:	70 PSI

Sample Data, Initial.						Sample Data, Final.			
Length	7.50	cm.	Moisture Content	17.7	%	7.50	cm.	23.9	%
Diameter	7.31	cm.	Wet Density	122.5	PCF	7.31	cm.	128.9	PCF
Area	41.97	sq.cm.	Dry Density	104.1	PCF	41.97	sq.cm.	104.1	PCF
Volume	314.76	cu.cm.	Saturation	78.5	%	314.76	cu.cm.	100	%
Wet Weight	617.60	grams	B-Parameter	99.2	%	650.13	grams	99.2	%
Dry Weight	524.72	grams	Initial Void Ratio	0.602		524.72	grams	0.602	
WATER TEMP. (C)	25.0		Porosity	0.376		25.0		0.376	
CORRECTION FACTOR	0.8893		Specific Gravity	2.67		0.8893		2.67	

TEST DATA:

k = (aL/2At) X ln(h1/h2)	k =	HYDRAULIC CONDUCTIVITY	
RATIO = Hv1-Hv2 / Hc2	L =	7.50	cm. Length of Sample
(hv1-hc1=h1)INITIAL LOSS	A =	41.97	sq.cm. Area of Sample
(hv2-hc2=h2)FINAL LOSS	a =	0.72	sq.cm. Area of Burett
i = h2/L	i =	HYDRAULIC GRADIENT	
	t=	Elapsed time of test (second)	

t/sec.	Hv1	Hc1	Hv2	Hc2	h1	h2	Out/In	H.G.
2100	30.0	0.0	27.4	2.6	30.0	24.8	1.00	3.31
1800	30.0	0.0	28.0	2.0	30.0	26.0	1.00	3.47
1680	30.0	0.0	28.0	2.0	30.0	26.0	1.00	3.47
3120	30.0	0.0	26.5	3.5	30.0	23.0	1.00	3.07

1. k =	5.83E-06	cm./sec.	AVERAGE :		
2. k =	5.11E-06	cm./sec.	k =	4.87E-06	cm./sec.
3. k =	5.48E-06	cm./sec.	i =	3.33	
4. k =	5.48E-06	cm./sec.	R=	1.00	

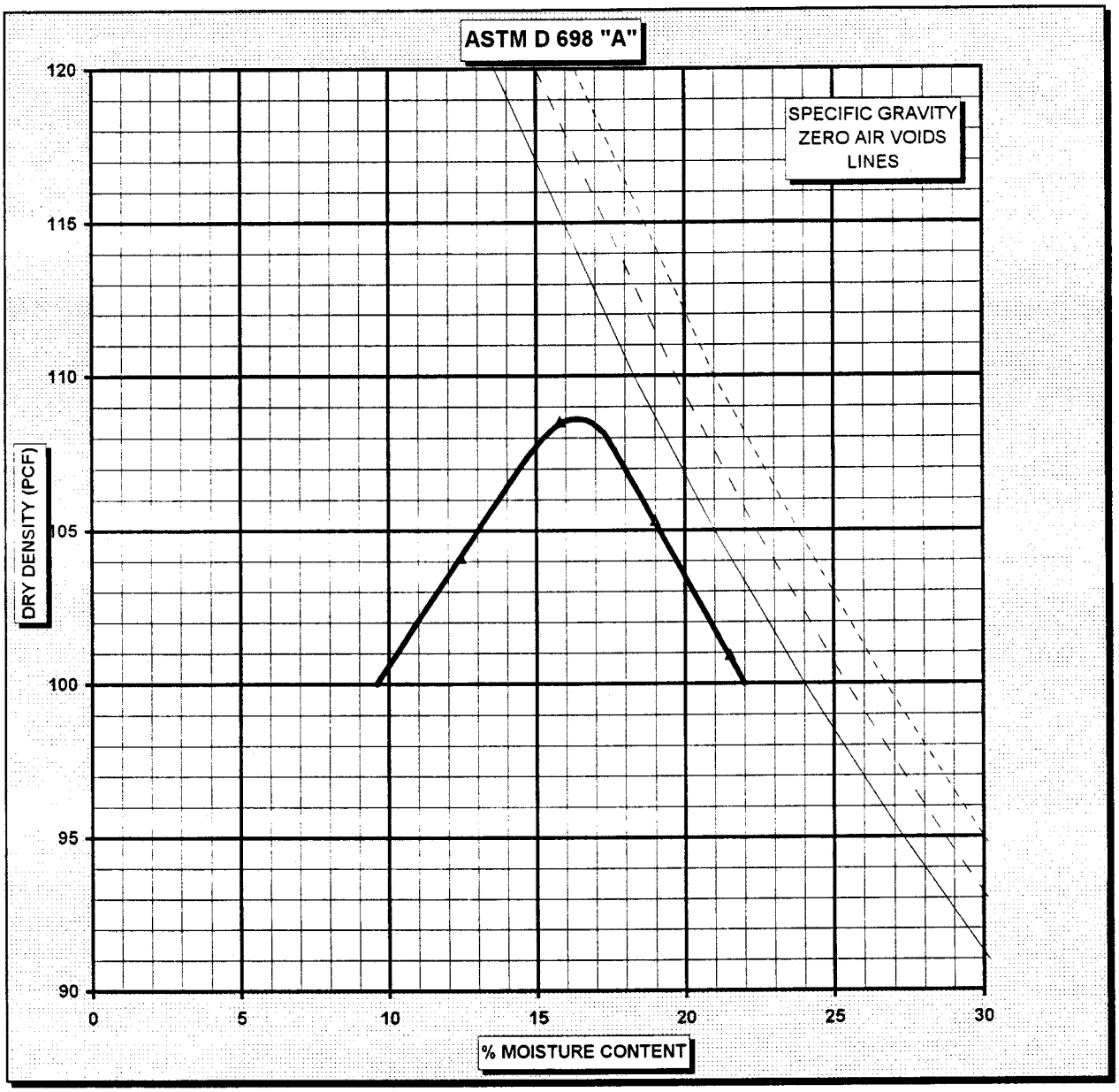
FINAL (k) VALUE AVERAGE WITH WATER TEMPERATURE CORRECTION.

Tested by: G. Sita Checked by: M. Krajan

MOISTURE - DENSITY RELATIONSHIP

PROJECT NUMBER:	1053-00-211	DATE TESTED:	7/10/00
PROJECT NAME:	RMT LAB SERVICE	SAMPLE NO.:	PS-9
PROJECT LOCATION:	PLYMOUTH, NC	BORING NO.:	Bag
SAMPLE DESCRIPTION:	Tan-Brown Silty Clayey SAND (SC-SM)	DEPTH (ft):	N/A

MAXIMUM DRY DENSITY:	108.6	PCF	LIQUID LIMIT:	24	
OPT. MOISTURE CONTENT:	16.5	%	PLASTICITY INDEX:	5	
NATURAL MOIST. CONT.:	13.3	%			
SPECIFIC GRAVITY:	2.68				



Scale: As Shown	Tested By: CL	Checked By: MK	Drawn By: MK	Date: 7/13/00

S&ME, Inc. 3109 Spring Forest Road, Raleigh, North Carolina 27604, (919) 872-2660, Fax (919) 876-3958

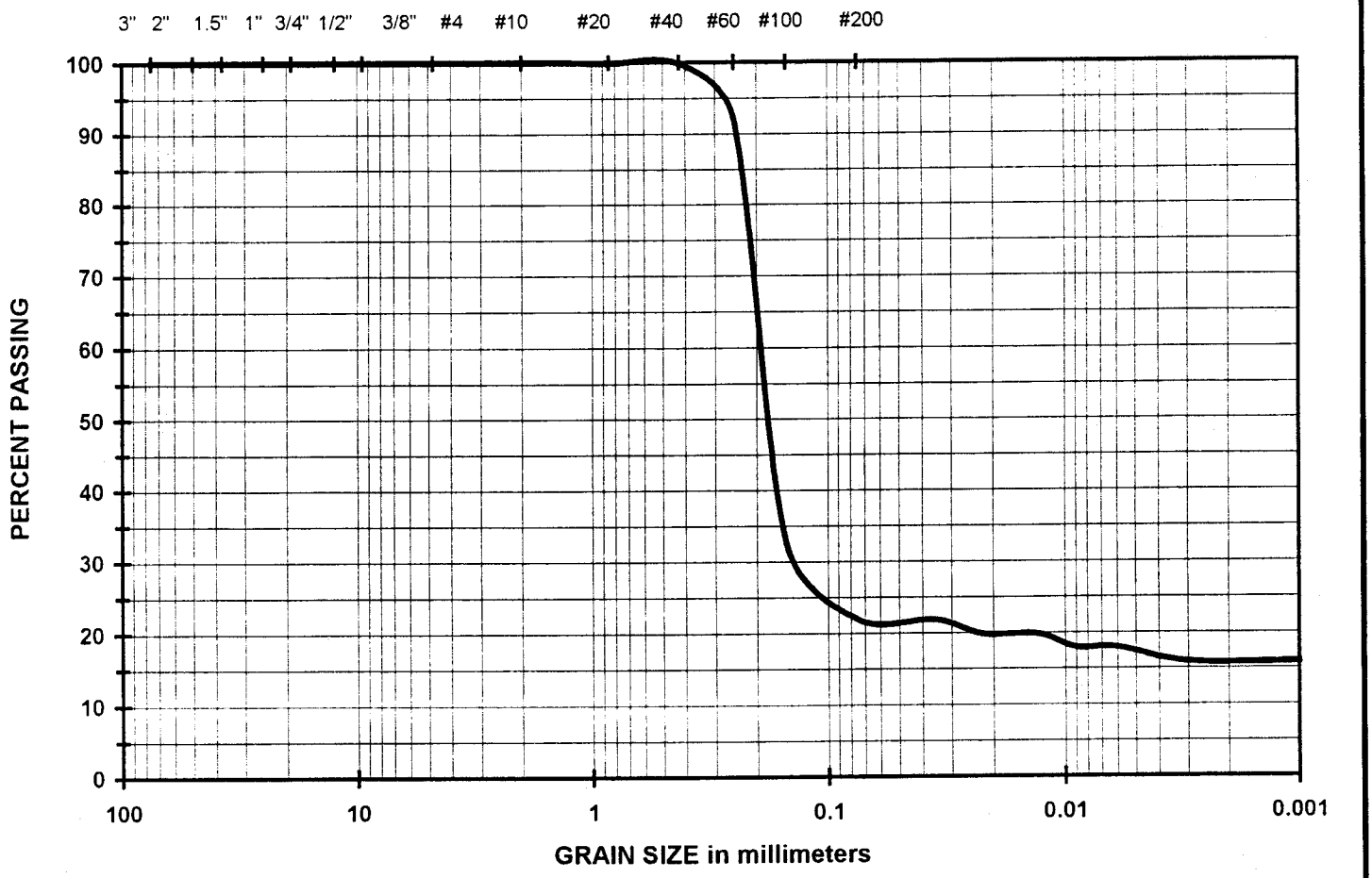
S&ME

GRAIN SIZE DATA SHEET

Project Description: RMT Lab Service

Project Number: 1053-00-211

GRAIN SIZE DISTRIBUTION CURVE



Gravel	< 75 mm and > 4.75 mm
Coarse Sand	< 4.75 mm and >2.00 mm
Medium Sand	< 2.00 mm and > 0.425 mm

Fine Sand	< 0.425 mm and > 0.075 mm
Silt	< 0.075 and > 0.005 mm
Clay	> 0.005 mm

Boring No.: PS - 9 Sample No.: Bag Depth (ft): N/A

Soil Description: Tan-Brown Silty Clayey SAND (SC-SM)

ATTERBER LIMIT (-#40 MATERIAL)	
LIQUID LIMIT	24
PLASTIC LIMIT	19
PLASTICITY INDEX	5
NATURAL MOISTURE (%)	13.3

GRAIN SIZE DATA	
SAND (%)	78.1
SILT (%)	4.9
CLAY (%)	17.0

HYDRAULIC CONDUCTIVITY TEST

(FALLING HEAD\INCREASING TAILWATER)
ASTM D-5084 METHOD (C)

Job No.: 1053-00-211 Job Name: RMT Lab Service

Date Sampled: N/A Date Tested: 7/14/00 Boring No.: PS-9 Sample No.: Bag Depth(ft): N/A

Soil Description: Tan-Brown Silty Clayey SAND (SC-SM)

Notes : Test specimen was remolded to 95% @ 2.0% wet of optimum moisture content ASTM D-698.

Undisturbed ( )	Remolded (X)	Standard Proctor
	Max Dry Density	108.6 lbs./cu.ft.
	Optimum Moisture	16.5 %
	% Compaction	95.0 %

Cell Pressure:	73 PSI
Back Pressure:	
Head:	70 PSI
Tail:	70 PSI

Sample Data, Initial.						Sample Data, Final.			
Length	7.50	cm.	Moisture Content	18.8	%	7.50	cm.	23.5	%
Diameter	7.31	cm.	Wet Density	122.9	PCF	7.31	cm.	127.8	PCF
Area	41.97	sq.cm.	Dry Density	103.5	PCF	41.97	sq.cm.	103.5	PCF
Volume	314.76	cu.cm.	Saturation	81.7	%	314.76	cu.cm.	100	%
Wet Weight	619.90	grams	B-Parameter	99.2	%	644.42	grams	99.2	%
Dry Weight	521.80	grams	Initial Void Ratio	0.617		521.80	grams	0.617	
WATER TEMP. (C)	25.0		Porosity	0.381		25.0		0.381	
CORRECTION FACTOR	0.8893		Specific Gravity	2.68		0.8893		2.68	

TEST DATA:

k = (aL/2At) X ln(h1/h2)	k =	HYDRAULIC CONDUCTIVITY	
RATIO = Hv1-Hv2 / Hc2	L =	7.50	cm. Length of Sample
(hv1-hc1=h1)INITIAL LOSS	A =	41.97	sq.cm. Area of Sample
(hv2-hc2=h2)FINAL LOSS	a =	0.72	sq.cm. Area of Burett
i = h2/L	i =	HYDRAULIC GRADIENT	
	t=	Elapsed time of test (second)	

t/sec.	Hv1	Hc1	Hv2	Hc2	h1	h2	Out/In	H.G.
240	20.0	0.0	17.0	3.0	20.0	14.0	1.00	1.87
240	20.0	0.0	17.0	3.0	20.0	14.0	1.00	1.87
300	20.0	0.0	16.5	3.6	20.0	12.9	0.97	1.72
180	20.0	0.0	17.8	2.3	20.0	15.5	0.96	2.07

1. k =	9.56E-05	cm./sec.	AVERAGE :		
2. k =	9.56E-05	cm./sec.	k =	8.37E-05	cm./sec.
3. k =	9.40E-05	cm./sec.	i =	1.88	
4. k =	9.11E-05	cm./sec.	R=	0.98	

FINAL (k) VALUE AVERAGE WITH WATER TEMPERATURE CORRECTION.

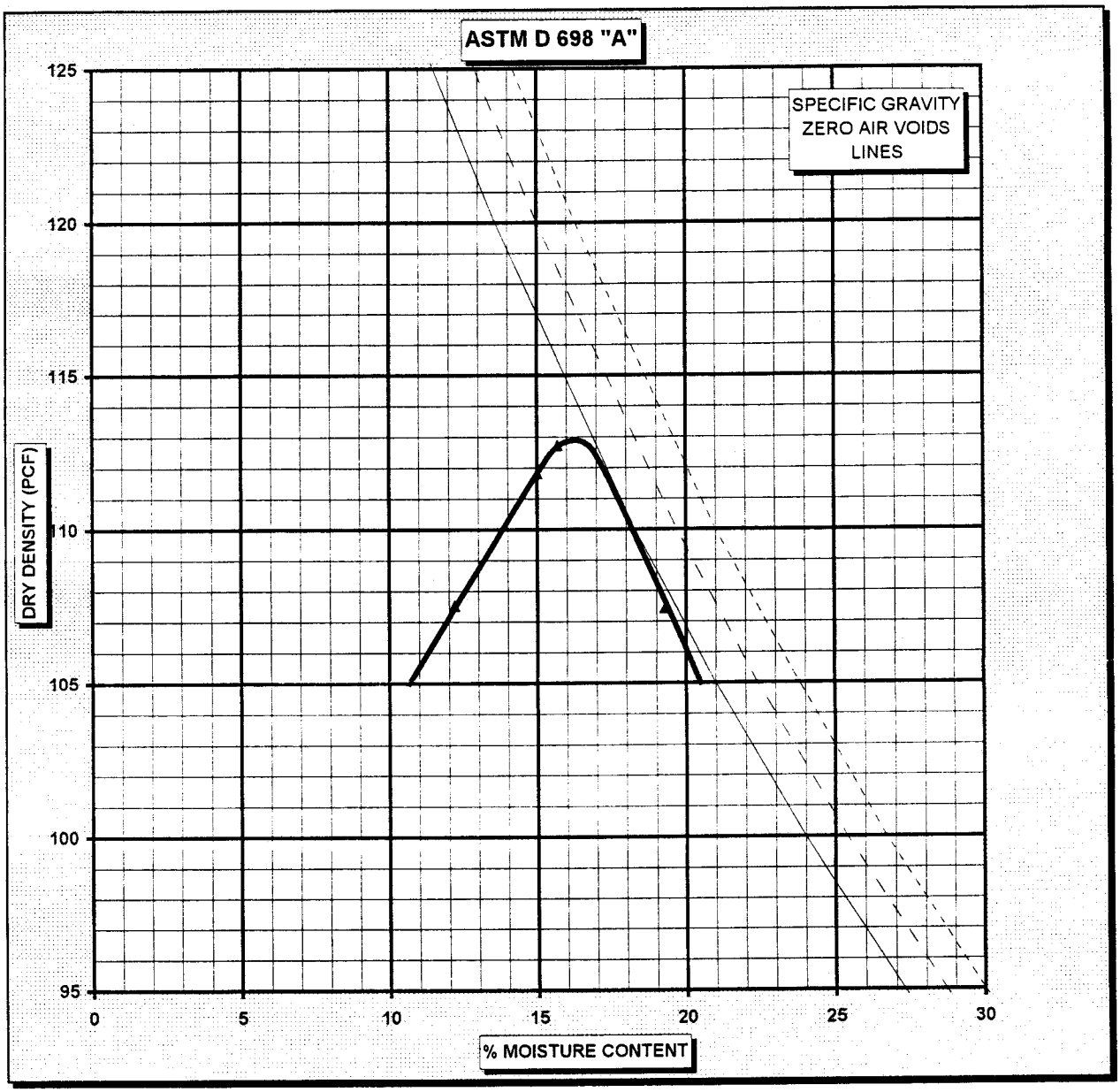
Tested by: G. Sita Checked by: M. Krajan

S&ME

MOISTURE - DENSITY RELATIONSHIP

PROJECT NUMBER:	1053-00-211	DATE TESTED:	7/20/00
PROJECT NAME:	RMT LAB SERVICE	SAMPLE NO.:	PS-10
PROJECT LOCATION:	PLYMOUTH, NC	BORING NO.:	Bag
SAMPLE DESCRIPTION:	Tan-Gray Fine Sandy Silty CLAY	DEPTH (ft):	N/A

MAXIMUM DRY DENSITY:	112.9	PCF	LIQUID LIMIT:	
OPT. MOISTURE CONTENT:	16.3	%	PLASTICITY INDEX:	
NATURAL MOIST. CONT.:	18.1	%		
SPECIFIC GRAVITY:	2.71			



Scale: As Shown	Tested By: CL	Checked By: MK	Drawn By: MK	Date: 7/31/00

S&ME, Inc. 3109 Spring Forest Road, Raleigh, North Carolina 27604, (919) 872-2660, Fax (919) 876-3958

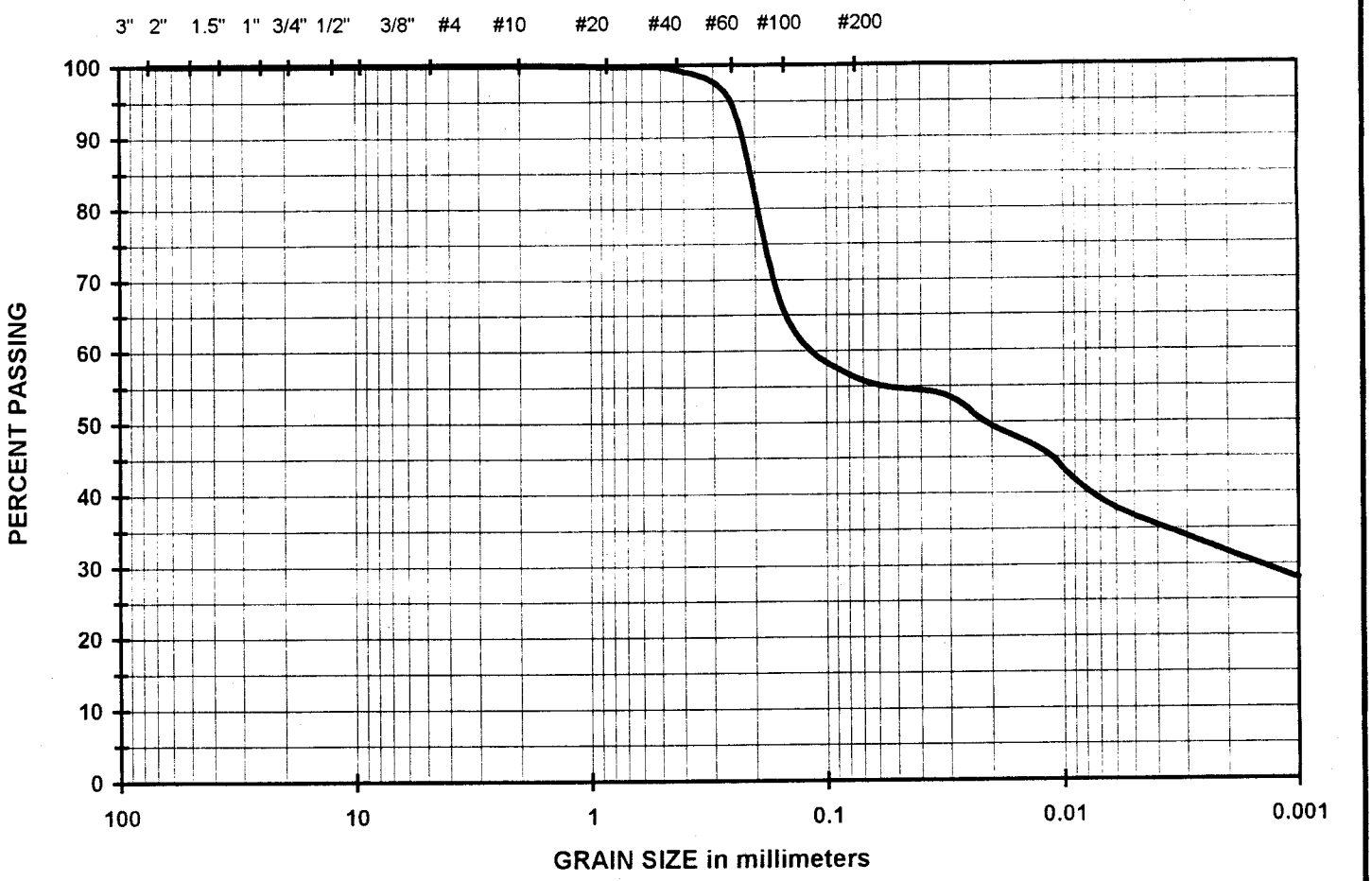
S&ME

GRAIN SIZE DATA SHEET

Project Description: RMT Lab Service

Project Number: 1053-00-211

GRAIN SIZE DISTRIBUTION CURVE



Gravel	< 75 mm and > 4.75 mm
Coarse Sand	< 4.75 mm and >2.00 mm
Medium Sand	< 2.00 mm and > 0.425 mm

Fine Sand	< 0.425 mm and > 0.075 mm
Silt	< 0.075 and > 0.005 mm
Clay	> 0.005 mm

Boring No.: P - 10 Sample No.: Bag Depth (ft): N/A

Soil Description: Tan-Brown Fine Sandy Silty CLAY

ATTERBER LIMIT (-#40 MATERIAL)	
LIQUID LIMIT	--
PLASTIC LIMIT	--
PLASTICITY INDEX	--
NATURAL MOISTURE (%)	18.1

GRAIN SIZE DATA	
SAND (%)	43.8
SILT (%)	20.2
CLAY (%)	36.0

Tested By:	B. Thompson	Checked By:	M. Krajan	Date Tested:	7/31/00

S&ME

HYDRAULIC CONDUCTIVITY TEST
(FALLING HEAD\INCREASING TAILWATER)
ASTM D-5084 METHOD (C)

Job No.: 1053-00-211 Job Name: RMT Lab Service

Date Sampled: N/A Date Tested: 7/31/00 Boring No.: PS-10 Sample No.: Bag Depth(ft): N/A

Soil Description: Tan-Brown Fine Sandy Silty CLAY

Notes : Test specimen was remolded to 95% @ 2.0% wet of optimum moisture content ASTM D-698.

Undisturbed ( )	Remolded (X)	Standard Proctor
	Max Dry Density	112.9 lbs./cu.ft.
	Optimum Moisture	16.3 %
	% Compaction	95.0 %

Cell Pressure:	73 PSI
Back Pressure:	
Head:	70 PSI
Tail:	70 PSI

Sample Data, Initial.						Sample Data, Final.			
Length	7.50	cm.	Moisture Content	18.7	%	7.50	cm.	20.5	%
Diameter	7.31	cm.	Wet Density	127.5	PCF	7.31	cm.	129.4	PCF
Area	41.97	sq.cm.	Dry Density	107.4	PCF	41.97	sq.cm.	107.4	PCF
Volume	314.76	cu.cm.	Saturation	91.1	%	314.76	cu.cm.	100	%
Wet Weight	642.80	grams	B-Parameter	99.2	%	652.55	grams	99.2	%
Dry Weight	541.53	grams	Initial Void Ratio	0.546		541.53	grams	0.546	
WATER TEMP. (C)	26.0		Porosity	0.353		26.0		0.353	
CORRECTION FACTOR	0.8694		Specific Gravity	2.66		0.8694		2.66	

TEST DATA:

k = (aL/2At) X ln(h1/h2)	k =	HYDRAULIC CONDUCTIVITY	
RATIO = Hv1-Hv2 / Hc2	L =	7.50	cm. Length of Sample
(hv1-hc1=h1)INITIAL LOSS	A =	41.97	sq.cm. Area of Sample
(hv2-hc2=h2)FINAL LOSS	a =	0.72	sq.cm. Area of Burett
i = h2/L	i =	HYDRAULIC GRADIENT	
	t=	Elapsed time of test (second)	

t/sec.	Hv1	Hc1	Hv2	Hc2	h1	h2	Out/In	H.G.
14640	40.0	0.0	39.6	0.3	40.0	39.3	1.33	5.24
69540	50.0	0.0	48.0	2.0	50.0	46.0	1.00	6.13
27180	50.0	0.0	49.3	0.9	50.0	48.4	0.78	6.45
62760	50.0	0.0	48.3	1.8	50.0	46.5	0.94	6.20

1. k =	7.76E-08	cm./sec.	AVERAGE :		
2. k =	7.71E-08	cm./sec.	k =	6.65E-08	cm./sec.
3. k =	7.70E-08	cm./sec.	i =	6.01	
4. k =	7.44E-08	cm./sec.	R=	1.01	

FINAL (k) VALUE AVERAGE WITH WATER TEMPERATURE CORRECTION.

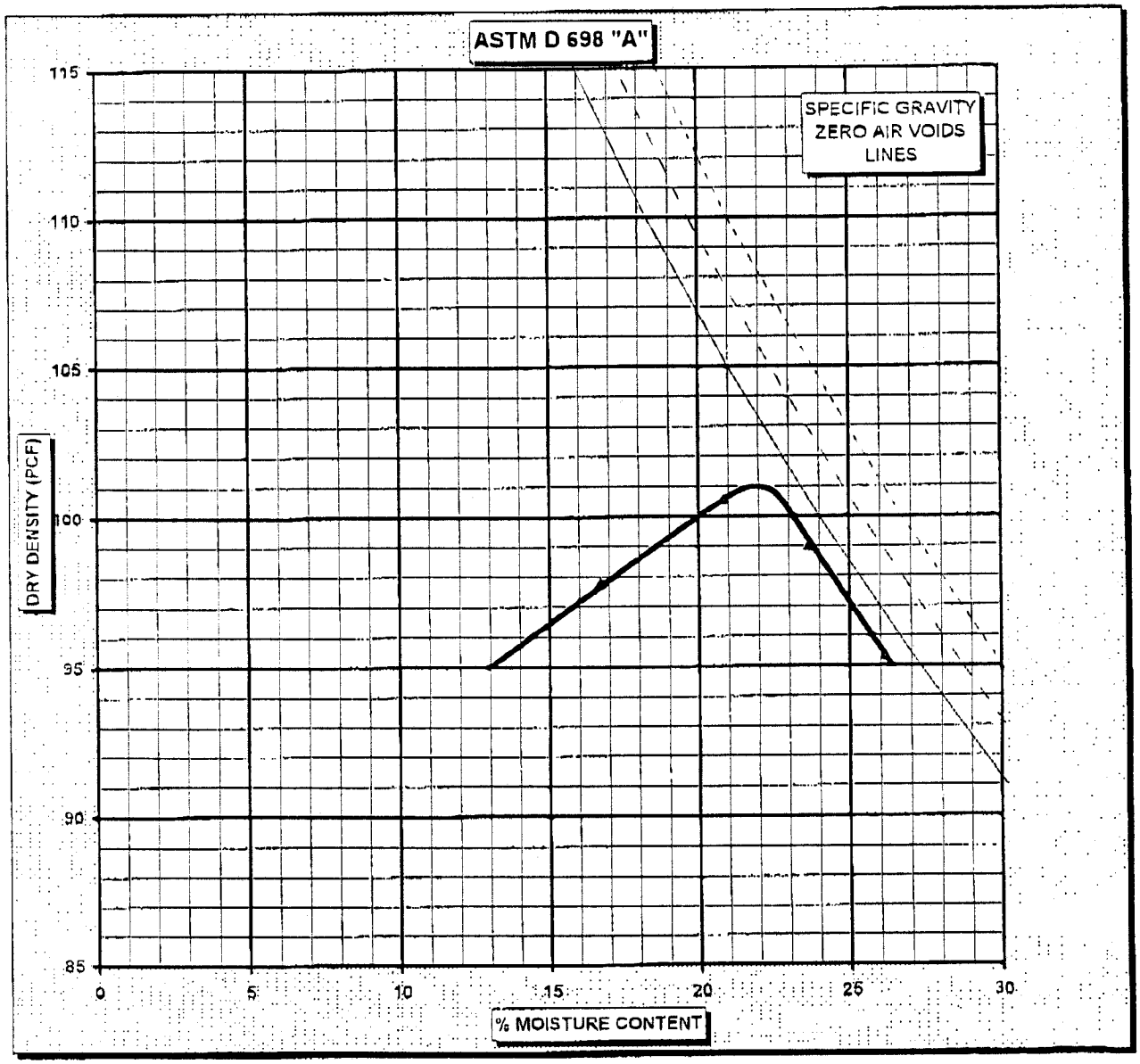
Tested by: G. Sita Checked by: M. Krajan

S&ME

MOISTURE - DENSITY RELATIONSHIP

PROJECT NUMBER:	1053-00-211	DATE TESTED:	8/23/00
PROJECT NAME:	RMT LAB SERVICE	SAMPLE NO.:	PS-12
PROJECT LOCATION:	PLYMOUTH, NC	BORING NO.:	Bag
SAMPLE DESCRIPTION:	Tan and Gray CLAY	DEPTH (ft):	N/A

MAXIMUM DRY DENSITY:	101.0	PCF	LIQUID LIMIT:	
OPT. MOISTURE CONTENT:	22.0	%	PLASTICITY INDEX:	
NATURAL MOIST. CONT.:		%		
SPECIFIC GRAVITY:	2.68			



Scale: As Shown	Tested By: CL	Checked By: MK	Drawn By: MK	Date: 8/29/00

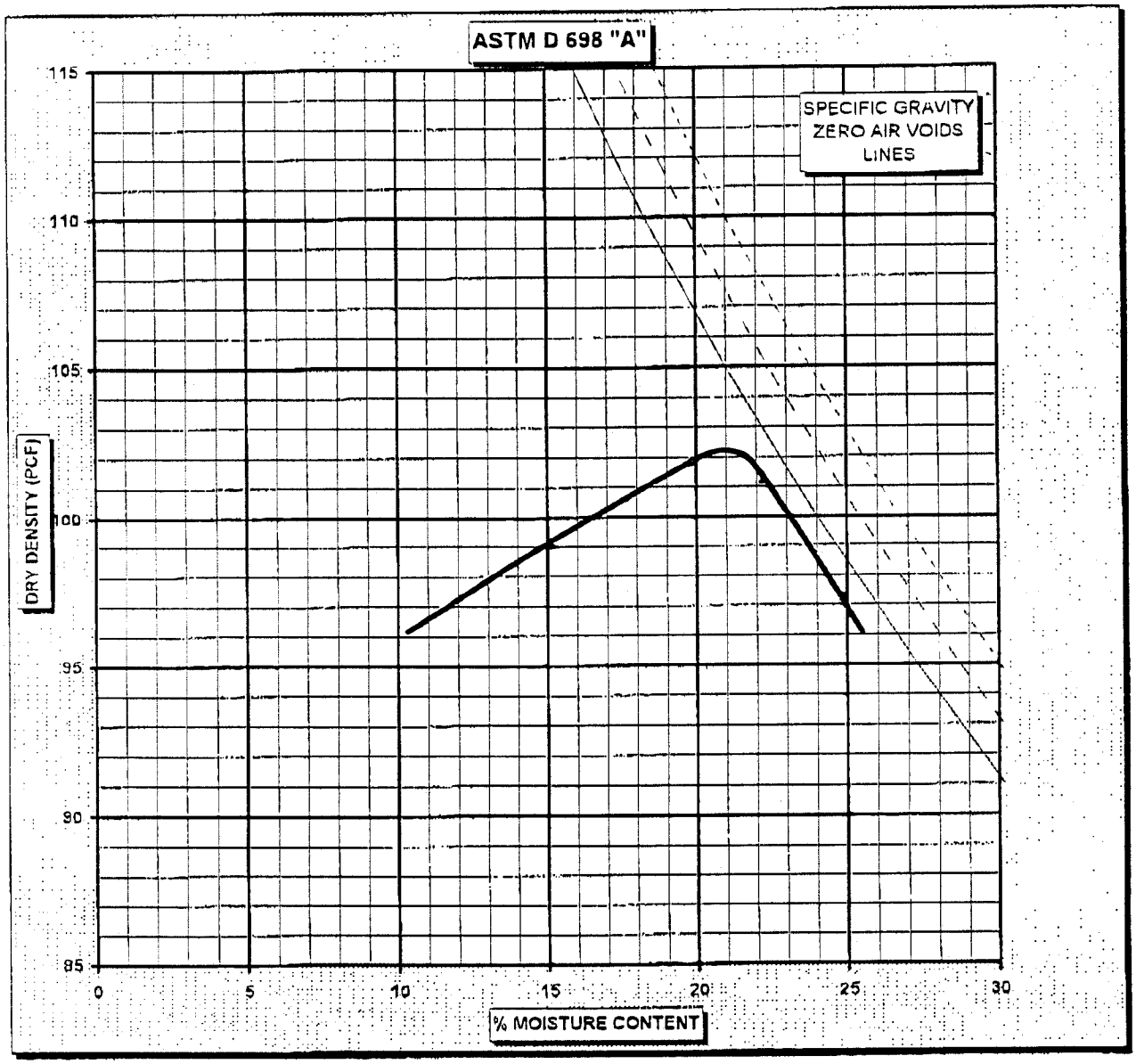
S&ME, Inc. 3109 Spring Forest Road, Raleigh, North Carolina 27604, (919) 872-2660, Fax (919) 876-3958

S&ME

MOISTURE - DENSITY RELATIONSHIP

PROJECT NUMBER:	1053-00-211	DATE TESTED:	8/23/00
PROJECT NAME:	RMT LAB SERVICE	SAMPLE NO.:	PS-13
PROJECT LOCATION:	PLYMOUTH, NC	BORING NO.:	Bag
SAMPLE DESCRIPTION:	Tan and Gray CLAY	DEPTH (ft):	N/A

MAXIMUM DRY DENSITY:	102.2	PCF	LIQUID LIMIT:	
OPT. MOISTURE CONTENT:	21.0	%	PLASTICITY INDEX:	
NATURAL MOIST. CONT.:		%		
SPECIFIC GRAVITY:	2.68			



Scale: As Shown	Tested By: CL	Checked By: MK	Drawn By: MK	Date: 8/29/00

S&ME, Inc. 3109 Spring Forest Road, Raleigh, North Carolina 27604, (919) 872-2660, Fax (919) 876-3958

Appendix E
Subgrade Inspection Report

RMT
Integrated
Environmental
Solutions

100 Verdae Blvd. 29607-3825
P.O. Box 16778 29606-6778
Greenville, SC
Telephone: 864-281-0030
Fax: 864-281-0288

July 26, 2000

Ms. Cheryl Marks
NC DENR-Division of Waste Management
Solid Waste Section
Mail Service Center 1646
Raleigh, North Carolina 27699-1646

Subject: Geologic Examination of Number 3 Landfill, Phase 1A Cell
Weyerhaeuser Company, Plymouth, North Carolina
Industrial Solid Waste Landfill Permit Number 94-01

Dear Ms. Marks:

On May 16, 2000, North Carolina Department of Environment and Natural Resources (NC DENR) issued Industrial Solid Waste Landfill Permit Number 94-01 for the Number 3 landfill, Phase 1A, for Weyerhaeuser Company, Plymouth, North Carolina. Attachment 2 to the permit includes Conditions of Permit to Construct. Condition 13 states as follows:

> "The owner's geologist shall examine the cell excavation and note any pertinent geologic features exposed during the construction process and shall notify the Solid Waste Section Hydrogeologist of these findings prior to the placement of any liner materials."

The landfill construction requires excavation of soils on the south end of the cell, while placement of fill is required on most of the north end. As a result, two geologic examinations would be required. The first examination would focus on the area where fill is to be placed. This includes most of the northern half of the cell. The geologic examination would be conducted in this area after the topsoil had been removed but before placement of any fill material. The second geologic examination would be conducted in the area to be excavated. This would take place after excavation activities have been completed but prior to placement of liner materials. The geologic examinations took place on June 14, 2000, and July 13, 2000. This letter presents the results of the geologic examinations.

First Geologic Examination

The topsoil was removed from the northern portion of the cell on June 12 and 13, 2000. Approximately one foot to 18 inches of soil was removed throughout the site. The geologic examination of this portion of the site took place on June 14, 2000. The geologic examination was conducted by Dan Madison, Consulting Hydrogeologist, RMT, Inc. The area examined

included the northern half of the cell, with the exception of the extreme western portion. Higher elevations along the western edge of the northern half of the cell required excavation. Therefore, this area was inspected during the second geologic examination.

The geologic examination consisted of walking over the cell area and looking for indications of significant geologic features that differ from conditions identified in the 1990 geologic report (included in the permit application). In addition, soils were collected to a depth of approximately 6 inches and were visually inspected at 21 locations in the area to be filled.

General examination of the area found no significant geologic features that differed from conditions described in the geologic report. The soils were all generally consistent in color, and there were no obvious features that stood out or drew attention. Inspection of the 21 soil samples found that most of the soils consisted of sand with varying amounts of silt and clay. At a few locations, the soil consisted of silty clay or very sandy clay. Locations of these soil samples and general soil types are presented on the attached Figure 1. The soils described in the field are consistent with the soils described in the geologic report, which stated, "The dominant soil type logged was silty sand but many of the silty sand beds were interbedded and interlaminated with clayey sands and clays."

During the site examination, several areas of shallow ponded water or very damp soils were identified near the northeast corner of the cell. The elevations of these areas, as indicated by a rough survey, were 5 to 5.5 feet above mean sea level. The elevation of the seasonal high water table surface in this area measured in April 1993 (see Drawing No. 510101-C03, Construction Plan Application, Landfill No. 3) was 6 to 8 feet above mean sea level. It is evident that the ponded water and damp spots are the result of the excavation intercepting the water table surface or capillary zone. This is consistent with the findings of the geologic report and Drawing No. 510101-C03 included in the Permit Application. Another small area of damp soils was identified along the eastern edge of the cell, about 430 feet south of the inside toe of the berm at the northeast corner of the cell. This damp spot was found at an elevation of about 9 feet above mean sea level. The April 1993 water table map indicates that the seasonal high water table surface in this area is about 10 to 11 feet above mean sea level. This damp spot is also an area where the excavation surface is near the estimated water table surface. The shallow water table surface in this area and in the area near the northeast corner of the cell is not unexpected. The design for the landfill anticipated this condition and specified that fill soil be added to these areas so that the bottom elevation of the cell would have adequate separation from the seasonal high water table surface.

The results of the first geologic examination were reported to Ms. Cheryl Marks, NC DENR, verbally via telephone on June 29, 2000.

Second Geologic Examination

Excavation of soils was completed during the week of July 10, 2000. The second geologic examination was conducted on July 13, 2000. As with the first examination, the second geologic examination consisted of walking over the cell area and looking for indications of significant geologic features that differ from conditions identified in the 1990 geologic report. The second examination only focused on the excavated portions of the cell, which included the southern half of the cell along with the extreme western portion of the northern half. Soil samples were collected to a depth of approximately 6 inches and were visually inspected at 17 locations in the excavation area. Soil sample locations are shown on Figure 1.

General examination of the excavation area found no significant geologic features that differed from conditions described in the geologic report. The soils were all generally consistent in color (dark yellowish orange to yellowish orange) except for some medium light gray soils found near the center portion of the cell. These gray soils formed a band approximately 100 feet wide (north-south direction) and extending from the west side of the excavation to within 100 feet of the east side. An approximate 50-foot-wide gap was found in the band of gray soils in the vicinity of soil sample 314 (see Figure 1). Inspection of the soil samples found that the gray soils consisted of clay at the eastern end of the band but consisted primarily of very clayey sand and silty sand in the remaining portions of the band. Similar gray soils were identified in soil boring logs for piezometers OW-5 and OW-6 at depths of about 10 to 15 feet below original land surface. This unit is also present in hydrogeologic cross section AA' included in the 1990 geologic report. The soils in the remaining portions of the excavation consisted of silty and clayey sand. The soils described in the field are consistent with the soils described in the geologic report.

The results of the second geologic examination were reported to Ms. Cheryl Marks, NC DENR, verbally via telephone on July 17, 2000.

Summary

RMT conducted geologic examinations of Phase 1A of Weyerhaeuser's Number 3 landfill. These examinations were performed in two stages. The first stage was conducted on

June 14, 2000, and included the portion of the cell that is to receive fill. The second stage was conducted in the excavated portion of the cell, prior to initiation of the cell liner construction. There were no geologic conditions identified that were inconsistent with findings in the 1990 geologic report for the site included in the permit document. The damp soils found at the northeast corner and east side of the cell footprint appear to be a result of topsoil removal activities intercepting the water table surface or capillary zone. The water table was expected at this general elevation and the design for the landfill has accounted for such an occurrence. Weyerhaeuser is proceeding with the construction of the cell liner.

If you have questions or comments, please call me at (864) 281-0030.

Sincerely,

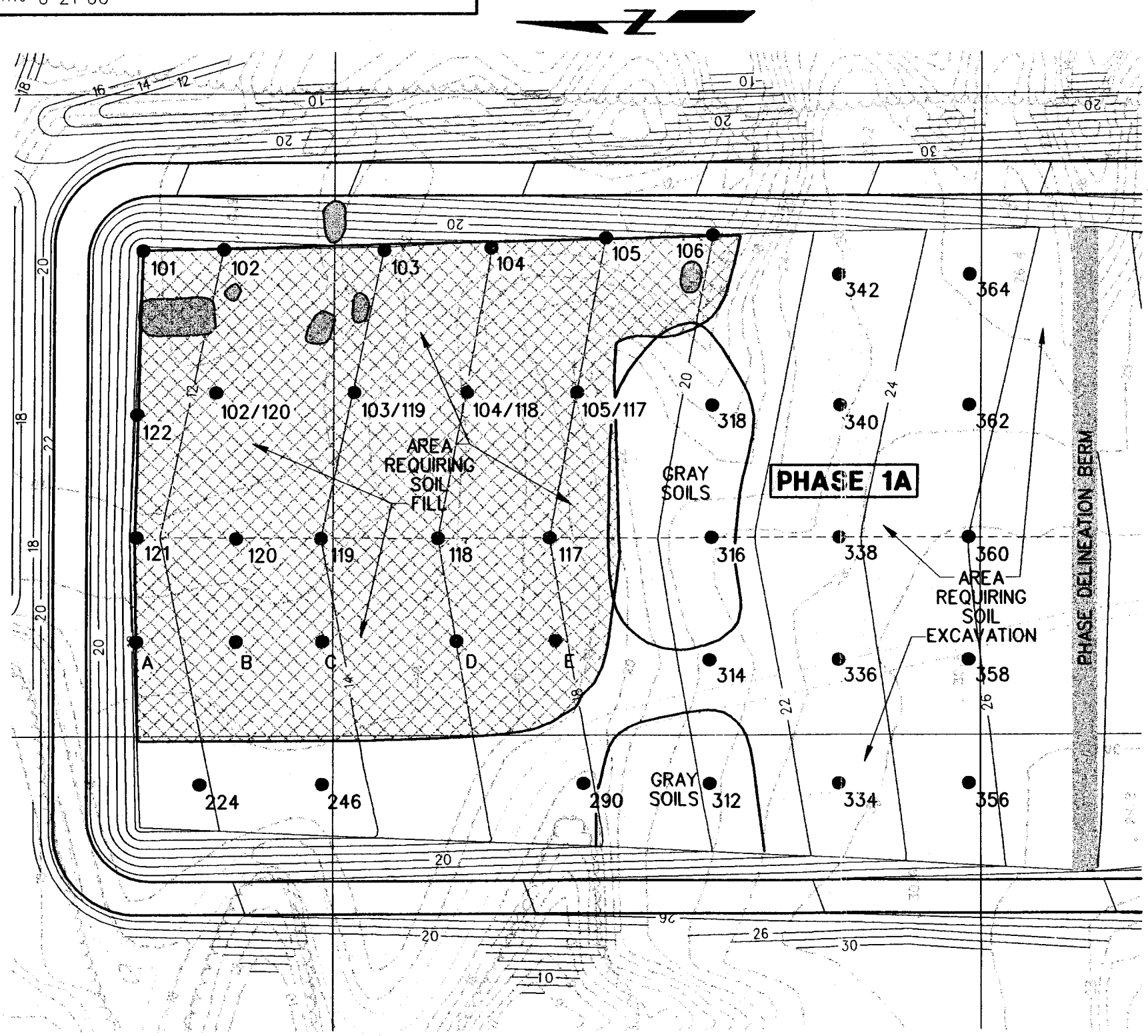
RMT, Inc.

Dan O. Madison, Jr., PG
Consulting Hydrogeologist

Enclosure

cc: Andy Sweatt, Tracy Coleman, Joe Kloeker, John Gray, Bill Morris - Weyerhaeuser
Kathy Huibregtse - RMT
RMT Central Files - 00-5101.18

j:\cad\civil\weyerhae\510108\8x11ph1.pln
dmc 6-21-00



LEGEND

APPROXIMATE AREAS OF SHALLOW STANDING WATER OR DAMP SOILS

105 APPROXIMATE LOCATION OF SOIL SAMPLES EXAMINED IN FIELD

GENERAL SOIL TYPES

LOCATION	SOIL TYPE	LOCATION	SOIL TYPE
101	SILTY SAND	224	SILTY SAND
102	SILTY SAND	246	SLIGHTLY CLAYEY SAND
103	SILTY SAND	290	CLAYEY SAND
104	SILTY SAND	312	CLAYEY SAND
105	VERY CLAYEY SAND	314	SILTY SAND
106	SANDY CLAY	316	VERY CLAYEY SAND
105/117	VERY CLAYEY SAND	318	CLAY
104/118	VERY CLAYEY SAND	334	VERY CLAYEY SAND
103/119	VERY SANDY CLAY	336	VERY CLAYEY SAND
102/120	SILTY CLAY	338	CLAYEY SAND
122	VERY SANDY CLAY	340	SILTY SAND
121	SILTY SAND	342	SILTY SAND
120	SILTY CLAY	356	SILTY SAND
119	SILTY SAND	358	SLIGHTLY CLAYEY SAND
118	SILTY SAND	360	SLIGHTLY CLAYEY SILTY SAND
117	VERY SANDY CLAY	362	SILTY SAND
A	SAND	364	SILTY SAND
B	SILTY SAND		
C	SILTY SAND		
D	SILTY SAND		
E	SAND		

FIGURE 1

RESULTS OF GEOLOGIC EXAMINATIONS CONDUCTED JUNE 14 & JULY 13, 2000 LANDFILL No. 3 PHASE 1A

0 100 200 300

SCALE: 1" = 100'

Weyerhaeuser

RMT

Drawn By:	D.M.C.
Approved By:	D.O.M.
Date:	7-24-00
Proj. No.:	5101.08

Appendix F
Field Density and Moisture Content Results

RMT
Nuclear Density Testing Sheet
Landfill #3 and Haul Road
Weyerhaeuser, Plymouth NC

Date	Test Number	Time	Standard Counts		Location		Lift Number	Depth In.	Elevation msl	Dry Density -pcf	Moisture Content - %	Proctor Number	Max Dry Density -pcf	Optimum Moisture - %	% Compaction	Comments
			Moisture	Density	North	East										
6/15/00	NDT -1	1822	672	2684	1100	1200	1	6	11.7	96.4	13.1	PS-3	112.8	16.2	85	Fail
6/15/00	NDT -2	1850	672	2684	1200	1200	1	6	11.5	103.0	15.1	PS-3	112.8	16.2	91	Fail
6/16/00	NDT -3	0752	671	2649	1100	1200	1	6	11.7	108.1	17.8	PS-3	112.8	16.2	96	Pass - Retest of NDT-1
6/16/00	NDT-4	0803	671	2649	1200	1200	1	6	11.5	107.3	17.2	PS-3	112.8	16.2	95	Pass - Retest of NDT-2
6/16/00	NDT -5	1118	671	2649	1300	1100	1	6	8.5	107.9	14.6	PS-3	112.8	16.2	96	Pass
6/16/00	NDT -6	1129	671	2649	1200	1100	1	6	12.0	108.1	15.3	PS-3	112.8	16.2	96	Pass
6/16/00	NDT -7	1140	671	2649	1300	1000	1	6	11.5	106.9	14.4	PS-3	112.8	16.2	95	Pass
6/16/00	NDT -8	1500	671	2649	1200	1000	1	6	12.6	107.7	15.8	PS-3	112.8	16.2	95	Pass
6/16/00	NDT -9	1510	671	2649	1400	900	1	6	10.4	109.3	16.2	PS-3	112.8	16.2	97	Pass
6/16/00	NDT -10	1514	671	2649	1300	900	1	6	11.0	107.4	17.1	PS-3	112.8	16.2	95	Pass
6/16/00	NDT -11	1520	671	2649	1200	900	1	6	13.2	108.6	15.3	PS-3	112.8	16.2	96	Pass
6/16/00	NDT -12	1528	671	2649	1400	800	1	6	11.2	106.9	14.3	PS-3	112.8	16.2	95	Pass
6/16/00	NDT -13	1535	671	2649	1300	800	1	6	12.5	109.7	15.1	PS-3	112.8	16.2	97	Pass
6/16/00	NDT -14	1552	671	2649	1200	800	1	6	13.7	107.5	15.0	PS-3	112.8	16.2	95	Pass
6/16/00	NDT -15	1620	671	2649	1000	1200	1	6	11.5	106.9	17.3	PS-3	112.8	16.2	95	Pass
6/16/00	NDT -16	1635	671	2649	1000	1100	1	6	13.3	110.1	15.2	PS-3	112.8	16.2	98	Pass
6/17/00	NDT -17	0815	670	2654	1000	1200	2	6	12.0	110.2	18.0	PS-3	112.8	16.2	98	Pass
6/17/00	NDT -18	0830	670	2654	1100	1200	2	6	11.7	110.7	17.3	PS-3	112.8	16.2	98	Pass
6/17/00	NDT -19	0841	670	2654	1200	1200	2	6	11.5	108.3	18.1	PS-3	112.8	16.2	96	Pass
6/17/00	NDT -20	0856	670	2654	1300	1200	1	6	6.7	102.7	17.0	PS-3	112.8	16.2	91	Pass
6/17/00	NDT -21	0910	670	2654	1400	1200	1	6	7.0	110.0	14.8	PS-3	112.8	16.2	98	Pass
6/17/00	NDT -22	1140	670	2654	1400	900	2	6	10.0	108.3	17.1	PS-3	112.8	16.2	96	Pass
6/17/00	NDT -23	1148	670	2654	1300	900	2	6	11.7	107.9	15.8	PS-3	112.8	16.2	96	Pass
6/17/00	NDT -24	1153	670	2654	1200	900	2	6	13.3	108.3	15.3	PS-3	112.8	16.2	96	Pass
6/17/00	NDT -25	1201	670	2654	1400	1000	1	6	8.5	106.8	14.9	PS-3	112.8	16.2	95	Pass
6/17/00	NDT -26	1215	670	2654	1300	1000	2	6	9.6	107.8	17.0	PS-3	112.8	16.2	96	Pass
6/17/00	NDT -27	1223	670	2654	1300	1100	2	6	8.8	109.3	15.9	PS-3	112.8	16.2	97	Pass

RMT
Nuclear Density Testing Sheet
Landfill #3 and Haul Road
Weyerhaeuser, Plymouth NC

Date	Test Number	Time	Standard Counts		Location		Lift Number	Depth In.	Elevation msl	Dry Density -pcf	Moisture Content - %	Proctor Number	Max Dry Density -pcf	Optimum Moisture - %	% Compaction	Comments
			Moisture	Density	North	East										
6/17/00	NDT -28	1231	670	2654	1200	1100	2	6	12.0	107.8	14.3	PS-3	112.8	16.2	96	Pass
6/17/00	NDT -29	1236	670	2654	1200	1000	2	6	11.9	109.3	13.9	PS-3	112.8	16.2	97	Pass
6/17/00	NDT -30	1415	670	2654	1500	750	1	6	13.7	107.3	17.3	PS-3	112.8	16.2	95	Pass
6/17/00	NDT -31	1432	670	2654	1500	900	1	6	9.5	108.7	13.9	PS-3	112.8	16.2	96	Pass
6/17/00	NDT -32	1447	670	2654	1500	1000	1	6	8.4	107.7	13.7	PS-3	112.8	16.2	95	Pass
6/17/00	NDT -33	1501	670	2654	1500	1100	1	6	7.8	108.1	14.2	PS-3	112.8	16.2	96	Pass
6/17/00	NDT -34	1532	670	2654	1400	1100	1	6	7.4	106.4	15.5	PS-3	112.8	16.2	94	Pass
6/19/00	NDT-35	1050	670	2620	1000	1200	3	6	13.2	107.7	14.5	PS-3	112.8	16.2	95	Pass
6/19/00	NDT-36	1056	670	2620	1000	1100	3	6	13.0	106.9	15.2	PS-3	112.8	16.2	95	Pass
6/19/00	NDT-37	1100	670	2620	1100	1200	3	6	13.7	107.2	17.2	PS-3	112.8	16.2	95	Pass
6/19/00	NDT-38	1105	670	2620	1200	1200	3	6	13.2	108.0	13.3	PS-3	112.8	16.2	96	Pass
6/19/00	NDT-39	1108	670	2620	1300	1200	2	6	11.5	108.6	14.4	PS-3	112.8	16.2	96	Pass
6/19/00	NDT-40	1111	670	2620	1400	1200	2	6	7.5	109.3	14.6	PS-3	112.8	16.2	97	Pass
6/19/00	NDT-41	1115	670	2620	1400	800	2	6	13.9	107.5	17.5	PS-3	112.8	16.2	95	Pass
6/19/00	NDT-42	1118	670	2620	1300	800	2	6	13.2	107.2	16.7	PS-3	112.8	16.2	95	Pass
6/19/00	NDT-43	1128	670	2620	1200	800	2	6	14.7	108.7	14.1	PS-3	112.8	16.2	96	Pass
6/19/00	NDT-44	1140	670	2620	1200	700	1	6	14.3	106.9	14.5	PS-3	112.8	16.2	95	Pass
6/19/00	NDT-45	1533	670	2620	1400	1100	2	6	7.7	116.1	11.4	PS-2	118.0	13.2	98	Pass
6/19/00	NDT-46	1541	670	2620	1400	1000	2	6	8.6	108.3	16.2	PS-3	112.8	16.2	96	Pass
6/19/00	NDT-47	1547	670	2620	1400	900	3	6	11.2	109.3	16.4	PS-3	112.8	16.2	97	Pass
6/19/00	NDT-48	1556	670	2620	1300	900	3	6	11.8	107.0	15.3	PS-3	112.8	16.2	95	Pass
6/19/00	NDT-49	1610	670	2620	1200	900	3	6	13.5	108.6	13.7	PS-3	112.8	16.2	96	Pass
6/19/00	NDT-50	1613	670	2620	1200	1000	3	6	13.0	106.9	15.5	PS-3	112.8	16.2	95	Pass
6/19/00	NDT-51	1617	670	2620	1300	1000	3	6	10.1	109.3	16.4	PS-3	112.8	16.2	97	Pass
6/19/00	NDT-52	1623	670	2620	1300	1100	3	6	9.6	107.0	16.0	PS-3	112.8	16.2	95	Pass
6/19/00	NDT-53	1625	670	2620	1200	1100	3	6	12.2	108.4	14.6	PS-3	112.8	16.2	96	Pass
6/19/00	NDT-54	1633	670	2620	1200	700	2	6	14.5	103.4	20.2	PS-3	112.8	16.2	92	Fail

RMT
Nuclear Density Testing Sheet
Landfill #3 and Haul Road
Weyerhaeuser, Plymouth NC

Date	Test Number	Time	Standard Counts		Location		Lift Number	Depth In.	Elevation msl	Dry Density -pcf	Moisture Content - %	Proctor Number	Max Dry Density -pcf	Optimum Moisture - %	% Compaction	Comments
			Moisture	Density	North	East										
6/19/00	NDT-55	1650	670	2620	1400	800	3	6	12.5	108.2	14.0	PS-3	112.8	16.2	96	Pass
6/19/00	NDT-56	1656	670	2620	1300	800	3	6	13.2	107.8	13.7	PS-3	112.8	16.2	96	Pass
6/19/00	NDT-57	1701	670	2620	1200	800	3	6	14.2	110.3	14.0	PS-3	112.8	16.2	98	Pass
6/21/00	NDT-58	1631	671	2657	1500	800	2	6	10.0	96.9	23.7	PS-6	102.2	22.5	95	Pass
6/21/00	NDT-59	1645	671	2657	1500	900	2	6	14.2	98.7	25.2	PS-6	102.2	22.5	97	Pass
6/22/00	NDT-60	741	677	2630	1500	900	2	6	-	102.6	20.7	PS-6	102.2	22.5	100	Pass
6/22/00	NDT-61	750	677	2630	1500	1000	2	6	-	102.4	19.9	PS-6	102.2	22.5	100	Pass
6/22/00	NDT-62	755	677	2630	1500	1100	2	6	9.0	109.4	15.7	PS-3	112.8	16.2	97	Pass
6/22/00	NDT-63	759	677	2630	1500	1200	2	6	8.5	109.1	13.9	PS-3	112.8	16.2	97	Pass
6/22/00	NDT-64	804	677	2630	1400	1200	3	6	8.5	112.3	16.0	PS-2	118.0	13.2	95	Pass
6/22/00	NDT-65	812	677	2630	1300	1200	3	6	8.0	102.4	21.2	PS-3	112.8	16.2	91	Pass
6/22/00	NDT-66	816	677	2630	1200	1200	4	6	12.0	100.6	8.3	PS-2	118.0	13.2	85	Fail
6/22/00	NDT-67	819	677	2630	1100	1200	4	6	12.2	104.0	8.3	PS-2	118.0	13.2	88	Fail
6/22/00	NDT-68	1520	677	2630	1500	700	3	6	13.5	101.3	21.3	PS-6	102.2	22.5	99	Pass
6/22/00	NDT-69	1535	677	2630	1400	625	3	6	13.6	99.6	22.2	PS-6	102.2	22.5	97	Pass
6/22/00	NDT-70	1545	677	2630	1500	800	3	6	14.2	98.5	24.3	PS-6	102.2	22.5	96	Pass
6/22/00	NDT-71	1552	677	2630	1400	1100	4	6	9.0	112.3	10.7	PS-2	118.0	13.2	95	Pass
6/22/00	NDT-72	1557	677	2630	1300	1100	4	6	9.5	111.9	11.3	PS-2	118.0	13.2	95	Pass
6/22/00	NDT-73	1600	677	2630	1200	1100	4	6	11.6	106.9	18.2	PS-3	112.8	16.2	95	Pass
6/22/00	NDT-74	1605	677	2630	1200	1000	4	6	13.6	110.4	16.4	PS-3	112.8	16.2	98	Pass
6/22/00	NDT-75	1611	677	2630	1300	1000	4	6	11.4	113.6	12.1	PS-2	118.0	13.2	96	Pass
6/22/00	NDT-76	1615	677	2630	1400	1000	4	6	10.0	109.6	14.1	PS-3	112.8	16.2	97	Pass
6/22/00	NDT-77	1621	677	2630	1400	900	4	6	11.6	104.7	19.9	PS-6	102.2	22.5	102	Pass
6/22/00	NDT-78	1632	677	2630	1300	900	4	6	12.7	117.4	10.4	PS-2	118.0	13.2	99	Pass
6/22/00	NDT-79	1641	677	2630	1200	900	4	6	13.5	98.2	25.4	PS-6	102.2	22.5	96	Pass
6/26/00	NDT-80	1450	675	2640	1400	625	3	6	15.4	104.6	20.3	PS-5	108.2	18.0	97	Pass
6/26/00	NDT-81	1455	675	2640	1500	700	3	6	15.6	104.6	15.8	PS-5	108.2	18.0	97	Pass

RMT
Nuclear Density Testing Sheet
Landfill #3 and Haul Road
Weyerhaeuser, Plymouth NC

Date	Test Number	Time	Standard Counts		Location		Lift Number	Depth In.	Elevation msl	Dry Density -pcf	Moisture Content - %	Proctor Number	Max Dry Density -pcf	Optimum Moisture - %	% Compaction	Comments
			Moisture	Density	North	East										
6/26/00	NDT-82	1501	675	2640	1500	800	3	6	13.9	102.8	16.5	PS-5	108.2	18.0	95	Pass
6/26/00	NDT-83	1506	675	2640	1500	900	3	6	12.6	103.6	16.6	PS-5	108.2	18.0	96	Pass
6/26/00	NDT-84	1558	675	2640	1200	1200	4	6	13.2	113.8	12.6	PS-2	118.0	13.2	96	Pass - Retest of NDT-66
6/26/00	NDT-85	1553	675	2640	1100	1200	4	6	14.8	115.3	15.4	PS-2	118.0	13.2	98	Pass - Retest of NDT-67
6/26/00	NDT-86	1549	675	2640	1000	1200	4	6	13.6	114.9	12.4	PS-2	118.0	13.2	97	Pass
6/26/00	NDT-87	1542	675	2640	1000	1100	4	6	14.5	116.3	10.7	PS-2	118.0	13.2	99	Pass
6/26/00	NDT-88	1750	675	2640	1350	925	5	6	12.9	104.7	17.3	PS-5	108.2	18.0	97	Pass
6/26/00	NDT-89	1757	675	2640	1250	925	5	6	13.8	104.6	18.8	PS-5	108.2	18.0	97	Pass
6/26/00	NDT-90	1603	675	2640	1150	925	5	6	16.0	104.8	18.0	PS-5	108.2	18.0	97	Pass
6/26/00	NDT-91	1825	675	2640	1200	1010	5	6	14.5	106.6	17.4	PS-5	108.2	18.0	99	Pass
6/26/00	NDT-92	1829	675	2640	1300	1010	5	6	12.5	103.7	20.0	PS-5	108.2	18.0	96	Pass
6/26/00	NDT-93	1834	675	2640	1400	1010	4	6	11.2	100.7	21.1	PS-5	108.2	18.0	93	Fail
6/27/00	NDT-94	1146	669	2649	1425	625	4	6	16.7	97.1	24.9	PS-5	108.2	18.0	90	Fail
6/27/00	NDT-95	1154	669	2649	1450	700	4	6	16.0	99.3	23.7	PS-5	108.2	18.0	92	Fail
6/27/00	NDT-96	1158	669	2649	1450	800	4	6	15.0	99.0	22.6	PS-5	108.2	18.0	91	Fail
6/27/00	NDT-97	1203	669	2649	1500	900	4	6	12.7	99.3	21.0	PS-5	108.2	18.0	92	Fail
6/27/00	NDT-98	1206	669	2649	1500	1000	3	6	10.7	103.5	9.3	PS-2	118.0	13.2	88	Fail
6/27/00	NDT-99	1210	669	2649	1500	1100	3	6	9.7	105.9	6.2	PS-2	118.0	13.2	90	Fail
6/27/00	NDT-100	1213	669	2649	1500	1200	3	6	8.7	100.4	23.4	PS-6	102.2	22.5	98	Pass
6/27/00	NDT-101	1217	669	2649	1400	1200	4	6	9.2	103.6	18.1	PS-5	108.2	18.0	96	Pass
6/27/00	NDT-102	1221	669	2649	1300	1200	4	6	9.7	103.1	20.9	PS-5	108.2	18.0	95	Pass
6/27/00	NDT-103	1433	669	2649	1200	1100	5	6	13.0	107.3	15.4	PS-5	108.2	18.0	99	Pass
6/27/00	NDT-104	1423	669	2649	1300	1100	5	6	10.5	105.8	16.6	PS-5	108.2	18.0	98	Pass
6/27/00	NDT-105	1421	669	2649	1400	1100	4	6	9.8	102.1	19.0	PS-5	108.2	18.0	94	Pass
6/27/00	NDT-106	1426	669	2649	1400	1010	4	6	11.0	106.2	16.0	PS-5	108.2	18.0	98	Pass
6/27/00	NDT-107	1456	669	2649	1125	625	1	6	-	103.6	19.3	PS-5	108.2	18.0	96	Pass
6/27/00	NDT-108	1456	669	2649	1250	625	2	6	15.0	104.1	19.4	PS-5	108.2	18.0	96	Pass

RMT
Nuclear Density Testing Sheet
Landfill #3 and Haul Road
Weyerhaeuser, Plymouth NC

Date	Test Number	Time	Standard Counts		Location		Lift Number	Depth In.	Elevation msl	Dry Density -pcf	Moisture Content - %	Proctor Number	Max Dry Density -pcf	Optimum Moisture - %	% Compaction	Comments
			Moisture	Density	North	East										
6/27/00	NDT-109	1522	669	2649	1500	1100	3	6	9.7	116.1	14.0	PS-2	118.0	13.2	98	Pass-Retest of NDT-99
6/27/00	NDT-110	1600	669	2649	1050	625	1	6	-	104.5	13.8	PS-3	112.8	16.2	93	Pass
6/27/00	NDT-111	1647	669	2649	1400	1200	5	6	9.4	102.3	20.7	PS-5	108.2	18.0	95	Fail
6/27/00	NDT-112	1652	669	2649	1300	1200	5	6	10.7	98.5	23.0	PS-5	108.2	18.0	91	Fail
6/27/00	NDT-113	1657	669	2649	1200	1200	5	6	13.7	104.2	19.6	PS-5	108.2	18.0	96	Pass
6/27/00	NDT-114	1707	669	2649	1100	1200	5	6	14.8	102.8	20.0	PS-5	108.2	18.0	95	Pass
6/27/00	NDT-115	1712	669	2649	1000	1200	5	6	13.7	99.8	22.1	PS-5	108.2	18.0	92	Fail
6/27/00	NDT-116	1721	669	2649	1500	1100	3	6	9.1	115.5	10.4	PS-2	118.0	13.2	98	Pass-Retest of NDT-109
6/27/00	NDT-117	1724	669	2649	1500	1000	3	6	9.4	116.4	11.3	PS-2	118.0	13.2	99	Pass-Retest of NDT-98
6/27/00	NDT-118	1736	669	2649	1500	900	4	6	12.9	106.4	17.2	PS-5	108.2	18.0	98	Pass-Retest of NDT-97
6/27/00	NDT-119	1741	669	2649	1450	800	4	6	14.9	104.9	18.5	PS-5	108.2	18.0	97	Pass-Retest of NDT-96
6/27/00	NDT-120	1745	669	2649	1450	700	4	6	16.1	105.1	17.5	PS-5	108.2	18.0	97	Pass-Retest of NDT-95
6/27/00	NDT-121	1751	669	2649	1425	625	4	6	16.5	102.8	19.1	PS-5	108.2	18.0	95	Pass-Retest of NDT-94
6/27/00	NDT-122	1840	669	2649	1400	1200	5	6	9.4	103.8	17.6	PS-5	108.2	18.0	96	Pass-Retest of NDT-111
6/27/00	NDT-123	1844	669	2649	1300	1200	5	6	10.7	102.9	19.5	PS-5	108.2	18.0	95	Pass-Retest of NDT-112
6/27/00	NDT-124	1900	669	2649	1400	1100	5	6	10.4	104.3	19.1	PS-5	108.2	18.0	96	Pass
6/27/00	NDT-125	1928	669	2649	1400	1000	5	6	11.5	102.9	20.6	PS-5	108.2	18.0	95	Pass
6/27/00	NDT-126	1902	669	2649	1300	1100	6	6	11.0	102.8	20.2	PS-5	108.2	18.0	95	Pass
6/27/00	NDT-127	1909	669	2649	1200	1100	6	6	13.5	106.5	16.5	PS-5	108.2	18.0	98	Pass
6/27/00	NDT-128	1913	669	2649	1300	1000	6	6	13.0	103.2	20.4	PS-5	108.2	18.0	95	Pass
6/27/00	NDT-129	1918	669	2649	1300	1000	6	6	13.0	103.2	20.4	PS-5	108.2	18.0	95	Pass
6/27/00	NDT-130	1926	669	2649	1000	1200	5	6	13.7	103.6	19.4	PS-5	108.2	18.0	96	Pass
6/27/00	NDT-131	1931	669	2649	1000	1100	5	6	13.9	104.1	18.7	PS-5	108.2	18.0	96	Pass
6/27/00	NDT-132	1940	669	2649	1100	1100	5	6	14.1	102.9	20.5	PS-5	108.2	18.0	95	Pass
6/28/00	NDT-133	1212	669	2649	1000	1200	6	6	15.1	102.9	20.7	PS-5	108.2	18.0	95	Pass
6/28/00	NDT-134	1215	669	2649	1000	1100	6	6	15.8	106.0	15.7	PS-5	108.2	18.0	98	Pass
6/28/00	NDT-135	1221	669	2649	1100	1200	6	6	15.5	106.4	18.1	PS-5	108.2	18.0	98	Pass

RMT
Nuclear Density Testing Sheet
Landfill #3 and Haul Road
Weyerhaeuser, Plymouth NC

Date	Test Number	Time	Standard Counts		Location		Lift Number	Depth In.	Elevation msl	Dry Density -pcf	Moisture Content - %	Proctor Number	Max Dry Density -pcf	Optimum Moisture - %	% Compaction	Comments
			Moisture	Density	North	East										
6/28/00	NDT-136	1515	669	2649	1300	1200	6	6	10.7	102.9	20.3	PS-5	108.2	18.0	95	Pass
6/28/00	NDT-137	1523	669	2649	1400	1200	6	6	9.8	104.2	19.3	PS-5	108.2	18.0	96	Pass
7/5/00	NDT-138	1446	672	2646	1500	1200	4	6	9.7	104.6	17.2	PS-5	108.2	18.0	97	Pass
7/5/00	NDT-139	1055	672	2646	1500	1100	4	6	10.0	105.2	16.7	PS-5	108.2	18.0	97	Pass
7/5/00	NDT-140	1101	672	2646	1500	1000	4	6	11.5	103.3	18.0	PS-5	108.2	18.0	95	Pass
7/5/00	NDT-141	1104	672	2646	1500	900	5	6	13.0	103.5	16.6	PS-5	108.2	18.0	96	Pass
7/5/00	NDT-142	1113	672	2646	1475	800	5	6	15.5	106.1	16.7	PS-5	108.2	18.0	98	Pass
7/5/00	NDT-143	1119	672	2646	1475	700	5	6	15.5	102.8	20.3	PS-5	108.2	18.0	95	Pass
7/5/00	NDT-144	1123	672	2646	1400	625	5	6	16.0	102.9	20.5	PS-5	108.2	18.0	95	Pass
7/5/00	NDT-145	1231	672	2646	1000	1100	7	6	11.5	108.3	13.4	PS-3	112.8	16.2	96	Pass
7/5/00	NDT-146	1234	672	2646	1000	1200	7	6	16.5	107.6	13.9	PS-3	112.8	16.2	95	Pass
7/5/00	NDT-147	1241	672	2646	1100	1200	7	6	16.5	106.9	15.8	PS-3	112.8	16.2	95	Pass
7/5/00	NDT-148	1246	672	2646	1200	1200	6	6	16.1	107.3	13.5	PS-3	112.8	16.2	95	Pass
7/5/00	NDT-149	1252	672	2646	1300	1200	7	6	13.0	106.9	16.3	PS-3	112.8	16.2	95	Pass
7/5/00	NDT-150	1513	672	2646	1250	625	3	6	-	104.1	17.2	PS-5	108.2	18.0	96	Pass
7/5/00	NDT-151	1525	672	2646	1100	625	3	6	-	107.3	15.3	PS-5	108.2	18.0	99	Pass
7/5/00	NDT-152	1540	672	2646	700	1200	1	6	-	107.4	16.3	PS-3	112.8	16.2	95	Pass
7/5/00	NDT-153	1545	672	2646	700	1100	1	6	-	109.7	14.2	PS-3	112.8	16.2	97	Pass
7/6/00	NDT-154	1126	670	2646	1500	900	6	6	13.5	104.7	16.5	PS-4	108.3	14.5	97	Pass
7/6/00	NDT-155	1135	670	2646	1500	1000	5	6	12.0	106.9	17.1	PS-4	108.3	14.5	99	Pass
7/6/00	NDT-156	1142	670	2646	1500	1100	5	6	10.5	105.4	16.2	PS-4	108.3	14.5	97	Pass
7/6/00	NDT-157	1150	670	2646	1500	1200	5	6	10.2	106.3	14.9	PS-4	108.3	14.5	98	Pass
7/6/00	NDT-158	1324	670	2646	1000	1100	8	6	18.7	107.7	14.5	PS-4	108.3	14.5	99	Pass
7/6/00	NDT-159	1307	670	2646	1000	1200	8	6	17.3	107.8	13.2	PS-4	108.3	14.5	100	Pass
7/6/00	NDT-160	1319	670	2646	1100	1200	8	6	16.3	106.0	14.5	PS-4	108.3	14.5	98	Pass
7/6/00	NDT-161	1309	670	2646	1200	1200	7	6	13.5	102.8	13.4	PS-4	108.3	14.5	95	Pass
7/6/00	NDT-162	1312	670	2646	1300	1200	8	6	13.0	102.9	17.4	PS-4	108.3	14.5	95	Pass

RMT
Nuclear Density Testing Sheet
Landfill #3 and Haul Road
Weyerhaeuser, Plymouth NC

Date	Test Number	Time	Standard Counts		Location		Lift Number	Depth In.	Elevation msl	Dry Density -pcf	Moisture Content - %	Proctor Number	Max Dry Density -pcf	Optimum Moisture - %	% Compaction	Comments
			Moisture	Density	North	East										
7/6/00	NDT-163	1315	670	2646	1400	1200	8	6	13.9	107.1	13.9	PS-4	108.3	14.5	99	Pass
7/6/00	NDT-164	1319	670	2646	1475	800	6	6	16.0	104.3	17.1	PS-4	108.3	14.5	96	Pass
7/6/00	NDT-165	1326	670	2646	1475	700	6	6	16.0	105.2	18.0	PS-4	108.3	14.5	97	Pass
7/6/00	NDT-166	1329	670	2646	1400	625	6	6	16.5	105.2	15.9	PS-4	108.3	14.5	97	Pass
7/6/00	NDT-167	1335	670	2646	1250	625	4	6	-	105.8	13.3	PS-4	108.3	14.5	98	Pass
7/6/00	NDT-168	1752	670	2646	700	700	1	6	-	108.4	13.7	PS-4	108.3	14.5	100	Pass
7/6/00	NDT-169	1756	670	2646	700	800	1	6	-	104.2	13.9	PS-4	108.3	14.5	96	Pass
7/6/00	NDT-170	1759	670	2646	700	900	1	6	-	103.8	14.7	PS-4	108.3	14.5	96	Pass
7/6/00	NDT-171	1803	670	2646	700	1000	1	6	-	103.9	14.4	PS-4	108.3	14.5	96	Pass
7/6/00	NDT-172	1817	670	2646	1475	800	7	6	16.0	102.3	18.8	PS-5	108.2	18.0	95	Pass
7/6/00	NDT-173	1825	670	2646	1500	900	7	6	14.1	103.4	22.5	PS-6	102.2	22.5	101	Pass
7/6/00	NDT-174	1829	670	2646	1500	1000	6	6	12.9	104.2	21.0	PS-6	102.2	22.5	102	Pass
7/6/00	NDT-175	1752	670	2646	1500	1100	6	6	12.5	104.4	20.7	PS-6	102.2	22.5	102	Pass
7/7/00	NDT-176	1146	679	2645	1500	1200	6	6	10.7	101.6	20.4	PS-6	102.2	22.5	99	Pass
7/7/00	NDT-177	1152	679	2645	1400	1200	9	6	14.4	105.7	17.0	PS-4	108.3	14.5	98	Pass
7/7/00	NDT-178	1155	679	2645	1300	1200	9	6	13.5	103.6	17.3	PS-4	108.3	14.5	96	Pass
7/7/00	NDT-179	1157	679	2645	1200	1200	8	6	14.0	103.7	16.9	PS-4	108.3	14.5	96	Pass
7/7/00	NDT-180	1201	679	2645	1100	1200	9	6	16.8	102.5	20.6	PS-6	102.2	22.5	100	Pass
7/7/00	NDT-181	1206	679	2645	1000	1200	9	6	17.8	103.0	17.3	PS-4	108.3	14.5	95	Pass
7/7/00	NDT-182	1210	679	2645	1000	1100	9	6	19.2	98.3	24.2	PS-6	102.2	22.5	96	Pass
7/7/00	NDT-183	1315	679	2645	1125	600	4	6	13.5	107.0	15.7	PS-4	108.3	14.5	99	Pass
7/7/00	NDT-184	1325	679	2645	1250	600	5	6	16.9	105.3	17.0	PS-4	108.3	14.5	97	Pass
7/7/00	NDT-185	1330	679	2645	1350	600	1	6	14.2	104.6	17.3	PS-4	108.3	14.5	97	Pass
7/7/00	NDT-186	1340	679	2645	550	600	1	6	-	105.8	17.3	PS-4	108.3	14.5	98	Pass
7/7/00	NDT-187	1349	679	2645	400	600	1	6	-	109.8	14.6	PS-4	108.3	14.5	101	Pass
7/7/00	NDT-188	1503	679	2645	700	1200	2	6	-	103.7	16.9	PS-4	108.3	14.5	96	Pass
7/7/00	NDT-189	1507	679	2645	700	1100	2	6	-	103.3	17.3	PS-4	108.3	14.5	95	Pass

RMT
Nuclear Density Testing Sheet
Landfill #3 and Haul Road
Weyerhaeuser, Plymouth NC

Date	Test Number	Time	Standard Counts		Location		Lift Number	Depth In.	Elevation msl	Dry Density -pcf	Moisture Content - %	Proctor Number	Max Dry Density -pcf	Optimum Moisture - %	% Compaction	Comments
			Moisture	Density	North	East										
7/7/00	NDT-190	1806	679	2645	1425	600	7	6	18.5	102.2	21.4	PS-6	102.2	22.5	100	Pass
7/7/00	NDT-191	1809	679	2645	1475	700	7	6	16.5	103.6	17.5	PS-4	108.3	14.5	96	Pass
7/7/00	NDT-192	1813	679	2645	1475	800	8	6	16.7	101.8	22.3	PS-6	102.2	22.5	100	Pass
7/7/00	NDT-193	1818	679	2645	1500	900	8	6	15.0	100.6	21.5	PS-6	102.2	22.5	98	Pass
7/7/00	NDT-194	1822	679	2645	1500	1000	7	6	13.5	103.7	17.1	PS-4	108.3	14.5	96	Pass
7/7/00	NDT-195	1829	679	2645	1500	1100	7	6	13.0	104.4	16.7	PS-4	108.3	14.5	96	Pass
7/8/00	NDT-196	1008	674	2655	1125	625	5	6	14.5	107.1	17.0	PS-4	108.3	14.5	99	Pass
7/8/00	NDT-197	1012	674	2655	1250	625	6	6	17.1	104.4	16.7	PS-4	108.3	14.5	96	Pass
7/8/00	NDT-198	1019	674	2655	1350	600	2	6	-	105.1	17.3	PS-4	108.3	14.5	97	Pass
7/8/00	NDT-199	1050	674	2655	1050	1200	10	6	17.4	104.6	19.4	PS-5	108.2	18.0	97	Pass
7/8/00	NDT-200	1105	674	2655	1150	1200	10	6	17.4	105.5	19.2	PS-5	108.2	18.0	98	Pass
7/8/00	NDT-201	1109	674	2655	1200	1200	9	6	16.0	105.0	19.2	PS-5	108.2	18.0	97	Pass
7/8/00	NDT-202	1113	674	2655	1300	1200	10	6	14.4	103.2	19.8	PS-5	108.2	18.0	95	Pass
7/8/00	NDT-203	1116	674	2655	1400	1200	10	6	14.9	103.3	18.7	PS-5	108.2	18.0	95	Pass
7/8/00	NDT-204	1121	674	2655	1500	1200	8	6	11.3	99.5	21.4	PS-6	102.2	22.5	97	Pass
7/8/00	NDT-205	1135	674	2655	1125	625	6	6	15.0	107.5	15.0	PS-5	108.2	18.0	99	Pass
7/8/00	NDT-206	1356	674	2655	700	1200	3	6	-	106.2	11.5	PS-4	108.3	14.5	98	Pass
7/8/00	NDT-207	1359	674	2655	700	1100	3	6	-	105.9	12.4	PS-4	108.3	14.5	98	Pass
7/8/00	NDT-208	1427	674	2655	1500	1100	8	6	13.5	112.3	12.5	PS-2	118.0	13.2	95	Pass
7/8/00	NDT-209	1436	674	2655	1500	1000	8	6	14.0	114.1	10.9	PS-2	118.0	13.2	97	Pass
7/8/00	NDT-210	1445	674	2655	1500	900	9	6	15.5	115.2	11.3	PS-2	118.0	13.2	98	Pass
7/8/00	NDT-211	1451	674	2655	1475	800	9	6	17.2	114.9	12.2	PS-2	118.0	13.2	97	Pass
7/8/00	NDT-212	1456	674	2655	1475	700	9	6	17.0	113.7	12.9	PS-2	118.0	13.2	96	Pass
7/8/00	NDT-213	1507	674	2655	1450	625	8	6	19.0	115.2	11.8	PS-2	118.0	13.2	98	Pass
7/10/00	NDT-214	901	671	2641	1500	1200	9	6	15.5	113.4	11.2	PS-2	118.0	13.2	96	Pass
7/10/00	NDT-215	906	671	2641	1400	1200	11	6	17.6	115.6	14.7	PS-2	118.0	13.2	98	Pass
7/10/00	NDT-216	911	671	2641	1300	1200	11	6	17.6	117.4	11.8	PS-2	118.0	13.2	99	Pass

RMT
Nuclear Density Testing Sheet
Landfill #3 and Haul Road
Weyerhaeuser, Plymouth NC

Date	Test Number	Time	Standard Counts		Location		Lift Number	Depth In.	Elevation msl	Dry Density -pcf	Moisture Content - %	Proctor Number	Max Dry Density -pcf	Optimum Moisture - %	% Compaction	Comments
			Moisture	Density	North	East										
7/10/00	NDT-217	915	671	2641	1200	1200	10	6	16.5	116.7	10.9	PS-2	118.0	13.2	99	Pass
7/10/00	NDT-218	918	671	2641	1100	1200	11	6	17.9	116.4	11.3	PS-2	118.0	13.2	99	Pass
7/10/00	NDT-219	921	671	2641	1000	1200	11	6	17.9	101.0	23.0	PS-6	102.2	22.5	99	Pass
7/10/00	NDT-220	925	671	2641	1000	1100	10	6	19.7	100.5	24.1	PS-6	102.2	22.5	98	Pass
7/10/00	NDT-221	929	671	2641	1125	625	7	6	-	107.3	12.9	PS-4	108.3	14.5	99	Pass
7/10/00	NDT-222	937	671	2641	1250	625	7	6	-	106.5	14.7	PS-4	108.3	14.5	98	Pass
7/10/00	NDT-223	1115	671	2641	700	1200	3	6	-	100.9	21.8	PS-4	108.3	14.5	93	Fail
7/10/00	NDT-224	1119	671	2641	700	1125	3	6	-	102.5	20.6	PS-4	108.3	14.5	94	Fail
7/10/00	NDT-225	1358	671	2641	700	1200	3	6	-	103.6	17.1	PS-4	108.3	14.5	96	Pass Retest of NDT-223
7/10/00	NDT-226	1402	671	2641	700	1125	3	6	-	104.5	16.9	PS-4	108.3	14.5	96	Pass Retest of NDT-224
7/10/00	NDT-227	1417	671	2641	550	625	2	6	-	102.9	17.4	PS-4	108.3	14.5	95	Pass
7/10/00	NDT-228	1421	671	2641	350	625	2	6	-	105.1	16.2	PS-4	108.3	14.5	97	Pass
7/10/00	NDT-229	1610	671	2641	1350	625	4	6	-	104.9	17.3	PS-4	108.3	14.5	97	Pass
7/10/00	NDT-230	1615	671	2641	1250	625	8	6	-	103.3	17.1	PS-4	108.3	14.5	95	Pass
7/10/00	NDT-231	1622	671	2641	1115	625	8	6	-	105.4	17.1	PS-4	108.3	14.5	97	Pass
7/10/00	NDT-232	1710	671	2641	1000	1200	12	6	18.4	104.9	17.4	PS-4	108.3	14.5	97	Pass
7/10/00	NDT-233	1716	671	2641	1100	1200	12	6	18.4	103.7	16.2	PS-4	108.3	14.5	96	Pass
7/10/00	NDT-234	1720	671	2641	1200	1200	11	6	17.0	108.1	15.8	PS-4	108.3	14.5	100	Pass
7/10/00	NDT-235	1421	671	2641	1300	1200	12	6	18.1	102.9	17.5	PS-4	108.3	14.5	95	Pass
7/10/00	NDT-236	1610	671	2641	1400	1200	12	6	15.1	103.3	17.4	PS-4	108.3	14.5	95	Pass
7/10/00	NDT-237	1615	671	2641	1500	1200	10	6	14.0	113.7	10.5	PS-2	118.0	13.2	96	Pass
7/10/00	NDT-238	1622	671	2641	1500	1100	9	6	14.9	103.7	16.1	PS-4	108.3	14.5	96	Pass
7/11/00	NDT-239	840	676	2663	1500	1100	9	6	14.9	115.2	14.5	PS-2	118.0	13.2	98	Pass
7/11/00	NDT-240	844	676	2663	1500	1000	9	6	16.7	114.3	13.1	PS-2	118.0	13.2	97	Pass
7/11/00	NDT-241	848	676	2663	1500	900	10	6	18.8	115.6	12.3	PS-2	118.0	13.2	98	Pass
7/11/00	NDT-242	851	676	2663	1475	800	10	6	18.3	104.9	16.3	PS-4	108.3	14.5	97	Pass
7/11/00	NDT-243	855	676	2663	1475	700	10	6	19.2	105.3	17.2	PS-4	108.3	14.5	97	Pass

RMT
Nuclear Density Testing Sheet
Landfill #3 and Haul Road
Weyerhaeuser, Plymouth NC

Date	Test Number	Time	Standard Counts		Location		Lift Number	Depth In.	Elevation msl	Dry Density -pcf	Moisture Content - %	Proctor Number	Max Dry Density -pcf	Optimum Moisture - %	% Compaction	Comments
			Moisture	Density	North	East										
7/11/00	NDT-244	859	676	2663	1450	625	9	6	19.6	102.9	17.4	PS-4	108.3	14.5	95	Pass
7/11/00	NDT-245	915	676	2663	550	625	3	6	-	105.3	15.8	PS-4	108.3	14.5	97	Pass
7/11/00	NDT-246	917	676	2663	350	625	3	6	-	103.6	16.9	PS-4	108.3	14.5	96	Pass
7/11/00	NDT-247	1204	676	2663	700	625	4	6	-	103.3	15.4	PS-4	108.3	14.5	95	Pass
7/11/00	NDT-248	1216	676	2663	1250	625	8	6	-	103.6	17.4	PS-4	108.3	14.5	96	Pass
7/11/00	NDT-249	1222	676	2663	1125	625	8	6	-	105.2	16.2	PS-4	108.3	14.5	97	Pass
7/11/00	NDT-250	1231	676	2663	1350	625	5	6	-	107.1	14.9	PS-4	108.3	14.5	99	Pass
7/11/00	NDT-251	1652	676	2663	1000	1175	13	6	18.9	102.8	21.6	PS-6	102.2	22.5	101	Pass
7/11/00	NDT-252	1703	676	2663	1100	1175	13	6	18.9	104.0	19.7	PS-6	102.2	22.5	102	Pass
7/11/00	NDT-253	1709	676	2663	1200	1175	12	6	17.5	103.3	19.6	PS-6	102.2	22.5	101	Pass
7/11/00	NDT-254	1714	676	2663	1300	1175	13	6	18.7	103.6	20.1	PS-6	102.2	22.5	101	Pass
7/11/00	NDT-255	1719	676	2663	1400	1175	13	6	16.7	103.1	21.2	PS-6	102.2	22.5	101	Pass
7/11/00	NDT-256	1721	676	2663	1500	1175	11	6	14.5	101.5	22.3	PS-6	102.2	22.5	99	Pass
7/11/00	NDT-257	1730	676	2663	1500	1075	10	6	15.4	103.8	17.5	PS-4	108.3	14.5	96	Pass
7/11/00	NDT-258	1733	676	2663	1475	975	10	6	17.2	104.1	17.1	PS-4	108.3	14.5	96	Pass
7/11/00	NDT-259	1736	676	2663	1475	900	11	6	19.3	107.6	16.6	PS-4	108.3	14.5	99	Pass
7/11/00	NDT-260	1741	676	2663	1475	800	11	6	18.8	105.2	17.1	PS-4	108.3	14.5	97	Pass
7/11/00	NDT-261	1747	676	2663	1475	700	11	6	19.7	104.9	16.3	PS-4	108.3	14.5	97	Pass
7/11/00	NDT-262	1752	676	2663	1115	625	9	6	-	105.8	17.4	PS-4	108.3	14.5	98	Pass
7/12/00	NDT-263	1038	672	2671	700	1175	5	6	24.9	102.7	21.5	PS-7	104.9	19.0	98	Pass
7/12/00	NDT-264	1057	672	2671	1125	1175	10	6	19.8	107.5	11.7	PS-4	108.3	14.5	99	Pass
7/12/00	NDT-265	1125	672	2671	550	1175	4	6	23.0	104.6	20.3	PS-7	104.9	19.0	100	Pass
7/12/00	NDT-266	1137	672	2671	350	1175	6	6	26.0	105.0	19.9	PS-7	104.9	19.0	100	Pass
7/12/00	NDT-267	1252	672	2671	1125	1075	11	6	20.3	109.1	14.6	PS-4	108.3	14.5	101	Pass
7/12/00	NDT-268	1425	672	2671	1000	975	14	6	20.6	101.6	21.3	PS-7	104.9	19.0	97	Pass
7/12/00	NDT-269	1434	672	2671	1100	900	14	6	20.6	102.2	20.9	PS-7	104.9	19.0	97	Pass
7/12/00	NDT-270	1437	672	2671	1200	1175	13	6	19.0	101.9	21.2	PS-7	104.9	19.0	97	Pass

RMT
Nuclear Density Testing Sheet
Landfill #3 and Haul Road
Weyerhaeuser, Plymouth NC

Date	Test Number	Time	Standard Counts		Location		Lift Number	Depth In.	Elevation msl	Dry Density -pcf	Moisture Content - %	Proctor Number	Max Dry Density -pcf	Optimum Moisture - %	% Compaction	Comments
			Moisture	Density	North	East										
7/12/00	NDT-271	1444	672	2671	1300	1175	14	6	16.2	101.1	21.6	PS-7	104.9	19.0	96	Pass
7/12/00	NDT-272	1455	672	2671	1400	1175	14	6	15.7	101.8	20.3	PS-7	104.9	19.0	97	Pass
7/12/00	NDT-273	1459	672	2671	1500	1175	12	6	15.2	101.6	20.5	PS-7	104.9	19.0	97	Pass
7/12/00	NDT-274	1549	672	2671	1125	625	11	6	21.0	109.2	13.7	PS-4	108.3	14.5	101	Pass
7/12/00	NDT-275	1647	672	2671	1475	1025	11	6	16.3	103.7	19.0	PS-7	104.9	19.0	99	Pass
7/12/00	NDT-276	1655	672	2671	1475	925	11	6	18.3	104.3	18.9	PS-7	104.9	19.0	99	Pass
7/12/00	NDT-277	1701	672	2671	1475	800	12	6	19.4	106.6	18.4	PS-7	104.9	19.0	102	Pass
7/12/00	NDT-278	1709	672	2671	1475	700	12	6	19.9	104.0	18.9	PS-7	104.9	19.0	99	Pass
7/12/00	NDT-279	1715	672	2671	1425	625	12	6	20.5	108.3	15.3	PS-4	108.3	14.5	100	Pass
7/13/00	NDT-280	1311	672	2631	350	625	5	6	-	101.8	22.0	PS-7	104.9	19.0	97	Pass
7/13/00	NDT-281	1315	672	2631	500	625	5	6	-	102.0	20.7	PS-7	104.9	19.0	97	Pass
7/13/00	NDT-282	1406	672	2631	1050	1175	15	6	-	102.6	20.1	PS-7	104.9	19.0	98	Pass
7/13/00	NDT-283	1409	672	2631	1250	1175	14	6	-	102.1	21.7	PS-7	104.9	19.0	97	Pass
7/13/00	NDT-284	1412	672	2631	1400	1175	15	6	-	106.0	16.8	PS-7	104.9	19.0	101	Pass
7/13/00	NDT-285	1647	672	2631	1450	625	13	6	-	106.2	11.7	PS-4	108.3	14.5	98	Pass
7/13/00	NDT-286	1654	672	2631	1475	750	13	6	-	107.3	12.5	PS-4	108.3	14.5	99	Pass
7/13/00	NDT-287	1658	672	2631	1275	625	9	6	-	113.4	13.2	PS-2	118.0	13.2	96	Pass
7/13/00	NDT-288	1730	672	2631	1150	625	12	6	21.5	105.8	12.3	PS-4	108.3	14.5	98	Pass
7/13/00	NDT-289	1747	672	2631	1475	975	12	6	18.8	105.5	13.0	PS-4	108.3	14.5	97	Pass
7/14/00	NDT-290	1142	647	2649	750	1175	6	6	-	105.1	16.7	PS-4	108.3	14.5	97	Pass
7/14/00	NDT-291	1147	674	2649	1000	1175	16	6	-	106.2	15.9	PS-4	108.3	14.5	98	Pass
7/17/00	NDT-292	1307	675	2668	1200	1175	15	6	20.0	112.0	11.3	PS-2	118.0	13.2	95	Pass
7/17/00	NDT-293	1315	675	2668	1400	1175	16	6	16.7	106.8	11.5	PS-4	108.3	14.5	99	Pass
7/17/00	NDT-294	1323	675	2668	600	625	6	6	-	107.1	16.3	PS-4	108.3	14.5	99	Pass
7/17/00	NDT-295	1329	675	2668	400	625	6	6	-	105.3	17.5	PS-4	108.3	14.5	97	Pass
7/17/00	NDT-296	1533	675	2668	1402	710	SF-1	6	11.1	102.6	20.4	PS-7	104.9	19.0	98	Pass -Select Fill Lift 1
7/17/00	NDT-297	1542	675	2668	1393	800	SF-1	6	12.0	104.3	19.7	PS-7	104.9	19.0	99	Pass -Select Fill Lift 1

RMT
Nuclear Density Testing Sheet
Landfill #3 and Haul Road
Weyerhaeuser, Plymouth NC

Date	Test Number	Time	Standard Counts		Location		Lift Number	Depth In.	Elevation msl	Dry Density -pcf	Moisture Content - %	Proctor Number	Max Dry Density -pcf	Optimum Moisture - %	% Compaction	Comments
			Moisture	Density	North	East										
7/17/00	NDT-298	1551	675	2668	1415	900	SF-1	6	12.6	107.2	16.0	PS-8	109.7	15.6	98	Pass -Select Fill Lift 1
7/17/00	NDT-290	1555	675	2668	1382	993	SF-1	6	11.7	104.0	15.9	PS-8	109.7	15.6	95	Pass -Select Fill Lift 1
7/17/00	NDT-300	1601	675	2668	1394	1071	SF-1	6	11.4	106.0	13.8	PS-8	109.7	15.6	97	Pass -Select Fill Lift 1
7/18/00	NDT-301	804	673	2653	475	610	7	6	-	99.0	24.5	PS-6	102.2	22.5	97	Pass
7/18/00	NDT-302	808	673	2653	600	610	7	6	-	100.1	24.6	PS-6	102.2	22.5	98	Pass
7/18/00	NDT-303	837	673	2653	1300	1106	SF-1	6	12.0	105.5	15.1	PS-8	109.7	15.6	96	Pass -Select Fill Lift 1
7/18/00	NDT-304	846	673	2653	1295	1008	SF-1	6	13.3	102.6	20.4	PS-7	104.9	19.0	98	Pass -Select Fill Lift 1
7/18/00	NDT-305	853	673	2653	1312	897	SF-1	6	13.3	99.7	18.5	PS-7	104.9	19.0	95	Pass -Select Fill Lift 1
7/18/00	NDT-306	901	673	2653	1296	800	SF-1	6	13.4	107.9	17.7	PS-8	109.7	15.6	98	Pass -Select Fill Lift 1
7/18/00	NDT-307	905	673	2653	1305	700	SF-1	6	13.0	110.3	16.6	PS-8	109.7	15.6	101	Pass -Select Fill Lift 1
7/18/00	NDT-308	1602	673	2653	1192	703	SF-1	6	15.3	108.1	16.4	PS-8	109.7	15.6	99	Pass -Select Fill Lift 1
7/18/00	NDT-309	1614	673	2653	1185	801	SF-1	6	15.9	110.7	15.4	PS-8	109.7	15.6	101	Pass -Select Fill Lift 1
7/18/00	NDT-310	1620	673	2653	1193	898	SF-1	6	16.0	109.3	14.7	PS-8	109.7	15.6	100	Pass -Select Fill Lift 1
7/18/00	NDT-311	1625	673	2653	1187	1001	SF-1	6	15.3	113.9	13.9	PS-1	117.9	13.7	97	Pass -Select Fill Lift 1
7/18/00	NDT-312	1629	673	2653	1195	1103	SF-1	6	15.0	113.4	14.3	PS-1	117.9	13.7	96	Pass -Select Fill Lift 1
7/18/00	NDT-313	1635	673	2653	1100	1105	SF-1	6	17.2	112.9	14.3	PS-1	117.9	13.7	96	Pass -Select Fill Lift 1
7/18/00	NDT-314	1650	673	2653	1093	1005	SF-1	6	17.9	104.7	18.1	PS-1	117.9	13.7	89	Pass -Select Fill Lift 1
7/18/00	NDT-315	1723	673	2653	1103	904	SF-1	6	18.3	115.6	12.9	PS-1	117.9	13.7	98	Pass -Select Fill Lift 1
7/18/00	NDT-316	1731	673	2653	1093	801	SF-1	6	18.1	113.7	10.9	PS-1	117.9	13.7	96	Pass -Select Fill Lift 1
7/18/00	NDT-317	1736	673	2653	1095	698	SF-1	6	17.0	113.4	11.2	PS-1	117.9	13.7	96	Pass -Select Fill Lift 1
7/18/00	NDT-318	1749	673	2653	997	692	SF-1	6	19.8	107.8	16.6	PS-3	112.8	16.2	96	Pass -Select Fill Lift 1
7/18/00	NDT-319	1755	673	2653	990	800	SF-1	6	20.4	116.3	11.9	PS-1	117.9	13.7	99	Pass -Select Fill Lift 1
7/18/00	NDT-320	1759	673	2653	993	993	SF-1	6	20.8	114.0	11.1	PS-1	117.9	13.7	97	Pass -Select Fill Lift 1
7/18/00	NDT-321	1802	673	2653	984	984	SF-1	6	20.0	113.0	15.9	PS-1	117.9	13.7	96	Pass -Select Fill Lift 1
7/19/00	NDT-322	932	669	2666	750	1200	7	6	-	102.3	21.2	PS-7	104.9	19.0	98	Pass
7/19/00	NDT-323	941	669	2666	1150	1200	16	6	-	105.4	15.5	PS-8	109.7	15.6	96	Pass
7/19/00	NDT-324	947	669	2666	1275	1200	17	6	-	107.1	12.7	PS-8	109.7	15.6	98	Pass

RMT
Nuclear Density Testing Sheet
Landfill #3 and Haul Road
Weyerhaeuser, Plymouth NC

Date	Test Number	Time	Standard Counts		Location		Lift Number	Depth In.	Elevation msl	Dry Density -pcf	Moisture Content - %	Proctor Number	Max Dry Density -pcf	Optimum Moisture - %	% Compaction	Comments
			Moisture	Density	North	East										
7/19/00	NDT-325	953	669	2666	1050	1200	17	6	-	105.9	14.3	PS-8	109.7	15.6	97	Pass
7/19/00	NDT-326	958	669	2666	1415	1200	17	6	-	107.2	15.3	PS-8	109.7	15.6	98	Pass
7/19/00	NDT-327	1022	669	2666	995	1110	SF-1	6	19.5	112.6	14.2	PS-1	117.9	13.7	96	Pass -Select Fill Lift 1
7/19/00	NDT-328	1028	669	2666	907	1028	SF-1	6	22.3	107.1	16.8	PS-8	109.7	15.6	98	Pass -Select Fill Lift 1
7/19/00	NDT-329	932	669	2666	895	1005	SF-1	6	22.5	113.4	21.2	PS-1	117.9	13.7	96	Pass -Select Fill Lift 1
7/19/00	NDT-330	941	669	2666	890	900	SF-1	6	22.9	106.9	15.5	PS-3	112.8	16.2	95	Pass -Select Fill Lift 1
7/19/00	NDT-331	947	669	2666	897	800	SF-1	6	22.7	113.6	12.7	PS-1	117.9	13.7	96	Pass -Select Fill Lift 1
7/19/00	NDT-332	953	669	2666	903	701	SF-1	6	22.0	107.4	14.3	PS-3	112.8	16.2	95	Pass -Select Fill Lift 1
7/19/00	NDT-333	958	669	2666	793	704	SF-1	6	24.5	115.4	15.3	PS-1	117.9	13.7	98	Pass -Select Fill Lift 1
7/19/00	NDT-334	1022	669	2666	810	801	SF-1	6	24.9	114.1	14.2	PS-1	117.9	13.7	97	Pass -Select Fill Lift 1
7/19/00	NDT-335	1028	669	2666	789	905	SF-1	6	25.4	113.9	16.8	PS-1	117.9	13.7	97	Pass -Select Fill Lift 1
7/19/00	NDT-336	1225	669	2666	800	1010	SF-1	6	12.2	114.9	12.2	PS-1	117.9	13.7	97	Pass -Select Fill Lift 1
7/19/00	NDT-337	1233	669	2666	795	1107	SF-1	6	11.4	114.6	11.4	PS-1	117.9	13.7	97	Pass -Select Fill Lift 1
7/19/00	NDT-338	1430	669	2666	700	700	SF-1	6	16.7	105.2	16.7	PS-8	109.7	15.6	96	Pass -Select Fill Lift 1
7/19/00	NDT-339	1435	669	2666	700	800	SF-1	6	15.3	106.7	15.3	PS-8	109.7	15.6	97	Pass -Select Fill Lift 1
7/19/00	NDT-340	1448	669	2666	700	900	SF-1	6	12.9	109.1	12.9	PS-8	109.7	15.6	99	Pass -Select Fill Lift 1
7/19/00	NDT-342	1453	669	2666	700	1000	SF-1	6	13.7	107.6	13.7	PS-8	109.7	15.6	98	Pass -Select Fill Lift 1
7/19/00	NDT-343	1501	669	2666	700	1100	SF-1	6	16.2	104.9	16.2	PS-8	109.7	15.6	96	Pass -Select Fill Lift 1
7/20/00	NDT-344	752	675	2663	750	1190	8	6	-	107.5	13.3	PS-8	109.7	15.6	98	Pass
7/20/00	NDT-345	756	675	2663	925	1190	8	6	-	105.4	16.9	PS-8	109.7	15.6	96	Pass
7/20/00	NDT-346	801	675	2663	1125	1190	18	6	-	109.3	14.2	PS-8	109.7	15.6	100	Pass
7/20/00	NDT-347	807	675	2663	1275	1190	18	6	-	108.6	14.3	PS-8	109.7	15.6	99	Pass
7/20/00	NDT-348	811	675	2663	1475	1190	18	6	-	107.2	15.1	PS-8	109.7	15.6	98	Pass
7/20/00	NDT-349	1322	675	2663	800	1000	SF-1	6	29.8	107.9	17.3	PS-8	109.7	15.6	98	Pass -Select Fill Lift 1
7/20/00	NDT-350	1324	675	2663	1000	1100	SF-1	6	29.3	106.2	16.5	PS-8	109.7	15.6	97	Pass -Select Fill Lift 1
7/20/00	NDT-351	1330	675	2663	1250	645	SF-1	6	18.0	105.8	18.6	PS-8	109.7	15.6	96	Pass -Select Fill Lift 1
7/20/00	NDT-352	1638	675	2663	1460	735	SF-1	6	15.4	107.1	16.3	PS-8	109.7	15.6	98	Pass -Select Fill Lift 1

RMT
Nuclear Density Testing Sheet
Landfill #3 and Haul Road
Weyerhaeuser, Plymouth NC

Date	Test Number	Time	Standard Counts		Location		Lift Number	Depth In.	Elevation msl	Dry Density -pcf	Moisture Content - %	Proctor Number	Max Dry Density -pcf	Optimum Moisture - %	% Compaction	Comments
			Moisture	Density	North	East										
7/20/00	NDT-353	1647	675	2663	1460	893	SF-1	6	16.0	107.3	17.4	PS-8	109.7	15.6	98	Pass -Select Fill Lift 1
7/20/00	NDT-354	1655	675	2663	1460	1030	SF-1	6	14.7	106.4	18.1	PS-8	109.7	15.6	97	Pass -Select Fill Lift 1
7/21/00	NDT-355	1040	679	2624	1235	1190	19	6	-	105.1	16.3	PS-9	108.6	16.5	97	Pass
7/21/00	NDT-356	1045	679	2624	1045	1190	19	6	-	107.3	14.7	PS-9	108.6	16.5	99	Pass
7/21/00	NDT-357	1051	679	2624	1051	1190	19	6	-	109.9	15.3	PS-9	108.6	16.5	101	Pass
7/21/00	NDT-358	1100	679	2624	1460	1190	19	6	-	102.8	19.9	PS-9	108.6	16.5	95	Fail due to Moisture
7/22/00	NDT-359	841	674	2631	1565	1175	1	6	-	107.1	20.5	PS-6	102.2	22.5	105	Pass - Pond #3 Outfall
7/22/00	NDT-360	1046	674	2631	1563	1170	2	6	-	100.6	22.9	PS-6	102.2	22.5	98	Pass - Pond #3 Outfall
7/22/00	NDT-361	1257	674	2631	1565	1200	3	6	-	98.4	24.1	PS-6	102.2	22.5	96	Pass - Pond #3 Outfall
7/31/00	NDT-362	1335	673	2640	1135	690	SF-2	6	16.6	103.8	19.5	PS-9	108.6	16.5	96	Pass -Select Fill Lift 2
7/31/00	NDT-363	1344	673	2640	1159	796	SF-2	6	17.2	104.3	18.1	PS-9	108.6	16.5	96	Pass -Select Fill Lift 2
7/31/00	NDT-364	1349	673	2640	1163	894	SF-2	6	17.7	106.0	17.8	PS-9	108.6	16.5	98	Pass -Select Fill Lift 2
7/31/00	NDT-365	1354	673	2640	1145	1004	SF-2	6	17.2	104.3	18.7	PS-9	108.6	16.5	96	Pass -Select Fill Lift 2
7/31/00	NDT-366	1359	673	2640	1151	1105	SF-2	6	17.0	105.7	19.1	PS-9	108.6	16.5	97	Pass -Select Fill Lift 2
7/31/00	NDT-367	1601	673	2640	745	700	SF-2	6	26.2	105.6	19.3	PS-9	108.6	16.5	97	Pass -Select Fill Lift 2
7/31/00	NDT-368	1605	673	2640	749	805	SF-2	6	26.7	104.6	18.2	PS-9	108.6	16.5	96	Pass -Select Fill Lift 2
7/31/00	NDT-369	1609	673	2640	750	903	SF-2	6	27.2	105.8	19.1	PS-9	108.6	16.5	97	Pass -Select Fill Lift 2
7/31/00	NDT-370	1613	673	2640	743	1009	SF-2	6	26.8	106.1	18.2	PS-9	108.6	16.5	98	Pass -Select Fill Lift 2
7/31/00	NDT-371	1617	673	2640	742	1097	SF-2	6	26.1	105.3	17.4	PS-9	108.6	16.5	97	Pass -Select Fill Lift 2
8/1/00	NDT-372	855	673	2661	844	712	SF-2	6	24.0	103.4	19.2	PS-9	108.6	16.5	95	Pass -Select Fill Lift 2
8/1/00	NDT-373	906	673	2661	847	800	SF-2	6	24.3	104.0	19.3	PS-9	108.6	16.5	96	Pass -Select Fill Lift 2
8/1/00	NDT-374	911	673	2661	848	903	SF-2	6	24.9	103.8	18.9	PS-9	108.6	16.5	96	Pass -Select Fill Lift 2
8/1/00	NDT-375	916	673	2661	845	1010	SF-2	6	24.2	105.7	18.5	PS-9	108.6	16.5	97	Pass -Select Fill Lift 2
8/1/00	NDT-376	925	673	2661	849	1103	SF-2	6	23.9	104.1	19.2	PS-9	108.6	16.5	96	Pass -Select Fill Lift 2
8/1/00	NDT-377	1517	673	2661	947	685	SF-2	6	21.4	108.3	16.3	PS-9	108.6	16.5	100	Pass -Select Fill Lift 2
8/1/00	NDT-378	1521	673	2661	942	800	SF-2	6	22.1	105.2	19.0	PS-9	108.6	16.5	97	Pass -Select Fill Lift 2
8/1/00	NDT-379	1527	673	2661	944	895	SF-2	6	22.1	103.7	18.6	PS-9	108.6	16.5	95	Pass -Select Fill Lift 2

RMT
Nuclear Density Testing Sheet
Landfill #3 and Haul Road
Weyerhaeuser, Plymouth NC

Date	Test Number	Time	Standard Counts		Location		Lift Number	Depth In.	Elevation msl	Dry Density -pcf	Moisture Content - %	Proctor Number	Max Dry Density -pcf	Optimum Moisture - %	% Compaction	Comments
			Moisture	Density	North	East										
8/1/00	NDT-380	1533	673	2661	947	1003	SF-2	6	21.7	103.4	19.4	PS-9	108.6	16.5	95	Pass -Select Fill Lift 2
8/1/00	NDT-381	1539	673	2661	940	1107	SF-2	6	21.4	105.1	18.2	PS-9	108.6	16.5	97	Pass -Select Fill Lift 2
8/2/00	NDT-382	740	673	2655	1051	669	SF-2	6	17.7	106.0	17.7	PS-9	108.6	16.5	98	Pass -Select Fill Lift 2
8/2/00	NDT-383	744	673	2655	1048	805	SF-2	6	16.4	108.6	16.4	PS-9	108.6	16.5	100	Pass -Select Fill Lift 2
8/2/00	NDT-384	749	673	2655	1045	907	SF-2	6	16.9	107.1	16.9	PS-9	108.6	16.5	99	Pass -Select Fill Lift 2
8/2/00	NDT-385	754	673	2655	1053	1007	SF-2	6	16.2	108.2	16.2	PS-9	108.6	16.5	100	Pass -Select Fill Lift 2
8/2/00	NDT-386	830	673	2655	1050	1113	SF-2	6	18.3	106.9	18.3	PS-9	108.6	16.5	98	Pass -Select Fill Lift 2
8/2/00	NDT-387	843	673	2655	1251	700	SF-2	6	17.1	109.4	17.1	PS-10	112.9	16.2	97	Pass -Select Fill Lift 2
8/2/00	NDT-388	855	673	2655	1249	801	SF-2	6	15.4	110.9	15.4	PS-10	112.9	16.2	98	Pass -Select Fill Lift 2
8/2/00	NDT-389	902	673	2655	1253	905	SF-2	6	15.2	108.4	14.8	PS-10	112.9	16.2	96	Pass -Select Fill Lift 2
8/2/00	NDT-390	910	673	2655	1248	1005	SF-2	6	14.9	109.6	15.3	PS-10	112.9	16.2	97	Pass -Select Fill Lift 2
8/2/00	NDT-391	917	673	2655	1250	1107	SF-2	6	14.4	110.7	16.0	PS-10	112.9	16.2	98	Pass -Select Fill Lift 2
8/3/00	NDT-392	801	675	2655	1348	700	SF-2	6	12.7	110.4	14.9	PS-10	112.9	16.2	98	Pass -Select Fill Lift 2
8/3/00	NDT-393	809	675	2655	1345	805	SF-2	6	13.3	109.7	15.3	PS-10	112.9	16.2	97	Pass -Select Fill Lift 2
8/3/00	NDT-394	913	675	2655	1352	907	SF-2	6	13.7	111.4	15.8	PS-10	112.9	16.2	99	Pass -Select Fill Lift 2
8/3/00	NDT-395	918	675	2655	1350	997	SF-2	6	13.1	108.7	16.3	PS-10	112.9	16.2	96	Pass -Select Fill Lift 2
8/3/00	NDT-396	923	675	2655	1348	1098	SF-2	6	12.7	110.3	14.8	PS-10	112.9	16.2	98	Pass -Select Fill Lift 2
8/3/00	NDT-397	1343	675	2655	885	635	SF-2	6	26.1	109.9	16.4	PS-10	112.9	16.2	97	Pass -Select Fill Lift 2
8/3/00	NDT-398	1355	675	2655	1100	650	SF-2	6	22.2	111.3	15.8	PS-10	112.9	16.2	99	Pass -Select Fill Lift 2
8/3/00	NDT-399	1423	675	2655	1325	650	SF-2	6	22.5	111.6	16.9	PS-10	112.9	16.2	99	Pass -Select Fill Lift 2
8/3/00	NDT-400	1429	675	2655	1475	700	SF-2	6	22.1	108.6	17.1	PS-10	112.9	16.2	96	Pass -Select Fill Lift 2
8/3/00	NDT-401	1435	675	2655	1475	800	SF-2	6	22	107.9	17.3	PS-10	112.9	16.2	96	Pass -Select Fill Lift 2
8/3/00	NDT-402	1447	675	2655	1475	900	SF-2	6	21.8	109.3	16.9	PS-10	112.9	16.2	97	Pass -Select Fill Lift 2
8/3/00	NDT-403	1456	675	2655	1475	1000	SF-2	6	22.3	109.7	17.1	PS-10	112.9	16.2	97	Pass -Select Fill Lift 2
8/3/00	NDT-404	1602	675	2655	1310	1150	SF-2	6	20.3	107.7	18.1	PS-10	112.9	16.2	95	Pass -Select Fill Lift 2
8/3/00	NDT-405	1609	675	2655	1115	1150	SF-2	6	23.0	110.3	15.9	PS-10	112.9	16.2	98	Pass -Select Fill Lift 2
8/3/00	NDT-406	1615	675	2655	885	1150	SF-2	6	27.3	107.6	16.3	PS-10	112.9	16.2	95	Pass -Select Fill Lift 2

RMT
Nuclear Density Testing Sheet
Landfill #3 and Haul Road
Weyerhaeuser, Plymouth NC

Date	Test Number	Time	Standard Counts		Location		Lift Number	Depth In.	Elevation msl	Dry Density -pcf	Moisture Content - %	Proctor Number	Max Dry Density -pcf	Optimum Moisture - %	% Compaction	Comments
			Moisture	Density	North	East										
8/3/00	NDT-407	1619	675	2655	675	1055	SF-2	6	28.4	110.3	15.5	PS-10	112.9	16.2	98	Pass -Select Fill Lift 2
8/3/00	NDT-408	1625	675	2655	675	890	SF-2	6	28.1	111.5	15.1	PS-10	112.9	16.2	99	Pass -Select Fill Lift 2
8/3/00	NDT-409	1630	675	2655	675	710	SF-2	6	28.1	109.2	16.8	PS-10	112.9	16.2	97	Pass -Select Fill Lift 2
8/15/00	NDT-410	1049	672	2663	1420	1120	LPS-1	6	8.0	96.4	25.3	PS-13	100.6	21.6		Pass - Low Perm Soil
8/15/00	NDT-411	1249	672	2663			LPS-1	6	8.5	96.9	24.8	PS-13	100.6	21.6		Pass - Low Perm Soil
8/15/00	NDT-412	1303	672	2663			LPS-1	6	9.0	99.2	25	PS-13	100.6	21.6		Pass - Low Perm Soil
8/15/00	NDT-413	1340	672	2663			LPS-1	6	9.5	101.2	23.5	PS-13	100.6	21.6		Pass - Low Perm Soil
8/15/00	NDT-414	1602	672	2663			LPS-2	6	8.0	98.6	24.3	PS-13	100.6	21.6		Pass - Low Perm Soil
8/15/00	NDT-415	1628	672	2663			LPS-2	6	8.5	101.9	22.3	PS-13	100.6	21.6		Pass - Low Perm Soil
8/15/00	NDT-416	1657	672	2663			LPS-2	6	9.0	100.6	23.7	PS-13	100.6	21.6		Pass - Low Perm Soil
8/15/00	NDT-417	1731	672	2663			LPS-2	6	9.5	98.6	25.6	PS-13	100.6	21.6		Pass - Low Perm Soil
8/15/00	NDT-418	1752	672	2663			19	6	-	104.3	17.1	PS-9	108.6	16.5		Retest of NDT-358

Appendix G
Prepared Subgrade Permeability Test Results

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW
QA: JSH

Project Name:	WEYERHAEUSER	Cell #:	1
Project #:	5108.08	USCS Description:	Clayey Sand
Sample Name:	PT-1, 1292N, 792E	USCS Classification:	SC
Visual Descript:	Clayey Sand	Average Kv =	1.1E-06 cm/sec

Sample Type:	Undisturbed	Initial Values	Final Values		
Sample Dia. (in)		2.83	2.83	Permeant:	Water
Sample Ht. (in)		2.28	2.28	Permeant Specific Gravity:	1.00
Tare & Wet (g)		482.00	575.00	Sample Specific Gravity:	2.70 Est.
Tare & Dry (g)		404.14	489.30	Confining Pressure (psi):	100.0
Tare (g)		0.00	85.16	Burette Diameter (in):	0.250
Sample Wt. (g)		482.00	489.84	Burette Zero (cm):	100.0
Moisture (%)		19.3	21.2	Maximum Gradient:	
Wet Density (pcf)		128.0	130.1	Average Gradient:	
Dry Density (pcf)		107.4	107.4	Max. Effect. Stress (psi):	5.7
Saturation (%)		91.4	100.6	Min. Effect. Stress (psi):	3.7
				Ave. Effect. Stress (psi):	4.6

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	20	7	52.00		0.0	95	95	46.20		4.70		95.30				
2	2000	7	20	7	59.00	420	20.0	95	95	46.40	0.20	6.80	2.10	93.20	2.10	0.0	2.6E-06	
3	2000	7	20	8	8.00	540	20.0	95	95	46.30	-0.10	9.40	2.60	90.80	2.40	4.0	2.5E-06	
4	2000	7	20	8	36.00	1680	20.0	95	95	46.30	0.00	16.00	6.60	84.75	6.05	4.3	2.3E-06	
5	2000	7	20	8	47.00	660	20.0	95	95	46.40	0.10	18.25	2.25	82.65	2.10	3.4	2.2E-06	
6	2000	7	21	7	38.00		0.0	95	95	48.75		7.55		94.35				
7	2000	7	21	7	46.00	480	21.0	95	95	48.70	-0.05	9.35	1.80	92.60	1.75	1.4	1.9E-06	
8	2000	7	21	7	56.00	600	21.0	95	95	48.40	-0.30	11.40	2.05	90.70	1.90	3.8	1.8E-06	
9	2000	7	21	8	5.00	540	21.0	95	95	48.35	-0.05	12.90	1.50	89.35	1.35	5.3	1.5E-06	
10	2000	7	21	8	10.00	300	21.0	95	95	48.35	0.00	13.95	1.05	88.35	1.00	2.4	2.0E-06	
11	2000	7	21	8	15.00	300	21.0	95	95	48.40	0.05	14.90	0.95	87.50	0.85	5.6	1.8E-06	
12	2000	7	24	7	48.00		0.0	95	95	76.50		8.05		95.85				
13	2000	7	24	8	1.00	780	20.0	95	95	76.75	0.25	9.80	1.75	94.20	1.65	2.9	1.1E-06	
14	2000	7	24	8	6.00	300	20.0	95	95	76.90	0.15	10.55	0.75	93.60	0.60	11.1	1.2E-06	
15	2000	7	24	8	29.00	1380	20.0	95	95	77.50	0.60	13.50	2.95	90.90	2.70	4.4	1.2E-06	
16	2000	7	24	8	46.00	1020	20.0	95	95	77.80	0.30	15.55	2.05	89.10	1.80	6.5	1.1E-06	
17	2000	7	24	9	1.00	900	20.0	95	95	78.50	0.70	17.20	1.65	87.75	1.35	10.0	1.0E-06	
18	2000	7	25	7	37.00		0.0	95	95	94.80		5.15		96.05				
19	2000	7	25	7	44.00	420	20.0	95	95	94.80	0.00	6.20	1.05	95.00	1.05	0.0	1.3E-06	
20	2000	7	25	8	7.00	1380	20.0	95	95	94.80	0.00	9.65	3.45	91.95	3.05	6.2	1.2E-06	
21	2000	7	25	8	25.00	1080	20.0	95	95	94.80	0.00	12.00	2.35	89.85	2.10	5.6	1.2E-06	
22	2000	7	25	8	42.00	1020	20.0	95	95	94.70	-0.10	13.95	1.95	87.95	1.90	1.3	1.1E-06	
23	2000	7	25	8	55.00	780	20.0	95	95	94.85	0.15	15.50	1.55	86.60	1.35	6.9	1.2E-06	
24	2000	7	25	9	25.00	1800	20.0	95	95	95.85	1.00	18.80	3.30	83.60	3.00	4.8	1.2E-06	
25	2000	7	26	7	40.00		0.0	95	95	96.30		7.55		96.60				
26	2000	7	26	8	2.00	1320	20.0	95	95	96.20	-0.10	10.80	3.25	93.60	3.00	4.0	1.2E-06	

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW
QA: JPH

Project Name:	WEYERHAEUSER	Cell #:	1
Project #:	5108.08	USCS Description:	Clayey Sand
Sample Name:	PT-1, 1292N, 792E	USCS Classification:	SC
Visual Descript:	Clayey Sand		

Sample Type: Undisturbed	Initial Values	Final Values			
Sample Dia. (in)	2.83	2.83	Permeant:	Water	
Sample Ht. (in)	2.28	2.28	Permeant Specific Gravity:	1.00	
Tare & Wet (g)	482.00	575.00	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)	404.14	489.30	Confining Pressure (psi):	100.0	
Tare (g)	0.00	85.16	Burette Diameter (in):	0.250	
Sample Wt. (g)	482.00	489.84	Burette Zero (cm):	100.0	

Moisture (%)	19.3	21.2	Maximum Gradient:	14.3
Wet Density (pcf)	128.0	130.1	Average Gradient:	12.9
Dry Density (pcf)	107.4	107.4	Max. Effect. Stress (psi):	5.0
Saturation (%)	91.4	100.6	Min. Effect. Stress (psi):	3.8
			Ave. Effect. Stress (psi):	4.4

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C°**	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	26	8	2.00		0.0	95	95	96.20		10.80		93.60				
2	2000	7	26	8	20.00	1080	20.0	95	95	96.05	-0.15	13.00	2.20	91.55	2.05	3.5	1.1E-06	1
3	2000	7	26	8	38.00	1080	20.0	95	95	96.05	0.00	15.05	2.05	89.65	1.90	3.8	1.1E-06	1
4	2000	7	26	8	49.00	660	20.0	95	95	96.10	0.05	16.25	1.20	88.60	1.05	6.7	1.0E-06	1
5	2000	7	26	9	15.00	1560	20.0	95	95	96.10	0.00	19.05	2.80	86.10	2.50	5.7	1.1E-06	1
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		
16																		
17																		
18																		
19																		
20																		
21																		
22																		
23																		
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column. 1.1E-06 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW

QA: 7/31

Project Name:	WEYERHAEUSER	Cell #:	2
Project #:	5108.08	USCS Description:	Silty, clayey sand
Sample Name:	PT-2, 1250N, 1051E	USCS Classification:	SC-SM
Visual Descript:	Silty, clayey sand	Average Kv =	cm/sec

	Initial Values	Final Values			
Sample Type:	Undisturbed				
Sample Dia. (in)	2.82	2.82	Permeant:	Water	
Sample Ht. (in)	2.31	2.27	Permeant Specific Gravity:	1.00	
Tare & Wet (g)	227.41	568.40	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)	214.74	486.00	Confining Pressure (psi):	100.0	
Tare (g)	117.77	83.17	Burette Diameter (in):	0.250	
Sample Wt. (g)	461.30	485.23	Burette Zero (cm):	100.0	
Moisture (%)	13.1	20.5	Maximum Gradient:		
Wet Density (pcf)	121.8	130.4	Average Gradient:		
Dry Density (pcf)	107.7	108.2	Max. Effect. Stress (psi):	5.7	
Saturation (%)	62.6	99.2	Min. Effect. Stress (psi):	4.3	
			Ave. Effect. Stress (psi):	5.0	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	20	7	55.00		0.0	95	95	46.30		5.40		96.00				
2	2000	7	20	7	55.50	30	20.0	95	95	46.30	0.00	18.90	13.50	82.50	13.50	0.0	2.7E-04	
3	2000	7	20	7	56.00	30	20.0	95	95	46.30	0.00	27.50	8.60	73.90	8.60	0.0	2.4E-04	
4	2000	7	20	7	56.50	30	20.0	95	95	46.30	0.00	34.10	6.60	67.30	6.60	0.0	2.5E-04	
5	2000	7	20	7	57.00	30	20.0	95	95	46.30	0.00	38.30	4.20	63.10	4.20	0.0	2.2E-04	
6	2000	7	20	7	57.50	30	20.0	95	95	46.30	0.00	41.70	3.40	59.70	3.40	0.0	2.4E-04	
7	2000	7	21	7	41.50		0.0	95	95	49.25		6.50		94.90				
8	2000	7	21	7	42.00	30	21.0	95	95	49.25	0.00	18.50	12.00	82.90	12.00	0.0	2.3E-04	
9	2000	7	21	7	42.50	30	21.0	95	95	49.25	0.00	28.75	10.25	72.65	10.25	0.0	2.8E-04	
10	2000	7	21	7	43.00	30	21.0	95	95	49.25	0.00	35.00	6.25	66.40	6.25	0.0	2.5E-04	
11	2000	7	21	7	43.50	30	21.0	95	95	49.25	0.00	39.75	4.75	61.65	4.75	0.0	2.7E-04	
12	2000	7	21	7	44.00	30	21.0	95	95	49.25	0.00	43.00	3.25	58.40	3.25	0.0	2.6E-04	
13	2000	7	24	7	44.00		0.0	95	95	51.35		4.10		97.30				
14	2000	7	24	7	44.50	30	20.0	95	95	51.35	0.00	16.90	12.80	84.50	12.80	0.0	2.4E-04	
15	2000	7	24	7	45.00	30	20.0	95	95	51.35	0.00	26.50	9.60	74.90	9.60	0.0	2.5E-04	
16	2000	7	24	7	45.50	30	20.0	95	95	51.35	0.00	33.50	7.00	67.90	7.00	0.0	2.6E-04	
17	2000	7	24	7	46.00	30	20.0	95	95	51.35	0.00	38.20	4.70	63.20	4.70	0.0	2.4E-04	
18	2000	7	24	7	46.50	30	20.0	95	95	51.35	0.00	41.60	3.40	59.80	3.40	0.0	2.4E-04	
19	2000	7	25	7	40.00		0.0	95	95	52.40		6.20		98.05				
20	2000	7	25	7	40.50	30	20.0	95	95	52.40	0.00	19.20	13.00	85.05	13.00	0.0	2.5E-04	
21	2000	7	25	7	41.00	30	20.0	95	95	52.40	0.00	28.20	9.00	76.05	9.00	0.0	2.4E-04	
22	2000	7	25	7	41.50	30	20.0	95	95	52.40	0.00	34.50	6.30	69.75	6.30	0.0	2.3E-04	
23	2000	7	25	7	42.00	30	20.0	95	95	52.40	0.00	39.00	4.50	65.25	4.50	0.0	2.2E-04	
24	2000	7	25	7	42.50	30	20.0	95	95	52.40	0.00	42.50	3.50	61.75	3.50	0.0	2.3E-04	
25	2000	7	26	7	43.00		0.0	95	95	53.45		5.10		97.95				
26	2000	7	26	7	43.50	30	20.0	95	95	53.45	0.00	17.80	12.70	85.25	12.70	0.0	2.4E-04	

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

QC: KJW

QA:

Falling Head Permeability Test (ASTM D5084)

Project Name:	WEYERHAEUSER	Cell #:	2
Project #:	5108.08	USCS Description:	Silty, clayey sand
Sample Name:	PT-2, 1250N, 1051E	USCS Classification:	SC-SM
Visual Descript:	Silty, clayey sand		

		Initial Values	Final Values			
Sample Type:	Undisturbed					
Sample Dia. (in)		2.82	2.82	Permeant:	Water	
Sample Ht. (in)		2.31	2.27	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		227.41	568.40	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)		214.74	486.00	Confining Pressure (psi):	100.0	
Tare (g)		117.77	83.17	Burette Diameter (in):	0.250	
Sample Wt. (g)		461.30	485.23	Burette Zero (cm):	100.0	
Moisture (%)		13.1	20.5	Maximum Gradient:	11.7	
Wet Density (pcf)		121.8	130.4	Average Gradient:	6.6	
Dry Density (pcf)		107.7	108.2	Max. Effect. Stress (psi):	5.5	
Saturation (%)		62.6	99.2	Min. Effect. Stress (psi):	4.5	
				Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	26	7	43.50		20.0	95	95	53.45		17.80		85.25				
2	2000	7	26	7	44.00	30	20.0	95	95	53.45	0.00	27.00	9.20	76.05	9.20	0.0	2.4E-04	1
3	2000	7	26	7	44.50	30	20.0	95	95	53.45	0.00	33.75	6.75	69.30	6.75	0.0	2.4E-04	1
4	2000	7	26	7	45.00	30	20.0	95	95	53.45	0.00	38.50	4.75	64.55	4.75	0.0	2.3E-04	1
5	2000	7	26	7	45.50	30	20.0	95	95	53.45	0.00	41.50	3.00	61.55	3.00	0.0	2.0E-04	1
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		
16																		
17																		
18																		
19																		
20																		
21																		
22																		
23																		
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

2.3E-04 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

QC: HJW
QA: [illegible]

Falling Head Permeability Test (ASTM D5084)

Project Name:	WEYERHAEUSER	Cell #:	5
Project #:	5108.08	USCS Description:	Silty, clayey sand
Sample Name:	PT-3, 1053N, 795E	USCS Classification:	SC-SM
Visual Descript:	Silty, clayey sand	Average Kv =	3.7E-05 cm/sec

	Initial Values	Final Values		
Sample Type:	Undisturbed			
Sample Dia. (in)	2.83	2.83	Permeant:	Water
Sample Ht. (in)	2.13	2.13	Permeant Specific Gravity:	1.00
Tare & Wet (g)	226.20	536.40	Sample Specific Gravity:	2.65 Est.
Tare & Dry (g)	213.96	464.60	Confining Pressure (psi):	100.0
Tare (g)	116.12	83.40	Burette Diameter (in):	0.250
Sample Wt. (g)	433.10	453.00	Burette Zero (cm):	100.0
Moisture (%)	12.5	18.8	Maximum Gradient:	15.0
Wet Density (pcf)	123.1	128.8	Average Gradient:	12.9
Dry Density (pcf)	109.5	108.4	Max. Effect. Stress (psi):	5.4
Saturation (%)	64.9	95.0	Min. Effect. Stress (psi):	4.1
			Ave. Effect. Stress (psi):	4.8

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C°**	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	20	7	57.00		0.0	95	95	60.10		13.30		91.60				
2	2000	7	20	7	59.00	120	20.0	95	95	60.10	0.00	20.85	7.55	83.95	7.65	-0.7	3.8E-05	
3	2000	7	20	8	0.00	60	20.0	95	95	60.10	0.00	24.20	3.35	80.70	3.25	1.5	3.9E-05	
4	2000	7	20	8	1.00	60	20.0	95	95	60.10	0.00	26.90	2.70	77.85	2.85	-2.7	3.6E-05	
5	2000	7	20	8	2.00	60	20.0	95	95	60.10	0.00	29.25	2.35	75.45	2.40	-1.1	3.4E-05	
6	2000	7	21	7	51.00		0.0	95	95	62.20		10.10		93.50				
7	2000	7	21	7	52.00	60	21.0	95	95	62.20	0.00	14.50	4.40	88.90	4.60	-2.2	3.9E-05	
8	2000	7	21	7	53.00	60	51.0	95	95	62.20	0.00	18.40	3.90	85.00	3.90	0.0	2.2E-05	
9	2000	7	21	7	54.00	60	21.0	95	95	62.20	0.00	21.90	3.50	81.50	3.50	0.0	3.8E-05	
10	2000	7	21	7	55.00	60	21.0	95	95	62.20	0.00	24.80	2.90	78.50	3.00	-1.7	3.6E-05	
11	2000	7	24	7	55.00		0.0	95	95	65.10		9.75		92.65				
12	2000	7	24	7	56.00	60	20.0	95	95	65.10	0.00	13.50	3.75	88.75	3.90	-2.0	3.4E-05	
13	2000	7	24	7	57.00	60	20.0	95	95	65.10	0.00	16.90	3.40	85.25	3.50	-1.4	3.4E-05	
14	2000	7	24	7	58.00	60	20.0	95	95	65.10	0.00	20.00	3.10	82.20	3.05	0.8	3.3E-05	
15	2000	7	24	7	59.00	60	20.0	95	95	65.10	0.00	23.00	3.00	79.30	2.90	1.7	3.5E-05	
16	2000	7	24	8	0.00	60	20.0	95	95	65.10	0.00	25.25	2.25	76.80	2.50	-5.3	3.1E-05	
17	2000	7	25	7	48.00		0.0	95	95	65.60		5.65		97.20				
18	2000	7	25	7	49.00	60	20.0	95	95	65.60	0.00	9.85	4.20	92.75	4.45	-2.9	3.5E-05	
19	2000	7	25	7	50.00	60	20.0	95	95	65.60	0.00	13.90	4.05	88.70	4.05	0.0	3.6E-05	
20	2000	7	25	7	51.00	60	20.0	95	95	65.60	0.00	17.25	3.35	85.20	3.50	-2.2	3.4E-05	
21	2000	7	25	7	52.00	60	20.0	95	95	65.60	0.00	20.25	3.00	82.20	3.00	0.0	3.3E-05	
22	2000	7	26	7	50.00		0.0	95	95	66.90		5.45		96.95				
23	2000	7	26	7	51.00	60	20.0	95	95	66.95	0.05	10.40	4.95	91.65	5.30	-3.4	4.2E-05	
24	2000	7	26	7	52.00	60	20.0	95	95	66.95	0.00	14.40	4.00	87.50	4.15	-1.8	3.7E-05	1
25	2000	7	26	7	53.00	60	20.0	95	95	66.95	0.00	18.00	3.60	83.90	3.60	0.0	3.6E-05	1
26	2000	7	26	7	54.00	60	20.0	95	95	66.95	0.00	21.40	3.40	80.65	3.25	2.3	3.7E-05	1
																	3.7E-05	cm/sec

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HLW

QA: JDH

Project Name:	WEYERHAEUSER	Cell #:	6
Project #:	5108.08	USCS Description:	Sandy silty clay
Sample Name:	PT-4, 1050N, 1050E	USCS Classification:	CL-ML
Visual Descript:	Sandy silty clay	Average Kv =	3.4E-07 cm/sec

Sample Type:	Undisturbed	Initial Values	Final Values			
Sample Dia. (in)		2.84	2.84	Permeant:	Water	
Sample Ht. (in)		2.31	2.31	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		221.76	589.40	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)		205.95	508.80	Confining Pressure (psi):	100.0	
Tare (g)		118.81	83.50	Burette Diameter (in):	0.250	
Sample Wt. (g)		497.60	505.90	Burette Zero (cm):	100.0	
Moisture (%)		18.1	19.0	Maximum Gradient:	15.0	
Wet Density (pcf)		129.5	131.7	Average Gradient:	13.4	
Dry Density (pcf)		109.7	110.7	Max. Effect. Stress (psi):	5.6	
Saturation (%)		91.3	98.1	Min. Effect. Stress (psi):	4.2	
				Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	20	7	58.00		0.0	95	95	52.95		3.45		96.90				
2	2000	7	20	8	3.00	300	20.0	95	95	53.01	0.06	4.10	0.65	96.30	0.60	4.0	1.0E-06	
3	2000	7	20	8	18.00	900	20.0	95	95	52.80	-0.21	5.80	1.70	94.60	1.70	0.0	9.5E-07	
4	2000	7	20	8	37.00	1140	20.0	95	95	52.70	-0.10	7.80	2.00	92.70	1.90	2.6	9.0E-07	
5	2000	7	20	8	49.00	720	20.0	95	95	52.80	0.10	9.05	1.25	91.55	1.15	4.2	9.1E-07	
6	2000	7	20	10	33.00	6240	20.0	95	95	52.90	0.10	17.90	8.85	82.95	8.60	1.4	8.7E-07	
7	2000	7	20	13	3.00	9000	21.0	95	95	53.75	0.85	27.25	9.35	74.10	8.85	2.7	8.1E-07	
8	2000	7	20	16	35.00	12720	21.0	95	95	54.50	0.75	35.80	8.55	66.00	8.10	2.7	7.7E-07	
9	2000	7	21	8	0.00		0.0	95	95	55.00		7.05		96.95				
10	2000	7	21	8	6.00	360	21.0	95	95	55.45	0.45	7.50	0.45	96.45	0.50	-5.3	6.5E-07	
11	2000	7	21	8	11.00	300	21.0	95	95	55.45	0.00	8.15	0.65	95.85	0.60	4.0	1.0E-06	
12	2000	7	21	8	16.00	300	21.0	95	95	55.45	0.00	8.60	0.45	95.35	0.50	-5.3	8.1E-07	
13	2000	7	21	8	21.00	300	21.0	95	95	55.45	0.00	9.10	0.50	94.85	0.50	0.0	8.6E-07	
14	2000	7	21	8	30.00	540	21.0	95	95	55.35	-0.10	9.95	0.85	94.05	0.80	3.0	8.0E-07	
15	2000	7	24	8	2.00		0.0	95	95	59.50		6.15		96.70				
16	2000	7	24	8	7.00	300	20.0	95	95	59.50	0.00	6.50	0.35	96.25	0.45	-12.5	6.7E-07	
17	2000	7	24	8	30.00	1380	20.0	95	95	59.30	-0.20	7.95	1.45	94.80	1.45	0.0	5.4E-07	
18	2000	7	24	8	46.00	960	20.0	95	95	59.30	0.00	9.00	1.05	93.80	1.00	2.4	5.7E-07	
19	2000	7	24	9	2.00	960	20.0	95	95	59.40	0.10	9.90	0.90	92.90	0.90	0.0	5.1E-07	
20	2000	7	24	9	16.00	840	20.0	95	95	59.40	0.00	10.75	0.85	92.15	0.75	6.2	5.3E-07	
21	2000	7	25	7	55.00		0.0	95	95	60.50		6.40		97.45				
22	2000	7	25	8	28.00	1980	20.0	95	95	60.45	-0.05	7.85	1.45	95.95	1.50	-1.7	3.8E-07	
23	2000	7	25	8	57.00	1740	20.0	95	95	60.45	0.00	9.05	1.20	94.85	1.10	4.3	3.5E-07	1
24	2000	7	25	9	26.00	1740	20.0	95	95	60.25	-0.20	10.15	1.10	93.60	1.25	-6.4	3.6E-07	1
25	2000	7	25	10	24.00	3480	20.0	95	95	60.30	0.05	12.40	2.25	91.70	1.90	8.4	3.3E-07	1
26	2000	7	25	12	54.00	9000	20.0	95	95	60.55	0.25	17.35	4.95	86.90	4.80	1.5	3.3E-07	1

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column. 3.4E-07 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW

QA: [illegible]

Project Name:	WEYERHAEUSER	Cell #:	18
Project #:	5108.08	USCS Description:	Clayey sand
Sample Name:	PT-5, 905N, 750E	USCS Classification:	SC
Visual Descript:	Clayey sand	Average Kv =	2.9E-08 cm/sec

Sample Type: Undisturbed	Initial Values	Final Values			
Sample Dia. (in)	2.84	2.84	Permeant:	Water	
Sample Ht. (in)	2.28	2.28	Permeant Specific Gravity:	1.00	
Tare & Wet (g)	461.70	549.70	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)	363.93	450.50	Confining Pressure (psi):	100.0	
Tare (g)	0.00	86.57	Burette Diameter (in):	0.250	
Sample Wt. (g)	461.70	463.13	Burette Zero (cm):	100.0	
Moisture (%)	26.9	27.3	Maximum Gradient:	7.8	
Wet Density (pcf)	121.8	122.2	Average Gradient:	7.1	
Dry Density (pcf)	96.0	96.0	Max. Effect. Stress (psi):	5.7	
Saturation (%)	96.1	97.5	Min. Effect. Stress (psi):	4.5	
			Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	21	8	2.00		0.0	95	95	44.40		7.40		96.80				
2	2000	7	21	8	7.00	300	20.0	95	95	44.50	0.10	7.50	0.10	96.20	0.60	-71.4	5.9E-07	
3	2000	7	21	8	33.00	1560	20.0	95	95	44.50	0.00	7.70	0.20	96.00	0.20	0.0	6.5E-08	
4	2000	7	21	8	53.00	1200	20.0	95	95	44.50	0.00	7.80	0.10	95.80	0.20	-33.3	6.4E-08	
5	2000	7	21	9	47.00	3240	20.0	95	95	44.60	0.10	7.90	0.10	95.55	0.25	-42.9	2.8E-08	
6	2000	7	21	12	53.00	11160	21.0	95	95	46.00	1.40	8.80	0.90	94.80	0.75	9.1	3.7E-08	
7	2000	7	21	16	14.00	12060	21.0	95	95	46.65	0.65	9.75	0.95	94.05	0.75	11.8	3.6E-08	
8	2000	7	24	7	53.00	229140	20.0	95	95	54.80	8.15	22.65	12.90	82.40	11.65	5.1	3.4E-08	
9	2000	7	24	10	27.00	9240	21.0	95	95	55.55	0.75	23.05	0.40	82.10	0.30	14.3	2.8E-08	
10	2000	7	24	12	51.00	8640	20.0	95	95	55.20	-0.35	23.35	0.30	81.70	0.40	-14.3	3.1E-08	
11	2000	7	24	16	25.00	12840	21.0	95	95	56.00	0.80	23.95	0.60	81.25	0.45	14.3	3.1E-08	
12	2000	7	25	7	57.00	55920	20.0	95	95	56.50	0.50	26.15	2.20	79.20	2.05	3.5	3.1E-08	
13	2000	7	25	10	31.00	9240	20.0	95	95	56.55	0.05	26.50	0.35	78.90	0.30	7.7	3.0E-08	
14	2000	7	25	13	5.00	9240	20.0	95	95	57.00	0.45	26.80	0.30	78.60	0.30	0.0	2.8E-08	
15	2000	7	25	16	20.00	11700	20.0	95	95	57.50	0.50	27.30	0.50	78.20	0.40	11.1	3.4E-08	
16	2000	7	26	8	54.00	59640	20.0	95	95	58.50	1.00	29.30	2.00	76.50	1.70	8.1	2.8E-08	
17	2000	7	26	10	37.00	6180	20.0	95	95	58.50	0.00	29.60	0.30	76.20	0.30	0.0	4.6E-08	
18	2000	7	26	13	23.00	9960	21.0	95	95	57.05	-1.45	29.95	0.35	75.95	0.25	16.7	2.8E-08	
19	2000	7	26	14	52.00	5340	21.0	95	95	59.40	2.35	30.15	0.20	75.80	0.15	14.3	3.1E-08	
20	2000	7	26	15	51.00	3540	21.0	95	95	59.50	0.10	30.25	0.10	75.70	0.10	0.0	2.7E-08	
21	2000	7	27	7	43.00	57120	20.0	95	95	59.85	0.35	32.00	1.75	74.15	1.55	6.1	3.0E-08	1
22	2000	7	27	13	8.00	19500	21.0	95	95	60.45	0.60	32.60	0.60	73.65	0.50	9.1	3.0E-08	1
23	2000	7	27	15	26.00	8280	21.0	95	95	60.55	0.10	32.85	0.25	73.50	0.15	25.0	2.6E-08	1
24	2000	7	28	8	1.00	59700	20.0	95	95	61.20	0.65	34.45	1.60	72.05	1.45	4.9	2.9E-08	1
25																		
26																		

**A zero in this column starts a series of measurements.

(Termination determined by stable Kv and low flow differential.)

*Average Kv for those rows with a 1 in the Ave. column. 2.9E-08 cm/sec

***Kv adjusted for temperature.

RMT, Inc.

QC: HW

QA: JBT

Falling Head Permeability Test (ASTM D5084)

Project Name:	WEYERHAEUSER	Cell #:	19
Project #:	5108.08	USCS Description:	Silty sand
Sample Name:	PT-6, 895N, 1009E	USCS Classification:	SM
Visual Descript:	Silty sand	Average Kv =	7.1E-05 cm/sec

		Initial Values	Final Values			
Sample Type:	Undisturbed			Permeant:	Water	
Sample Dia. (in)		2.84	2.84	Permeant Specific Gravity:	1.00	
Sample Ht. (in)		2.31	2.30	Sample Specific Gravity:	2.65	Est.
Tare & Wet (g)		266.22	569.35	Confining Pressure (psi):	100.0	
Tare & Dry (g)		247.92	485.50	Burette Diameter (in):	0.250	
Tare (g)		117.82	86.86	Burette Zero (cm):	70.0	
Sample Wt. (g)		461.50	482.49			
Moisture (%)		14.1	21.0	Maximum Gradient:	8.0	
Wet Density (pcf)		120.1	126.2	Average Gradient:	6.7	
Dry Density (pcf)		105.3	104.2	Max. Effect. Stress (psi):	5.6	
Saturation (%)		65.4	95.0	Min. Effect. Stress (psi):	4.3	
				Ave. Effect. Stress (psi):	5.0	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	21	8	17.00		0.0	95	95	51.10		5.10		66.60				
2	2000	7	21	8	17.50	30	21.0	95	95	51.10	0.00	8.76	3.66	62.94	3.66	0.0	9.3E-05	
3	2000	7	21	8	18.00	30	21.0	95	95	51.10	0.00	11.70	2.94	60.00	2.94	0.0	8.5E-05	
4	2000	7	21	8	18.50	30	21.0	95	95	51.10	0.00	14.50	2.80	57.20	2.80	0.0	9.1E-05	
5	2000	7	21	8	19.00	30	21.0	95	95	51.10	0.00	17.00	2.50	54.70	2.50	0.0	9.2E-05	
6	2000	7	21	8	19.50	30	21.0	95	95	51.10	0.00	19.10	2.10	52.60	2.10	0.0	8.7E-05	
7	2000	7	24	8	0.00		0.0	95	95	23.30		3.20		67.50				
8	2000	7	24	8	0.50	30	21.0	95	95	23.30	0.00	6.90	3.70	63.80	3.70	0.0	9.0E-05	
9	2000	7	24	8	1.00	30	21.0	95	95	23.30	0.00	10.20	3.30	60.50	3.30	0.0	9.1E-05	
10	2000	7	24	8	1.50	30	21.0	95	95	23.30	0.00	13.00	2.80	57.70	2.80	0.0	8.7E-05	
11	2000	7	24	8	2.00	30	21.0	95	95	23.30	0.00	15.60	2.60	55.10	2.60	0.0	9.1E-05	
12	2000	7	24	8	2.50	30	21.0	95	95	23.30	0.00	17.80	2.20	52.90	2.20	0.0	8.7E-05	
13	2000	7	25	7	50.00		0.0	95	95	31.10		4.40		68.00				
14	2000	7	25	7	50.50	30	21.0	95	95	31.10	0.00	7.50	3.10	64.90	3.10	0.0	7.6E-05	
15	2000	7	25	7	51.00	30	21.0	95	95	31.10	0.00	10.10	2.60	62.30	2.60	0.0	7.0E-05	
16	2000	7	25	7	51.50	30	21.0	95	95	31.10	0.00	12.50	2.40	59.90	2.40	0.0	7.1E-05	
17	2000	7	25	7	52.00	30	21.0	95	95	31.10	0.00	14.70	2.20	57.70	2.20	0.0	7.2E-05	
18	2000	7	25	7	52.50	30	21.0	95	95	31.10	0.00	16.60	1.90	55.80	1.90	0.0	6.8E-05	
19	2000	7	26	7	43.00		0.0	95	95	39.00		4.45		67.70				
20	2000	7	26	7	43.50	30	21.0	95	95	39.00	0.00	7.50	3.05	64.65	3.05	0.0	7.5E-05	
21	2000	7	26	7	44.00	30	21.0	95	95	39.00	0.00	10.20	2.70	61.95	2.70	0.0	7.3E-05	
22	2000	7	26	7	44.50	30	21.0	95	95	39.00	0.00	12.60	2.40	59.55	2.40	0.0	7.2E-05	
23	2000	7	26	7	45.00	30	21.0	95	95	39.00	0.00	14.80	2.20	57.35	2.20	0.0	7.2E-05	1
24	2000	7	26	7	45.50	30	21.0	95	95	39.00	0.00	16.80	2.00	55.35	2.00	0.0	7.3E-05	1
25	2000	7	26	7	46.00	30	21.0	95	95	39.00	0.00	18.60	1.80	53.55	1.80	0.0	7.2E-05	1
26	2000	7	26	7	46.50	30	21.0	95	95	39.00	0.00	20.10	1.50	52.05	1.50	0.0	6.6E-05	1

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column. 7.1E-05 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: MJW

QA: JDH

Project Name:	WEYERHAEUSER	Cell #:	20
Project #:	5108.08	USCS Description:	Silty sand
Sample Name:	PT-7, 750N, 755E	USCS Classification:	SM
Visual Descript:	Silty sand	Average Kv =	8.0E-05 cm/sec

Sample Type:	Undisturbed	Initial Values	Final Values			
Sample Dia. (in)		2.80	2.80	Permeant:	Water	
Sample Ht. (in)		2.30	2.30	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		239.05	567.00	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)		227.02	485.30	Confining Pressure (psi):	100.0	
Tare (g)		117.77	84.18	Burette Diameter (in):	0.250	
Sample Wt. (g)		452.00	482.82	Burette Zero (cm):	70.0	
Moisture (%)		11.0	20.4	Maximum Gradient:	7.7	
Wet Density (pcf)		121.6	129.9	Average Gradient:	6.3	
Dry Density (pcf)		109.5	107.9	Max. Effect. Stress (psi):	45.2	
Saturation (%)		55.2	97.9	Min. Effect. Stress (psi):	4.3	
				Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	21	8	21.00		0.0	95	55	50.10		3.10		66.40				
2	2000	7	21	8	21.50	30	20.0	95	95	50.10	0.00	6.50	3.40	63.00	3.40	0.0	3.1E-03	
3	2000	7	21	8	22.00	30	20.0	95	95	50.10	0.00	9.60	3.10	59.90	3.10	0.0	9.0E-05	
4	2000	7	21	8	22.50	30	20.0	95	95	50.10	0.00	12.20	2.60	57.30	2.60	0.0	8.5E-05	
5	2000	7	21	8	23.00	30	20.0	95	95	50.10	0.00	14.60	2.40	54.90	2.40	0.0	8.7E-05	
6	2000	7	21	8	23.50	30	20.0	95	95	50.10	0.00	16.70	2.10	52.80	2.10	0.0	8.5E-05	
7	2000	7	24	8	6.00		0.0	95	95	13.50		6.90		67.50				
8	2000	7	24	8	6.50	30	21.0	95	95	13.50	0.00	10.00	3.10	64.40	3.10	0.0	8.2E-05	
9	2000	7	24	8	7.00	30	21.0	95	95	13.50	0.00	12.60	2.60	61.80	2.60	0.0	7.6E-05	
10	2000	7	24	8	7.50	30	21.0	95	95	13.50	0.00	15.10	2.50	59.30	2.50	0.0	8.1E-05	
11	2000	7	24	8	8.00	30	21.0	95	95	13.50	0.00	17.20	2.10	57.20	2.10	0.0	7.6E-05	
12	2000	7	24	8	8.50	30	21.0	95	95	13.50	0.00	19.10	1.90	55.30	1.90	0.0	7.6E-05	
13	2000	7	25	7	54.00		0.0	95	95	19.00		3.70		67.50				
14	2000	7	25	7	54.50	30	21.0	95	95	19.00	0.00	6.90	3.20	64.30	3.20	0.0	8.0E-05	
15	2000	7	25	7	55.00	30	21.0	95	95	19.00	0.00	9.70	2.80	61.50	2.80	0.0	7.8E-05	
16	2000	7	25	7	55.50	30	21.0	95	95	19.00	0.00	12.20	2.50	59.00	2.50	0.0	7.7E-05	
17	2000	7	25	7	56.00	30	21.0	95	95	19.00	0.00	14.60	2.40	56.60	2.40	0.0	8.2E-05	
18	2000	7	25	7	56.50	30	21.0	95	95	19.00	0.00	16.70	2.10	54.50	2.10	0.0	8.0E-05	
19	2000	7	26	7	48.00		0.0	95	95	23.20		5.90		67.20				
20	2000	7	26	7	48.50	30	21.0	95	95	23.20	0.00	8.90	3.00	64.20	3.00	0.0	7.8E-05	
21	2000	7	26	7	49.00	30	21.0	95	95	23.20	0.00	11.70	2.80	61.40	2.80	0.0	8.1E-05	
22	2000	7	26	7	49.50	30	21.0	95	95	23.20	0.00	14.10	2.40	59.00	2.40	0.0	7.7E-05	
23	2000	7	26	7	50.00	30	21.0	95	95	23.20	0.00	16.30	2.20	56.80	2.20	0.0	7.8E-05	1
24	2000	7	26	7	50.50	30	21.0	95	95	23.20	0.00	18.40	2.10	54.70	2.10	0.0	8.3E-05	1
25	2000	7	26	7	51.00	30	21.0	95	95	23.20	0.00	20.20	1.80	52.90	1.80	0.0	7.9E-05	1
26	2000	7	26	7	51.50	30	21.0	95	95	23.20	0.00	21.80	1.60	51.30	1.60	0.0	7.8E-05	1

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column. 8.0E-05 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW
QA: JSH

Project Name:	WEYERHAUSER	Cell #:	21
Project #:	5108.08	USCS Description:	Silty sand
Sample Name:	PT-8, 700N, 1000E	USCS Classification:	SM
Visual Descript:	Silty sand	Average Kv =	3.9E-04 cm/sec

		Initial Values	Final Values			
Sample Type:	Undisturbed					
Sample Dia. (in)		2.83	2.83	Permeant:	Water	
Sample Ht. (in)		2.31	2.31	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		432.10	746.30	Sample Specific Gravity:	2.65	Est.
Tare & Dry (g)		384.34	656.50	Confining Pressure (psi):	100.0	
Tare (g)		0.00	272.16	Burette Diameter (in):	0.250	
Sample Wt. (g)		432.10	474.14	Burette Zero (cm):	70.0	
Moisture (%)		12.4	23.4	Maximum Gradient:	10.6	
Wet Density (pcf)		113.3	124.3	Average Gradient:	5.9	
Dry Density (pcf)		100.8	100.8	Max. Effect. Stress (psi):	5.5	
Saturation (%)		51.4	96.6	Min. Effect. Stress (psi):	4.5	
				Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	21	8	30.00		0.0	95	95	29.50		4.10		67.20				
2	2000	7	21	8	30.25	15	21.0	95	95	29.50	0.00	11.40	7.30	59.90	7.30	0.0	3.9E-04	
3	2000	7	21	8	30.50	15	21.0	95	95	29.50	0.00	17.00	5.60	54.30	5.60	0.0	3.9E-04	
4	2000	7	21	8	30.75	15	21.0	95	95	29.50	0.00	21.50	4.50	49.80	4.50	0.0	4.1E-04	
5	2000	7	21	8	31.00	15	21.0	95	95	29.50	0.00	24.80	3.30	46.50	3.30	0.0	4.0E-04	
6	2000	7	21	8	31.25	15	21.0	95	95	29.50	0.00	27.40	2.60	43.90	2.60	0.0	4.1E-04	
7	2000	7	21	9	36.00		0.0	95	95	41.00		4.90		66.80				
8	2000	7	21	9	36.25	15	21.0	95	95	41.00	0.00	11.90	7.00	59.80	7.00	0.0	3.8E-04	
9	2000	7	21	9	36.50	15	21.0	95	95	41.00	0.00	17.50	5.60	54.20	5.60	0.0	4.0E-04	
10	2000	7	21	9	36.75	15	21.0	95	95	41.00	0.00	21.70	4.20	50.00	4.20	0.0	3.9E-04	
11	2000	7	21	9	37.00	15	21.0	95	95	41.00	0.00	25.10	3.40	46.60	3.40	0.0	4.1E-04	
12	2000	7	21	9	37.25	15	21.0	95	95	41.00	0.00	27.50	2.40	44.20	2.40	0.0	3.8E-04	
13	2000	7	21	9	40.00		0.0	95	95	41.90		5.40		67.40				
14	2000	7	21	9	40.25	15	21.0	95	95	41.90	0.00	12.30	6.90	60.50	6.90	0.0	3.8E-04	1
15	2000	7	21	9	40.50	15	21.0	95	95	41.90	0.00	18.00	5.70	54.80	5.70	0.0	4.0E-04	1
16	2000	7	21	9	40.75	15	21.0	95	95	41.90	0.00	22.20	4.20	50.60	4.20	0.0	3.9E-04	1
17	2000	7	21	9	41.00	15	21.0	95	95	41.90	0.00	25.40	3.20	47.40	3.20	0.0	3.8E-04	1
18	2000	7	21	9	41.25	15	21.0	95	95	41.90	0.00	27.90	2.50	44.90	2.50	0.0	3.8E-04	1
19																		
20																		
21																		
22																		
23																		
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

3.9E-04 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW

QA: JPH

Project Name:	WEYERHAEUSER	Cell #:	23
Project #:	5108.08	USCS Description:	Silty, clayey sand
Sample Name:	PT-9, 1460N, 900E	USCS Classification:	SC - SM
Visual Descript:	Silty, clayey sand	Average Kv =	9.9E-06 cm/sec

		Initial Values	Final Values			
Sample Type:	Undisturbed					
Sample Dia. (in)		2.83	2.83	Permeant:	Water	
Sample Ht. (in)		2.11	2.11	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		639.80	524.95	Sample Specific Gravity:	2.65	Est.
Tare & Dry (g)		586.80	449.00	Confining Pressure (psi):	100.0	
Tare (g)		266.69	84.78	Burette Diameter (in):	0.250	
Sample Wt. (g)		429.60	440.17	Burette Zero (cm):	70.0	
Moisture (%)		16.6	20.9	Maximum Gradient:	11.6	
Wet Density (pcf)		123.3	126.3	Average Gradient:	9.3	
Dry Density (pcf)		105.8	104.5	Max. Effect. Stress (psi):	5.7	
Saturation (%)		77.9	95.0	Min. Effect. Stress (psi):	4.5	
				Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	25	7	38.00		0.0	95	95	49.30		11.85		67.00				
2	2000	7	25	7	41.00	180	21.0	95	95	49.30	0.00	14.40	2.55	64.40	2.60	-1.0	1.1E-05	
3	2000	7	25	7	43.00	120	21.0	95	95	49.30	0.00	16.00	1.60	62.90	1.50	3.2	1.1E-05	
4	2000	7	25	7	45.00	120	21.0	95	95	49.30	0.00	17.30	1.30	61.60	1.30	0.0	9.7E-06	
5	2000	7	25	7	47.00	120	21.0	95	95	49.30	0.00	18.60	1.30	60.40	1.20	4.0	9.9E-06	
6	2000	7	25	7	49.00	120	21.0	95	95	49.30	0.00	19.70	1.10	59.20	1.20	-4.3	9.6E-06	
7	2000	7	26	9	44.00		0.0	95	95	40.20		4.90		67.20				
8	2000	7	26	9	46.00	120	21.0	95	95	40.20	0.00	6.85	1.95	64.90	2.30	-8.2	1.2E-05	
9	2000	7	26	9	50.00	240	21.0	95	95	41.30	1.10	9.80	2.95	61.85	3.05	-1.7	9.3E-06	
10	2000	7	26	9	57.00	420	21.0	95	95	41.80	0.50	14.80	5.00	56.80	5.05	-0.5	1.0E-05	
11	2000	7	26	10	6.00	540	21.0	95	95	42.80	1.00	18.70	3.90	52.90	3.90	0.0	7.8E-06	
12	2000	7	26	10	12.00	360	21.0	95	95	42.70	-0.10	21.15	2.45	50.50	2.40	1.0	8.7E-06	
13	2000	7	27	7	40.00		0.0	95	95	18.80		6.90		68.70				
14	2000	7	27	7	43.00	180	21.0	95	95	19.10	0.30	9.10	2.20	65.50	3.20	-18.5	1.0E-05	
15	2000	7	27	7	45.00	120	21.0	95	95	19.10	0.00	10.40	1.30	64.15	1.35	-1.9	8.2E-06	
16	2000	7	27	7	47.00	120	21.0	95	95	19.10	0.00	11.60	1.20	62.95	1.20	0.0	7.8E-06	
17	2000	7	27	7	49.00	120	21.0	95	95	19.10	0.00	12.75	1.15	61.80	1.15	0.0	7.8E-06	
18	2000	7	28	8	4.00		0.0	95	95	41.70		5.50		67.90				
19	2000	7	28	8	6.00	120	21.0	95	95	41.60	-0.10	6.95	1.45	66.00	1.90	-13.4	9.4E-06	1
20	2000	7	28	8	10.00	240	21.0	95	95	41.60	0.00	9.60	2.65	63.30	2.70	-0.9	8.1E-06	1
21	2000	7	28	8	18.00	480	21.0	95	95	41.60	0.00	14.00	4.40	58.80	4.50	-1.1	7.7E-06	1
22	2000	7	28	8	21.00	180	21.0	95	95	41.60	0.00	15.40	1.40	54.40	4.40	-51.7	1.6E-05	1
23	2000	7	28	8	23.00	120	21.0	95	95	41.60	0.00	16.40	1.00	53.50	0.90	5.3	8.5E-06	1
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

9.9E-06 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW
QA: JPA

Project Name:	WEYERHAEUSER	Cell #:	9
Project #:	5108.08	USCS Description:	Silty sand
Sample Name:	PT-10, 670N, 900E	USCS Classification:	SM
Visual Descript:	Silty sand	Average Kv =	6.2E-05 cm/sec

Sample Type:	Undisturbed	Initial Values	Final Values		
Sample Dia. (in)		2.84	2.84	Permeant:	Water
Sample Ht. (in)		2.31	2.30	Permeant Specific Gravity:	1.00
Tare & Wet (g)		715.40	588.50	Sample Specific Gravity:	2.70 Est.
Tare & Dry (g)		663.40	507.80	Confining Pressure (psi):	100.0
Tare (g)		285.74	84.01	Burette Diameter (in):	0.250
Sample Wt. (g)		483.90	504.49	Burette Zero (cm):	100.0
Moisture (%)		13.8	19.0	Maximum Gradient:	15.3
Wet Density (pcf)		126.0	131.9	Average Gradient:	11.2
Dry Density (pcf)		110.7	110.8	Max. Effect. Stress (psi):	5.5
Saturation (%)		71.3	98.8	Min. Effect. Stress (psi):	4.2
				Ave. Effect. Stress (psi):	4.8

	Date			Time		Run	Temp	Pressure (psi)			Cham.	Bot.		Top		Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	3	7	58.00		0.0	95	95	58.15		11.50		92.80				
2	2000	8	3	7	59.00	60	20.0	95	95	58.20	0.05	18.90	7.40	85.25	7.55	-1.0	7.7E-05	
3	2000	8	3	8	0.00	60	20.0	95	95	58.20	0.00	24.90	6.00	79.00	6.25	-2.0	7.7E-05	
4	2000	8	3	8	1.00	60	20.0	95	95	58.20	0.00	30.00	5.10	74.10	4.90	2.0	7.7E-05	
5	2000	8	3	8	2.00	60	20.0	95	95	58.20	0.00	33.85	3.85	70.00	4.10	-3.1	7.5E-05	
6	2000	8	4	7	39.00		0.0	95	95	61.35		15.20		89.30				
7	2000	8	4	7	40.00	60	20.0	95	95	61.35	0.00	21.40	6.20	83.25	6.05	1.2	6.8E-05	
8	2000	8	4	7	41.00	60	20.0	95	95	61.35	0.00	26.75	5.35	77.60	5.65	-2.7	7.4E-05	
9	2000	8	4	7	42.00	60	20.0	95	95	61.35	0.00	31.20	4.45	73.20	4.40	0.6	7.2E-05	
10	2000	8	4	7	43.00	60	20.0	95	95	61.35	0.00	34.70	3.50	69.80	3.40	1.4	6.8E-05	
11	2000	8	7	7	41.00		0.0	95	95	66.10		8.70		98.00				
12	2000	8	7	7	42.00	60	20.0	95	95	66.10	0.00	15.50	6.80	90.80	7.20	-2.9	6.4E-05	
13	2000	8	7	7	43.00	60	20.0	95	95	66.10	0.00	21.30	5.80	85.00	5.80	0.0	6.3E-05	
14	2000	8	7	7	44.00	60	20.0	95	95	66.10	0.00	26.20	4.90	80.10	4.90	0.0	6.3E-05	
15	2000	8	7	7	45.00	60	20.0	95	95	66.10	0.00	30.30	4.10	75.90	4.20	-1.2	6.3E-05	
16	2000	8	8	7	40.00		0.0	95	95	67.55		9.50		101.10				
17	2000	8	8	7	41.00	60	20.0	95	95	67.55	0.00	16.30	6.80	93.80	7.30	-3.5	6.3E-05	
18	2000	8	8	7	42.00	60	20.0	95	95	67.55	0.00	22.40	6.10	87.75	6.05	0.4	6.4E-05	
19	2000	8	8	7	43.00	60	20.0	95	95	67.55	0.00	27.20	4.80	82.80	4.95	-1.5	6.1E-05	
20	2000	8	8	7	44.00	60	20.0	95	95	67.55	0.00	31.30	4.10	78.50	4.30	-2.4	6.2E-05	
21	2000	8	8	7	45.00	60	20.0	95	95	67.55	0.00	34.90	3.60	75.00	3.50	1.4	6.1E-05	
22	2000	8	9	7	41.00		0.0	95	95	68.50		9.20		98.50				
23	2000	8	9	7	42.00	60	20.0	95	95	68.50	0.00	15.90	6.70	91.60	6.90	-1.5	6.2E-05	1
24	2000	8	9	7	43.00	60	20.0	95	95	68.55	0.05	21.80	5.90	85.80	5.80	0.9	6.3E-05	1
25	2000	8	9	7	44.00	60	20.0	95	95	68.60	0.05	26.50	4.70	80.90	4.90	-2.1	6.1E-05	1
26	2000	8	9	7	45.00	60	20.0	95	95	68.60	0.00	30.60	4.10	76.80	4.10	0.0	6.2E-05	1

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

6.2E-05 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

QC: HJW

QA: SKH

Falling Head Permeability Test (ASTM D5084)

Project Name:	WEYERHAEUSER	Cell #:	10
Project #:	5108.08	USCS Description:	Silty, clayey sand
Sample Name:	PT-11, 800N, 705E	USCS Classification:	SC-SM
Visual Descript:	Silty, clayey sand	Average Kv =	2.8E-06 cm/sec

Sample Type: Undisturbed	Initial Values	Final Values		
Sample Dia. (in)	2.85	2.85	Permeant:	Water
Sample Ht. (in)	2.29	2.28	Permeant Specific Gravity:	1.00
Tare & Wet (g)	756.70	586.30	Sample Specific Gravity:	2.70 Est.
Tare & Dry (g)	687.70	505.30	Confining Pressure (psi):	100.0
Tare (g)	288.02	82.75	Burette Diameter (in):	0.250
Sample Wt. (g)	497.50	503.55	Burette Zero (cm):	100.0
Moisture (%)	17.3	19.2	Maximum Gradient:	15.7
Wet Density (pcf)	129.7	131.9	Average Gradient:	13.9
Dry Density (pcf)	110.6	110.7	Max. Effect. Stress (psi):	5.6
Saturation (%)	89.2	99.1	Min. Effect. Stress (psi):	4.2
			Ave. Effect. Stress (psi):	4.9

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	3	8	3.00		0.0	95	95	50.80		7.95		94.20				
2	2000	8	3	8	16.00	780	20.0	95	95	50.70	-0.10	12.80	4.85	89.05	5.15	-3.0	3.5E-06	
3	2000	8	3	8	24.00	480	20.0	95	95	50.70	0.00	15.50	2.70	86.20	2.85	-2.7	3.5E-06	
4	2000	8	3	8	39.00	900	20.0	95	95	50.60	-0.10	19.95	4.45	81.50	4.70	-2.7	3.4E-06	
5	2000	8	3	8	50.00	660	20.0	95	95	50.60	0.00	22.90	2.95	78.40	3.10	-2.5	3.5E-06	
6	2000	8	4	7	45.00		0.0	95	95	55.90		4.70		96.65				
7	2000	8	4	7	49.00	240	20.0	95	95	55.75	-0.15	6.80	2.10	94.25	2.40	-6.7	4.7E-06	
8	2000	8	4	7	55.00	360	20.0	95	95	55.70	-0.05	10.00	3.20	90.85	3.40	-3.0	4.9E-06	
9	2000	8	4	8	0.00	300	20.0	95	95	55.70	0.00	12.45	2.45	88.20	2.65	-3.9	4.8E-06	
10	2000	8	4	8	5.00	300	20.0	95	95	55.65	-0.05	14.35	1.90	86.15	2.05	-3.8	4.0E-06	
11	2000	8	7	7	47.00		0.0	95	95	63.00		9.55		95.00				
12	2000	8	7	7	52.00	300	20.0	95	95	63.05	0.05	11.60	2.05	92.50	2.50	-9.9	4.1E-06	
13	2000	8	7	8	9.00	1020	20.0	95	95	62.90	-0.15	17.45	5.85	86.25	6.25	-3.3	3.5E-06	
14	2000	8	7	8	31.00	1320	20.0	95	95	62.80	-0.10	24.25	6.80	79.05	7.20	-2.9	3.8E-06	
15	2000	8	7	8	36.00	300	20.0	95	95	62.85	0.05	25.55	1.30	77.55	1.50	-7.1	3.9E-06	
16	2000	8	8	7	46.00		0.0	95	95	64.70		7.15		97.25				
17	2000	8	8	8	2.00	960	20.0	95	95	64.65	-0.05	12.90	5.75	91.10	6.15	-3.4	3.3E-06	
18	2000	8	8	8	11.00	540	20.0	95	95	64.60	-0.05	15.80	2.90	87.90	3.20	-4.9	3.4E-06	
19	2000	8	8	8	16.00	300	20.0	95	95	64.60	0.00	17.30	1.50	86.40	1.50	0.0	3.2E-06	
20	2000	8	8	8	23.00	420	20.0	95	95	64.55	-0.05	19.05	1.75	84.45	1.95	-5.4	2.9E-06	
21	2000	8	9	7	47.00		0.0	95	95	66.50		7.05		97.90				
22	2000	8	9	7	53.00	360	20.0	95	95	66.40	-0.10	8.90	1.85	95.75	2.15	-7.5	2.8E-06	1
23	2000	8	9	8	4.00	660	20.0	95	95	66.15	-0.25	12.20	3.30	92.15	3.60	-4.3	2.8E-06	1
24	2000	8	9	8	14.00	600	20.0	95	95	66.15	0.00	14.90	2.70	89.20	2.95	-4.4	2.7E-06	1
25	2000	8	9	8	20.00	360	20.0	95	95	66.15	0.00	16.50	1.60	87.60	1.60	0.0	2.7E-06	1
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column. 2.8E-06 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW

QA: SN

Project Name:	WEYERHAEUSER	Cell #:	11
Project #:	5108.08	USCS Description:	Clayey sand
Sample Name:	PT-12, 800N, 1045E	USCS Classification:	SC
Visual Descript:	Clayey sand	Average Kv =	9.5E-08 cm/sec

Sample Type:	Undisturbed	Initial Values	Final Values			
Sample Dia. (in)		2.86	2.86	Permeant:	Water	
Sample Ht. (in)		2.32	2.30	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		503.00	590.30	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)		425.44	509.30	Confining Pressure (psi):	100.0	
Tare (g)		0.00	83.86	Burette Diameter (in):	0.250	
Sample Wt. (g)		503.00	506.44	Burette Zero (cm):	100.0	
Moisture (%)		18.2	19.0	Maximum Gradient:	14.2	
Wet Density (pcf)		128.6	130.6	Average Gradient:	13.6	
Dry Density (pcf)		108.7	109.7	Max. Effect. Stress (psi):	5.6	
Saturation (%)		89.6	95.9	Min. Effect. Stress (psi):	4.3	
				Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	3	8	4.00		0.0	95	95	51.95		8.45		96.05				
2	2000	8	3	8	17.00	780	20.0	95	95	51.90	-0.05	9.45	1.00	94.90	1.15	-7.0	7.1E-07	
3	2000	8	3	8	25.00	480	20.0	95	95	51.90	0.00	10.10	0.65	94.25	0.65	0.0	7.1E-07	
4	2000	8	3	8	40.00	900	20.0	95	95	51.80	-0.10	11.05	0.95	93.20	1.05	-5.0	6.0E-07	
5	2000	8	3	8	51.00	660	20.0	95	95	51.85	0.05	11.80	0.75	92.45	0.75	0.0	6.2E-07	
6	2000	8	4	7	47.00		0.0	95	95	55.25		6.65		95.70				
7	2000	8	4	7	56.00	540	20.0	95	95	55.15	-0.10	7.15	0.50	95.05	0.65	-13.0	5.4E-07	
8	2000	8	4	8	6.00	600	20.0	95	95	55.10	-0.05	7.75	0.60	94.45	0.60	0.0	5.1E-07	
9	2000	8	4	8	15.00	540	20.0	95	95	55.10	0.00	8.30	0.55	93.90	0.55	0.0	5.3E-07	
10	2000	8	4	9	14.00	3540	20.0	95	95	55.10	0.00	11.40	3.10	90.85	3.05	0.8	4.7E-07	
11	2000	8	7	7	49.00		0.0	95	95	59.80		9.20		94.20				
12	2000	8	7	8	10.00	1260	20.0	95	95	59.60	-0.20	9.55	0.35	93.75	0.45	-12.5	1.7E-07	
13	2000	8	7	8	32.00	1320	20.0	95	95	59.50	-0.10	9.90	0.35	93.35	0.40	-6.7	1.5E-07	
14	2000	8	7	8	37.00	300	20.0	95	95	59.65	0.15	10.00	0.10	93.25	0.10	0.0	1.8E-07	
15	2000	8	7	9	28.00	3060	20.0	95	95	59.40	-0.25	10.70	0.70	92.55	0.70	0.0	1.2E-07	
16	2000	8	7	13	3.00	12900	20.0	95	95	59.80	0.40	13.55	2.85	89.80	2.75	1.8	1.2E-07	
17	2000	8	7	16	8.00	11100	20.0	95	95	60.00	0.20	15.60	2.05	87.80	2.00	1.2	1.1E-07	
18	2000	8	8	7	47.00	56340	20.0	95	95	60.75	0.75	23.45	7.85	80.10	7.70	1.0	9.6E-08	
19	2000	8	8	8	22.00	2100	20.0	95	95	60.70	-0.05	23.75	0.30	79.80	0.30	0.0	1.1E-07	
20	2000	8	8	14	14.00	21120	20.0	95	95	60.70	0.00	26.00	2.25	77.60	2.20	1.1	8.7E-08	
21	2000	8	8	16	29.00	8100	20.0	95	95	61.50	0.80	26.80	0.80	76.95	0.65	10.3	7.9E-08	
22	2000	8	9	7	49.00		0.0	95	95	61.90		13.65		96.80				
23	2000	8	9	8	31.00	2520	20.0	95	95	61.80	-0.10	14.15	0.50	96.20	0.60	-9.1	1.2E-07	1
24	2000	8	9	9	36.00	3900	20.0	95	95	61.80	0.00	14.80	0.65	95.70	0.50	13.0	8.1E-08	1
25	2000	8	9	11	55.00	8340	20.0	95	95	61.90	0.10	16.20	1.40	94.30	1.40	0.0	9.4E-08	1
26	2000	8	9	14	5.00	7800	20.0	95	95	62.20	0.30	17.40	1.20	93.20	1.10	4.3	8.6E-08	1

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column. 9.5E-08 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW

QA: dgl

Project Name:	WEYERHAEUSER	Cell #:	15
Project #:	5108.08	USCS Description:	Silty, clayey sand
Sample Name:	PT-13, 1000N, 750E	USCS Classification:	SC-SM
Visual Descript:	Silty, clayey sand	Average Kv =	2.2E-08 cm/sec

Sample Type:	Undisturbed	Initial Values	Final Values			
Sample Dia. (in)		2.85	2.85	Permeant:	Water	
Sample Ht. (in)		2.34	2.32	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		587.60	573.10	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)		533.30	481.10	Confining Pressure (psi):	100.0	
Tare (g)		268.20	84.39	Burette Diameter (in):	0.250	
Sample Wt. (g)		484.50	488.71	Burette Zero (cm):	100.0	
Moisture (%)		20.5	23.2	Maximum Gradient:	8.3	
Wet Density (pcf)		123.6	125.8	Average Gradient:	8.2	
Dry Density (pcf)		102.6	102.1	Max. Effect. Stress (psi):	5.5	
Saturation (%)		86.2	96.3	Min. Effect. Stress (psi):	4.3	
				Ave. Effect. Stress (psi):	4.8	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	7	7	55.00		0.0	95	95	59.60		9.05		96.60				
2	2000	8	7	8	12.00	1020	20.0	95	95	59.65	0.05	9.95	0.90	94.85	1.75	-32.1	6.8E-07	
3	2000	8	7	8	34.00	1320	20.0	95	95	59.45	-0.20	10.30	0.35	94.40	0.45	-12.5	1.6E-07	
4	2000	8	7	8	40.00	360	20.0	95	95	59.50	0.05	10.45	0.15	94.25	0.15	0.0	2.3E-07	
5	2000	8	7	8	49.00	540	20.0	95	95	59.60	0.10	10.55	0.10	94.05	0.20	-33.3	1.5E-07	
6	2000	8	8	7	55.00	83160	20.0	95	95	61.60	2.00	18.15	7.60	86.55	7.50	0.7	5.4E-08	
7	2000	8	8	8	21.00	1560	20.0	95	95	61.70	0.10	18.20	0.05	86.45	0.10	-33.3	3.2E-08	
8	2000	8	8	9	21.00	3600	20.0	95	95	61.40	-0.30	18.40	0.20	86.30	0.15	14.3	3.2E-08	
9	2000	8	8	14	16.00	17700	20.0	95	95	62.20	0.80	19.40	1.00	85.45	0.85	8.1	3.5E-08	
10	2000	8	8	16	28.00	7920	20.0	95	95	63.00	0.80	19.80	0.40	85.05	0.40	0.0	3.5E-08	
11	2000	8	9	7	55.00	55620	20.0	95	95	63.40	0.40	22.30	2.50	82.65	2.40	2.0	3.2E-08	
12	2000	8	9	9	38.00	6180	20.0	95	95	63.30	-0.10	22.45	0.15	82.40	0.25	-25.0	2.4E-08	
13	2000	8	9	11	57.00	8340	20.0	95	95	63.65	0.35	22.85	0.40	82.05	0.35	6.7	3.4E-08	
14	2000	8	10	7	44.00	71220	20.0	95	95	64.95	1.30	25.45	2.60	79.70	2.35	5.1	2.8E-08	
15	2000	8	10	9	50.00	7560	20.0	95	95	64.90	-0.05	25.65	0.20	79.45	0.25	-11.1	2.5E-08	
16	2000	8	10	11	43.00	6780	21.0	95	95	65.45	0.55	25.90	0.25	79.20	0.25	0.0	3.0E-08	
17	2000	8	10	13	58.00	8100	21.0	95	95	65.90	0.45	26.20	0.30	79.00	0.20	20.0	2.6E-08	
18	2000	8	10	16	10.00	7920	21.0	95	95	66.60	0.70	26.40	0.20	78.80	0.20	0.0	2.1E-08	
19	2000	8	11	7	46.00	56160	20.0	95	95	66.05	-0.55	27.95	1.55	77.25	1.55	0.0	2.5E-08	
20	2000	8	11	8	52.00	3960	20.0	95	95	66.15	0.10	28.05	0.10	77.10	0.15	-20.0	2.9E-08	
21	2000	8	11	9	46.00	3240	20.0	95	95	66.10	-0.05	28.10	0.05	77.00	0.10	-33.3	2.1E-08	1
22	2000	8	11	11	55.00	7740	20.0	95	95	66.30	0.20	28.35	0.25	76.85	0.15	25.0	2.4E-08	1
23	2000	8	11	14	15.00	8400	20.0	95	95	66.35	0.05	28.55	0.20	76.60	0.25	-11.1	2.5E-08	1
24	2000	8	11	16	22.00	7620	20.0	95	95	66.80	0.45	28.75	0.20	76.50	0.10	33.3	1.9E-08	1
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

2.2E-08 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJH

QA: JKH

Project Name:	WEYERHAEUSER	Cell #:	16
Project #:	5108.08	USCS Description:	Silty, clayey sand
Sample Name:	PT-14, 100N, 1015E	USCS Classification:	SC-SM
Visual Descript:	Silty, clayey sand	Average Kv =	1.7E-05 cm/sec

Sample Type:	Undisturbed	Initial Values	Final Values			
Sample Dia. (in)		2.84	2.84	Permeant:	Water	
Sample Ht. (in)		2.31	2.30	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		477.50	578.80	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)		407.20	491.40	Confining Pressure (psi):	100.0	
Tare (g)		0.00	84.20	Burette Diameter (in):	0.250	
Sample Wt. (g)		477.50	494.60	Burette Zero (cm):	100.0	
Moisture (%)		17.3	21.5	Maximum Gradient:	15.7	
Wet Density (pcf)		124.3	129.3	Average Gradient:	14.3	
Dry Density (pcf)		106.0	106.5	Max. Effect. Stress (psi):	5.6	
Saturation (%)		79.1	99.5	Min. Effect. Stress (psi):	4.2	
				Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	7	7	56.00		0.0	95	95	52.60		8.50		94.40				
2	2000	8	7	7	57.00	60	20.0	95	95	52.60	0.00	10.90	2.40	92.00	2.40	0.0	2.2E-05	
3	2000	8	7	7	58.00	60	20.0	95	95	52.60	0.00	12.90	2.00	89.90	2.10	-2.4	2.0E-05	
4	2000	8	7	7	59.00	60	20.0	95	95	52.60	0.00	15.10	2.20	87.80	2.10	2.3	2.2E-05	
5	2000	8	7	8	0.00	60	20.0	95	95	52.60	0.00	16.90	1.80	85.90	1.90	-2.7	2.0E-05	
6	2000	8	8	7	56.00		0.0	95	95	56.60		6.70		97.20				
7	2000	8	8	7	57.00	60	20.0	95	95	56.60	0.00	9.00	2.30	94.75	2.45	-3.2	2.0E-05	
8	2000	8	8	7	58.00	60	20.0	95	95	56.60	0.00	10.80	1.80	92.75	2.00	-5.3	1.7E-05	
9	2000	8	8	7	59.00	60	20.0	95	95	56.60	0.00	12.70	1.90	90.90	1.85	1.3	1.8E-05	
10	2000	8	8	8	0.00	60	20.0	95	95	56.60	0.00	14.60	1.90	89.10	1.80	2.7	1.8E-05	
11	2000	8	8	8	1.00	60	20.0	95	95	56.60	0.00	16.25	1.65	87.30	1.80	-4.3	1.8E-05	
12	2000	8	9	7	57.00		0.0	95	95	60.45		7.10		98.50				
13	2000	8	9	7	58.00	60	20.0	95	95	60.45	0.00	9.10	2.00	96.40	2.10	-2.4	1.7E-05	
14	2000	8	9	7	59.00	60	20.0	95	95	60.45	0.00	11.00	1.90	94.40	2.00	-2.6	1.7E-05	
15	2000	8	9	8	0.00	60	20.0	95	95	60.45	0.00	12.90	1.90	92.50	1.90	0.0	1.8E-05	
16	2000	8	9	8	1.00	60	20.0	95	95	60.45	0.00	14.70	1.80	90.70	1.80	0.0	1.7E-05	
17	2000	8	9	8	2.00	60	20.0	95	95	60.45	0.00	16.20	1.50	89.10	1.60	-3.2	1.6E-05	
18	2000	8	10	7	52.00		0.0	95	95	63.25		5.40		96.90				
19	2000	8	10	7	53.00	60	20.0	95	95	63.25	0.00	7.70	2.30	94.80	2.10	4.5	1.9E-05	1
20	2000	8	10	7	54.00	60	20.0	95	95	63.25	0.00	9.50	1.80	92.80	2.00	-5.3	1.7E-05	1
21	2000	8	10	7	55.00	60	20.0	95	95	63.25	0.00	11.30	1.80	91.10	1.70	2.9	1.6E-05	1
22	2000	8	10	7	56.00	60	20.0	95	95	63.25	0.00	12.85	1.55	89.40	1.70	-4.6	1.6E-05	1
23																		
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

1.7E-05 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW
QA: SHJ

Project Name:	WEYERHAEUSER	Cell #:	17
Project #:	5108.08	USCS Description:	Silty sand
Sample Name:	PT-15, 1200N, 775E	USCS Classification:	SM
Visual Descript:	Silty sand	Average Kv =	8.4E-06 cm/sec

		Initial Values	Final Values			
Sample Type:	Undisturbed					
Sample Dia. (in)		2.85	2.85	Permeant:	Water	
Sample Ht. (in)		2.21	2.20	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		476.50	764.10	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)		415.54	691.60	Confining Pressure (psi):	100.0	
Tare (g)		0.00	276.06	Burette Diameter (in):	0.250	
Sample Wt. (g)		476.50	488.04	Burette Zero (cm):	100.0	
Moisture (%)		14.7	17.4	Maximum Gradient:	16.2	
Wet Density (pcf)		128.8	132.5	Average Gradient:	10.1	
Dry Density (pcf)		112.3	112.8	Max. Effect. Stress (psi):	5.4	
Saturation (%)		79.1	95.4	Min. Effect. Stress (psi):	4.0	
				Ave. Effect. Stress (psi):	4.7	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C°**	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	7	8	1.00		0.0	95	95	69.65		15.40		93.50				
2	2000	8	7	8	13.00	720	20.0	95	95	69.70	0.05	24.15	8.75	84.30	9.20	-2.5	7.8E-06	
3	2000	8	7	8	34.00	1260	20.0	95	95	69.60	-0.10	37.30	13.15	71.20	13.10	0.2	9.8E-06	
4	2000	8	7	8	41.00	420	20.0	95	95	69.55	-0.05	39.85	2.55	68.60	2.60	-1.0	8.4E-06	
5	2000	8	8	8	5.00		0.0	95	95	71.70		7.10		97.20				
6	2000	8	8	8	15.00	600	20.0	95	95	71.65	-0.05	16.60	9.50	87.55	9.65	-0.8	8.6E-06	
7	2000	8	8	8	19.00	240	20.0	95	95	71.55	-0.10	20.50	3.90	83.45	4.10	-2.5	1.1E-05	
8	2000	8	8	8	26.00	420	20.0	95	95	71.45	-0.10	24.95	4.45	79.10	4.35	1.1	7.7E-06	
9	2000	8	8	8	30.00	240	20.0	95	95	71.40	-0.05	27.80	2.85	76.25	2.85	0.0	1.0E-05	
10	2000	8	9	8	7.00		0.0	95	95	73.40		8.60		96.60				
11	2000	8	9	8	16.00	540	20.0	95	95	73.45	0.05	17.45	8.85	87.75	8.85	0.0	8.9E-06	
12	2000	8	9	8	22.00	360	20.0	95	95	73.40	-0.05	22.25	4.80	82.90	4.85	-0.5	8.8E-06	
13	2000	8	9	8	27.00	300	20.0	95	95	73.25	-0.15	25.55	3.30	79.50	3.40	-1.5	8.4E-06	
14	2000	8	9	8	30.00	180	20.0	95	95	73.20	-0.05	27.35	1.80	77.70	1.80	0.0	8.2E-06	
15	2000	8	10	8	1.00		0.0	95	95	74.95		7.05		97.15				
16	2000	8	10	8	6.00	300	20.0	95	95	75.00	0.05	11.20	4.15	92.95	4.20	-0.6	7.0E-06	
17	2000	8	10	8	14.00	480	20.0	95	95	74.90	-0.10	17.80	6.60	86.35	6.60	0.0	7.9E-06	
18	2000	8	10	8	20.00	360	20.0	95	95	74.85	-0.05	21.10	3.30	82.85	3.50	-2.9	6.2E-06	
19	2000	8	10	8	24.00	240	20.0	95	95	74.70	-0.15	23.80	2.70	80.20	2.65	0.9	8.1E-06	
20	2000	8	11	7	51.00		0.0	95	95	75.95		5.95		96.35				
21	2000	8	11	8	8.00	1020	20.0	95	95	75.80	-0.15	20.45	14.50	81.50	14.85	-1.2	8.3E-06	1
22	2000	8	11	8	16.00	480	20.0	95	95	75.80	0.00	25.85	5.40	76.15	5.35	0.5	8.7E-06	1
23	2000	8	11	8	31.00	900	20.0	95	95	75.75	-0.05	32.30	6.45	69.75	6.40	0.4	7.0E-06	1
24	2000	8	11	8	36.00	300	20.0	95	95	75.80	0.05	34.65	2.35	67.40	2.35	0.0	9.6E-06	1
25																		
26																		

**A zero in this column starts a series of measurements.
(Termination determined by stable Kv and low flow differential.)

*Average Kv for those rows with a 1 in the Ave. column. 8.4E-06 cm/sec

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: KJW
QA: SH

Project Name: WEYERHAEUSER
Project #: 5108.08
Sample Name: PT-16, 1200N, 1010E
Visual Descript: Silty, clayey sand

Cell #: 18
USCS Description: Silty, clayey sand
USCS Classification: SC-SM
Average Kv = 1.3E-04 cm/sec

Sample Type: Undisturbed

	Initial Values	Final Values
Sample Dia. (in)	2.80	2.80
Sample Ht. (in)	2.51	2.49
Tare & Wet (g)	546.80	606.40
Tare & Dry (g)	516.10	522.10
Tare (g)	272.60	83.16
Sample Wt. (g)	497.10	523.24

Permeant:	Water
Permeant Specific Gravity:	1.00
Sample Specific Gravity:	2.70 Est.
Confining Pressure (psi):	100.0
Burette Diameter (in):	0.250
Burette Zero (cm):	100.0

Moisture (%)	12.6	19.2
Wet Density (pcf)	122.5	130.0
Dry Density (pcf)	108.8	109.1
Saturation (%)	62.1	95.2

Maximum Gradient:	14.4
Average Gradient:	10.0
Max. Effect. Stress (psi):	5.7
Min. Effect. Stress (psi):	4.3
Ave. Effect. Stress (psi):	5.0

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	7	8	4.00		0.0	95	95	49.90		13.30		96.05				
2	2000	8	7	8	4.50	30	20.0	95	95	49.90	0.00	19.80	6.50	89.55	6.50	0.0	1.4E-04	
3	2000	8	7	8	5.00	30	20.0	95	95	49.90	0.00	25.80	6.00	83.55	6.00	0.0	1.6E-04	
4	2000	8	7	8	5.50	30	20.0	95	95	49.90	0.00	30.70	4.90	78.65	4.90	0.0	1.6E-04	
5	2000	8	7	8	6.00	30	20.0	95	95	49.90	0.00	35.00	4.30	74.35	4.30	0.0	1.7E-04	
6	2000	8	7	8	6.50	30	20.0	95	95	49.90	0.00	38.20	3.20	71.15	3.20	0.0	1.5E-04	
7	2000	8	8	8	7.00		0.0	95	95	51.90		7.50		101.85				
8	2000	8	8	8	7.50	30	20.0	95	95	51.90	0.00	15.50	8.00	93.85	8.00	0.0	1.6E-04	
9	2000	8	8	8	8.00	30	20.0	95	95	51.90	0.00	21.50	6.00	87.85	6.00	0.0	1.4E-04	
10	2000	8	8	8	8.50	30	20.0	95	95	51.90	0.00	26.50	5.00	82.85	5.00	0.0	1.4E-04	
11	2000	8	8	8	9.00	30	20.0	95	95	51.90	0.00	31.00	4.50	78.35	4.50	0.0	1.5E-04	
12	2000	8	8	8	9.50	30	20.0	95	95	51.90	0.00	34.50	3.50	74.85	3.50	0.0	1.3E-04	
13	2000	8	9	8	10.00		0.0	95	95	54.65		11.20		94.80				
14	2000	8	9	8	10.50	30	20.0	95	95	54.65	0.00	16.80	5.60	89.20	5.60	0.0	1.2E-04	
15	2000	8	9	8	11.00	30	20.0	95	95	54.65	0.00	22.30	5.50	83.70	5.50	0.0	1.4E-04	
16	2000	8	9	8	11.50	30	20.0	95	95	54.65	0.00	27.20	4.90	78.80	4.90	0.0	1.5E-04	
17	2000	8	9	8	12.00	30	20.0	95	95	54.65	0.00	31.10	3.90	74.90	3.90	0.0	1.4E-04	
18	2000	8	9	8	12.50	30	20.0	95	95	54.65	0.00	34.40	3.30	71.60	3.30	0.0	1.4E-04	
19	2000	8	10	8	8.00		0.0	95	95	56.90		9.80		101.00				
20	2000	8	10	8	8.50	30	20.0	95	95	56.90	0.00	16.40	6.60	94.40	6.60	0.0	1.3E-04	1
21	2000	8	10	8	9.00	30	20.0	95	95	56.90	0.00	22.10	5.70	88.70	5.70	0.0	1.3E-04	1
22	2000	8	10	8	9.50	30	20.0	95	95	56.90	0.00	27.00	4.90	83.80	4.90	0.0	1.3E-04	1
23	2000	8	10	8	10.00	30	20.0	95	95	56.90	0.00	31.30	4.30	79.50	4.30	0.0	1.4E-04	1
24	2000	8	10	8	10.50	30	20.0	95	95	56.90	0.00	34.90	3.60	75.90	3.60	0.0	1.4E-04	1
25																		
26																		

**A zero in this column starts a series of measurements.
(Termination determined by stable Kv and low flow differential.)

*Average Kv for those rows with a 1 in the Ave. column. 1.3E-04 cm/sec

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJ

QA: JH

Project Name:	WEYERHAEUSER	Cell #:	19
Project #:	5108.08	USCS Description:	Silty sand
Sample Name:	PT-17, 1400N, 775E	USCS Classification:	SM
Visual Descript:	Silty sand	Average Kv =	8.4E-04 cm/sec

Sample Type: Undisturbed	Initial Values	Final Values			
Sample Dia. (in)	2.85	2.85	Permeant:	Water	
Sample Ht. (in)	2.08	2.06	Permeant Specific Gravity:	1.00	
Tare & Wet (g)	614.40	524.90	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)	579.30	447.70	Confining Pressure (psi):	100.0	
Tare (g)	260.80	84.49	Burette Diameter (in):	0.250	
Sample Wt. (g)	406.80	440.41	Burette Zero (cm):	70.0	
Moisture (%)	11.0	21.3	Maximum Gradient:	12.1	
Wet Density (pcf)	116.8	127.7	Average Gradient:	4.5	
Dry Density (pcf)	105.2	105.3	Max. Effect. Stress (psi):	5.3	
Saturation (%)	49.5	95.6	Min. Effect. Stress (psi):	4.3	
			Ave. Effect. Stress (psi):	4.7	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	7	8	5.00		0.0	95	95	49.25		0.00		70.00				
2	2000	8	7	8	5.10	6	21.0	95	95	49.25	0.00	10.00	10.00	60.00	10.00	0.0	1.1E-03	
3	2000	8	7	8	5.30	12	21.0	95	95	49.25	0.00	20.00	10.00	50.00	10.00	0.0	8.4E-04	
4	2000	8	7	8	5.70	24	21.0	95	95	49.25	0.00	30.00	10.00	40.00	10.00	0.0	9.0E-04	
5	2000	8	7	8	10.00		0.0	95	95	49.25		0.00		70.00				
6	2000	8	7	8	10.10	6	21.0	95	95	49.25	0.00	10.00	10.00	60.00	10.00	0.0	1.1E-03	
7	2000	8	7	8	10.30	12	21.0	95	95	49.25	0.00	20.00	10.00	50.00	10.00	0.0	8.4E-04	
8	2000	8	7	8	10.70	24	21.0	95	95	49.25	0.00	30.00	10.00	40.00	10.00	0.0	9.0E-04	
9	2000	8	8	7	49.25		0.0	95	95	51.40		4.35		65.65				
10	2000	8	8	7	49.50	15	21.0	95	95	51.40	0.00	19.20	14.85	50.80	14.85	0.0	8.7E-04	
11	2000	8	8	7	49.75	15	21.0	95	95	51.40	0.00	27.00	7.80	43.00	7.80	0.0	8.9E-04	
12	2000	8	8	7	50.00	15	21.0	95	95	51.40	0.00	31.40	4.40	38.60	4.40	0.0	1.0E-03	
13	2000	8	8	7	50.25	15	21.0	95	95	51.40	0.00	33.50	2.10	36.50	2.10	0.0	1.1E-03	
14	2000	8	9	7	41.00		0.0	95	95	53.40		5.40		68.50				
15	2000	8	9	7	41.25		21.0	95	95	53.40	0.00	19.70	14.30	54.20	14.30	0.0	7.9E-04	1
16	2000	8	9	7	41.50	15	21.0	95	95	53.40	0.00	27.70	8.00	46.20	8.00	0.0	8.2E-04	1
17	2000	8	9	7	41.75	15	21.0	95	95	53.40	0.00	32.10	4.40	41.80	4.40	0.0	8.5E-04	1
18	2000	8	9	7	42.00	15	21.0	95	95	53.40	0.00	34.50	2.40	39.40	2.40	0.0	8.9E-04	1
19																		
20																		
21																		
22																		
23																		
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

8.4E-04 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: 11/14/00
QA: 11/14/00

Project Name:	WEYERHAEUSER	Cell #:	19
Project #:	5108.08	USCS Description:	Silty sand
Sample Name:	PT-17A, 1400N, 775E	USCS Classification:	SM
Visual Descript:	Silty sand	Average Kv =	4.5E-04 cm/sec

Sample Type:	Undisturbed	Initial Values	Final Values			
Sample Dia. (in)		2.83	2.83	Permeant:	Water	
Sample Ht. (in)		2.31	2.29	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		456.20	568.00	Sample Specific Gravity:	2.65	Est.
Tare & Dry (g)		406.47	489.20	Confining Pressure (psi):	100.0	
Tare (g)		0.00	82.73	Burette Diameter (in):	0.250	
Sample Wt. (g)		456.20	485.27	Burette Zero (cm):	70.0	
Moisture (%)		12.2	19.4	Maximum Gradient:	11.0	
Wet Density (pcf)		119.6	128.3	Average Gradient:	5.7	
Dry Density (pcf)		106.6	107.5	Max. Effect. Stress (psi):	5.5	
Saturation (%)		58.8	95.5	Min. Effect. Stress (psi):	4.4	
				Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	10	7	46.00		0.0	95	95	37.10		4.30		68.40				
2	2000	8	10	7	46.25	15	21.0	95	95	37.10	0.00	12.40	8.10	60.30	8.10	0.0	4.3E-04	
3	2000	8	10	7	46.50	15	21.0	95	95	37.10	0.00	19.00	6.60	53.70	6.60	0.0	4.8E-04	
4	2000	8	10	7	46.75	15	21.0	95	95	37.10	0.00	23.40	4.40	49.30	4.40	0.0	4.3E-04	
5	2000	8	10	7	47.00	15	21.0	95	95	37.10	0.00	27.00	3.60	45.70	3.60	0.0	4.8E-04	
6	2000	8	10	7	47.25	15	21.0	95	95	37.10	0.00	29.40	2.40	43.30	2.40	0.0	4.4E-04	
7	2000	8	10	8	28.00		0.0	95	95	37.10		4.20		69.00				
8	2000	8	10	8	28.25	15	21.0	95	95	37.10	0.00	13.10	8.90	60.10	8.90	0.0	4.7E-04	
9	2000	8	10	8	28.50	15	21.0	95	95	37.10	0.00	19.30	6.20	53.90	6.20	0.0	4.5E-04	
10	2000	8	10	8	28.75	15	21.0	95	95	37.10	0.00	24.10	4.80	49.10	4.80	0.0	4.8E-04	
11	2000	8	10	8	29.00	15	21.0	95	95	37.10	0.00	27.60	3.50	45.60	3.50	0.0	4.9E-04	
12	2000	8	10	8	29.25	15	21.0	95	95	37.10	0.00	30.00	2.40	43.20	2.40	0.0	4.6E-04	
13	2000	8	11	7	46.00		0.0	95	95	39.70		4.50		68.20				
14	2000	8	11	7	46.25	15	21.0	95	95	39.70	0.00	12.50	8.00	60.20	8.00	0.0	4.3E-04	
15	2000	8	11	7	46.50	15	21.0	95	95	39.70	0.00	18.60	6.10	54.10	6.10	0.0	4.4E-04	
16	2000	8	11	7	46.75	15	21.0	95	95	39.70	0.00	23.20	4.60	49.50	4.60	0.0	4.4E-04	
17	2000	8	11	7	47.00	15	21.0	95	95	39.70	0.00	26.50	3.30	46.20	3.30	0.0	4.3E-04	
18	2000	8	11	7	47.25	15	21.0	95	95	39.70	0.00	29.10	2.60	43.60	2.60	0.0	4.5E-04	
19	2000	8	14	7	55.00		0.0	95	95	45.20		4.20		68.30				
20	2000	8	14	7	55.25	15	21.0	95	95	45.20	0.00	12.80	8.60	59.70	8.60	0.0	4.6E-04	1
21	2000	8	14	7	55.50	15	21.0	95	95	45.20	0.00	19.00	6.20	53.50	6.20	0.0	4.5E-04	1
22	2000	8	14	7	55.75	15	21.0	95	95	45.20	0.00	23.30	4.30	49.20	4.30	0.0	4.2E-04	1
23	2000	8	14	7	56.00	15	21.0	95	95	45.20	0.00	26.80	3.50	45.70	3.50	0.0	4.7E-04	1
24	2000	8	14	7	56.25	15	21.0	95	95	45.20	0.00	29.20	2.40	43.30	2.40	0.0	4.3E-04	1
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

4.5E-04 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: JRL

QA: JRL

Project Name:	WEYERHAEUSER	Cell #:	10
Project #:	5108.08	USCS Description:	Silty sand
Sample Name:	PT-17B, 1393N, 715E	USCS Classification:	SM
Visual Descript:	Silty sand	Average Kv =	6.6E-07 cm/sec

	Initial Values	Final Values			
Sample Type:	Undisturbed				
Sample Dia. (in)	2.86	2.86	Permeant:	Water	
Sample Ht. (in)	2.30	2.28	Permeant Specific Gravity:	1.00	
Tare & Wet (g)	494.10	579.40	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)	412.63	496.20	Confining Pressure (psi):	100.0	
Tare (g)	0.00	83.57	Burette Diameter (in):	0.250	
Sample Wt. (g)	494.10	495.83	Burette Zero (cm):	100.0	
Moisture (%)	19.7	20.2	Maximum Gradient:	15.7	
Wet Density (pcf)	127.4	129.0	Average Gradient:	13.6	
Dry Density (pcf)	106.4	107.3	Max. Effect. Stress (psi):	5.6	
Saturation (%)	91.3	95.5	Min. Effect. Stress (psi):	4.0	
			Ave. Effect. Stress (psi):	4.7	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	14	13	6.00		0.0	95	95	54.20		16.60		98.60				
2	2000	8	14	13	19.00	780	21.0	95	95	54.20	0.00	17.80	1.20	96.50	2.10	-27.3	1.1E-06	
3	2000	8	14	13	48.00	1740	21.0	95	95	55.90	1.70	19.90	2.10	94.30	2.20	-2.3	7.0E-07	
4	2000	8	14	14	45.00	3420	21.0	95	95	58.10	2.20	23.30	3.40	90.60	3.70	-4.2	6.3E-07	
5	2000	8	14	15	16.00	1860	21.0	95	95	59.20	1.10	24.90	1.60	89.00	1.60	0.0	5.7E-07	
6	2000	8	14	16	4.00	2880	21.0	95	95	61.30	2.10	27.05	2.15	86.65	2.35	-4.4	5.5E-07	
7	2000	8	15	7	44.00		0.0	95	95	69.80		7.40		99.50				
8	2000	8	15	7	57.00	780	21.0	95	95	69.80	0.00	9.20	1.80	97.70	1.80	0.0	1.1E-06	
9	2000	8	15	8	13.00	960	21.0	95	95	69.80	0.00	10.80	1.60	96.00	1.70	-3.0	8.5E-07	
10	2000	8	15	9	5.00	3120	21.0	95	95	69.80	0.00	16.10	5.30	90.30	5.70	-3.6	9.6E-07	
11	2000	8	15	10	30.00	5100	21.0	95	95	71.00	1.20	22.90	6.80	83.20	7.10	-2.2	8.8E-07	
12	2000	8	15	12	58.00	8880	20.0	95	95	71.45	0.45	31.25	8.35	74.50	8.70	-2.1	8.3E-07	
13	2000	8	16	8	6.00		0.0	95	95	73.90		9.20		99.15				
14	2000	8	16	11	42.00	12960	21.0	95	95	74.90	1.00	23.90	14.70	83.40	15.75	-3.4	6.9E-07	
15	2000	8	16	12	55.00	4380	21.0	95	95	74.55	-0.35	27.10	3.20	80.05	3.35	-2.3	5.7E-07	
16	2000	8	16	15	56.00	10860	22.0	95	95	78.00	3.45	23.05	-4.05	73.75	6.30	-460.0	8.4E-08	
17	2000	8	17	7	42.00		0.0	95	95	76.20		8.45		96.05				
18	2000	8	17	8	40.00	3480	20.0	95	95	75.90	-0.30	13.40	4.95	90.80	5.25	-2.9	7.9E-07	
19	2000	8	17	10	10.00	5400	20.0	95	95	76.00	0.10	19.25	5.85	84.75	6.05	-1.7	6.8E-07	
20	2000	8	17	13	9.00	10740	20.0	95	95	76.40	0.40	27.65	8.40	76.05	8.70	-1.8	6.2E-07	
21	2000	8	17	16	4.00	10500	20.0	95	95	76.45	0.05	33.20	5.55	70.35	5.70	-1.3	5.6E-07	
22	2000	8	18	7	40.00		0.0	95	95	78.00		6.80		97.60				
23	2000	8	18	8	23.00	2580	20.0	95	95	77.50	-0.50	10.20	3.40	93.95	3.65	-3.5	6.9E-07	1
24	2000	8	18	8	52.00	1740	20.0	95	95	77.40	-0.10	12.40	2.20	91.65	2.30	-2.2	7.0E-07	1
25	2000	8	18	9	50.00	3480	20.0	95	95	77.85	0.45	16.15	3.75	87.65	4.00	-3.2	6.5E-07	1
26	2000	8	18	10	21.00	1860	20.0	95	95	77.90	0.05	17.80	1.65	85.90	1.75	-2.9	5.8E-07	1

**A zero in this column starts a series of measurements.	*Average Kv for those rows with a 1 in the Ave. column.	6.6E-07 cm/sec
(Termination determined by stable Kv and low flow differential.)	***Kv adjusted for temperature.	

RMT, Inc.

QC: HJW

QA:

Falling Head Permeability Test (ASTM D5084)

Project Name:	WEYERHAEUSER	Cell #:	20
Project #:	5108.08	USCS Description:	Silty, clayey sand
Sample Name:	PT-18, 1400N, 1050E	USCS Classification:	SC-SM
Visual Descript:	Silty, clayey sand	Average Kv =	1.1E-07 cm/sec

Sample Type: Undisturbed	Initial Values	Final Values		
Sample Dia. (in)	2.85	2.85	Permeant:	Water
Sample Ht. (in)	2.30	2.29	Permeant Specific Gravity:	1.00
Tare & Wet (g)	482.60	754.70	Sample Specific Gravity:	2.70 Est.
Tare & Dry (g)	402.30	668.90	Confining Pressure (psi):	100.0
Tare (g)	0.00	266.60	Burette Diameter (in):	0.250
Sample Wt. (g)	482.60	488.10	Burette Zero (cm):	70.0
Moisture (%)	20.0	21.3	Maximum Gradient:	6.9
Wet Density (pcf)	125.3	127.3	Average Gradient:	5.6
Dry Density (pcf)	104.5	104.9	Max. Effect. Stress (psi):	5.2
Saturation (%)	87.9	95.0	Min. Effect. Stress (psi):	4.3
			Ave. Effect. Stress (psi):	4.8

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	7	8	29.00		0.0	95	95	47.60		3.90		63.30				
2	2000	8	7	8	30.00	60	21.0	95	95	47.60	0.00	4.10	0.20	63.05	0.25	-11.1	2.8E-06	
3	2000	8	7	8	35.00	300	21.0	95	95	47.40	-0.20	4.50	0.40	62.80	0.25	23.1	8.1E-07	
4	2000	8	7	8	41.00	360	21.0	95	95	47.35	-0.05	4.80	0.30	62.65	0.15	33.3	4.7E-07	
5	2000	8	7	8	49.00	480	21.0	95	95	47.25	-0.10	5.20	0.40	62.55	0.10	60.0	3.9E-07	
6	2000	8	7	13	2.00	15180	21.0	95	95	47.85	0.60	13.10	7.90	59.20	3.35	40.4	3.1E-07	
7	2000	8	8	7	52.00		0.0	95	95	49.60		3.50		64.60				
8	2000	8	8	8	10.00	1080	21.0	95	95	49.30	-0.30	4.10	0.60	64.20	0.40	20.0	3.3E-07	
9	2000	8	8	9	21.00	4260	21.0	95	95	49.50	0.20	5.75	1.65	63.25	0.95	26.9	2.3E-07	
10	2000	8	8	12	2.00	9660	21.0	95	95	49.80	0.30	8.70	2.95	61.35	1.90	21.6	2.0E-07	
11	2000	8	8	14	10.00	7680	21.0	95	95	50.00	0.20	10.75	2.05	60.00	1.35	20.6	1.9E-07	
12	2000	8	8	16	25.00	8100	21.0	95	95	50.05	0.05	12.50	1.75	58.80	1.20	18.6	1.7E-07	
13	2000	8	9	7	43.00	55080	21.0	95	95	51.30	1.25	20.90	8.40	52.60	6.20	15.1	1.5E-07	
14	2000	8	9	8	51.00	4080	21.0	95	95	51.50	0.20	21.35	0.45	52.25	0.35	12.5	1.4E-07	
15	2000	8	9	9	40.00	2940	21.0	95	95	51.40	-0.10	21.70	0.35	51.95	0.30	7.7	1.6E-07	
16	2000	8	9	11	51.00	7860	21.0	95	95	51.50	0.10	22.55	0.85	51.40	0.55	21.4	1.3E-07	
17	2000	8	9	14	7.00	8160	21.0	95	95	51.80	0.30	23.30	0.75	50.25	1.15	-21.1	1.8E-07	
18	2000	8	9	16	20.00	7980	21.0	95	95	51.85	0.05	24.05	0.75	50.20	0.05	87.5	8.2E-08	
19	2000	8	10	7	50.00		0.0	95	95	53.10		28.50		68.45				
20	2000	8	10	9	26.00	5760	21.0	95	95	53.10	0.00	29.10	0.60	67.90	0.55	4.3	1.1E-07	1
21	2000	8	10	11	43.00	8220	21.0	95	95	53.20	0.10	29.95	0.85	67.10	0.80	3.0	1.2E-07	1
22	2000	8	10	13	57.00	8040	21.0	95	95	53.50	0.30	30.75	0.80	66.50	0.60	14.3	1.0E-07	1
23	2000	8	10	16	11.00	8040	21.0	95	95	52.70	-0.80	31.55	0.80	65.90	0.60	14.3	1.1E-07	1
24	2000	8	11	7	48.00	56220	21.0	95	95	54.70	2.00	35.90	4.35	62.30	3.60	9.4	1.0E-07	1
25																		
26																		

**A zero in this column starts a series of measurements.

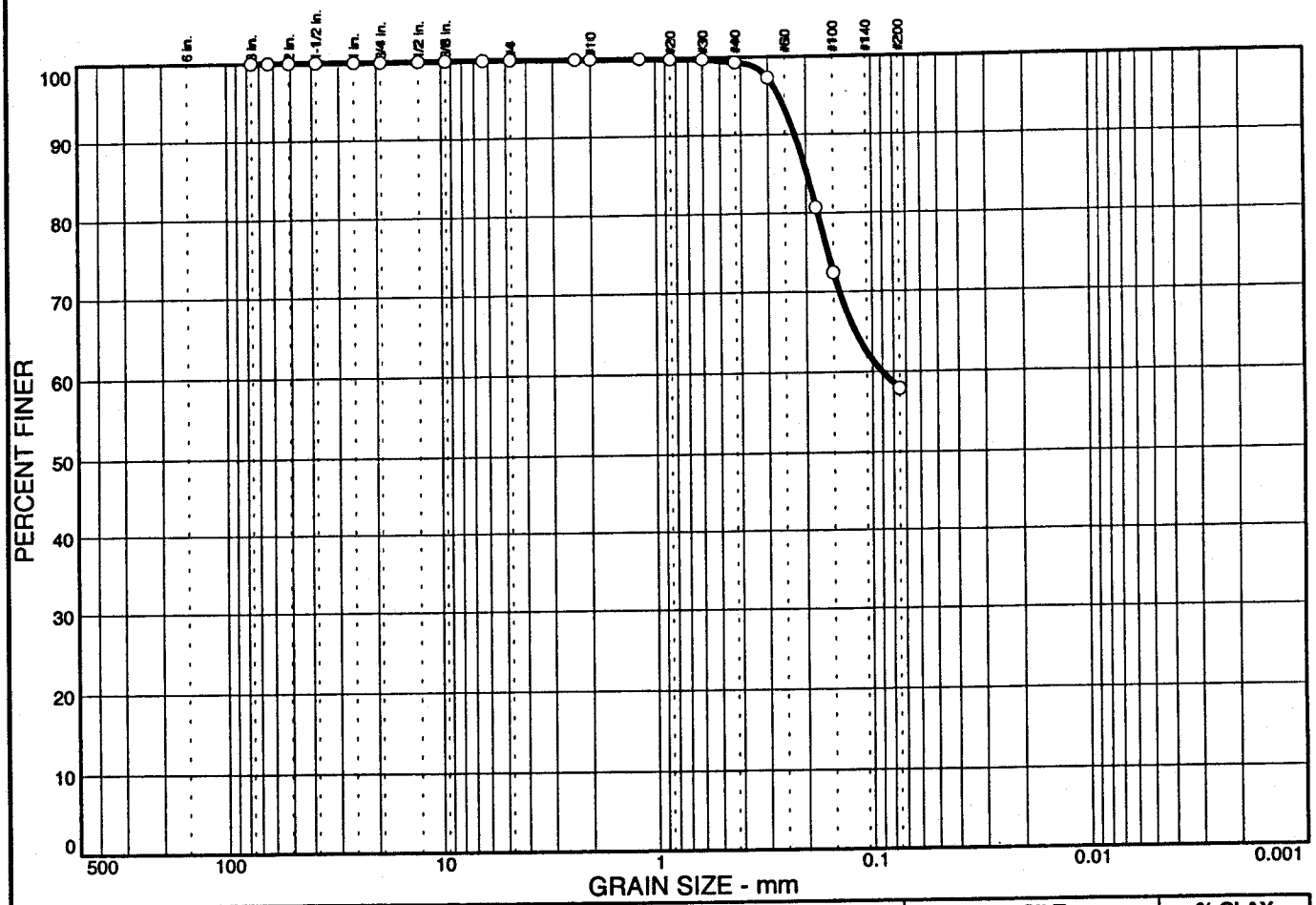
*Average Kv for those rows with a 1 in the Ave. column. 1.1E-07 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

VJDS

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	42.1	57.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	99.9		
#20	99.8		
#30	99.7		
#40	99.3		
#50	97.3		
#80	80.7		
#100	72.4		
#200	57.9		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 20 LL= 39 PI= 19

Coefficients

D_{85}= 0.199 D_{60}= 0.0901 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

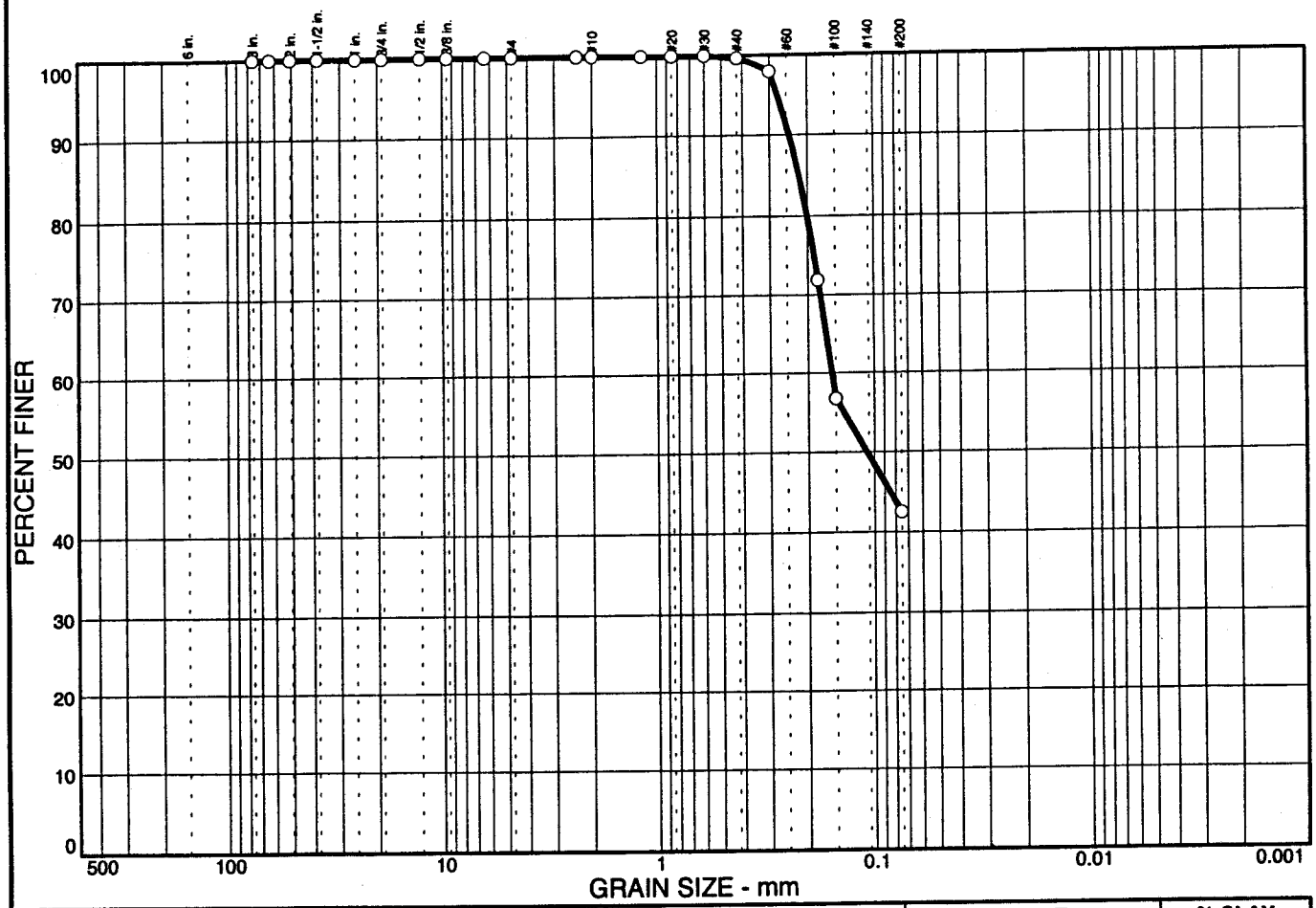
Remarks

Sample No.: 1420N, 684E **Source of Sample:** LPT-8 **Date:** 9-7-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	57.5	42.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	99.9		
#20	99.9		
#30	99.9		
#40	99.6		
#50	97.9		
#80	71.9		
#100	56.7		
#200	42.5		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 24 LL= 35 PI= 11

Coefficients

D_{85}= 0.220 D_{60}= 0.156 D_{50}= 0.108
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

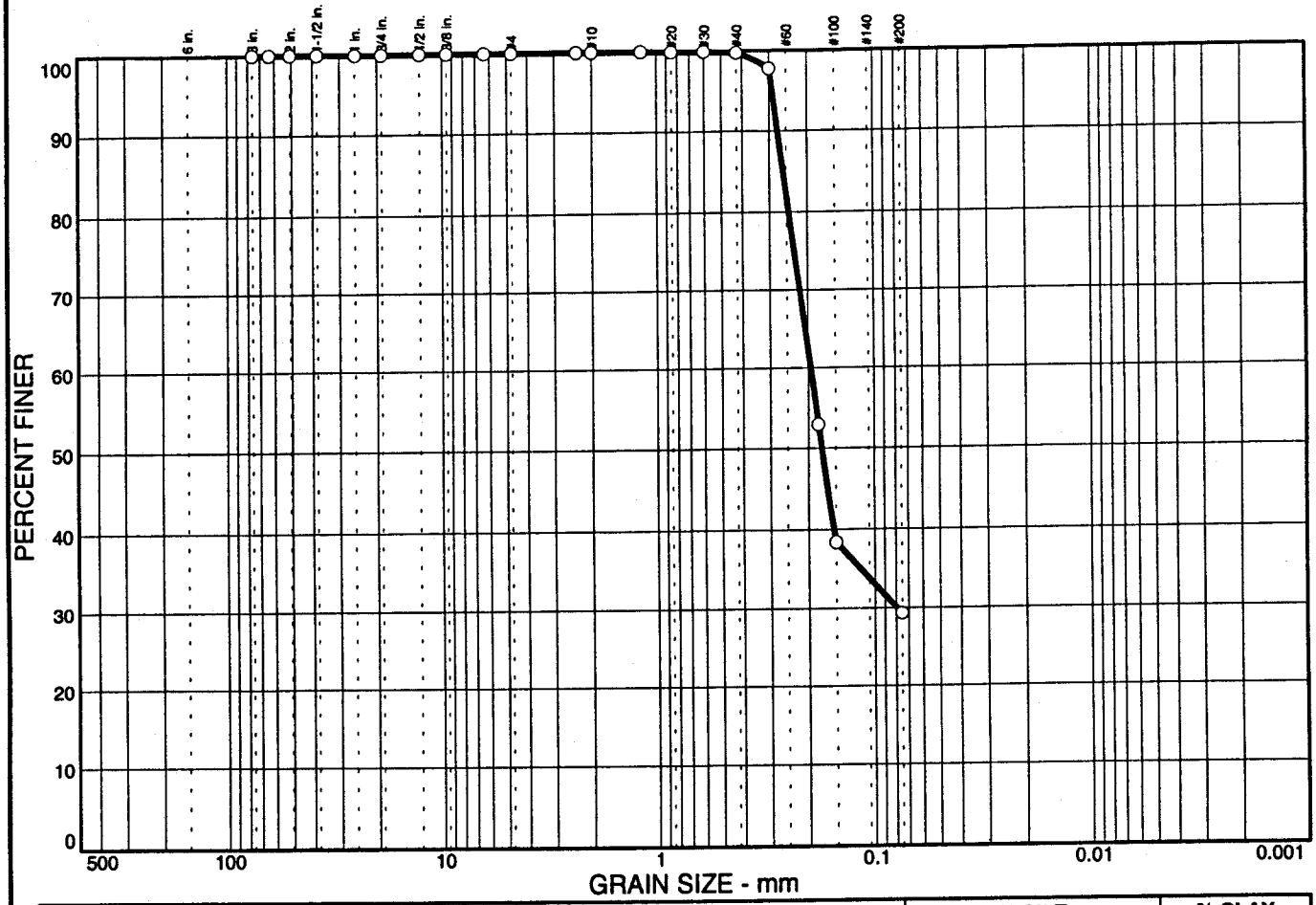
Remarks

Sample No.: PT-1,1292N,792E **Source of Sample:** PT **Date:** 7-26-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	70.7	29.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	100.0		
#20	99.9		
#30	99.9		
#40	99.7		
#50	97.7		
#80	52.9		
#100	38.4		
#200	29.3		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 18 LL= 24 PI= 6

Coefficients

D_{85}= 0.259 D_{60}= 0.195 D_{50}= 0.174
D_{30}= 0.0791 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO=

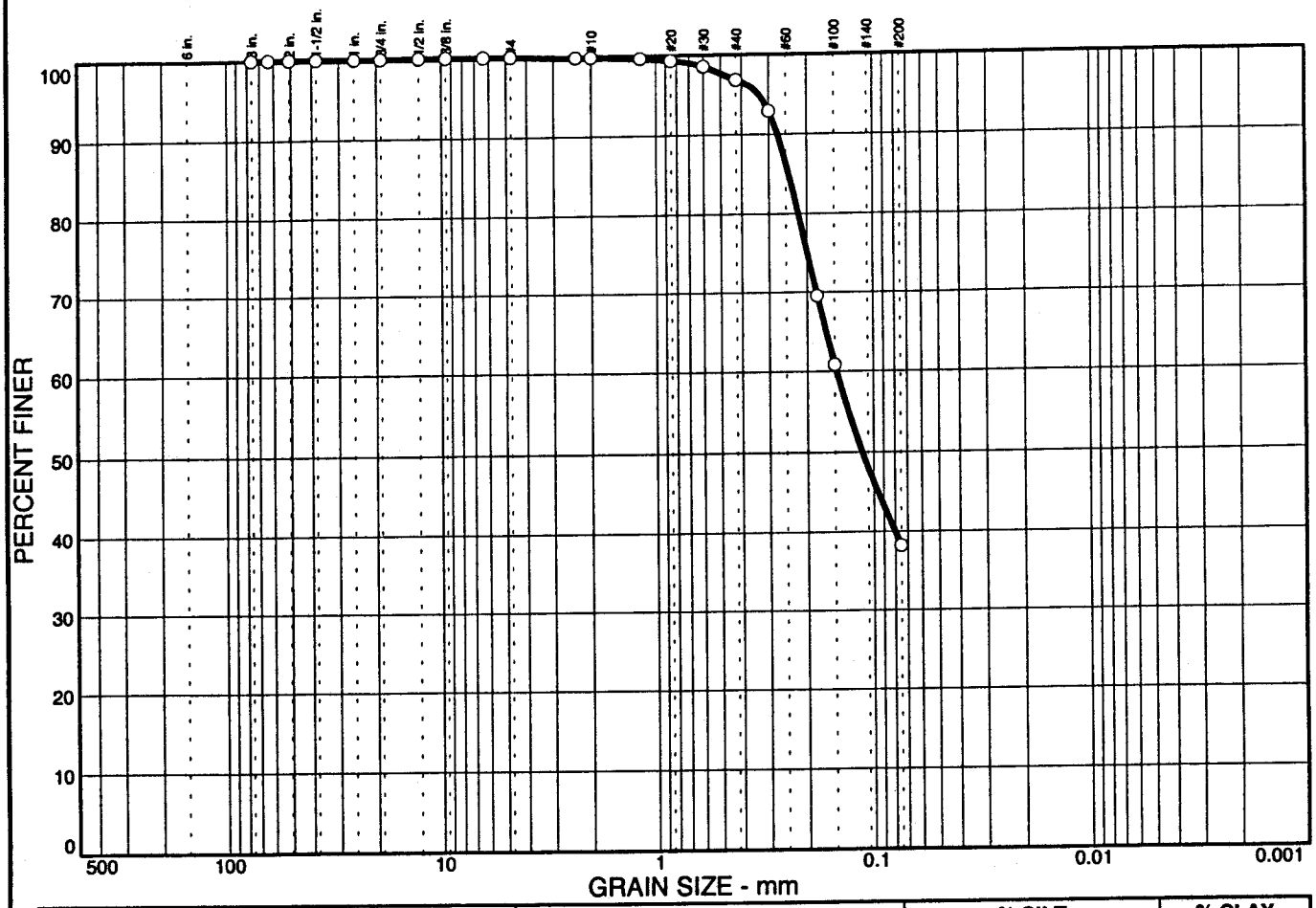
Remarks

Sample No.: PT-2,1250N,1051E **Source of Sample:** PT **Date:** 7-26-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	61.8	38.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	99.8		
#10	99.8		
#16	99.6		
#20	99.3		
#30	98.5		
#40	96.8		
#50	92.9		
#80	69.5		
#100	60.8		
#200	38.2		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 20 LL= 26 PI= 6

Coefficients

D_{85}= 0.243 D_{60}= 0.147 D_{50}= 0.113
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO=

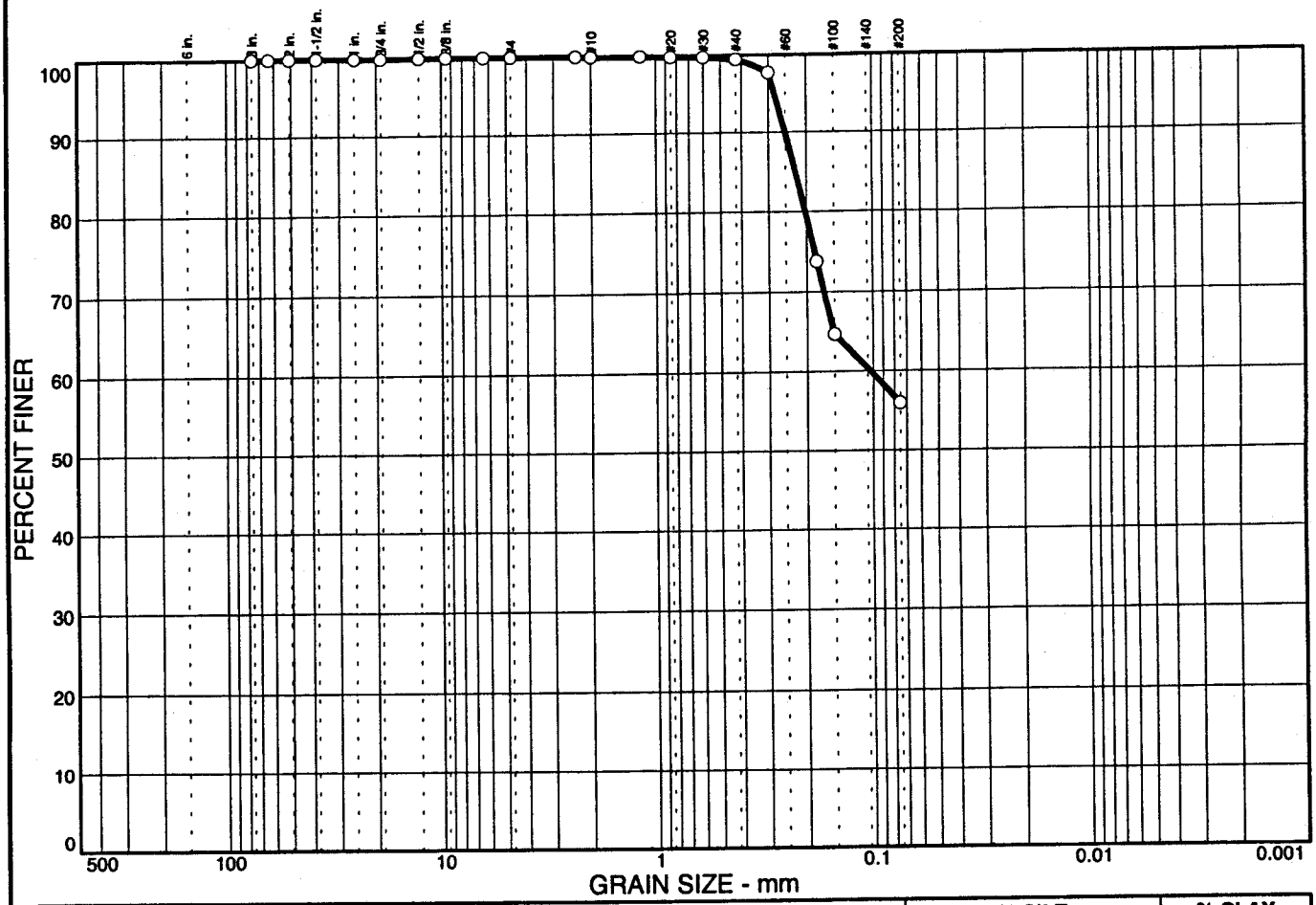
Remarks

Sample No.: PT-3,1053N,795E **Source of Sample:** PT **Date:** 7-26-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	44.0	56.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	99.9		
#16	99.9		
#20	99.8		
#30	99.7		
#40	99.4		
#50	97.7		
#80	73.8		
#100	64.7		
#200	56.0		

* (no specification provided)

Soil Description

Sandy silty clay

Atterberg Limits

PL= 17 LL= 24 PI= 7

Coefficients

D_{85}= 0.226 D_{60}= 0.103 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL-ML AASHTO=

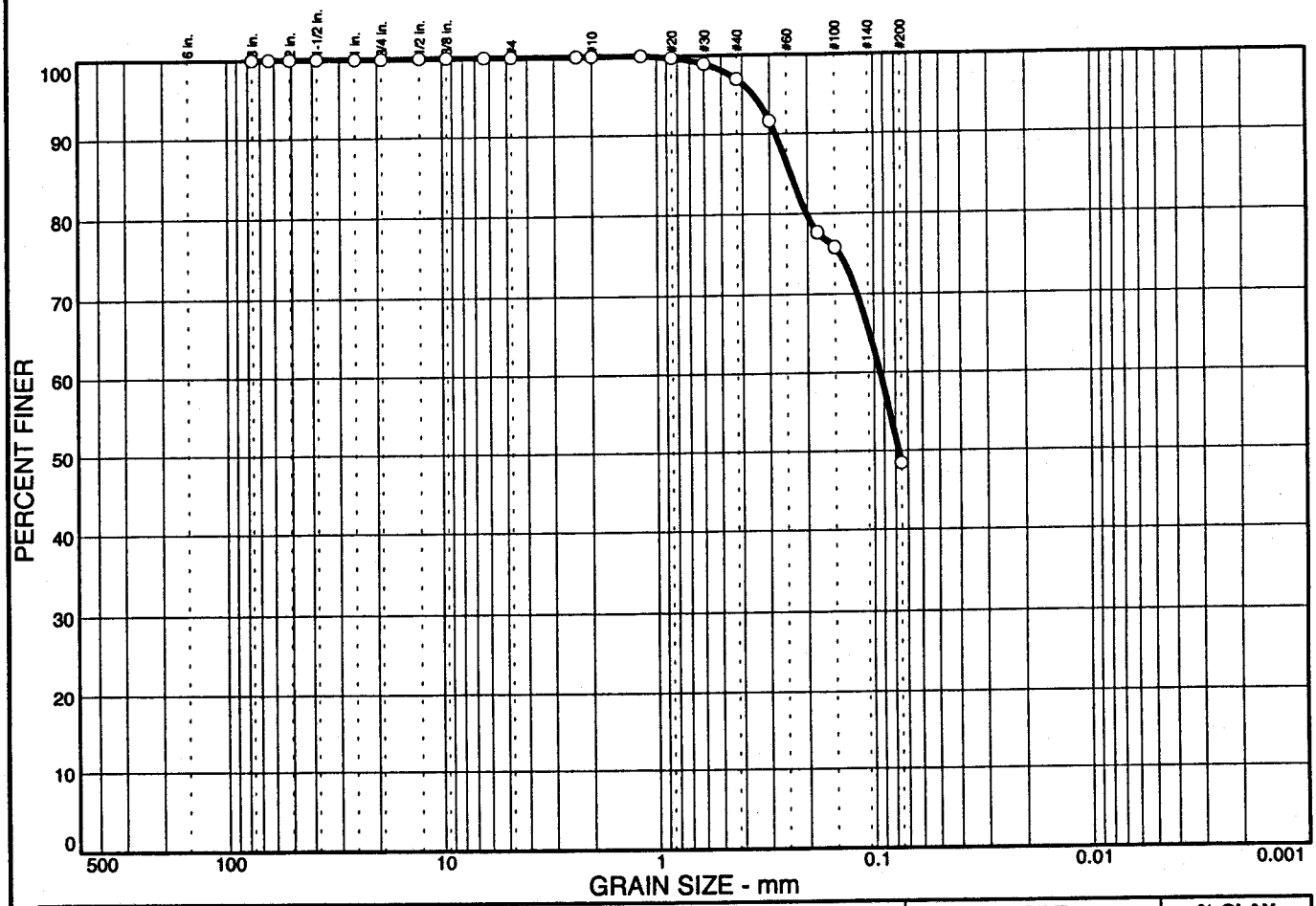
Remarks

Sample No.: PT-4,1050N,1050E **Source of Sample:** PT **Date:**
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	51.6	48.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	100.0		
#20	99.7		
#30	98.9		
#40	96.9		
#50	91.6		
#80	77.7		
#100	75.9		
#200	48.4		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 24 LL= 35 PI= 11

Coefficients

D_{85}= 0.240 D_{60}= 0.0940 D_{50}= 0.0773
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

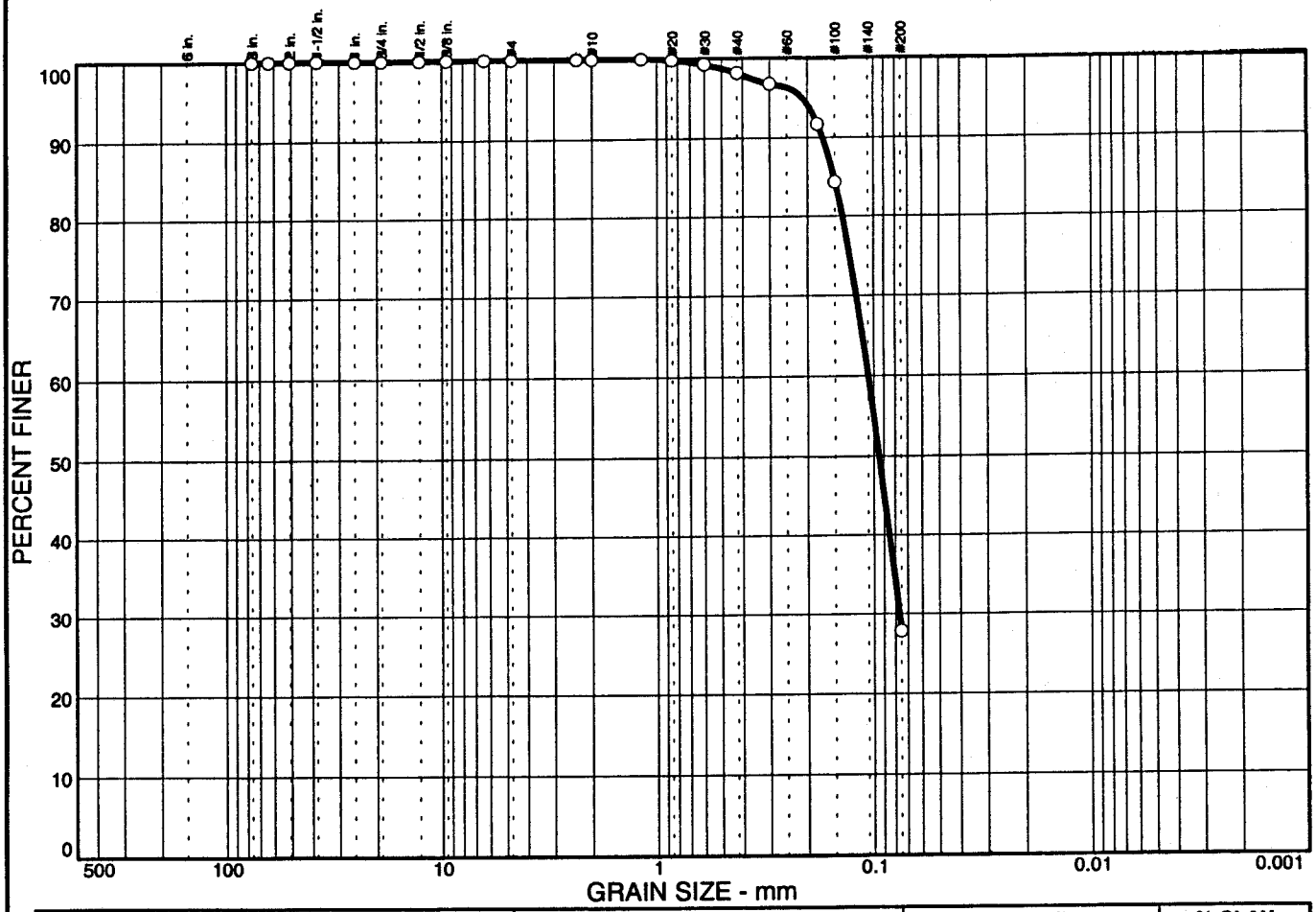
Remarks

Sample No.: PT-5,905N,750E **Source of Sample:** PT **Date:** 7-26-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	72.2	27.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	100.0		
#20	99.8		
#30	99.2		
#40	98.1		
#50	96.7		
#80	91.7		
#100	84.4		
#200	27.8		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= 23 LL= 24 PI= 1

Coefficients

D_{85}= 0.152 D_{60}= 0.106 D_{50}= 0.0947
D_{30}= 0.0767 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

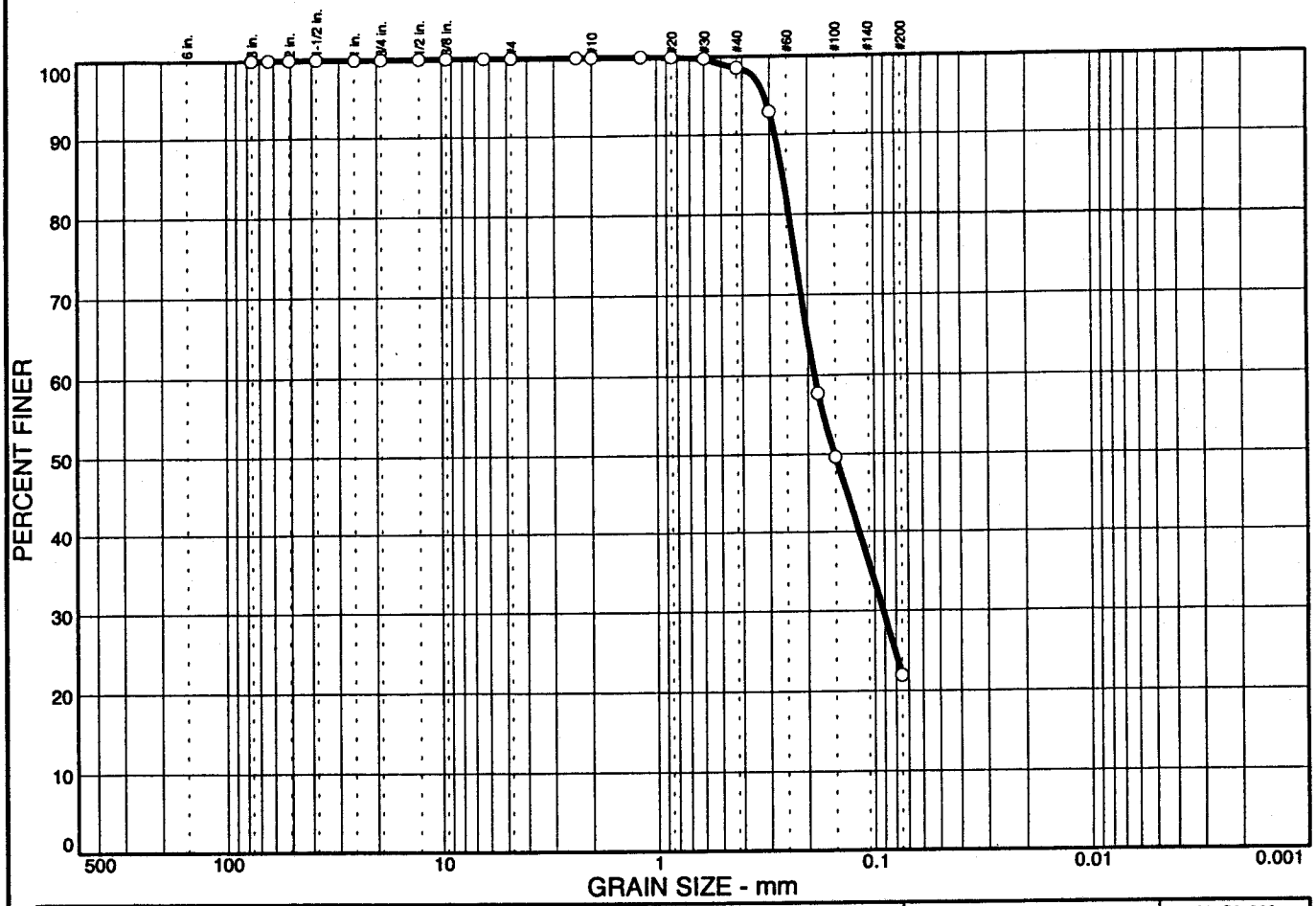
Remarks

Sample No.: PT-6,895N,1009E **Source of Sample:** PT **Date:** 7-26-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	78.1	21.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	100.0		
#20	99.9		
#30	99.7		
#40	98.5		
#50	92.9		
#80	57.7		
#100	49.6		
#200	21.9		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= 21 LL= 23 PI= 2

Coefficients

D_{85}= 0.262 D_{60}= 0.187 D_{50}= 0.152
D_{30}= 0.0916 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

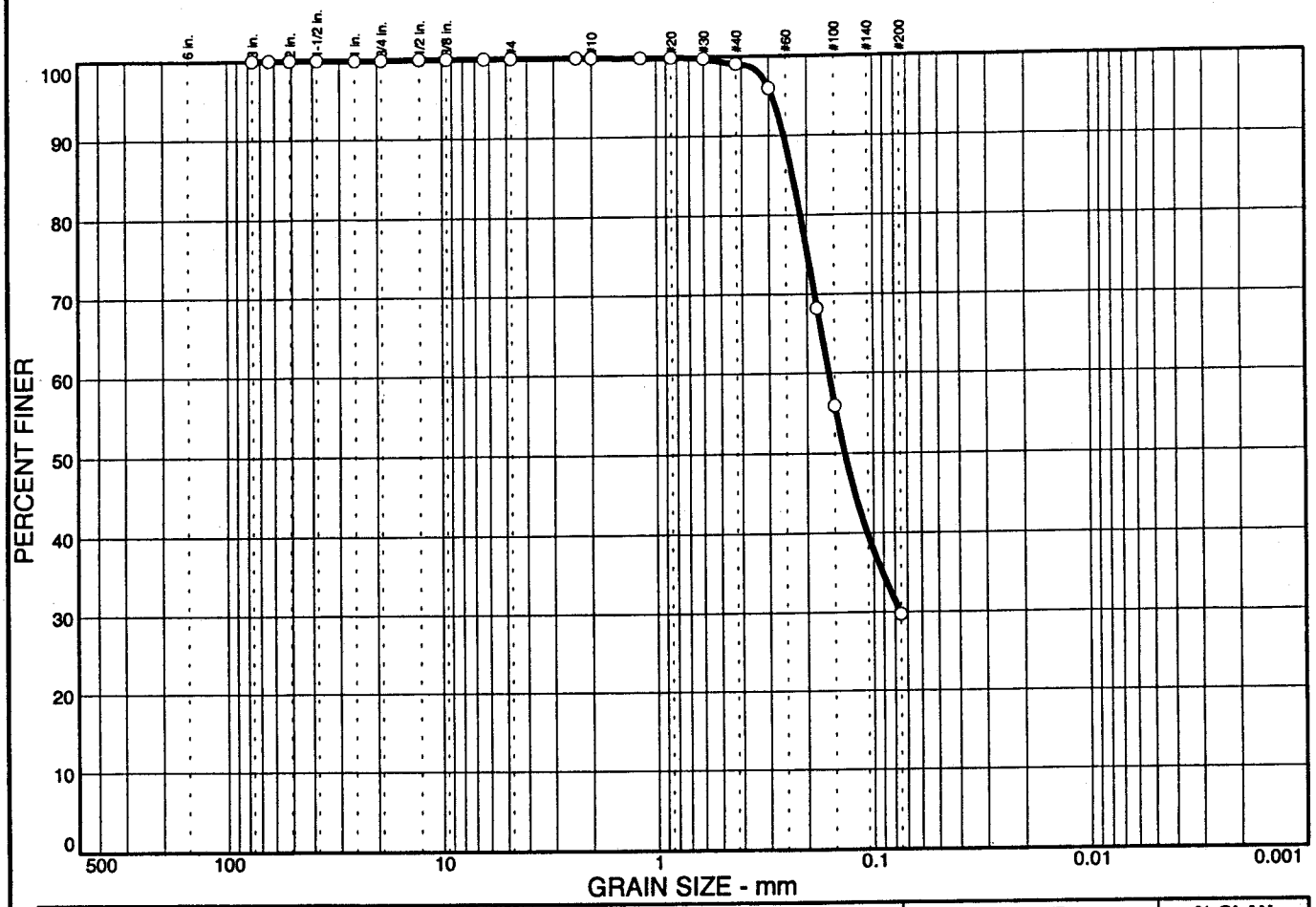
Remarks

Sample No.: PT-7,750N,755E **Source of Sample:** PT **Date:** 7-26-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	70.3	29.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	99.9		
#20	99.9		
#30	99.7		
#40	99.0		
#50	95.9		
#80	68.2		
#100	55.9		
#200	29.7		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= 21 LL= 23 PI= 2

Coefficients

D_{85}= 0.233 D_{60}= 0.160 D_{50}= 0.135
D_{30}= 0.0759 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

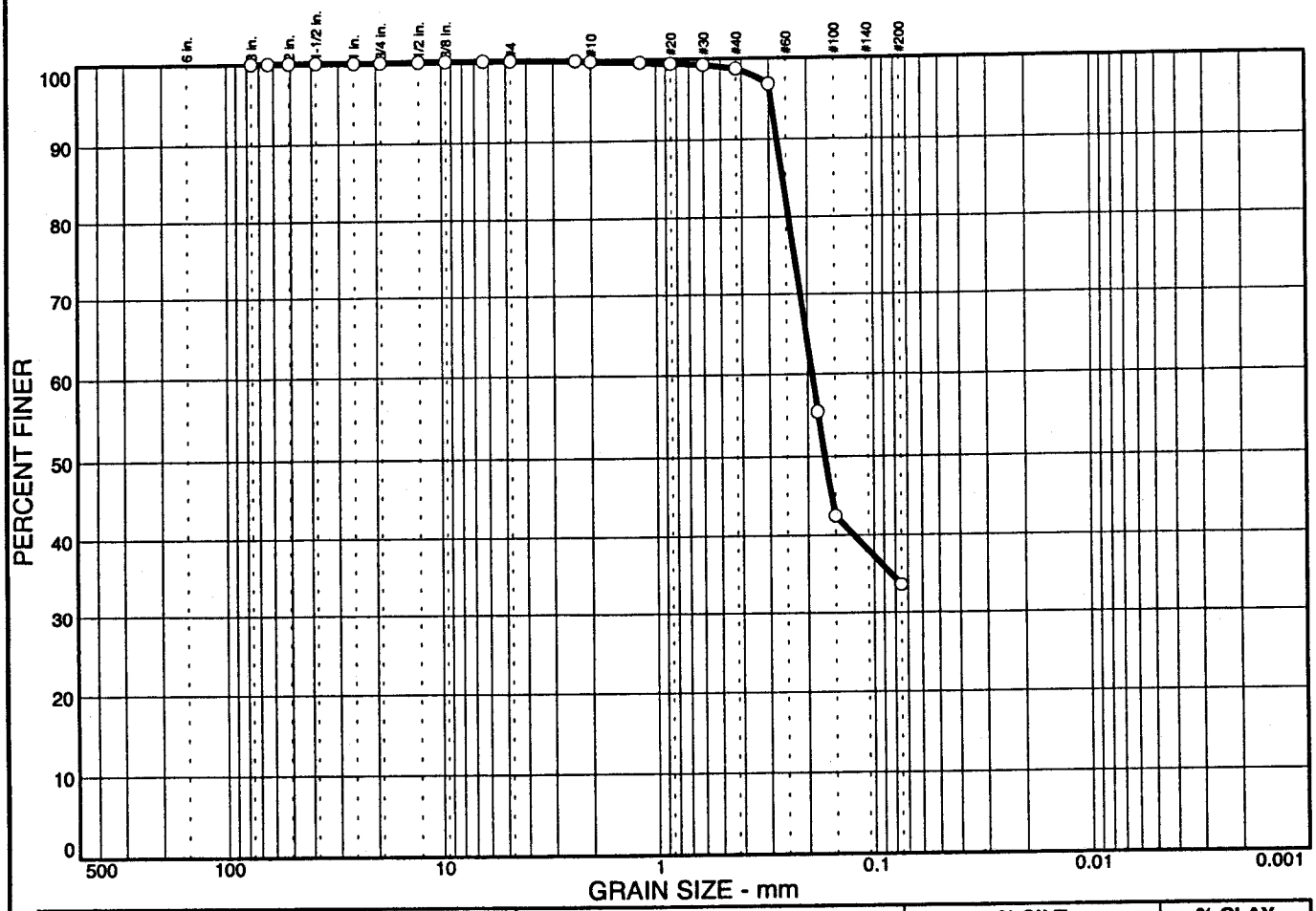
Remarks

Sample No.: PT-8,700N,1000E **Source of Sample:** PT **Date:** 7-25-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	66.4	33.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	99.9		
#10	99.8		
#16	99.6		
#20	99.4		
#30	99.2		
#40	98.7		
#50	96.8		
#80	55.4		
#100	42.5		
#200	33.6		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 22 LL= 29 PI= 7

Coefficients

D_{85}= 0.260 D_{60}= 0.191 D_{50}= 0.168
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO=

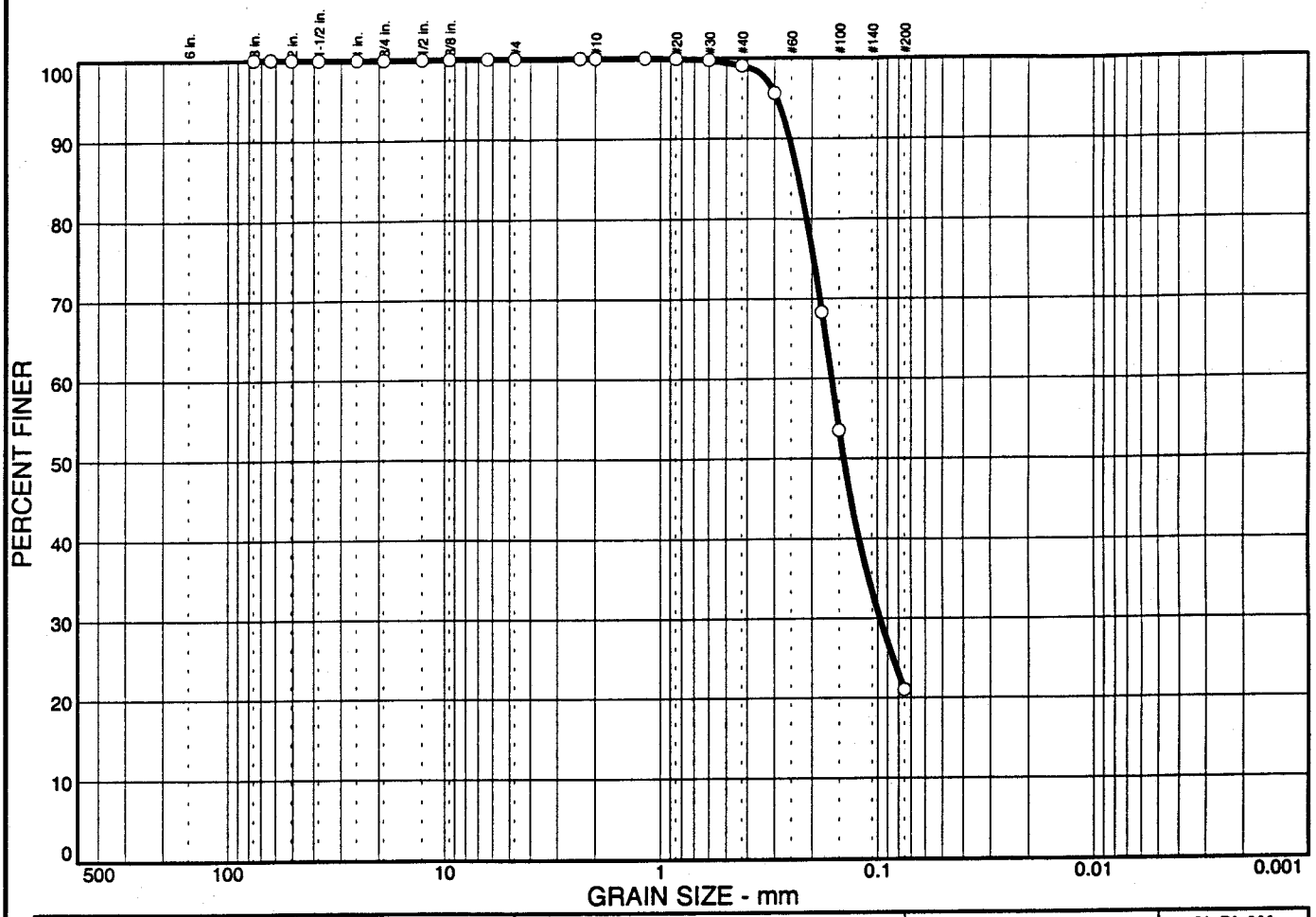
Remarks

Sample No.: PT-9,1460N,900E **Source of Sample:** PT **Date:** 7-26-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	79.0	21.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	100.0		
#20	99.9		
#30	99.7		
#40	99.0		
#50	95.6		
#80	68.3		
#100	53.5		
#200	21.0		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= 21 LL= 22 PI= 1

Coefficients

D_{85}= 0.230 D_{60}= 0.163 D_{50}= 0.143
D_{30}= 0.0975 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

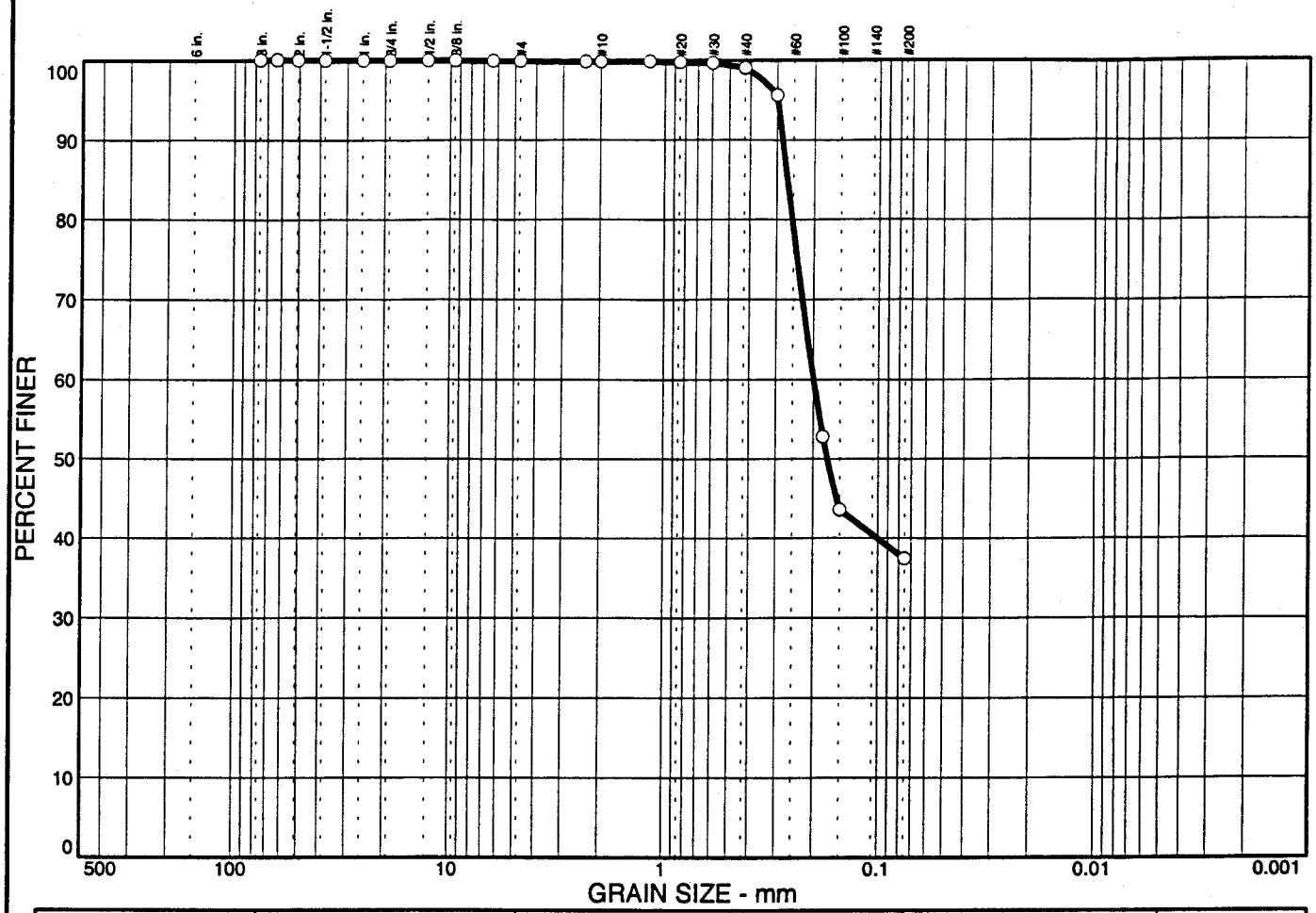
Remarks

Sample No.: PT-10, 670N, 900E **Source of Sample:** PT **Date:** 8-3-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	62.5	37.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	99.9		
#4	99.9		
#8	99.8		
#10	99.8		
#16	99.8		
#20	99.7		
#30	99.6		
#40	99.0		
#50	95.6		
#80	52.8		
#100	43.6		
#200	37.4		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 20 LL= 27 PI= 7

Coefficients

D_{85}= 0.267 D_{60}= 0.200 D_{50}= 0.172
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO=

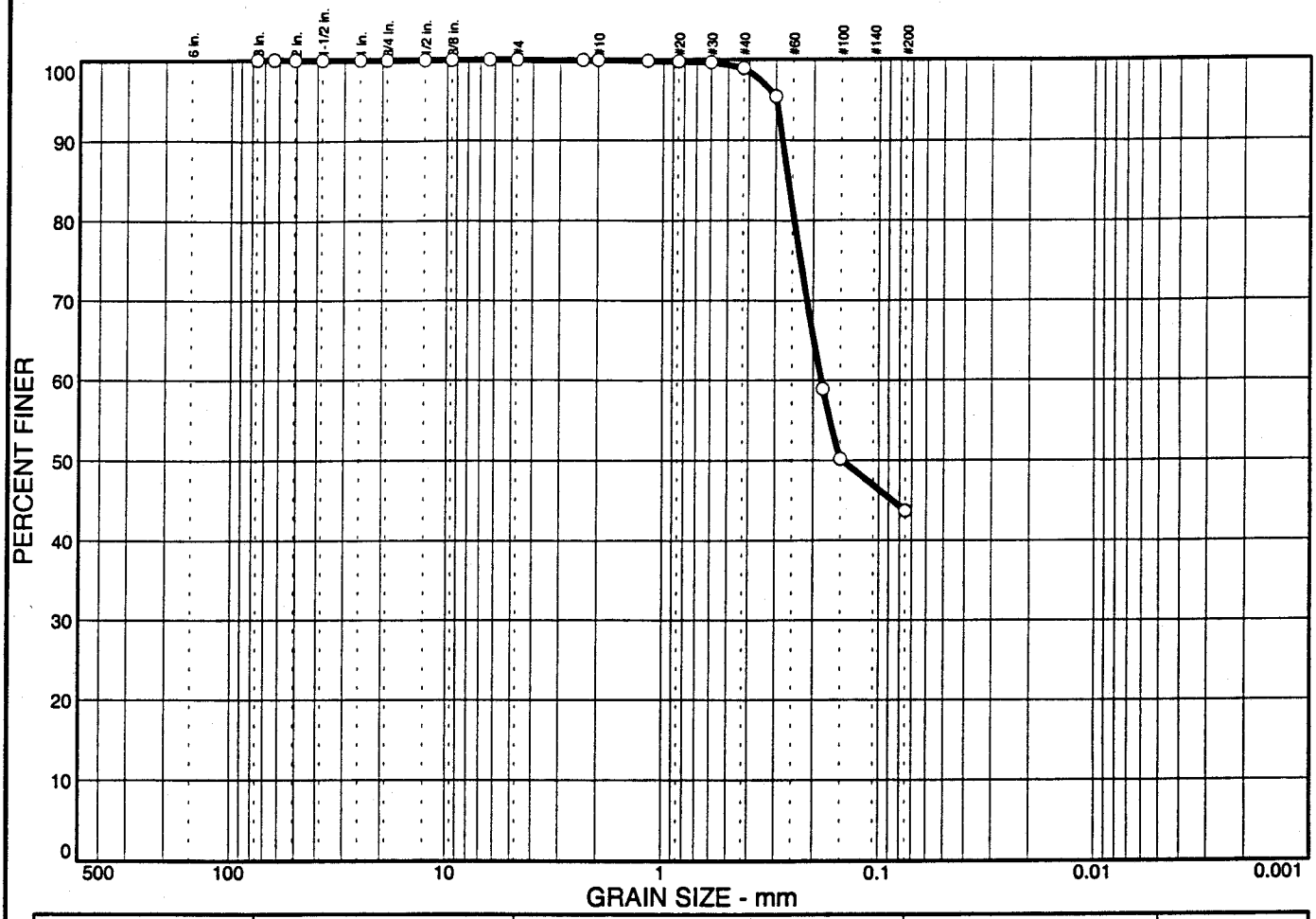
Remarks

Sample No.: PT-11, 800N, 705E **Source of Sample:** PT **Date:** 8-3-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	56.3	43.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	99.8		
#20	99.7		
#30	99.6		
#40	98.9		
#50	95.4		
#80	58.9		
#100	50.2		
#200	43.7		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 20 LL= 32 PI= 12

Coefficients

D_{85}= 0.262 D_{60}= 0.183 D_{50}= 0.147
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

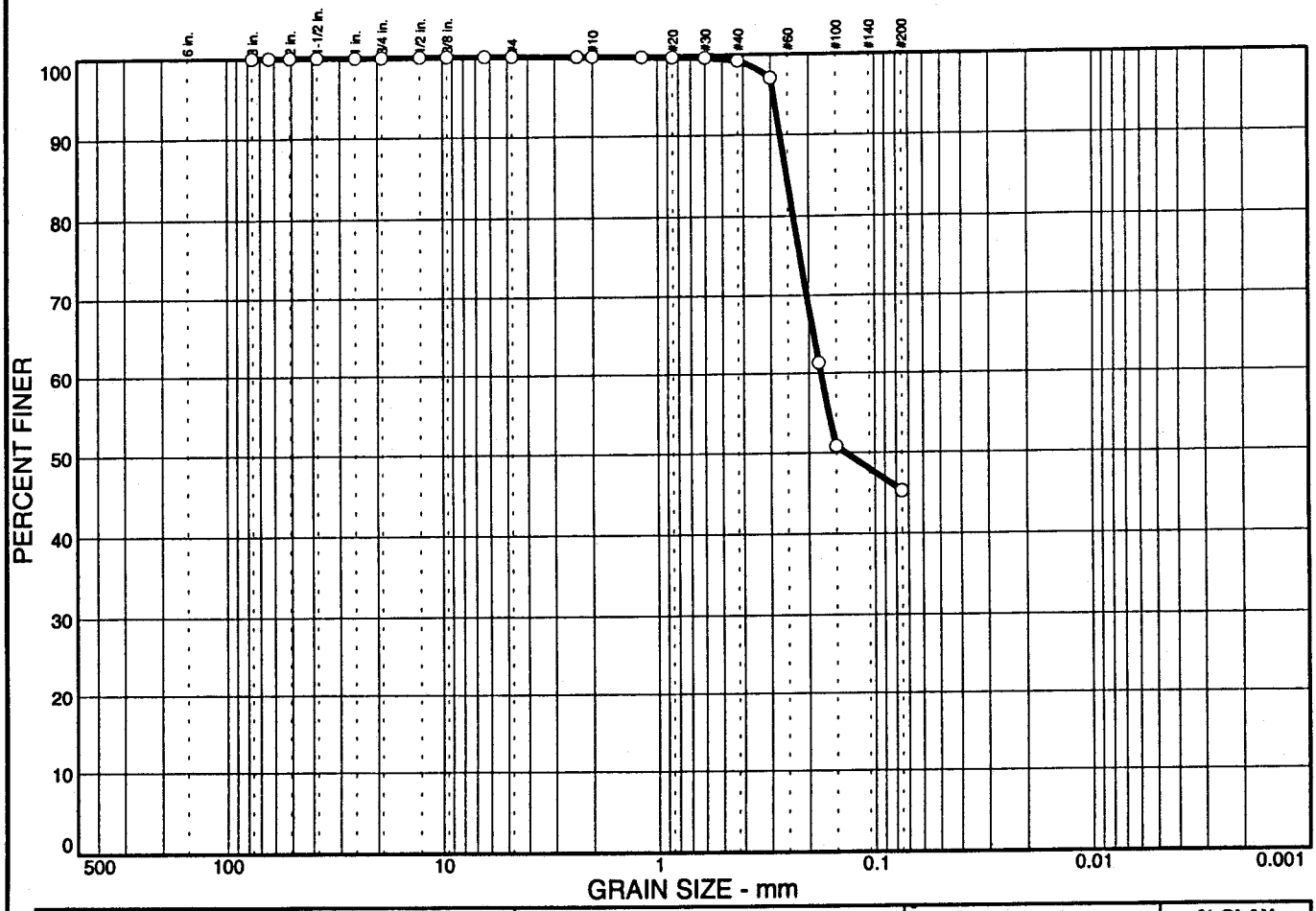
Remarks

Sample No.: PT-12, 800N, 1045E **Source of Sample:** PT **Date:** 8-3-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	54.8	45.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	99.8		
#20	99.7		
#30	99.6		
#40	99.2		
#50	97.0		
#80	61.3		
#100	50.8		
#200	45.2		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 21 LL= 28 PI= 7

Coefficients

D_{85}= 0.254 D_{60}= 0.176 D_{50}= 0.136
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO=

Remarks

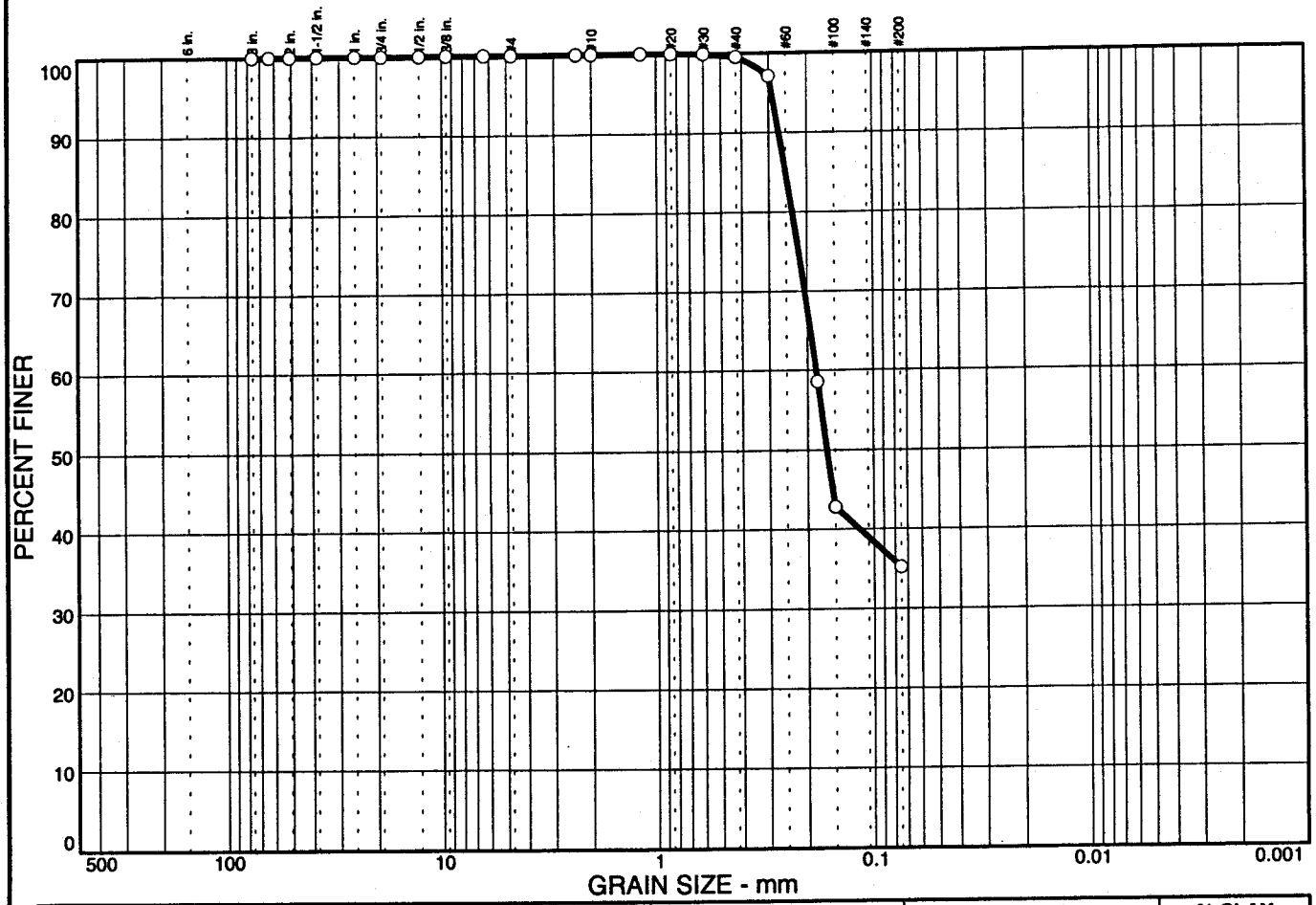
Sample No.: PT-13, 1000N, 750E **Source of Sample:** PT **Date:** 8-11-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

V3RS

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	64.8	35.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	100.0		
#20	100.0		
#30	99.9		
#40	99.5		
#50	97.1		
#80	58.5		
#100	42.8		
#200	35.2		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 20 LL= 27 PI= 7

Coefficients

D_{85}= 0.251 D_{60}= 0.183 D_{50}= 0.164
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO=

Remarks

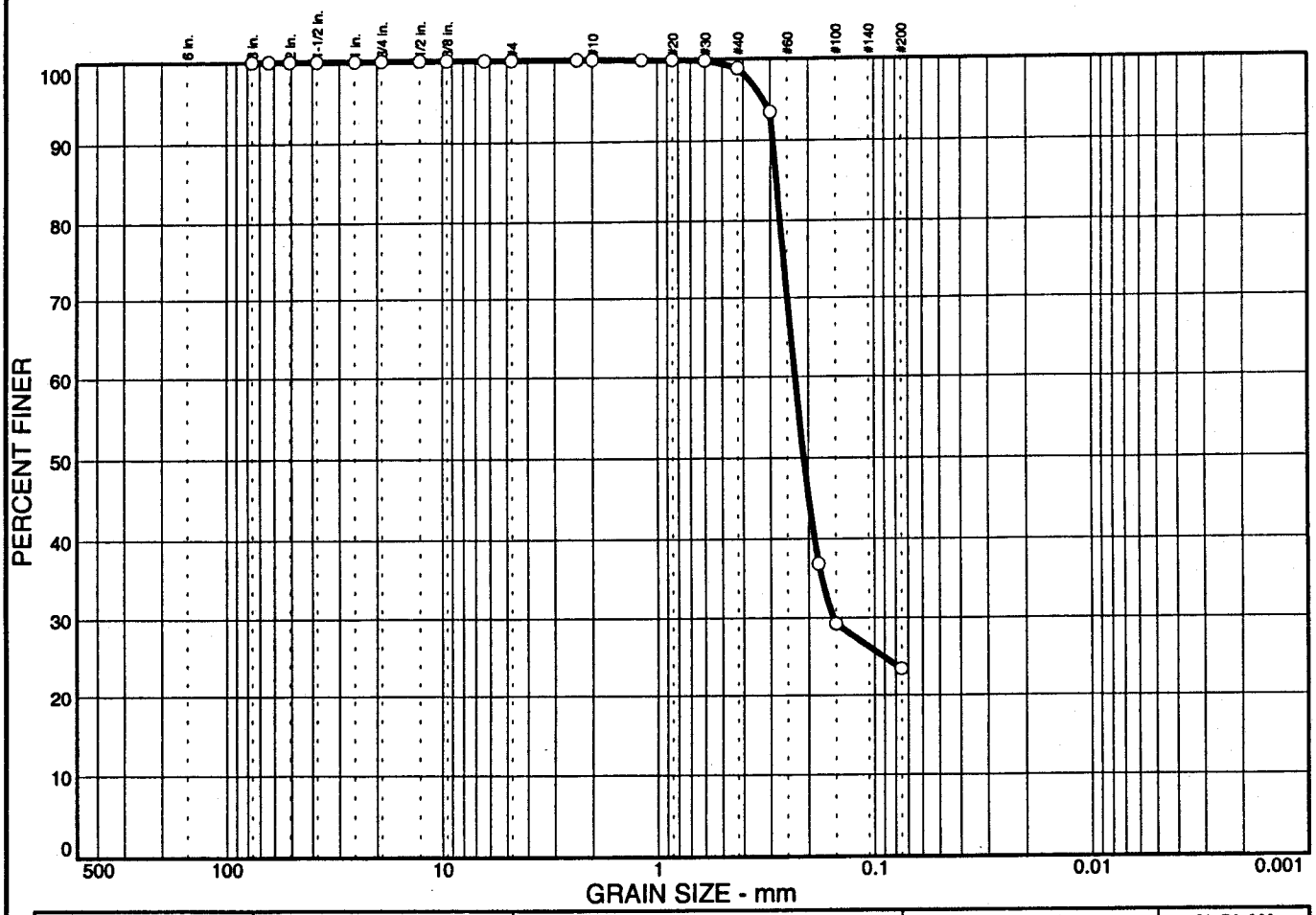
Sample No.: PT-14, 100N, 1015E **Source of Sample:** PT **Date:** 8-11-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

VTRS

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	76.6	23.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	99.9		
#20	99.9		
#30	99.8		
#40	98.8		
#50	93.4		
#80	36.9		
#100	29.2		
#200	23.4		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.281 D_{60}= 0.231 D_{50}= 0.211
D_{30}= 0.154 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

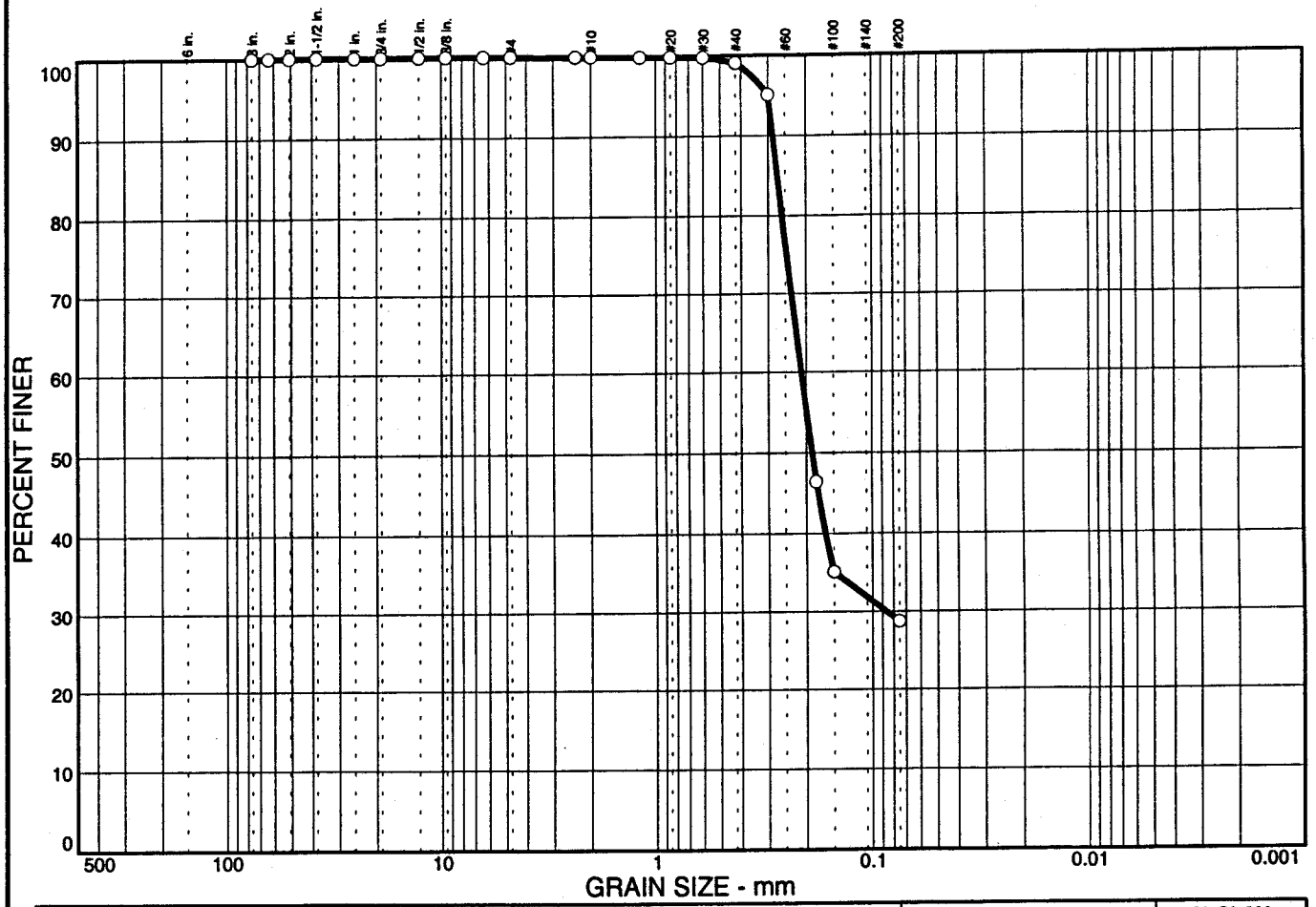
Remarks

Sample No.: PT-15, 1200N, 775E **Source of Sample:** PT **Date:** 8-11-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	71.3	28.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	99.8		
#20	99.8		
#30	99.7		
#40	99.0		
#50	95.1		
#80	46.4		
#100	35.1		
#200	28.7		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 17 LL= 21 PI= 4

Coefficients

D_{85}= 0.272 D_{60}= 0.211 D_{50}= 0.188
D_{30}= 0.0863 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO=

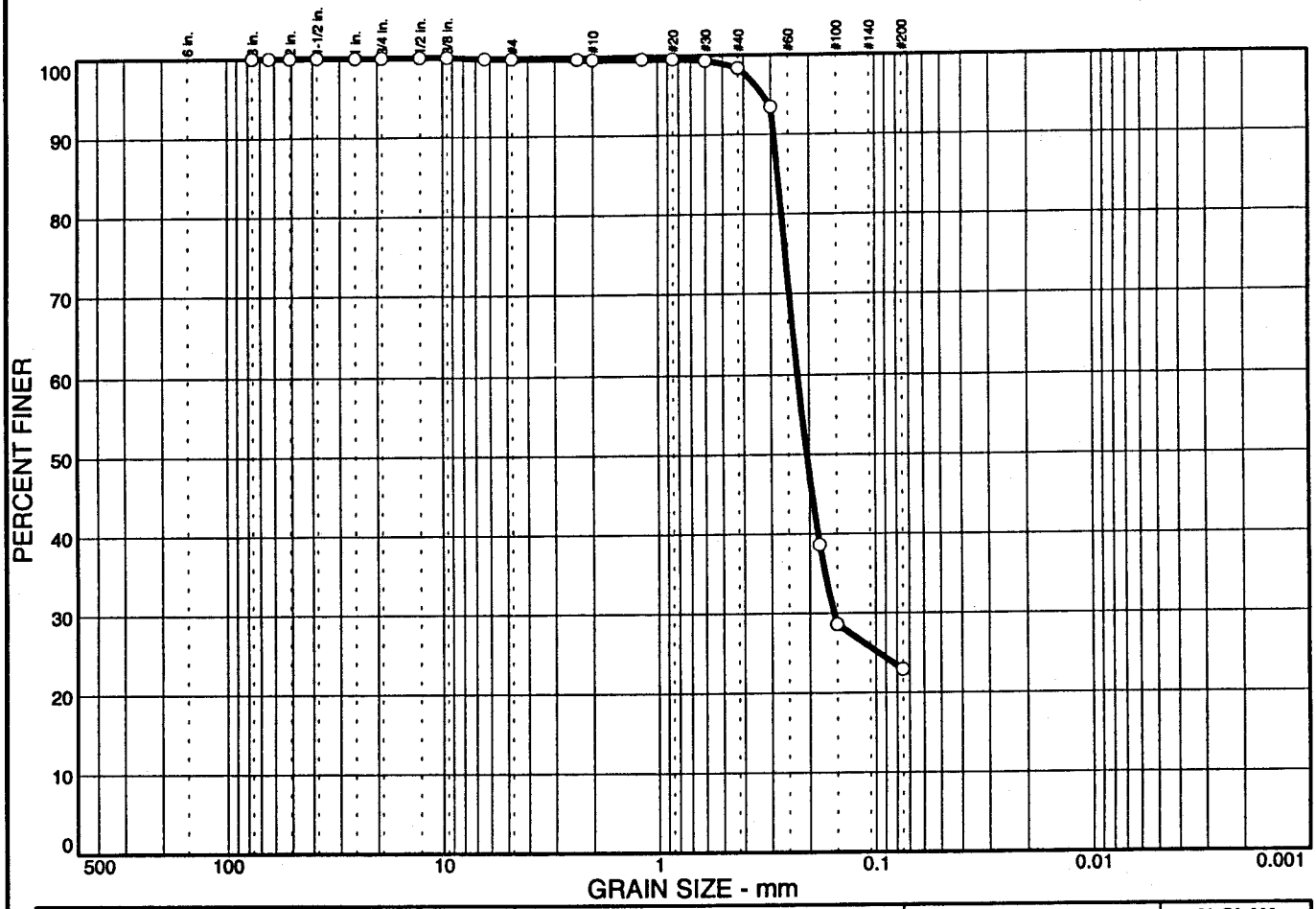
Remarks

Sample No.: PT-16, 1200N, 1010E **Source of Sample:** PT **Date:** 8-11-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	76.8	22.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	99.8		
#4	99.7		
#8	99.6		
#10	99.5		
#16	99.5		
#20	99.5		
#30	99.3		
#40	98.3		
#50	93.4		
#80	38.6		
#100	28.6		
#200	22.9		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= 16 LL= 17 PI= 1

Coefficients

D_{85}= 0.280 D_{60}= 0.226 D_{50}= 0.206
D_{30}= 0.155 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

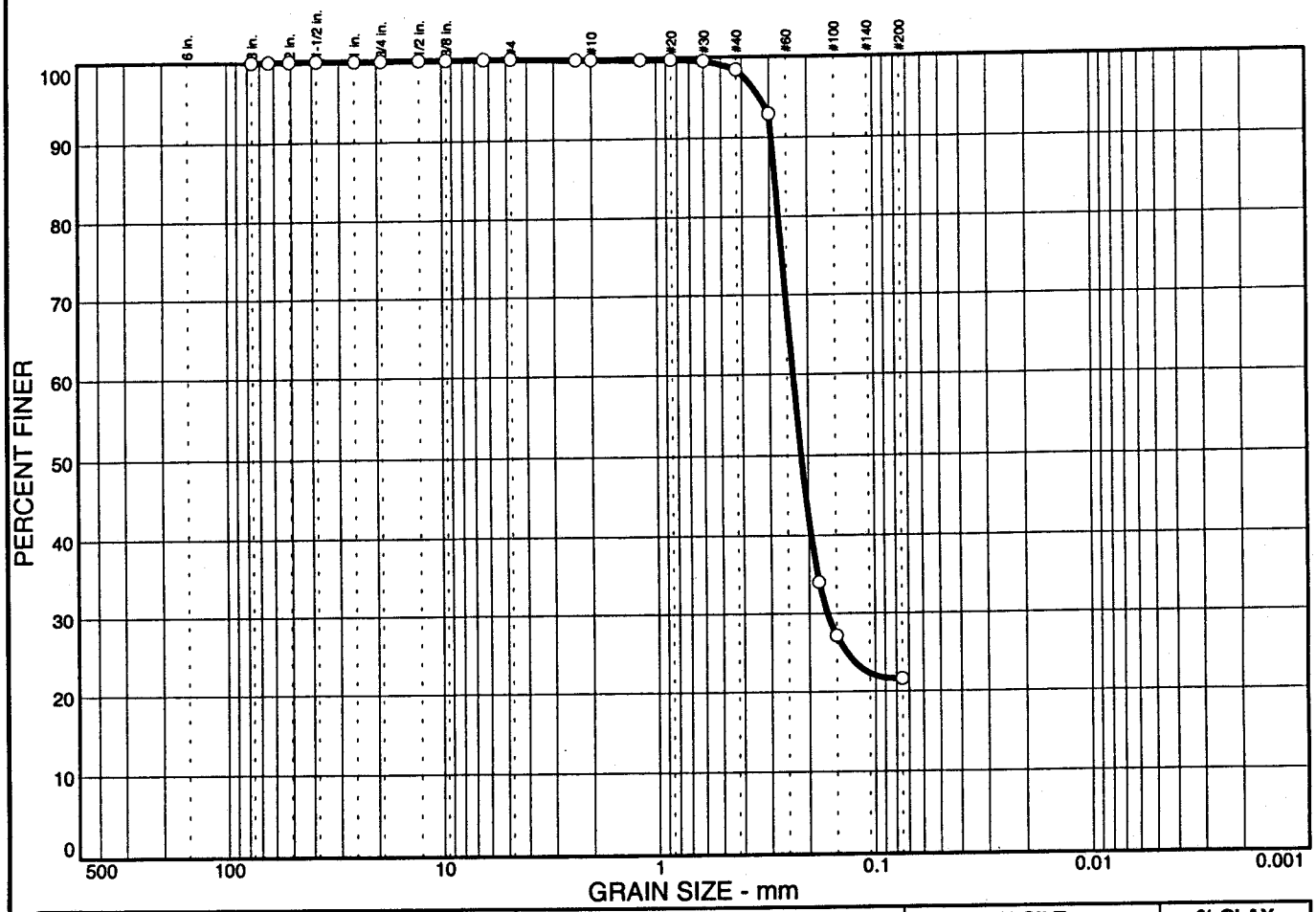
Remarks

Sample No.: PT-17, 1400N, 1050E **Source of Sample:** PT **Date:** 8-11-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	78.4	21.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	99.8		
#10	99.8		
#16	99.7		
#20	99.7		
#30	99.5		
#40	98.4		
#50	92.9		
#80	34.0		
#100	27.1		
#200	21.6		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.283 D_{60}= 0.235 D_{50}= 0.216
D_{30}= 0.166 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

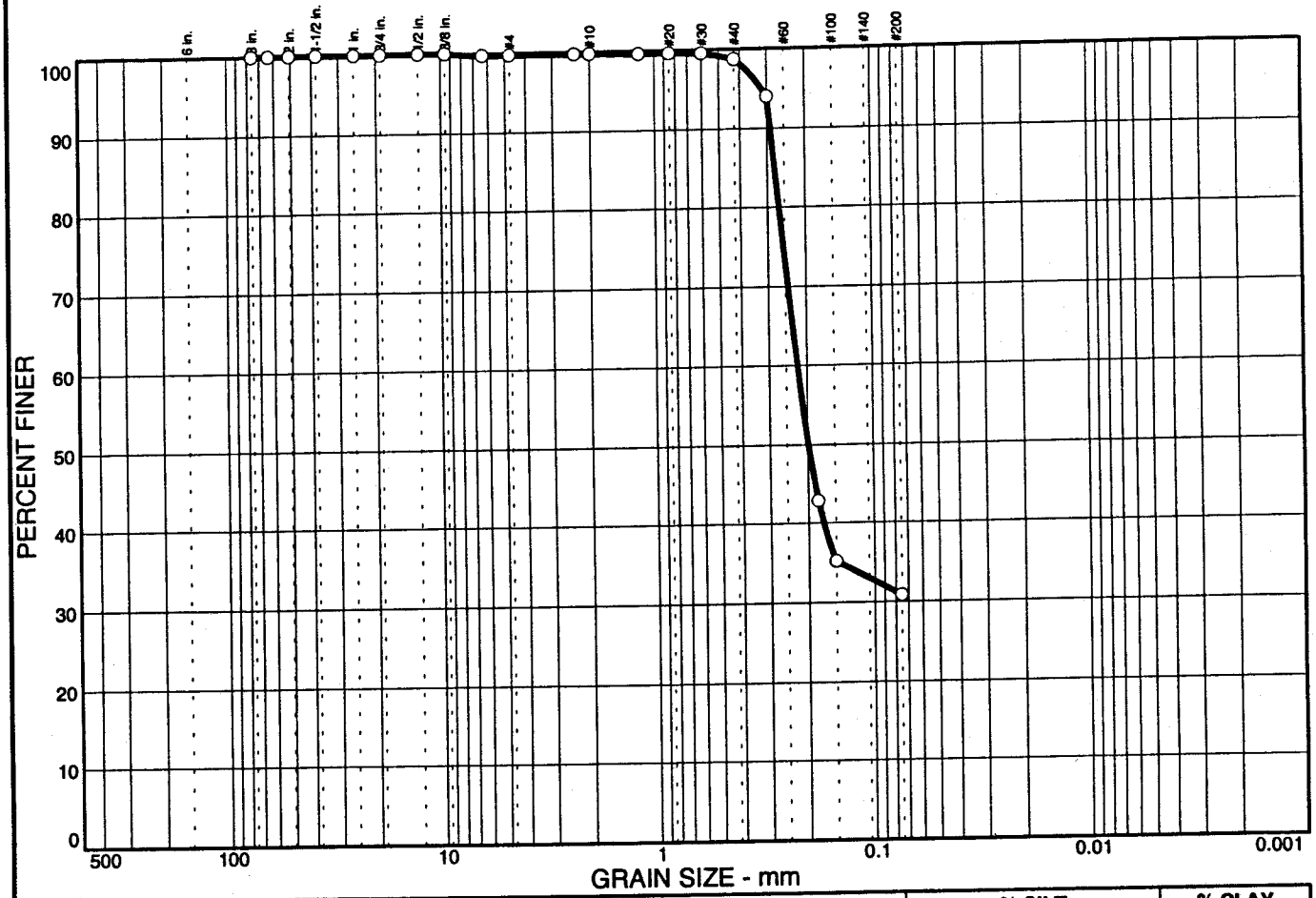
Remarks

Sample No.: PT-17A, 1400N,775E **Source of Sample:** PT **Date:** 8-11-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	68.9	30.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	99.7		
#4	99.7		
#8	99.7		
#10	99.7		
#16	99.6		
#20	99.6		
#30	99.5		
#40	98.7		
#50	94.0		
#80	42.8		
#100	35.2		
#200	30.8		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 19 LL= 23 PI= 4

Coefficients

D_{85}= 0.278 D_{60}= 0.222 D_{50}= 0.199
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO=

Remarks

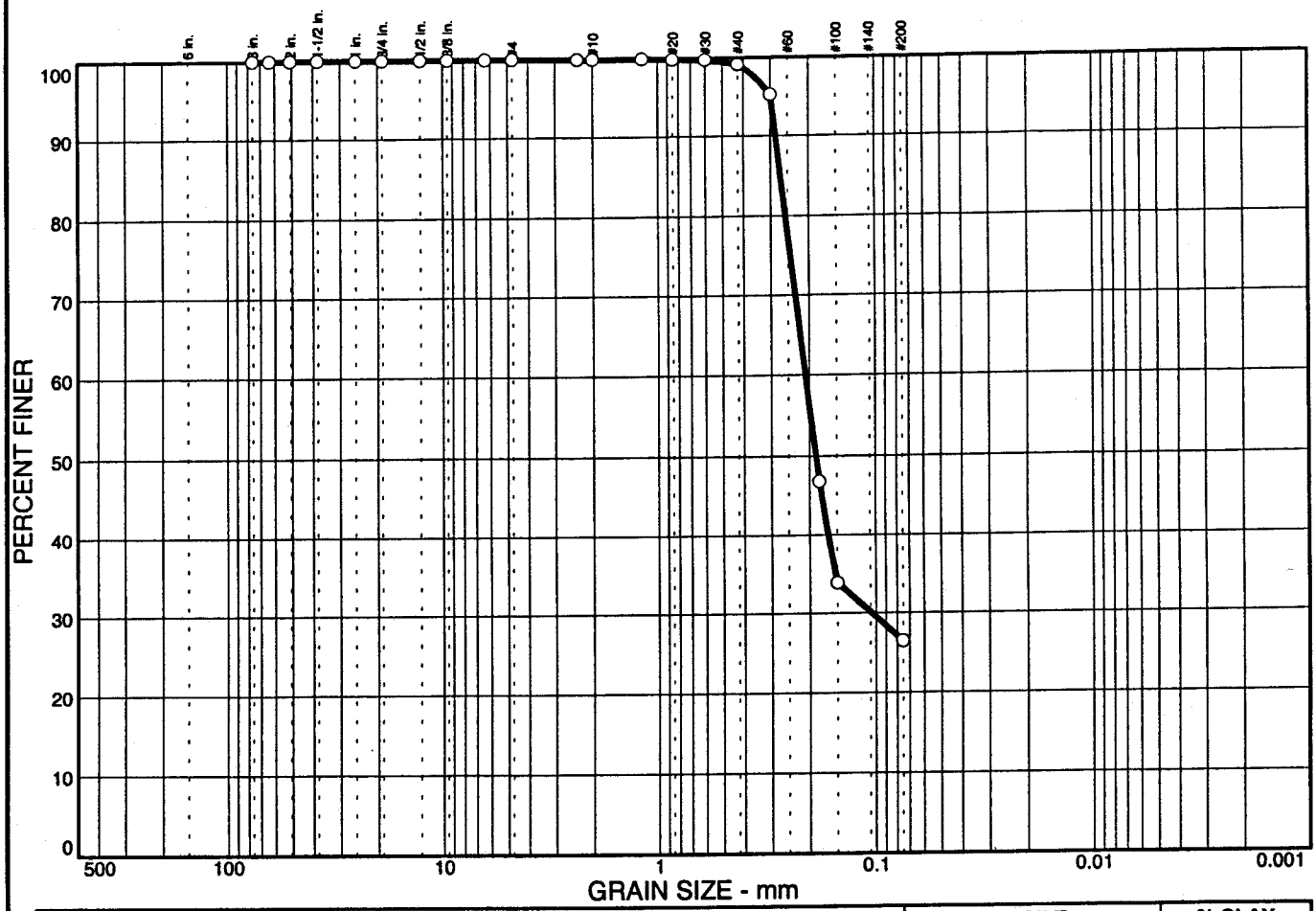
Sample No.: PT-18, 1400N, 1050E **Source of Sample:** PT **Date:** 8-11-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

✓ HJW

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	73.5	26.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	99.9		
#20	99.8		
#30	99.7		
#40	99.1		
#50	95.2		
#80	46.8		
#100	33.8		
#200	26.5		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= 17 LL= 19 PI= 2

Coefficients

D_{85}= 0.270 D_{60}= 0.209 D_{50}= 0.187
D_{30}= 0.105 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

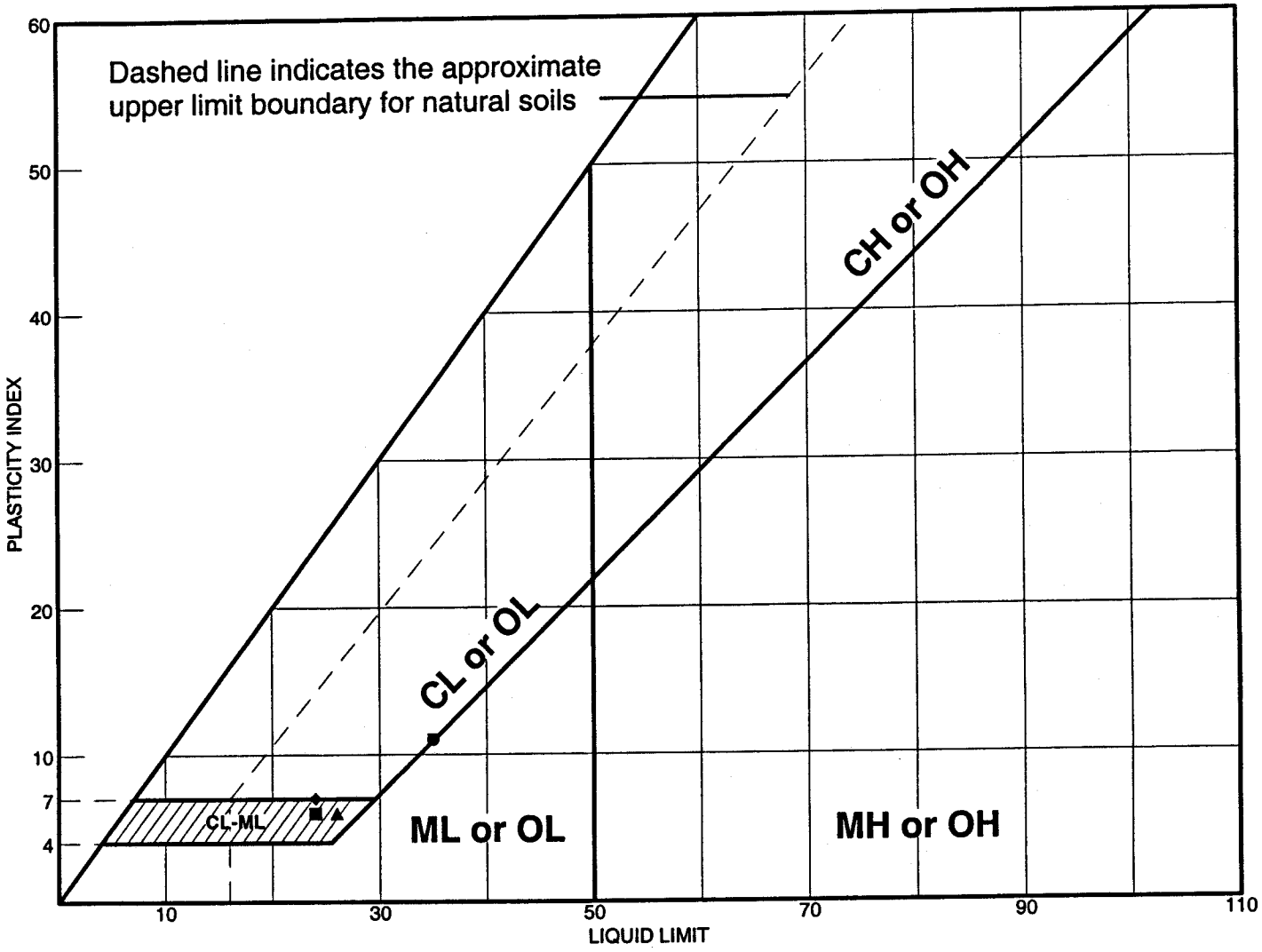
Remarks

Sample No.: PT-17B, 1393N, 715E **Source of Sample:** PT **Date:** 8-22-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey sand	35	24	11	99.6	42.5	SC
■	Silty, clayey sand	24	18	6	99.7	29.3	SC-SM
▲	Silty, clayey sand	26	20	6	96.8	38.2	SC-SM
◆	Sandy silty clay	24	17	7	99.4	56.0	CL-ML
▼	Clayey sand	35	24	11	96.9	48.4	SC

Project No. 5108.08 **Client:** WEYERHAEUSER

Project:

● **Source:** PT **Sample No.:** PT-1,1292N,792E

■ **Source:** PT **Sample No.:** PT-2,1250N,1051E

▲ **Source:** PT **Sample No.:** PT-3,1053N,795E

◆ **Source:** PT **Sample No.:** PT-4,1050N,1050E

▼ **Source:** PT **Sample No.:** PT-5,905N,750E

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)

RMT, Inc.

Remarks:

●

■

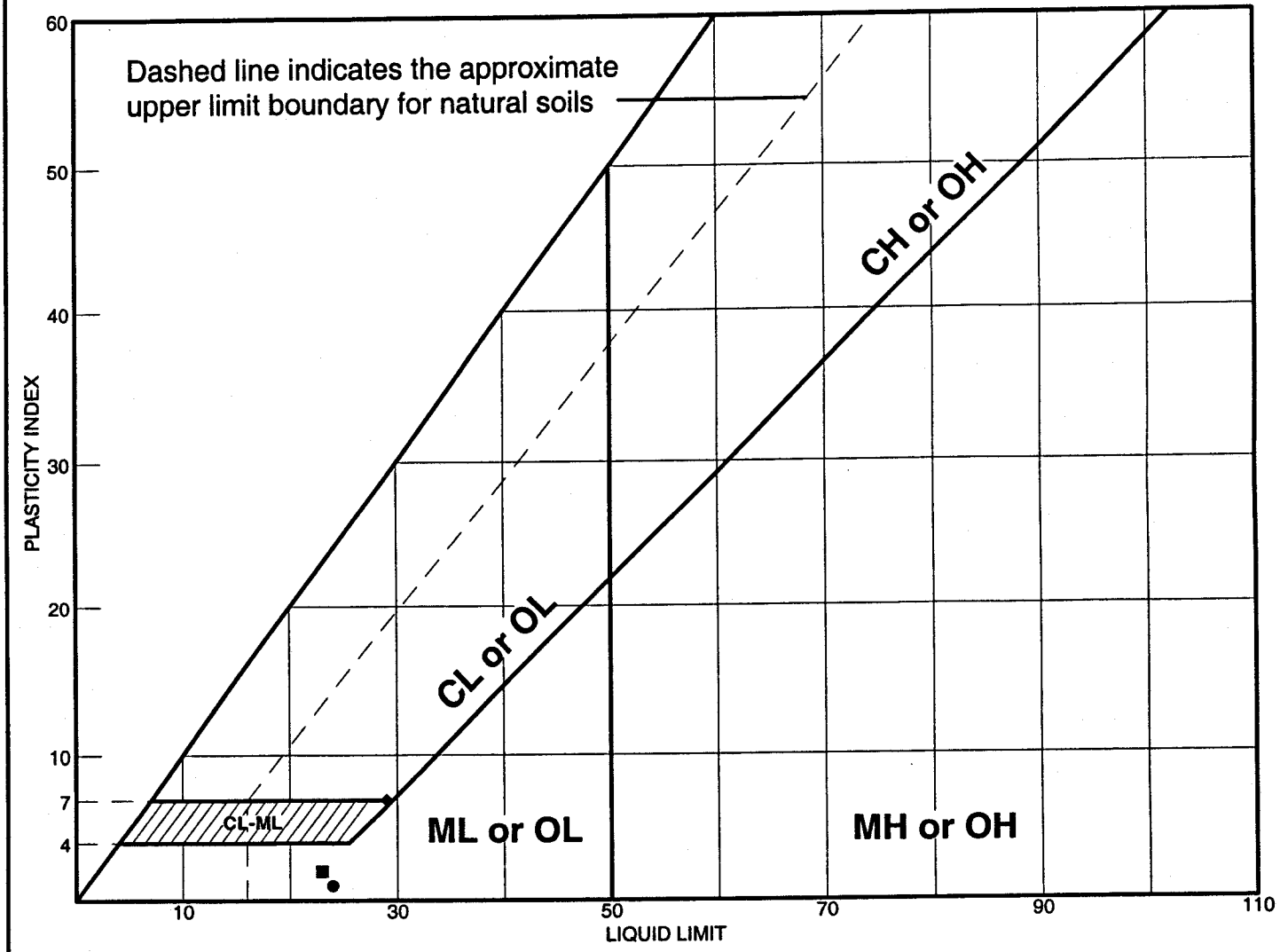
▲

◆

▼

Figure:

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand	24	23	1	98.1	27.8	SM
■	Silty sand	23	21	2	98.5	21.9	SM
▲	Silty sand	23	21	2	99.0	29.7	SM
◆	Silty, clayey sand	29	22	7	98.7	33.6	SC-SM

Project No. 5108.08 **Client:** WEYERHAEUSER

Project:

● **Source:** PT **Sample No.:** PT-6,895N,1009E
■ **Source:** PT **Sample No.:** PT-7,750N,755E
▲ **Source:** PT **Sample No.:** PT-8,700N,1000E
◆ **Source:** PT **Sample No.:** PT-9,1460N,900E

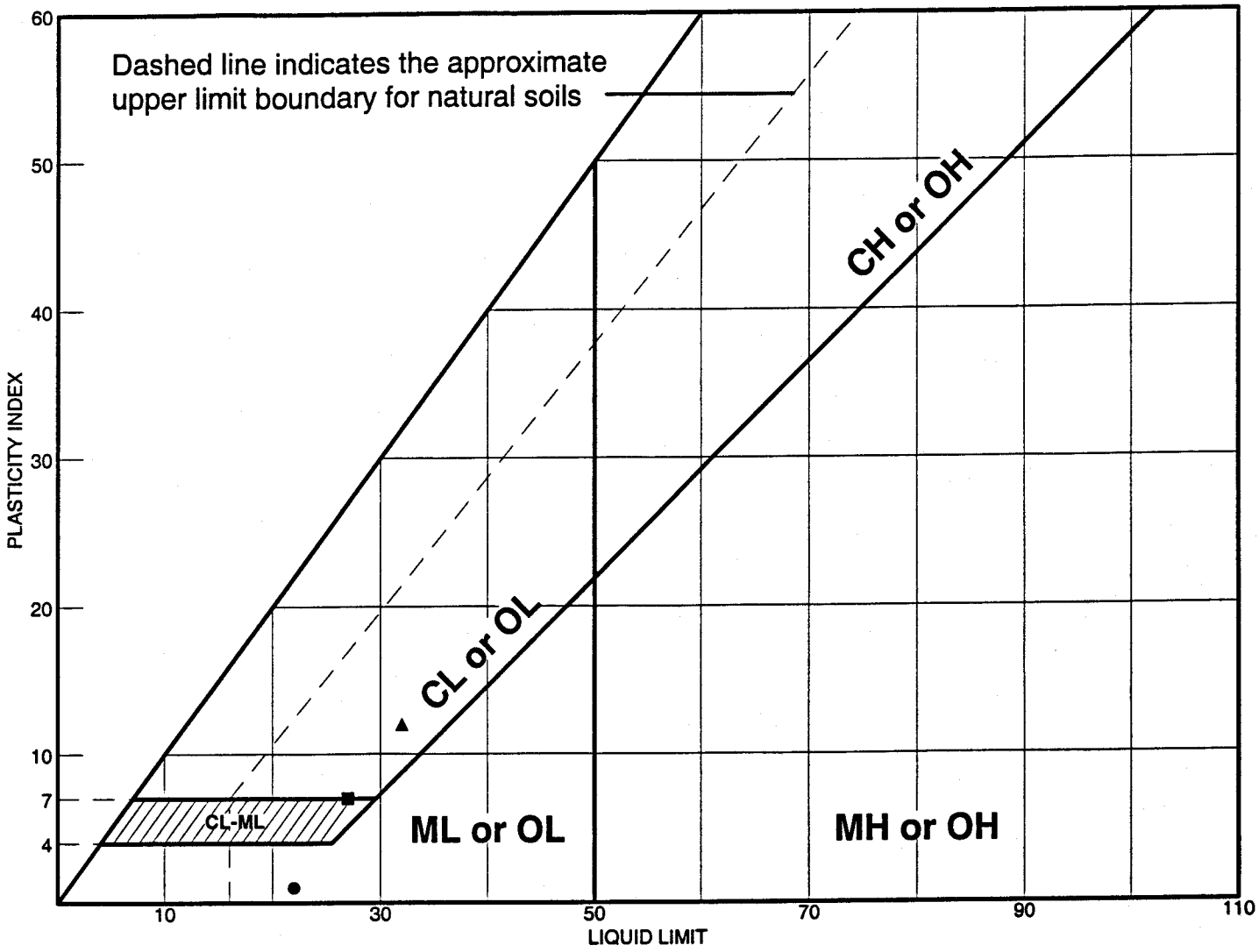
Remarks:
●
■
▲
◆

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)

RMT, Inc.

Figure:

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand	22	21	1	99.0	21.0	SM
■	Silty, clayey sand	27	20	7	99.0	37.4	SC-SM
▲	Clayey sand	32	20	12	98.9	43.7	SC

Project No. 5108.08 **Client:** WEYERHAEUSER

Project:

● **Source:** PT **Sample No.:** PT-10, 670N, 900E

■ **Source:** PT **Sample No.:** PT-11, 800N, 705E

▲ **Source:** PT **Sample No.:** PT-12, 800N, 1045E

Remarks:

●

■

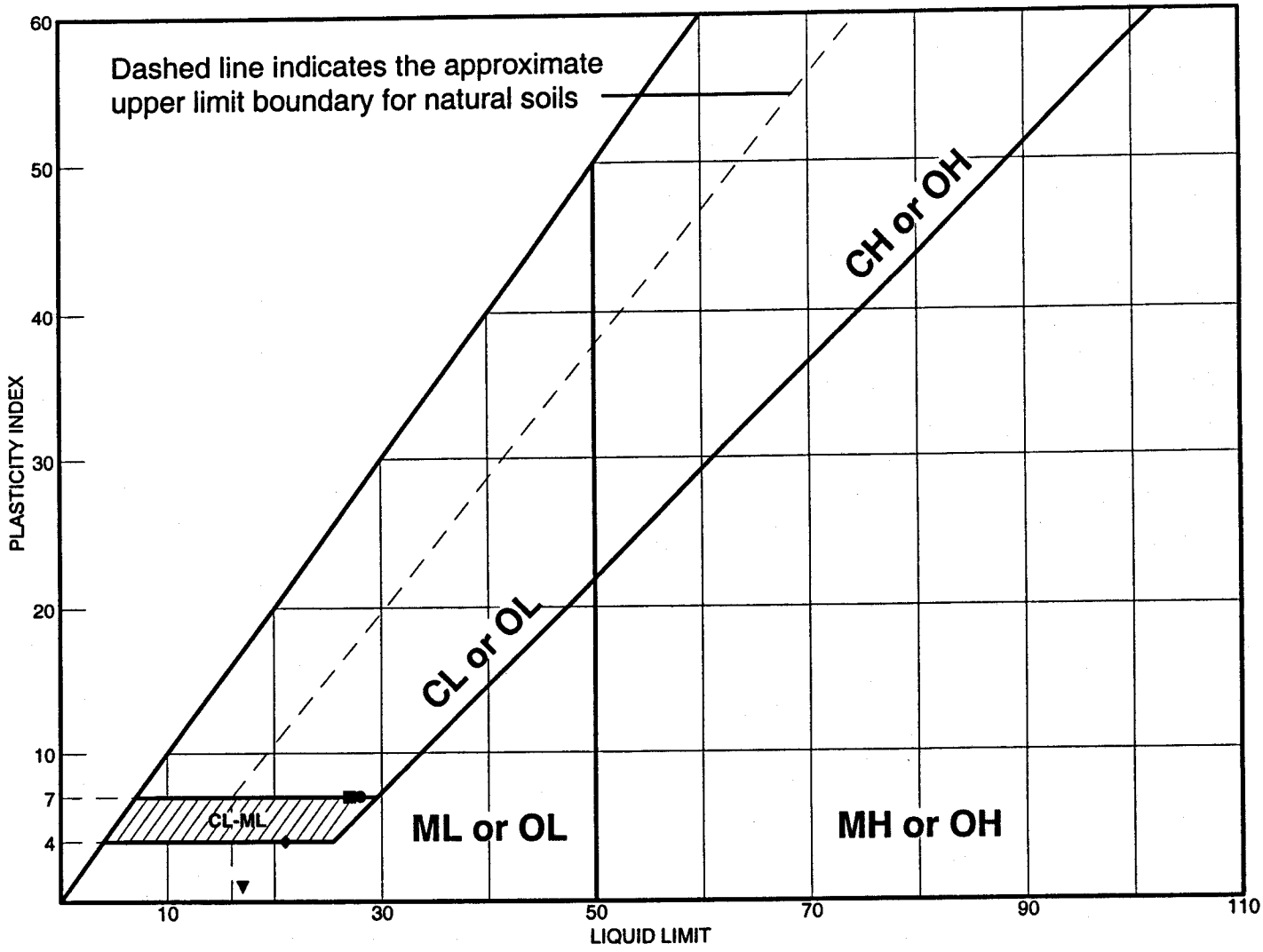
▲

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)

RMT, Inc.

Figure:

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty, clayey sand	28	21	7	99.2	45.2	SC-SM
■	Silty, clayey sand	27	20	7	99.5	35.2	SC-SM
▲	Silty sand	NV	NP	NP	98.8	23.4	SM
◆	Silty, clayey sand	21	17	4	99.0	28.7	SC-SM
▼	Silty sand	17	16	1	98.3	22.9	SM

Project No. 5108.08 **Client:**

Project: WEYERHAEUSER

● **Source:** PT **Sample No.:** PT-13, 1000N, 750E
■ **Source:** PT **Sample No.:** PT-14, 100N, 1015E
▲ **Source:** PT **Sample No.:** PT-15, 1200N, 775E
◆ **Source:** PT **Sample No.:** PT-16, 1200N, 1010E
▼ **Source:** PT **Sample No.:** PT-17, 1400N, 1050E

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)

RMT, Inc.

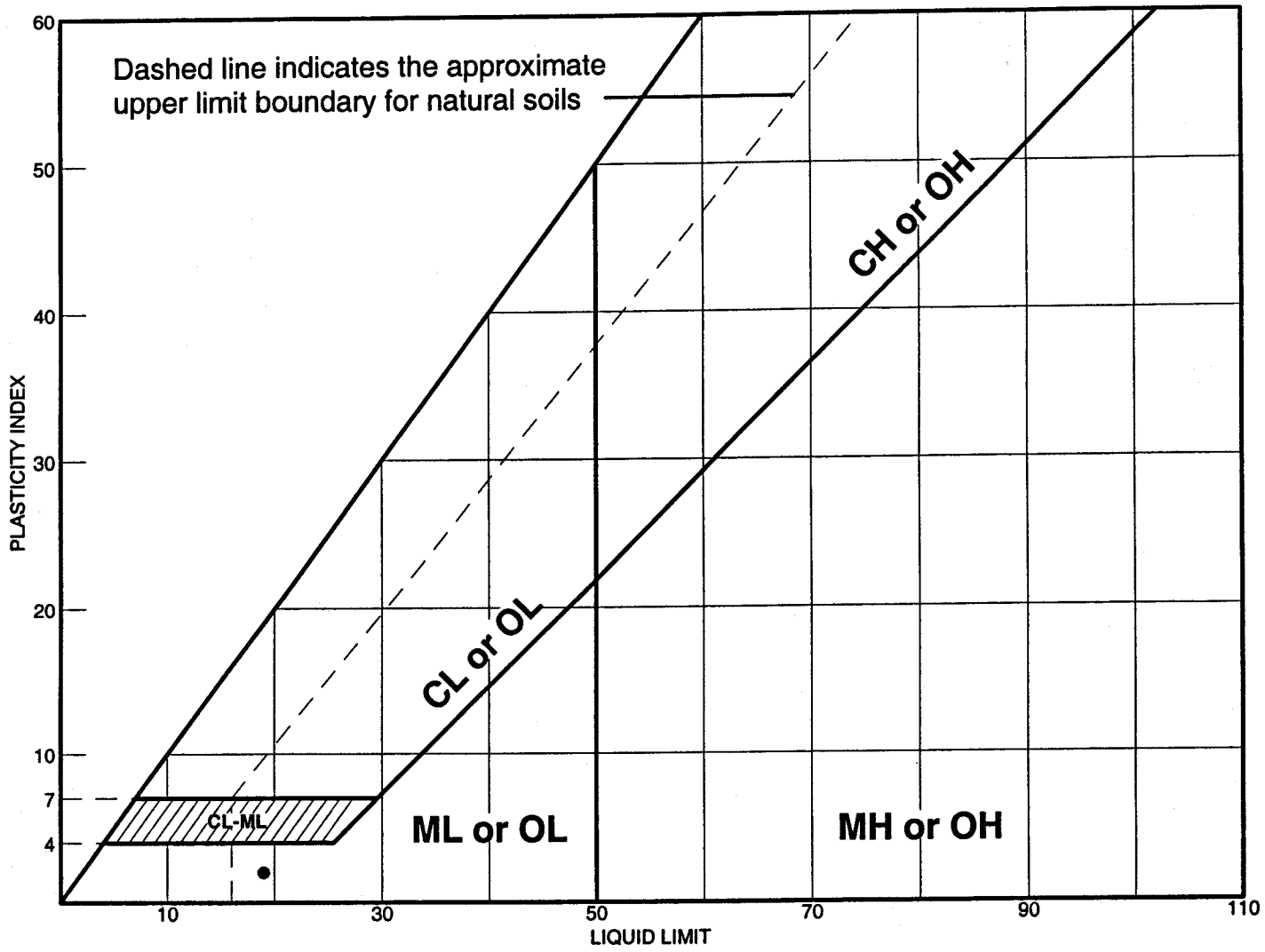
Remarks:
●
■
▲
◆
▼

Figure:

✓ HJW

J01

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand	19	17	2	99.1	26.5	SM

Project No. 5108.08 **Client:**

Project: WEYERHAEUSER

● **Source:** PT **Sample No.:** PT-17B, 1393N, 715E

Remarks:

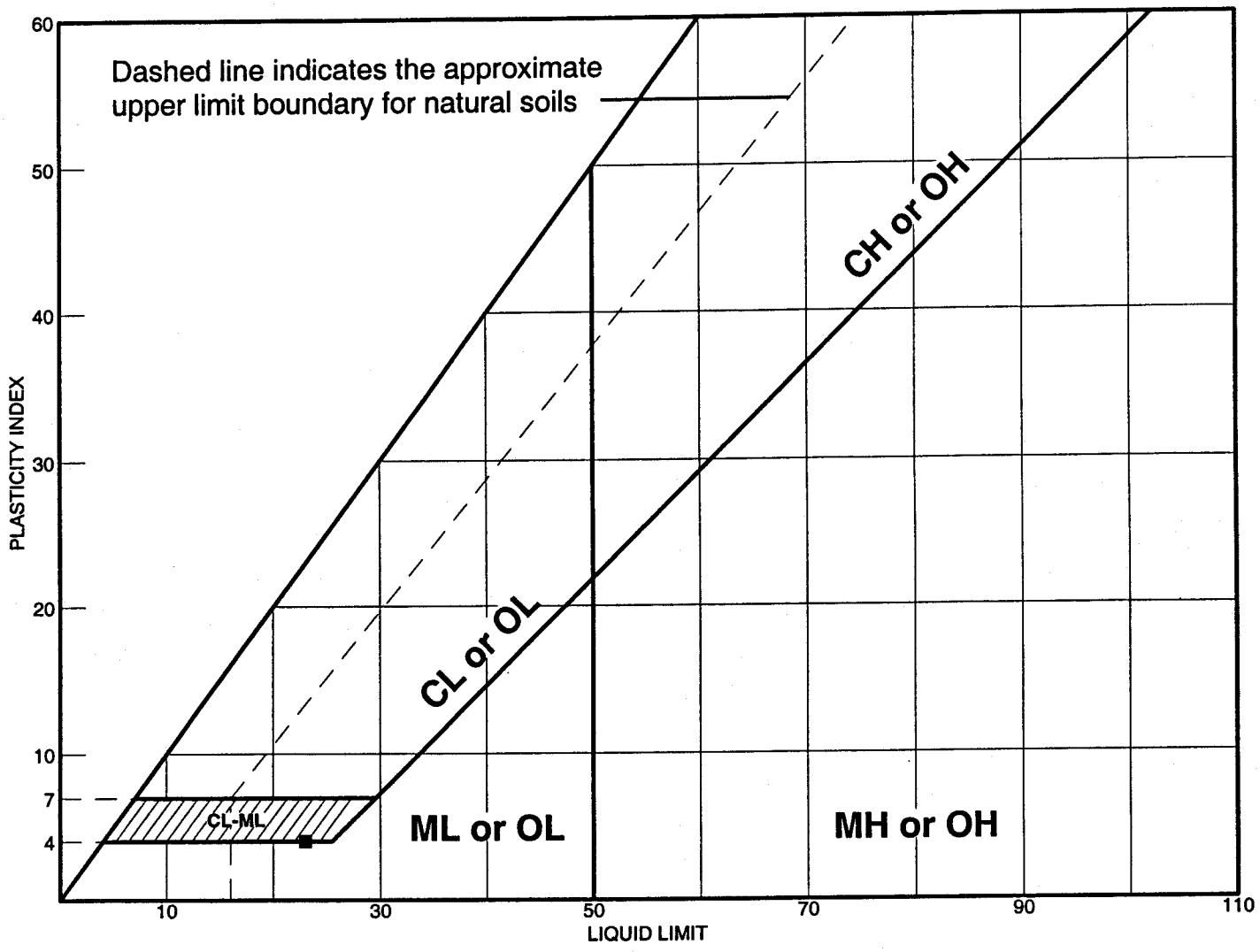
●

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)

RMT, Inc.

Figure:

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand	NV	NP	NP	98.4	21.6	SM
■	Silty, clayey sand	23	19	4	98.7	30.8	SC-SM

Project No. 5108.08 **Client:**

Project: WEYERHAEUSER

● **Source:** PT **Sample No.:** PT-17A, 1400N,775E

■ **Source:** PT **Sample No.:** PT-18, 1400N, 1050E

Remarks:

●

■

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)

RMT, Inc.

Figure:

Appendix G
Prepared Subgrade Permeability Test Results

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW

QA: JDH

Project Name:	WEYERHAEUSER	Cell #:	1
Project #:	5108.08	USCS Description:	Clayey Sand
Sample Name:	PT-1, 1292N, 792E	USCS Classification:	SC
Visual Descript:	Clayey Sand	Average Kv =	1.1E-06 cm/sec

		Initial Values	Final Values			
Sample Type:	Undisturbed					
Sample Dia. (in)		2.83	2.83	Permeant:	Water	
Sample Ht. (in)		2.28	2.28	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		482.00	575.00	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)		404.14	489.30	Confining Pressure (psi):	100.0	
Tare (g)		0.00	85.16	Burette Diameter (in):	0.250	
Sample Wt. (g)		482.00	489.84	Burette Zero (cm):	100.0	
Moisture (%)		19.3	21.2	Maximum Gradient:		
Wet Density (pcf)		128.0	130.1	Average Gradient:		
Dry Density (pcf)		107.4	107.4	Max. Effect. Stress (psi):	5.7	
Saturation (%)		91.4	100.6	Min. Effect. Stress (psi):	3.7	
				Ave. Effect. Stress (psi):	4.6	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C**	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	20	7	52.00		0.0	95	95	46.20		4.70		95.30				
2	2000	7	20	7	59.00	420	20.0	95	95	46.40	0.20	6.80	2.10	93.20	2.10	0.0	2.6E-06	
3	2000	7	20	8	8.00	540	20.0	95	95	46.30	-0.10	9.40	2.60	90.80	2.40	4.0	2.5E-06	
4	2000	7	20	8	36.00	1680	20.0	95	95	46.30	0.00	16.00	6.60	84.75	6.05	4.3	2.3E-06	
5	2000	7	20	8	47.00	660	20.0	95	95	46.40	0.10	18.25	2.25	82.65	2.10	3.4	2.2E-06	
6	2000	7	21	7	38.00		0.0	95	95	48.75		7.55		94.35				
7	2000	7	21	7	46.00	480	21.0	95	95	48.70	-0.05	9.35	1.80	92.60	1.75	1.4	1.9E-06	
8	2000	7	21	7	56.00	600	21.0	95	95	48.40	-0.30	11.40	2.05	90.70	1.90	3.8	1.8E-06	
9	2000	7	21	8	5.00	540	21.0	95	95	48.35	-0.05	12.90	1.50	89.35	1.35	5.3	1.5E-06	
10	2000	7	21	8	10.00	300	21.0	95	95	48.35	0.00	13.95	1.05	88.35	1.00	2.4	2.0E-06	
11	2000	7	21	8	15.00	300	21.0	95	95	48.40	0.05	14.90	0.95	87.50	0.85	5.6	1.8E-06	
12	2000	7	24	7	48.00		0.0	95	95	76.50		8.05		95.85				
13	2000	7	24	8	1.00	780	20.0	95	95	76.75	0.25	9.80	1.75	94.20	1.65	2.9	1.1E-06	
14	2000	7	24	8	6.00	300	20.0	95	95	76.90	0.15	10.55	0.75	93.60	0.60	11.1	1.2E-06	
15	2000	7	24	8	29.00	1380	20.0	95	95	77.50	0.60	13.50	2.95	90.90	2.70	4.4	1.2E-06	
16	2000	7	24	8	46.00	1020	20.0	95	95	77.80	0.30	15.55	2.05	89.10	1.80	6.5	1.1E-06	
17	2000	7	24	9	1.00	900	20.0	95	95	78.50	0.70	17.20	1.65	87.75	1.35	10.0	1.0E-06	
18	2000	7	25	7	37.00		0.0	95	95	94.80		5.15		96.05				
19	2000	7	25	7	44.00	420	20.0	95	95	94.80	0.00	6.20	1.05	95.00	1.05	0.0	1.3E-06	
20	2000	7	25	8	7.00	1380	20.0	95	95	94.80	0.00	9.65	3.45	91.95	3.05	6.2	1.2E-06	
21	2000	7	25	8	25.00	1080	20.0	95	95	94.80	0.00	12.00	2.35	89.85	2.10	5.6	1.2E-06	
22	2000	7	25	8	42.00	1020	20.0	95	95	94.70	-0.10	13.95	1.95	87.95	1.90	1.3	1.1E-06	
23	2000	7	25	8	55.00	780	20.0	95	95	94.85	0.15	15.50	1.55	86.60	1.35	6.9	1.2E-06	
24	2000	7	25	9	25.00	1800	20.0	95	95	95.85	1.00	18.80	3.30	83.60	3.00	4.8	1.2E-06	
25	2000	7	26	7	40.00		0.0	95	95	96.30		7.55		96.60				
26	2000	7	26	8	2.00	1320	20.0	95	95	96.20	-0.10	10.80	3.25	93.60	3.00	4.0	1.2E-06	

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW

QA: JPH

Project Name:	WEYERHAEUSER	Cell #:	1
Project #:	5108.08	USCS Description:	Clayey Sand
Sample Name:	PT-1, 1292N, 792E	USCS Classification:	SC
Visual Descript:	Clayey Sand		

Sample Type: Undisturbed	Initial Values	Final Values			
Sample Dia. (in)	2.83	2.83	Permeant:	Water	
Sample Ht. (in)	2.28	2.28	Permeant Specific Gravity:	1.00	
Tare & Wet (g)	482.00	575.00	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)	404.14	489.30	Confining Pressure (psi):	100.0	
Tare (g)	0.00	85.16	Burette Diameter (in):	0.250	
Sample Wt. (g)	482.00	489.84	Burette Zero (cm):	100.0	

Moisture (%)	19.3	21.2	Maximum Gradient:	14.3
Wet Density (pcf)	128.0	130.1	Average Gradient:	12.9
Dry Density (pcf)	107.4	107.4	Max. Effect. Stress (psi):	5.0
Saturation (%)	91.4	100.6	Min. Effect. Stress (psi):	3.8
			Ave. Effect. Stress (psi):	4.4

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C°**	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	26	8	2.00		0.0	95	95	96.20		10.80		93.60				
2	2000	7	26	8	20.00	1080	20.0	95	95	96.05	-0.15	13.00	2.20	91.55	2.05	3.5	1.1E-06	1
3	2000	7	26	8	38.00	1080	20.0	95	95	96.05	0.00	15.05	2.05	89.65	1.90	3.8	1.1E-06	1
4	2000	7	26	8	49.00	660	20.0	95	95	96.10	0.05	16.25	1.20	88.60	1.05	6.7	1.0E-06	1
5	2000	7	26	9	15.00	1560	20.0	95	95	96.10	0.00	19.05	2.80	86.10	2.50	5.7	1.1E-06	1
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		
16																		
17																		
18																		
19																		
20																		
21																		
22																		
23																		
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

1.1E-06 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HW

QA: DOT

Project Name:	WEYERHAEUSER	Cell #:	2
Project #:	5108.08	USCS Description:	Silty, clayey sand
Sample Name:	PT-2, 1250N, 1051E	USCS Classification:	SC-SM
Visual Descript:	Silty, clayey sand	Average Kv =	cm/sec

Sample Type: Undisturbed	Initial Values	Final Values			
Sample Dia. (in)	2.82	2.82	Permeant:	Water	
Sample Ht. (in)	2.31	2.27	Permeant Specific Gravity:	1.00	
Tare & Wet (g)	227.41	568.40	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)	214.74	486.00	Confining Pressure (psi):	100.0	
Tare (g)	117.77	83.17	Burette Diameter (in):	0.250	
Sample Wt. (g)	461.30	485.23	Burette Zero (cm):	100.0	
Moisture (%)	13.1	20.5	Maximum Gradient:		
Wet Density (pcf)	121.8	130.4	Average Gradient:		
Dry Density (pcf)	107.7	108.2	Max. Effect. Stress (psi):	5.7	
Saturation (%)	62.6	99.2	Min. Effect. Stress (psi):	4.3	
			Ave. Effect. Stress (psi):	5.0	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	20	7	55.00		0.0	95	95	46.30		5.40		96.00				
2	2000	7	20	7	55.50	30	20.0	95	95	46.30	0.00	18.90	13.50	82.50	13.50	0.0	2.7E-04	
3	2000	7	20	7	56.00	30	20.0	95	95	46.30	0.00	27.50	8.60	73.90	8.60	0.0	2.4E-04	
4	2000	7	20	7	56.50	30	20.0	95	95	46.30	0.00	34.10	6.60	67.30	6.60	0.0	2.5E-04	
5	2000	7	20	7	57.00	30	20.0	95	95	46.30	0.00	38.30	4.20	63.10	4.20	0.0	2.2E-04	
6	2000	7	20	7	57.50	30	20.0	95	95	46.30	0.00	41.70	3.40	59.70	3.40	0.0	2.4E-04	
7	2000	7	21	7	41.50		0.0	95	95	49.25		6.50		94.90				
8	2000	7	21	7	42.00	30	21.0	95	95	49.25	0.00	18.50	12.00	82.90	12.00	0.0	2.3E-04	
9	2000	7	21	7	42.50	30	21.0	95	95	49.25	0.00	28.75	10.25	72.65	10.25	0.0	2.8E-04	
10	2000	7	21	7	43.00	30	21.0	95	95	49.25	0.00	35.00	6.25	66.40	6.25	0.0	2.5E-04	
11	2000	7	21	7	43.50	30	21.0	95	95	49.25	0.00	39.75	4.75	61.65	4.75	0.0	2.7E-04	
12	2000	7	21	7	44.00	30	21.0	95	95	49.25	0.00	43.00	3.25	58.40	3.25	0.0	2.6E-04	
13	2000	7	24	7	44.00		0.0	95	95	51.35		4.10		97.30				
14	2000	7	24	7	44.50	30	20.0	95	95	51.35	0.00	16.90	12.80	84.50	12.80	0.0	2.4E-04	
15	2000	7	24	7	45.00	30	20.0	95	95	51.35	0.00	26.50	9.60	74.90	9.60	0.0	2.5E-04	
16	2000	7	24	7	45.50	30	20.0	95	95	51.35	0.00	33.50	7.00	67.90	7.00	0.0	2.6E-04	
17	2000	7	24	7	46.00	30	20.0	95	95	51.35	0.00	38.20	4.70	63.20	4.70	0.0	2.4E-04	
18	2000	7	24	7	46.50	30	20.0	95	95	51.35	0.00	41.60	3.40	59.80	3.40	0.0	2.4E-04	
19	2000	7	25	7	40.00		0.0	95	95	52.40		6.20		98.05				
20	2000	7	25	7	40.50	30	20.0	95	95	52.40	0.00	19.20	13.00	85.05	13.00	0.0	2.5E-04	
21	2000	7	25	7	41.00	30	20.0	95	95	52.40	0.00	28.20	9.00	76.05	9.00	0.0	2.4E-04	
22	2000	7	25	7	41.50	30	20.0	95	95	52.40	0.00	34.50	6.30	69.75	6.30	0.0	2.3E-04	
23	2000	7	25	7	42.00	30	20.0	95	95	52.40	0.00	39.00	4.50	65.25	4.50	0.0	2.2E-04	
24	2000	7	25	7	42.50	30	20.0	95	95	52.40	0.00	42.50	3.50	61.75	3.50	0.0	2.3E-04	
25	2000	7	26	7	43.00		0.0	95	95	53.45		5.10		97.95				
26	2000	7	26	7	43.50	30	20.0	95	95	53.45	0.00	17.80	12.70	85.25	12.70	0.0	2.4E-04	

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: KJW

QA: [illegible]

Project Name:	WEYERHAEUSER	Cell #:	2
Project #:	5108.08	USCS Description:	Silty, clayey sand
Sample Name:	PT-2, 1250N, 1051E	USCS Classification:	SC-SM
Visual Descript:	Silty, clayey sand		

Sample Type: Undisturbed	Initial Values	Final Values			
Sample Dia. (in)	2.82	2.82	Permeant:	Water	
Sample Ht. (in)	2.31	2.27	Permeant Specific Gravity:	1.00	
Tare & Wet (g)	227.41	568.40	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)	214.74	486.00	Confining Pressure (psi):	100.0	
Tare (g)	117.77	83.17	Burette Diameter (in):	0.250	
Sample Wt. (g)	461.30	485.23	Burette Zero (cm):	100.0	
Moisture (%)	13.1	20.5	Maximum Gradient:	11.7	
Wet Density (pcf)	121.8	130.4	Average Gradient:	6.6	
Dry Density (pcf)	107.7	108.2	Max. Effect. Stress (psi):	5.5	
Saturation (%)	62.6	99.2	Min. Effect. Stress (psi):	4.5	
			Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C**	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	26	7	43.50		20.0	95	95	53.45		17.80		85.25				
2	2000	7	26	7	44.00	30	20.0	95	95	53.45	0.00	27.00	9.20	76.05	9.20	0.0	2.4E-04	1
3	2000	7	26	7	44.50	30	20.0	95	95	53.45	0.00	33.75	6.75	69.30	6.75	0.0	2.4E-04	1
4	2000	7	26	7	45.00	30	20.0	95	95	53.45	0.00	38.50	4.75	64.55	4.75	0.0	2.3E-04	1
5	2000	7	26	7	45.50	30	20.0	95	95	53.45	0.00	41.50	3.00	61.55	3.00	0.0	2.0E-04	1
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		
16																		
17																		
18																		
19																		
20																		
21																		
22																		
23																		
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

2.3E-04 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW

QA: [illegible]

Project Name: WEYERHAEUSER

Project #: 5108.08

Sample Name: PT-3, 1053N, 795E

Visual Descript: Silty, clayey sand

Cell #: 5

USCS Description: Silty, clayey sand

USCS Classification: SC-SM

Average Kv = 3.7E-05 cm/sec

Sample Type: Undisturbed

	Initial Values	Final Values
Sample Dia. (in)	2.83	2.83
Sample Ht. (in)	2.13	2.13
Tare & Wet (g)	226.20	536.40
Tare & Dry (g)	213.96	464.60
Tare (g)	116.12	83.40
Sample Wt. (g)	433.10	453.00
Moisture (%)	12.5	18.8
Wet Density (pcf)	123.1	128.8
Dry Density (pcf)	109.5	108.4
Saturation (%)	64.9	95.0

Permeant:	Water
Permeant Specific Gravity:	1.00
Sample Specific Gravity:	2.65 Est.
Confining Pressure (psi):	100.0
Burette Diameter (in):	0.250
Burette Zero (cm):	100.0
Maximum Gradient:	15.0
Average Gradient:	12.9
Max. Effect. Stress (psi):	5.4
Min. Effect. Stress (psi):	4.1
Ave. Effect. Stress (psi):	4.8

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow		Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	20	7	57.00		0.0	95	95	60.10		13.30		91.60				
2	2000	7	20	7	59.00	120	20.0	95	95	60.10	0.00	20.85	7.55	83.95	7.65	-0.7	3.8E-05	
3	2000	7	20	8	0.00	60	20.0	95	95	60.10	0.00	24.20	3.35	80.70	3.25	1.5	3.9E-05	
4	2000	7	20	8	1.00	60	20.0	95	95	60.10	0.00	26.90	2.70	77.85	2.85	-2.7	3.6E-05	
5	2000	7	20	8	2.00	60	20.0	95	95	60.10	0.00	29.25	2.35	75.45	2.40	-1.1	3.4E-05	
6	2000	7	21	7	51.00		0.0	95	95	62.20		10.10		93.50				
7	2000	7	21	7	52.00	60	21.0	95	95	62.20	0.00	14.50	4.40	88.90	4.60	-2.2	3.9E-05	
8	2000	7	21	7	53.00	60	51.0	95	95	62.20	0.00	18.40	3.90	85.00	3.90	0.0	2.2E-05	
9	2000	7	21	7	54.00	60	21.0	95	95	62.20	0.00	21.90	3.50	81.50	3.50	0.0	3.8E-05	
10	2000	7	21	7	55.00	60	21.0	95	95	62.20	0.00	24.80	2.90	78.50	3.00	-1.7	3.6E-05	
11	2000	7	24	7	55.00		0.0	95	95	65.10		9.75		92.65				
12	2000	7	24	7	56.00	60	20.0	95	95	65.10	0.00	13.50	3.75	88.75	3.90	-2.0	3.4E-05	
13	2000	7	24	7	57.00	60	20.0	95	95	65.10	0.00	16.90	3.40	85.25	3.50	-1.4	3.4E-05	
14	2000	7	24	7	58.00	60	20.0	95	95	65.10	0.00	20.00	3.10	82.20	3.05	0.8	3.3E-05	
15	2000	7	24	7	59.00	60	20.0	95	95	65.10	0.00	23.00	3.00	79.30	2.90	1.7	3.5E-05	
16	2000	7	24	8	0.00	60	20.0	95	95	65.10	0.00	25.25	2.25	76.80	2.50	-5.3	3.1E-05	
17	2000	7	25	7	48.00		0.0	95	95	65.60		5.65		97.20				
18	2000	7	25	7	49.00	60	20.0	95	95	65.60	0.00	9.85	4.20	92.75	4.45	-2.9	3.5E-05	
19	2000	7	25	7	50.00	60	20.0	95	95	65.60	0.00	13.90	4.05	88.70	4.05	0.0	3.6E-05	
20	2000	7	25	7	51.00	60	20.0	95	95	65.60	0.00	17.25	3.35	85.20	3.50	-2.2	3.4E-05	
21	2000	7	25	7	52.00	60	20.0	95	95	65.60	0.00	20.25	3.00	82.20	3.00	0.0	3.3E-05	
22	2000	7	26	7	50.00		0.0	95	95	66.90		5.45		96.95				
23	2000	7	26	7	51.00	60	20.0	95	95	66.95	0.05	10.40	4.95	91.65	5.30	-3.4	4.2E-05	
24	2000	7	26	7	52.00	60	20.0	95	95	66.95	0.00	14.40	4.00	87.50	4.15	-1.8	3.7E-05	1
25	2000	7	26	7	53.00	60	20.0	95	95	66.95	0.00	18.00	3.60	83.90	3.60	0.0	3.6E-05	1
26	2000	7	26	7	54.00	60	20.0	95	95	66.95	0.00	21.40	3.40	80.65	3.25	2.3	3.7E-05	1

**A zero in this column starts a series of measurements.

(Termination determined by stable Kv and low flow differential.)

*Average Kv for those rows with a 1 in the Ave. column. 3.7E-05 cm/sec

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW

QA: JDH

Project Name:	WEYERHAEUSER	Cell #:	6
Project #:	5108.08	USCS Description:	Sandy silty clay
Sample Name:	PT-4, 1050N, 1050E	USCS Classification:	CL-ML
Visual Descript:	Sandy silty clay	Average Kv =	3.4E-07 cm/sec

Sample Type: Undisturbed	Initial Values	Final Values			
Sample Dia. (in)	2.84	2.84	Permeant:	Water	
Sample Ht. (in)	2.31	2.31	Permeant Specific Gravity:	1.00	
Tare & Wet (g)	221.76	589.40	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)	205.95	508.80	Confining Pressure (psi):	100.0	
Tare (g)	118.81	83.50	Burette Diameter (in):	0.250	
Sample Wt. (g)	497.60	505.90	Burette Zero (cm):	100.0	
Moisture (%)	18.1	19.0	Maximum Gradient:	15.0	
Wet Density (pcf)	129.5	131.7	Average Gradient:	13.4	
Dry Density (pcf)	109.7	110.7	Max. Effect. Stress (psi):	5.6	
Saturation (%)	91.3	98.1	Min. Effect. Stress (psi):	4.2	
			Ave. Effect. Stress (psi):	4.9	

	Date		Time		Run	Temp	Pressure (psi)			Cham.	Bot.		Top	Top	Flow	Kv ***	Ave.*
	Yr.	Mo. Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7 20	7	58.00		0.0	95	95	52.95		3.45		96.90				
2	2000	7 20	8	3.00	300	20.0	95	95	53.01	0.06	4.10	0.65	96.30	0.60	4.0	1.0E-06	
3	2000	7 20	8	18.00	900	20.0	95	95	52.80	-0.21	5.80	1.70	94.60	1.70	0.0	9.5E-07	
4	2000	7 20	8	37.00	1140	20.0	95	95	52.70	-0.10	7.80	2.00	92.70	1.90	2.6	9.0E-07	
5	2000	7 20	8	49.00	720	20.0	95	95	52.80	0.10	9.05	1.25	91.55	1.15	4.2	9.1E-07	
6	2000	7 20	10	33.00	6240	20.0	95	95	52.90	0.10	17.90	8.85	82.95	8.60	1.4	8.7E-07	
7	2000	7 20	13	3.00	9000	21.0	95	95	53.75	0.85	27.25	9.35	74.10	8.85	2.7	8.1E-07	
8	2000	7 20	16	35.00	12720	21.0	95	95	54.50	0.75	35.80	8.55	66.00	8.10	2.7	7.7E-07	
9	2000	7 21	8	0.00		0.0	95	95	55.00		7.05		96.95				
10	2000	7 21	8	6.00	360	21.0	95	95	55.45	0.45	7.50	0.45	96.45	0.50	-5.3	6.5E-07	
11	2000	7 21	8	11.00	300	21.0	95	95	55.45	0.00	8.15	0.65	95.85	0.60	4.0	1.0E-06	
12	2000	7 21	8	16.00	300	21.0	95	95	55.45	0.00	8.60	0.45	95.35	0.50	-5.3	8.1E-07	
13	2000	7 21	8	21.00	300	21.0	95	95	55.45	0.00	9.10	0.50	94.85	0.50	0.0	8.6E-07	
14	2000	7 21	8	30.00	540	21.0	95	95	55.35	-0.10	9.95	0.85	94.05	0.80	3.0	8.0E-07	
15	2000	7 24	8	2.00		0.0	95	95	59.50		6.15		96.70				
16	2000	7 24	8	7.00	300	20.0	95	95	59.50	0.00	6.50	0.35	96.25	0.45	-12.5	6.7E-07	
17	2000	7 24	8	30.00	1380	20.0	95	95	59.30	-0.20	7.95	1.45	94.80	1.45	0.0	5.4E-07	
18	2000	7 24	8	46.00	960	20.0	95	95	59.30	0.00	9.00	1.05	93.80	1.00	2.4	5.7E-07	
19	2000	7 24	9	2.00	960	20.0	95	95	59.40	0.10	9.90	0.90	92.90	0.90	0.0	5.1E-07	
20	2000	7 24	9	16.00	840	20.0	95	95	59.40	0.00	10.75	0.85	92.15	0.75	6.2	5.3E-07	
21	2000	7 25	7	55.00		0.0	95	95	60.50		6.40		97.45				
22	2000	7 25	8	28.00	1980	20.0	95	95	60.45	-0.05	7.85	1.45	95.95	1.50	-1.7	3.8E-07	
23	2000	7 25	8	57.00	1740	20.0	95	95	60.45	0.00	9.05	1.20	94.85	1.10	4.3	3.5E-07	1
24	2000	7 25	9	26.00	1740	20.0	95	95	60.25	-0.20	10.15	1.10	93.60	1.25	-6.4	3.6E-07	1
25	2000	7 25	10	24.00	3480	20.0	95	95	60.30	0.05	12.40	2.25	91.70	1.90	8.4	3.3E-07	1
26	2000	7 25	12	54.00	9000	20.0	95	95	60.55	0.25	17.35	4.95	86.90	4.80	1.5	3.3E-07	1

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column. 3.4E-07 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW
QA: [illegible]

Project Name:	WEYERHAEUSER	Cell #:	18
Project #:	5108.08	USCS Description:	Clayey sand
Sample Name:	PT-5, 905N, 750E	USCS Classification:	SC
Visual Descript:	Clayey sand	Average Kv =	2.9E-08 cm/sec

		Initial Values	Final Values			
Sample Type:	Undisturbed					
Sample Dia. (in)		2.84	2.84	Permeant:	Water	
Sample Ht. (in)		2.28	2.28	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		461.70	549.70	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)		363.93	450.50	Confining Pressure (psi):	100.0	
Tare (g)		0.00	86.57	Burette Diameter (in):	0.250	
Sample Wt. (g)		461.70	463.13	Burette Zero (cm):	100.0	
Moisture (%)		26.9	27.3	Maximum Gradient:	7.8	
Wet Density (pcf)		121.8	122.2	Average Gradient:	7.1	
Dry Density (pcf)		96.0	96.0	Max. Effect. Stress (psi):	5.7	
Saturation (%)		96.1	97.5	Min. Effect. Stress (psi):	4.5	
				Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	21	8	2.00		0.0	95	95	44.40		7.40		96.80				
2	2000	7	21	8	7.00	300	20.0	95	95	44.50	0.10	7.50	0.10	96.20	0.60	-71.4	5.9E-07	
3	2000	7	21	8	33.00	1560	20.0	95	95	44.50	0.00	7.70	0.20	96.00	0.20	0.0	6.5E-08	
4	2000	7	21	8	53.00	1200	20.0	95	95	44.50	0.00	7.80	0.10	95.80	0.20	-33.3	6.4E-08	
5	2000	7	21	9	47.00	3240	20.0	95	95	44.60	0.10	7.90	0.10	95.55	0.25	-42.9	2.8E-08	
6	2000	7	21	12	53.00	11160	21.0	95	95	46.00	1.40	8.80	0.90	94.80	0.75	9.1	3.7E-08	
7	2000	7	21	16	14.00	12060	21.0	95	95	46.65	0.65	9.75	0.95	94.05	0.75	11.8	3.6E-08	
8	2000	7	24	7	53.00	229140	20.0	95	95	54.80	8.15	22.65	12.90	82.40	11.65	5.1	3.4E-08	
9	2000	7	24	10	27.00	9240	21.0	95	95	55.55	0.75	23.05	0.40	82.10	0.30	14.3	2.8E-08	
10	2000	7	24	12	51.00	8640	20.0	95	95	55.20	-0.35	23.35	0.30	81.70	0.40	-14.3	3.1E-08	
11	2000	7	24	16	25.00	12840	21.0	95	95	56.00	0.80	23.95	0.60	81.25	0.45	14.3	3.1E-08	
12	2000	7	25	7	57.00	55920	20.0	95	95	56.50	0.50	26.15	2.20	79.20	2.05	3.5	3.1E-08	
13	2000	7	25	10	31.00	9240	20.0	95	95	56.55	0.05	26.50	0.35	78.90	0.30	7.7	3.0E-08	
14	2000	7	25	13	5.00	9240	20.0	95	95	57.00	0.45	26.80	0.30	78.60	0.30	0.0	2.8E-08	
15	2000	7	25	16	20.00	11700	20.0	95	95	57.50	0.50	27.30	0.50	78.20	0.40	11.1	3.4E-08	
16	2000	7	26	8	54.00	59640	20.0	95	95	58.50	1.00	29.30	2.00	76.50	1.70	8.1	2.8E-08	
17	2000	7	26	10	37.00	6180	20.0	95	95	58.50	0.00	29.60	0.30	76.20	0.30	0.0	4.6E-08	
18	2000	7	26	13	23.00	9960	21.0	95	95	57.05	-1.45	29.95	0.35	75.95	0.25	16.7	2.8E-08	
19	2000	7	26	14	52.00	5340	21.0	95	95	59.40	2.35	30.15	0.20	75.80	0.15	14.3	3.1E-08	
20	2000	7	26	15	51.00	3540	21.0	95	95	59.50	0.10	30.25	0.10	75.70	0.10	0.0	2.7E-08	
21	2000	7	27	7	43.00	57120	20.0	95	95	59.85	0.35	32.00	1.75	74.15	1.55	6.1	3.0E-08	1
22	2000	7	27	13	8.00	19500	21.0	95	95	60.45	0.60	32.60	0.60	73.65	0.50	9.1	3.0E-08	1
23	2000	7	27	15	26.00	8280	21.0	95	95	60.55	0.10	32.85	0.25	73.50	0.15	25.0	2.6E-08	1
24	2000	7	28	8	1.00	59700	20.0	95	95	61.20	0.65	34.45	1.60	72.05	1.45	4.9	2.9E-08	1
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column. 2.9E-08 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

QC: HLW
QA: [illegible]

Falling Head Permeability Test (ASTM D5084)

Project Name:	WEYERHAEUSER	Cell #:	19
Project #:	5108.08	USCS Description:	Silty sand
Sample Name:	PT-6, 895N, 1009E	USCS Classification:	SM
Visual Descript:	Silty sand	Average Kv =	7.1E-05 cm/sec

		Initial Values	Final Values			
Sample Type:	Undisturbed					
Sample Dia. (in)		2.84	2.84	Permeant:	Water	
Sample Ht. (in)		2.31	2.30	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		266.22	569.35	Sample Specific Gravity:	2.65	Est.
Tare & Dry (g)		247.92	485.50	Confining Pressure (psi):	100.0	
Tare (g)		117.82	86.86	Burette Diameter (in):	0.250	
Sample Wt. (g)		461.50	482.49	Burette Zero (cm):	70.0	
Moisture (%)		14.1	21.0	Maximum Gradient:	8.0	
Wet Density (pcf)		120.1	126.2	Average Gradient:	6.7	
Dry Density (pcf)		105.3	104.2	Max. Effect. Stress (psi):	5.6	
Saturation (%)		65.4	95.0	Min. Effect. Stress (psi):	4.3	
				Ave. Effect. Stress (psi):	5.0	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	21	8	17.00		0.0	95	95	51.10		5.10		66.60				
2	2000	7	21	8	17.50	30	21.0	95	95	51.10	0.00	8.76	3.66	62.94	3.66	0.0	9.3E-05	
3	2000	7	21	8	18.00	30	21.0	95	95	51.10	0.00	11.70	2.94	60.00	2.94	0.0	8.5E-05	
4	2000	7	21	8	18.50	30	21.0	95	95	51.10	0.00	14.50	2.80	57.20	2.80	0.0	9.1E-05	
5	2000	7	21	8	19.00	30	21.0	95	95	51.10	0.00	17.00	2.50	54.70	2.50	0.0	9.2E-05	
6	2000	7	21	8	19.50	30	21.0	95	95	51.10	0.00	19.10	2.10	52.60	2.10	0.0	8.7E-05	
7	2000	7	24	8	0.00		0.0	95	95	23.30		3.20		67.50				
8	2000	7	24	8	0.50	30	21.0	95	95	23.30	0.00	6.90	3.70	63.80	3.70	0.0	9.0E-05	
9	2000	7	24	8	1.00	30	21.0	95	95	23.30	0.00	10.20	3.30	60.50	3.30	0.0	9.1E-05	
10	2000	7	24	8	1.50	30	21.0	95	95	23.30	0.00	13.00	2.80	57.70	2.80	0.0	8.7E-05	
11	2000	7	24	8	2.00	30	21.0	95	95	23.30	0.00	15.60	2.60	55.10	2.60	0.0	9.1E-05	
12	2000	7	24	8	2.50	30	21.0	95	95	23.30	0.00	17.80	2.20	52.90	2.20	0.0	8.7E-05	
13	2000	7	25	7	50.00		0.0	95	95	31.10		4.40		68.00				
14	2000	7	25	7	50.50	30	21.0	95	95	31.10	0.00	7.50	3.10	64.90	3.10	0.0	7.6E-05	
15	2000	7	25	7	51.00	30	21.0	95	95	31.10	0.00	10.10	2.60	62.30	2.60	0.0	7.0E-05	
16	2000	7	25	7	51.50	30	21.0	95	95	31.10	0.00	12.50	2.40	59.90	2.40	0.0	7.1E-05	
17	2000	7	25	7	52.00	30	21.0	95	95	31.10	0.00	14.70	2.20	57.70	2.20	0.0	7.2E-05	
18	2000	7	25	7	52.50	30	21.0	95	95	31.10	0.00	16.60	1.90	55.80	1.90	0.0	6.8E-05	
19	2000	7	26	7	43.00		0.0	95	95	39.00		4.45		67.70				
20	2000	7	26	7	43.50	30	21.0	95	95	39.00	0.00	7.50	3.05	64.65	3.05	0.0	7.5E-05	
21	2000	7	26	7	44.00	30	21.0	95	95	39.00	0.00	10.20	2.70	61.95	2.70	0.0	7.3E-05	
22	2000	7	26	7	44.50	30	21.0	95	95	39.00	0.00	12.60	2.40	59.55	2.40	0.0	7.2E-05	
23	2000	7	26	7	45.00	30	21.0	95	95	39.00	0.00	14.80	2.20	57.35	2.20	0.0	7.2E-05	1
24	2000	7	26	7	45.50	30	21.0	95	95	39.00	0.00	16.80	2.00	55.35	2.00	0.0	7.3E-05	1
25	2000	7	26	7	46.00	30	21.0	95	95	39.00	0.00	18.60	1.80	53.55	1.80	0.0	7.2E-05	1
26	2000	7	26	7	46.50	30	21.0	95	95	39.00	0.00	20.10	1.50	52.05	1.50	0.0	6.6E-05	1
																	7.1E-05	cm/sec

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: KJW

QA: JH

Project Name:	WEYERHAEUSER	Cell #:	20
Project #:	5108.08	USCS Description:	Silty sand
Sample Name:	PT-7, 750N, 755E	USCS Classification:	SM
Visual Descript:	Silty sand	Average Kv =	8.0E-05 cm/sec

Sample Type: Undisturbed	Initial Values	Final Values			
Sample Dia. (in)	2.80	2.80	Permeant:	Water	
Sample Ht. (in)	2.30	2.30	Permeant Specific Gravity:	1.00	
Tare & Wet (g)	239.05	567.00	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)	227.02	485.30	Confining Pressure (psi):	100.0	
Tare (g)	117.77	84.18	Burette Diameter (in):	0.250	
Sample Wt. (g)	452.00	482.82	Burette Zero (cm):	70.0	
Moisture (%)	11.0	20.4	Maximum Gradient:	7.7	
Wet Density (pcf)	121.6	129.9	Average Gradient:	6.3	
Dry Density (pcf)	109.5	107.9	Max. Effect. Stress (psi):	45.2	
Saturation (%)	55.2	97.9	Min. Effect. Stress (psi):	4.3	
			Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	21	8	21.00		0.0	95	55	50.10		3.10		66.40				
2	2000	7	21	8	21.50	30	20.0	95	95	50.10	0.00	6.50	3.40	63.00	3.40	0.0	3.1E-03	
3	2000	7	21	8	22.00	30	20.0	95	95	50.10	0.00	9.60	3.10	59.90	3.10	0.0	9.0E-05	
4	2000	7	21	8	22.50	30	20.0	95	95	50.10	0.00	12.20	2.60	57.30	2.60	0.0	8.5E-05	
5	2000	7	21	8	23.00	30	20.0	95	95	50.10	0.00	14.60	2.40	54.90	2.40	0.0	8.7E-05	
6	2000	7	21	8	23.50	30	20.0	95	95	50.10	0.00	16.70	2.10	52.80	2.10	0.0	8.5E-05	
7	2000	7	24	8	6.00		0.0	95	95	13.50		6.90		67.50				
8	2000	7	24	8	6.50	30	21.0	95	95	13.50	0.00	10.00	3.10	64.40	3.10	0.0	8.2E-05	
9	2000	7	24	8	7.00	30	21.0	95	95	13.50	0.00	12.60	2.60	61.80	2.60	0.0	7.6E-05	
10	2000	7	24	8	7.50	30	21.0	95	95	13.50	0.00	15.10	2.50	59.30	2.50	0.0	8.1E-05	
11	2000	7	24	8	8.00	30	21.0	95	95	13.50	0.00	17.20	2.10	57.20	2.10	0.0	7.6E-05	
12	2000	7	24	8	8.50	30	21.0	95	95	13.50	0.00	19.10	1.90	55.30	1.90	0.0	7.6E-05	
13	2000	7	25	7	54.00		0.0	95	95	19.00		3.70		67.50				
14	2000	7	25	7	54.50	30	21.0	95	95	19.00	0.00	6.90	3.20	64.30	3.20	0.0	8.0E-05	
15	2000	7	25	7	55.00	30	21.0	95	95	19.00	0.00	9.70	2.80	61.50	2.80	0.0	7.8E-05	
16	2000	7	25	7	55.50	30	21.0	95	95	19.00	0.00	12.20	2.50	59.00	2.50	0.0	7.7E-05	
17	2000	7	25	7	56.00	30	21.0	95	95	19.00	0.00	14.60	2.40	56.60	2.40	0.0	8.2E-05	
18	2000	7	25	7	56.50	30	21.0	95	95	19.00	0.00	16.70	2.10	54.50	2.10	0.0	8.0E-05	
19	2000	7	26	7	48.00		0.0	95	95	23.20		5.90		67.20				
20	2000	7	26	7	48.50	30	21.0	95	95	23.20	0.00	8.90	3.00	64.20	3.00	0.0	7.8E-05	
21	2000	7	26	7	49.00	30	21.0	95	95	23.20	0.00	11.70	2.80	61.40	2.80	0.0	8.1E-05	
22	2000	7	26	7	49.50	30	21.0	95	95	23.20	0.00	14.10	2.40	59.00	2.40	0.0	7.7E-05	
23	2000	7	26	7	50.00	30	21.0	95	95	23.20	0.00	16.30	2.20	56.80	2.20	0.0	7.8E-05	1
24	2000	7	26	7	50.50	30	21.0	95	95	23.20	0.00	18.40	2.10	54.70	2.10	0.0	8.3E-05	1
25	2000	7	26	7	51.00	30	21.0	95	95	23.20	0.00	20.20	1.80	52.90	1.80	0.0	7.9E-05	1
26	2000	7	26	7	51.50	30	21.0	95	95	23.20	0.00	21.80	1.60	51.30	1.60	0.0	7.8E-05	1

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column. 8.0E-05 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

QC: HJW
QA: JSH

Falling Head Permeability Test (ASTM D5084)

Project Name:	WEYERHAUSER	Cell #:	21
Project #:	5108.08	USCS Description:	Silty sand
Sample Name:	PT-8, 700N, 1000E	USCS Classification:	SM
Visual Descript:	Silty sand	Average Kv =	3.9E-04 cm/sec

		Initial Values	Final Values			
Sample Type:	Undisturbed					
Sample Dia. (in)		2.83	2.83	Permeant:	Water	
Sample Ht. (in)		2.31	2.31	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		432.10	746.30	Sample Specific Gravity:	2.65	Est.
Tare & Dry (g)		384.34	656.50	Confining Pressure (psi):	100.0	
Tare (g)		0.00	272.16	Burette Diameter (in):	0.250	
Sample Wt. (g)		432.10	474.14	Burette Zero (cm):	70.0	
Moisture (%)		12.4	23.4	Maximum Gradient:	10.6	
Wet Density (pcf)		113.3	124.3	Average Gradient:	5.9	
Dry Density (pcf)		100.8	100.8	Max. Effect. Stress (psi):	5.5	
Saturation (%)		51.4	96.6	Min. Effect. Stress (psi):	4.5	
				Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	21	8	30.00		0.0	95	95	29.50		4.10		67.20				
2	2000	7	21	8	30.25	15	21.0	95	95	29.50	0.00	11.40	7.30	59.90	7.30	0.0	3.9E-04	
3	2000	7	21	8	30.50	15	21.0	95	95	29.50	0.00	17.00	5.60	54.30	5.60	0.0	3.9E-04	
4	2000	7	21	8	30.75	15	21.0	95	95	29.50	0.00	21.50	4.50	49.80	4.50	0.0	4.1E-04	
5	2000	7	21	8	31.00	15	21.0	95	95	29.50	0.00	24.80	3.30	46.50	3.30	0.0	4.0E-04	
6	2000	7	21	8	31.25	15	21.0	95	95	29.50	0.00	27.40	2.60	43.90	2.60	0.0	4.1E-04	
7	2000	7	21	9	36.00		0.0	95	95	41.00		4.90		66.80				
8	2000	7	21	9	36.25	15	21.0	95	95	41.00	0.00	11.90	7.00	59.80	7.00	0.0	3.8E-04	
9	2000	7	21	9	36.50	15	21.0	95	95	41.00	0.00	17.50	5.60	54.20	5.60	0.0	4.0E-04	
10	2000	7	21	9	36.75	15	21.0	95	95	41.00	0.00	21.70	4.20	50.00	4.20	0.0	3.9E-04	
11	2000	7	21	9	37.00	15	21.0	95	95	41.00	0.00	25.10	3.40	46.60	3.40	0.0	4.1E-04	
12	2000	7	21	9	37.25	15	21.0	95	95	41.00	0.00	27.50	2.40	44.20	2.40	0.0	3.8E-04	
13	2000	7	21	9	40.00		0.0	95	95	41.90		5.40		67.40				
14	2000	7	21	9	40.25	15	21.0	95	95	41.90	0.00	12.30	6.90	60.50	6.90	0.0	3.8E-04	1
15	2000	7	21	9	40.50	15	21.0	95	95	41.90	0.00	18.00	5.70	54.80	5.70	0.0	4.0E-04	1
16	2000	7	21	9	40.75	15	21.0	95	95	41.90	0.00	22.20	4.20	50.60	4.20	0.0	3.9E-04	1
17	2000	7	21	9	41.00	15	21.0	95	95	41.90	0.00	25.40	3.20	47.40	3.20	0.0	3.8E-04	1
18	2000	7	21	9	41.25	15	21.0	95	95	41.90	0.00	27.90	2.50	44.90	2.50	0.0	3.8E-04	1
19																		
20																		
21																		
22																		
23																		
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

3.9E-04 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW

QA: JMA

Project Name:	WEYERHAEUSER	Cell #:	23
Project #:	5108.08	USCS Description:	Silty, clayey sand
Sample Name:	PT-9, 1460N, 900E	USCS Classification:	SC - SM
Visual Descript:	Silty, clayey sand	Average Kv =	9.9E-06 cm/sec

		Initial Values	Final Values			
Sample Type:	Undisturbed					
Sample Dia. (in)		2.83	2.83	Permeant:	Water	
Sample Ht. (in)		2.11	2.11	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		639.80	524.95	Sample Specific Gravity:	2.65	Est.
Tare & Dry (g)		586.80	449.00	Confining Pressure (psi):	100.0	
Tare (g)		266.69	84.78	Burette Diameter (in):	0.250	
Sample Wt. (g)		429.60	440.17	Burette Zero (cm):	70.0	
Moisture (%)		16.6	20.9	Maximum Gradient:	11.6	
Wet Density (pcf)		123.3	126.3	Average Gradient:	9.3	
Dry Density (pcf)		105.8	104.5	Max. Effect. Stress (psi):	5.7	
Saturation (%)		77.9	95.0	Min. Effect. Stress (psi):	4.5	
				Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	7	25	7	38.00		0.0	95	95	49.30		11.85		67.00				
2	2000	7	25	7	41.00	180	21.0	95	95	49.30	0.00	14.40	2.55	64.40	2.60	-1.0	1.1E-05	
3	2000	7	25	7	43.00	120	21.0	95	95	49.30	0.00	16.00	1.60	62.90	1.50	3.2	1.1E-05	
4	2000	7	25	7	45.00	120	21.0	95	95	49.30	0.00	17.30	1.30	61.60	1.30	0.0	9.7E-06	
5	2000	7	25	7	47.00	120	21.0	95	95	49.30	0.00	18.60	1.30	60.40	1.20	4.0	9.9E-06	
6	2000	7	25	7	49.00	120	21.0	95	95	49.30	0.00	19.70	1.10	59.20	1.20	-4.3	9.6E-06	
7	2000	7	26	9	44.00		0.0	95	95	40.20		4.90		67.20				
8	2000	7	26	9	46.00	120	21.0	95	95	40.20	0.00	6.85	1.95	64.90	2.30	-8.2	1.2E-05	
9	2000	7	26	9	50.00	240	21.0	95	95	41.30	1.10	9.80	2.95	61.85	3.05	-1.7	9.3E-06	
10	2000	7	26	9	57.00	420	21.0	95	95	41.80	0.50	14.80	5.00	56.80	5.05	-0.5	1.0E-05	
11	2000	7	26	10	6.00	540	21.0	95	95	42.80	1.00	18.70	3.90	52.90	3.90	0.0	7.8E-06	
12	2000	7	26	10	12.00	360	21.0	95	95	42.70	-0.10	21.15	2.45	50.50	2.40	1.0	8.7E-06	
13	2000	7	27	7	40.00		0.0	95	95	18.80		6.90		68.70				
14	2000	7	27	7	43.00	180	21.0	95	95	19.10	0.30	9.10	2.20	65.50	3.20	-18.5	1.0E-05	
15	2000	7	27	7	45.00	120	21.0	95	95	19.10	0.00	10.40	1.30	64.15	1.35	-1.9	8.2E-06	
16	2000	7	27	7	47.00	120	21.0	95	95	19.10	0.00	11.60	1.20	62.95	1.20	0.0	7.8E-06	
17	2000	7	27	7	49.00	120	21.0	95	95	19.10	0.00	12.75	1.15	61.80	1.15	0.0	7.8E-06	
18	2000	7	28	8	4.00		0.0	95	95	41.70		5.50		67.90				
19	2000	7	28	8	6.00	120	21.0	95	95	41.60	-0.10	6.95	1.45	66.00	1.90	-13.4	9.4E-06	1
20	2000	7	28	8	10.00	240	21.0	95	95	41.60	0.00	9.60	2.65	63.30	2.70	-0.9	8.1E-06	1
21	2000	7	28	8	18.00	480	21.0	95	95	41.60	0.00	14.00	4.40	58.80	4.50	-1.1	7.7E-06	1
22	2000	7	28	8	21.00	180	21.0	95	95	41.60	0.00	15.40	1.40	54.40	4.40	-51.7	1.6E-05	1
23	2000	7	28	8	23.00	120	21.0	95	95	41.60	0.00	16.40	1.00	53.50	0.90	5.3	8.5E-06	1
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

9.9E-06 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW
QA: JPA

Project Name:	WEYERHAEUSER	Cell #:	9
Project #:	5108.08	USCS Description:	Silty sand
Sample Name:	PT-10, 670N, 900E	USCS Classification:	SM
Visual Descript:	Silty sand	Average Kv =	6.2E-05 cm/sec

Sample Type:	Undisturbed	Initial Values	Final Values		
Sample Dia. (in)		2.84	2.84	Permeant:	Water
Sample Ht. (in)		2.31	2.30	Permeant Specific Gravity:	1.00
Tare & Wet (g)		715.40	588.50	Sample Specific Gravity:	2.70 Est.
Tare & Dry (g)		663.40	507.80	Confining Pressure (psi):	100.0
Tare (g)		285.74	84.01	Burette Diameter (in):	0.250
Sample Wt. (g)		483.90	504.49	Burette Zero (cm):	100.0
Moisture (%)		13.8	19.0	Maximum Gradient:	15.3
Wet Density (pcf)		126.0	131.9	Average Gradient:	11.2
Dry Density (pcf)		110.7	110.8	Max. Effect. Stress (psi):	5.5
Saturation (%)		71.3	98.8	Min. Effect. Stress (psi):	4.2
				Ave. Effect. Stress (psi):	4.8

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C°**	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	3	7	58.00		0.0	95	95	58.15		11.50		92.80				
2	2000	8	3	7	59.00	60	20.0	95	95	58.20	0.05	18.90	7.40	85.25	7.55	-1.0	7.7E-05	
3	2000	8	3	8	0.00	60	20.0	95	95	58.20	0.00	24.90	6.00	79.00	6.25	-2.0	7.7E-05	
4	2000	8	3	8	1.00	60	20.0	95	95	58.20	0.00	30.00	5.10	74.10	4.90	2.0	7.7E-05	
5	2000	8	3	8	2.00	60	20.0	95	95	58.20	0.00	33.85	3.85	70.00	4.10	-3.1	7.5E-05	
6	2000	8	4	7	39.00		0.0	95	95	61.35		15.20		89.30				
7	2000	8	4	7	40.00	60	20.0	95	95	61.35	0.00	21.40	6.20	83.25	6.05	1.2	6.8E-05	
8	2000	8	4	7	41.00	60	20.0	95	95	61.35	0.00	26.75	5.35	77.60	5.65	-2.7	7.4E-05	
9	2000	8	4	7	42.00	60	20.0	95	95	61.35	0.00	31.20	4.45	73.20	4.40	0.6	7.2E-05	
10	2000	8	4	7	43.00	60	20.0	95	95	61.35	0.00	34.70	3.50	69.80	3.40	1.4	6.8E-05	
11	2000	8	7	7	41.00		0.0	95	95	66.10		8.70		98.00				
12	2000	8	7	7	42.00	60	20.0	95	95	66.10	0.00	15.50	6.80	90.80	7.20	-2.9	6.4E-05	
13	2000	8	7	7	43.00	60	20.0	95	95	66.10	0.00	21.30	5.80	85.00	5.80	0.0	6.3E-05	
14	2000	8	7	7	44.00	60	20.0	95	95	66.10	0.00	26.20	4.90	80.10	4.90	0.0	6.3E-05	
15	2000	8	7	7	45.00	60	20.0	95	95	66.10	0.00	30.30	4.10	75.90	4.20	-1.2	6.3E-05	
16	2000	8	8	7	40.00		0.0	95	95	67.55		9.50		101.10				
17	2000	8	8	7	41.00	60	20.0	95	95	67.55	0.00	16.30	6.80	93.80	7.30	-3.5	6.3E-05	
18	2000	8	8	7	42.00	60	20.0	95	95	67.55	0.00	22.40	6.10	87.75	6.05	0.4	6.4E-05	
19	2000	8	8	7	43.00	60	20.0	95	95	67.55	0.00	27.20	4.80	82.80	4.95	-1.5	6.1E-05	
20	2000	8	8	7	44.00	60	20.0	95	95	67.55	0.00	31.30	4.10	78.50	4.30	-2.4	6.2E-05	
21	2000	8	8	7	45.00	60	20.0	95	95	67.55	0.00	34.90	3.60	75.00	3.50	1.4	6.1E-05	
22	2000	8	9	7	41.00		0.0	95	95	68.50		9.20		98.50				
23	2000	8	9	7	42.00	60	20.0	95	95	68.50	0.00	15.90	6.70	91.60	6.90	-1.5	6.2E-05	1
24	2000	8	9	7	43.00	60	20.0	95	95	68.55	0.05	21.80	5.90	85.80	5.80	0.9	6.3E-05	1
25	2000	8	9	7	44.00	60	20.0	95	95	68.60	0.05	26.50	4.70	80.90	4.90	-2.1	6.1E-05	1
26	2000	8	9	7	45.00	60	20.0	95	95	68.60	0.00	30.60	4.10	76.80	4.10	0.0	6.2E-05	1
																	6.2E-05	cm/sec

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW
QA: SDW

Project Name:	WEYERHAEUSER	Cell #:	10
Project #:	5108.08	USCS Description:	Silty, clayey sand
Sample Name:	PT-11, 800N, 705E	USCS Classification:	SC-SM
Visual Descript:	Silty, clayey sand	Average Kv =	2.8E-06 cm/sec

Sample Type: Undisturbed	Initial Values	Final Values			
Sample Dia. (in)	2.85	2.85	Permeant:	Water	
Sample Ht. (in)	2.29	2.28	Permeant Specific Gravity:	1.00	
Tare & Wet (g)	756.70	586.30	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)	687.70	505.30	Confining Pressure (psi):	100.0	
Tare (g)	288.02	82.75	Burette Diameter (in):	0.250	
Sample Wt. (g)	497.50	503.55	Burette Zero (cm):	100.0	
Moisture (%)	17.3	19.2	Maximum Gradient:	15.7	
Wet Density (pcf)	129.7	131.9	Average Gradient:	13.9	
Dry Density (pcf)	110.6	110.7	Max. Effect. Stress (psi):	5.6	
Saturation (%)	89.2	99.1	Min. Effect. Stress (psi):	4.2	
			Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C**	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	3	8	3.00		0.0	95	95	50.80		7.95		94.20				
2	2000	8	3	8	16.00	780	20.0	95	95	50.70	-0.10	12.80	4.85	89.05	5.15	-3.0	3.5E-06	
3	2000	8	3	8	24.00	480	20.0	95	95	50.70	0.00	15.50	2.70	86.20	2.85	-2.7	3.5E-06	
4	2000	8	3	8	39.00	900	20.0	95	95	50.60	-0.10	19.95	4.45	81.50	4.70	-2.7	3.4E-06	
5	2000	8	3	8	50.00	660	20.0	95	95	50.60	0.00	22.90	2.95	78.40	3.10	-2.5	3.5E-06	
6	2000	8	4	7	45.00		0.0	95	95	55.90		4.70		96.65				
7	2000	8	4	7	49.00	240	20.0	95	95	55.75	-0.15	6.80	2.10	94.25	2.40	-6.7	4.7E-06	
8	2000	8	4	7	55.00	360	20.0	95	95	55.70	-0.05	10.00	3.20	90.85	3.40	-3.0	4.9E-06	
9	2000	8	4	8	0.00	300	20.0	95	95	55.70	0.00	12.45	2.45	88.20	2.65	-3.9	4.8E-06	
10	2000	8	4	8	5.00	300	20.0	95	95	55.65	-0.05	14.35	1.90	86.15	2.05	-3.8	4.0E-06	
11	2000	8	7	7	47.00		0.0	95	95	63.00		9.55		95.00				
12	2000	8	7	7	52.00	300	20.0	95	95	63.05	0.05	11.60	2.05	92.50	2.50	-9.9	4.1E-06	
13	2000	8	7	8	9.00	1020	20.0	95	95	62.90	-0.15	17.45	5.85	86.25	6.25	-3.3	3.5E-06	
14	2000	8	7	8	31.00	1320	20.0	95	95	62.80	-0.10	24.25	6.80	79.05	7.20	-2.9	3.8E-06	
15	2000	8	7	8	36.00	300	20.0	95	95	62.85	0.05	25.55	1.30	77.55	1.50	-7.1	3.9E-06	
16	2000	8	8	7	46.00		0.0	95	95	64.70		7.15		97.25				
17	2000	8	8	8	2.00	960	20.0	95	95	64.65	-0.05	12.90	5.75	91.10	6.15	-3.4	3.3E-06	
18	2000	8	8	8	11.00	540	20.0	95	95	64.60	-0.05	15.80	2.90	87.90	3.20	-4.9	3.4E-06	
19	2000	8	8	8	16.00	300	20.0	95	95	64.60	0.00	17.30	1.50	86.40	1.50	0.0	3.2E-06	
20	2000	8	8	8	23.00	420	20.0	95	95	64.55	-0.05	19.05	1.75	84.45	1.95	-5.4	2.9E-06	
21	2000	8	9	7	47.00		0.0	95	95	66.50		7.05		97.90				
22	2000	8	9	7	53.00	360	20.0	95	95	66.40	-0.10	8.90	1.85	95.75	2.15	-7.5	2.8E-06	1
23	2000	8	9	8	4.00	660	20.0	95	95	66.15	-0.25	12.20	3.30	92.15	3.60	-4.3	2.8E-06	1
24	2000	8	9	8	14.00	600	20.0	95	95	66.15	0.00	14.90	2.70	89.20	2.95	-4.4	2.7E-06	1
25	2000	8	9	8	20.00	360	20.0	95	95	66.15	0.00	16.50	1.60	87.60	1.60	0.0	2.7E-06	1
26																		

**A zero in this column starts a series of measurements.
(Termination determined by stable Kv and low flow differential.)

*Average Kv for those rows with a 1 in the Ave. column. 2.8E-06 cm/sec

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: LNW
QA: [illegible]

Project Name:	WEYERHAEUSER	Cell #:	11
Project #:	5108.08	USCS Description:	Clayey sand
Sample Name:	PT-12, 800N, 1045E	USCS Classification:	SC
Visual Descript:	Clayey sand	Average Kv =	9.5E-08 cm/sec

		Initial Values	Final Values			
Sample Type:	Undisturbed					
Sample Dia. (in)		2.86	2.86	Permeant:	Water	
Sample Ht. (in)		2.32	2.30	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		503.00	590.30	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)		425.44	509.30	Confining Pressure (psi):	100.0	
Tare (g)		0.00	83.86	Burette Diameter (in):	0.250	
Sample Wt. (g)		503.00	506.44	Burette Zero (cm):	100.0	
Moisture (%)		18.2	19.0	Maximum Gradient:	14.2	
Wet Density (pcf)		128.6	130.6	Average Gradient:	13.6	
Dry Density (pcf)		108.7	109.7	Max. Effect. Stress (psi):	5.6	
Saturation (%)		89.6	95.9	Min. Effect. Stress (psi):	4.3	
				Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow		Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C**	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	3	8	4.00		0.0	95	95	51.95		8.45		96.05				
2	2000	8	3	8	17.00	780	20.0	95	95	51.90	-0.05	9.45	1.00	94.90	1.15	-7.0	7.1E-07	
3	2000	8	3	8	25.00	480	20.0	95	95	51.90	0.00	10.10	0.65	94.25	0.65	0.0	7.1E-07	
4	2000	8	3	8	40.00	900	20.0	95	95	51.80	-0.10	11.05	0.95	93.20	1.05	-5.0	6.0E-07	
5	2000	8	3	8	51.00	660	20.0	95	95	51.85	0.05	11.80	0.75	92.45	0.75	0.0	6.2E-07	
6	2000	8	4	7	47.00		0.0	95	95	55.25		6.65		95.70				
7	2000	8	4	7	56.00	540	20.0	95	95	55.15	-0.10	7.15	0.50	95.05	0.65	-13.0	5.4E-07	
8	2000	8	4	8	6.00	600	20.0	95	95	55.10	-0.05	7.75	0.60	94.45	0.60	0.0	5.1E-07	
9	2000	8	4	8	15.00	540	20.0	95	95	55.10	0.00	8.30	0.55	93.90	0.55	0.0	5.3E-07	
10	2000	8	4	9	14.00	3540	20.0	95	95	55.10	0.00	11.40	3.10	90.85	3.05	0.8	4.7E-07	
11	2000	8	7	7	49.00		0.0	95	95	59.80		9.20		94.20				
12	2000	8	7	8	10.00	1260	20.0	95	95	59.60	-0.20	9.55	0.35	93.75	0.45	-12.5	1.7E-07	
13	2000	8	7	8	32.00	1320	20.0	95	95	59.50	-0.10	9.90	0.35	93.35	0.40	-6.7	1.5E-07	
14	2000	8	7	8	37.00	300	20.0	95	95	59.65	0.15	10.00	0.10	93.25	0.10	0.0	1.8E-07	
15	2000	8	7	9	28.00	3060	20.0	95	95	59.40	-0.25	10.70	0.70	92.55	0.70	0.0	1.2E-07	
16	2000	8	7	13	3.00	12900	20.0	95	95	59.80	0.40	13.55	2.85	89.80	2.75	1.8	1.2E-07	
17	2000	8	7	16	8.00	11100	20.0	95	95	60.00	0.20	15.60	2.05	87.80	2.00	1.2	1.1E-07	
18	2000	8	8	7	47.00	56340	20.0	95	95	60.75	0.75	23.45	7.85	80.10	7.70	1.0	9.6E-08	
19	2000	8	8	8	22.00	2100	20.0	95	95	60.70	-0.05	23.75	0.30	79.80	0.30	0.0	1.1E-07	
20	2000	8	8	14	14.00	21120	20.0	95	95	60.70	0.00	26.00	2.25	77.60	2.20	1.1	8.7E-08	
21	2000	8	8	16	29.00	8100	20.0	95	95	61.50	0.80	26.80	0.80	76.95	0.65	10.3	7.9E-08	
22	2000	8	9	7	49.00		0.0	95	95	61.90		13.65		96.80				
23	2000	8	9	8	31.00	2520	20.0	95	95	61.80	-0.10	14.15	0.50	96.20	0.60	-9.1	1.2E-07	1
24	2000	8	9	9	36.00	3900	20.0	95	95	61.80	0.00	14.80	0.65	95.70	0.50	13.0	8.1E-08	1
25	2000	8	9	11	55.00	8340	20.0	95	95	61.90	0.10	16.20	1.40	94.30	1.40	0.0	9.4E-08	1
26	2000	8	9	14	5.00	7800	20.0	95	95	62.20	0.30	17.40	1.20	93.20	1.10	4.3	8.6E-08	1

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column. 9.5E-08 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW

QA: [illegible]

Project Name:	WEYERHAEUSER	Cell #:	15
Project #:	5108.08	USCS Description:	Silty, clayey sand
Sample Name:	PT-13, 1000N, 750E	USCS Classification:	SC-SM
Visual Descript:	Silty, clayey sand	Average Kv =	2.2E-08 cm/sec

	Initial Values	Final Values			
Sample Type:	Undisturbed				
Sample Dia. (in)	2.85	2.85	Permeant:	Water	
Sample Ht. (in)	2.34	2.32	Permeant Specific Gravity:	1.00	
Tare & Wet (g)	587.60	573.10	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)	533.30	481.10	Confining Pressure (psi):	100.0	
Tare (g)	268.20	84.39	Burette Diameter (in):	0.250	
Sample Wt. (g)	484.50	488.71	Burette Zero (cm):	100.0	
Moisture (%)	20.5	23.2	Maximum Gradient:	8.3	
Wet Density (pcf)	123.6	125.8	Average Gradient:	8.2	
Dry Density (pcf)	102.6	102.1	Max. Effect. Stress (psi):	5.5	
Saturation (%)	86.2	96.3	Min. Effect. Stress (psi):	4.3	
			Ave. Effect. Stress (psi):	4.8	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow		Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	Kv *** cm/sec	0,1
1	2000	8	7	7	55.00		0.0	95	95	59.60		9.05		96.60				
2	2000	8	7	8	12.00	1020	20.0	95	95	59.65	0.05	9.95	0.90	94.85	1.75	-32.1	6.8E-07	
3	2000	8	7	8	34.00	1320	20.0	95	95	59.45	-0.20	10.30	0.35	94.40	0.45	-12.5	1.6E-07	
4	2000	8	7	8	40.00	360	20.0	95	95	59.50	0.05	10.45	0.15	94.25	0.15	0.0	2.3E-07	
5	2000	8	7	8	49.00	540	20.0	95	95	59.60	0.10	10.55	0.10	94.05	0.20	-33.3	1.5E-07	
6	2000	8	8	7	55.00	83160	20.0	95	95	61.60	2.00	18.15	7.60	86.55	7.50	0.7	5.4E-08	
7	2000	8	8	8	21.00	1560	20.0	95	95	61.70	0.10	18.20	0.05	86.45	0.10	-33.3	3.2E-08	
8	2000	8	8	9	21.00	3600	20.0	95	95	61.40	-0.30	18.40	0.20	86.30	0.15	14.3	3.2E-08	
9	2000	8	8	14	16.00	17700	20.0	95	95	62.20	0.80	19.40	1.00	85.45	0.85	8.1	3.5E-08	
10	2000	8	8	16	28.00	7920	20.0	95	95	63.00	0.80	19.80	0.40	85.05	0.40	0.0	3.5E-08	
11	2000	8	9	7	55.00	55620	20.0	95	95	63.40	0.40	22.30	2.50	82.65	2.40	2.0	3.2E-08	
12	2000	8	9	9	38.00	6180	20.0	95	95	63.30	-0.10	22.45	0.15	82.40	0.25	-25.0	2.4E-08	
13	2000	8	9	11	57.00	8340	20.0	95	95	63.65	0.35	22.85	0.40	82.05	0.35	6.7	3.4E-08	
14	2000	8	10	7	44.00	71220	20.0	95	95	64.95	1.30	25.45	2.60	79.70	2.35	5.1	2.8E-08	
15	2000	8	10	9	50.00	7560	20.0	95	95	64.90	-0.05	25.65	0.20	79.45	0.25	-11.1	2.5E-08	
16	2000	8	10	11	43.00	6780	21.0	95	95	65.45	0.55	25.90	0.25	79.20	0.25	0.0	3.0E-08	
17	2000	8	10	13	58.00	8100	21.0	95	95	65.90	0.45	26.20	0.30	79.00	0.20	20.0	2.6E-08	
18	2000	8	10	16	10.00	7920	21.0	95	95	66.60	0.70	26.40	0.20	78.80	0.20	0.0	2.1E-08	
19	2000	8	11	7	46.00	56160	20.0	95	95	66.05	-0.55	27.95	1.55	77.25	1.55	0.0	2.5E-08	
20	2000	8	11	8	52.00	3960	20.0	95	95	66.15	0.10	28.05	0.10	77.10	0.15	-20.0	2.9E-08	
21	2000	8	11	9	46.00	3240	20.0	95	95	66.10	-0.05	28.10	0.05	77.00	0.10	-33.3	2.1E-08	1
22	2000	8	11	11	55.00	7740	20.0	95	95	66.30	0.20	28.35	0.25	76.85	0.15	25.0	2.4E-08	1
23	2000	8	11	14	15.00	8400	20.0	95	95	66.35	0.05	28.55	0.20	76.60	0.25	-11.1	2.5E-08	1
24	2000	8	11	16	22.00	7620	20.0	95	95	66.80	0.45	28.75	0.20	76.50	0.10	33.3	1.9E-08	1
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

2.2E-08 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJ

QA: HH

Project Name:	WEYERHAEUSER	Cell #:	16
Project #:	5108.08	USCS Description:	Silty, clayey sand
Sample Name:	PT-14, 100N, 1015E	USCS Classification:	SC-SM
Visual Descript:	Silty, clayey sand	Average Kv =	1.7E-05 cm/sec

		Initial Values	Final Values			
Sample Type:	Undisturbed					
Sample Dia. (in)		2.84	2.84	Permeant:	Water	
Sample Ht. (in)		2.31	2.30	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		477.50	578.80	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)		407.20	491.40	Confining Pressure (psi):	100.0	
Tare (g)		0.00	84.20	Burette Diameter (in):	0.250	
Sample Wt. (g)		477.50	494.60	Burette Zero (cm):	100.0	
Moisture (%)		17.3	21.5	Maximum Gradient:	15.7	
Wet Density (pcf)		124.3	129.3	Average Gradient:	14.3	
Dry Density (pcf)		106.0	106.5	Max. Effect. Stress (psi):	5.6	
Saturation (%)		79.1	99.5	Min. Effect. Stress (psi):	4.2	
				Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C°**	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	7	7	56.00		0.0	95	95	52.60		8.50		94.40				
2	2000	8	7	7	57.00	60	20.0	95	95	52.60	0.00	10.90	2.40	92.00	2.40	0.0	2.2E-05	
3	2000	8	7	7	58.00	60	20.0	95	95	52.60	0.00	12.90	2.00	89.90	2.10	-2.4	2.0E-05	
4	2000	8	7	7	59.00	60	20.0	95	95	52.60	0.00	15.10	2.20	87.80	2.10	2.3	2.2E-05	
5	2000	8	7	8	0.00	60	20.0	95	95	52.60	0.00	16.90	1.80	85.90	1.90	-2.7	2.0E-05	
6	2000	8	8	7	56.00		0.0	95	95	56.60		6.70		97.20				
7	2000	8	8	7	57.00	60	20.0	95	95	56.60	0.00	9.00	2.30	94.75	2.45	-3.2	2.0E-05	
8	2000	8	8	7	58.00	60	20.0	95	95	56.60	0.00	10.80	1.80	92.75	2.00	-5.3	1.7E-05	
9	2000	8	8	7	59.00	60	20.0	95	95	56.60	0.00	12.70	1.90	90.90	1.85	1.3	1.8E-05	
10	2000	8	8	8	0.00	60	20.0	95	95	56.60	0.00	14.60	1.90	89.10	1.80	2.7	1.8E-05	
11	2000	8	8	8	1.00	60	20.0	95	95	56.60	0.00	16.25	1.65	87.30	1.80	-4.3	1.8E-05	
12	2000	8	9	7	57.00		0.0	95	95	60.45		7.10		98.50				
13	2000	8	9	7	58.00	60	20.0	95	95	60.45	0.00	9.10	2.00	96.40	2.10	-2.4	1.7E-05	
14	2000	8	9	7	59.00	60	20.0	95	95	60.45	0.00	11.00	1.90	94.40	2.00	-2.6	1.7E-05	
15	2000	8	9	8	0.00	60	20.0	95	95	60.45	0.00	12.90	1.90	92.50	1.90	0.0	1.8E-05	
16	2000	8	9	8	1.00	60	20.0	95	95	60.45	0.00	14.70	1.80	90.70	1.80	0.0	1.7E-05	
17	2000	8	9	8	2.00	60	20.0	95	95	60.45	0.00	16.20	1.50	89.10	1.60	-3.2	1.6E-05	
18	2000	8	10	7	52.00		0.0	95	95	63.25		5.40		96.90				
19	2000	8	10	7	53.00	60	20.0	95	95	63.25	0.00	7.70	2.30	94.80	2.10	4.5	1.9E-05	1
20	2000	8	10	7	54.00	60	20.0	95	95	63.25	0.00	9.50	1.80	92.80	2.00	-5.3	1.7E-05	1
21	2000	8	10	7	55.00	60	20.0	95	95	63.25	0.00	11.30	1.80	91.10	1.70	2.9	1.6E-05	1
22	2000	8	10	7	56.00	60	20.0	95	95	63.25	0.00	12.85	1.55	89.40	1.70	-4.6	1.6E-05	1
23																		
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

1.7E-05 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW

QA: JRH

Project Name:	WEYERHAEUSER	Cell #:	17
Project #:	5108.08	USCS Description:	Silty sand
Sample Name:	PT-15, 1200N, 775E	USCS Classification:	SM
Visual Descript:	Silty sand	Average Kv =	8.4E-06 cm/sec

Sample Type:	Undisturbed	Initial Values	Final Values			
Sample Dia. (in)		2.85	2.85	Permeant:	Water	
Sample Ht. (in)		2.21	2.20	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		476.50	764.10	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)		415.54	691.60	Confining Pressure (psi):	100.0	
Tare (g)		0.00	276.06	Burette Diameter (in):	0.250	
Sample Wt. (g)		476.50	488.04	Burette Zero (cm):	100.0	
Moisture (%)		14.7	17.4	Maximum Gradient:	16.2	
Wet Density (pcf)		128.8	132.5	Average Gradient:	10.1	
Dry Density (pcf)		112.3	112.8	Max. Effect. Stress (psi):	5.4	
Saturation (%)		79.1	95.4	Min. Effect. Stress (psi):	4.0	
				Ave. Effect. Stress (psi):	4.7	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C°**	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	7	8	1.00		0.0	95	95	69.65		15.40		93.50				
2	2000	8	7	8	13.00	720	20.0	95	95	69.70	0.05	24.15	8.75	84.30	9.20	-2.5	7.8E-06	
3	2000	8	7	8	34.00	1260	20.0	95	95	69.60	-0.10	37.30	13.15	71.20	13.10	0.2	9.8E-06	
4	2000	8	7	8	41.00	420	20.0	95	95	69.55	-0.05	39.85	2.55	68.60	2.60	-1.0	8.4E-06	
5	2000	8	8	8	5.00		0.0	95	95	71.70		7.10		97.20				
6	2000	8	8	8	15.00	600	20.0	95	95	71.65	-0.05	16.60	9.50	87.55	9.65	-0.8	8.6E-06	
7	2000	8	8	8	19.00	240	20.0	95	95	71.55	-0.10	20.50	3.90	83.45	4.10	-2.5	1.1E-05	
8	2000	8	8	8	26.00	420	20.0	95	95	71.45	-0.10	24.95	4.45	79.10	4.35	1.1	7.7E-06	
9	2000	8	8	8	30.00	240	20.0	95	95	71.40	-0.05	27.80	2.85	76.25	2.85	0.0	1.0E-05	
10	2000	8	9	8	7.00		0.0	95	95	73.40		8.60		96.60				
11	2000	8	9	8	16.00	540	20.0	95	95	73.45	0.05	17.45	8.85	87.75	8.85	0.0	8.9E-06	
12	2000	8	9	8	22.00	360	20.0	95	95	73.40	-0.05	22.25	4.80	82.90	4.85	-0.5	8.8E-06	
13	2000	8	9	8	27.00	300	20.0	95	95	73.25	-0.15	25.55	3.30	79.50	3.40	-1.5	8.4E-06	
14	2000	8	9	8	30.00	180	20.0	95	95	73.20	-0.05	27.35	1.80	77.70	1.80	0.0	8.2E-06	
15	2000	8	10	8	1.00		0.0	95	95	74.95		7.05		97.15				
16	2000	8	10	8	6.00	300	20.0	95	95	75.00	0.05	11.20	4.15	92.95	4.20	-0.6	7.0E-06	
17	2000	8	10	8	14.00	480	20.0	95	95	74.90	-0.10	17.80	6.60	86.35	6.60	0.0	7.9E-06	
18	2000	8	10	8	20.00	360	20.0	95	95	74.85	-0.05	21.10	3.30	82.85	3.50	-2.9	6.2E-06	
19	2000	8	10	8	24.00	240	20.0	95	95	74.70	-0.15	23.80	2.70	80.20	2.65	0.9	8.1E-06	
20	2000	8	11	7	51.00		0.0	95	95	75.95		5.95		96.35				
21	2000	8	11	8	8.00	1020	20.0	95	95	75.80	-0.15	20.45	14.50	81.50	14.85	-1.2	8.3E-06	1
22	2000	8	11	8	16.00	480	20.0	95	95	75.80	0.00	25.85	5.40	76.15	5.35	0.5	8.7E-06	1
23	2000	8	11	8	31.00	900	20.0	95	95	75.75	-0.05	32.30	6.45	69.75	6.40	0.4	7.0E-06	1
24	2000	8	11	8	36.00	300	20.0	95	95	75.80	0.05	34.65	2.35	67.40	2.35	0.0	9.6E-06	1
25																		
26																		

**A zero in this column starts a series of measurements.

(Termination determined by stable Kv and low flow differential.)

*Average Kv for those rows with a 1 in the Ave. column. 8.4E-06 cm/sec

***Kv adjusted for temperature.

RMT, Inc.

QC: KJW
QA: JRH

Falling Head Permeability Test (ASTM D5084)

Project Name:	WEYERHAEUSER	Cell #:	18
Project #:	5108.08	USCS Description:	Silty, clayey sand
Sample Name:	PT-16, 1200N, 1010E	USCS Classification:	SC-SM
Visual Descript:	Silty, clayey sand	Average Kv =	1.3E-04 cm/sec

		Initial Values	Final Values			
Sample Type:	Undisturbed			Permeant:	Water	
Sample Dia. (in)		2.80	2.80	Permeant Specific Gravity:	1.00	
Sample Ht. (in)		2.51	2.49	Sample Specific Gravity:	2.70	Est.
Tare & Wet (g)		546.80	606.40	Confining Pressure (psi):	100.0	
Tare & Dry (g)		516.10	522.10	Burette Diameter (in):	0.250	
Tare (g)		272.60	83.16	Burette Zero (cm):	100.0	
Sample Wt. (g)		497.10	523.24			
Moisture (%)		12.6	19.2	Maximum Gradient:	14.4	
Wet Density (pcf)		122.5	130.0	Average Gradient:	10.0	
Dry Density (pcf)		108.8	109.1	Max. Effect. Stress (psi):	5.7	
Saturation (%)		62.1	95.2	Min. Effect. Stress (psi):	4.3	
				Ave. Effect. Stress (psi):	5.0	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow		Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	7	8	4.00		0.0	95	95	49.90		13.30		96.05				
2	2000	8	7	8	4.50	30	20.0	95	95	49.90	0.00	19.80	6.50	89.55	6.50	0.0	1.4E-04	
3	2000	8	7	8	5.00	30	20.0	95	95	49.90	0.00	25.80	6.00	83.55	6.00	0.0	1.6E-04	
4	2000	8	7	8	5.50	30	20.0	95	95	49.90	0.00	30.70	4.90	78.65	4.90	0.0	1.6E-04	
5	2000	8	7	8	6.00	30	20.0	95	95	49.90	0.00	35.00	4.30	74.35	4.30	0.0	1.7E-04	
6	2000	8	7	8	6.50	30	20.0	95	95	49.90	0.00	38.20	3.20	71.15	3.20	0.0	1.5E-04	
7	2000	8	8	8	7.00		0.0	95	95	51.90		7.50		101.85				
8	2000	8	8	8	7.50	30	20.0	95	95	51.90	0.00	15.50	8.00	93.85	8.00	0.0	1.6E-04	
9	2000	8	8	8	8.00	30	20.0	95	95	51.90	0.00	21.50	6.00	87.85	6.00	0.0	1.4E-04	
10	2000	8	8	8	8.50	30	20.0	95	95	51.90	0.00	26.50	5.00	82.85	5.00	0.0	1.4E-04	
11	2000	8	8	8	9.00	30	20.0	95	95	51.90	0.00	31.00	4.50	78.35	4.50	0.0	1.5E-04	
12	2000	8	8	8	9.50	30	20.0	95	95	51.90	0.00	34.50	3.50	74.85	3.50	0.0	1.3E-04	
13	2000	8	9	8	10.00		0.0	95	95	54.65		11.20		94.80				
14	2000	8	9	8	10.50	30	20.0	95	95	54.65	0.00	16.80	5.60	89.20	5.60	0.0	1.2E-04	
15	2000	8	9	8	11.00	30	20.0	95	95	54.65	0.00	22.30	5.50	83.70	5.50	0.0	1.4E-04	
16	2000	8	9	8	11.50	30	20.0	95	95	54.65	0.00	27.20	4.90	78.80	4.90	0.0	1.5E-04	
17	2000	8	9	8	12.00	30	20.0	95	95	54.65	0.00	31.10	3.90	74.90	3.90	0.0	1.4E-04	
18	2000	8	9	8	12.50	30	20.0	95	95	54.65	0.00	34.40	3.30	71.60	3.30	0.0	1.4E-04	
19	2000	8	10	8	8.00		0.0	95	95	56.90		9.80		101.00				
20	2000	8	10	8	8.50	30	20.0	95	95	56.90	0.00	16.40	6.60	94.40	6.60	0.0	1.3E-04	1
21	2000	8	10	8	9.00	30	20.0	95	95	56.90	0.00	22.10	5.70	88.70	5.70	0.0	1.3E-04	1
22	2000	8	10	8	9.50	30	20.0	95	95	56.90	0.00	27.00	4.90	83.80	4.90	0.0	1.3E-04	1
23	2000	8	10	8	10.00	30	20.0	95	95	56.90	0.00	31.30	4.30	79.50	4.30	0.0	1.4E-04	1
24	2000	8	10	8	10.50	30	20.0	95	95	56.90	0.00	34.90	3.60	75.90	3.60	0.0	1.4E-04	1
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column. 1.3E-04 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: HJW

QA: JHH

Project Name:	WEYERHAEUSER	Cell #:	19
Project #:	5108.08	USCS Description:	Silty sand
Sample Name:	PT-17, 1400N, 775E	USCS Classification:	SM
Visual Descript:	Silty sand	Average Kv =	8.4E-04 cm/sec

		Initial Values	Final Values			
Sample Type:	Undisturbed					
Sample Dia. (in)		2.85	2.85	Permeant:	Water	
Sample Ht. (in)		2.08	2.06	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		614.40	524.90	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)		579.30	447.70	Confining Pressure (psi):	100.0	
Tare (g)		260.80	84.49	Burette Diameter (in):	0.250	
Sample Wt. (g)		406.80	440.41	Burette Zero (cm):	70.0	
Moisture (%)		11.0	21.3	Maximum Gradient:	12.1	
Wet Density (pcf)		116.8	127.7	Average Gradient:	4.5	
Dry Density (pcf)		105.2	105.3	Max. Effect. Stress (psi):	5.3	
Saturation (%)		49.5	95.6	Min. Effect. Stress (psi):	4.3	
				Ave. Effect. Stress (psi):	4.7	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	7	8	5.00		0.0	95	95	49.25		0.00		70.00				
2	2000	8	7	8	5.10	6	21.0	95	95	49.25	0.00	10.00	10.00	60.00	10.00	0.0	1.1E-03	
3	2000	8	7	8	5.30	12	21.0	95	95	49.25	0.00	20.00	10.00	50.00	10.00	0.0	8.4E-04	
4	2000	8	7	8	5.70	24	21.0	95	95	49.25	0.00	30.00	10.00	40.00	10.00	0.0	9.0E-04	
5	2000	8	7	8	10.00		0.0	95	95	49.25		0.00		70.00				
6	2000	8	7	8	10.10	6	21.0	95	95	49.25	0.00	10.00	10.00	60.00	10.00	0.0	1.1E-03	
7	2000	8	7	8	10.30	12	21.0	95	95	49.25	0.00	20.00	10.00	50.00	10.00	0.0	8.4E-04	
8	2000	8	7	8	10.70	24	21.0	95	95	49.25	0.00	30.00	10.00	40.00	10.00	0.0	9.0E-04	
9	2000	8	8	7	49.25		0.0	95	95	51.40		4.35		65.65				
10	2000	8	8	7	49.50	15	21.0	95	95	51.40	0.00	19.20	14.85	50.80	14.85	0.0	8.7E-04	
11	2000	8	8	7	49.75	15	21.0	95	95	51.40	0.00	27.00	7.80	43.00	7.80	0.0	8.9E-04	
12	2000	8	8	7	50.00	15	21.0	95	95	51.40	0.00	31.40	4.40	38.60	4.40	0.0	1.0E-03	
13	2000	8	8	7	50.25	15	21.0	95	95	51.40	0.00	33.50	2.10	36.50	2.10	0.0	1.1E-03	
14	2000	8	9	7	41.00		0.0	95	95	53.40		5.40		68.50				
15	2000	8	9	7	41.25		21.0	95	95	53.40	0.00	19.70	14.30	54.20	14.30	0.0	7.9E-04	1
16	2000	8	9	7	41.50	15	21.0	95	95	53.40	0.00	27.70	8.00	46.20	8.00	0.0	8.2E-04	1
17	2000	8	9	7	41.75	15	21.0	95	95	53.40	0.00	32.10	4.40	41.80	4.40	0.0	8.5E-04	1
18	2000	8	9	7	42.00	15	21.0	95	95	53.40	0.00	34.50	2.40	39.40	2.40	0.0	8.9E-04	1
19																		
20																		
21																		
22																		
23																		
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

8.4E-04 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: 11/14/00

QA: 11/14

Project Name:	WEYERHAEUSER	Cell #:	19
Project #:	5108.08	USCS Description:	Silty sand
Sample Name:	PT-17A, 1400N, 775E	USCS Classification:	SM
Visual Descript:	Silty sand	Average Kv =	4.5E-04 cm/sec

Sample Type:	Undisturbed	Initial Values	Final Values		
Sample Dia. (in)		2.83	2.83	Permeant:	Water
Sample Ht. (in)		2.31	2.29	Permeant Specific Gravity:	1.00
Tare & Wet (g)		456.20	568.00	Sample Specific Gravity:	2.65 Est.
Tare & Dry (g)		406.47	489.20	Confining Pressure (psi):	100.0
Tare (g)		0.00	82.73	Burette Diameter (in):	0.250
Sample Wt. (g)		456.20	485.27	Burette Zero (cm):	70.0
Moisture (%)		12.2	19.4	Maximum Gradient:	11.0
Wet Density (pcf)		119.6	128.3	Average Gradient:	5.7
Dry Density (pcf)		106.6	107.5	Max. Effect. Stress (psi):	5.5
Saturation (%)		58.8	95.5	Min. Effect. Stress (psi):	4.4
				Ave. Effect. Stress (psi):	4.9

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow		Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	10	7	46.00		0.0	95	95	37.10		4.30		68.40				
2	2000	8	10	7	46.25	15	21.0	95	95	37.10	0.00	12.40	8.10	60.30	8.10	0.0	4.3E-04	
3	2000	8	10	7	46.50	15	21.0	95	95	37.10	0.00	19.00	6.60	53.70	6.60	0.0	4.8E-04	
4	2000	8	10	7	46.75	15	21.0	95	95	37.10	0.00	23.40	4.40	49.30	4.40	0.0	4.3E-04	
5	2000	8	10	7	47.00	15	21.0	95	95	37.10	0.00	27.00	3.60	45.70	3.60	0.0	4.8E-04	
6	2000	8	10	7	47.25	15	21.0	95	95	37.10	0.00	29.40	2.40	43.30	2.40	0.0	4.4E-04	
7	2000	8	10	8	28.00		0.0	95	95	37.10		4.20		69.00				
8	2000	8	10	8	28.25	15	21.0	95	95	37.10	0.00	13.10	8.90	60.10	8.90	0.0	4.7E-04	
9	2000	8	10	8	28.50	15	21.0	95	95	37.10	0.00	19.30	6.20	53.90	6.20	0.0	4.5E-04	
10	2000	8	10	8	28.75	15	21.0	95	95	37.10	0.00	24.10	4.80	49.10	4.80	0.0	4.8E-04	
11	2000	8	10	8	29.00	15	21.0	95	95	37.10	0.00	27.60	3.50	45.60	3.50	0.0	4.9E-04	
12	2000	8	10	8	29.25	15	21.0	95	95	37.10	0.00	30.00	2.40	43.20	2.40	0.0	4.6E-04	
13	2000	8	11	7	46.00		0.0	95	95	39.70		4.50		68.20				
14	2000	8	11	7	46.25	15	21.0	95	95	39.70	0.00	12.50	8.00	60.20	8.00	0.0	4.3E-04	
15	2000	8	11	7	46.50	15	21.0	95	95	39.70	0.00	18.60	6.10	54.10	6.10	0.0	4.4E-04	
16	2000	8	11	7	46.75	15	21.0	95	95	39.70	0.00	23.20	4.60	49.50	4.60	0.0	4.4E-04	
17	2000	8	11	7	47.00	15	21.0	95	95	39.70	0.00	26.50	3.30	46.20	3.30	0.0	4.3E-04	
18	2000	8	11	7	47.25	15	21.0	95	95	39.70	0.00	29.10	2.60	43.60	2.60	0.0	4.5E-04	
19	2000	8	14	7	55.00		0.0	95	95	45.20		4.20		68.30				
20	2000	8	14	7	55.25	15	21.0	95	95	45.20	0.00	12.80	8.60	59.70	8.60	0.0	4.6E-04	1
21	2000	8	14	7	55.50	15	21.0	95	95	45.20	0.00	19.00	6.20	53.50	6.20	0.0	4.5E-04	1
22	2000	8	14	7	55.75	15	21.0	95	95	45.20	0.00	23.30	4.30	49.20	4.30	0.0	4.2E-04	1
23	2000	8	14	7	56.00	15	21.0	95	95	45.20	0.00	26.80	3.50	45.70	3.50	0.0	4.7E-04	1
24	2000	8	14	7	56.25	15	21.0	95	95	45.20	0.00	29.20	2.40	43.30	2.40	0.0	4.3E-04	1
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column. 4.5E-04 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC:

QA:

Project Name:	WEYERHAEUSER	Cell #:	10
Project #:	5108.08	USCS Description:	Silty sand
Sample Name:	PT-17B, 1393N, 715E	USCS Classification:	SM
Visual Descript:	Silty sand	Average Kv =	6.6E-07 cm/sec

Sample Type:	Undisturbed	Initial Values	Final Values		
Sample Dia. (in)		2.86	2.86	Permeant:	Water
Sample Ht. (in)		2.30	2.28	Permeant Specific Gravity:	1.00
Tare & Wet (g)		494.10	579.40	Sample Specific Gravity:	2.70 Est.
Tare & Dry (g)		412.63	496.20	Confining Pressure (psi):	100.0
Tare (g)		0.00	83.57	Burette Diameter (in):	0.250
Sample Wt. (g)		494.10	495.83	Burette Zero (cm):	100.0
Moisture (%)		19.7	20.2	Maximum Gradient:	15.7
Wet Density (pcf)		127.4	129.0	Average Gradient:	13.6
Dry Density (pcf)		106.4	107.3	Max. Effect. Stress (psi):	5.6
Saturation (%)		91.3	95.5	Min. Effect. Stress (psi):	4.0
				Ave. Effect. Stress (psi):	4.7

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow		Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C**	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	Kv *** cm/sec	0,1
1	2000	8	14	13	6.00		0.0	95	95	54.20		16.60		98.60				
2	2000	8	14	13	19.00	780	21.0	95	95	54.20	0.00	17.80	1.20	96.50	2.10	-27.3	1.1E-06	
3	2000	8	14	13	48.00	1740	21.0	95	95	55.90	1.70	19.90	2.10	94.30	2.20	-2.3	7.0E-07	
4	2000	8	14	14	45.00	3420	21.0	95	95	58.10	2.20	23.30	3.40	90.60	3.70	-4.2	6.3E-07	
5	2000	8	14	15	16.00	1860	21.0	95	95	59.20	1.10	24.90	1.60	89.00	1.60	0.0	5.7E-07	
6	2000	8	14	16	4.00	2880	21.0	95	95	61.30	2.10	27.05	2.15	86.65	2.35	-4.4	5.5E-07	
7	2000	8	15	7	44.00		0.0	95	95	69.80		7.40		99.50				
8	2000	8	15	7	57.00	780	21.0	95	95	69.80	0.00	9.20	1.80	97.70	1.80	0.0	1.1E-06	
9	2000	8	15	8	13.00	960	21.0	95	95	69.80	0.00	10.80	1.60	96.00	1.70	-3.0	8.5E-07	
10	2000	8	15	9	5.00	3120	21.0	95	95	69.80	0.00	16.10	5.30	90.30	5.70	-3.6	9.6E-07	
11	2000	8	15	10	30.00	5100	21.0	95	95	71.00	1.20	22.90	6.80	83.20	7.10	-2.2	8.8E-07	
12	2000	8	15	12	58.00	8880	20.0	95	95	71.45	0.45	31.25	8.35	74.50	8.70	-2.1	8.3E-07	
13	2000	8	16	8	6.00		0.0	95	95	73.90		9.20		99.15				
14	2000	8	16	11	42.00	12960	21.0	95	95	74.90	1.00	23.90	14.70	83.40	15.75	-3.4	6.9E-07	
15	2000	8	16	12	55.00	4380	21.0	95	95	74.55	-0.35	27.10	3.20	80.05	3.35	-2.3	5.7E-07	
16	2000	8	16	15	56.00	10860	22.0	95	95	78.00	3.45	23.05	-4.05	73.75	6.30	-460.0	8.4E-08	
17	2000	8	17	7	42.00		0.0	95	95	76.20		8.45		96.05				
18	2000	8	17	8	40.00	3480	20.0	95	95	75.90	-0.30	13.40	4.95	90.80	5.25	-2.9	7.9E-07	
19	2000	8	17	10	10.00	5400	20.0	95	95	76.00	0.10	19.25	5.85	84.75	6.05	-1.7	6.8E-07	
20	2000	8	17	13	9.00	10740	20.0	95	95	76.40	0.40	27.65	8.40	76.05	8.70	-1.8	6.2E-07	
21	2000	8	17	16	4.00	10500	20.0	95	95	76.45	0.05	33.20	5.55	70.35	5.70	-1.3	5.6E-07	
22	2000	8	18	7	40.00		0.0	95	95	78.00		6.80		97.60				
23	2000	8	18	8	23.00	2580	20.0	95	95	77.50	-0.50	10.20	3.40	93.95	3.65	-3.5	6.9E-07	1
24	2000	8	18	8	52.00	1740	20.0	95	95	77.40	-0.10	12.40	2.20	91.65	2.30	-2.2	7.0E-07	1
25	2000	8	18	9	50.00	3480	20.0	95	95	77.85	0.45	16.15	3.75	87.65	4.00	-3.2	6.5E-07	1
26	2000	8	18	10	21.00	1860	20.0	95	95	77.90	0.05	17.80	1.65	85.90	1.75	-2.9	5.8E-07	1

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column. 6.6E-07 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

QC: HJW

QA: DR

Falling Head Permeability Test (ASTM D5084)

Project Name:	WEYERHAEUSER	Cell #:	20
Project #:	5108.08	USCS Description:	Silty, clayey sand
Sample Name:	PT-18, 1400N, 1050E	USCS Classification:	SC-SM
Visual Descript:	Silty, clayey sand	Average Kv =	1.1E-07 cm/sec

	Initial Values	Final Values			
Sample Type:	Undisturbed				
Sample Dia. (in)	2.85	2.85	Permeant:	Water	
Sample Ht. (in)	2.30	2.29	Permeant Specific Gravity:	1.00	
Tare & Wet (g)	482.60	754.70	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)	402.30	668.90	Confining Pressure (psi):	100.0	
Tare (g)	0.00	266.60	Burette Diameter (in):	0.250	
Sample Wt. (g)	482.60	488.10	Burette Zero (cm):	70.0	
Moisture (%)	20.0	21.3	Maximum Gradient:	6.9	
Wet Density (pcf)	125.3	127.3	Average Gradient:	5.6	
Dry Density (pcf)	104.5	104.9	Max. Effect. Stress (psi):	5.2	
Saturation (%)	87.9	95.0	Min. Effect. Stress (psi):	4.3	
			Ave. Effect. Stress (psi):	4.8	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow		Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	Kv *** cm/sec	0,1
1	2000	8	7	8	29.00		0.0	95	95	47.60		3.90		63.30				
2	2000	8	7	8	30.00	60	21.0	95	95	47.60	0.00	4.10	0.20	63.05	0.25	-11.1	2.8E-06	
3	2000	8	7	8	35.00	300	21.0	95	95	47.40	-0.20	4.50	0.40	62.80	0.25	23.1	8.1E-07	
4	2000	8	7	8	41.00	360	21.0	95	95	47.35	-0.05	4.80	0.30	62.65	0.15	33.3	4.7E-07	
5	2000	8	7	8	49.00	480	21.0	95	95	47.25	-0.10	5.20	0.40	62.55	0.10	60.0	3.9E-07	
6	2000	8	7	13	2.00	15180	21.0	95	95	47.85	0.60	13.10	7.90	59.20	3.35	40.4	3.1E-07	
7	2000	8	8	7	52.00		0.0	95	95	49.60		3.50		64.60				
8	2000	8	8	8	10.00	1080	21.0	95	95	49.30	-0.30	4.10	0.60	64.20	0.40	20.0	3.3E-07	
9	2000	8	8	9	21.00	4260	21.0	95	95	49.50	0.20	5.75	1.65	63.25	0.95	26.9	2.3E-07	
10	2000	8	8	12	2.00	9660	21.0	95	95	49.80	0.30	8.70	2.95	61.35	1.90	21.6	2.0E-07	
11	2000	8	8	14	10.00	7680	21.0	95	95	50.00	0.20	10.75	2.05	60.00	1.35	20.6	1.9E-07	
12	2000	8	8	16	25.00	8100	21.0	95	95	50.05	0.05	12.50	1.75	58.80	1.20	18.6	1.7E-07	
13	2000	8	9	7	43.00	55080	21.0	95	95	51.30	1.25	20.90	8.40	52.60	6.20	15.1	1.5E-07	
14	2000	8	9	8	51.00	4080	21.0	95	95	51.50	0.20	21.35	0.45	52.25	0.35	12.5	1.4E-07	
15	2000	8	9	9	40.00	2940	21.0	95	95	51.40	-0.10	21.70	0.35	51.95	0.30	7.7	1.6E-07	
16	2000	8	9	11	51.00	7860	21.0	95	95	51.50	0.10	22.55	0.85	51.40	0.55	21.4	1.3E-07	
17	2000	8	9	14	7.00	8160	21.0	95	95	51.80	0.30	23.30	0.75	50.25	1.15	-21.1	1.8E-07	
18	2000	8	9	16	20.00	7980	21.0	95	95	51.85	0.05	24.05	0.75	50.20	0.05	87.5	8.2E-08	
19	2000	8	10	7	50.00		0.0	95	95	53.10		28.50		68.45				
20	2000	8	10	9	26.00	5760	21.0	95	95	53.10	0.00	29.10	0.60	67.90	0.55	4.3	1.1E-07	1
21	2000	8	10	11	43.00	8220	21.0	95	95	53.20	0.10	29.95	0.85	67.10	0.80	3.0	1.2E-07	1
22	2000	8	10	13	57.00	8040	21.0	95	95	53.50	0.30	30.75	0.80	66.50	0.60	14.3	1.0E-07	1
23	2000	8	10	16	11.00	8040	21.0	95	95	52.70	-0.80	31.55	0.80	65.90	0.60	14.3	1.1E-07	1
24	2000	8	11	7	48.00	56220	21.0	95	95	54.70	2.00	35.90	4.35	62.30	3.60	9.4	1.0E-07	1
25																		
26																		

**A zero in this column starts a series of measurements.

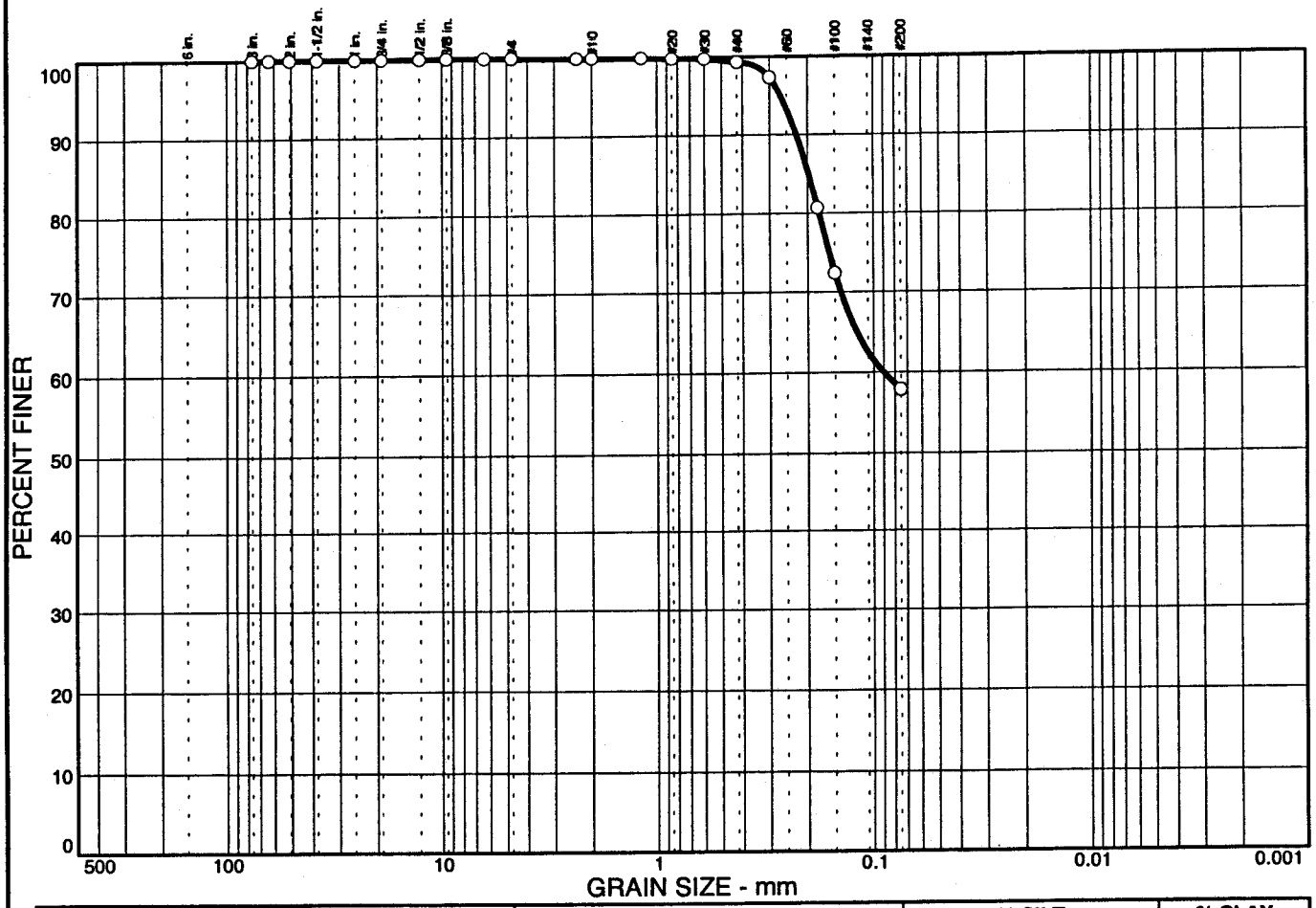
*Average Kv for those rows with a 1 in the Ave. column. 1.1E-07 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

VJPS

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	42.1	57.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	99.9		
#20	99.8		
#30	99.7		
#40	99.3		
#50	97.3		
#80	80.7		
#100	72.4		
#200	57.9		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 20 LL= 39 PI= 19

Coefficients

D_{85}= 0.199 D_{60}= 0.0901 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

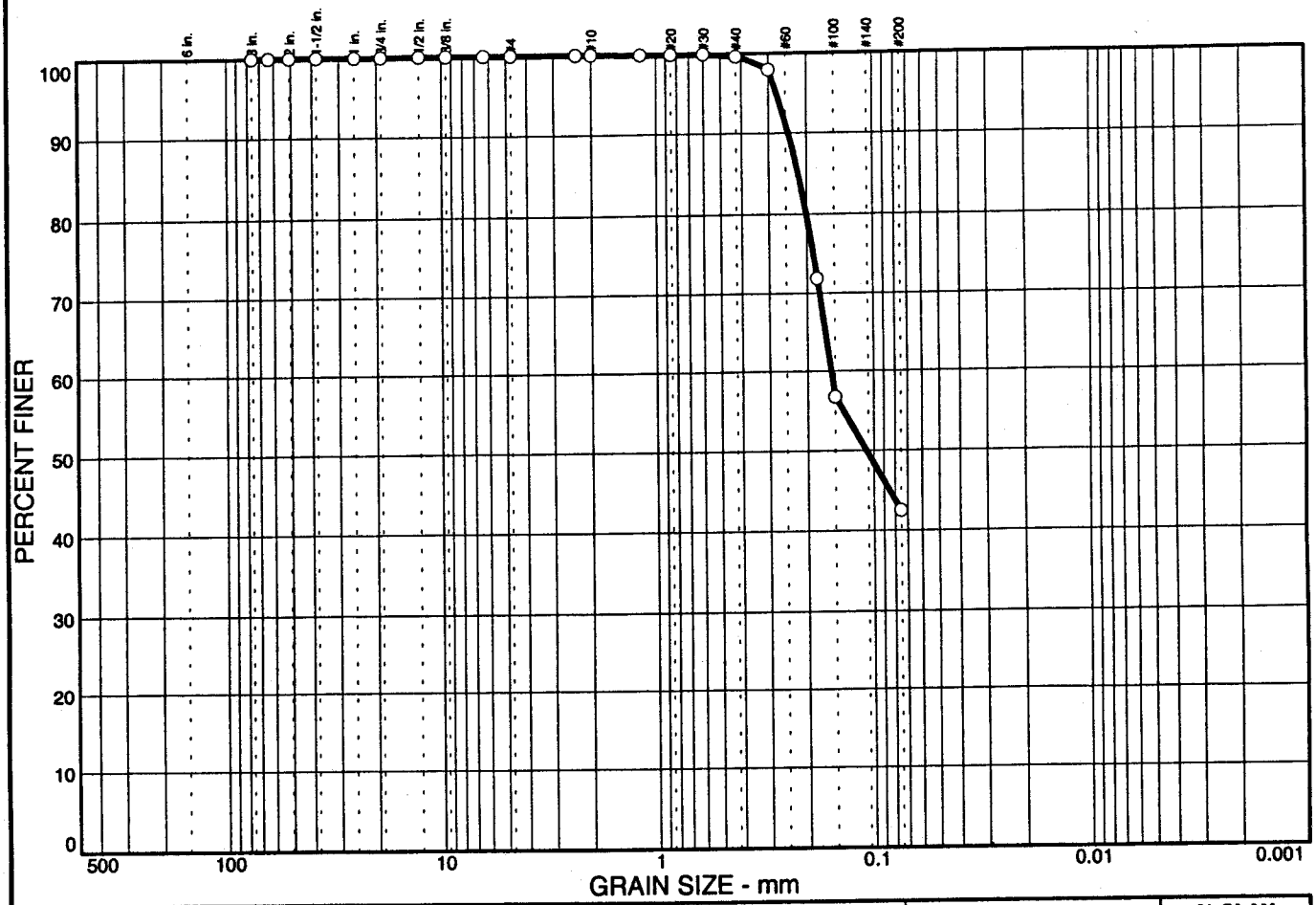
Remarks

Sample No.: 1420N, 684E **Source of Sample:** LPT-8 **Date:** 9-7-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	57.5	42.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	99.9		
#20	99.9		
#30	99.9		
#40	99.6		
#50	97.9		
#80	71.9		
#100	56.7		
#200	42.5		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 24 LL= 35 PI= 11

Coefficients

D_{85}= 0.220 D_{60}= 0.156 D_{50}= 0.108
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

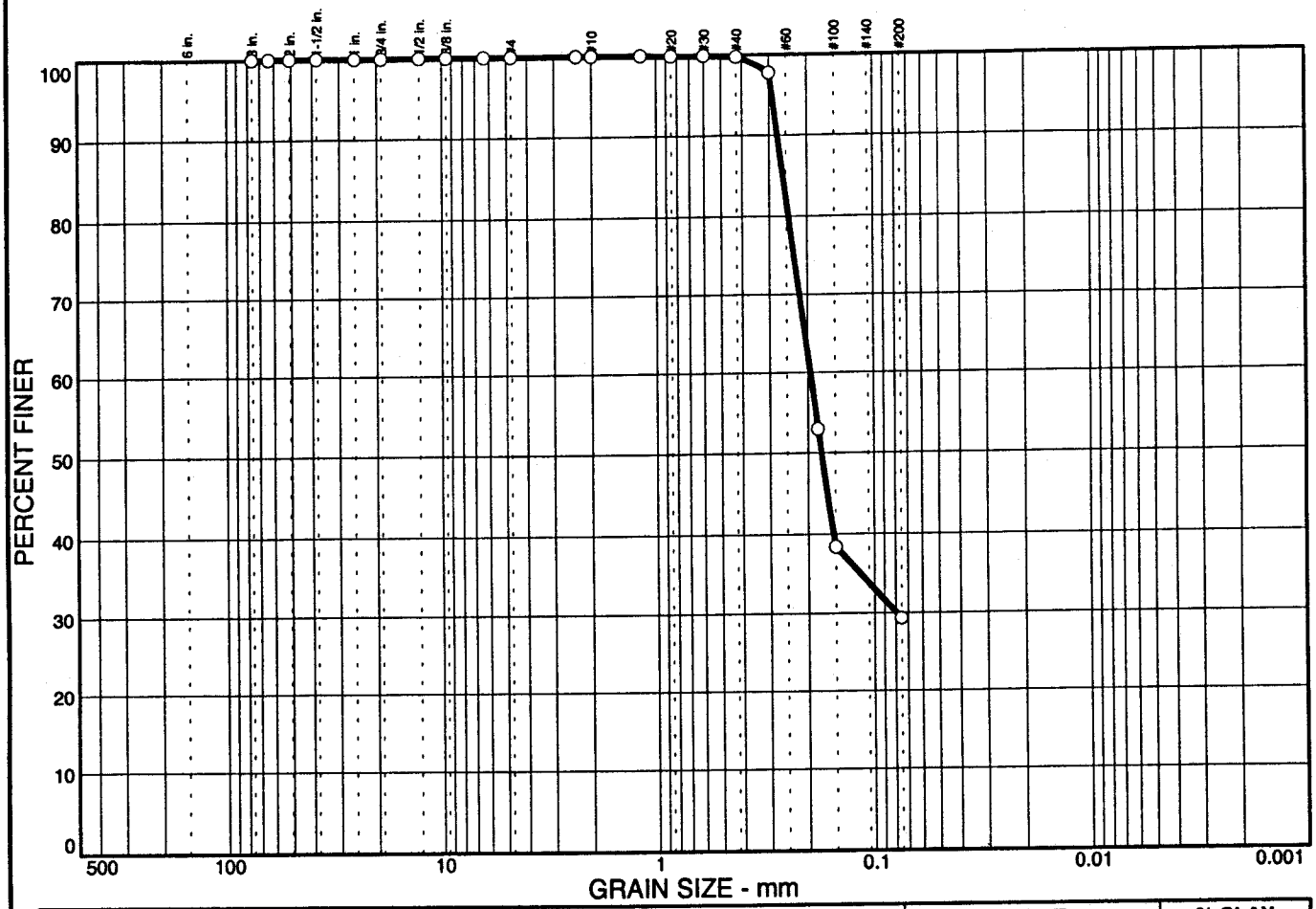
Remarks

Sample No.: PT-1,1292N,792E **Source of Sample:** PT **Date:** 7-26-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	70.7	29.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	100.0		
#20	99.9		
#30	99.9		
#40	99.7		
#50	97.7		
#80	52.9		
#100	38.4		
#200	29.3		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 18 LL= 24 PI= 6

Coefficients

D_{85}= 0.259 D_{60}= 0.195 D_{50}= 0.174
D_{30}= 0.0791 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO=

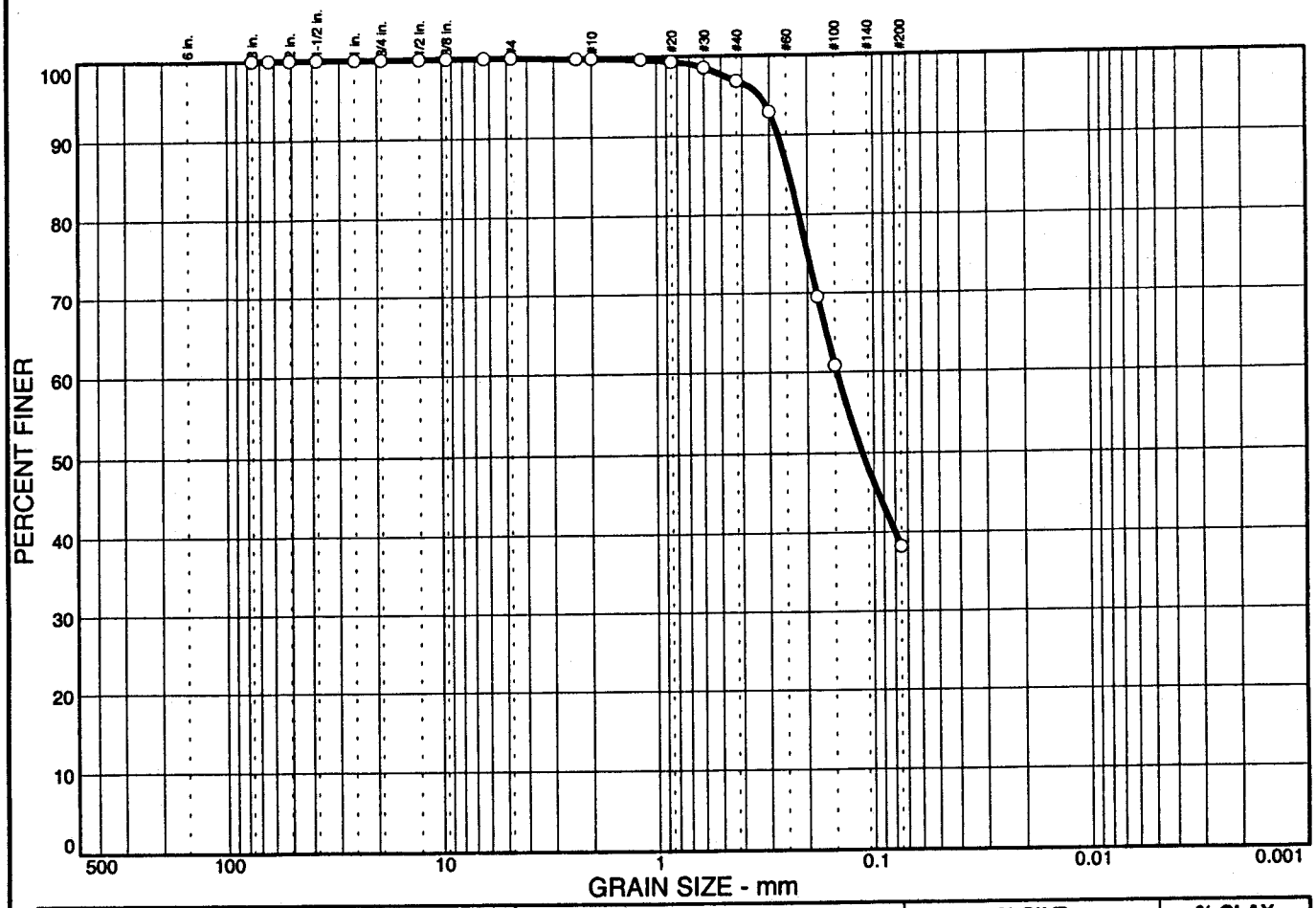
Remarks

Sample No.: PT-2,1250N,1051E **Source of Sample:** PT **Date:** 7-26-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	61.8	38.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	99.8		
#10	99.8		
#16	99.6		
#20	99.3		
#30	98.5		
#40	96.8		
#50	92.9		
#80	69.5		
#100	60.8		
#200	38.2		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 20 LL= 26 PI= 6

Coefficients

D_{85}= 0.243 D_{60}= 0.147 D_{50}= 0.113
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO=

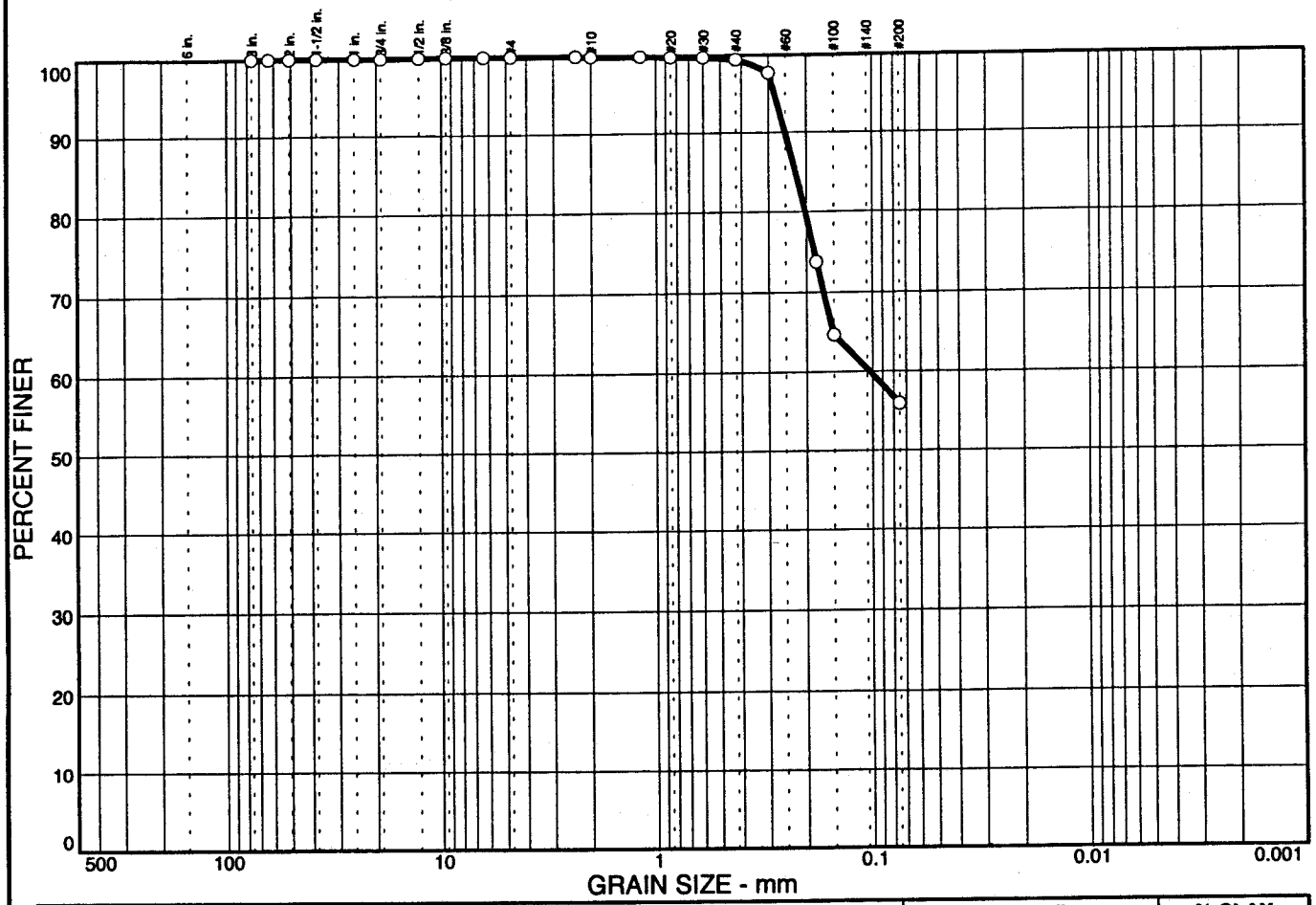
Remarks

Sample No.: PT-3,1053N,795E **Source of Sample:** PT **Date:** 7-26-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	44.0	56.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	99.9		
#16	99.9		
#20	99.8		
#30	99.7		
#40	99.4		
#50	97.7		
#80	73.8		
#100	64.7		
#200	56.0		

* (no specification provided)

Soil Description

Sandy silty clay

Atterberg Limits

PL= 17 LL= 24 PI= 7

Coefficients

D_{85}= 0.226 D_{60}= 0.103 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL-ML AASHTO=

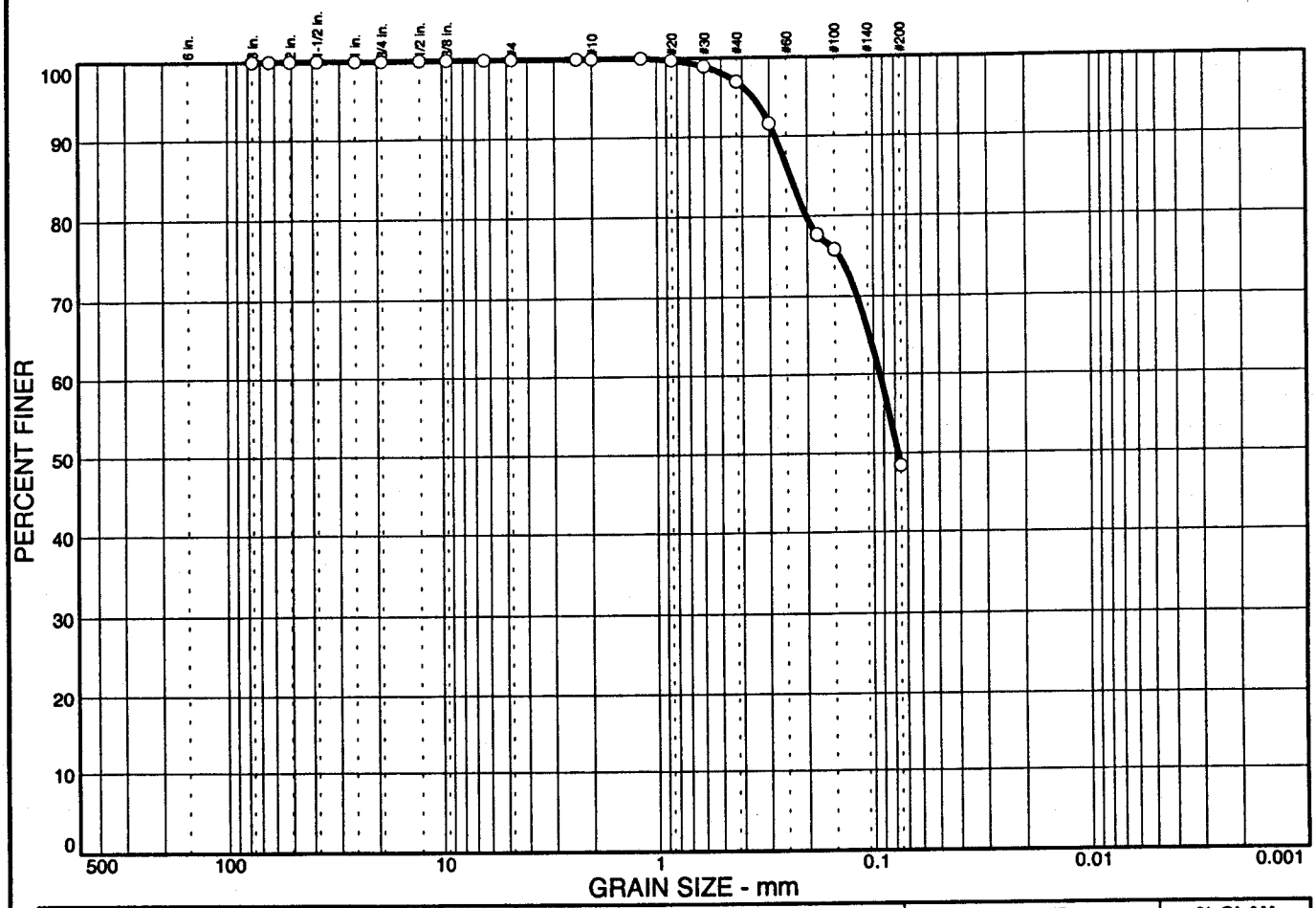
Remarks

Sample No.: PT-4,1050N,1050E **Source of Sample:** PT **Date:**
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	51.6	48.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	100.0		
#20	99.7		
#30	98.9		
#40	96.9		
#50	91.6		
#80	77.7		
#100	75.9		
#200	48.4		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 24 LL= 35 PI= 11

Coefficients

D_{85}= 0.240 D_{60}= 0.0940 D_{50}= 0.0773
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

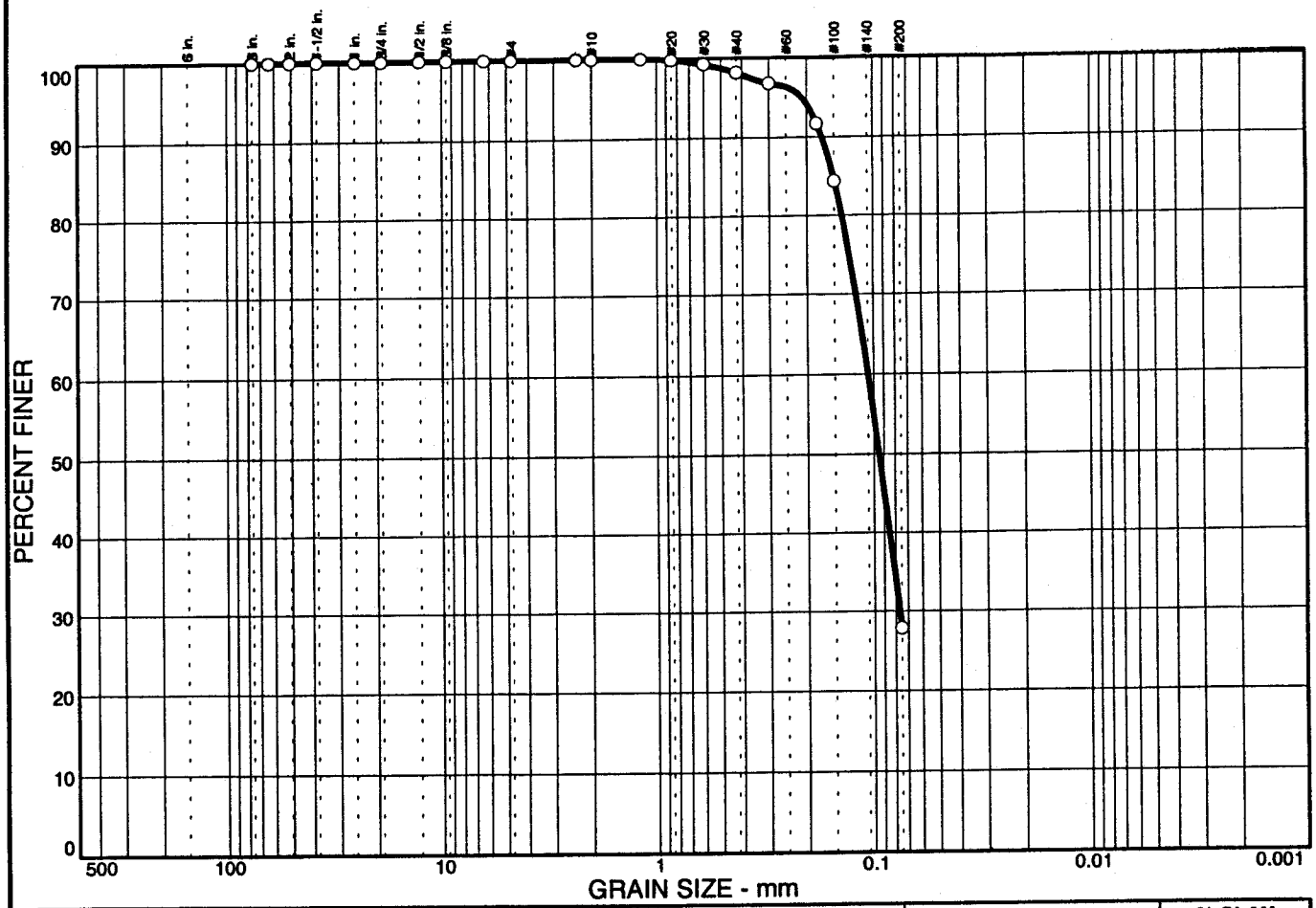
Remarks

Sample No.: PT-5,905N,750E **Source of Sample:** PT **Date:** 7-26-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	72.2	27.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	100.0		
#20	99.8		
#30	99.2		
#40	98.1		
#50	96.7		
#80	91.7		
#100	84.4		
#200	27.8		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= 23 LL= 24 PI= 1

Coefficients

D_{85}= 0.152 D_{60}= 0.106 D_{50}= 0.0947
D_{30}= 0.0767 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

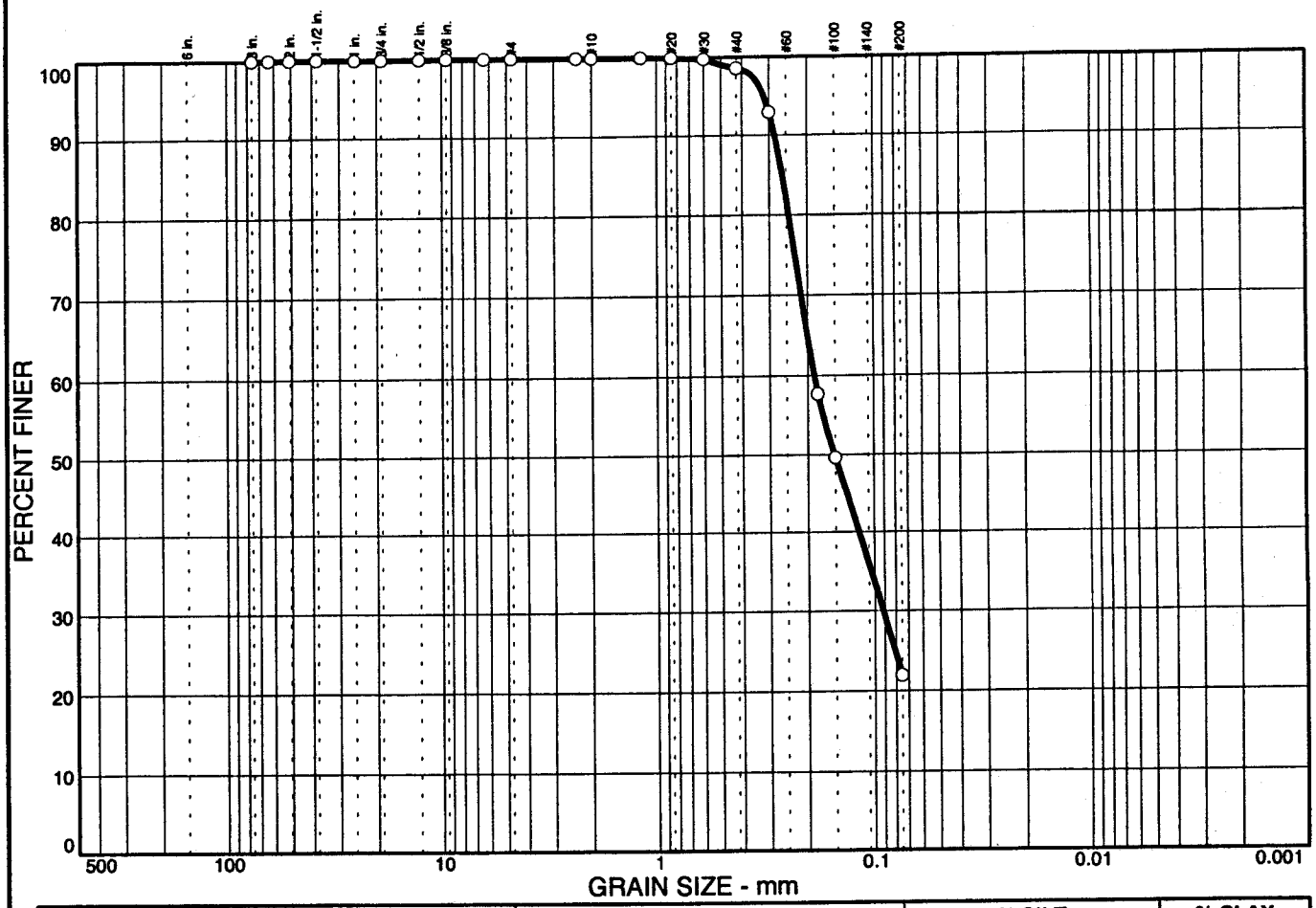
Remarks

Sample No.: PT-6,895N,1009E **Source of Sample:** PT **Date:** 7-26-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	78.1	21.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	100.0		
#20	99.9		
#30	99.7		
#40	98.5		
#50	92.9		
#80	57.7		
#100	49.6		
#200	21.9		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= 21 LL= 23 PI= 2

Coefficients

D_{85}= 0.262 D_{60}= 0.187 D_{50}= 0.152
D_{30}= 0.0916 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

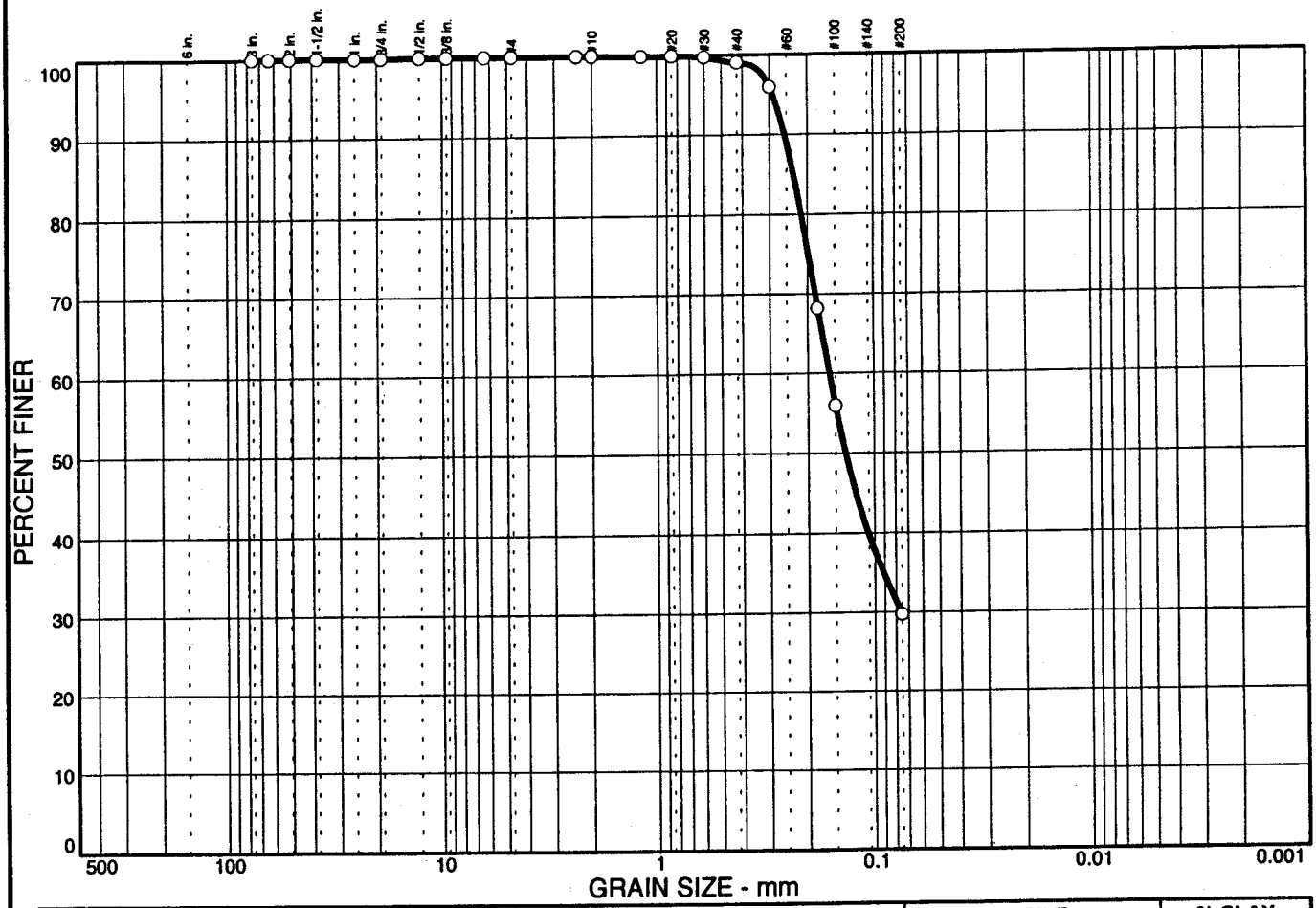
Remarks

Sample No.: PT-7,750N,755E **Source of Sample:** PT **Date:** 7-26-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	70.3	29.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	99.9		
#20	99.9		
#30	99.7		
#40	99.0		
#50	95.9		
#80	68.2		
#100	55.9		
#200	29.7		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= 21 LL= 23 PI= 2

Coefficients

D_{85}= 0.233 D_{60}= 0.160 D_{50}= 0.135
D_{30}= 0.0759 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

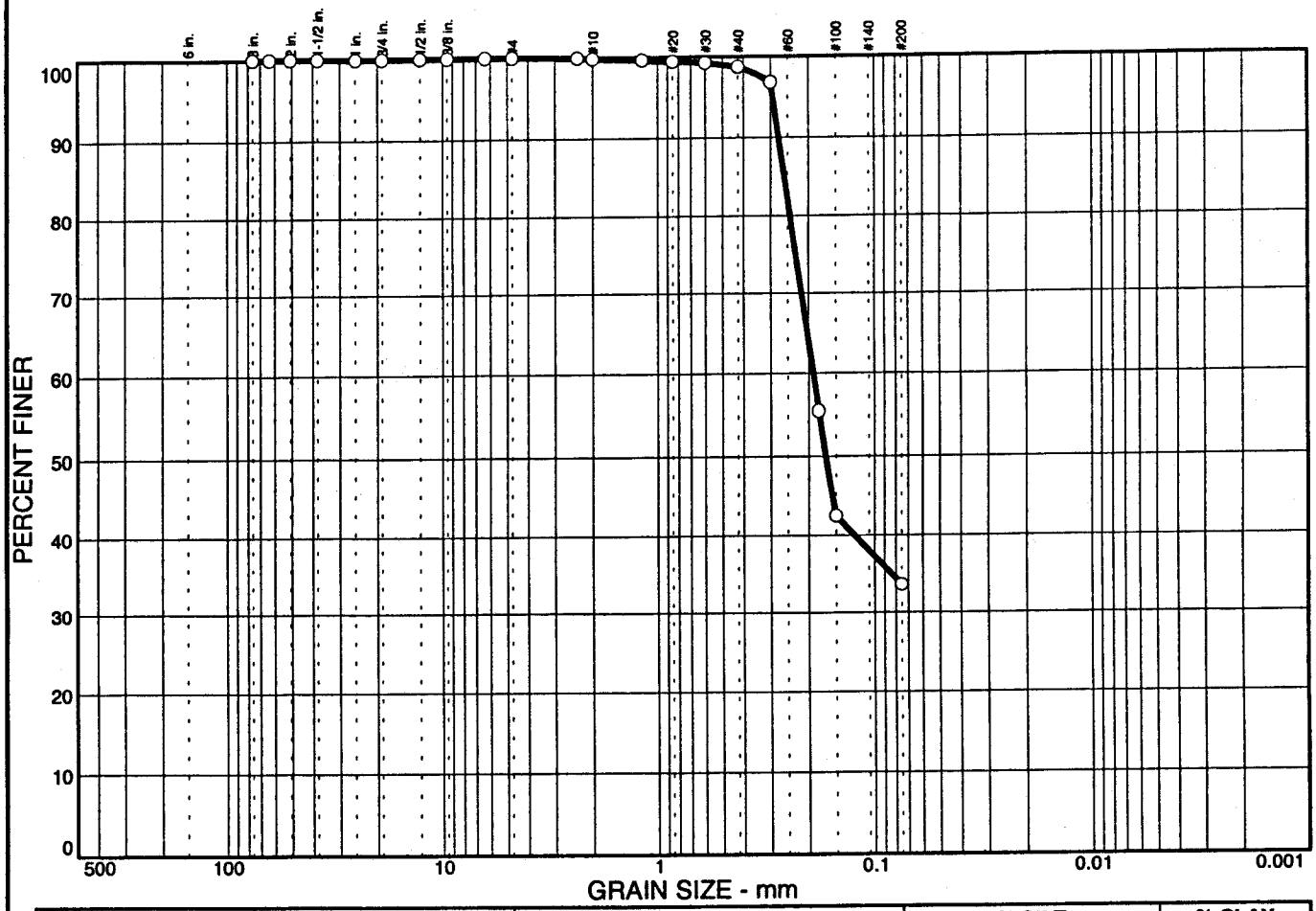
Remarks

Sample No.: PT-8,700N,1000E **Source of Sample:** PT **Date:** 7-25-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	66.4	33.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	99.9		
#10	99.8		
#16	99.6		
#20	99.4		
#30	99.2		
#40	98.7		
#50	96.8		
#80	55.4		
#100	42.5		
#200	33.6		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 22 LL= 29 PI= 7

Coefficients

D_{85}= 0.260 D_{60}= 0.191 D_{50}= 0.168
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO=

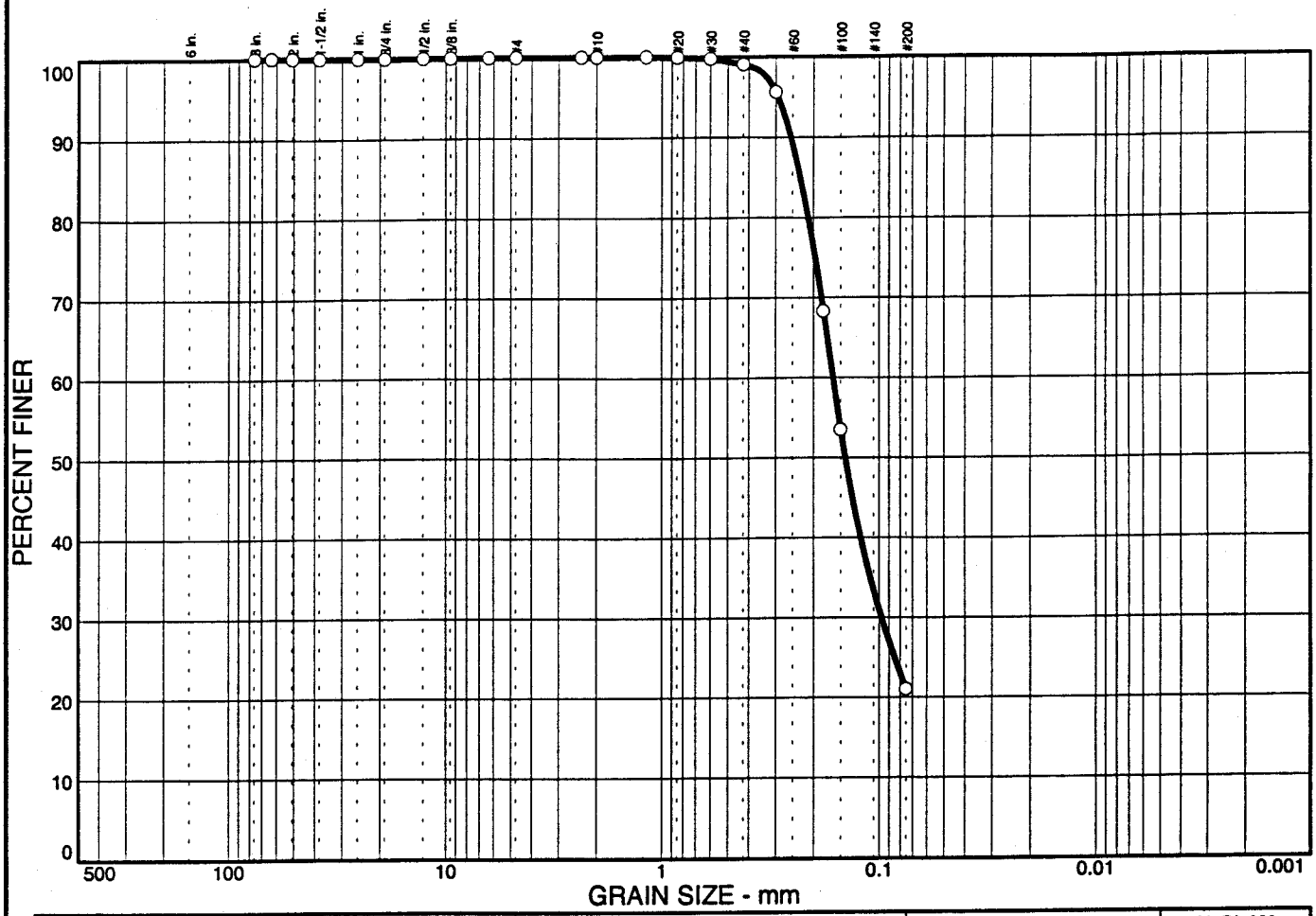
Remarks

Sample No.: PT-9,1460N,900E **Source of Sample:** PT **Date:** 7-26-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	79.0	21.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	100.0		
#20	99.9		
#30	99.7		
#40	99.0		
#50	95.6		
#80	68.3		
#100	53.5		
#200	21.0		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= 21 LL= 22 PI= 1

Coefficients

D_{85}= 0.230 D_{60}= 0.163 D_{50}= 0.143
D_{30}= 0.0975 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

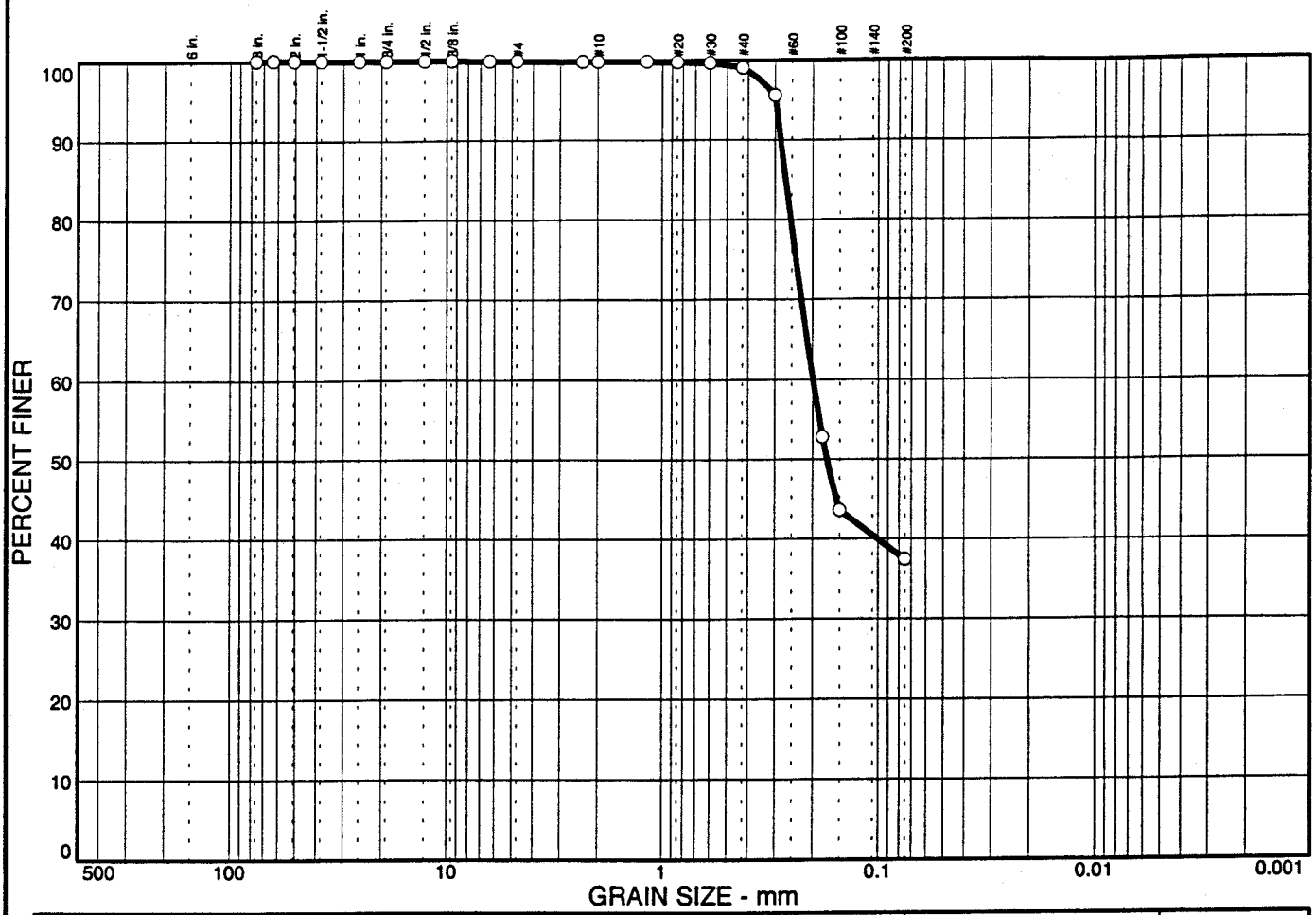
Remarks

Sample No.: PT-10, 670N, 900E **Source of Sample:** PT **Date:** 8-3-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	62.5	37.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	99.9		
#4	99.9		
#8	99.8		
#10	99.8		
#16	99.8		
#20	99.7		
#30	99.6		
#40	99.0		
#50	95.6		
#80	52.8		
#100	43.6		
#200	37.4		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 20 LL= 27 PI= 7

Coefficients

D_{85}= 0.267 D_{60}= 0.200 D_{50}= 0.172
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO=

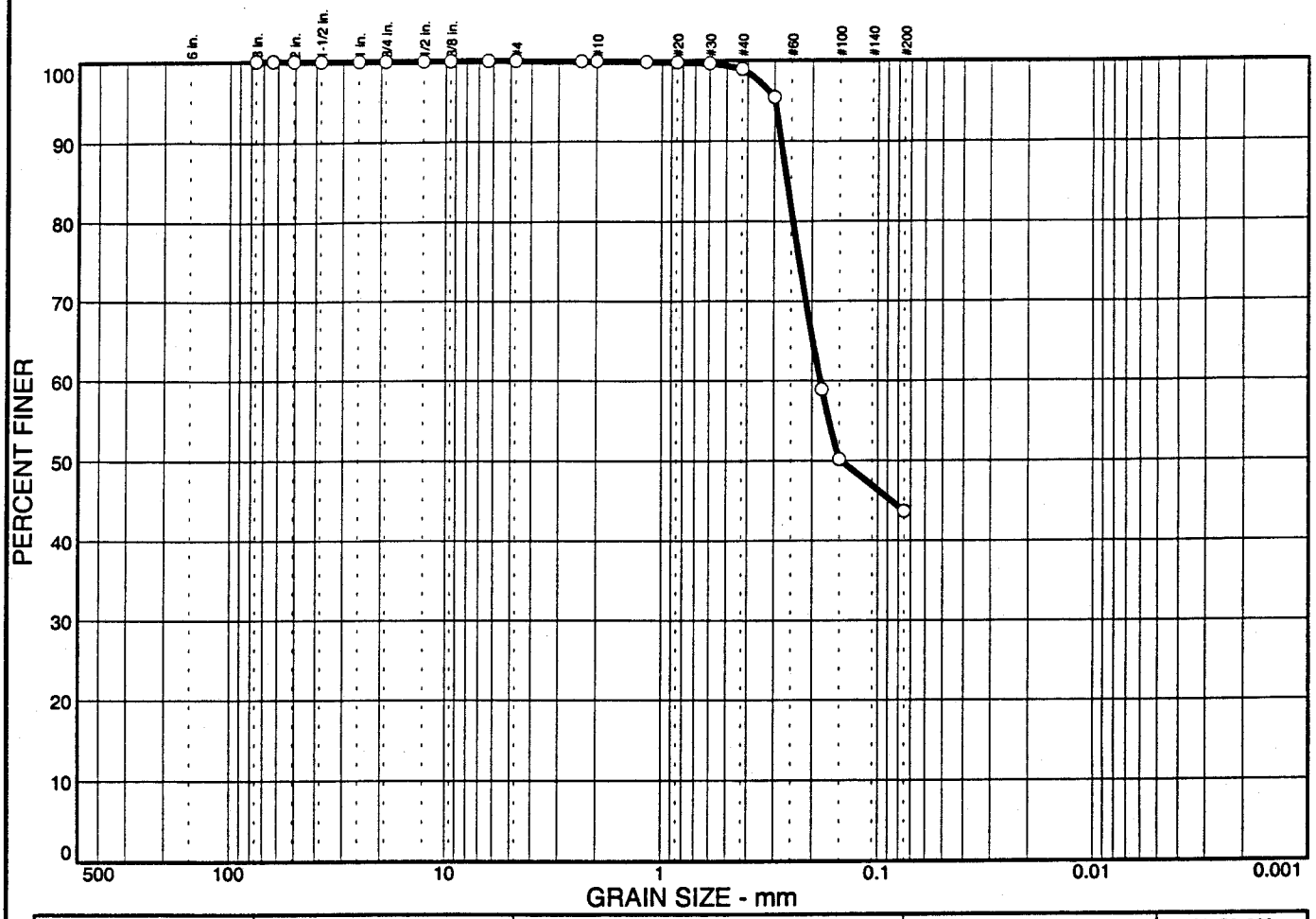
Remarks

Sample No.: PT-11, 800N, 705E **Source of Sample:** PT **Date:** 8-3-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	56.3	43.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	99.8		
#20	99.7		
#30	99.6		
#40	98.9		
#50	95.4		
#80	58.9		
#100	50.2		
#200	43.7		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 20 LL= 32 PI= 12

Coefficients

D_{85}= 0.262 D_{60}= 0.183 D_{50}= 0.147
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

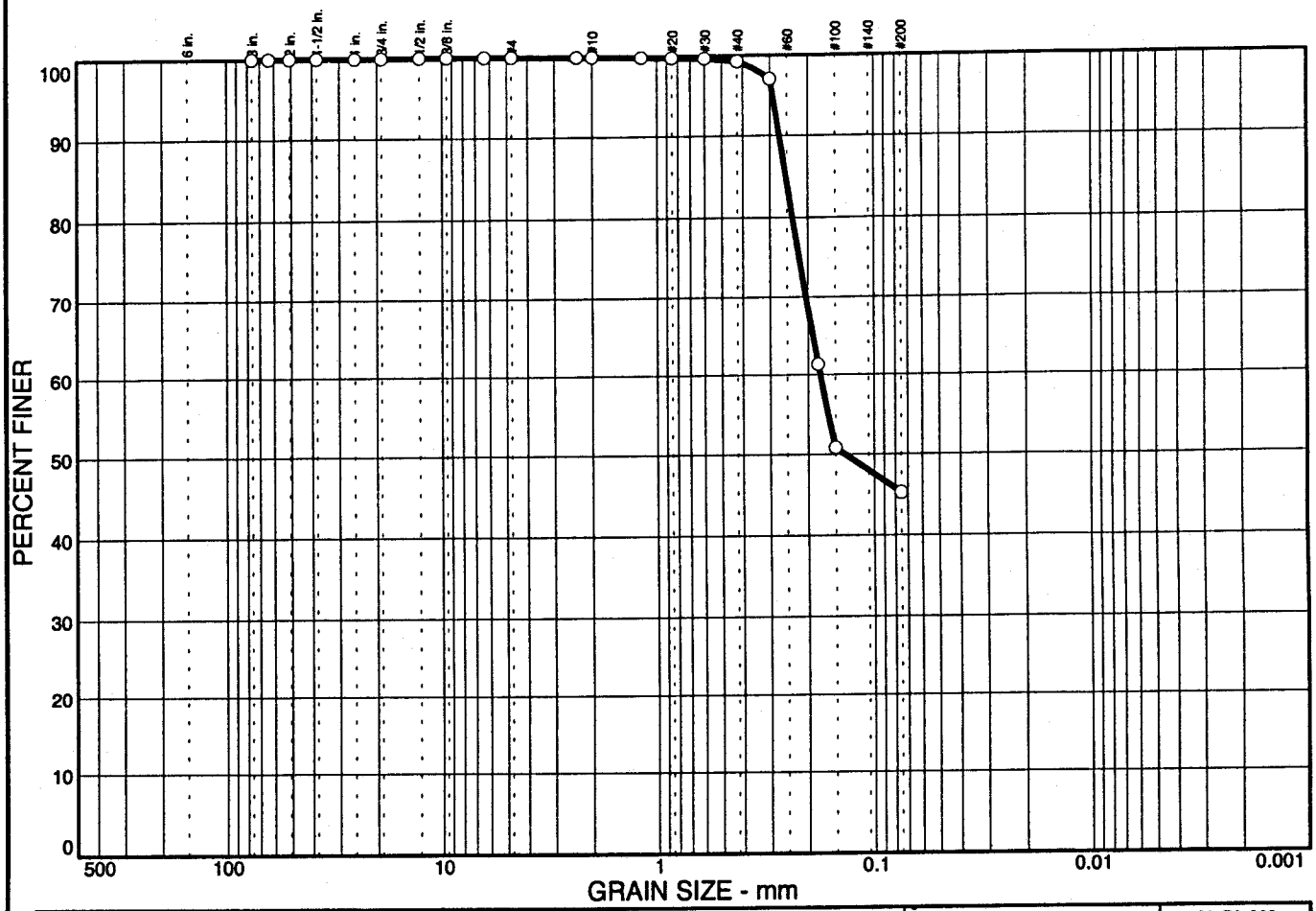
Remarks

Sample No.: PT-12, 800N, 1045E **Source of Sample:** PT **Date:** 8-3-00
Location: **Elev./Depth:**

RMT, Inc.

Client: WEYERHAEUSER
Project:
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	54.8	45.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	99.8		
#20	99.7		
#30	99.6		
#40	99.2		
#50	97.0		
#80	61.3		
#100	50.8		
#200	45.2		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 21 LL= 28 PI= 7

Coefficients

D_{85}= 0.254 D_{60}= 0.176 D_{50}= 0.136
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO=

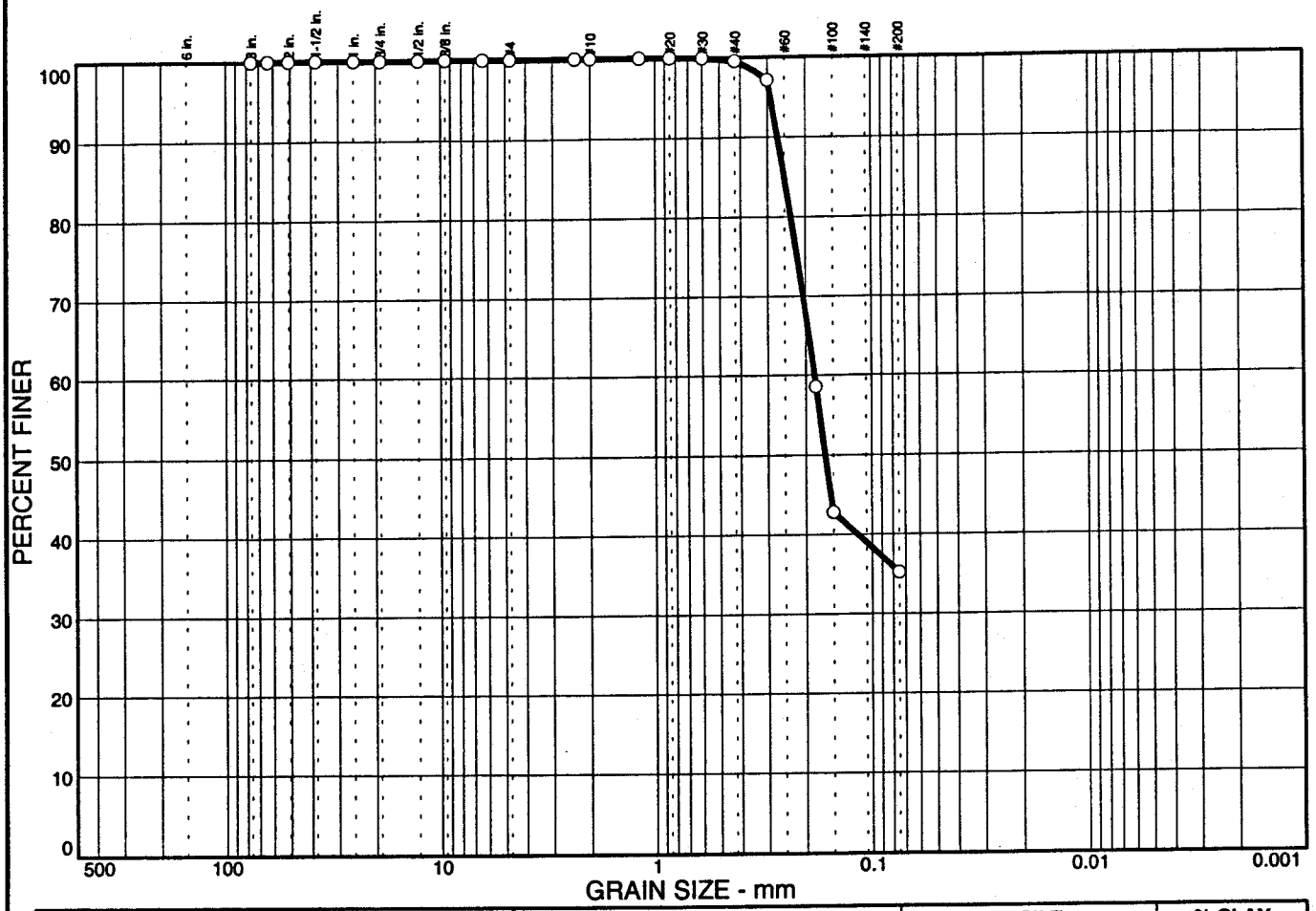
Remarks

Sample No.: PT-13, 1000N, 750E **Source of Sample:** PT **Date:** 8-11-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	64.8	35.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	100.0		
#20	100.0		
#30	99.9		
#40	99.5		
#50	97.1		
#80	58.5		
#100	42.8		
#200	35.2		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 20 LL= 27 PI= 7

Coefficients

D_{85}= 0.251 D_{60}= 0.183 D_{50}= 0.164
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO=

Remarks

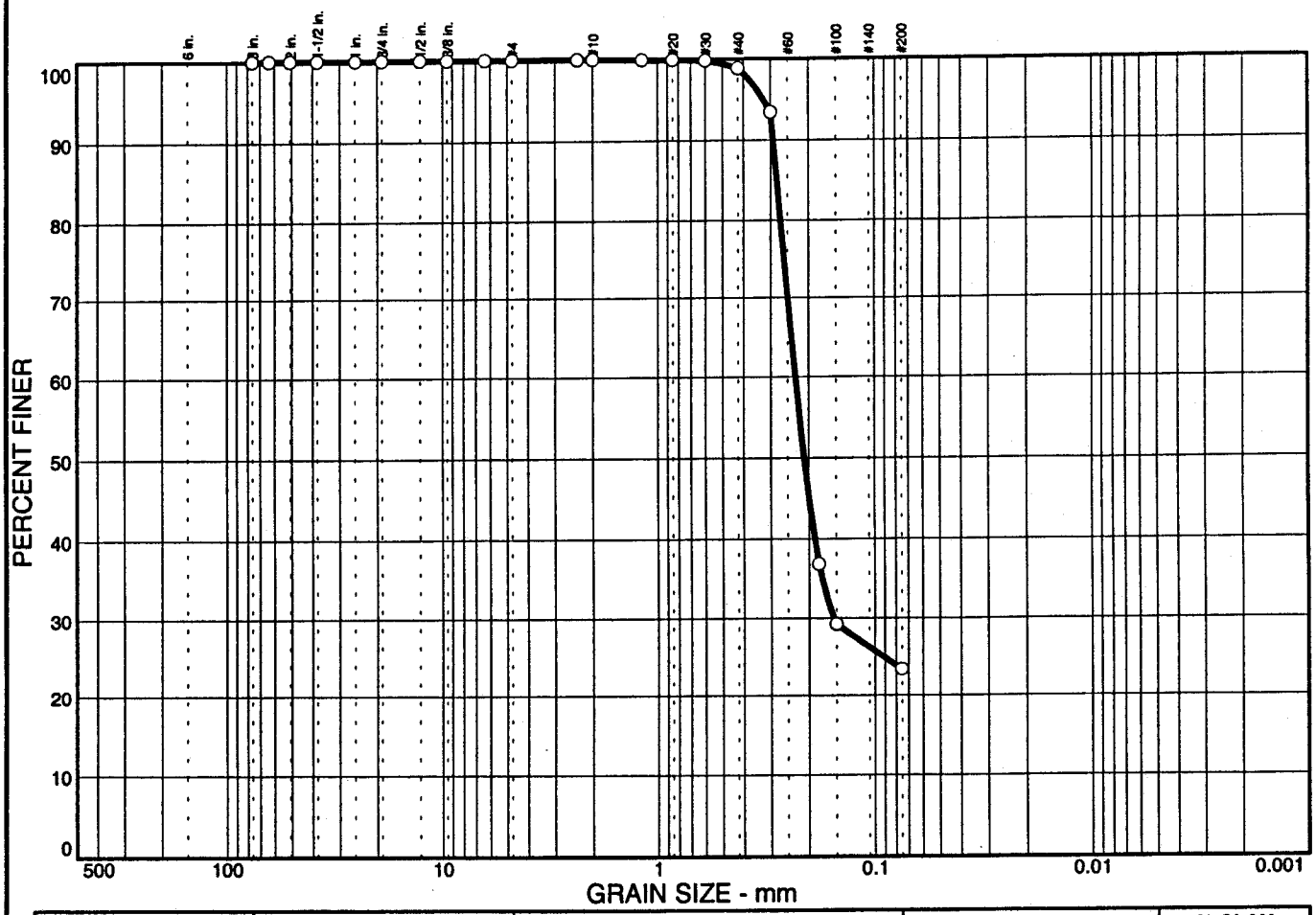
Sample No.: PT-14, 100N, 1015E **Source of Sample:** PT **Date:** 8-11-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

VTR-5 JAM

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	76.6	23.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	99.9		
#20	99.9		
#30	99.8		
#40	98.8		
#50	93.4		
#80	36.9		
#100	29.2		
#200	23.4		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.281 D_{60}= 0.231 D_{50}= 0.211
D_{30}= 0.154 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

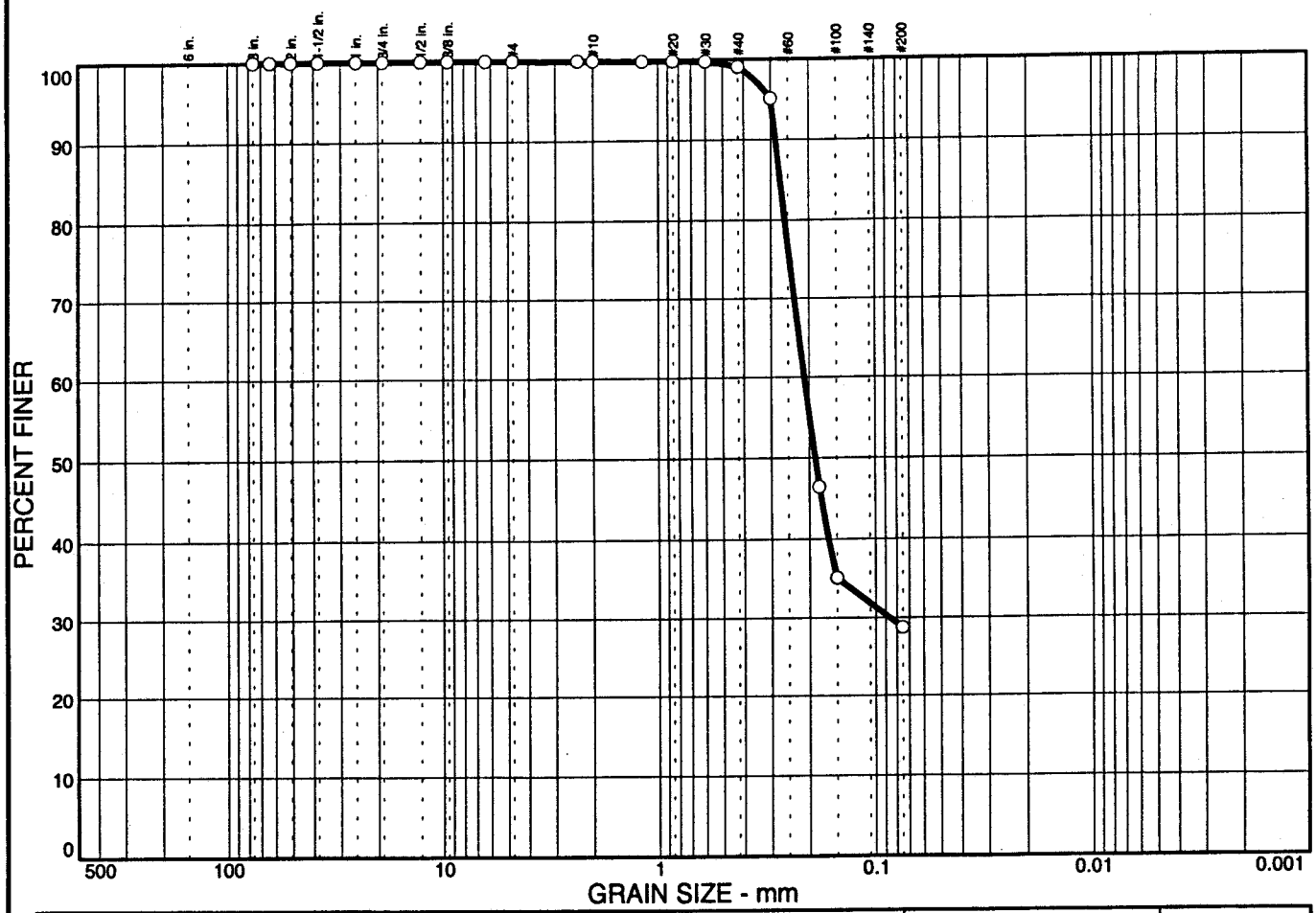
Remarks

Sample No.: PT-15, 1200N, 775E **Source of Sample:** PT **Date:** 8-11-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	71.3	28.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	99.8		
#20	99.8		
#30	99.7		
#40	99.0		
#50	95.1		
#80	46.4		
#100	35.1		
#200	28.7		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 17 LL= 21 PI= 4

Coefficients

D_{85}= 0.272 D_{60}= 0.211 D_{50}= 0.188
D_{30}= 0.0863 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO=

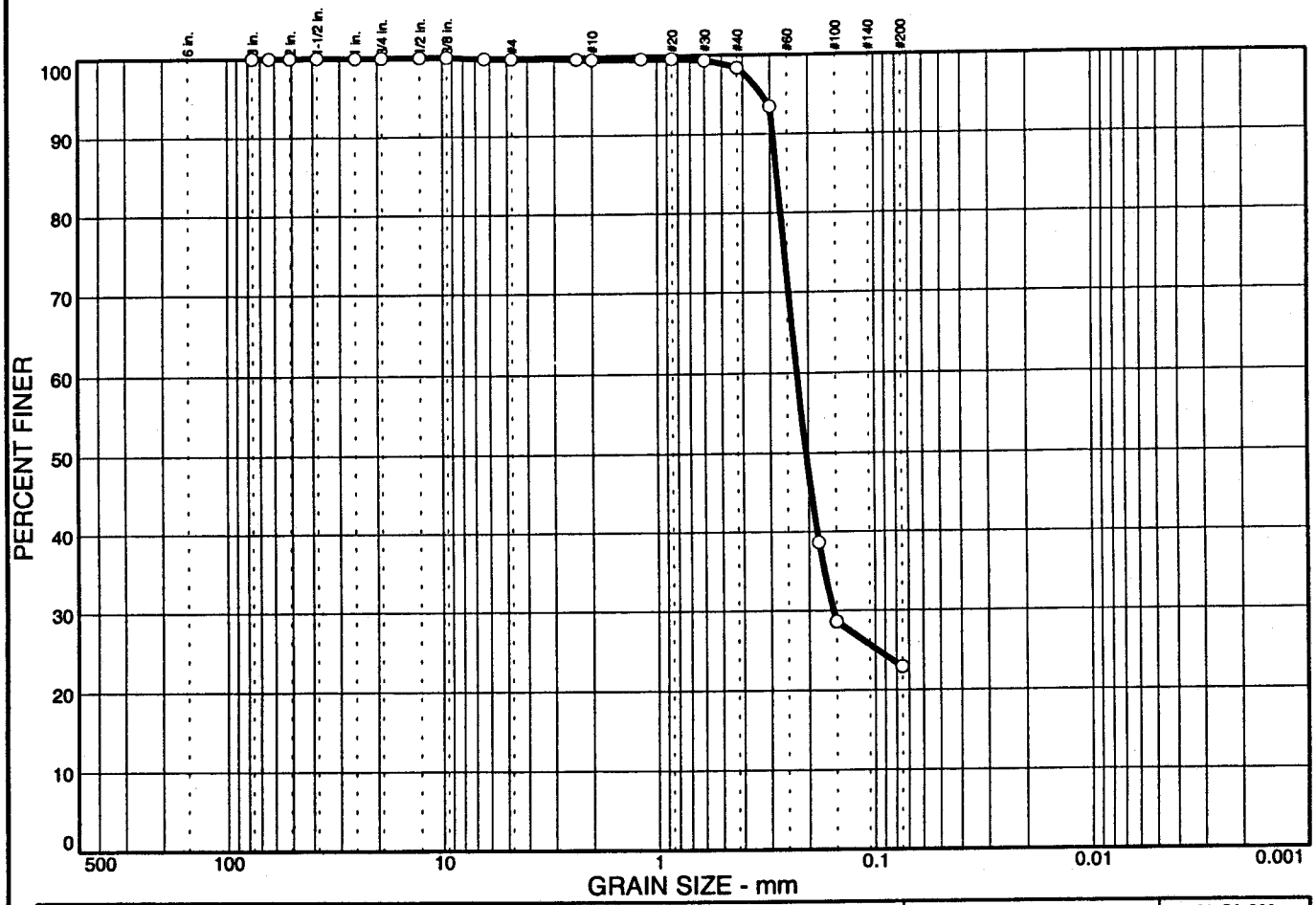
Remarks

Sample No.: PT-16, 1200N, 1010E **Source of Sample:** PT **Date:** 8-11-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	76.8	22.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	99.8		
#4	99.7		
#8	99.6		
#10	99.5		
#16	99.5		
#20	99.5		
#30	99.3		
#40	98.3		
#50	93.4		
#80	38.6		
#100	28.6		
#200	22.9		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= 16 LL= 17 PI= 1

Coefficients

D_{85}= 0.280 D_{60}= 0.226 D_{50}= 0.206
D_{30}= 0.155 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

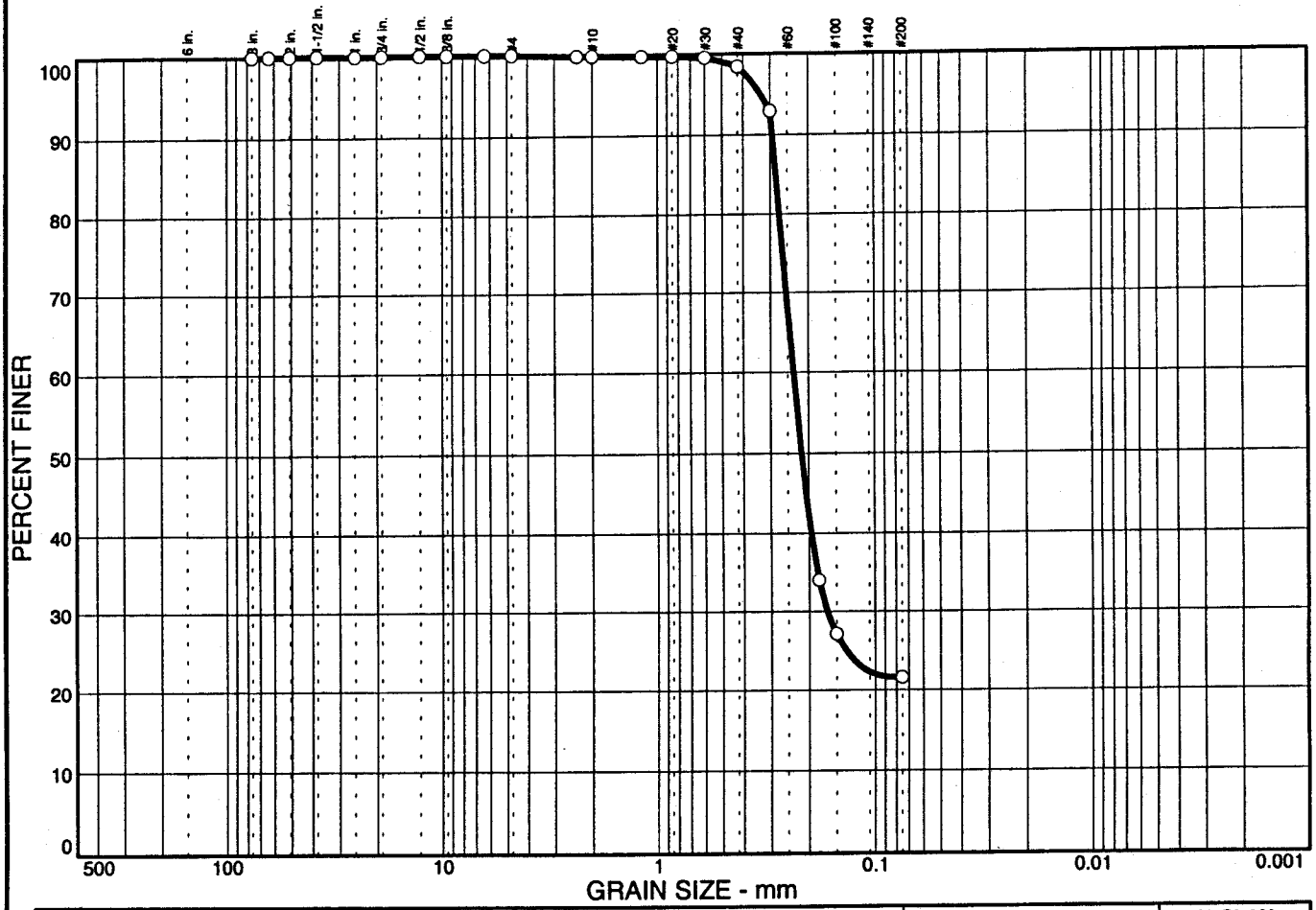
Remarks

Sample No.: PT-17, 1400N, 1050E **Source of Sample:** PT **Date:** 8-11-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	78.4	21.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	99.8		
#10	99.8		
#16	99.7		
#20	99.7		
#30	99.5		
#40	98.4		
#50	92.9		
#80	34.0		
#100	27.1		
#200	21.6		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{85}= 0.283 D_{60}= 0.235 D_{50}= 0.216
D_{30}= 0.166 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

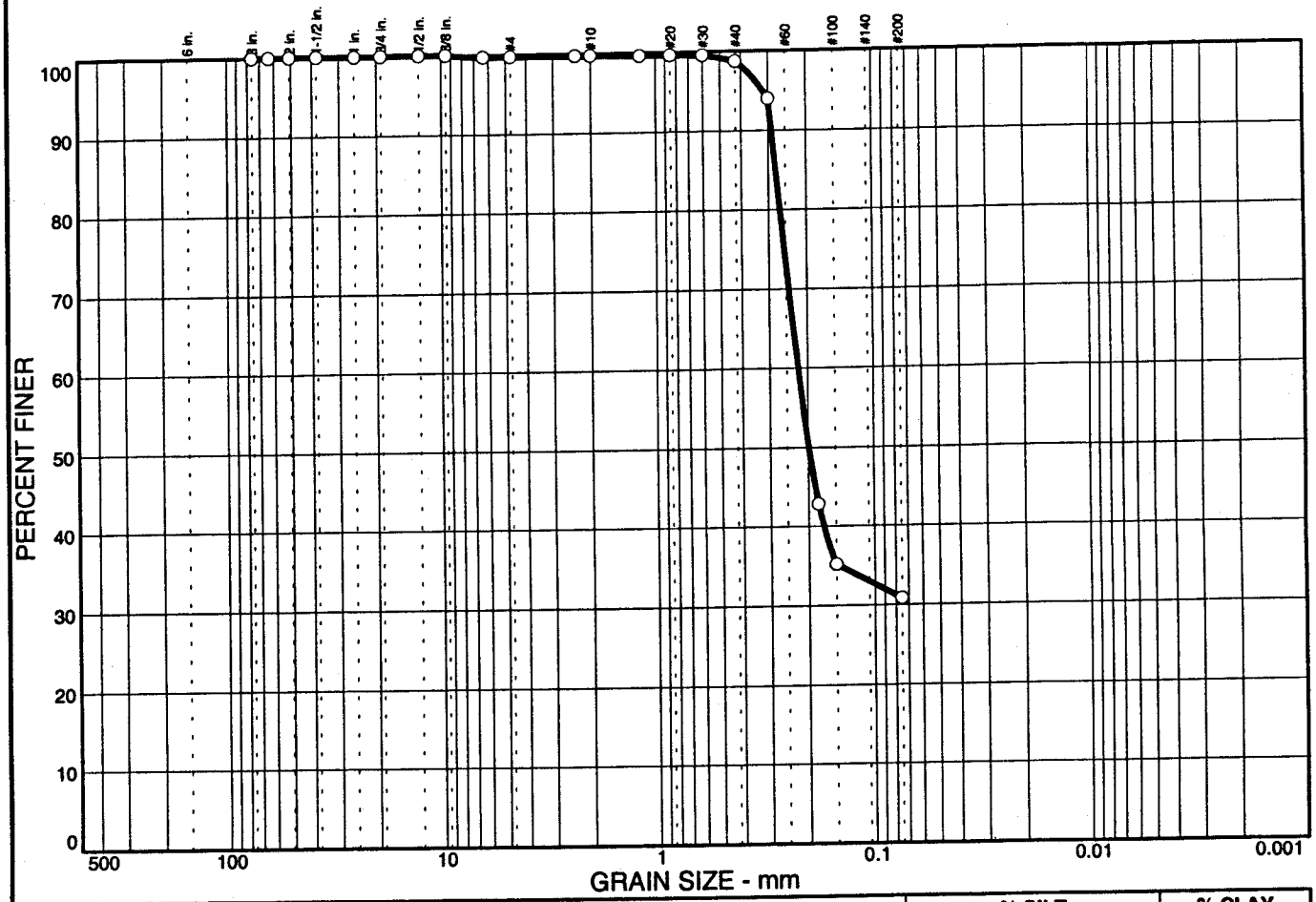
Remarks

Sample No.: PT-17A, 1400N,775E **Source of Sample:** PT **Date:** 8-11-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	68.9	30.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	99.7		
#4	99.7		
#8	99.7		
#10	99.7		
#16	99.6		
#20	99.6		
#30	99.5		
#40	98.7		
#50	94.0		
#80	42.8		
#100	35.2		
#200	30.8		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 19 LL= 23 PI= 4

Coefficients

D_{85}= 0.278 D_{60}= 0.222 D_{50}= 0.199
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO=

Remarks

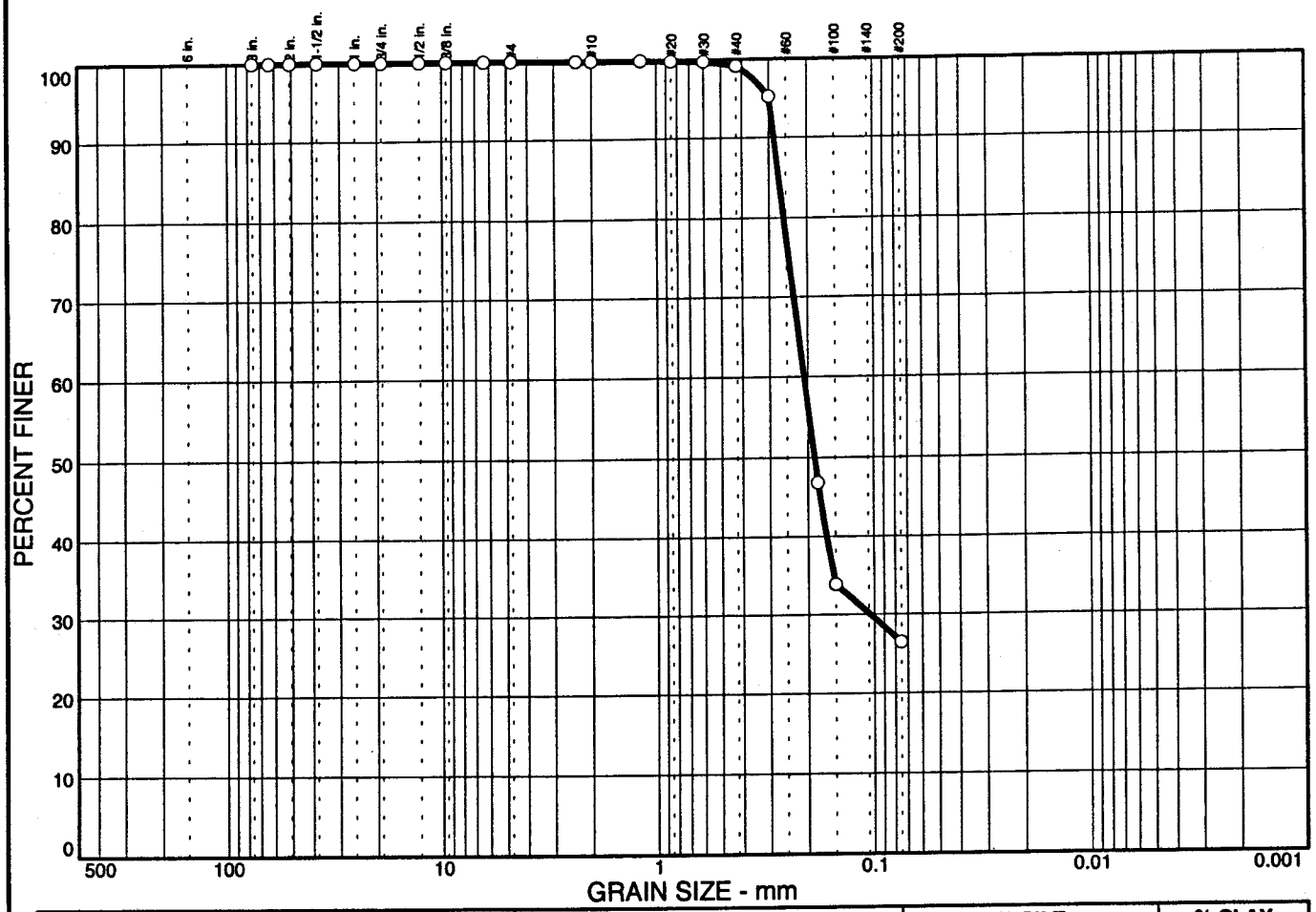
Sample No.: PT-18, 1400N, 1050E **Source of Sample:** PT **Date:** 8-11-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

✓ HJW

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	73.5	26.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	99.9		
#20	99.8		
#30	99.7		
#40	99.1		
#50	95.2		
#80	46.8		
#100	33.8		
#200	26.5		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= 17 LL= 19 PI= 2

Coefficients

D_{85}= 0.270 D_{60}= 0.209 D_{50}= 0.187
D_{30}= 0.105 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

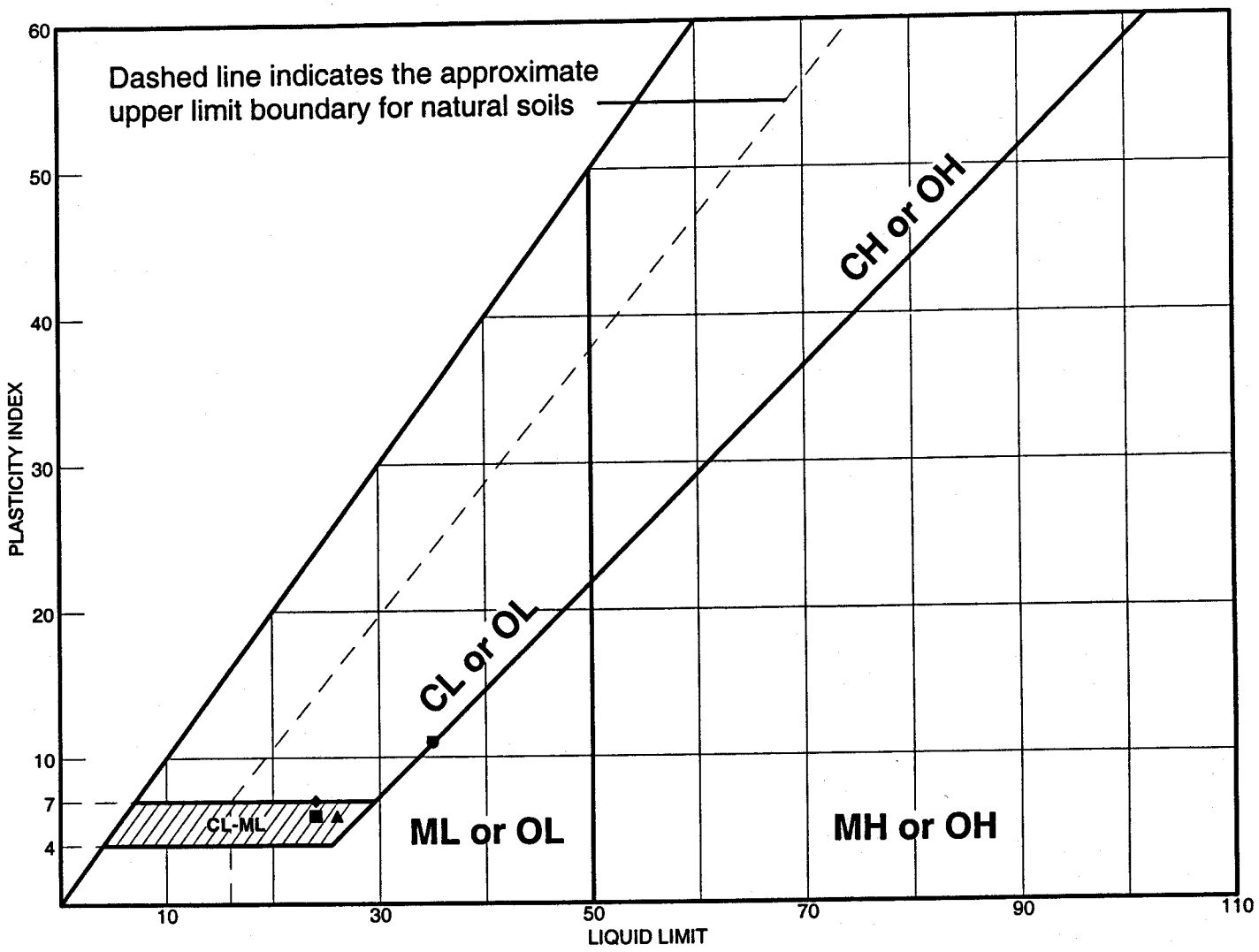
Remarks

Sample No.: PT-17B, 1393N, 715E **Source of Sample:** PT **Date:** 8-22-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey sand	35	24	11	99.6	42.5	SC
■	Silty, clayey sand	24	18	6	99.7	29.3	SC-SM
▲	Silty, clayey sand	26	20	6	96.8	38.2	SC-SM
◆	Sandy silty clay	24	17	7	99.4	56.0	CL-ML
▼	Clayey sand	35	24	11	96.9	48.4	SC

Project No. 5108.08 **Client:** WEYERHAEUSER

Project:

● **Source:** PT **Sample No.:** PT-1,1292N,792E
■ **Source:** PT **Sample No.:** PT-2,1250N,1051E
▲ **Source:** PT **Sample No.:** PT-3,1053N,795E
◆ **Source:** PT **Sample No.:** PT-4,1050N,1050E
▼ **Source:** PT **Sample No.:** PT-5,905N,750E

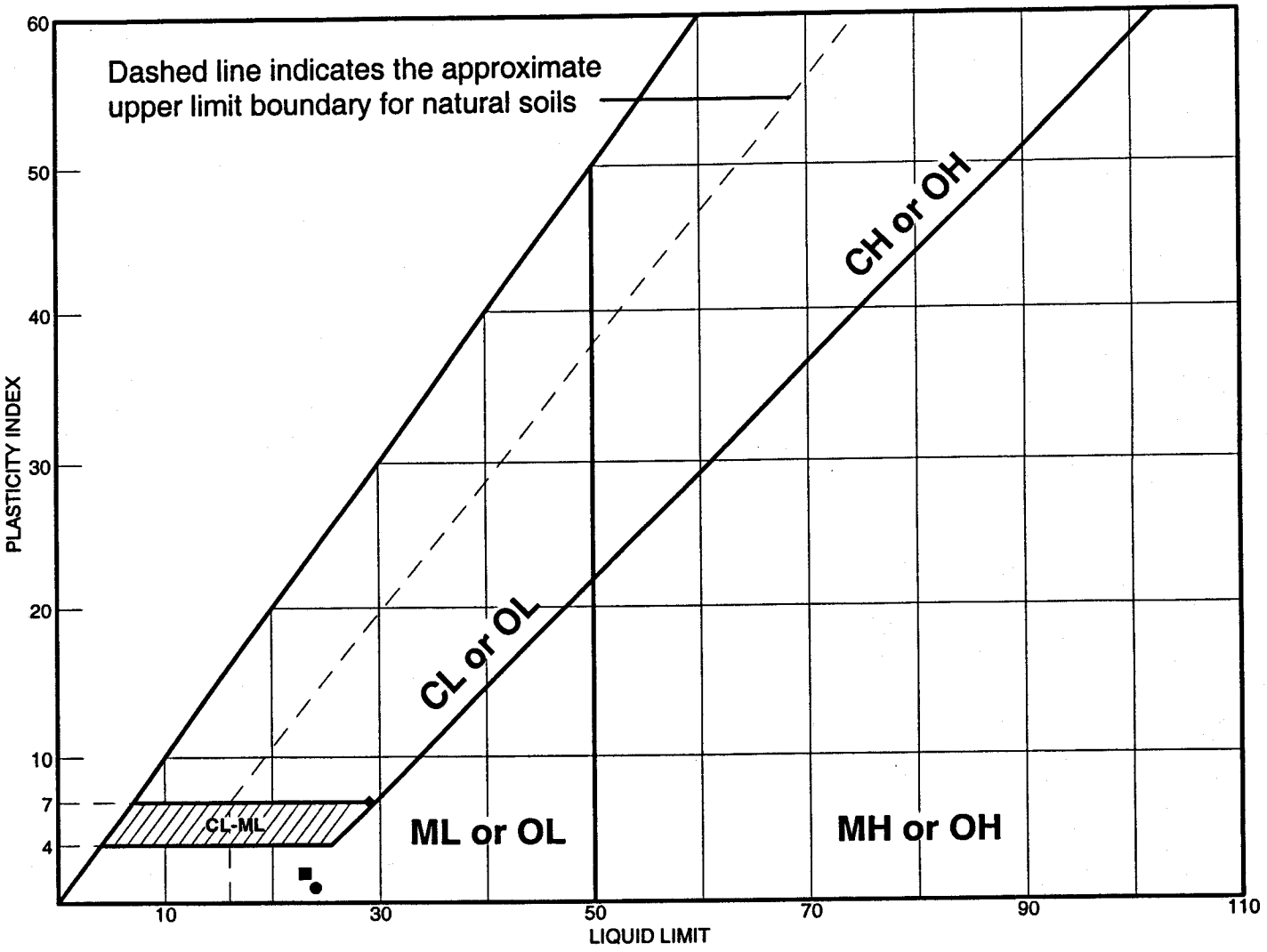
LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)

RMT, Inc.

Remarks:
●
■
▲
◆
▼

Figure:

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand	24	23	1	98.1	27.8	SM
■	Silty sand	23	21	2	98.5	21.9	SM
▲	Silty sand	23	21	2	99.0	29.7	SM
◆	Silty, clayey sand	29	22	7	98.7	33.6	SC-SM

Project No. 5108.08 **Client:** WEYERHAEUSER

Project:

● **Source:** PT **Sample No.:** PT-6,895N,1009E
■ **Source:** PT **Sample No.:** PT-7,750N,755E
▲ **Source:** PT **Sample No.:** PT-8,700N,1000E
◆ **Source:** PT **Sample No.:** PT-9,1460N,900E

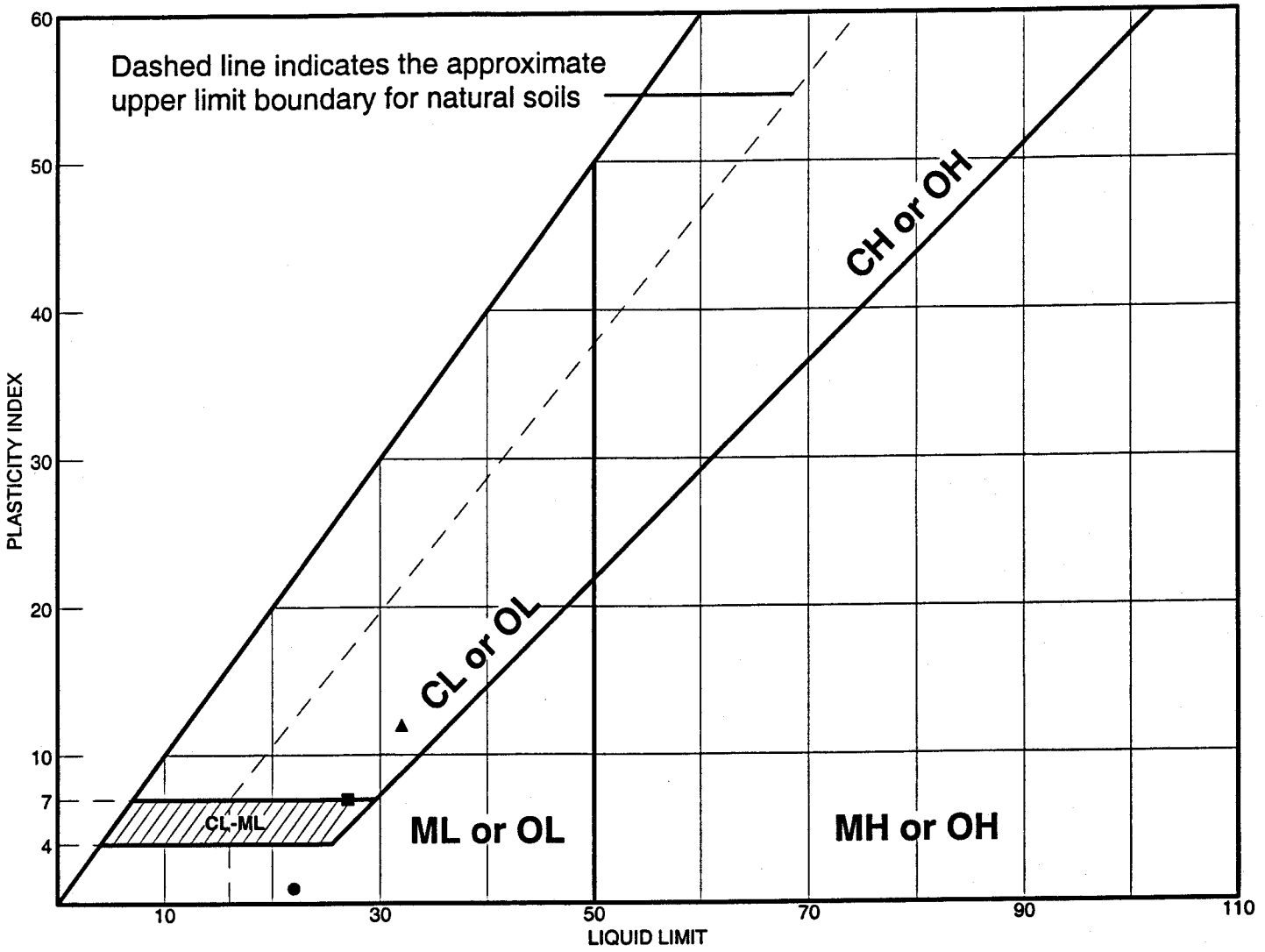
Remarks:
●
■
▲
◆

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)

RMT, Inc.

Figure:

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand	22	21	1	99.0	21.0	SM
■	Silty, clayey sand	27	20	7	99.0	37.4	SC-SM
▲	Clayey sand	32	20	12	98.9	43.7	SC

Project No. 5108.08 **Client:** WEYERHAEUSER

Project:

● **Source:** PT **Sample No.:** PT-10, 670N, 900E

■ **Source:** PT **Sample No.:** PT-11, 800N, 705E

▲ **Source:** PT **Sample No.:** PT-12, 800N, 1045E

Remarks:

●

■

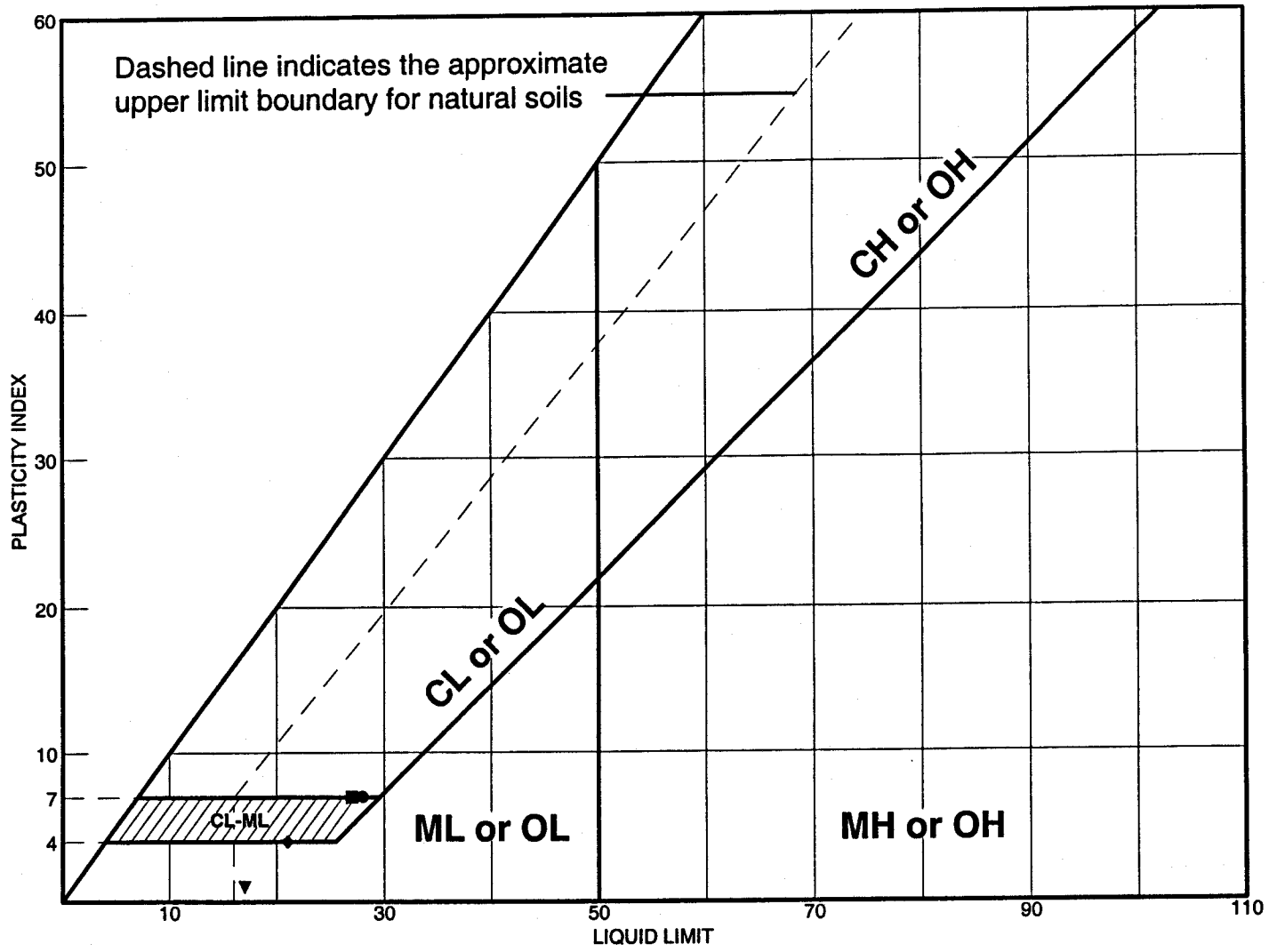
▲

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)

RMT, Inc.

Figure:

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty, clayey sand	28	21	7	99.2	45.2	SC-SM
■	Silty, clayey sand	27	20	7	99.5	35.2	SC-SM
▲	Silty sand	NV	NP	NP	98.8	23.4	SM
◆	Silty, clayey sand	21	17	4	99.0	28.7	SC-SM
▼	Silty sand	17	16	1	98.3	22.9	SM

Project No. 5108.08 **Client:**

Project: WEYERHAEUSER

● **Source:** PT **Sample No.:** PT-13, 1000N, 750E
■ **Source:** PT **Sample No.:** PT-14, 100N, 1015E
▲ **Source:** PT **Sample No.:** PT-15, 1200N, 775E
◆ **Source:** PT **Sample No.:** PT-16, 1200N, 1010E
▼ **Source:** PT **Sample No.:** PT-17, 1400N, 1050E

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)

RMT, Inc.

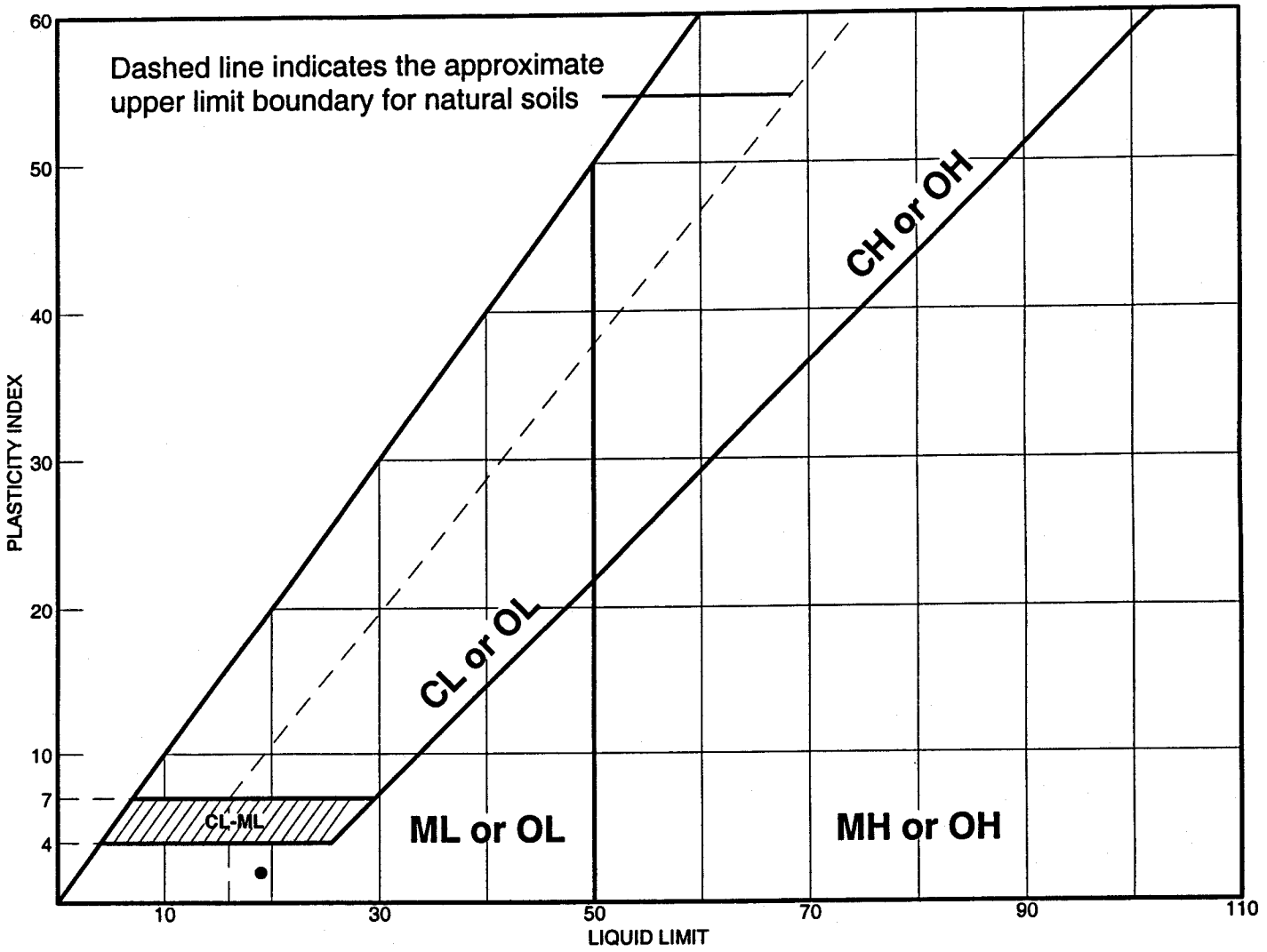
Remarks:
●
■
▲
◆
▼

Figure:

✓ HJW

Jol

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand	19	17	2	99.1	26.5	SM

Project No. 5108.08 **Client:**

Project: WEYERHAEUSER

● **Source:** PT **Sample No.:** PT-17B, 1393N, 715E

Remarks:

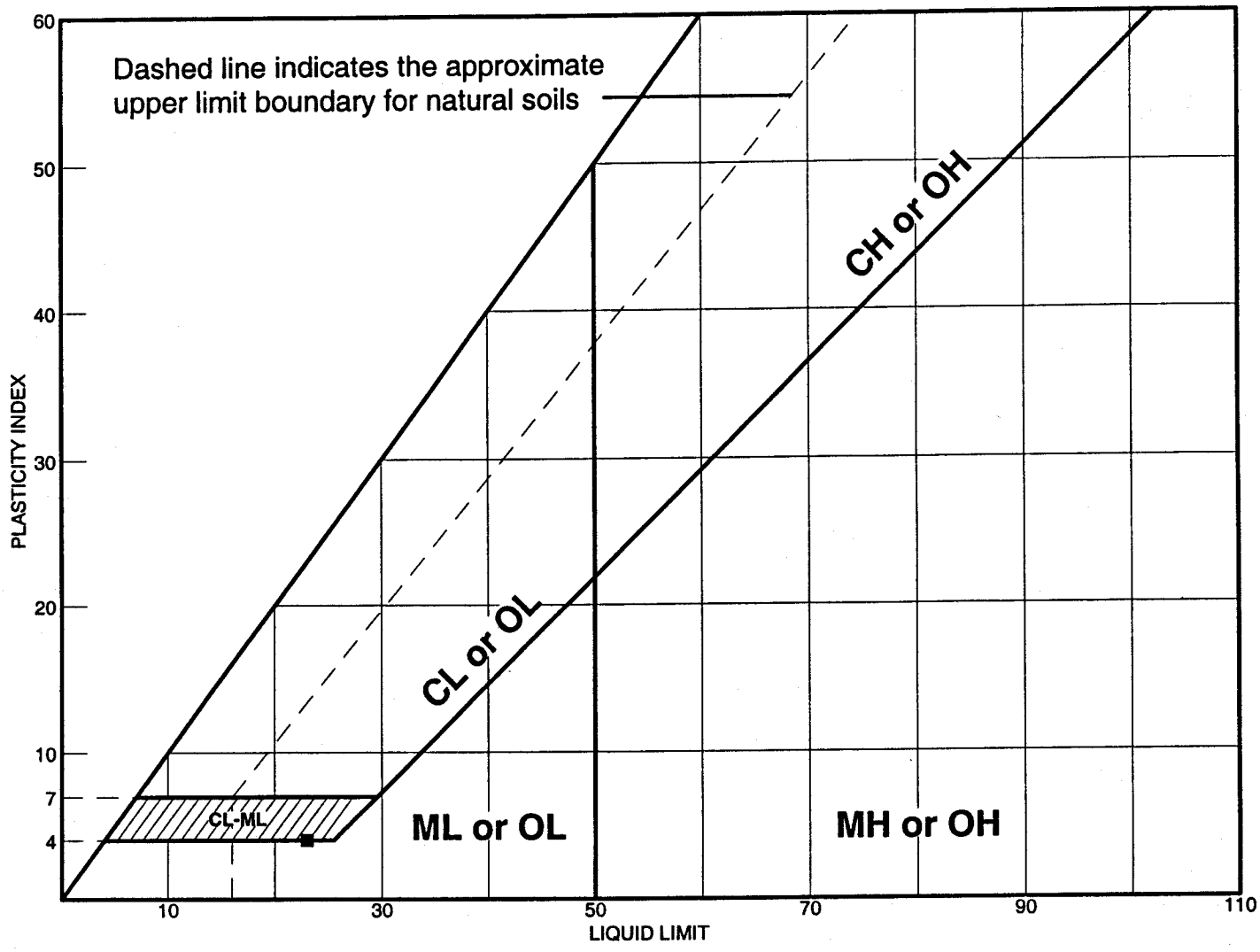
●

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)

RMT, Inc.

Figure:

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty sand	NV	NP	NP	98.4	21.6	SM
■	Silty, clayey sand	23	19	4	98.7	30.8	SC-SM

Project No. 5108.08 **Client:**

Project: WEYERHAEUSER

● **Source:** PT **Sample No.:** PT-17A, 1400N,775E

■ **Source:** PT **Sample No.:** PT-18, 1400N, 1050E

Remarks:

●

■

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)

RMT, Inc.

Figure:

Appendix H
Low Permeability Soil Test Results

RMT, Inc.

QC: JRS
QA: JDK

Falling Head Permeability Test (ASTM D5084)

Project Name:	WEYERHAEUSER	Cell #:	1
Project #:	5108.08	USCS Description:	Clayey sand
Sample Name:	LPT-1, 1420 N, 1120 E	USCS Classification:	SC
Visual Descript:	Clayey sand	Average Kv =	2.0E-08 cm/sec

		Initial Values	Final Values			
Sample Type:	Undisturbed					
Sample Dia. (in)		2.85	2.85	Permeant:	Water	
Sample Ht. (in)		2.32	2.30	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		568.30	559.80	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)		515.90	463.00	Confining Pressure (psi):	100.0	
Tare (g)		278.88	86.81	Burette Diameter (in):	0.250	
Sample Wt. (g)		470.10	472.99	Burette Zero (cm):	100.0	
Moisture (%)		22.1	25.7	Maximum Gradient:	7.8	
Wet Density (pcf)		121.0	122.8	Average Gradient:	7.4	
Dry Density (pcf)		99.1	97.7	Max. Effect. Stress (psi):	5.7	
Saturation (%)		85.3	95.8	Min. Effect. Stress (psi):	4.5	
				Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	18	7	43.00		0.0	95	95	52.10		16.00		98.70				
2	2000	8	18	8	15.00	1920	20.0	95	95	52.15	0.05	16.05	0.05	98.20	0.50	-81.8	7.8E-08	
3	2000	8	18	8	42.00	1620	20.0	95	95	52.30	0.15	16.15	0.10	98.05	0.15	-20.0	4.2E-08	
4	2000	8	18	9	56.00	4440	20.0	95	95	52.80	0.50	16.60	0.45	97.80	0.25	28.6	4.3E-08	
5	2000	8	18	11	57.00	7260	20.0	95	95	53.20	0.40	17.05	0.45	97.50	0.30	20.0	2.9E-08	
6	2000	8	18	14	58.00	10860	20.0	95	95	54.25	1.05	18.05	1.00	96.85	0.65	21.2	4.3E-08	
7	2000	8	21	7	42.00	233040	20.0	95	95	63.00	8.75	30.75	12.70	89.25	7.60	25.1	2.9E-08	
8	2000	8	21	9	30.00	6480	20.0	95	95	63.30	0.30	31.00	0.25	89.10	0.15	25.0	2.4E-08	
9	2000	8	21	12	50.00	12000	20.0	95	95	63.45	0.15	31.50	0.50	88.80	0.30	25.0	2.6E-08	
10	2000	8	21	16	12.00	12120	20.0	95	95	63.60	0.15	31.90	0.40	88.55	0.25	23.1	2.1E-08	
11	2000	8	22	7	38.00	55560	20.0	95	95	65.00	1.40	33.80	1.90	87.40	1.15	24.6	2.2E-08	
12	2000	8	22	10	27.00	10140	20.0	95	95	65.20	0.20	34.20	0.40	87.20	0.20	33.3	2.5E-08	
13	2000	8	22	13	58.00	12660	20.0	95	95	65.30	0.10	34.60	0.40	86.90	0.30	14.3	2.4E-08	
14	2000	8	22	16	14.00	8160	20.0	95	95	65.40	0.10	34.85	0.25	86.80	0.10	42.9	1.8E-08	
15	2000	8	23	7	38.00	55440	20.0	95	95	66.60	1.20	36.60	1.75	85.80	1.00	27.3	2.2E-08	
16	2000	8	23	11	49.00	15060	20.0	95	95	67.20	0.60	37.10	0.50	85.55	0.25	33.3	2.3E-08	
17	2000	8	23	14	44.00	10500	21.0	95	95	67.30	0.10	37.35	0.25	85.35	0.20	11.1	1.9E-08	
18	2000	8	23	16	23.00	5940	21.0	95	95	67.50	0.20	37.50	0.15	85.25	0.10	20.0	1.9E-08	
19	2000	8	24	7	39.00	54960	20.0	95	95	68.20	0.70	38.95	1.45	84.40	0.85	26.1	2.0E-08	
20	2000	8	24	9	47.00	7680	20.0	95	95	68.50	0.30	39.10	0.15	84.30	0.10	20.0	1.6E-08	1
21	2000	8	24	12	56.00	11340	20.0	95	95	68.50	0.00	39.45	0.35	84.10	0.20	27.3	2.4E-08	1
22	2000	8	25	15	17.00	94860	21.0	95	95	70.70	2.20	41.80	2.35	82.80	1.30	28.8	2.0E-08	1
23																		
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column. 2.0E-08 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

QC: JTS

QA: DJL

Falling Head Permeability Test (ASTM D5084)

Project Name:	WEYERHAEUSER	Cell #:	2
Project #:	5108.08	USCS Description:	Sandy lean clay
Sample Name:	LPT-2, 1422 N, 1118E	USCS Classification:	CL
Visual Descript:	Sandy lean clay	Average Kv =	1.6E-08 cm/sec

		Initial Values	Final Values			
Sample Type:	Undisturbed			Permeant:	Water	
Sample Dia. (in)		2.84	2.84	Permeant Specific Gravity:	1.00	
Sample Ht. (in)		2.31	2.29	Sample Specific Gravity:	2.70	Est.
Tare & Wet (g)		629.30	557.80	Confining Pressure (psi):	100.0	
Tare & Dry (g)		561.50	461.90	Burette Diameter (in):	0.250	
Tare (g)		273.32	84.17	Burette Zero (cm):	100.0	
Sample Wt. (g)		470.90	473.63			
Moisture (%)		23.5	25.4	Maximum Gradient:	9.0	
Wet Density (pcf)		122.6	124.4	Average Gradient:	8.6	
Dry Density (pcf)		99.2	99.2	Max. Effect. Stress (psi):	5.7	
Saturation (%)		91.1	98.1	Min. Effect. Stress (psi):	4.5	
				Ave. Effect. Stress (psi):	4.9	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	18	7	44.00		0.0	95	95	50.10		12.80		97.30				
2	2000	8	18	8	16.00	1920	20.0	95	95	49.90	-0.20	12.90	0.10	96.90	0.40	-60.0	7.0E-08	
3	2000	8	18	8	43.00	1620	20.0	95	95	50.10	0.20	13.00	0.10	96.75	0.15	-20.0	4.1E-08	
4	2000	8	18	9	57.00	4440	20.0	95	95	50.50	0.40	13.25	0.25	96.55	0.20	11.1	2.7E-08	
5	2000	8	18	11	38.00	6060	20.0	95	95	50.70	0.20	13.55	0.30	96.35	0.20	20.0	2.2E-08	
6	2000	8	18	14	59.00	12060	20.0	95	95	51.50	0.80	14.20	0.65	96.00	0.35	30.0	2.3E-08	
7	2000	8	21	7	43.00	233040	20.0	95	95	58.00	6.50	23.80	9.60	89.30	6.70	17.8	2.1E-08	
8	2000	8	21	9	31.00	6480	20.0	95	95	58.10	0.10	24.00	0.20	89.15	0.15	14.3	1.9E-08	
9	2000	8	21	12	51.00	12000	20.0	95	95	58.20	0.10	24.40	0.40	88.90	0.25	23.1	1.9E-08	
10	2000	8	21	16	13.00	12120	20.0	95	95	58.45	0.25	24.75	0.35	88.60	0.30	7.7	1.9E-08	
11	2000	8	22	7	39.00	55560	20.0	95	95	59.40	0.95	26.50	1.75	87.30	1.30	14.8	2.0E-08	
12	2000	8	22	10	27.00	10080	20.0	95	95	59.50	0.10	26.80	0.30	87.00	0.30	0.0	2.2E-08	
13	2000	8	22	13	59.00	12720	20.0	95	95	59.60	0.10	27.15	0.35	86.80	0.20	27.3	1.6E-08	
14	2000	8	22	16	15.00	8160	20.0	95	95	59.60	0.00	27.40	0.25	86.55	0.25	0.0	2.3E-08	
15	2000	8	23	7	39.00	55440	20.0	95	95	60.55	0.95	28.90	1.50	85.45	1.10	15.4	1.8E-08	
16	2000	8	23	11	48.00	14940	20.0	95	95	60.90	0.35	29.30	0.40	85.10	0.35	6.7	2.0E-08	
17	2000	8	23	14	45.00	10620	21.0	95	95	61.05	0.15	29.60	0.30	84.85	0.25	9.1	2.1E-08	
18	2000	8	23	16	24.00	5940	21.0	95	95	61.20	0.15	29.75	0.15	84.75	0.10	20.0	1.7E-08	
19	2000	8	24	7	40.00	54960	20.0	95	95	61.80	0.60	31.15	1.40	83.60	1.15	9.8	1.9E-08	
20	2000	8	24	9	49.00	7740	20.0	95	95	61.90	0.10	31.35	0.20	83.55	0.05	60.0	1.4E-08	1
21	2000	8	24	12	57.00	11280	20.0	95	95	61.85	-0.05	31.55	0.20	83.35	0.20	0.0	1.5E-08	1
22	2000	8	25	15	16.00	94740	21.0	95	95	63.60	1.75	33.70	2.15	81.70	1.65	13.2	1.8E-08	1
23																		
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

1.6E-08 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: JRS

QA: JRS

Project Name:	WEYERHAEUSER	Cell #:	3
Project #:	5108.08	USCS Description:	Clayey sand
Sample Name:	LPT-3, 1420 N, 1123 E	USCS Classification:	SC
Visual Descript:	Clayey sand	Average Kv =	2.6E-08 cm/sec

Sample Type:	Undisturbed	Initial Values	Final Values		
Sample Dia. (in)		2.85	2.85	Permeant:	Water
Sample Ht. (in)		2.31	2.29	Permeant Specific Gravity:	1.00
Tare & Wet (g)		589.99	563.10	Sample Specific Gravity:	2.70 Est.
Tare & Dry (g)		533.70	468.10	Confining Pressure (psi):	100.0
Tare (g)		265.15	83.36	Burette Diameter (in):	0.250
Sample Wt. (g)		475.70	479.74	Burette Zero (cm):	100.0
Moisture (%)		21.0	24.7	Maximum Gradient:	6.7
Wet Density (pcf)		123.0	125.1	Average Gradient:	6.3
Dry Density (pcf)		101.7	100.3	Max. Effect. Stress (psi):	5.6
Saturation (%)		86.1	98.1	Min. Effect. Stress (psi):	4.4
				Ave. Effect. Stress (psi):	4.8

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	18	7	45.00		0.0	95	95	54.30		12.05		97.05				
2	2000	8	18	8	17.00	1920	20.0	95	95	53.95	-0.35	12.25	0.20	96.70	0.35	-27.3	7.6E-08	
3	2000	8	18	8	44.00	1620	20.0	95	95	54.20	0.25	12.50	0.25	96.45	0.25	0.0	8.2E-08	
4	2000	8	18	9	58.00	4440	20.0	95	95	54.80	0.60	13.05	0.55	96.00	0.45	10.0	6.0E-08	
5	2000	8	18	11	39.00	6060	20.0	95	95	54.90	0.10	13.70	0.65	95.25	0.75	-7.1	6.3E-08	
6	2000	8	18	15	0.00	12060	20.0	95	95	55.85	0.95	14.80	1.10	94.20	1.05	2.3	5.0E-08	
7	2000	8	21	7	44.00	233040	20.0	95	95	62.70	6.85	28.20	13.40	81.90	12.30	4.3	3.8E-08	
8	2000	8	21	9	32.00	6480	20.0	95	95	62.80	0.10	28.45	0.25	81.70	0.20	11.1	2.9E-08	
9	2000	8	21	12	52.00	12000	20.0	95	95	62.90	0.10	28.90	0.45	81.25	0.45	0.0	3.2E-08	
10	2000	8	21	16	14.00	12120	20.0	95	95	63.25	0.35	29.40	0.50	80.90	0.35	17.6	3.0E-08	
11	2000	8	22	7	40.00	55560	20.0	95	95	64.20	0.95	31.25	1.85	79.15	1.75	2.8	2.9E-08	
12	2000	8	22	10	28.00	10080	20.0	95	95	64.25	0.05	31.55	0.30	78.85	0.30	0.0	2.8E-08	
13	2000	8	22	14	0.00	12720	20.0	95	95	64.50	0.25	31.90	0.35	78.50	0.35	0.0	2.6E-08	
14	2000	8	22	16	16.00	8160	20.0	95	95	64.50	0.00	32.25	0.35	78.25	0.25	16.7	3.6E-08	
15	2000	8	23	7	40.00	55440	20.0	95	95	65.50	1.00	33.85	1.60	76.85	1.40	6.7	2.7E-08	
16	2000	8	23	11	47.00	14820	20.0	95	95	65.90	0.40	34.25	0.40	76.50	0.35	6.7	2.7E-08	
17	2000	8	23	14	46.00	10740	21.0	95	95	66.00	0.10	34.50	0.25	76.20	0.30	-9.1	2.7E-08	
18	2000	8	23	16	24.00	5880	21.0	95	95	66.20	0.20	34.65	0.15	76.10	0.10	20.0	2.2E-08	
19	2000	8	24	7	41.00	55020	20.0	95	95	66.85	0.65	36.00	1.35	74.75	1.35	0.0	2.7E-08	
20	2000	8	24	9	50.00	7740	20.0	95	95	67.00	0.15	36.25	0.25	74.60	0.15	25.0	3.0E-08	1
21	2000	8	24	12	58.00	11280	20.0	95	95	66.95	-0.05	36.45	0.20	74.35	0.25	-11.1	2.3E-08	1
22	2000	8	25	15	15.00	94620	21.0	95	95	68.80	1.85	38.51	2.06	72.60	1.75	8.1	2.4E-08	1
23																		
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

(Termination determined by stable Kv and low flow differential.)

*Average Kv for those rows with a 1 in the Ave. column. 2.6E-08 cm/sec

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: JRS

QA:

Project Name:	WEYERHAEUSER	Cell #:	4
Project #:	5108.08	USCS Description:	Sandy lean clay
Sample Name:	LPT-4, 1420N, 1120E	USCS Classification:	CL
Visual Descript:	Sandy lean clay	Average Kv =	1.6E-08 cm/sec

		Initial Values	Final Values			
Sample Type:	Undisturbed					
Sample Dia. (in)		2.85	2.85	Permeant:	Water	
Sample Ht. (in)		2.30	2.29	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		581.80	553.90	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)		520.40	454.80	Confining Pressure (psi):	100.0	
Tare (g)		269.50	82.81	Burette Diameter (in):	0.250	
Sample Wt. (g)		467.70	471.09	Burette Zero (cm):	100.0	
Moisture (%)		24.5	26.6	Maximum Gradient:	9.4	
Wet Density (pcf)		121.4	122.8	Average Gradient:	9.0	
Dry Density (pcf)		97.6	97.0	Max. Effect. Stress (psi):	5.7	
Saturation (%)		90.9	97.6	Min. Effect. Stress (psi):	4.5	
				Ave. Effect. Stress (psi):	5.0	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	18	7	45.00		0.0	95	95	47.20		15.35		98.60				
2	2000	8	18	8	18.00	1980	20.0	95	95	47.00	-0.20	15.40	0.05	98.20	0.40	-77.8	6.1E-08	
3	2000	8	18	8	46.00	1680	20.0	95	95	47.20	0.20	15.45	0.05	98.10	0.10	-33.3	2.4E-08	
4	2000	8	18	9	59.00	4380	20.0	95	95	47.80	0.60	15.60	0.15	98.00	0.10	20.0	1.5E-08	
5	2000	8	18	11	40.00	6060	20.0	95	95	47.90	0.10	15.90	0.30	97.75	0.25	9.1	2.5E-08	
6	2000	8	18	15	1.00	12060	20.0	95	95	48.90	1.00	16.45	0.55	97.35	0.40	15.8	2.2E-08	
7	2000	8	21	7	45.00	233040	20.0	95	95	55.50	6.60	24.25	7.80	90.95	6.40	9.9	1.9E-08	
8	2000	8	21	9	34.00	6540	20.0	95	95	55.70	0.20	24.45	0.20	90.85	0.10	33.3	1.5E-08	
9	2000	8	21	12	53.00	11940	20.0	95	95	55.75	0.05	24.75	0.30	90.60	0.25	9.1	1.6E-08	
10	2000	8	21	16	15.00	12120	20.0	95	95	56.05	0.30	25.05	0.30	90.35	0.25	9.1	1.5E-08	
11	2000	8	22	7	41.00	55560	20.0	95	95	56.90	0.85	26.55	1.50	89.05	1.30	7.1	1.8E-08	
12	2000	8	22	10	36.00	10500	20.0	95	95	57.00	0.10	26.80	0.25	88.80	0.25	0.0	1.7E-08	
13	2000	8	22	14	1.00	12300	20.0	95	95	57.10	0.10	27.15	0.35	88.55	0.25	16.7	1.8E-08	
14	2000	8	22	16	17.00	8160	20.0	95	95	57.15	0.05	27.35	0.20	88.35	0.20	0.0	1.8E-08	
15	2000	8	23	7	41.00	55440	20.0	95	95	58.15	1.00	28.75	1.40	87.20	1.15	9.8	1.7E-08	
16	2000	8	23	11	46.00	14700	20.0	95	95	58.40	0.25	29.00	0.25	86.90	0.30	-9.1	1.4E-08	
17	2000	8	23	14	47.00	10860	21.0	95	95	58.65	0.25	29.25	0.25	86.60	0.30	-9.1	1.9E-08	
18	2000	8	23	16	25.00	5880	21.0	95	95	58.80	0.15	29.50	0.25	86.50	0.10	42.9	2.3E-08	
19	2000	8	24	7	42.00	55020	20.0	95	95	59.35	0.55	30.75	1.25	85.45	1.05	8.7	1.7E-08	
20	2000	8	24	9	50.00	7680	20.0	95	95	59.40	0.05	30.90	0.15	85.30	0.15	0.0	1.6E-08	1
21	2000	8	24	12	59.00	11340	20.0	95	95	59.40	0.00	31.15	0.25	85.10	0.20	11.1	1.6E-08	1
22	2000	8	25	15	15.00	94560	21.0	95	95	61.30	1.90	33.15	2.00	83.40	1.70	8.1	1.6E-08	1
23																		
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column. 1.6E-08 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

QC: JTBS
QA: dlf

Falling Head Permeability Test (ASTM D5084)

Project Name:	WEYERHAEUSER	Cell #:	5
Project #:	5108.08	USCS Description:	Sandy lean clay
Sample Name:	LPT-5, 1421 N, 681 E	USCS Classification:	CL
Visual Descript:	Sandy lean clay	Average Kv =	1.2E-08 cm/sec

Sample Type:	Undisturbed	Initial Values	Final Values		
Sample Dia. (in)		2.85	2.85	Permeant:	Water
Sample Ht. (in)		2.31	2.28	Permeant Specific Gravity:	1.00
Tare & Wet (g)		461.50	562.30	Sample Specific Gravity:	2.70 Est.
Tare & Dry (g)		424.00	466.10	Confining Pressure (psi):	100.0
Tare (g)		272.60	84.36	Burette Diameter (in):	0.250
Sample Wt. (g)		475.40	477.94	Burette Zero (cm):	100.0
Moisture (%)		24.8	25.2	Maximum Gradient:	10.5
Wet Density (pcf)		122.9	125.2	Average Gradient:	10.2
Dry Density (pcf)		98.5	100.0	Max. Effect. Stress (psi):	5.6
Saturation (%)		94.1	99.3	Min. Effect. Stress (psi):	4.4
				Ave. Effect. Stress (psi):	4.8

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	18	7	46.00		0.0	95	95	54.60		14.30		97.50				
2	2000	8	18	8	19.00	1980	20.0	95	95	54.25	-0.35	14.35	0.05	97.15	0.35	-75.0	5.4E-08	
3	2000	8	18	8	47.00	1680	20.0	95	95	54.50	0.25	14.40	0.05	97.10	0.05	0.0	1.6E-08	
4	2000	8	18	10	0.00	4380	20.0	95	95	55.30	0.80	14.55	0.15	97.00	0.10	20.0	1.5E-08	
5	2000	8	18	11	41.00	6060	20.0	95	95	55.55	0.25	14.75	0.20	96.80	0.20	0.0	1.8E-08	
6	2000	8	18	15	2.00	12060	20.0	95	95	56.85	1.30	15.10	0.35	96.60	0.20	27.3	1.2E-08	
7	2000	8	21	7	46.00	233040	20.0	95	95	65.90	9.05	21.10	6.00	91.60	5.00	9.1	1.4E-08	
8	2000	8	21	9	35.00	6540	20.0	95	95	65.90	0.00	21.30	0.20	91.45	0.15	14.3	1.7E-08	
9	2000	8	21	12	54.00	11940	20.0	95	95	66.25	0.35	21.55	0.25	91.25	0.20	11.1	1.2E-08	
10	2000	8	21	16	16.00	12120	20.0	95	95	66.60	0.35	21.90	0.35	91.00	0.25	16.7	1.6E-08	
11	2000	8	22	7	42.00	55560	20.0	95	95	67.80	1.20	23.00	1.10	90.00	1.00	4.8	1.2E-08	
12	2000	8	22	10	37.00	10500	20.0	95	95	67.90	0.10	23.20	0.20	89.80	0.20	0.0	1.3E-08	
13	2000	8	22	14	2.00	12300	20.0	95	95	68.20	0.30	23.50	0.30	89.55	0.25	9.1	1.5E-08	
14	2000	8	22	16	18.00	8160	20.0	95	95	68.20	0.00	23.60	0.10	89.45	0.10	0.0	8.3E-09	
15	2000	8	23	7	42.00	55440	20.0	95	95	68.40	0.20	24.75	1.15	88.45	1.00	7.0	1.3E-08	
16	2000	8	23	11	45.00	14580	20.0	95	95	69.80	1.40	25.00	0.25	88.20	0.25	0.0	1.2E-08	
17	2000	8	23	14	48.00	10980	21.0	95	95	70.05	0.25	25.15	0.15	88.05	0.15	0.0	9.4E-09	
18	2000	8	23	16	25.00	5820	21.0	95	95	70.20	0.15	25.30	0.15	87.95	0.10	20.0	1.5E-08	
19	2000	8	24	7	43.00	55080	20.0	95	95	70.90	0.70	26.30	1.00	87.05	0.90	5.3	1.2E-08	
20	2000	8	24	9	52.00	7740	20.0	95	95	71.10	0.20	26.40	0.10	86.95	0.10	0.0	9.5E-09	1
21	2000	8	24	12	59.00	11220	20.0	95	95	71.05	-0.05	26.60	0.20	86.65	0.30	-20.0	1.6E-08	1
22	2000	8	25	15	14.00	94500	21.0	95	95	73.40	2.35	28.20	1.60	85.40	1.25	12.3	1.1E-08	1
23																		
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

1.2E-08 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

QC: JFS

QA: DH

Falling Head Permeability Test (ASTM D5084)

Project Name:	WEYERHAEUSER	Cell #:	6
Project #:	5108.08	USCS Description:	Sandy lean clay
Sample Name:	LPT-6, 1420N, 683E	USCS Classification:	CL
Visual Descript:	Sandy lean clay	Average Kv =	1.8E-08 cm/sec

		Initial Values	Final Values			
Sample Type:	Undisturbed					
Sample Dia. (in)		2.85	2.85	Permeant:	Water	
Sample Ht. (in)		2.31	2.29	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		554.60	575.40	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)		505.30	486.20	Confining Pressure (psi):	100.0	
Tare (g)		275.26	82.71	Burette Diameter (in):	0.250	
Sample Wt. (g)		489.80	492.69	Burette Zero (cm):	100.0	
Moisture (%)		21.4	22.1	Maximum Gradient:	8.7	
Wet Density (pcf)		126.6	128.5	Average Gradient:	8.3	
Dry Density (pcf)		104.3	105.2	Max. Effect. Stress (psi):	5.5	
Saturation (%)		94.0	99.3	Min. Effect. Stress (psi):	4.3	
				Ave. Effect. Stress (psi):	4.8	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C°**	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	18	7	47.00		0.0	95	95	60.80		14.50		97.75				
2	2000	8	18	8	20.00	1980	20.0	95	95	60.40	-0.40	14.55	0.05	97.30	0.45	-80.0	6.8E-08	
3	2000	8	18	8	48.00	1680	20.0	95	95	60.50	0.10	14.65	0.10	97.20	0.10	0.0	3.2E-08	
4	2000	8	18	10	2.00	4440	20.0	95	95	61.50	1.00	14.90	0.25	97.00	0.20	11.1	2.8E-08	
5	2000	8	18	11	42.00	6000	20.0	95	95	61.75	0.25	15.15	0.25	96.75	0.25	0.0	2.3E-08	
6	2000	8	18	15	3.00	12060	20.0	95	95	62.70	0.95	15.70	0.55	96.30	0.45	10.0	2.3E-08	
7	2000	8	21	7	47.00	233040	20.0	95	95	69.00	6.30	24.40	8.70	88.60	7.70	6.1	2.2E-08	
8	2000	8	21	9	36.00	6540	20.0	95	95	69.00	0.00	24.70	0.30	88.40	0.20	20.0	2.7E-08	
9	2000	8	21	12	55.00	11940	20.0	95	95	69.20	0.20	25.05	0.35	88.00	0.40	-6.7	2.2E-08	
10	2000	8	21	16	17.00	12120	20.0	95	95	69.65	0.45	25.45	0.40	87.65	0.35	6.7	2.2E-08	
11	2000	8	22	7	43.00	55560	20.0	95	95	70.40	0.75	27.05	1.60	86.25	1.40	6.7	2.0E-08	
12	2000	8	22	10	38.00	10500	20.0	95	95	70.50	0.10	27.35	0.30	85.95	0.30	0.0	2.2E-08	
13	2000	8	22	14	3.00	12300	20.0	95	95	70.30	-0.20	27.70	0.35	85.70	0.25	16.7	1.9E-08	
14	2000	8	22	16	19.00	8160	20.0	95	95	70.60	0.30	27.90	0.20	85.45	0.25	-11.1	2.1E-08	
15	2000	8	23	7	43.00	55440	20.0	95	95	71.60	1.00	29.40	1.50	84.15	1.30	7.1	2.0E-08	
16	2000	8	23	11	45.00	14520	20.0	95	95	71.90	0.30	29.75	0.35	83.80	0.35	0.0	2.0E-08	
17	2000	8	23	14	49.00	11040	21.0	95	95	72.15	0.25	30.00	0.25	83.60	0.20	11.1	1.7E-08	
18	2000	8	23	16	26.00	5820	21.0	95	95	72.30	0.15	30.20	0.20	83.50	0.10	33.3	2.1E-08	
19	2000	8	24	7	44.00	55080	20.0	95	95	72.75	0.45	31.50	1.30	82.25	1.25	2.0	2.0E-08	
20	2000	8	24	9	53.00	7740	20.0	95	95	72.90	0.15	31.65	0.15	82.10	0.15	0.0	1.7E-08	1
21	2000	8	24	13	0.00	11220	20.0	95	95	72.80	-0.10	31.90	0.25	81.90	0.20	11.1	1.8E-08	1
22	2000	8	25	15	13.00	94380	21.0	95	95	74.80	2.00	34.00	2.10	80.20	1.70	10.5	1.8E-08	1
23																		
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

1.8E-08 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

RMT, Inc.

QC: JRS
QA:

Falling Head Permeability Test (ASTM D5084)

Project Name:	WEYERHAEUSER	Cell #:	7
Project #:	5108.08	USCS Description:	Sandy lean clay
Sample Name:	LPT-7, 1422 N, 680 E	USCS Classification:	CL
Visual Descript:	Sandy lean clay	Average Kv =	3.3E-08 cm/sec

Sample Type: Undisturbed	Initial Values	Final Values			
Sample Dia. (in)	2.84	2.84	Permeant:	Water	
Sample Ht. (in)	2.30	2.28	Permeant Specific Gravity:	1.00	
Tare & Wet (g)	538.30	565.20	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)	487.80	470.80	Confining Pressure (psi):	100.0	
Tare (g)	270.10	83.90	Burette Diameter (in):	0.250	
Sample Wt. (g)	477.80	481.30	Burette Zero (cm):	100.0	
Moisture (%)	23.2	24.4	Maximum Gradient:	7.0	
Wet Density (pcf)	124.9	127.0	Average Gradient:	6.5	
Dry Density (pcf)	101.4	102.1	Max. Effect. Stress (psi):	5.7	
Saturation (%)	94.7	101.2	Min. Effect. Stress (psi):	4.5	
			Ave. Effect. Stress (psi):	4.8	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	18	7	46.00		0.0	95	95	49.50		13.20		96.65				
2	2000	8	18	8	21.00	2100	20.0	95	95	49.35	-0.15	13.35	0.15	96.15	0.50	-53.8	8.4E-08	
3	2000	8	18	8	49.00	1680	20.0	95	95	49.60	0.25	13.50	0.15	95.95	0.20	-14.3	5.7E-08	
4	2000	8	18	10	3.00	4440	20.0	95	95	50.70	1.10	13.90	0.40	95.60	0.35	6.7	4.6E-08	
5	2000	8	18	11	43.00	6000	20.0	95	95	51.05	0.35	14.35	0.45	95.20	0.40	5.9	3.9E-08	
6	2000	8	18	15	4.00	12060	20.0	95	95	52.25	1.20	15.35	1.00	94.55	0.65	21.2	3.8E-08	
7	2000	8	21	7	48.00	233040	20.0	95	95	62.40	10.15	27.35	12.00	84.60	9.95	9.3	3.1E-08	
8	2000	8	21	9	37.00	6540	20.0	95	95	62.50	0.10	27.60	0.25	84.40	0.20	11.1	2.7E-08	
9	2000	8	21	12	56.00	11940	20.0	95	95	63.70	1.20	28.05	0.45	84.05	0.35	12.5	2.7E-08	
10	2000	8	21	16	18.00	12120	20.0	95	95	64.65	0.95	28.55	0.50	83.65	0.40	11.1	3.0E-08	
11	2000	8	22	7	44.00	55560	20.0	95	95	66.70	2.05	30.50	1.95	82.00	1.65	8.3	2.7E-08	
12	2000	8	22	10	52.00	11280	20.0	95	95	67.10	0.40	30.80	0.30	81.70	0.30	0.0	2.3E-08	
13	2000	8	22	14	3.00	11460	20.0	95	95	67.50	0.40	31.20	0.40	81.40	0.30	14.3	2.7E-08	
14	2000	8	22	16	20.00	8220	20.0	95	95	67.55	0.05	31.50	0.30	81.10	0.30	0.0	3.3E-08	
15	2000	8	23	7	44.00	55440	20.0	95	95	69.65	2.10	33.25	1.75	79.65	1.45	9.4	2.7E-08	
16	2000	8	23	11	44.00	14400	20.0	95	95	70.20	0.55	33.60	0.35	79.40	0.25	16.7	2.0E-08	
17	2000	8	23	14	49.00	11100	21.0	95	95	70.55	0.35	33.95	0.35	78.15	1.25	-56.2	7.0E-08	
18	2000	8	23	16	26.00	5820	21.0	95	95	70.70	0.15	34.35	0.40	77.90	0.25	23.1	5.6E-08	
19	2000	8	24	7	45.00	55140	20.0	95	95	71.75	1.05	36.40	2.05	77.20	0.70	49.1	2.7E-08	
20	2000	8	24	9	54.00	7740	20.0	95	95	71.80	0.05	36.60	0.20	76.95	0.25	-11.1	3.2E-08	1
21	2000	8	24	13	1.00	11220	20.0	95	95	71.85	0.05	37.00	0.40	76.65	0.30	14.3	3.5E-08	1
22	2000	8	25	15	12.00	94260	21.0	95	95	72.50	0.65	39.70	2.70	74.45	2.20	10.2	3.1E-08	1
23																		
24																		
25																		
26																		

**A zero in this column starts a series of measurements.
(Termination determined by stable Kv and low flow differential.)

*Average Kv for those rows with a 1 in the Ave. column. 3.3E-08 cm/sec

***Kv adjusted for temperature.

RMT, Inc.

Falling Head Permeability Test (ASTM D5084)

QC: JBS

QA:

Project Name:	WEYERHAEUSER	Cell #:	8
Project #:	5108.08	USCS Description:	Sandy lean clay
Sample Name:	LPT-8, 1420 N, 684 E	USCS Classification:	CL
Visual Descript:	Sandy lean clay	Average Kv =	2.5E-08 cm/sec

Sample Type:	Undisturbed	Initial Values	Final Values			
Sample Dia. (in)		2.84	2.84	Permeant:	Water	
Sample Ht. (in)		2.30	2.30	Permeant Specific Gravity:	1.00	
Tare & Wet (g)		549.70	558.10	Sample Specific Gravity:	2.70	Est.
Tare & Dry (g)		497.10	460.20	Confining Pressure (psi):	100.0	
Tare (g)		273.30	84.16	Burette Diameter (in):	0.250	
Sample Wt. (g)		470.10	473.94	Burette Zero (cm):	100.0	
Moisture (%)		23.5	26.0	Maximum Gradient:	8.5	
Wet Density (pcf)		122.9	123.9	Average Gradient:	8.0	
Dry Density (pcf)		99.5	98.3	Max. Effect. Stress (psi):	5.6	
Saturation (%)		91.6	98.5	Min. Effect. Stress (psi):	4.3	
				Ave. Effect. Stress (psi):	4.7	

	Date			Time		Run	Temp	Pressure (psi)			Cham.		Bot.		Top	Flow	Kv ***	Ave.*
	Yr.	Mo.	Day	Hr.	Min.	Time	C***	Bot	Top	Cham	Dif.	Bot	Dif.	Top	Dif.	Dif.%	cm/sec	0,1
1	2000	8	18	7	45.00		0.0	95	95	50.95		7.95		93.95				
2	2000	8	18	8	22.00	2220	20.0	95	95	50.60	-0.35	8.10	0.15	93.25	0.70	-64.7	1.0E-07	
3	2000	8	18	8	50.00	1680	20.0	95	95	50.80	0.20	8.20	0.10	93.20	0.05	33.3	2.4E-08	
4	2000	8	18	10	4.00	4440	20.0	95	95	51.90	1.10	8.50	0.30	93.10	0.10	50.0	2.4E-08	
5	2000	8	18	11	44.00	6000	20.0	95	95	52.35	0.45	8.90	0.40	92.80	0.30	14.3	3.1E-08	
6	2000	8	18	15	5.00	12060	20.0	95	95	53.75	1.40	9.50	0.60	92.45	0.35	26.3	2.1E-08	
7	2000	8	21	7	49.00	233040	20.0	95	95	67.70	13.95	19.50	10.00	85.30	7.15	16.6	2.2E-08	
8	2000	8	21	9	39.00	6600	20.0	95	95	67.70	0.00	19.75	0.25	85.15	0.15	25.0	2.1E-08	
9	2000	8	21	12	57.00	11880	20.0	95	95	68.25	0.55	20.20	0.45	84.85	0.30	20.0	2.2E-08	
10	2000	8	21	16	19.00	12120	20.0	95	95	68.90	0.65	20.55	0.35	84.55	0.30	7.7	1.9E-08	
11	2000	8	22	7	46.00	55620	20.0	95	95	70.60	1.70	22.40	1.85	83.10	1.45	12.1	2.2E-08	
12	2000	8	22	10	53.00	11220	20.0	95	95	70.90	0.30	22.75	0.35	82.90	0.20	27.3	1.8E-08	
13	2000	8	22	14	4.00	11460	20.0	95	95	71.40	0.50	23.10	0.35	82.60	0.30	7.7	2.1E-08	
14	2000	8	22	16	21.00	8220	20.0	95	95	71.25	-0.15	23.30	0.20	82.35	0.25	-11.1	2.1E-08	
15	2000	8	23	7	45.00	55440	20.0	95	95	73.25	2.00	25.05	1.75	81.10	1.25	16.7	2.1E-08	
16	2000	8	23	11	42.00	14220	20.0	95	95	73.80	0.55	25.50	0.45	80.80	0.30	20.0	2.1E-08	
17	2000	8	23	14	50.00	11280	21.0	95	95	74.20	0.40	25.80	0.30	80.50	0.30	0.0	2.1E-08	
18	2000	8	23	16	27.00	5820	21.0	95	95	74.10	-0.10	27.60	1.80	80.10	0.40	63.6	1.6E-07	
19	2000	8	24	7	46.00	55140	20.0	95	95	75.25	1.15	28.70	1.10	78.20	1.90	-26.7	2.4E-08	
20	2000	8	24	9	57.00	7860	20.0	95	95	75.35	0.10	28.90	0.20	78.00	0.20	0.0	2.3E-08	1
21	2000	8	24	13	2.00	11100	20.0	95	95	75.50	0.15	29.25	0.35	77.70	0.30	7.7	2.7E-08	1
22	2000	8	25	15	11.00	94140	21.0	95	95	78.60	3.10	32.15	2.90	75.60	2.10	16.0	2.6E-08	1
23																		
24																		
25																		
26																		

**A zero in this column starts a series of measurements.

*Average Kv for those rows with a 1 in the Ave. column.

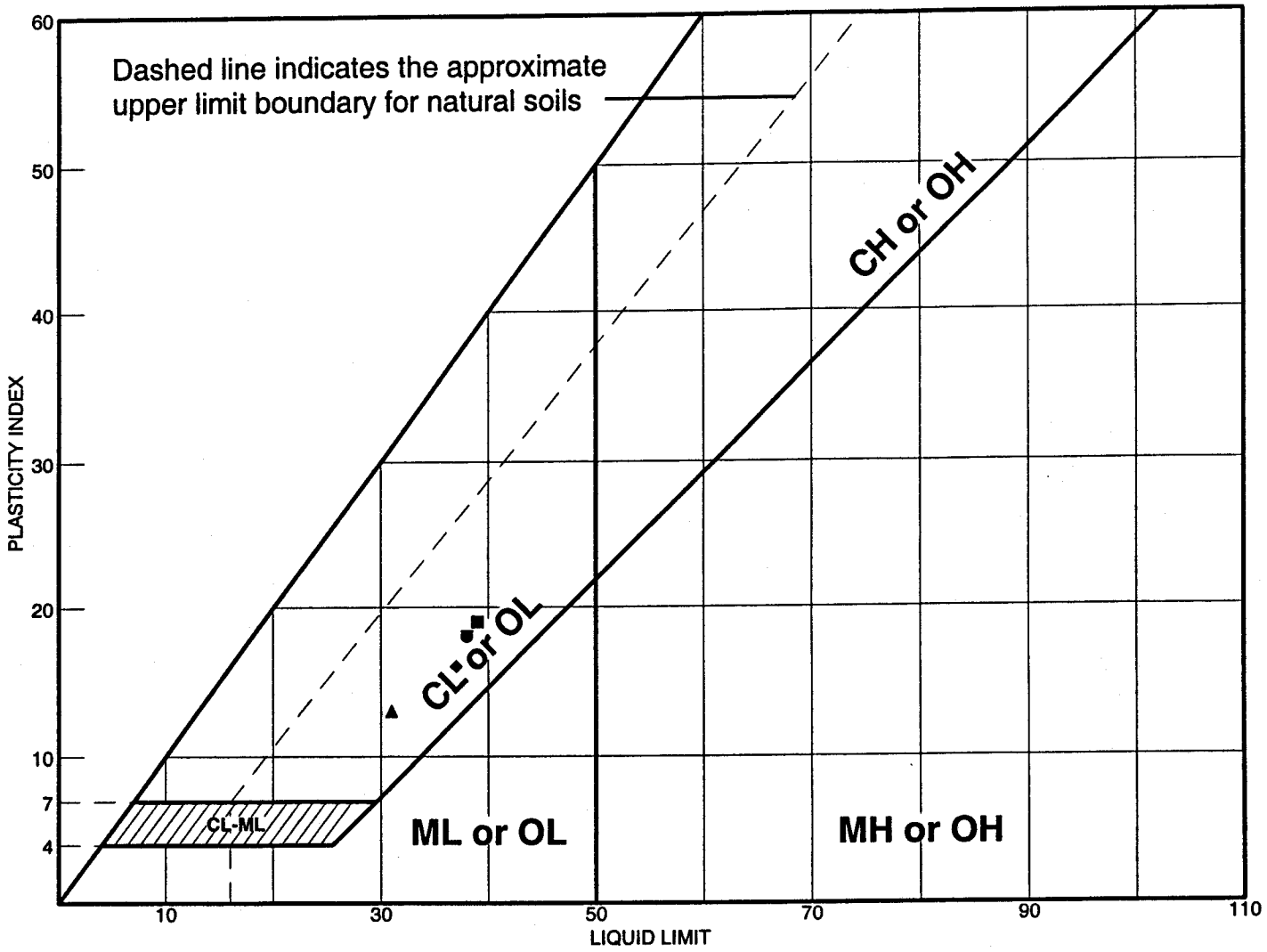
2.5E-08 cm/sec

(Termination determined by stable Kv and low flow differential.)

***Kv adjusted for temperature.

VJRS

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Clayey sand	38	20	18	99.2	49.1	SC
■	Sandy lean clay	39	20	19	99.3	55.9	CL
▲	Clayey sand	31	18	13	99.3	47.2	SC
◆	Sandy lean clay	37	21	16	99.3	53.6	CL
▼	Sandy lean clay	38	20	18	99.3	55.3	CL

Project No. 5108.08 **Client:**

Project: WEYERHAEUSER

● **Source:** LPT-1 **Sample No.:** 1420N, 1120E

■ **Source:** LPT-2 **Sample No.:** 1422N, 1118E

▲ **Source:** LPT-3 **Sample No.:** 1420N, 1123E

◆ **Source:** LPT-4 **Sample No.:** 1420N, 1120E

▼ **Source:** LPT-5 **Sample No.:** 1421N, 681E

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)

RMT, Inc.

Remarks:

●

■

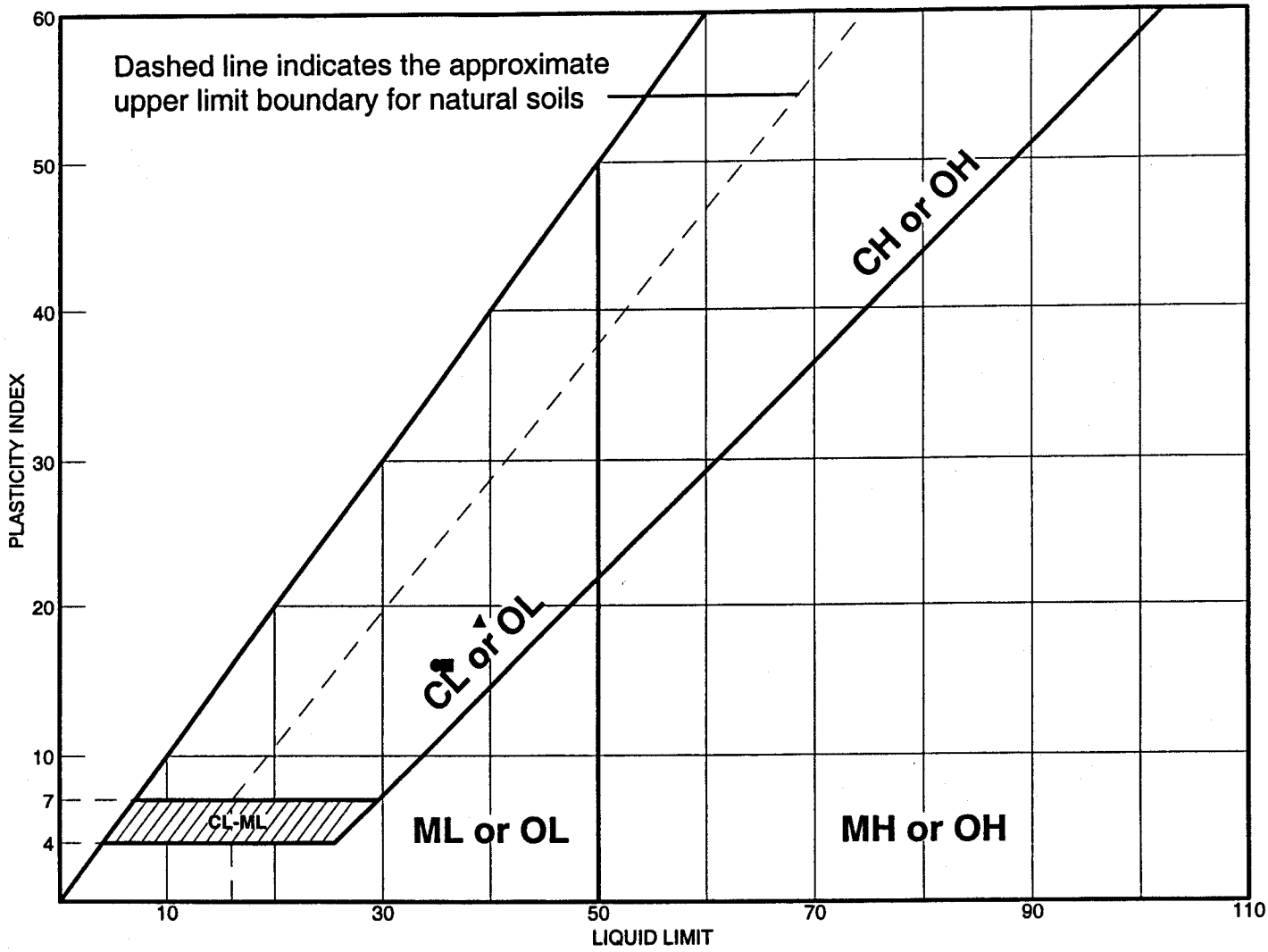
▲

◆

▼

Figure:

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sandy lean clay	35	19	16	99.3	50.0	CL
■	Sandy lean clay	36	20	16	99.2	53.4	CL
▲	Sandy lean clay	39	20	19	99.3	57.9	CL

Project No. 5108.08 **Client:**

Project: WEYERHAEUSER

● **Source:** LPT-6 **Sample No.:** 1420N, 683E

■ **Source:** LPT-7 **Sample No.:** 1422N, 680E

▲ **Source:** LPT-8 **Sample No.:** 1420N, 684E

Remarks:

●

■

▲

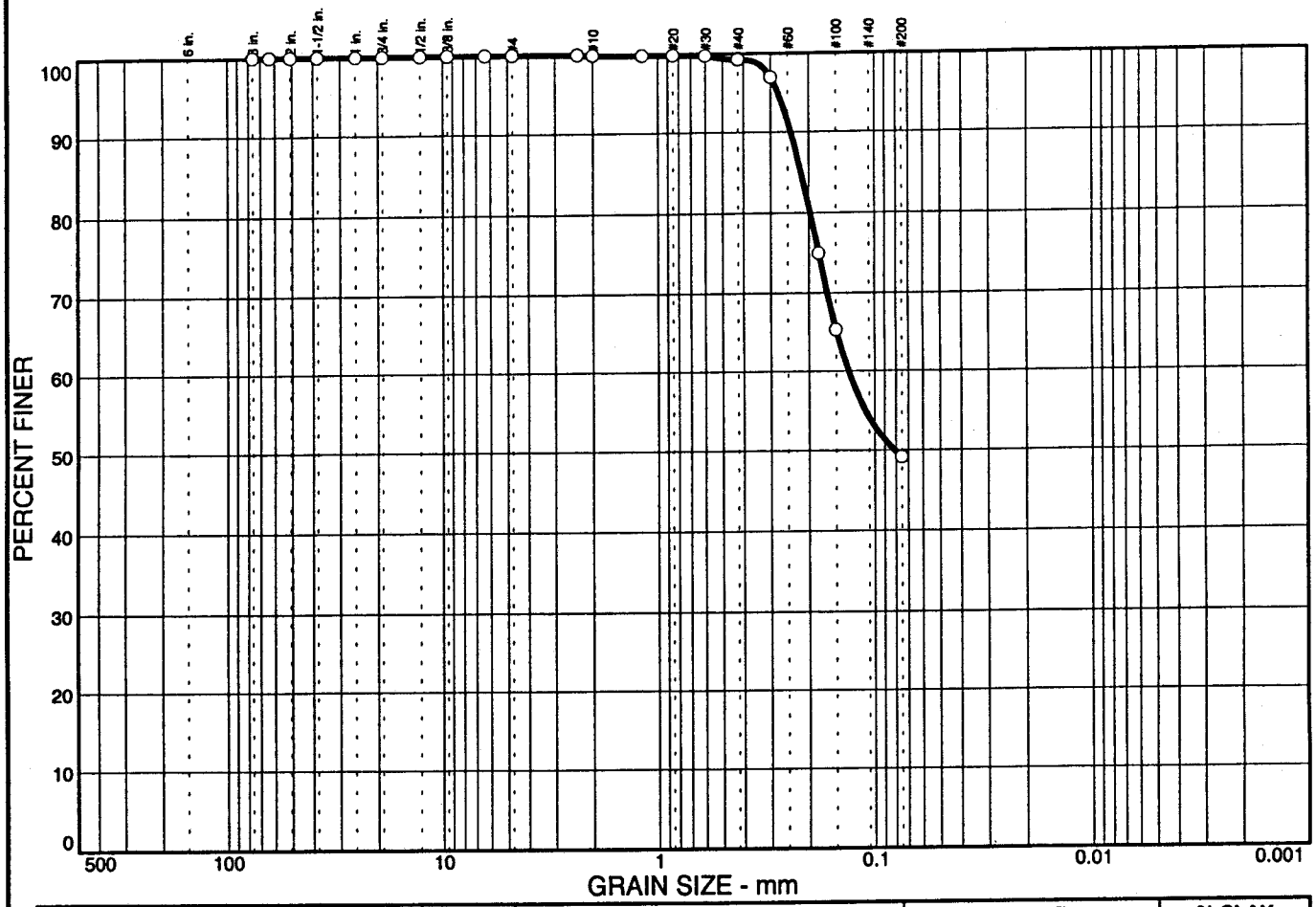
LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)

RMT, Inc.

Figure:

VJRS JAM

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	50.9	49.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	99.9		
#16	99.8		
#20	99.8		
#30	99.7		
#40	99.2		
#50	96.9		
#80	74.9		
#100	65.3		
#200	49.1		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 20 LL= 38 PI= 18

Coefficients

D_{85}= 0.218 D_{60}= 0.132 D_{50}= 0.0809
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

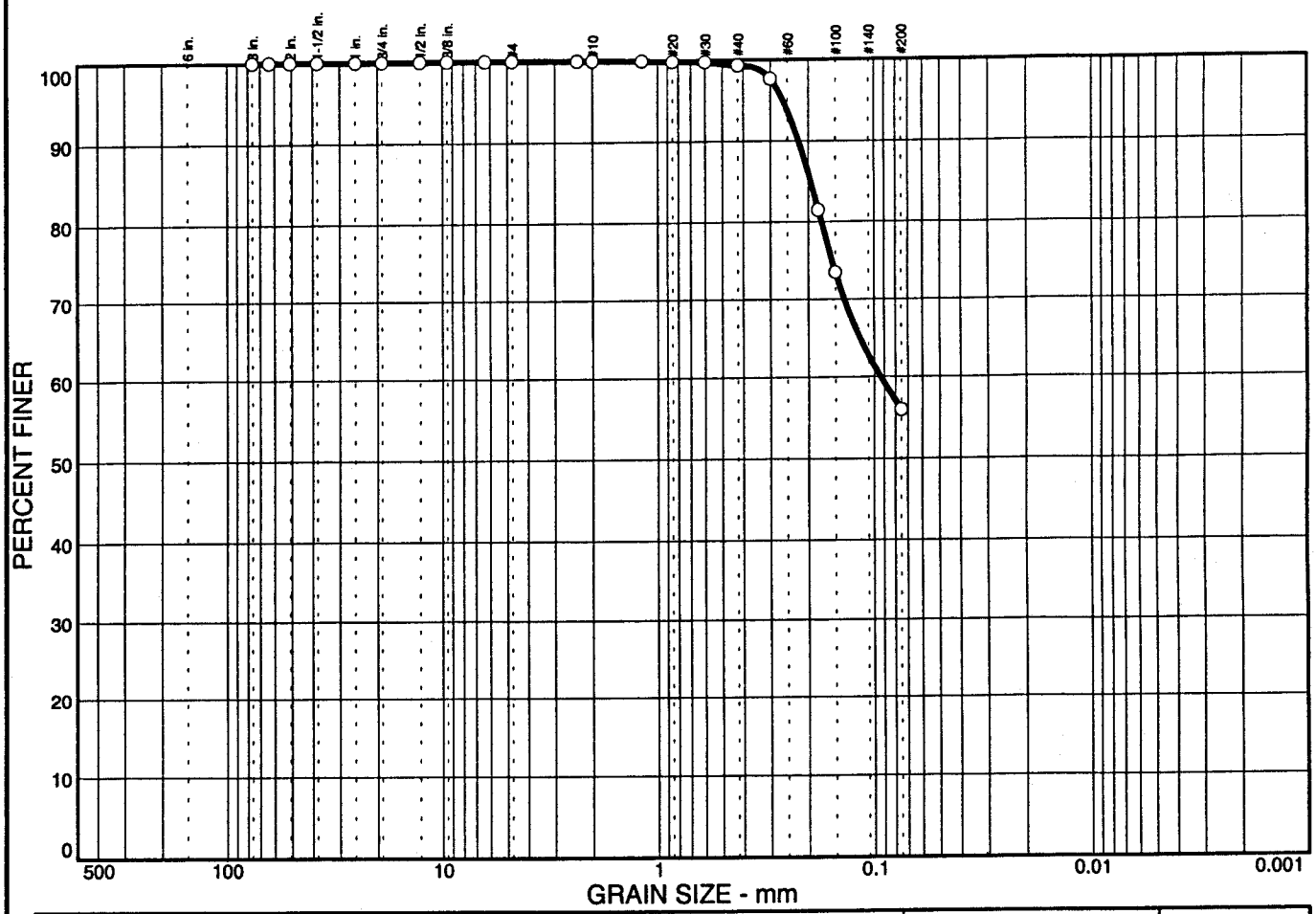
Sample No.: 1420N, 1120E **Source of Sample:** LPT-1 **Date:** 9-7-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

JJB JH

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	44.1	55.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	99.9		
#20	99.8		
#30	99.7		
#40	99.3		
#50	97.6		
#80	81.5		
#100	73.5		
#200	55.9		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 20 LL= 39 PI= 19

Coefficients

D_{85}= 0.195 D_{60}= 0.0936 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

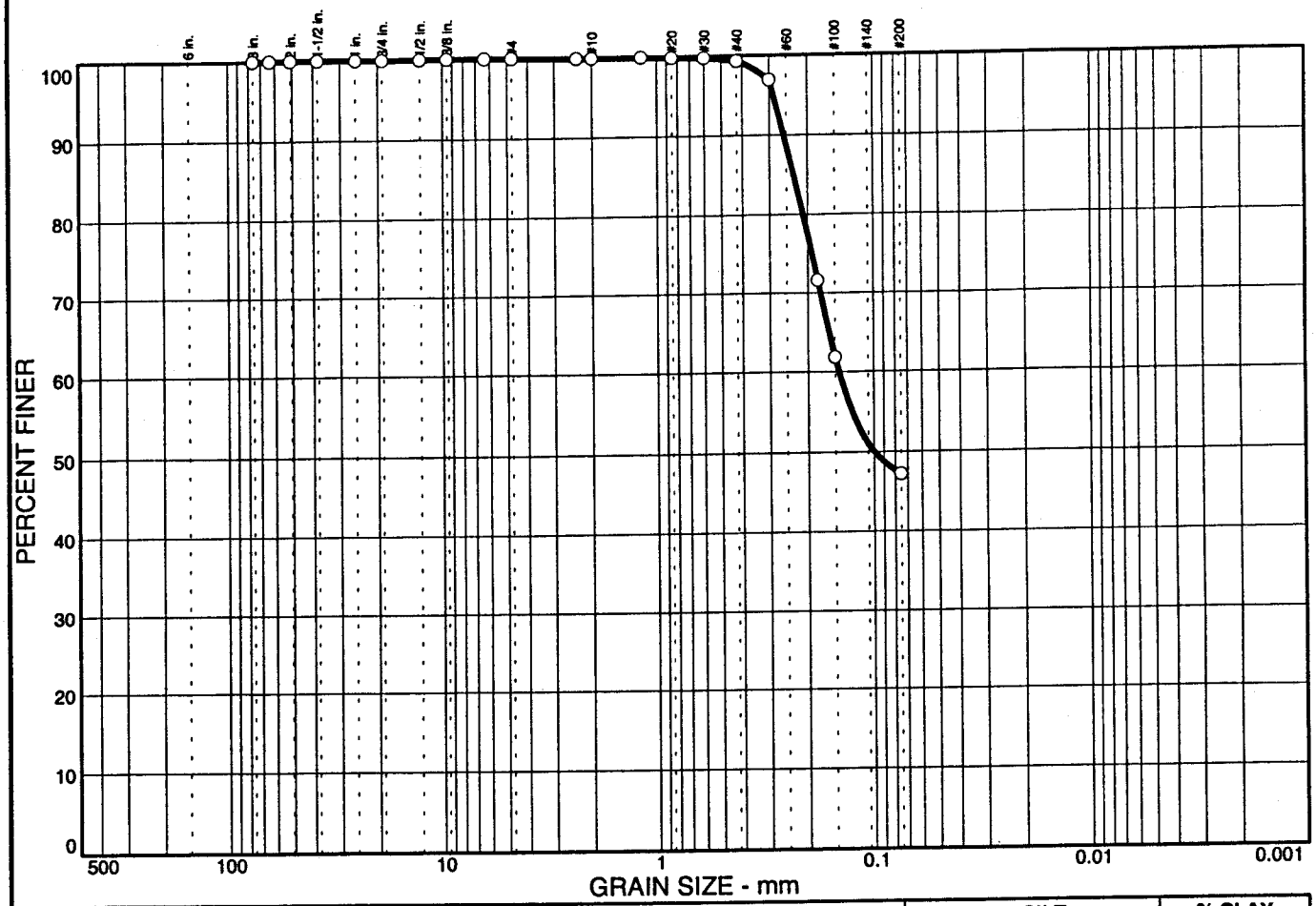
Sample No.: 1422N, 1118E **Source of Sample:** LPT-2 **Date:** 9-7-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

VJ125/ML

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	52.8	47.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	99.9		
#20	99.8		
#30	99.7		
#40	99.3		
#50	96.9		
#80	71.6		
#100	61.8		
#200	47.2		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 18 LL= 31 PI= 13

Coefficients

D_{85}= 0.233 D_{60}= 0.144 D_{50}= 0.0993
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

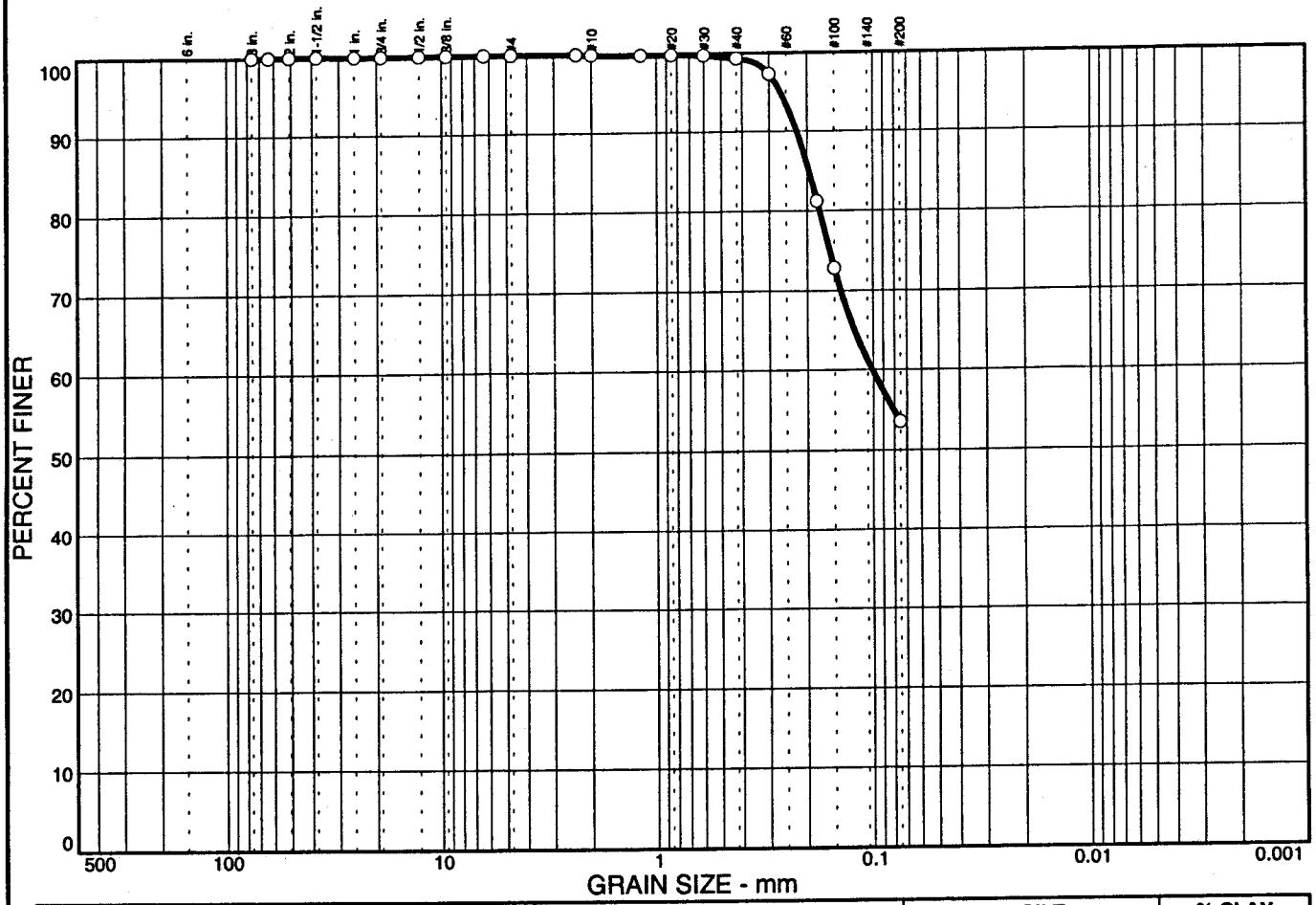
Remarks

Sample No.: 1420N, 1123E **Source of Sample:** LPT-3 **Date:** 9-7-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	46.4	53.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	99.9		
#16	99.8		
#20	99.8		
#30	99.7		
#40	99.3		
#50	97.3		
#80	81.2		
#100	72.8		
#200	53.6		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 21 LL= 37 PI= 16

Coefficients

D_{85}= 0.196 D_{60}= 0.101 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

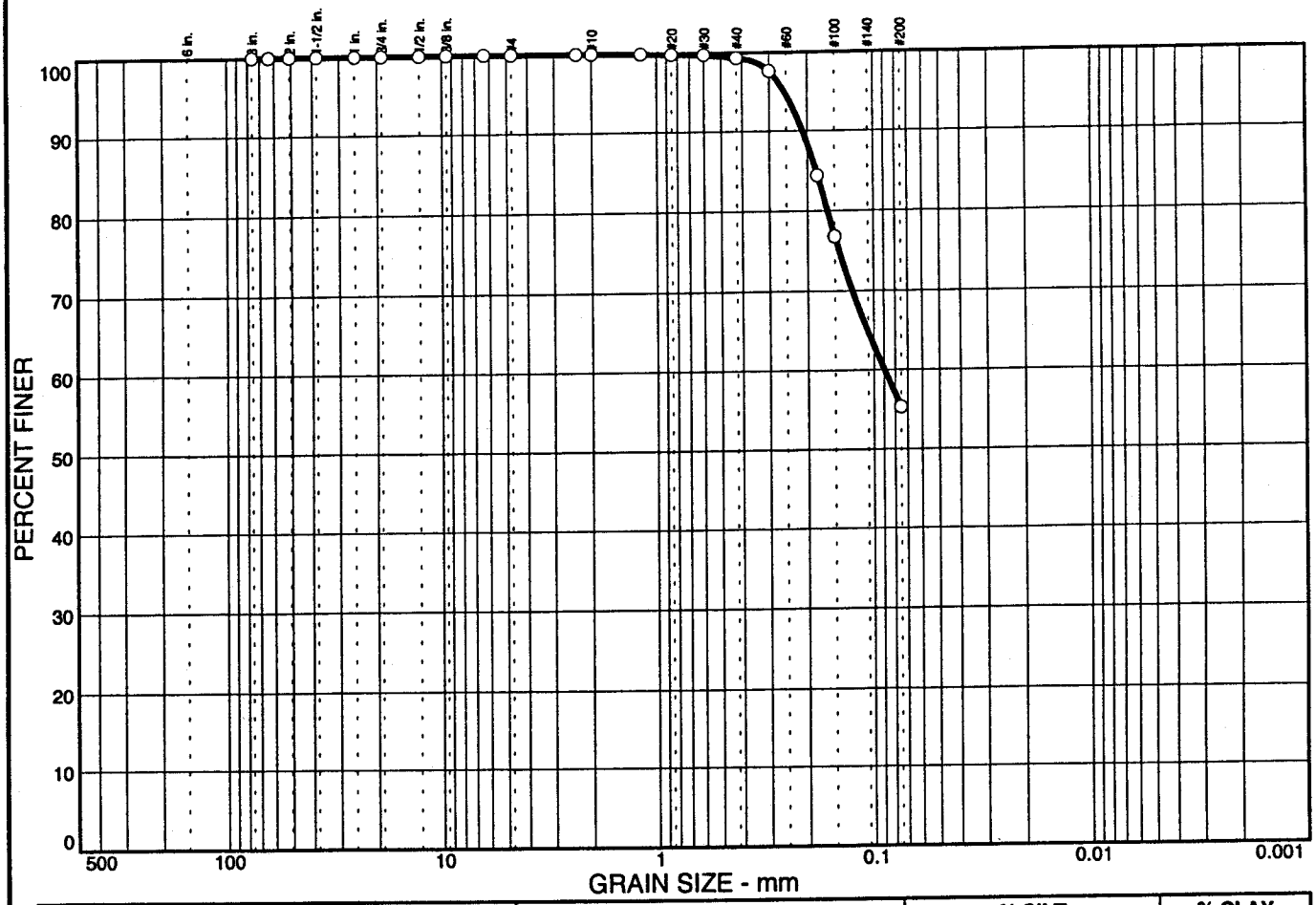
Sample No.: 1420N, 1120E **Source of Sample:** LPT-4 **Date:** 9-7-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

VJRS 1/17

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	44.7	55.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	99.9		
#20	99.8		
#30	99.7		
#40	99.3		
#50	97.6		
#80	84.4		
#100	76.8		
#200	55.3		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 20 LL= 38 PI= 18

Coefficients

D_{85}= 0.183 D_{60}= 0.0896 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

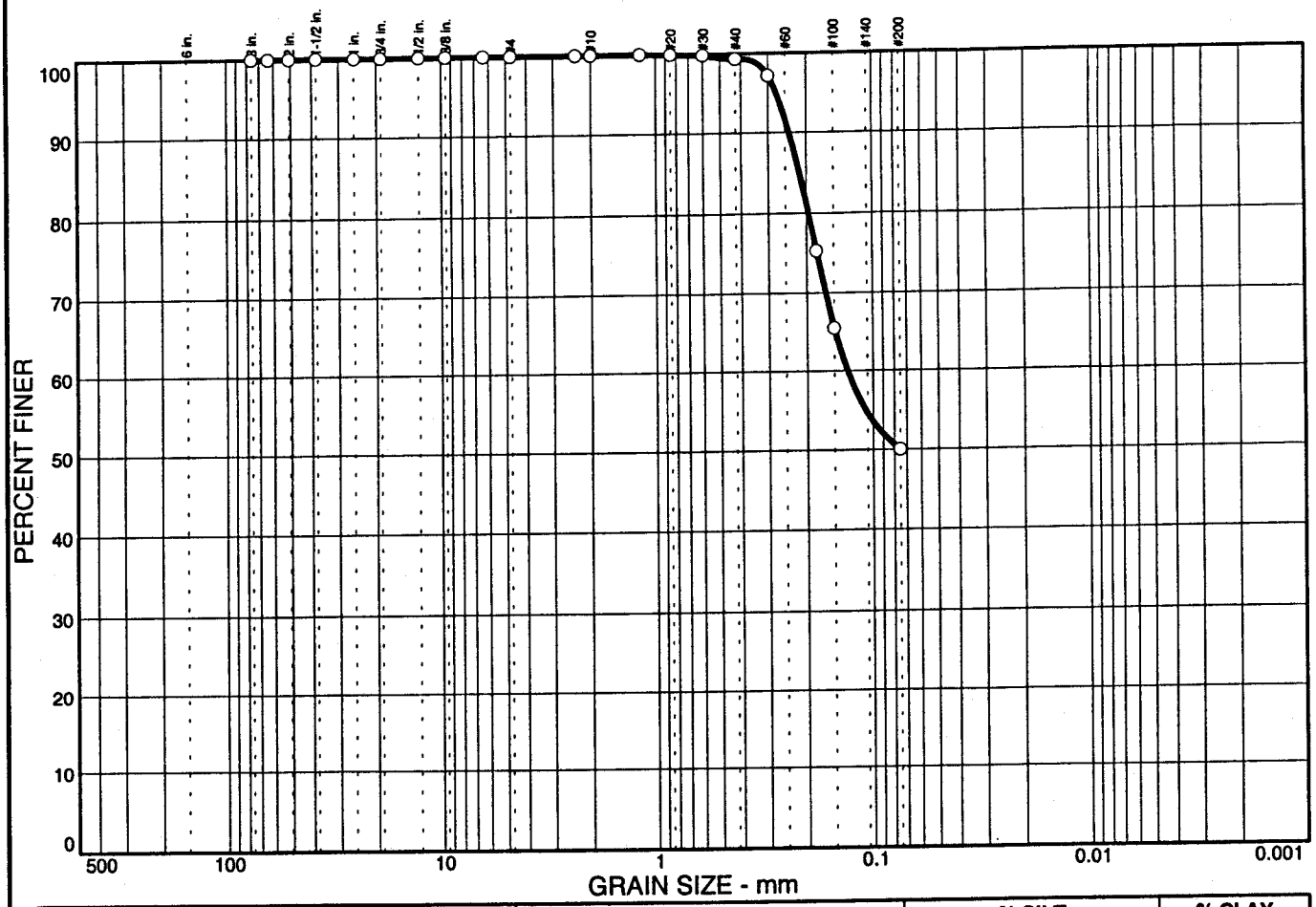
Sample No.: 1421N, 681E **Source of Sample:** LPT-5 **Date:** 9-7-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

VJRS

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	50.0	50.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	100.0		
#20	99.9		
#30	99.8		
#40	99.3		
#50	97.1		
#80	75.3		
#100	65.6		
#200	50.0		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 19 LL= 35 PI= 16

Coefficients

D_{85}= 0.216 D_{60}= 0.130 D_{50}= 0.0750
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

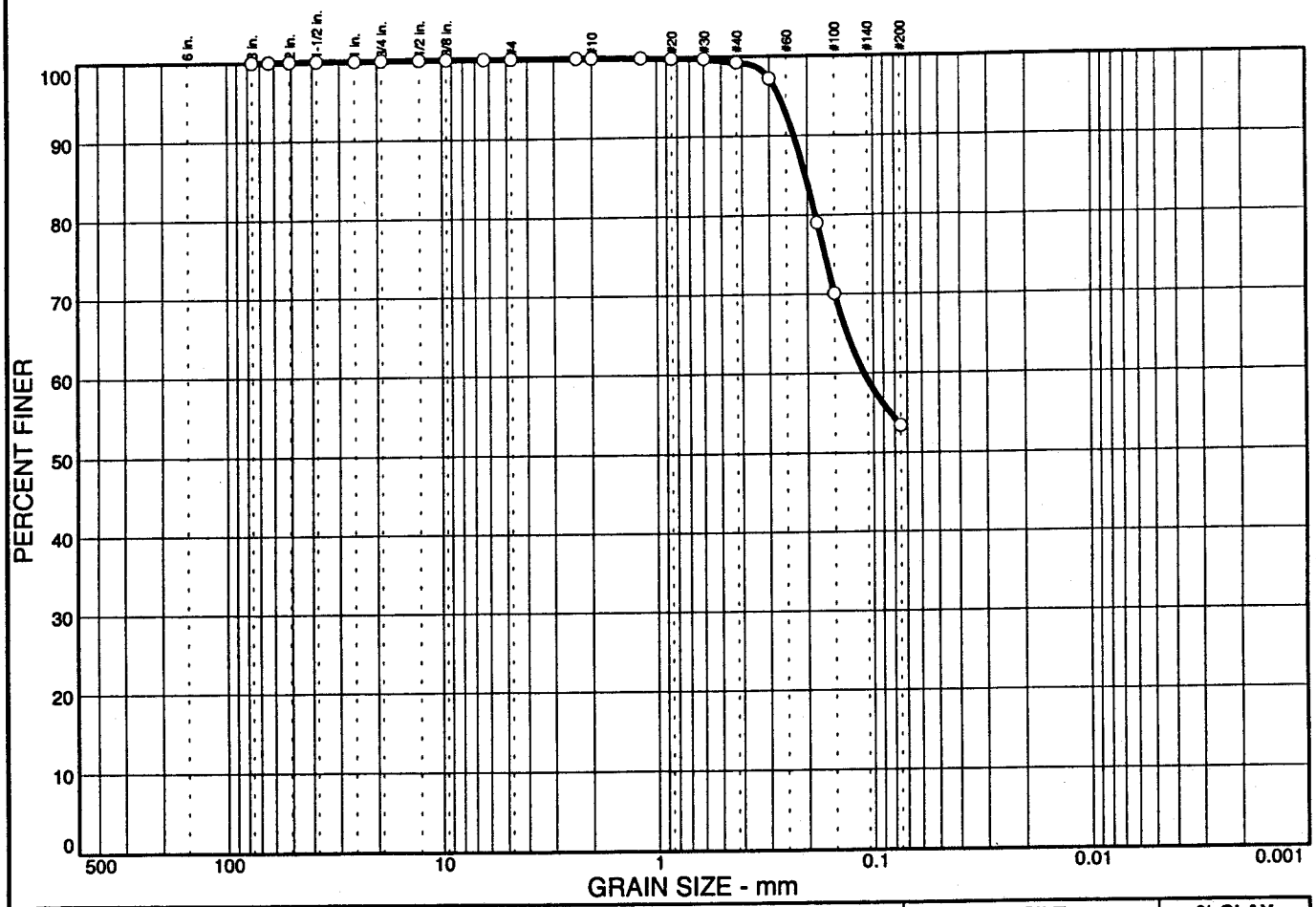
Remarks

Sample No.: 1420N, 683E **Source of Sample:** LPT-6 **Date:** 9-7-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	46.6	53.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	99.9		
#20	99.8		
#30	99.7		
#40	99.2		
#50	97.2		
#80	79.0		
#100	70.1		
#200	53.4		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 20 LL= 36 PI= 16

Coefficients

D_{85}= 0.205 D_{60}= 0.110 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

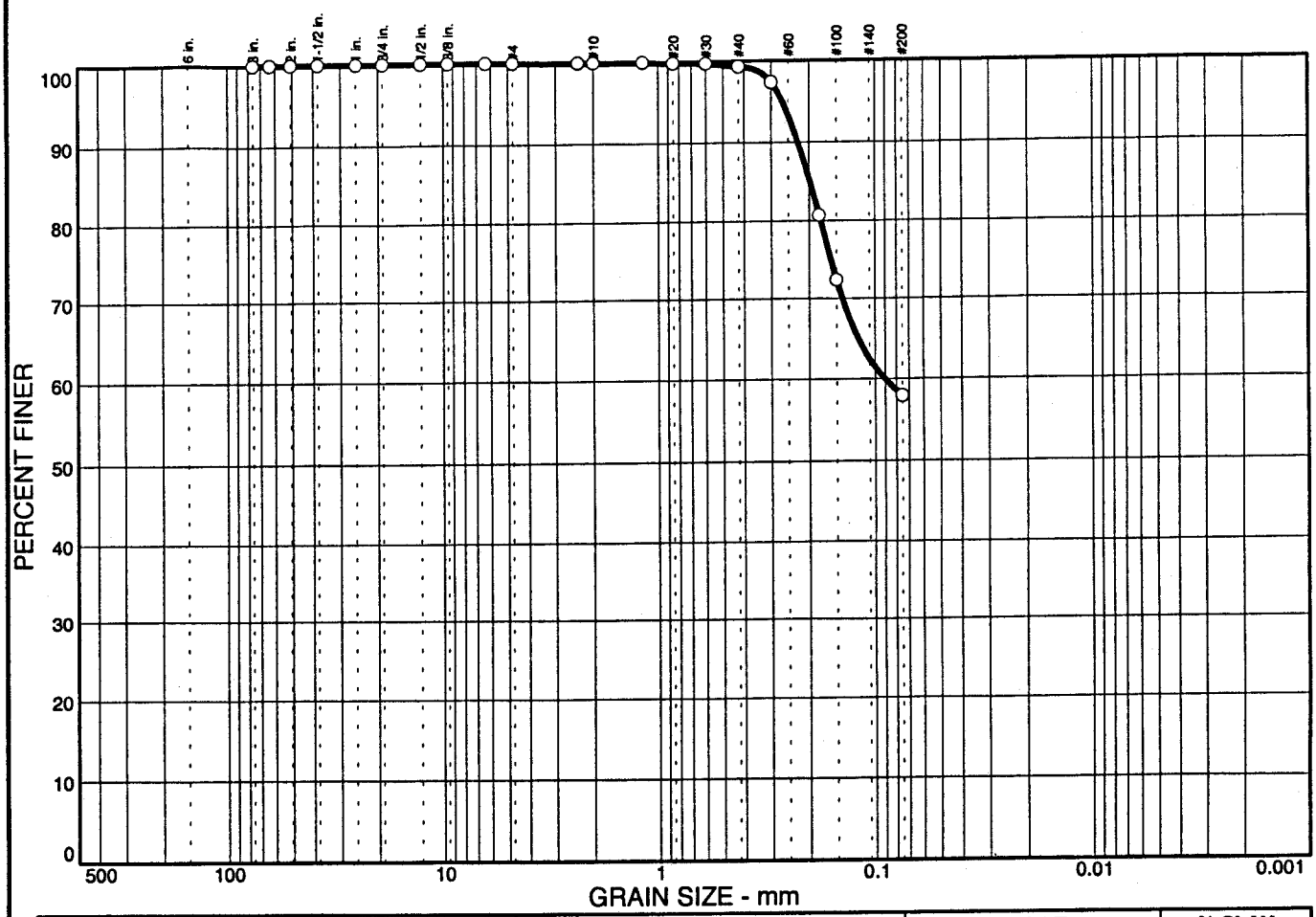
Remarks

Sample No.: 1422N, 680E **Source of Sample:** LPT-7 **Date:** 9-7-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

GRAIN SIZE DISTRIBUTION TEST REPORT



% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	42.1	57.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3.0 in.	100.0		
2.5 in.	100.0		
2.0 in.	100.0		
1.5 in.	100.0		
1.0 in.	100.0		
.75 in.	100.0		
.5 in.	100.0		
.375 in.	100.0		
.25 in.	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	99.9		
#20	99.8		
#30	99.7		
#40	99.3		
#50	97.3		
#80	80.7		
#100	72.4		
#200	57.9		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 20 LL= 39 PI= 19

Coefficients

D_{85}= 0.199 D_{60}= 0.0901 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sample No.: 1420N, 684E **Source of Sample:** LPT-8 **Date:** 9-7-00
Location: **Elev./Depth:**

RMT, Inc.

Client:
Project: WEYERHAEUSER
Project No: 5108.08 **Figure:**

Appendix I
Subgrade Acceptance Forms

Geo-Synthetics Construction, Inc.

426 N. Pewaukee Road
Waukesha, WI 53188
414-524-7979
Fax 414-542-8334

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE PREPARATION FOR GEOMEMBRANE INSTALLATION

PROJECT: WEYERHAEUSER

LOCATION: PLYMOUTH N.C.

JOB #: 20040 OWNER: WEYERHAEUSER

AREA ACCEPTED: PANELS 1 – 7

INSTALLER: The undersigned authorized representative of GSCI certifies that he or she has visually inspected the subgrade surface of the area described above and has found the surface to be acceptable for installation of the geomembrane materials.

This certification is based on observations of the subgrade surface conditions only. GSCI has made no sub-terrain inspections or tests and makes no representations or warranties as to the conditions which may exist below the surface of the subgrade.

AUTHORIZED GSCI REPRESENTATIVE:

Ryan M. Cox — Signature

8/20/2000 — Date

QAQC — Title

INSPECTOR:

CERTIFICATE APPROVED AND ACCEPTED BY:

Signature

8-20-00 — Date

RPR — Title

RMT — Company

GSI
Geo-Synthetics Construction, Inc.

428 N. Pewaukee Road
Waukesha, WI 53188
414-524-7979
Fax 414-542-8334

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE PREPARATION FOR GEOMEMBRANE INSTALLATION

PROJECT: WEYERHAEUSER

LOCATION: ~~[illegible]~~ PLYMOUTH NC

JOB #: 20040 OWNER: WEYERHAEUSER

AREA ACCEPTED: PANELS 8-19 S. BERM

INSTALLER: The undersigned authorized representative of GSCI certifies that he or she has visually inspected the subgrade surface of the area described above and has found the surface to be acceptable for installation of the geomembrane materials.

This certification is based on observations of the subgrade surface conditions only. GSCI has made no sub-terrain inspections or tests and makes no representations or warranties as to the conditions which may exist below the surface of the subgrade.

AUTHORIZED GSCI REPRESENTATIVE:

Ruth M. Cap. — Signature

8/21/2000 — Date

QAQC — Title

INSPECTOR:

CERTIFICATE APPROVED AND ACCEPTED BY:

[signature] — Signature

8-21-00 — Date

RPR — Title

[illegible] — Company

GSI
Geo-Synthetics Construction, Inc.

428 N. Pewaukee Road
Waukesha, WI 53188
414-524-7979
Fax 414-542-8334

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE PREPARATION FOR GEOMEMBRANE INSTALLATION

PROJECT: WEYERHAEUSER

LOCATION: PLYMOUTH N.C.

JOB #: 20040 OWNER: WEYERHAEUSER

AREA ACCEPTED: PANELS 20-34

INSTALLER: The undersigned authorized representative of GSCI certifies that he or she has visually inspected the subgrade surface of the area described above and has found the surface to be acceptable for installation of the geomembrane materials.

This certification is based on observations of the subgrade surface conditions only. GSCI has made no sub-terrain inspections or tests and makes no representations or warranties as to the conditions which may exist below the surface of the subgrade.

AUTHORIZED GSCI REPRESENTATIVE:

Ruth M. Cox
Signature

Aug 22, 2000
Date

QAQC
Title

INSPECTOR:

CERTIFICATE APPROVED AND ACCEPTED BY:

Signature

8-22-00
Date

RPR
Title

RMT
Company

GSI
Geo-Synthetics Construction, Inc.

428 N. Pewaukee Road
Waukesha, WI 53188
414-524-7979
Fax 414-542-8334

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE PREPARATION FOR GEOMEMBRANE INSTALLATION

PROJECT: WEYERHAEUSER

LOCATION: PLYMOUTH N.C.

JOB #: 20040 OWNER: WEYERHAEUSER

AREA ACCEPTED: PANELS 35-47

INSTALLER: The undersigned authorized representative of GSCI certifies that he or she has visually inspected the subgrade surface of the area described above and has found the surface to be acceptable for installation of the geomembrane materials.

This certification is based on observations of the subgrade surface conditions only. GSCI has made no sub-terrain inspections or tests and makes no representations or warranties as to the conditions which may exist below the surface of the subgrade.

AUTHORIZED GSCI REPRESENTATIVE:

Ruth M. Cox.
Signature

Aug. 23, 2000
Date

QA.QC
Title

INSPECTOR:

CERTIFICATE APPROVED AND ACCEPTED BY:

Signature

8-23-00
Date

RPR
Title

RMT
Company

GSI
Geo-Synthetics Construction, Inc.

428 N. Pewaukee Road
Waukesha, WI 53188
414-524-7979
Fax 414-542-8334

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE PREPARATION FOR GEOMEMBRANE INSTALLATION

PROJECT: WEYERHAEUSER

LOCATION: PLYMOUTH N.C.

JOB #: 20040 OWNER: WEYERHAEUSER

AREA ACCEPTED: PANEL 48-62

INSTALLER: The undersigned authorized representative of GSCI certifies that he or she has visually inspected the subgrade surface of the area described above and has found the surface to be acceptable for installation of the geomembrane materials.

This certification is based on observations of the subgrade surface conditions only. GSCI has made no sub-terrain inspections or tests and makes no representations or warranties as to the conditions which may exist below the surface of the subgrade.

AUTHORIZED GSCI REPRESENTATIVE:

Ruth M. Cox
Signature

Aug 24, 2000
Date

QA, QC,
Title

INSPECTOR:

CERTIFICATE APPROVED AND ACCEPTED BY:

Signature

8-24-00
Date

RPR
Title

RMT
Company

GSI
Geo-Synthetics Construction, Inc.

428 N. Pewaukee Road
Waukesha, WI 53188
414-524-7979
Fax 414-542-8334

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE PREPARATION FOR GEOMEMBRANE INSTALLATION

PROJECT: WEYERHAEUSER

LOCATION: PLYMOUTH N.C.

JOB #: 20040 OWNER: WEYERHAEUSER

AREA ACCEPTED: PANEL 63-70

INSTALLER: The undersigned authorized representative of GSCI certifies that he or she has visually inspected the subgrade surface of the area described above and has found the surface to be acceptable for installation of the geomembrane materials.

This certification is based on observations of the subgrade surface conditions only. GSCI has made no sub-terrain inspections or tests and makes no representations or warranties as to the conditions which may exist below the surface of the subgrade.

AUTHORIZED GSCI REPRESENTATIVE:

Ruth M. Cox
Signature

Aug. 26, 2000
Date

QAQC
Title

INSPECTOR:

CERTIFICATE APPROVED AND ACCEPTED BY:

Signature

8-26-00
Date

RPR
Title

RMT
Company

GSI
Geo-Synthetics Construction, Inc.

428 N. Pewaukee Road
Waukesha, WI 53188
414-524-7979
Fax 414-542-8334

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE PREPARATION FOR GEOMEMBRANE INSTALLATION

PROJECT: WEYERHEAUSER

LOCATION: PLYMOUTH N.C.

JOB #: 20040 OWNER: WEYERHEAUSER

AREA ACCEPTED: PANELS 71-76

INSTALLER: The undersigned authorized representative of GSCI certifies that he or she has visually inspected the subgrade surface of the area described above and has found the surface to be acceptable for installation of the geomembrane materials.

This certification is based on observations of the subgrade surface conditions only. GSCI has made no sub-terrain inspections or tests and makes no representations or warranties as to the conditions which may exist below the surface of the subgrade.

AUTHORIZED GSCI REPRESENTATIVE:

Ruth M. Cox. — Signature

9-8-2000 — Date

QAQC — Title

INSPECTOR:

CERTIFICATE APPROVED AND ACCEPTED BY:

[signature] — Signature

9-8-2000 — Date

RPR — Title

RMT — Company

GSI
Geo-Synthetics Construction, Inc.

428 N. Pewaukee Road
Waukesha, WI 53188
414-524-7979
Fax 414-542-8334

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE PREPARATION FOR GEOMEMBRANE INSTALLATION

PROJECT: WEYERHEAUSER

LOCATION: PLYMOUTH N.C.

JOB #: 20040 OWNER: WEYERHEAUSER

AREA ACCEPTED: PANELS 77-79

INSTALLER: The undersigned authorized representative of GSCI certifies that he or she has visually inspected the subgrade surface of the area described above and has found the surface to be acceptable for installation of the geomembrane materials.

This certification is based on observations of the subgrade surface conditions only. GSCI has made no sub-terrain inspections or tests and makes no representations or warranties as to the conditions which may exist below the surface of the subgrade.

AUTHORIZED GSCI REPRESENTATIVE:

Ruth M. Cox. — Signature

9-9-2000 — Date

QAQC — Title

INSPECTOR:

CERTIFICATE APPROVED AND ACCEPTED BY:

Signature

9-9-200 — Date

RPR — Title

RMT — Company

GSI
Geo-Synthetics Construction, Inc.

428 N. Pewaukee Road
Waukesha, WI 53188
414-524-7979
Fax 414-542-8334

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE PREPARATION FOR GEOMEMBRANE INSTALLATION

PROJECT: WEYERHAEUSER

LOCATION: PLYMOUTH N. C.

JOB #: 20040 OWNER: WEYERHAEUSER

AREA ACCEPTED: PANELS 80-82

INSTALLER: The undersigned authorized representative of GSCI certifies that he or she has visually inspected the subgrade surface of the area described above and has found the surface to be acceptable for installation of the geomembrane materials.

This certification is based on observations of the subgrade surface conditions only. GSCI has made no sub-terrain inspections or tests and makes no representations or warranties as to the conditions which may exist below the surface of the subgrade.

AUTHORIZED GSCI REPRESENTATIVE:

Ruth M. Cox. — Signature

9-10-2000 — Date

QAQC — Title

INSPECTOR:

CERTIFICATE APPROVED AND ACCEPTED BY:

[signature] — Signature

9-10-200 — Date

RPR — Title

RMT — Company

GSI
Geo-Synthetics Construction, Inc.

428 N. Pewaukee Road
Waukesha, WI 53188
414-524-7979
Fax 414-542-8334

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE PREPARATION FOR GEOMEMBRANE INSTALLATION

PROJECT: WEYERHEAUSER

LOCATION: PLYMOUTH NC

JOB #: 20040 OWNER: WEYERHEAUSER

AREA ACCEPTED: PANELS 83-86

INSTALLER: The undersigned authorized representative of GSCI certifies that he or she has visually inspected the subgrade surface of the area described above and has found the surface to be acceptable for installation of the geomembrane materials.

This certification is based on observations of the subgrade surface conditions only. GSCI has made no sub-terrain inspections or tests and makes no representations or warranties as to the conditions which may exist below the surface of the subgrade.

AUTHORIZED GSCI REPRESENTATIVE:

Ruth M. Cox. — Signature

9/11/2000 — Date

QAQC — Title

INSPECTOR:

CERTIFICATE APPROVED AND ACCEPTED BY:

Signature — Date: 9/11/2000

RPR — Title

RMT — Company

GSI
Geo-Synthetics Construction, Inc.

428 N. Pewaukee Road
Waukesha, WI 53188
414-524-7979
Fax 414-542-8334

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE PREPARATION FOR GEOMEMBRANE INSTALLATION

PROJECT: WEYERHAEUSER

LOCATION: PLYMOUTH N.C.

JOB #: 20040 OWNER: WEYERHAEUSER

AREA ACCEPTED: PANELS 87-91

INSTALLER: The undersigned authorized representative of GSCI certifies that he or she has visually inspected the subgrade surface of the area described above and has found the surface to be acceptable for installation of the geomembrane materials.

This certification is based on observations of the subgrade surface conditions only. GSCI has made no sub-terrain inspections or tests and makes no representations or warranties as to the conditions which may exist below the surface of the subgrade.

AUTHORIZED GSCI REPRESENTATIVE:

Ruth M. Cox. — Signature

9/12/2000 — Date

QAQC — Title

INSPECTOR:

CERTIFICATE APPROVED AND ACCEPTED BY:

Signature

9-12-2000 — Date

RPR — Title

RMT — Company

GSI
Geo-Synthetics Construction, Inc.

428 N. Pewaukee Road
Waukesha, WI 53188
414-524-7979
Fax 414-542-8334

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE PREPARATION FOR GEOMEMBRANE INSTALLATION

PROJECT: WEYERHAEUSER

LOCATION: PLYMOUTH N.C.

JOB #: 20040 OWNER: WEYERHAEUSER

AREA ACCEPTED: PANELS 92-100

INSTALLER: The undersigned authorized representative of GSCI certifies that he or she has visually inspected the subgrade surface of the area described above and has found the surface to be acceptable for installation of the geomembrane materials.

This certification is based on observations of the subgrade surface conditions only. GSCI has made no sub-terrain inspections or tests and makes no representations or warranties as to the conditions which may exist below the surface of the subgrade.

AUTHORIZED GSCI REPRESENTATIVE:

Ruth M. Cox. — Signature

9/12/2000 — Date

QAQC — Title

INSPECTOR:

CERTIFICATE APPROVED AND ACCEPTED BY:

Signature

9-13-00 — Date

RPR — Title

RMT — Company

GSI
Geo-Synthetics Construction, Inc.

428 N. Pewaukee Road
Waukesha, WI 53188
414-524-7979
Fax 414-542-8334

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE PREPARATION FOR GEOMEMBRANE INSTALLATION

PROJECT: WEYERHAEUSER

LOCATION: PLYMOUTH N.C.

JOB #: 20040 OWNER: WEYERHAEUSER

AREA ACCEPTED: PANELS 101 - 110

INSTALLER: The undersigned authorized representative of GSCI certifies that he or she has visually inspected the subgrade surface of the area described above and has found the surface to be acceptable for installation of the geomembrane materials.

This certification is based on observations of the subgrade surface conditions only. GSCI has made no sub-terrain inspections or tests and makes no representations or warranties as to the conditions which may exist below the surface of the subgrade.

AUTHORIZED GSCI REPRESENTATIVE:

Ruth M. Cox. — Signature

9-15-2000 — Date

QAQC — Title

INSPECTOR:

CERTIFICATE APPROVED AND ACCEPTED BY:

[signature] — Signature

9-15-2000 — Date

PRP — Title

RMT — Company

GSI
Geo-Synthetics Construction, Inc.

428 N. Pewaukee Road
Waukesha, WI 53188
414-524-7979
Fax 414-542-8334

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE PREPARATION FOR GEOMEMBRANE INSTALLATION

PROJECT: WEYERHAEUSER

LOCATION: PLYMOUTH N.C.

JOB #: 20040 OWNER: WEYERHAEUSER

AREA ACCEPTED: PANELS 111 - 116

INSTALLER: The undersigned authorized representative of GSCI certifies that he or she has visually inspected the subgrade surface of the area described above and has found the surface to be acceptable for installation of the geomembrane materials.

This certification is based on observations of the subgrade surface conditions only. GSCI has made no sub-terrain inspections or tests and makes no representations or warranties as to the conditions which may exist below the surface of the subgrade.

AUTHORIZED GSCI REPRESENTATIVE:

Ruth M. Cox. — Signature

9-16-2000 — Date

QAQC — Title

INSPECTOR:

CERTIFICATE APPROVED AND ACCEPTED BY:

Joe Lamb — Signature

9-16-00 — Date

RCP — Title

RMI. — Company

GSI
Geo-Synthetics Construction, Inc.

428 N. Pewaukee Road
Waukesha, WI 53188
414-524-7979
Fax 414-542-8334

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE PREPARATION FOR GEOMEMBRANE INSTALLATION

PROJECT: WEYERHAEUSER

LOCATION: PLYMOUTH N.C.

JOB #: 20040 OWNER: WEYERHAEUSER

AREA ACCEPTED: PANELS 117 - 135

INSTALLER: The undersigned authorized representative of GSCI certifies that he or she has visually inspected the subgrade surface of the area described above and has found the surface to be acceptable for installation of the geomembrane materials.

This certification is based on observations of the subgrade surface conditions only. GSCI has made no sub-terrain inspections or tests and makes no representations or warranties as to the conditions which may exist below the surface of the subgrade.

AUTHORIZED GSCI REPRESENTATIVE:

Ruth M. Cox — Signature

9-17-2000 — Date

QAQC — Title

INSPECTOR:

CERTIFICATE APPROVED AND ACCEPTED BY:

[signature] — Signature

9-17-00 — Date

PE — Title

RMT — Company

GSI
Geo-Synthetics Construction, Inc.

428 N. Pewaukee Road
Waukesha, WI 53188
414-524-7979
Fax 414-542-8334

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE PREPARATION FOR GEOMEMBRANE INSTALLATION

PROJECT: WEYERHAEUSER

LOCATION: PLYMOUTH N.C.

JOB #: 20040 OWNER: WEYERHAEUSER

AREA ACCEPTED: PANELS 136 - 140

INSTALLER: The undersigned authorized representative of GSCI certifies that he or she has visually inspected the subgrade surface of the area described above and has found the surface to be acceptable for installation of the geomembrane materials.

This certification is based on observations of the subgrade surface conditions only. GSCI has made no sub-terrain inspections or tests and makes no representations or warranties as to the conditions which may exist below the surface of the subgrade.

AUTHORIZED GSCI REPRESENTATIVE:

Ruth M. Cox — Signature

9-18-2000 — Date

QAQC — Title

INSPECTOR:

CERTIFICATE APPROVED AND ACCEPTED BY:

[signature] — Signature

9-18-00 — Date

RPR — Title

RMT — Company

GSI
Geo-Synthetics Construction, Inc.

428 N. Pewaukee Road
Waukesha, WI 53188
414-524-7979
Fax 414-542-8334

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE PREPARATION FOR GEOMEMBRANE INSTALLATION

PROJECT: WEYERHAEUSER

LOCATION: PLYMOUTH N.C

JOB #: 20040 OWNER: WEYERHAEUSER

AREA ACCEPTED: PANELS 141-144

INSTALLER: The undersigned authorized representative of GSCI certifies that he or she has visually inspected the subgrade surface of the area described above and has found the surface to be acceptable for installation of the geomembrane materials.

This certification is based on observations of the subgrade surface conditions only. GSCI has made no sub-terrain inspections or tests and makes no representations or warranties as to the conditions which may exist below the surface of the subgrade.

AUTHORIZED GSCI REPRESENTATIVE:

Ruth M. Cox
Signature

9-21-2000
Date

QAQC
Title

INSPECTOR:

CERTIFICATE APPROVED AND ACCEPTED BY:

Signature

9-21-00
Date

RPR
Title

RMT
Company

GSI
Geo-Synthetics Construction, Inc.

428 N. Pewaukee Road
Waukesha, WI 53188
414-524-7979
Fax 414-542-8334

CERTIFICATE OF ACCEPTANCE OF SUBGRADE SURFACE PREPARATION FOR GEOMEMBRANE INSTALLATION

PROJECT: WEYERHAEUSER

LOCATION: PLYMOUTH N.C.

JOB #: 20040 OWNER: WEYERHAEUSER

AREA ACCEPTED: PANELS 145-150

INSTALLER: The undersigned authorized representative of GSCI certifies that he or she has visually inspected the subgrade surface of the area described above and has found the surface to be acceptable for installation of the geomembrane materials.

This certification is based on observations of the subgrade surface conditions only. GSCI has made no sub-terrain inspections or tests and makes no representations or warranties as to the conditions which may exist below the surface of the subgrade.

AUTHORIZED GSCI REPRESENTATIVE:

Ruth M. Cox. — Signature

9/28/2000 — Date

QAQC — Title

INSPECTOR:

CERTIFICATE APPROVED AND ACCEPTED BY:

Signature

9-28-00 — Date

RPR — Title

RMT — Company

Appendix J
Geosynthetic Clay Liner Submittals

GEO-SYNTHETICS, INC.
W239 N428 Pewaukee Road
Waukesha, WI 53188
262-524-7979 800-444-5523 FAX (262) 524-7961
www.geo-synthetics.com

LETTER OF TRANSMITTAL

RECEIVED
AUG 16 2000
RYAN INC. CENTRAL

DATE: **8-14-00** JOB NO.: **20040**

ATTENTION: **Joe VanRemortel**

RE: **Weyerhaeuser Roll Certs**

TO: **RYAN INC.**
PO BOX 206
JANESVILLE, WI 53547-0206

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

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

COPIES	DATE	NO.	DESCRIPTION
1	8-14-00		Liner Roll Certifications

THESE ARE TRANSMITTED as checked below:

☒ For approval
☐ For your use
☐ As requested
☐ For review and comment
☐ FOR BIDS DUE _____, 20____.

☐ Approved as submitted
☐ Approved as noted
☐ Returned for corrections
☐ _____

☐ Resubmit _____ copies for approval
☐ Submit _____ copies for distribution
☐ Return _____ corrected prints

☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS:
Here are more liner roll certs. I will forward them to you as I receive them.

COPY TO: **File**

SIGNED: **Randy Flatt**
GSI Project Manager

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

GSE
19103 Gundle Road
Houston, Texas 77073
Ph: 800-435-2008 or 281-443-8564
Fx: 281-230-8663 or 281-230-5833

FAX COVER SHEET

DATE: 8/8/00

RECEIVED
AUG 10 2000
RYAN INC. CENTRAL

FAX #: 262-524-7964

TO: Randy Flatt

FROM: Mary Cruthirds

NUMBER OF PAGES: 27 **(INCLUDING THIS PAGE)**

REMARKS:

AMERICAN COLLOID COMPANY

P.O Box 88 • 234 Gordon Street
Fairmount, Georgia 30139
Tel: (706) 337-6316
Fax. (706) 337-2215

"FAX COVER SHEET"

DATE: 8-7-00

FAX# 281-875-6010

TO: Mary Cruthride
GSF

FROM: Cynthia Willix

fax
Randy
Flatt.

NUMBER OF PAGES : ~~25~~ 26 (WITH COVER SHEET)

REMARKS:

→ Weyerhauser Cell 1A + Haul Rd.

CETCO
COLLOID ENVIRONMENTAL TECHNOLOGIES COMPANY
P.O. Box 88 • 234 Gordon Street • Fairmount, GA 30139 • USA
(706) 337-5316 • Fax (706) 337-7334

7-Aug-00

Ms. Mary Cruthride
GSE Lining Technology
19103 Gundle Rd.
Houston, TX 77073

Dear Ms. Cruthride:

Please find enclosed the MQA/MQC Data Package for Geosynthetic Clay Liner (GCL) shipments to GSE-Weyerhauser Cell 1A, Plymouth, NC. These shipments left our CETCO-ACC-Fairmount, GA, plant on 08/04/00.

If you have any questions regarding the enclosed QA/QC information, please contact Mr. Derek Reece @ 1-800-220-2536.

Sincerely,

Cynthia Willix

Cynthia Willix
Quality Assurance Coordinator
CETCO-American Colloid Company

GEOSYNTHETIC CLAY LINER

MANUFACTURING QA/QC DATA PACKAGE

PROJECT NAME: Weyerhauser Cell 1A & Haul Rd.

PREPARED FOR:
Ms. Mary Cruthride
GSE Lining Technology
19103 Gundle Rd.
Houston, TX 77073

PREPARED BY:
Cynthia Willix
CETCO-ACC
P. O. Box 88
234 Gordon Street
Fairmount, GA 30139
Telephone # (706) 337-5316
Fax # (706) 337-2215

A Wholly Owned Subsidiary of AMCOL International
Printed on recycled paper.

GEOSYNTHETIC CLAY LINER

DAILY MANUFACTURING QA/QC DATA

FOR ALL GCL MANUFACTURED ON:

WEYERHAUSER CELL 1A & HAUL RD.
PLYMOUTH, NC
CUSTOMER PO# 2732-000-0D
PROJECT # 505141
ORDER # 14021 SP
ORDER# 131037 AND 131039

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. GCL MANUFACTURING CERTIFICATON AND TEST RESULTS
3. GCL MQA TRACKING FORM

CETCO

DAILY GEOSYNTHETIC CLAY LINER PRODUCTION CERTIFICATION

GEOSYNTHETIC CLAY LINER MANUFACTURING CERTIFICATION

CETCO JOB:	WEYERHAUSER CELL 1A & HAUL RD.
DATE:	AUGUST 4, 2000
ORDER#(S):	131037 AND 131039
PRODUCT:	BENTOMAT ST

Colloid Environmental Technologies Company (CETCO)- American Colloid Company (ACC) hereby affirms and certifies that all of the Geosynthetic Clay Liner (GCL) manufactured in this lot achieves the physical and chemical criteria listed on the attached analysis sheets.

Cynthia Willix

Cynthia Willix
Quality Assurance Coordinator
CETCO-American Colloid Company

Subscribed and sworn to before me this 7 day of Aug., 20 00.

Judy Hall

Notary Public

OFFICIAL SEAL
JUDY HALL
Notary Public, Georgia
GORDON COUNTY
My Commission Expires
Jan. 7, 2002

CETCO

BENTOMAT ST
MANUFACTURING CERTIFICATION

TO: Ms. Mary Cruthride
GSE Lining Technology
19103 Gundle Rd.
Houston, TX 77073

PROJECT: Weyerhauser Cell 1A and Haul Rd.

ORDER #: 131037 and 131039

CETCO-ACC hereby affirms and certifies that Bentomat ST material supplied to this project will meet the physical criteria listed below:

PROPERTY	TEST METHOD	REQUIRED VALUE
Bentonite		
Free Swell	ASTM D 5890	24 min.
Fluid Loss	ASTM D 5891	18 max.
Finished Product		
Bentonite Mass/Area	ASTM D 5993*	0.75 lb/sq.ft. min.
Grab Strength	ASTM D 4632	90 lbs. MARV
Index Flux	ASTM D 5887	1 x 10(-8) m3/m2/sec (max.)
Peel Strength	ASTM D 4632(modified)	15 lbs. min.
Permeability	ASTM D 5084	max. 5 x 10(-9) cm/sec

* Reported at 0% moisture content.
* GCL has been continously inspected for broken needles.

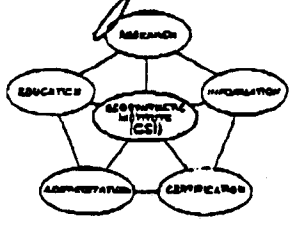
GAI Lab Accredited Test Methods were followed during confromance testing for :
ASTM D 5993 - Bentonite Mass/Area
ASTM D 4632 - Grab Strength and Grab Elongation

Cynthia Willer
CETCO-American Colloid Company

Subscribed and sworn to before me this 7 day of Aug. 20 00.

Judy Hall
Notary Public

OFFICIAL SEAL
JUDY HALL
Notary Public, Georgia
GORDON COUNTY
My Commission Expires
Jan. 7, 2002



VO HB MARKEL HC

STRAIGHT BILL OF LADING—ORIGINAL—NOT NEGOTIABLE — PAGE 1 OF

CARRIER NAME: NATIONWIDE / TEI

DELIVERING CARRIER:

CONSIGNED TO: WYERHAUSER CELL 1A & HAUL RD

SHIPPER'S NO: 000131037

DEL DATE: ~~8/04/00~~ SHIP DATE: 8/04/00

GSI/RYAN INC.
MAIN STREET EXTENSION

SHIPPER: Colloid Environmental
1500 West Shure Drive
Arlington Heights IL 60004

PLYMOUTH NC 27962
PHONE: 2625247979

SOLDTO: 001376 SHIPTO: 94

CONSIGNED P.O.#: 2732-000-0D

CAR/VEHICLE#:

SHIPPING PLANT: FAIRMOUNT AMERICAN COLLOID
P.O. BOX 88
FAIRMOUNT GA 30139

ROUTING/CONTRACT:

CUSTOMER COMMENTS ALL BAGGED SHIPMENTS LOADED ON FLATBED OR OPEN TOP TRAILERS MUST BE COVERED WITH ADEQUATE TARPAULIN PRIOR TO HIGHWAY MOVEMENT. CARRIER WILL BE HELD FULLY RESPONSIBLE FOR LOSS OR DAMAGE OCCURRING TO UNPROTECTED LOADS.

QUANTITY	HM	DESCRIPTION OF ARTICLES PROD DESCRIPTION	WEIGHT (SUBJECT TO CORRECTION)
~~33750~~ 36000 0000		BENTOMAT ST CLOTH, SYNTHETIC FIBRE, NOT WOVEN, KNITTED NOR STITCHED	[redacted]

15A0115-150
31 CG-50

GROSS: .00 TARE: .00 NET: [redacted]

42988
1600
94,588lbs

Subject to Section 7 of conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

COLLOID ENVIRONMENTAL TE
(Signature of Consignor)

If charges are to be prepaid, write or stamp here, "Prepaid."

PREPAID

Shipper liable for line haul charges only.
COD charges to be paid by: Consignee

"MARK WITH "X" TO DESIGNATE HAZARDOUS MATERIALS AS DEFINED IN TITLE 49 OF THE CODE OF FEDERAL REGULATIONS

RECEIVED, subject to the classifications and lawfully filed tariffs in effect on the date of issue of this Bill of Lading, the property described above in apparent good order, except as noted (contents and condition of contents of packages unknown) marked, consigned, and destined as indicated above which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its own route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classification in effect on the date hereof, if this is a rail or a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.
Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

CARRIER:

This is to certify that the above named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

PLACARDS REQUIRED

PLACARDS SUPPLIED

☐ YES ☐ NO—FURNISHED BY CARRIER

DRIVERS SIGNATURE

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:. 000131037
ORDER DATE: 8/04/2000
SHIP DATE:. 8/04/2000

SOLD TO: 001376
GSE LINING TECHNOLOGY, INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. FAIRMOUNT AMERICAN CO
FRT TERMS:. PREPAID & ADD
SHIP VIA:. NATIONWIDE

SHIP TO: 94
WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
MAIN STREET EXTENSION

PLYMOUTH NC 27962

PO: 2732-000-00

PRODUCT	SIZE U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
FA-BENTOMAT ST	SFT SF	200032FA	00007277	150.0	15.0	2250.0	2956.0
FA-BENTOMAT ST	SFT SF	200032FA	00007279	150.0	15.0	2250.0	2867.0
FA-BENTOMAT ST	SFT SF	200032FA	00007303	150.0	15.0	2250.0	2815.0
FA-BENTOMAT ST	SFT SF	200032FA	00007304	150.0	15.0	2250.0	2861.0
FA-BENTOMAT ST	SFT SF	200032FA	00007305	150.0	15.0	2250.0	2865.0
FA-BENTOMAT ST	SFT SF	200032FA	00007306	150.0	15.0	2250.0	2875.0
FA-BENTOMAT ST	SFT SF	200032FA	00007307	150.0	15.0	2250.0	2870.0
FA-BENTOMAT ST	SFT SF	200032FA	00007308	150.0	15.0	2250.0	2873.0
FA-BENTOMAT ST	SFT SF	200032FA	00007309	150.0	15.0	2250.0	2840.0
FA-BENTOMAT ST	SFT SF	200032FA	00007310	150.0	15.0	2250.0	2889.0
FA-BENTOMAT ST	SFT SF	200032FA	00007312	150.0	15.0	2250.0	2875.0
FA-BENTOMAT ST	SFT SF	200032FA	00007313	150.0	15.0	2250.0	2836.0
FA-BENTOMAT ST	SFT SF	200032FA	00007314	150.0	15.0	2250.0	2859.0
FA-BENTOMAT ST	SFT SF	200032FA	00007315	150.0	15.0	2250.0	2868.0
FA-BENTOMAT ST	SFT SF	200032FA	00007316	150.0	15.0	2250.0	2839.0
ORDER TOTALS.....						33750.0	42988.0
TOTAL ITEMS.....	15						

NO HB Markel HC

STRAIGHT BILL OF LADING—ORIGINAL—NOT NEGOTIABLE

CARRIER NAME: NATIONWIDE

DELIVERING CARRIER:

CONSIGNED TO: WYERHAUSER CELL 1A & HAUL RD

8/7

SHIPPER'S NO: 000131039

GSI/RYAN INC.

DEL DATE: ~~8/04/00~~ SHIP DATE: 8/04/00

MAIN STREET EXTENSION

SHIPPER: Colloid Environmental
1500 West Shure Drive
Arlington Heights IL 60004

PLYMOUTH NC 27962

PHONE: 2625247979

SOLDTO: 001376 SHIPTO: 94

CONSIGNED P.O.#: 2732-000-0D

CAR/VEHICLE#:

SHIPPING PLANT: FAIRMOUNT AMERICAN COLLOID
P.O. BOX 88
FAIRMOUNT GA 30139

ROUTING/CONTRACT:

CUSTOMER COMMENTS ALL BAGGED SHIPMENTS LOADED ON FLATBED OR OPEN TOP TRAILERS MUST BE COVERED WITH ADEQUATE TARPAULIN PRIOR TO HIGHWAY MOVEMENT. CARRIER WILL BE HELD FULLY RESPONSIBLE FOR LOSS OR DAMAGE OCCURRING TO UNPROTECTED LOADS.

~~QUANTITY~~	HM	DESCRIPTION OF ARTICLES PROD DESCRIPTION	WEIGHT (SUBJECT TO CORRECTION)
~~36000 0000~~ 16 Rolls - 150'		BENTOMAT ST CLOTH, SYNTHETIC FIBRE, NOT WOVEN, KNITTED NOR STITCHED	~~45,188.0000~~ 45,808 lbs

GROSS: .00 TARE: .00 NET: ~~45,188.00~~

Subject to Section 7 of conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

COLLOID ENVIRONMENTAL TE

(Signature of Consignor)

If charges are to be prepaid, write or stamp here, "Prepaid."

PREPAID

Shipper liable for line haul charges only.

COD charges to be paid by: Consignee

MARK WITH "X" TO DESIGNATE HAZARDOUS MATERIALS AS DEFINED IN TITLE 49 OF THE CODE OF FEDERAL REGULATIONS

RECEIVED, subject to the classifications and tariffs in effect on the date of issue of this Bill of Lading, the property described above in apparent good order, except as noted (contents and condition of contents of packages unknown) marked, consigned, and destined as indicated above which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classifications in effect on the date hereof, if this is a rail or a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.

Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

CARRIER:

This is to certify that the above named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

PLACARDS REQUIRED

PLACARDS SUPPLIED

☐ YES ☐ NO—FURNISHED BY CARRIER

DRIVERS SIGNATURE:

PACKING LIST

COLLOID ENVIRONMENTAL TECH CO
1500 WEST SHURE DRIVE
ARLINGTON HEIGHTS IL 60004

ORDER NO:.. 000131039
ORDER DATE: 8/04/2000
SHIP DATE:. 8/04/2000

SOLD TO: 001376
GSE LINING TECHNOLOGY, INC.
19103 GUNDLE ROAD

HOUSTON TX 77073

SHIP FROM:. FAIRMOUNT AMERICAN CO
FRT TERMS:. PREPAID & ADD
SHIP VIA:.. NATIONWIDE

SHIP TO: 94
WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
MAIN STREET EXTENSION

PLYMOUTH NC 27962

PO: 2732-000-00

PRODUCT	STYF U/M	LOT #	ROLL#	LNGTH	WIDTH	SHIP QTY	WEIGHT
FA-BENTOMAT ST	SFT SF	200031FA	00007016	150.0	15.0	2250.0	2887.0
FA-BENTOMAT ST	SFT SF	200031FA	00007017	150.0	15.0	2250.0	2876.0
FA-BENTOMAT ST	SFT SF	200032FA	00007280	150.0	15.0	2250.0	2854.0
FA-BENTOMAT ST	SFT SF	200032FA	00007281	150.0	15.0	2250.0	2850.0
FA-BENTOMAT ST	SFT SF	200032FA	00007282	150.0	15.0	2250.0	2869.0
FA-BENTOMAT ST	SFT SF	200032FA	00007283	150.0	15.0	2250.0	2863.0
FA-BENTOMAT ST	SFT SF	200032FA	00007286	150.0	15.0	2250.0	2881.0
FA-BENTOMAT ST	SFT SF	200032FA	00007290	150.0	15.0	2250.0	2899.0
FA-BENTOMAT ST	SFT SF	200032FA	00007292	150.0	15.0	2250.0	2696.0
FA-BENTOMAT ST	SFT SF	200032FA	00007296	150.0	15.0	2250.0	2872.0
FA-BENTOMAT ST	SFT SF	200032FA	00007297	150.0	15.0	2250.0	2884.0
FA-BENTOMAT ST	SFT SF	200032FA	00007298	150.0	15.0	2250.0	2856.0
FA-BENTOMAT ST	SFT SF	200032FA	00007299	150.0	15.0	2250.0	2861.0
FA-BENTOMAT ST	SFT SF	200032FA	00007300	150.0	15.0	2250.0	2842.0
FA-BENTOMAT ST	SFT SF	200032FA	00007301	150.0	15.0	2250.0	2858.0
FA BENTOMAT ST	SFT SF	200032FA	00007302	150.0	15.0	2250.0	2760.0
ORDER TOTALS.....						36000.0	45808.0
TOTAL ITEMS.....	16						

CETCO

GEOSYNTHETIC CLAY LINER QUALITY TEST RESULTS

FAIRMOUNT AMERICAN COLLOID

SHIP TO: MECKLENBURG CNTY LF & [illegible] RD
GSI/RYAN INC.
PLYMOUTH NC

O R D E R # 0?6131331

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632
FA-BENTOMAT ST	7000037FA	00007316	.91	107.30	21.30
FA-BENTOMAT ST	7000037FA	00007315	.92	127.33	28.30
FA-BENTOMAT ST	7000037FA	00007314	.92	167.30	24.70
FA-BENTOMAT ST	7003332FA	00007313	.91	137.30	24.33
FA-BENTOMAT ST	7013331FA	00007312	.91	133.30	24.33
FA-BENTOMAT ST	7013332FA	00007310	.87	103.30	31.63
FA-BENTOMAT ST	7013327FA	00007309	.87	194.30	31.63
FA-BENTOMAT ST	7010327FA	00007308	.87	109.30	31.53
FA-BENTOMAT ST	7010327FA	00007301	.87	109.30	31.43
FA-BENTOMAT ST	7000027FA	00007306	.87	109.30	32.46
FA-BENTOMAT ST	7000027FA	00007305	.87	107.30	32.46
FA-BENTOMAT ST	7000032FA	00007304	.87	107.30	32.64
FA-BENTOMAT ST	7000027FA	00007302	.87	127.33	32.64
FA-BENTOMAT ST	7007327FA	00007279	.87	127.33	29.60*
FA-BENTOMAT ST	7003327FA	00007277	.69	137.39	53.10
			.69*	137.39*	53.10*

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.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

CEGRT?2 ??14??2
3/07/00 11:12:50

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

PAGE: 1

FAIRMONT AMERICAN COLLOID

SHIP TO: WIERTZ:SEN COLE SA & HAUL RD
[illegible]
[illegible] MC

O R D E R # 633131039

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632
FA-BENTOMAT ST	2000327FA	20007302	.77	137.30	33.93
FA-BENTOMAT ST	2000327FA	00007301	.77	137.30	33.93
FA-BENTOMAT ST	2000327FA	00007303	.77	137.30	33.93
FA-BENTOMAT ST	2000327FA	33031299	.77	137.30	33.93
FA-BENTOMAT ST	2000327FA	33031298	.77	137.30	33.93
FA-BENTOMAT ST	2000321FA	33037287	.77	137.30	33.93
FA-BENTOMAT ST	2000321FA	33037236	.77	137.30	33.91
FA-BENTOMAT ST	2000327FA	33037232	.89	197.30	47.01
FA-BENTOMAT ST	2000327FA	33037230	.89	197.30	47.09
FA-BENTOMAT ST	2000321FA	33037296	.79	197.30	47.09*
FA-BENTOMAT ST	2000321FA	33037293	.79	197.30	53.13
FA-BENTOMAT ST	2000327FA	33037292	.69	197.30	53.13
FA-BENTOMAT ST	2000327FA	03037291	.65	197.30	53.13
FA-BENTOMAT ST	2000327FA	03037289	.59	197.30	53.13
FA-BENTOMAT ST	2000381FA	00037317	1.65	135.30	39.63
FA-BENTOMAT ST	2000381FA	03007316	1.65	135.30	39.63

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.
Bentonite Mass/Area is reported at 0% moisture content.
Grab Elongation is tested a minimum of every 200,000sf.

*** End of Report ***

QUOTED (QUOTED)
8/07/00 13:32:18

COLLOID ENVIRONMENTAL TECH CO
GEOTEXTILE QC DATA

PAGE: 1

FAIRMONT AMERICAN COLLOID

SHIP TO: WEYERHAUSER CELL 1A S HAUL RD
GSE/RYAN INC.
PLYMOUTH NC

ORDER # CC0131037

MATERIAL	LOT#	ROLL#	GEOTEXTILE 6.0oz/sy mv ASTM D 5261	GRAB STRENGTH 6.0 lbs macv ASTM D 4632
FA-NON-WOVEN	200029VR	00001083	6.7	39.1
FA-NON-WOVEN	200029VR	00001099	6.7	39.1

TOTAL PAGES 1

QCGTFJ QCTFJ
6/07/00 13:32:50

COLLOID ENVIRONMENTAL TECH CO
GEOTEXTILE QC DATA

PAGE: 1

FAIRMOUNT AMERICAN COLLOID

SHIP TO: NYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

O R D E R # 000131039

MATERIAL	LOC#	ROLL#	GEOTEXTILE 6.0oz/sy mv ASTM D 5261	GRAB STRENGTH 6.0 lbs mary ASTM D 4632
FA-NON-WOVEN	200029VR	00001096	6.7	39.1
FA-NON-WOVEN	200029VR	00001098	6.7	39.1
FA-NON-WOVEN	200029VR	00001099	6.7	39.1
FA-NON-WOVEN	200030VR	00001123	6.7	39.1

TOTAL PAGES 1

SYNTHETIC INDUSTRIES

Performance Nonwovens Division

8/1/2000

American Coloid-Fairmont, GA
Cynthia Willix
P.O. Box 88
Fairmont GA 30139
BOL 60057011 PO O-OCW-28808
Ref:

This is to certify that Product 82TEX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				()		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kpa)	265			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.5)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.46		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely

Warren Sickler

Warren Sickler
Senior Technical Manager
Geosynthetics Products Division

Seller makes no warranty express or implied concerning the product furnished hereunder other than in the time of delivery [illegible] ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 [illegible] to be obtained. If the product does not meet Synthetic Industries current published specifications, and the Customer gives notice to Synthetic Industries before [illegible] 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 [illegible]

Synthetic Industries, Inc.
428 Rollins Industrial Blvd.,• Ringgold, Georgia 30736
Telephone • 706-965-6300 • Fax • 706-965-8067

Bill Of Lading # 80057011

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4632 GRAB ELONGATION (%) W x F	ASTM D-3786 MULLEN BURST PSI	ASTM D-5261 MASS/UNIT AREA OZ/SQ YARD
Product :	**82-TEX**			
7868174	159 x 149	21 x 24	297	3.5
7868660	156 x 137	21 x 24	323	3.4
7868701	172 x 135	23 x 20	338	3.4
7868969	172 x 135	22 x 22	323	3.5
7869271	168 x 140	23 x 22	324	3.4
7869529	170 x 143	23 x 22	293	3.3
7869530	160 x 147	22 x 28	313	3.3
7869532	170 x 149	22 x 23	331	3.4
7871171	150 x 135	19 x 19	299	3.4
7873871	152 x 135	19 x 21	336	3.3
7873956	157 x 135	21 x 24	308	3.3
7873959	163 x 135	21 x 24	292	3.5
7876970	164 x 136	22 x 24	319	3.4
7876971	166 x 150	22 x 25	296	3.5
7880721	152 x 135	20 x 21	296	3.4
7892275	157 x 135	22 x 21	297	3.4
7893798	145 x 139	19 x 24	319	3.6
7899021	170 x 135	22 x 22	288	3.5
7899023	170 x 135	25 x 24	318	3.6
7901355	170 x 142	22 x 23	309	3.5
7901968	170 x 136	22 x 23	303	3.5
7904582	160 x 139	21 x 21	319	3.5
7907263	144 x 143	18 x 24	291	3.4
7907266	157 x 148	21 x 22	321	3.4
7914966	169 x 135	21 x 24	293	3.5
7985972	153 x 135	19 x 20	300	3.4
7998701	162 x 135	23 x 23	340	3.5
8001450	154 x 135	21 x 21	317	3.4
8074218	177 x 158	23 x 17	347	3.2
8110824	177 x 159	23 x 15	383	3.7
8116319	165 x 140	20 x 16	367	3.6
8173115	169 x 170	21 x 18	370	3.9
8182788	180 x 146	23 x 16	340	3.6
8189782	166 x 152	21 x 16	373	3.6
Product :	**82TEX184**			
8218837	169 x 151	22 x 16	380	3.7
8231447	161 x 161	19 x 15	388	3.7

SYNTHETIC INDUSTRIES

Performance Nonwovens Division

8/2/2000

American Coloid-Fairmont, GA
Cynthia Willix
P.O. Box 88
Fairmont GA 30139
BOL 80057652 PO O-OCW-2840
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Warren Sickler

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 or 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. The 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 3/30/2000

Synthetic Industries, Inc.
428 Rollins Industrial Blvd.• Ringgold, Georgia 30736
Telephone • 706-965-6300 • Fax • 706-965-6087

Synthetic Industries
Individual Roll Data

Bill of Lading: 80057652

PoNumber: 0-QCW-28640
ShipDate: 7/28/2000
CustomerNumber: 452

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
				MD	CD	MD	CD	MD	CD		
		Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
		D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
5209888A	650	6.7	123	74	114	135	127	38	38	260	73
5209905A	650	6.7	137	72	132	129	124	39	36	256	72
B862167A	650	7.5	149	111	176	126	131	65	65	253	80
B862212A	650	7.6	140	103	158	132	128	52	61	250	75

BENTONITE
CERTIFICATE OF ANALYSIS

AMERICAN COLLOID
92 HWY 37
LOVELL, WYO. 82431

DATE: 07-Aug-00

TO: CETCO - CLAYMAX CORP.
P.O. BOX 86

FAIRMOUNT, GA. 30139

ATTN: CYNTHIA WILLIX

Dear Sirs:

A shipment of CG 50
left our Lovell, WY plant on 29-Jun-00
in BNSF 420413
as requested on your order no. VERBAL

A sample from this shipment was tested, and gave the following results:

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET 10 MESH	ASTM C 136	0% .	0
PASSING 200 MESH	ASTM C 136	1.0 % MAX	0.6
MOISTURE	ASTM D 2216	12.0% MAX.	8
FREE SWELL	ASTM D 5890	24 MIN.	24
FLUID LOSS	ASTM D 5891	18.0 MAX.	14.6

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.U
Product made in the U.S.A.

Tests Conducted By: C.L.

Approved By: MOSES BRISENO

ACC

In any correspondence regarding this shipment, please refer to our
Order Number 389319

BENTONITE
CERTIFICATE OF ANALYSIS

AMERICAN COLLOID
92 HWY 37
LOVELL, WYO. 82431

DATE: 07-Aug-00

TO: CETCO - CLAYMAX CORP.
P.O. BOX 86

FAIRMOUNT, GA. 30139

ATTN: CYNTHIA WILLIX

Dear Sirs:

A shipment of CG 50
left our Lovell, WY plant on 26-Jun-00
in BNSF 453100
as requested on your order no. VERBAL

A sample from this shipment was tested, and gave the following results:

TEST	METHOD	REQ. SPECIFICATION	ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0% .	0
PASSING 200 MESH	ASTM C 136	1.0 % MAX	0.6
MOISTURE	ASTM D 2216	12.0% MAX.	9.2
FREE SWELL	ASTM D 5890	24 MIN.	24
FLUID LOSS	ASTM D 5891	18.0 MAX.	14.2

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.U
Product made in the U.S.A.

Tests Conducted By: D.W.

Approved By: MOSES BRISENO

ACC

In any correspondence regarding this shipment, please refer to our
Order Number 389336

CETCO

GEOSYNTHETIC CLAY LINER
MQA TRACKING FORMS

COLLOID ENVIRONMENTAL TECH CO
GEL NCA/MQC TRACKING FORM

SHIP TO: WEYERHAEUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

ORDER NUMBER 000131037

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
BOTH 200032FA									
00007277	FA-BENTOMAT ST	150	2250	2956	7873956		38621648		420413
00007279	FA-BENTOMAT ST	150	2250	2861	7873956		B8621648		420413
00007303	FA-BENTOMAT ST	150	2250	2315	7868969		200029VR	00001099	420413
00007304	FA-BENTOMAT ST	150	2250	2361	7868969		200029VR	00001099	420413
00007305	FA-BENTOMAT ST	150	2250	2865	7868969		200029VR	00001099	420413
00007306	FA-BENTOMAT ST	150	2250	2875	7868969		200029VR	00001099	420413
00007307	FA-BENTOMAT ST	150	2250	2870	7868969		200029VR	00001099	420413
00007308	FA-BENTOMAT ST	150	2250	2873	7868969		200029VR	00001088	420413
00007309	FA-BENTOMAT ST	150	2250	2840	7868969		200029VR	00001088	420413
00007310	FA-BENTOMAT ST	150	2250	2889	7868969		200029VR	00001088	420413
00007312	FA-BENTOMAT ST	150	2250	2875	7868969		200029VR	00001088	420413
00007313	FA-BENTOMAT ST	150	2250	2836	7868969		200029VR	00001088	420413
00007314	FA-BENTOMAT ST	150	2250	2859	7868969		200029VR	00001088	420413
00007315	FA-BENTOMAT ST	150	2250	2866	7868969		200029VR	00001088	420413
00007316	FA-BENTOMAT ST	150	2250	2839	8001430		200029VR	00001088	420413

TOTAL SQUARE FEET..... 33,750

TOTAL PAGES 1

QCGITF1 QCTHTF1
8/07/00 13:32:49

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

PAGE: 1

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

ORDER NUMBER 000131039

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
LOT# 200031FA									
00007016	FA-BENTOMAT ST	150	2250	2887	8189782		200030VR	00001123	453100
00007017	FA-BENTOMAT ST	150	2250	2876	8189782		200030VR	00001123	453100
LOT# 200032FA									
00007280	FA-BENTOMAT ST	150	2250	2854	7873956		B862164A		420413
00007281	FA-BENTOMAT ST	150	2250	2850	7873956		B862164A		420413
00007282	FA-BENTOMAT ST	150	2250	2869	7873956		200029VR	00001096	420413
00007283	FA-BENTOMAT ST	150	2250	2863	7873956		200029VR	00001096	420413
00007286	FA-BENTOMAT ST	150	2250	2881	7873956		200029VR	00001096	420413
00007290	FA-BENTOMAT ST	150	2250	2899	7873956		200029VR	00001096	420413
00007292	FA-BENTOMAT ST	150	2250	2896	7873956		200029VR	00001098	420413
00007296	FA-BENTOMAT ST	150	2250	2872	7868969		200029VR	00001098	420413
00007297	FA-BENTOMAT ST	150	2250	2884	7868969		200029VR	00001098	420413
00007298	FA-BENTOMAT ST	150	2250	2856	7868969		200029VR	00001098	420413
00007299	FA-BENTOMAT ST	150	2250	2861	7868969		200029VR	00001098	420413
00007300	FA-BENTOMAT ST	150	2250	2842	7868969		200029VR	00001099	420413
00007301	FA-BENTOMAT ST	150	2250	2858	7868969		200029VR	00001099	420413
00007302	FA-BENTOMAT ST	150	2250	2760	7868969		200029VR	00001099	420413

TOTAL SQUARE FEET..... 36,000

TOTAL PAGES 1

CETCO 1350 W. Shure Dr. Arlington Hgts., IL **Computation Sheet:GRI Accredited ASTM D-5887, Index Flux**

Sample: ST
Lot#: 200031fa Roll#: 6488
Project # : Bentomat QA

Permeability equation : ((0.879*Thickness)/(2*Pi*r^2*Time))*ln(Change in Head)

Flux equation : ((Inflow+Outflow)/200)/Pi*r^2/Time

Initial Thickness : 0.68 cm Hydration : 48hrs Permeant : De-aired DI Water

Test Position : 1 Initial Head : 2psi 140.6 cm. Analyst : DR Date: 8/7/00

Cell Size : 4 in. Max. Effective Stress : 5psi 34.5kPa Requested by : Date Started: 7/24/00

Final Thickness : 0.87 cm

* indicates value meets Flux Ratio ASTM termination criteria

Conversions : 1 psi = 2.307 feet of head 1 foot of head = 30.48 cm 1 psi = 70.32 cm Flux (English) = Flux * 9.2368E+10

Date	Time (min)	Reading In	X	Reading Out	Y	X-Y	Head (cm)	H (cm)	Initial K (cm/sec)	Initial Flux ($m^3/m^2/sec$)		Avg Flux ($m^3/m^2/sec$)	Final K (cm/sec)	Final Flux (Gal/Acre /Day)	Inflow to Outflow Ratio
7/26/00	0	1.0	23.0	24.0	0.0	23.0	140.63	163.63							
	191	2.7	21.3	23.8	0.2	21.1	140.63	161.73	3.76E-09	1.02E-08			4.81E-9		8.50
	449	4.2	19.8	23.0	1.0	18.8	140.63	159.43	3.41E-09	9.16E-09	*		4.36E-9		1.88
	523	4.5	19.5	22.8	1.2	18.3	140.63	158.93	2.61E-09	6.95E-09	*		3.34E-9		1.50
	698	5.2	18.8	22.4	1.6	17.2	140.63	157.83	2.44E-09	6.46E-09	*		3.12E-9		1.75
7/27/00	1425	7.7	15.3	20.5	3.5	12.8	140.63	153.43	2.39E-09	6.22E-09	*		3.06E-9		1.32
	1636	8.4	15.6	19.9	4.1	11.5	140.63	152.13	2.48E-09	6.33E-09	*		3.17E-9		1.17
	1791	8.9	15.1	19.5	4.5	10.6	140.63	151.23	2.35E-09	5.97E-09	*		3.01E-9		1.25
	1980	9.4	14.6	19.1	4.9	9.7	140.63	150.33	1.94E-09	4.89E-09	*		2.48E-9		1.25
	2137	9.9	14.1	18.7	5.3	8.8	140.63	149.43	2.35E-09	5.89E-09	*		3.01E-9		1.25
	2922	11.9	12.1	16.9	7.1	5.0	140.63	145.63	2.02E-09	4.98E-09	*	5.25E-09	2.58E-9	485	1.11

Final Flux 5.3E-9 $m^3/m^2/sec$

Final Hydraulic Conductivity 2.7E-9 cm/s

File Name: sl1330

Final Results

GSE Lining Technology, Inc.

LETTER OF TRANSMITTAL

02
Tim Hanson
GSI
W239 N. 428 Pewaukee Road
Waukesha, WI 53188

DATE: August 23, 2000
JOB NO: SO14021
JOB NAME: Weyerhauser Cell
RE: MQA/MQC Data Package

COPIES	DESCRIPTION
1	Bentomat ST 8/17/00.

TRANSMIT VIA:

U.S. Mail

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

SIGNED: Mary Cruthirds
DATE: August 23, 2000

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

Date: August 18, 2000
PO: 2732-000-OD
Order #: 131563, 131564, 131570

Mary Cruthirds,
GSE Lining Technology, Inc.
19103 Gundle Road
Houston TX. 77073
800-435-2008

Dear Mary Cruthirds,

Please find enclosed the MQA/MQC Data Package for BENTOMAT ST shipments to GSE Lining Technology, Inc. . These shipments left our CETCO - Lovell, Wy. plant on 8/17 .

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 ST

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: **Wyerhauser Cell 1A**
Plymouth, NC. 27962

CUSTOMER P.O.: **2732-000-OD**

PREPARED FOR: **GSE Lining Technology, Inc.**
19103 Gundle Road
Houston TX. 77073
Telephone # : **800-435-2008**

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: **ngarc@cetco.com**

BENTOMAT ST

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	Wyerhauser Cell 1A
Prepared For:	GSE Lining Technology, Inc.
Customer PO:	2732-000-OD
Order Number:	131563, 131564, 131570
Ship Date:	8/17

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. NEEDLE DETECTION CERTIFICATION
3. BENTONITE CLAY CERTIFICATION
4. WOVEN GEOTEXTILE MANUFACTURER'S CERTIFICATION
5. NON-WOVEN GEOTEXTILE MANUFACTURER'S CERTIFICATION
6. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
7. GCL MQA TRACKING FORM

DAILY BENTOMAT ST PRODUCTION
PRODUCTION CERTIFICATION

BENTOMAT ST
MANUFACTURING CERTIFICATION

Project Name:	Wyerhauser Cell 1A
Prepared For:	GSE Lining Technology, Inc.
Customer PO:	2732-000-OD
Order Number:	131563, 131564, 131570
Ship Date:	17-Aug

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

Moses Briseno
Quality Assurance Coordinator

Subscribed and sworn to before me this 18th day of August 2000.

Notary-Public

A. CHRISTINE SUMER - Notary Public
County of Big Horn
State of Wyoming
My Commission Expires 5-22-2002

NEEDLE DETECTION CERTIFICATION

CERTIFICATION STATEMENT

Project Name:	Wyerhauser Cell 1A
Prepared For:	GSE Lining Technology, Inc.
Customer PO:	2732-000-OD
Order Number:	131563, 131564, 131570
Ship Date:	17-Aug

This statement is to certify that all components of the **BENTOMAT ST** manufactur
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 18th day of August 2000.

A. Christine Somer
NOTARY PUBLIC

A. CHRISTINE SOMER - Notary Public
County of Big Horn, State of Wyoming
My Commission Expires 8-22-2002

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

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **7/28/00**

ATTN: **Mary Cruthirds,**

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 **072800C** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # ACTUAL RESULTS Daily Result
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Bentonite Free Swell	ASTM D 5890	24 mL / 2g MIN.	**24.0**
Bentonite Fluid Loss	ASTM D 5891	18.0 mL (MAX)	**16.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.2**

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: **RP, SF, JT**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
131563, 131564, 131570

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **8/9/00**

ATTN: **Mary Cruthirds,**

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 **080900C** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # ACTUAL RESULTS Daily Result
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Bentonite Free Swell	ASTM D 5890	24 mL / 2g MIN.	**25.0**
Bentonite Fluid Loss	ASTM D 5891	18.0 mL (MAX)	**16.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.8**
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: **RP, SF, JT**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
131563, 131564, 131570

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **8/11/00**

ATTN: **Mary Cruthirds,**

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 **081100C** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Result ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Bentonite Free Swell	ASTM D 5890	24 mL / 2g MIN.	**28.0**
Bentonite Fluid Loss	ASTM D 5891	18.0 mL (MAX)	**15.4**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.6**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.2**

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: **RP, SF, JT**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
131563, 131564, 131570

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **8/14/00**

ATTN: **Mary Cruthirds,**

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

A sample of the CG 50 was tested from Lot Number **081400A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # ACTUAL	Daily Resul RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT		**0**
Bentonite Free Swell	ASTM D 5890	24 mL / 2g MIN.		**26.0**
Bentonite Fluid Loss	ASTM D 5891	18.0 mL (MAX)		**15.2**
Moisture	ASTM D 2216	12.0 % (MAX)		**7.8**
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: **RP, SF, JT**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
131563, 131564, 131570

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **8/17/00**

ATTN: **Mary Cruthirds,**

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 **081700A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # ACTUAL RESULTS Daily Result
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Bentonite Free Swell	ASTM D 5890	24 mL / 2g MIN.	**26.0**
Bentonite Fluid Loss	ASTM D 5891	18.0 mL (MAX)	**15.8**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.2**

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: **RP, SF, JT**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
131563, 131564, 131570

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **8/17/00**

ATTN: **Mary Cruthirds,**

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 **081700B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # Daily Result ACTUAL RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Bentonite Free Swell	ASTM D 5890	24 mL / 2g MIN.	**26.0**
Bentonite Fluid Loss	ASTM D 5891	18.0 mL (MAX)	**15.8**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.4**
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: **RP, SF, JT**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
131563, 131564, 131570

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **8/17/00**

ATTN: **Mary Cruthirds,**

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 **081700C** 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**
Bentonite Free Swell	ASTM D 5890	24 mL / 2g MIN.	**26.0**
Bentonite Fluid Loss	ASTM D 5891	18.0 mL (MAX)	**16.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.6**
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: **RP, SF, JT**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
131563, 131564, 131570

WOVEN GEOTEXTILE
MANUFACTURER'S CERTIFICATION

TECHNICAL DATA SHEET

ORIGIN INFORMATION

WOVEN GEOTEXTILE

Manufacturer: **Synthetic Industries Inc.**

PRODUCTION

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

Contact: Randy Johnson

Brand Name: 82 Tex.

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/4/2000

American Colloid Cetco WY
Noe Garcia
PO Box 426
Lovell WY 82431
BOL 80058649 PO 75680
Ref:

This is to certify that Product 62TEX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				()		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kpa)	265			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.5)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.46		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely,

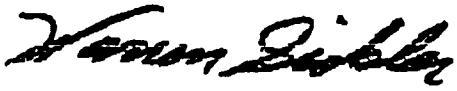
Warren Sickler
Senior Technical Manager
Geosynthetics Products Division

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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 Date Sheet supersedes all previous Data Sheets for this style and is subject to change without notice. The effective date for this product data is 8/28/2000

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

Bill Of Lading # 80058644

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4632 GRAB ELONGATION (%) W x F	ASTM D-3786 MULLEN BURST PSI	ASTM D-5261 MASS/UNIT AREA OZ/SQ YARD
Product :	**82-TEX**			
7850784	176 x 144	23 x 21	326	3.4
7866240	164 x 136	23 x 22	297	3.4
7868651	162 x 145	21 x 23	322	3.4
7868658	176 x 137	23 x 20	332	3.6
7868967	171 x 147	24 x 23	323	3.4
7869526	167 x 150	22 x 26	338	3.4
7874594	158 x 139	20 x 32	312	3.4
7874598	147 x 135	19 x 23	308	3.3
7874599	152 x 143	20 x 22	282	3.4
7876068	169 x 135	22 x 20	329	3.4
7880038	159 x 138	21 x 24	293	3.4
7880183	163 x 136	22 x 22	312	3.3
7885336	157 x 135	21 x 21	288	3.3
7893797	157 x 140	22 x 24	327	3.5
7896335	156 x 135	21 x 24	313	3.4
7897981	160 x 135	20 x 23	296	3.6
7899022	166 x 135	22 x 22	293	3.5
7899693	178 x 155	24 x 24	340	3.7
7899695	168 x 150	23 x 23	312	3.5
7901790	178 x 137	24 x 22	310	3.4
7901963	170 x 135	22 x 22	325	3.5
7903642	166 x 141	21 x 22	303	3.4
7912347	142 x 138	22 x 29	307	3.5
7912436	161 x 135	21 x 24	299	3.5



SYNTHETIC INDUSTRIES

Geosynthetic Products Division

7/25/2000

American Colloid Cetco W
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80055438 PO 75671
Ref:

This is to certify that Product 82TEX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				()		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kpa)	265			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.5)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.46		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely,

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IT IS CONTRARY TO THIS PROVISION ANYTHING 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' normal acceptance 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 6/29/2000

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7019 • 1-800-621-0444

Bill Of Lading # 80055438

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4632 GRAB ELONGATION (%) W x F	ASTM D-3786 MULLEN BURST PSI	ASTM D-5261 MASS/UNIT AREA OZ/SQ YARD
Product :	**82-TEX**			
7878667	168 x 144	22 x 24	315	3.7
7882867	153 x 135	19 x 21	326	3.4
7884440	167 x 138	23 x 22	301	3.5
7884626	168 x 135	22 x 22	310	3.5
7885267	154 x 138	22 x 23	312	3.4
7885341	162 x 142	23 x 22	302	3.6
7887512	154 x 144	20 x 24	328	3.5
7887513	162 x 145	20 x 23	314	3.4
7892267	158 x 135	24 x 25	306	3.5
7892268	162 x 135	21 x 22	326	3.5
7893792	168 x 153	21 x 21	303	3.6
7893799	140 x 137	18 x 23	296	3.4
7894135	167 x 137	22 x 22	306	3.5
7894588	167 x 148	20 x 21	315	3.5
7896339	162 x 135	22 x 23	302	3.5
7910263	161 x 135	21 x 21	318	3.5
8017978	145 x 135	20 x 22	347	3.3
8072004	166 x 144	24 x 25	337	3.5
8160979	159 x 135	21 x 17	337	3.5
8160979	163 x 135	23 x 15	347	3.5
Product :	**82TEX184**			
8202101	168 x 172	21 x 16	423	3.6
8206708	168 x 159	20 x 16	370	3.7
8215680	165 x 146	20 x 15	370	3.4
8215684	171 x 142	20 x 15	357	3.6
8223646	165 x 158	21 x 17	360	3.6

Warren Sibley

8/3/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80056348 PO
Ref:

This is to certify that Product 82TFX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				()		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kpa)	285			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.5)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.46		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 6/30/2000

Bill Of Lading # 80056348

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4632 GRAB ELONGATION (%) W x F	ASTM D-3786 MULLEN BURST PSI	ASTM D-5261 MASS/UNIT AREA OZ/SQ YARD
Product :	**82-TEX**			
7884443	172 x 148	22 x 23	318	3.5
7884627	160 x 143	22 x 22	316	3.5
7900350	171 x 143	25 x 29	311	3.6
7909683	156 x 135	20 x 23	310	3.4
8070715	149 x 138	18 x 23	330	3.5
8085606	164 x 152	23 x 16	354	3.7
8104263	157 x 153	22 x 18	353	3.8
8109548	174 x 142	23 x 16	380	3.6
8109549	172 x 180	23 x 18	373	3.8
8110821	166 x 156	21 x 16	370	3.7
8128342	173 x 142	24 x 15	363	3.7
8177234	151 x 149	21 x 16	360	3.7
8179962	174 x 141	21 x 17	367	3.5
8181170	171 x 135	21 x 16	360	3.5
8182791	172 x 160	22 x 17	362	3.7
8186838	171 x 158	25 x 17	370	3.7
Product :	**82TEX184**			
8218836	159 x 149	20 x 17	350	3.6
8218838	175 x 146	21 x 16	373	3.6
8219139	156 x 147	19 x 15	348	3.7
8223647	159 x 151	20 x 16	355	3.7
8228953	159 x 149	20 x 15	360	3.7
8228954	163 x 140	22 x 16	320	3.6
8231445	149 x 137	18 x 16	317	3.6
8238433	160 x 151	20 x 16	348	3.7

NON-WOVEN GEOTEXTILE MANUFACTURER'S CERTIFICATION

TECHNICAL DATA SHEET

ORIGIN INFORMATION

NON-WOVEN GEOTEXTILE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

FACILITY: **Colloid Environmental Technologies Co.**
102 Conners Road
Villa Rica, GA 30180

CONTACT: Debbie Bivins 404-459-4995

BRAND NAME: Standard

NON-WOVEN GEOTEXTILE MANUFACTURING CERTIFICATION

Project Name:	Wyerhauser Cell 1A
Prepared For:	GSE Lining Technology, Inc.
Customer PO:	2732-000-OD
Order Number:	131563, 131564, 131570
Ship Date:	17-Aug

CETCO hereby affirms and certifies that the Non-Woven geotextile in the **BENTOMAT ST** product for the above project has been manufactured to meet the following physical properties.

PROPERTY	TEST METHOD	MINIMUM VALUE
Mass / Area	ASTM D-5261	6.0 OZ./SQ.YD.
Grab Strength	ASTM D-4632	6.0 Lbs.

COLLOID ENVIRONMENTAL TECHNOLOGIES CO. (**CETCO**)

Subscribed and sworn to before me this 18th day of August 2000.

A. Christine Somer
NOTARY PUBLIC

A. CHRISTINE SOMER - Notary Public
County of Big Horn
State of Wyoming
My Commission Expires 8-22-2002

COLLOID ENVIRONMENTAL TECH CO
GEOTEXTILE QC DATA

LOVELL AMERICAN COLLOID

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

O R D E R # 000131563

MATERIAL	LOT#	ROLL#	GEOTEXTILE 6.0oz/sy mv ASTM D 5261	GRAB STRENGTH 6.0 lbs marv ASTM D 4632
LO-NON-WOVEN	200028VR	00001033	6.5	14.2
LO-NON-WOVEN	200029VR	00001054	6.7	39.1

TOTAL PAGES 1

COLLOID ENVIRONMENTAL TECH CO
GEOTEXTILE QC DATA

LOVELL AMERICAN COLLOID

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

O R D E R # 000131564

MATERIAL	LOT#	ROLL#	GEOTEXTILE 6.0oz/sy mv ASTM D 5261	GRAB STRENGTH 6.0 lbs marv ASTM D 4632
LO-NON-WOVEN	200029VR	00001054	6.7	39.1

TOTAL PAGES 1

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

Performance Nonwovens Division

8/1/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80056334 PO 75675
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 3/28/2000

Synthetic Industries, Inc.
428 Rollins Industrial Blvd.. • Ringgold, Georgia 30736
Telephone • 706-965-6300 • Fax • 706-965-6067

Synthetic Industries
Individual Roll Data
Bill of Lading: 80056334

PoNumber: 75675
ShipDate: 7/26/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
				MD	CD	MD	CD	MD	CD		
		Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
		D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3788	D4833
5209869A	650	7.5	149	88	146	136	126	44	46	241	84
5209898A	650	7.1	143	87	146	123	113	46	43	247	81
B862191A	650	7.2	146	99	134	119	121	40	52	229	87

AUG-01-2000 16:28 SI RINGGOLD TECHNI P.02

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/4/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80058781 PO 75682
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 2/29/2000

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: 80058781

ShipDate: 8/3/2000

CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
				MD	CD	MD	CD	MD	CD		
		Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
		D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B863760A	650	7.4	138	117	145	130	123	49	45	213	72
B863781A	650	6.5	143	73	117	122	108	41	41	234	69
B863784A	650	6.8	141	83	150	143	125	43	56	223	70
B863787A	650	7.3	152	95	188	133	120	50	63	257	69
B863805A	650	6.7	139	78	153	122	124	39	44	248	63

Vernon Dibble

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/10/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80059993 PO 75682
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure to Xenon Arc Weatherometer

Sincerely

Patti Weaver
Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY DISCLAIMED 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 but Seller makes no warranty of results to be obtained. If the product does not meet warranties hereunder, 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 1/20/2000

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: 80059993

PoNumber: 75682
ShipDate: 8/9/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
		Osy D5261	mils D5199	MD lbs D4632	CD lbs D4632	MD % D4632	CD % D4632	MD lbs D4533	CD lbs D4533	psi D3786	lbs D4833
B864033A	650	7.0	157	83	133	142	116	29	37	224	64
B864066A	650	6.8	144	76	159	125	127	45	46	247	61
B864070A	650	6.6	138	95	154	114	90	63	79	233	66

Patti Weaver

AUG-10-2000 14:24 SI RINGGOLD TECHNI P.02

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/14/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80060104 PO 75682
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Patti Weaver

Patti Weaver
Technical Manager
Geosynthetics Products 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 classification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 applicable indicated 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 2/28/2000

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: 80060104

PoNumber: 75682
ShipDate: 8/10/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
		Osy D5261	mils D5199	MD lbs D4632	CD lbs D4632	MD % D4632	CD % D4632	MD lbs D4533	CD lbs D4533	psi D3786	lbs D4833
B864058A	650	6.8	140	82	121	143	117	46	46	253	69
B864100A	650	7.7	158	89	190	158	127	57	57	254	72
B864109A	650	7.3	145	83	123	107	114	44	44	240	54
B864115A	650	7.8	157	177	120	126	144	57	56	221	73

Patti Weaver

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/17/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80061007 PO 75688
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Patti Weaver
Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IT IS NOT 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. This effective date for this product data is 8/20/2000

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: 80061007

PoNumber: 75000
ShipDate: 6/15/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
				MD	CD	MD	CD	MD	CD		
		Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
		D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B863928A	650	6.8	140	92	159	143	133	56	51	219	60

AUG-17-2000 11:36 SI RINGGOLD TECHNI P.20

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/8/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80059039 PO 75682
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Patti Weaver
Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 2/29/2000

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: 80059039

ShipDate: 8/4/2000

CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
		Osy D5261	mils D5199	MD lbs D4632	CD lbs D4632	MD % D4632	CD % D4632	MD lbs D4533	CD lbs D4533	psi D3786	lbs D4833
B863790A	650	7.3	145	90	176	135	119	56	51	223	65
B863793A	650	6.0	137	68	115	128	114	41	32	204	57
B863797A	650	7.0	138	79	124	139	112	43	48	206	62
B863824A	650	6.5	140	78	133	122	109	40	33	247	52
B863833A	650	6.7	136	83	139	138	131	48	45	236	62

Patti Weaver

BENTOMAT ST
QUALITY TEST RESULTS

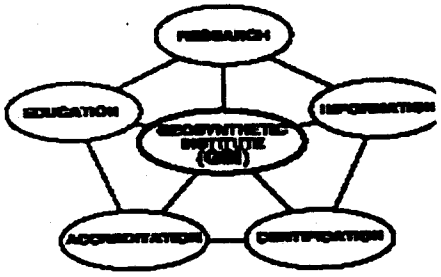
BENTOMAT ST
MANUFACTURING CERTIFICATION

Project Name:	Wyerhauser Cell 1A
Prepared For:	GSE Lining Technology, Inc.
Customer PO:	2732-000-OD
Order Number:	131563, 131564, 131570
Ship Date:	17-Aug

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

PROPERTY	TEST METHOD	MINIMUM VALUE
Peel Strength	ASTM D 4632	**15 lbs (65 N)**
Bentonite Free Swell	ASTM D 5890	**24 mL / 2g MIN.**
Bentonite Fluid Loss	ASTM D 5891	**18.0 mL (MAX)**
Bentonite Mass / Area	ASTM D 5993	*** .75 lb/sq.ft. (Min.)**
Grab Strength	ASTM D 4632	**90 lbs. (400 N)**
Grab Elongation	ASTM D 4632	**15 Percent Typical**
Permeability	ASTM D 5084	**5 x 10 (-9) cm/sec. (Max)**
Index Flux	ASTM D 5887	**1.0 x 10 (-8) m(3)/m(2)/sec. (max.)**

*** 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 18th day of August 2000.

Notary Public

A. CHRISTINE SUMER - Notary Public
County of Big Horn State of Wyoming
My Commission Expires 2-23-2002

QCG8FT2 QCT8FT2
8/18/00 9:40:34

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL AMERICAN COLLOID

SHIP TO: WYERNAUSER
GSI/RYAN I
PLYMOUTH

O R D E R # 000131563

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632
LO-BENTOMAT ST	200034LO	00009522	.93	311.20	24.70
LO-BENTOMAT ST	200034LO	00009521	.93	311.20	24.70
LO-BENTOMAT ST	200034LO	00009520	.93*	311.20*	24.70*
LO-BENTOMAT ST	200034LO	00009519	.89	201.40	32.50
LO-BENTOMAT ST	200034LO	00009517	.89	201.40	32.50
LO-BENTOMAT ST	200034LO	00009516	.89	201.40	32.50
LO-BENTOMAT ST	200034LO	00009515	.89	201.40	32.50
LO-BENTOMAT ST	200034LO	00009514	.89	201.40	32.50
LO-BENTOMAT ST	200034LO	00009513	.89	201.40	32.50
LO-BENTOMAT ST	200034LO	00009512	.89	201.40	32.50
LO-BENTOMAT ST	200034LO	00009510	.89	201.40	32.50
LO-BENTOMAT ST	200034LO	00009451	.87	256.30	55.10

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 ***

QCGBFT2 QCTBFT2
8/18/00 9:40:57

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL AMERICAN COLLOID

SHIP TO: WYERHAUSER
GSI/RYAN I
PLYMOUTH

O R D E R # 000131564

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632
LO-BENTOMAT ST	200034LO	00009466	.85	201.40	50.30
LO-BENTOMAT ST	200034LO	00009465	.85	201.40	50.30
LO-BENTOMAT ST	200034LO	00009464	.85	201.40	50.30
LO-BENTOMAT ST	200034LO	00009463	.85	201.40	50.30
LO-BENTOMAT ST	200034LO	00009462	.85	201.40	50.30
LO-BENTOMAT ST	200034LO	00009460	.85	201.40	50.30
LO-BENTOMAT ST	200034LO	00009459	.85	201.40	50.30
LO-BENTOMAT ST	200034LO	00009458	.85	201.40	50.30
LO-BENTOMAT ST	200034LO	00009457	.85*	201.40*	50.30*
LO-BENTOMAT ST	200034LO	00009453	.87	256.30	55.10
LO-BENTOMAT ST	200034LO	00009452	.87	256.30	55.10
LO-BENTOMAT ST	200034LO	00009447	.87	256.30	55.10
LO-BENTOMAT ST	200033LO	00009101	.89	167.80	37.40
LO-BENTOMAT ST	200033LO	00009100	.89	167.80	37.40
LO-BENTOMAT ST	200033LO	00009099	.89	167.80	37.40
LO-BENTOMAT ST	200033LO	00009098	.89	167.80	37.40
LO-BENTOMAT ST	200031LO	00007824	.92	203.00	38.60

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 ***

QCG8FT2 QCT8FT2
8/18/00 9:41:16

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL AMERICAN COLLOID

SHIP TO: WYERHAUSER
GSI/RYAN I
PLYMOUTH

O R D E R # 000131570

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632
LO-BENTOMAT ST	200034LO	00009150	.86	166.70	68.70
LO-BENTOMAT ST	200034LO	00009149	.86	166.70	68.70
LO-BENTOMAT ST	200033LO	00008948	.90	184.90	27.10
LO-BENTOMAT ST	200033LO	00008947	.90	184.90	27.10
LO-BENTOMAT ST	200033LO	00008946	.90	184.90	27.10
LO-BENTOMAT ST	200033LO	00008944	.90	184.90	27.10
LO-BENTOMAT ST	200033LO	00008943	.90	184.90	27.10
LO-BENTOMAT ST	200033LO	00008942	.90	184.90	27.10
LO-BENTOMAT ST	200033LO	00008941	.90*	184.90	27.10*
LO-BENTOMAT ST	200033LO	00008940	.89	184.90	39.10
LO-BENTOMAT ST	200033LO	00008939	.89	184.90	39.10
LO-BENTOMAT ST	200033LO	00008938	.89	184.90	39.10
LO-BENTOMAT ST	200033LO	00008937	.89	184.90	39.10
LO-BENTOMAT ST	200033LO	00008936	.89	184.90	39.10
LO-BENTOMAT ST	200033LO	00008935	.89	184.90	39.10
LO-BENTOMAT ST	200033LO	00008934	.89	184.90	39.10
LO-BENTOMAT ST	200033LO	00008933	.89	184.90	39.10

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 ST
MQA TRACKING FORMS

@CG#TF1 @CT#TF1
8/18/00 9:40:34

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

ORDER NUMBER 00013156 3

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
LOT# 200034L0									
00009451	L0-BENTOMAT ST	150	2250	2732	7899022		200029VR	00001054	081700A
00009510	L0-BENTOMAT ST	150	2250	2758	7901960		200028VR	00001033	081700B
00009512	L0-BENTOMAT ST	150	2250	2875	7901960		200028VR	00001033	081700B
00009513	L0-BENTOMAT ST	150	2250	2788	7901960		200028VR	00001033	081700B
00009514	L0-BENTOMAT ST	150	2250	2789	7901960		200028VR	00001033	081700B
00009515	L0-BENTOMAT ST	150	2250	2801	7901960		200028VR	00001033	081700B
00009516	L0-BENTOMAT ST	150	2250	2789	7901960		200028VR	00001033	081700B
00009517	L0-BENTOMAT ST	150	2250	2795	7901960		200028VR	00001033	081700B
00009519	L0-BENTOMAT ST	150	2250	2795	7901960		B863928A		081700B
00009520	L0-BENTOMAT ST	150	2250	2796	B863928A		7901960		081700C
00009521	L0-BENTOMAT ST	150	2250	2777	B863928A		7901960		081700C
00009522	L0-BENTOMAT ST	150	2250	2778	B863928A		7901960		081700C

TOTAL SQUARE FEET..... 27,000

TOTAL PAGES 1

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

ORDER NUMBER 0001131564

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
LOT# 200033L0									
00007824	L0-BENTOMAT ST	150	2250	2642	8223647		5209889A		072800C
LOT# 200033L0									
00009098	L0-BENTOMAT ST	150	2250	2702	7885341		B864076A		081100C
00009099	L0-BENTOMAT ST	150	2250	2690	7885341		B864076A		081100C
00009100	L0-BENTOMAT ST	150	2250	2702	7885341		B864076A		081100C
00009101	L0-BENTOMAT ST	150	2250	2692	7885341		B864076A		081100C
LOT# 200034L0									
00009447	L0-BENTOMAT ST	150	2250	2652	7899022		B864069A		081700A
00009452	L0-BENTOMAT ST	150	2250	2715	7899022		200029VR	00001054	081700A
00009453	L0-BENTOMAT ST	150	2250	2723	7899022		200029VR	00001054	081700A
00009457	L0-BENTOMAT ST	150	2250	2727	7899022		B863788A		081700B
00009458	L0-BENTOMAT ST	150	2250	2712	7899022		B863788A		081700B
00009459	L0-BENTOMAT ST	150	2250	2703	7899022		B863788A		081700B
00009460	L0-BENTOMAT ST	150	2250	2685	7899022		B863788A		081700B
00009462	L0-BENTOMAT ST	150	2250	2692	7899022		B863788A		081700B
00009463	L0-BENTOMAT ST	150	2250	2670	7899022		B863788A		081700B
00009464	L0-BENTOMAT ST	150	2250	2703	7899022		B863788A		081700B
00009465	L0-BENTOMAT ST	150	2250	2680	7899022		B863788A		081700B
00009466	L0-BENTOMAT ST	150	2250	2682	7899022		B863788A		081700B

TOTAL SQUARE FEET..... 38,250

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

ORDER NUMBER 000131570

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
LOT# 200033L0									
00008933	L0-BENTOMAT ST	150	2250	2737	7901963		B863808A		080900C
00008934	L0-BENTOMAT ST	150	2250	2732	7901963		B863808A		080900C
00008935	L0-BENTOMAT ST	150	2250	2740	7901963		B863808A		080900C
00008936	L0-BENTOMAT ST	150	2250	2727	7901963		B863808A		080900C
00008937	L0-BENTOMAT ST	150	2250	2739	7901963		B863820A		080900C
00008938	L0-BENTOMAT ST	150	2250	2739	7901963		B863820A		080900C
00008939	L0-BENTOMAT ST	150	2250	2744	7901963		B863820A		080900C
00008940	L0-BENTOMAT ST	150	2250	2736	7901963		B863820A		080900C
00008941	L0-BENTOMAT ST	150	2250	2718	7901963		B863820A		080900C
00008942	L0-BENTOMAT ST	150	2250	2708	7901963		B863820A		080900C
00008943	L0-BENTOMAT ST	150	2250	2743	7901963		B863820A		080900C
00008944	L0-BENTOMAT ST	150	2250	2719	7901963		B863820A		080900C
00008946	L0-BENTOMAT ST	150	2250	2722	7901963		B863807A		080900C
00008947	L0-BENTOMAT ST	150	2250	2720	7901963		B863807A		080900C
00008948	L0-BENTOMAT ST	150	2250	2713	7901963		B863807A		080900C
LOT# 200034L0									
00009149	L0-BENTOMAT ST	150	2250	2754	7896335		B864100A		081400A
00009150	L0-BENTOMAT ST	150	2250	2764	7896335		B864100A		081400A

TOTAL SQUARE FEET..... 38,250

BENTOMAT ST

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: **Wyerhauser Cell 1A**
Plymouth, NC. 27962

CUSTOMER P.O.: **2732-000-OD**

PREPARED FOR: **GSE Lining Technology, Inc.**
19103 Gundle Road
Houston TX. 77073
Telephone # : **800-435-2008**

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: **ngarc@cetco.com**

BENTOMAT ST

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	Wyerhauser Cell 1A
Prepared For:	GSE Lining Technology, Inc.
Customer PO:	2732-000-OD
Order Number:	131566, 131567, 131568, 131569, 131271, 131572, 131573
Ship Date:	8/18

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. NEEDLE DETECTION CERTIFICATION
3. BENTONITE CLAY CERTIFICATION
4. WOVEN GEOTEXTILE MANUFACTURER'S CERTIFICATION
5. NON-WOVEN GEOTEXTILE MANUFACTURER'S CERTIFICATION
6. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
7. GCL MQA TRACKING FORM

DAILY BENTOMAT ST PRODUCTION
PRODUCTION CERTIFICATION

BENTOMAT ST
MANUFACTURING CERTIFICATION

Project Name:	Wyerhauser Cell 1A
Prepared For:	GSE Lining Technology, Inc.
Customer PO:	2732-000-OD
Order Number:	131566, 131567, 131568, 131569, 131271, 131572, 131573
Ship Date:	18-Aug

Colloid Environmental Technologies Company (CETCO) hereby affirms and certifies that all of the BENTOMAT ST 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 21st day of August 2000.

A. Christine Somer
Notary-Public

A. CHRISTINE SOMER - Notary Public
County of Big Horn
State of Wyoming
My Commission Expires 8-22-2002

NEEDLE DETECTION CERTIFICATION

CERTIFICATION STATEMENT

Project Name:	Wyerhauser Cell 1A
Prepared For:	GSE Lining Technology, Inc.
Customer PO:	2732-000-OD
Order Number:	131566, 131567, 131568, 131569, 131271, 131572, 131573
Ship Date:	18-Aug

This statement is to certify that all components of the BENTOMAT ST 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 21st day of August 2000.

A. Christine Somer
NOTARY PUBLIC

A. CHRISTINE SOMER - Notary Public
County of Big Horn
State of Wyoming
My Commission Expires 2-22-02

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

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **7/29/00**

ATTN: **Mary Cruthirds,**

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 **072900A** 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**
Bentonite Free Swell	ASTM D 5890	24 mL / 2g MIN.	**24.0**
Bentonite Fluid Loss	ASTM D 5891	18.0 mL (MAX)	**15.8**
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: **RP, SF, JT**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
131566, 131567, 131568, 131569, 131271, 131572, 131573

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **7/29/00**

ATTN: **Mary Cruthirds,**

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 **072900B** 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**
Bentonite Free Swell	ASTM D 5890	24 mL / 2g MIN.	**26.0**
Bentonite Fluid Loss	ASTM D 5891	18.0 mL (MAX)	**15.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.8**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.9**

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: **RP, SF, JT**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
131566, 131567, 131568, 131569, 131271, 131572, 131573

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **8/9/00**

ATTN: **Mary Cruthirds,**

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 **080900A** 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**
Bentonite Free Swell	ASTM D 5890	24 mL / 2g MIN.	**24.0**
Bentonite Fluid Loss	ASTM D 5891	18.0 mL (MAX)	**15.6**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
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: **RP, SF, JT**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
131566, 131567, 131568, 131569, 131271, 131572, 131573

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **8/9/00**

ATTN: **Mary Cruthirds,**

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 **080900B** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # ACTUAL RESULTS Daily Results
RET. 10 MESH	ASTM C 136	0 PERCENT	**0**
Bentonite Free Swell	ASTM D 5890	24 mL / 2g MIN.	**24.0**
Bentonite Fluid Loss	ASTM D 5891	18.0 mL (MAX)	**16.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.6**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.2**

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: **RP, SF, JT**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
131566, 131567, 131568, 131569, 131271, 131572, 131573

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **8/14/00**

ATTN: **Mary Cruthirds,**

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 **081400A** 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**
Bentonite Free Swell	ASTM D 5890	24 mL / 2g MIN.	**26.0**
Bentonite Fluid Loss	ASTM D 5891	18.0 mL (MAX)	**15.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.8**
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: **RP, SF, JT**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
131566, 131567, 131568, 131569, 131271, 131572, 131573

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **8/14/00**

ATTN: **Mary Cruthirds,**

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 **081400C** 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**
Bentonite Free Swell	ASTM D 5890	24 mL / 2g MIN.	**24.0**
Bentonite Fluid Loss	ASTM D 5891	18.0 mL (MAX)	**16.2**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.4**
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: **RP, SF, JT**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
131566, 131567, 131568, 131569, 131271, 131572, 131573

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **8/17/00**

ATTN: **Mary Cruthirds,**

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 **081700A** 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**
Bentonite Free Swell	ASTM D 5890	24 mL / 2g MIN.	**26.0**
Bentonite Fluid Loss	ASTM D 5891	18.0 mL (MAX)	**15.8**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.2**

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: **RP, SF, JT**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
131566, 131567, 131568, 131569, 131271, 131572, 131573

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **8/18/00**

ATTN: **Mary Cruthirds,**

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 **081800A** and was provided the following test results below.

TEST	METHOD	REQ. SPECIFICATION	ROLL # ACTUAL	Daily Results RESULTS
RET. 10 MESH	ASTM C 136	0 PERCENT		**0**
Bentonite Free Swell	ASTM D 5890	24 mL / 2g MIN.		**25.0**
Bentonite Fluid Loss	ASTM D 5891	18.0 mL (MAX)		**16.0**
Moisture	ASTM D 2216	12.0 % (MAX)		**9.0**
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: **RP, SF, JT**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
131566, 131567, 131568, 131569, 131271, 131572, 131573

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **8/18/00**

ATTN: **Mary Cruthirds,**

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 **081800B** 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**
Bentonite Free Swell	ASTM D 5890	24 mL / 2g MIN.	**24.0**
Bentonite Fluid Loss	ASTM D 5891	18.0 mL (MAX)	**16.8**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.4**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.2**

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: **RP, SF, JT**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
131566, 131567, 131568, 131569, 131271, 131572, 131573

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **8/17/00**

ATTN: **Mary Cruthirds,**

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 **081700B** 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**
Bentonite Free Swell	ASTM D 5890	24 mL / 2g MIN.	**26.0**
Bentonite Fluid Loss	ASTM D 5891	18.0 mL (MAX)	**15.8**
Moisture	ASTM D 2216	12.0 % (MAX)	**7.4**
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: **RP, SF, JT**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
131566, 131567, 131568, 131569, 131271, 131572, 131573

WOVEN GEOTEXTILE
MANUFACTURER'S CERTIFICATION

TECHNICAL DATA SHEET

ORIGIN INFORMATION

WOVEN GEOTEXTILE

Manufacturer: **Synthetic Industries Inc.**

PRODUCTION

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

Contact: Randy Johnson

Brand Name: 82 Tex.

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/4/2000

American Colloid Cetco WY
Noe Garcia
PO Box 426
Lovell WY 82431
BOL 80058649 PO 75680
Ref:

This is to certify that Product 62TEX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				()		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kpa)	265			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.5)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.46		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 6/29/2000

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

Bill Of Lading # 80058644

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4632 GRAB ELONGATION (%) W x F	ASTM D-3786 MULLEN BURST PSI	ASTM D-5261 MASS/UNIT AREA OZ/SQ YARD
Product :	**82-TEX**			
7850784	176 x 144	23 x 21	326	3.4
7866240	164 x 136	23 x 22	297	3.4
7868651	162 x 145	21 x 23	322	3.4
7868658	176 x 137	23 x 20	332	3.6
7868967	171 x 147	24 x 23	323	3.4
7869526	167 x 150	22 x 26	338	3.4
7874594	158 x 139	20 x 32	312	3.4
7874598	147 x 135	19 x 23	308	3.3
7874599	152 x 143	20 x 22	282	3.4
7876068	169 x 135	22 x 20	329	3.4
7880038	159 x 138	21 x 24	293	3.4
7880183	163 x 136	22 x 22	312	3.3
7885336	157 x 135	21 x 21	288	3.3
7893797	157 x 140	22 x 24	327	3.5
7896335	156 x 135	21 x 24	313	3.4
7897981	160 x 135	20 x 23	296	3.6
7899022	166 x 135	22 x 22	293	3.5
7899693	178 x 155	24 x 24	340	3.7
7899695	168 x 150	23 x 23	312	3.5
7901790	178 x 137	24 x 22	310	3.4
7901963	170 x 135	22 x 22	325	3.5
7903642	166 x 141	21 x 22	303	3.4
7912347	142 x 138	22 x 29	307	3.5
7912436	161 x 135	21 x 24	299	3.5

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/4/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80057411 PO 75680

Ref:

This is to certify that Product 82TEX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				()		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kpa)	266			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.5)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.46		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 8/28/2000

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

Bill Of Lading # 80057411

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4632 GRAB ELONGATION (%) W x F	ASTM D-3786 MULLEN BURST PSI	ASTM D-5261 MASS/UNIT AREA OZ/SQ YARD
Product :	**82-TEX**			
7866239	159 x 135	22 x 25	307	3.4
7867675	151 x 137	20 x 23	299	3.5
7868173	155 x 146	20 x 22	302	3.5
7868653	172 x 144	23 x 22	316	3.5
7871169	159 x 143	22 x 22	321	3.5
7873869	148 x 136	19 x 22	299	3.3
7873872	155 x 145	20 x 23	295	3.4
7874593	138 x 135	18 x 24	292	3.4
7874600	160 x 135	20 x 22	281	3.5
7876071	145 x 135	19 x 20	305	3.3
7876073	150 x 135	19 x 22	295	3.3
7877445	173 x 151	23 x 23	313	3.5
7877445	168 x 145	24 x 25	320	3.5
7878660	159 x 140	21 x 26	309	3.4
7878661	156 x 135	20 x 19	290	3.3
7880036	161 x 145	20 x 27	298	3.5
7880059	156 x 135	20 x 23	298	3.4
7880628	168 x 142	23 x 30	316	3.5
7884619	175 x 143	23 x 23	325	3.5
7884620	163 x 135	22 x 22	304	3.5
7885252	164 x 135	22 x 21	292	3.4
7901356	170 x 144	23 x 23	302	3.5
7902435	171 x 138	21 x 23	319	3.4
7903641	163 x 141	21 x 23	313	3.5

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

7/25/2000

American Colloid Cetco W
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80055438 PO 75671
Ref:

This is to certify that Product 82TEX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				()		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kpa)	265			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.5)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.46		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely,

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification 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 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 normal 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 6/29/2000

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7019 • 1-800-621-0444

Bill Of Lading # 80055438

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4632 GRAB ELONGATION (%) W x F	ASTM D-3786 MULLEN BURST PSI	ASTM D-5261 MASS/UNIT AREA OZ/SQ YARD
Product :	**82-TEX**			
7878667	168 x 144	22 x 24	315	3.7
7882867	153 x 135	19 x 21	326	3.4
7884440	167 x 138	23 x 22	301	3.5
7884626	168 x 135	22 x 22	310	3.5
7885267	154 x 138	22 x 23	312	3.4
7885341	162 x 142	23 x 22	302	3.6
7887512	154 x 144	20 x 24	328	3.5
7887513	162 x 145	20 x 23	314	3.4
7892267	158 x 135	24 x 25	306	3.5
7892268	162 x 135	21 x 22	326	3.5
7893792	168 x 153	21 x 21	303	3.6
7893799	140 x 137	18 x 23	296	3.4
7894135	167 x 137	22 x 22	306	3.5
7894588	167 x 148	20 x 21	315	3.5
7896339	162 x 135	22 x 23	302	3.5
7910263	161 x 135	21 x 21	318	3.5
8017978	145 x 135	20 x 22	347	3.3
8072004	166 x 144	24 x 25	337	3.5
8160979	159 x 135	21 x 17	337	3.5
8160979	163 x 135	23 x 15	347	3.5
Product :	**82TEX184**			
8202101	168 x 172	21 x 16	423	3.6
8206708	168 x 159	20 x 16	370	3.7
8215680	165 x 146	20 x 15	370	3.4
8215684	171 x 142	20 x 15	357	3.6
8223646	165 x 158	21 x 17	360	3.6

Warren Sibley

8/3/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80056348 PO
Ref:

This is to certify that Product 8?TFX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				()		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kps)	285			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.5)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.46		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 6/29/2000

Bill Of Lading # 80056348

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4632 GRAB ELONGATION (%) W x F	ASTM D-3786 MULLEN BURST PSI	ASTM D-5261 MASS/UNIT AREA OZ/SQ YARD
Product :	**82-TEX**			
7884443	172 x 148	22 x 23	318	3.5
7884627	160 x 143	22 x 22	316	3.5
7900350	171 x 143	25 x 29	311	3.6
7909683	156 x 135	20 x 23	310	3.4
8070715	149 x 138	18 x 23	330	3.5
8085606	164 x 152	23 x 16	354	3.7
8104263	157 x 153	22 x 18	353	3.8
8109548	174 x 142	23 x 16	380	3.6
8109549	172 x 180	23 x 18	373	3.8
8110821	166 x 156	21 x 16	370	3.7
8128342	173 x 142	24 x 15	363	3.7
8177234	151 x 149	21 x 16	360	3.7
8179962	174 x 141	21 x 17	367	3.5
8181170	171 x 135	21 x 16	360	3.5
8182791	172 x 160	22 x 17	362	3.7
8186838	171 x 158	25 x 17	370	3.7
Product :	**82TEX184**			
8218836	159 x 149	20 x 17	350	3.6
8218838	175 x 146	21 x 16	373	3.6
8219139	156 x 147	19 x 15	348	3.7
8223647	159 x 151	20 x 16	355	3.7
8228953	159 x 149	20 x 15	360	3.7
8228954	163 x 140	22 x 16	320	3.6
8231445	149 x 137	18 x 16	317	3.6
8238433	160 x 151	20 x 16	348	3.7

NON-WOVEN GEOTEXTILE MANUFACTURER'S CERTIFICATION

TECHNICAL DATA SHEET

ORIGIN INFORMATION

NON-WOVEN GEOTEXTILE

Manufacturer: **Colloid Environmental Technologies Co.**

PRODUCTION

FACILITY: **Colloid Environmental Technologies Co.**
102 Conners Road
Villa Rica, GA 30180

CONTACT: Debbie Bivins 404-459-4995

BRAND NAME: Standard

NON-WOVEN GEOTEXTILE MANUFACTURING CERTIFICATION

Project Name:	Wyerhauser Cell 1A
Prepared For:	GSE Lining Technology, Inc.
Customer PO:	2732-000-OD
Order Number:	131566, 131567, 131568, 131569, 131271, 131572, 131573
Ship Date:	18-Aug

CETCO hereby affirms and certifies that the Non-Woven geotextile in the **BENTOMAT ST** product for the above project has been manufactured to meet the following physical properties.

PROPERTY	TEST METHOD	MINIMUM VALUE
Mass / Area	ASTM D-5261	6.0 OZ./SQ.YD.
Grab Strength	ASTM D-4632	6.0 Lbs.

COLLOID ENVIRONMENTAL TECHNOLOGIES CO. (CETCO)

Subscribed and sworn to before me this 21st day of August 2000.

A. Christine Somer
NOTARY PUBLIC

A. CHRISTINE SOMER - Notary Public
County of Big Horn State of Wyoming
My Commission Expires 8-23-2002

COLLOID ENVIRONMENTAL TECH CO
GEOTEXTILE QC DATA

LOVELL AMERICAN COLLOID

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

O R D E R # 00013156 9

MATERIAL	LOT#	ROLL#	GEOTEXTILE 6.0oz/sy mv ASTM D 5261	GRAB STRENGTH 6.0 lbs marv ASTM D 4632
LO-NON-WOVEN	200029VR	00001054	6.7	39.1

TOTAL PAGES 1

COLLOID ENVIRONMENTAL TECH CO
GEOTEXTILE QC DATA

LOVELL AMERICAN COLLOID

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

O R D E R # 000131571

MATERIAL	LOT#	ROLL#	GEOTEXTILE 6.0oz/sy mv ASTM D 5261	GRAB STRENGTH 6.0 lbs marv ASTM D 4632
LO-NON-WOVEN	200027VR	00001012	6.4	44.8

TOTAL PAGES 1

COLLOID ENVIRONMENTAL TECH CO
GEOTEXTILE QC DATA

LOVELL AMERICAN COLLOID

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

O R D E R # 000131573

MATERIAL	LOT#	ROLL#	GEOTEXTILE 6.0oz/sy mv ASTM D 5261	GRAB STRENGTH 6.0 lbs marv ASTM D 4632
LO-NON-WOVEN	200028VR	00001037	6.7	32.0

TOTAL PAGES 1

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

7/25/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80055679 PO 75668
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Warren Sickler
Senior Technical Manager
Geosynthetics Products Division

Seller makes no warranty express or implied concerning the product furnished hereunder other than as 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 IF 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's 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 the style and is subject to change without notice. The effective date for this product data is 2/29/2000

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: 80055679

PoNumber: 75668
ShipDate: 7/19/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
		Osy D5261	mils D5199	MD lbs D4632	CD lbs D4632	MD % D4632	CD % D4632	MD lbs D4533	CD lbs D4533	psi D3786	lbs D4833
B862163A	650	7.0	159	87	115	143	126	42	37	251	77
B862227A	650	7.2	144	107	174	129	133	44	53	254	68
B862241A	650	6.5	139	78	135	116	126	44	47	224	63

Karen Sibley

JUL-25-2000 12:49 SI RINGGOLD TECHNI P.10/22

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

7/14/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80054404 PO 75665
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 2/29/2000

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

Individual Roll Data
Bill of Lading 80054404

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
850856A	650	80310	6.4	132	106	146	128	124	50	56	250	67
850859A	650	80310	6.5	133	119	148	126	120	64	40	231	59
850931A	650	80310	6.6	136	113	173	124	147	64	65	211	77

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

Performance Nonwovens Division

8/1/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80057239 PO 75675
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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 97.6 percent confidence level. This geotextile has been continuously inspected for the presence of needles and none were detected.

Physical Property	Test Method	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	60	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 3/29/2000

Synthetic Industries, Inc.
426 Rollins Industrial Blvd.• Ringgold, Georgia 30736
Telephone • 706-965-6300 • Fax • 706-965-6067

Synthetic Industries
Individual Roll Data

Bill of Lading: 80057239

PoNumber: 75675
ShipDate: 7/26/2000
CustomerNumber: 4953

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
		Osy D5261	mils D5199	MD lbs D4632	CD lbs D4632	MD % D4632	CD % D4632	MD lbs D4533	CD lbs D4533	psi D3786	lbs D4833
5209918A	650	7.1	131	82	133	129	120	43	41	266	84
5209935A	650	6.5	134	62	93	129	131	34	33	233	60
B862209A	650	6.9	144	91	152	133	128	53	45	230	71
B862218A	650	7.1	139	101	159	121	124	48	55	247	82

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

7/25/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80055679 PO 75668
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Warren Sickler
Senior Technical Manager
Geosynthetics Products Division

Seller makes no warranty express or implied concerning the product. Acceptance hereunder other than at the time of delivery is shall be at the quality and specifications stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 the style and is subject to change without notice. The effective date for this product data is 2/29/2000

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: 80055679

PoNumber: 75668
ShipDate: 7/19/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
				MD	CD	MD	CD	MD	CD		
		Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
		D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B862163A	650	7.0	159	87	115	143	126	42	37	251	77
B862227A	650	7.2	144	107	174	129	133	44	53	254	68
B862241A	650	6.5	139	78	135	116	126	44	47	224	63

Karen Sibley

JUL-25-2000 12:49 SI RINGGOLD TECHNI P.10/22

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

7/14/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80054404 PO 75665
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 2/29/2000

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: 80057239

PoNumber: 75675
ShipDate: 7/26/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
		Osy D5261	mils D5199	MD lbs D4632	CD lbs D4632	MD % D4632	CD % D4632	MD lbs D4533	CD lbs D4533	psi D3786	lbs D4833
5209918A	650	7.1	131	82	133	129	120	43	41	266	64
5209935A	650	6.5	134	62	93	129	131	34	33	233	60
B862209A	650	6.9	144	91	152	133	128	53	45	230	71
B862218A	650	7.1	139	101	159	121	124	48	55	247	82

Individual Roll Data
Bill of Lading 80054404

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B850856A	650	80310	6.4	132	106	146	128	124	50	56	250	67
B850859A	650	80310	6.5	133	119	148	126	120	64	40	231	59
B850931A	650	80310	6.6	136	113	173	124	147	64	65	211	77

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

Performance Nonwovens Division

8/1/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80057239 PO 75675
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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 97.6 percent confidence level. This geotextile has been continuously inspected for the presence of needles and none were detected.

Physical Property	Test Method	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 hereon. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 3/29/2000

Synthetic Industries, Inc.
426 Rollins Industrial Blvd.• Ringgold, Georgia 30736
Telephone • 706-965-6300 • Fax • 706-965-6067

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

7/25/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80055894 PO 75670
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D 4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely,

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 2/29/2000

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: 80055894

PoNumber: 75670
ShipDate: 7/20/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
		Osy D5261	mils D5199	MD lbs D4632	CD lbs D4632	MD % D4632	CD % D4632	MD lbs D4533	CD lbs D4533	psi D3786	lbs D4833
5209939A	650	7.2	141	73	108	132	131	46	34	220	73
B862224A	650	7.7	139	100	167	127	127	58	60	250	75
B862230A	650	6.8	142	104	160	123	124	51	54	258	69

Karen Sibley

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/8/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80059039 PO 75682
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Patti Weaver
Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 2/29/2000

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: 80059039

PoNumber: 75682
ShipDate: 8/4/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
				MD	CD	MD	CD	MD	CD		
		Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
		D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B863790A	650	7.3	145	90	176	135	119	56	51	223	65
B863793A	650	6.0	137	68	115	128	114	41	32	204	57
B863797A	650	7.0	138	79	124	139	112	43	48	206	62
B863824A	650	6.5	140	78	133	122	109	40	33	247	52
B863833A	650	6.7	136	83	139	138	131	48	45	236	62

Patti Weaver

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/17/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80061007 PO 75688
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Patti Weaver
Technical Manager
Geosynthetics Products 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 specification 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 2/23/2000

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: 80061007

PoNumber: 75688
ShipDate: 6/15/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
				MD	CD	MD	CD	MD	CD		
		Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
		D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B863928A	650	6.8	140	92	159	143	133	56	51	219	60

AUG-17-2000 11:36 SI RINGGOLD TECHNI P.20

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/17/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80061101 PO 75689
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained After 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Patti Weaver

Patti Weaver
Technical Manager
Geosynthetics Products 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 specification stated hereon. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IT IS UNLAWFUL 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 within 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 2/29/2000

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: 80061101

PoNumber: 75689
ShipDate: 8/15/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
				MD	CD	MD	CD	MD	CD		
		Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
		D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4633
B863839A	650	6.5	143	82	129	135	121	41	48	233	68
B863856A	650	6.4	126	79	111	128	109	47	39	204	62

Patti Weaver

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/4/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80058781 PO 75682
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 2/29/2000

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: 80058781

PoNumber: 75682
ShipDate: 8/3/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
		Osy D5261	mils D5199	MD lbs D4632	CD lbs D4632	MD % D4632	CD % D4632	MD lbs D4533	CD lbs D4533	psi D3786	lbs D4833
B863760A	650	7.4	138	117	145	130	123	49	45	213	72
B863781A	650	6.5	143	73	117	122	108	41	41	234	69
B863784A	650	6.8	141	83	150	143	125	43	56	223	70
B863787A	650	7.3	152	95	188	133	120	50	63	257	69
B863805A	650	6.7	139	78	153	122	124	39	44	248	63

Vernon Gibbs

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/8/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80059215 PO 75682
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Patti Weaver

Patti Weaver
Technical Manager
Geosynthetics Products Division

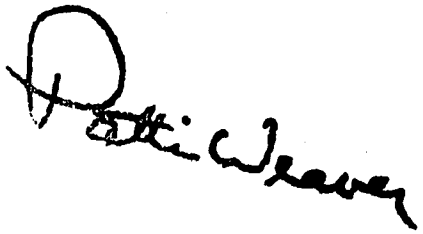
Seller makes no warranty express or implied concerning the product furnished hereunder other than at the time of delivery it shall be of the quality and specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF IT IS CONTRARY 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 2/29/2000

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: 80059215

PoNumber: 75682
ShipDate: 8/4/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
		Osy D5261	mils D5199	MD lbs D4632	CD lbs D4632	MD % D4632	CD % D4632	MD lbs D4533	CD lbs D4533	psi D3786	lbs D4833
B863935A	650	6.8	136	83	157	137	126	53	62	226	61
B863944A	650	7.2	151	88	149	133	113	52	50	240	78



SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/14/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80060104 PO 75682
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Patti Weaver

Patti Weaver
Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 2/29/2000

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: 80060104

PoNumber: 75682
ShipDate: 8/10/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
		Osy D5261	mils D5199	MD lbs D4632	CD lbs D4632	MD % D4632	CD % D4632	MD lbs D4533	CD lbs D4533	psi D3786	lbs D4833
B864058A	650	6.8	140	82	121	143	117	46	46	253	69
B864100A	650	7.7	158	89	190	158	127	57	57	254	72
B864109A	650	7.3	145	83	123	107	114	44	44	240	54
B884115A	650	7.8	157	177	120	126	144	57	56	221	73

Patti Weaver

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/10/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80059879 PO 75682
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Patti Weaver

Patti Weaver
Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 received. 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 2/29/2000

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: 80059879

PoNumber: 75682
ShipDate: 8/9/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
		Osy D5261	mils D5199	MD lbs D4632	CD lbs D4632	MD % D4632	CD % D4632	MD lbs D4533	CD lbs D4533	psi D3786	lbs D4833
B864080A	650	7.4	158	84	146	143	117	47	56	240	77
B864085A	650	7.4	154	94	154	151	127	39	60	240	62
B864106A	650	6.4	128	75	115	131	126	36	38	209	58
B864120A	650	6.7	142	91	168	141	135	51	49	221	62

Patti Weaver

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/4/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80058093 PO 75680
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 2/29/2000

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

Individual Roll Data
Bill of Lading 80058093

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
5209825A	650	51346	7.6	144	98	192	123	125	49	66	246	79
5209830A	650	51346	6.8	138	77	144	128	128	42	47	246	69
5209840A	650	51346	7.1	131	75	159	137	125	47	44	251	68
5209930A	650	51346	6.6	125	70		132		42		234	66
8862090A	650	80393	7.3	145	88	147	120	109	47	41	283	73
8862230A	650	80394	6.8	142	104	160	123	124	51	54	256	69

Vernon Bibler

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

8/8/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80059214 PO 75682
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Patti Weaver

Patti Weaver
Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 2/29/2000

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

Individual Roll Data
Bill of Lading 80059214

Roll #	Style	Batch	Weight	Thick	Tensile		Elongation		T.Tear		Burst	Punct
					MD	XMD	MD	XMD	MD	XMD		
			Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
			D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
5209840A	650	51346	7.1	131	75	159	137	125	47	44	251	68
B862102A	650	80394	7.5	163	100	155	117	110	50	65	273	90
B863760A	650	80904	7.4	138	117	145	130	123	49	45	213	72
B863800A	650	80904	7.4	154	91	146	133	108	49	54	214	73

Patti Weaver

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

8/17/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80061019 PO 75688
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D 4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Patti Weaver

Patti Weaver
Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 in its 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 2/29/2000

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: 80061019

PoNumber: 75688
ShipDate: 8/15/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
		Osy D5261	mils D5199	MD lbs D4632	CD lbs D4632	MD % D4632	CD % D4632	MD lbs D4533	CD lbs D4533	psi D3786	lbs D4833
B863836A	650	6.9	144	79	137	126	116	40	43	220	37
B863845A	650	7.6	154	83	135	131	103	54	46	214	73
B863859A	650	7.6	150	92	151	130	124	55	51	239	74

Patti Weaver

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/17/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80060996 PO 75688
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Patti Weaver
Technical Manager
Geosynthetics Products 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 specification 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 CONTENDS 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 5/20/2000

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: 80060996

PoNumber: 75688
ShipDate: 8/15/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
		Osy D5261	mils D5199	MD lbs D4632	CD lbs D4632	MD % D4632	CD % D4632	MD lbs D4533	CD lbs D4533	psi D3786	lbs D4833
B863853A	650	6.8	147	79	116	133	118	42	41	196	68
B863868A	650	6.7	147	83	158	129	125	45	45	230	74
B863885A	650	7.5	148	97	164	152	118	50	62	238	67
B863891A	650	7.4	147	91	171	130	123	65	72	251	91
B863925A	650	6.9	135	92	146	139	118	60	52	221	73

Patti Weaver

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/17/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80060994 PO 75688
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Patti Weaver
Technical Manager
Geosynthetics Products 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 specification stated hereon. 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 quoted 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 5/25/2000

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: 80060994

PoNumber: 75688
ShipDate: 8/15/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
		Osy D5261	mils D5199	MD lbs D4632	CD lbs D4632	MD % D4632	CD % D4632	MD lbs D4533	CD lbs D4533	psi D3786	lbs D4833
B863938A	650	7.4	152	91	140	136	120	49	52	233	60
B863963A	650	6.8	150	82	126	140	132	44	34	230	61
B863971A	650	7.0	151	94	127	144	127	49	54	271	72
B864000A	650	6.2	135	77	103	128	112	39	34	233	56

Patti Weaver

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/17/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80060993 PO 75688
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D 5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Patti Weaver
Technical Manager
Geosynthetics Products 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 specification 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 Seller 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 2/23/2000

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: 80060993

PoNumber: 75688
ShipDate: 8/15/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
		Osy D5261	mils D5199	MD lbs D4632	CD bs D4632	MD % D4632	CD % D4632	MD lbs D4533	CD lbs D4533	psi D3786	lbs D4833
B864006A	650	6.7	132	92	126	133	116	42	60	209	62
B864038A	650	6.8	144	80	143	147	118	40	65	220	62
B864097A	650	7.2	139	111	184	140	127	46	55	250	77
B864103A	650	7.9	150	93	185	142	130	60	60	254	72

Patti Weaver

AUG-17-2000 11:32 SI RINGGOLD TECHNI P.08

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/17/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80061073 PO 75688
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Patti Weaver

Patti Weaver
Technical Manager
Geosynthetics Products 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 specification 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 Consumer 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 3/23/2000

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: 80061073

PoNumber: 75688
ShipDate: 8/15/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
		Osy D5261	mils D5199	MD lbs D4632	CD lbs D4632	MD % D4632	CD % D4632	MD lbs D4533	CD lbs D4533	psi D3786	lbs D4833
B863862A	650	7.7	144	93	171	137	139	40	76	229	84
B863865A	650	7.4	156	95	143	136	121	49	58	284	83
B863888A	650	6.9	149	88	133	138	114	53	58	233	69
B863921A	650	7.3	149	97	141	139	113	51	53	244	69

Patti Weaver

BENTOMAT ST
QUALITY TEST RESULTS

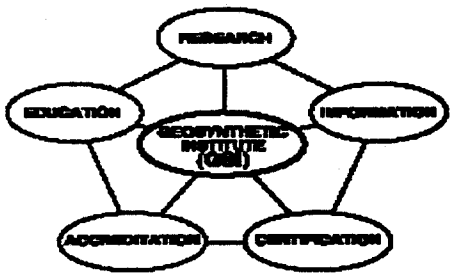
BENTOMAT ST
MANUFACTURING CERTIFICATION

Project Name:	Wyerhauser Cell 1A
Prepared For:	GSE Lining Technology, Inc.
Customer PO:	2732-000-OD
Order Number:	131566, 131567, 131568, 131569, 131271, 131572, 131573
Ship Date:	18-Aug

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

PROPERTY	TEST METHOD	MINIMUM VALUE
Peel Strength	ASTM D 4632	**15 lbs (65 N)**
Bentonite Free Swell	ASTM D 5890	**24 mL / 2g MIN.**
Bentonite Fluid Loss	ASTM D 5891	**18.0 mL (MAX)**
Bentonite Mass / Area	ASTM D 5993	*** .75 lb/sq.ft. (Min.)**
Grab Strength	ASTM D 4632	**90 lbs. (400 N)**
Grab Elongation	ASTM D 4632	**15 Percent Typical**
Permeability	ASTM D 5084	**5 x 10 (-9) cm/sec. (Max)**
Index Flux	ASTM D 5887	**1.0 x 10 (-8) m(3)/m(2)/sec. (max.)**

*** 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 21st day of August 2000.

A. Christine Somer
Notary Public

A. CHRISTINE SOMER-Notary Public
County of Big Horn
State of Wyoming
My Commission Expires 8-22-2002

QCG#FT2 QCT#FT2

8/21/00 8:37:32

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL AMERICAN COLLOID

SHIP TO: WYERHAUSER
GSI/RYAN I
PLYMOUTH

O R D E R # 000131566

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632
LO-BENTOMAT ST	200034LO	00009577	.90	242.40	46.40
LO-BENTOMAT ST	200034LO	00009576	.90	242.40	46.40
LO-BENTOMAT ST	200034LO	00009575	.90	242.40	46.40
LO-BENTOMAT ST	200034LO	00009574	.90	242.40	46.40
LO-BENTOMAT ST	200034LO	00009573	.90*	242.40*	46.40*
LO-BENTOMAT ST	200034LO	00009572	.92	242.20	42.90
LO-BENTOMAT ST	200033LO	00008859	.89	213.50	32.10
LO-BENTOMAT ST	200033LO	00008858	.89	213.50	32.10
LO-BENTOMAT ST	200033LO	00008856	.89	213.50	32.10
LO-BENTOMAT ST	200033LO	00008855	.89	213.50	32.10
LO-BENTOMAT ST	200033LO	00008854	.89	213.50	32.10
LO-BENTOMAT ST	200033LO	00008853	.89	213.50	32.10
LO-BENTOMAT ST	200033LO	00008851	.89	213.50	32.10
LO-BENTOMAT ST	200033LO	00008826	.98	224.60	43.80
LO-BENTOMAT ST	200033LO	00008825	.98	224.60	43.80
LO-BENTOMAT ST	200033LO	00008824	.98	224.60	43.80
LO-BENTOMAT ST	200033LO	00008821	.98	224.60	43.80

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
8/21/00 8:37:51

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL AMERICAN COLLOID

SHIP TO: WYERHAUSER
GSI/RYAN I
PLYMOUTH

O R D E R # 000131567

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632
LO-BENTOMAT ST	200034LO	00009568	.92	242.20	42.90
LO-BENTOMAT ST	200034LO	00009567	.92	242.20	42.90
LO-BENTOMAT ST	200034LO	00009566	.92	242.20	42.90
LO-BENTOMAT ST	200034LO	00009565	.92	242.20	42.90
LO-BENTOMAT ST	200034LO	00009564	.92	242.20	42.90
LO-BENTOMAT ST	200034LO	00009563	.92	242.20	42.90
LO-BENTOMAT ST	200034LO	00009558	.92	242.20	42.90
LO-BENTOMAT ST	200034LO	00009557	.92*	242.20	42.90*
LO-BENTOMAT ST	200034LO	00009556	.88	242.20	43.70
LO-BENTOMAT ST	200034LO	00009555	.88	242.20	43.70
LO-BENTOMAT ST	200034LO	00009554	.88	242.20	43.70
LO-BENTOMAT ST	200034LO	00009552	.88	242.20	43.70
LO-BENTOMAT ST	200034LO	00009548	.88	242.20	43.70
LO-BENTOMAT ST	200034LO	00009547	.88	242.20	43.70
LO-BENTOMAT ST	200034LO	00009546	.88	242.20	43.70
LO-BENTOMAT ST	200034LO	00009545	.88	242.20	43.70

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
8/21/00 8:38:08

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL AMERICAN COLLOID

SHIP TO: WYERHAUSER
GSI/RYAN I
PLYMOUTH

O R D E R # 000131568

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632
LO-BENTOMAT ST	200034LO	00009562	.92	242.20	42.90
LO-BENTOMAT ST	200034LO	00009561	.92	242.20	42.90
LO-BENTOMAT ST	200034LO	00009560	.92	242.20	42.90
LO-BENTOMAT ST	200034LO	00009559	.92	242.20	42.90
LO-BENTOMAT ST	200034LO	00009551	.88	242.20	43.70
LO-BENTOMAT ST	200034LO	00009550	.88	242.20	43.70
LO-BENTOMAT ST	200034LO	00009549	.88	242.20	43.70
LO-BENTOMAT ST	200034LO	00009542	.88	242.20	43.70
LO-BENTOMAT ST	200034LO	00009541	.88*	242.20*	43.70*
LO-BENTOMAT ST	200034LO	00009504	.88	201.40	45.00
LO-BENTOMAT ST	200034LO	00009502	.88	201.40	45.00
LO-BENTOMAT ST	200034LO	00009501	.88	201.40	45.00
LO-BENTOMAT ST	200034LO	00009217	.92	217.50	25.20
LO-BENTOMAT ST	200034LO	00009216	.92	217.50	25.20
LO-BENTOMAT ST	200034LO	00009114	.89	108.10	58.30
LO-BENTOMAT ST	200031LO	00007909	.89	178.60	47.10

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
8/21/00 8:38:27

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL AMERICAN COLLOID

SHIP TO: MYERHAUSER
GSI/RYAN I
PLYMOUTH

O R D E R # 000131569

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632
LO-BENTOMAT ST	200034LO	00009589	.89	259.80	48.60
LO-BENTOMAT ST	200034LO	00009588	.89*	259.80*	48.60*
LO-BENTOMAT ST	200034LO	00009553	.88	242.20	43.70
LO-BENTOMAT ST	200034LO	00009544	.88	242.20	43.70
LO-BENTOMAT ST	200034LO	00009543	.88	242.20	43.70
LO-BENTOMAT ST	200034LO	00009535	.90	242.40	47.10
LO-BENTOMAT ST	200034LO	00009534	.90	242.40	47.10
LO-BENTOMAT ST	200034LO	00009533	.90	242.40	47.10
LO-BENTOMAT ST	200034LO	00009532	.90	242.40	47.10
LO-BENTOMAT ST	200034LO	00009525	.90*	242.40*	47.10*
LO-BENTOMAT ST	200034LO	00009450	.87	256.30	55.10
LO-BENTOMAT ST	200034LO	00009449	.87	256.30	55.10
LO-BENTOMAT ST	200034LO	00009215	.92	217.50	25.20
LO-BENTOMAT ST	200031LO	00007908	.89	178.60	47.10
LO-BENTOMAT ST	200031LO	00007888	.89	178.10	45.90
LO-BENTOMAT ST	200031LO	00007887	.89	178.10	45.90
LO-BENTOMAT ST	200031LO	00007886	.89	178.10	45.90

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#PT2 QCT#PT2
8/21/00 8:38:45

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL AMERICAN COLLOID

SHIP TO: WYERHAUSER
GSI/RYAN I
PLYMOUTH

O R D E R # 000131571

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632
LO-BENTOMAT ST	200034LO	00009607	.91	259.80	43.80
LO-BENTOMAT ST	200034LO	00009606	.91	259.80	43.80
LO-BENTOMAT ST	200034LO	00009605	.91	259.80	43.80
LO-BENTOMAT ST	200034LO	00009604	.91*	259.80	43.80*
LO-BENTOMAT ST	200034LO	00009603	.89	259.80	48.60
LO-BENTOMAT ST	200034LO	00009602	.89	259.80	48.60
LO-BENTOMAT ST	200034LO	00009601	.89	259.80	48.60
LO-BENTOMAT ST	200034LO	00009600	.89	259.80	48.60
LO-BENTOMAT ST	200034LO	00009599	.89	259.80	48.60
LO-BENTOMAT ST	200034LO	00009598	.89	259.80	48.60
LO-BENTOMAT ST	200034LO	00009597	.89	259.80	48.60
LO-BENTOMAT ST	200034LO	00009596	.89	259.80	48.60
LO-BENTOMAT ST	200034LO	00009595	.89	259.80	48.60
LO-BENTOMAT ST	200034LO	00009594	.89	259.80	48.60
LO-BENTOMAT ST	200034LO	00009593	.89	259.80	48.60
LO-BENTOMAT ST	200034LO	00009592	.89	259.80	48.60

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
8/21/00 8:39:03

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL AMERICAN COLLOID

SHIP TO: WYERHAUSER
GSI/RYAN I
PLYMOUTH

O R D E R # 000131572

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632
LO-BENTOMAT ST	200034LO	00009214	.92*	217.50	25.20*
LO-BENTOMAT ST	200031LO	00007907	.89	178.60	47.10
LO-BENTOMAT ST	200031LO	00007906	.89	178.60	47.10
LO-BENTOMAT ST	200031LO	00007905	.89*	178.60	47.10*
LO-BENTOMAT ST	200031LO	00007904	.88	178.60	43.90
LO-BENTOMAT ST	200031LO	00007903	.88	178.60	43.90
LO-BENTOMAT ST	200031LO	00007885	.89	178.10	45.90
LO-BENTOMAT ST	200031LO	00007884	.89	178.10	45.90
LO-BENTOMAT ST	200031LO	00007883	.89	178.10	45.90
LO-BENTOMAT ST	200031LO	00007882	.89	178.10	45.90
LO-BENTOMAT ST	200031LO	00007881	.89	178.10	45.90
LO-BENTOMAT ST	200031LO	00007860	.89*	178.10	25.60*
LO-BENTOMAT ST	200031LO	00007859	.90	178.10	32.60
LO-BENTOMAT ST	200031LO	00007858	.90	178.10	32.60
LO-BENTOMAT ST	200031LO	00007857	.90	178.10	32.60
LO-BENTOMAT ST	200031LO	00007838	.93	178.10	31.00
LO-BENTOMAT ST	200031LO	00007837	.93	178.10	31.00

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

8/21/00 8:39:21

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL AMERICAN COLLOID

SHIP TO: WYERHAUSER
GSI/RYAN I
PLYMOUTH

O R D E R # 000131573

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632
LO-BENTOMAT ST	200034LO	00009540	.90	242.40	47.10
LO-BENTOMAT ST	200034LO	00009539	.90	242.40	47.10
LO-BENTOMAT ST	200034LO	00009538	.90	242.40	47.10
LO-BENTOMAT ST	200034LO	00009537	.90	242.40	47.10
LO-BENTOMAT ST	200034LO	00009536	.90	242.40	47.10
LO-BENTOMAT ST	200034LO	00009531	.90	242.40	47.10
LO-BENTOMAT ST	200034LO	00009530	.90	242.40	47.10
LO-BENTOMAT ST	200034LO	00009529	.90	242.40	47.10
LO-BENTOMAT ST	200034LO	00009528	.90	242.40	47.10
LO-BENTOMAT ST	200034LO	00009527	.90	242.40	47.10
LO-BENTOMAT ST	200034LO	00009526	.90	242.40	47.10
LO-BENTOMAT ST	200034LO	00009487	.89	201.40	52.90
LO-BENTOMAT ST	200034LO	00009486	.89	201.40	52.90
LO-BENTOMAT ST	200034LO	00009485	.89	201.40	52.90
LO-BENTOMAT ST	200034LO	00009484	.89	201.40	52.90
LO-BENTOMAT ST	200034LO	00009482	.89	201.40	52.90

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 ST
MQA TRACKING FORMS

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

ORDER NUMBER 000131566

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
LOT# 200033L0									
00008821	L0-BENTOMAT ST	150	2250	2719	7876068		B863821A		080900A
00008824	L0-BENTOMAT ST	150	2250	2704	7876068		B863794A		080900A
00008825	L0-BENTOMAT ST	150	2250	2707	7876068		B863794A		080900A
00008826	L0-BENTOMAT ST	150	2250	2692	7876068		B863794A		080900A
00008851	L0-BENTOMAT ST	150	2250	2693	7873892		B863801A		080900B
00008853	L0-BENTOMAT ST	150	2250	2690	7873892		B863801A		080900B
00008854	L0-BENTOMAT ST	150	2250	2701	7897981		B863801A		080900B
00008855	L0-BENTOMAT ST	150	2250	2702	7897981		B863801A		080900B
00008856	L0-BENTOMAT ST	150	2250	2708	7897981		B863801A		080900B
00008858	L0-BENTOMAT ST	150	2250	2691	7897981		B862216A		080900B
00008859	L0-BENTOMAT ST	150	2250	2692	7897981		B862216A		080900B
LOT# 200034L0									
00009572	L0-BENTOMAT ST	150	2250	2769	7894138		B863956A		081800A
00009573	L0-BENTOMAT ST	150	2250	2813	7894138		B863956A		081800A
00009574	L0-BENTOMAT ST	150	2250	2793	7894138		B863956A		081800A
00009575	L0-BENTOMAT ST	150	2250	2805	7894138		B863956A		081800A
00009576	L0-BENTOMAT ST	150	2250	2808	7894138		B863857A		081800A
00009577	L0-BENTOMAT ST	150	2250	2759	7894138		B863857A		081800A

TOTAL SQUARE FEET..... 38,250

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

ORDER NUMBER 000131568

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
LOT# 200031L0									
00007909	L0-BENTOMAT ST	150	2250	2642	8181170		5209935A		0729008
LOT# 200034L0									
00009114	L0-BENTOMAT ST	150	2250	2805	7885341		B863805A		081400A
00009216	L0-BENTOMAT ST	150	2250	2810	7876073		B864108A		081400C
00009217	L0-BENTOMAT ST	150	2250	2782	7876073		B864108A		081400C
00009501	L0-BENTOMAT ST	150	2250	2799	7893805		B863886A		081700B
00009502	L0-BENTOMAT ST	150	2250	2783	7893805		B863886A		081700B
00009504	L0-BENTOMAT ST	150	2250	2755	7893805		B863886A		081700B
00009541	L0-BENTOMAT ST	150	2250	2808	8001453		B863860A		081800A
00009542	L0-BENTOMAT ST	150	2250	2764	8001453		B863860A		081800A
00009549	L0-BENTOMAT ST	150	2250	2768	7902432		B863923A		081800A
00009550	L0-BENTOMAT ST	150	2250	2761	7902432		B863927A		081800A
00009551	L0-BENTOMAT ST	150	2250	2744	7902432		B863927A		081800A
00009559	L0-BENTOMAT ST	150	2250	2781	7902432		B863927A		081800A
00009560	L0-BENTOMAT ST	150	2250	2802	7902432		B863927A		081800A
00009561	L0-BENTOMAT ST	150	2250	2798	7902432		B863927A		081800A
00009562	L0-BENTOMAT ST	150	2250	2796	7902432		B863927A		081800A

TOTAL SQUARE FEET..... 36,000

TOTAL PAGES 1

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

ORDER NUMBER 00013156B

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
LOT# 200031L0									
00007909	L0-BENTOMAT ST	150	2250	2642	8181170		5209935A		072900B
LOT# 200034L0									
00009114	L0-BENTOMAT ST	150	2250	2805	7885341		B863805A		081400A
00009216	L0-BENTOMAT ST	150	2250	2810	7876073		B864108A		081400C
00009217	L0-BENTOMAT ST	150	2250	2782	7876073		B864108A		081400C
00009501	L0-BENTOMAT ST	150	2250	2799	7893805		B863886A		081700B
00009502	L0-BENTOMAT ST	150	2250	2783	7893805		B863886A		081700B
00009504	L0-BENTOMAT ST	150	2250	2755	7893805		B863886A		081700B
00009541	L0-BENTOMAT ST	150	2250	2808	8001453		B863860A		081800A
00009542	L0-BENTOMAT ST	150	2250	2764	8001453		B863860A		081800A
00009549	L0-BENTOMAT ST	150	2250	2768	7902432		B863923A		081800A
00009550	L0-BENTOMAT ST	150	2250	2761	7902432		B863927A		081800A
00009551	L0-BENTOMAT ST	150	2250	2744	7902432		B863927A		081800A
00009559	L0-BENTOMAT ST	150	2250	2781	7902432		B863927A		081800A
00009560	L0-BENTOMAT ST	150	2250	2802	7902432		B863927A		081800A
00009561	L0-BENTOMAT ST	150	2250	2798	7902432		B863927A		081800A
00009562	L0-BENTOMAT ST	150	2250	2796	7902432		B863927A		081800A

TOTAL SQUARE FEET..... 36,000

TOTAL PAGES 1

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

ORDER NUMBER 000131571

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
LOT# 200034L0									
00009592	L0-BENTOMAT ST	150	2250	2731	7897978		B850930A		0818008
00009593	L0-BENTOMAT ST	150	2250	2766	7897978		B850930A		0818008
00009594	L0-BENTOMAT ST	150	2250	2759	7897978		B850930A		0818008
00009595	L0-BENTOMAT ST	150	2250	2765	7897978		B850930A		0818008
00009596	L0-BENTOMAT ST	150	2250	2762	7897978		B850930A		0818008
00009597	L0-BENTOMAT ST	150	2250	2771	7897978		B864005A		0818008
00009598	L0-BENTOMAT ST	150	2250	2780	7897978		B864005A		0818008
00009599	L0-BENTOMAT ST	150	2250	2769	7897978		B864005A		0818008
00009600	L0-BENTOMAT ST	150	2250	2772	7897978		B864005A		0818008
00009601	L0-BENTOMAT ST	150	2250	2780	7897978		B864005A		0818008
00009602	L0-BENTOMAT ST	150	2250	2866	7897978		B864005A		0818008
00009603	L0-BENTOMAT ST	150	2250	2768	7897978		B864005A		0818008
00009604	L0-BENTOMAT ST	150	2250	2736	7897978		B864005A		0818008
00009605	L0-BENTOMAT ST	150	2250	2746	7897978		B864005A		0818008
00009606	L0-BENTOMAT ST	150	2250	2806	7897978		200027VR	00001012	0818008
00009607	L0-BENTOMAT ST	150	2250	2801	7897978		200027VR	00001012	0818008

TOTAL SQUARE FEET..... 36,000

@CG#TF1 @CT#TF1
8/21/00 8:37:51

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

ORDER NUMBER 000131567

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
LOT# 200034L0									
00009545	L0-BENTOMAT ST	150	2250	2790	8001453		B863860A		081800A
00009546	L0-BENTOMAT ST	150	2250	2768	7902432		B863860A		081800A
00009547	L0-BENTOMAT ST	150	2250	2784	7902432		B863923A		081800A
00009548	L0-BENTOMAT ST	150	2250	2774	7902432		B863923A		081800A
00009552	L0-BENTOMAT ST	150	2250	2772	7902432		B863927A		081800A
00009554	L0-BENTOMAT ST	150	2250	2770	7902432		B863927A		081800A
00009555	L0-BENTOMAT ST	150	2250	2769	7902432		B863927A		081800A
00009556	L0-BENTOMAT ST	150	2250	2790	7902432		B863923A		081800A
00009557	L0-BENTOMAT ST	150	2250	2789	7902432		B863927A		081800A
00009558	L0-BENTOMAT ST	150	2250	2826	7902432		B863923A		081800A
00009563	L0-BENTOMAT ST	150	2250	2822	7902432		B863927A		081800A
00009564	L0-BENTOMAT ST	150	2250	2739	7902432		B863927A		081800A
00009565	L0-BENTOMAT ST	150	2250	2734	7902432		B863927A		081800A
00009566	L0-BENTOMAT ST	150	2250	2736	7902432		B863927A		081800A
00009567	L0-BENTOMAT ST	150	2250	2737	7894138		B863927A		081800A
00009568	L0-BENTOMAT ST	150	2250	2717	7894138		B863956A		081800A

TOTAL SQUARE FEET..... 36,000

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

ORDER NUMBER 000131572

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
LOT# 200031L0									
00007837	L0-BENTOMAT ST	150	2250	2646	8223647		5209913A		072900A
00007838	L0-BENTOMAT ST	150	2250	2627	8223647		5209913A		072900A
00007857	L0-BENTOMAT ST	150	2250	2642	8085606		5209930A		072900A
00007858	L0-BENTOMAT ST	150	2250	2629	8085606		5209930A		072900A
00007859	L0-BENTOMAT ST	150	2250	2628	8085606		5209930A		072900A
00007860	L0-BENTOMAT ST	150	2250	2685	8085606		5209930A		072900A
00007881	L0-BENTOMAT ST	150	2250	2673	8070715		B862232A		072900A
00007882	L0-BENTOMAT ST	150	2250	2672	8070715		B862232A		072900A
00007883	L0-BENTOMAT ST	150	2250	2668	8070715		B862242A		072900A
00007884	L0-BENTOMAT ST	150	2250	2669	8070715		B862242A		072900A
00007885	L0-BENTOMAT ST	150	2250	2649	8070715		B862242A		072900A
00007903	L0-BENTOMAT ST	150	2250	2624	8181170		5209935A		072900B
00007904	L0-BENTOMAT ST	150	2250	2612	8181170		5209935A		072900B
00007905	L0-BENTOMAT ST	150	2250	2594	8181170		5209935A		072900B
00007906	L0-BENTOMAT ST	150	2250	2617	8181170		5209935A		072900B
00007907	L0-BENTOMAT ST	150	2250	2629	8181170		5209935A		072900B
LOT# 200034L0									
00009214	L0-BENTOMAT ST	150	2250	2782	7876073		B864108A		081400C

TOTAL SQUARE FEET..... 38,250

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

ORDER NUMBER 000131573

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
LOT# 200034L0									
00009482	L0-BENTOMAT ST	150	2250	2831	7902435		200028VR	00001037	081700B
00009484	L0-BENTOMAT ST	150	2250	2766	7902435		200028VR	00001037	081700B
00009485	L0-BENTOMAT ST	150	2250	2748	7893805		B863840A		081700B
00009486	L0-BENTOMAT ST	150	2250	2753	7893805		B863840A		081700B
00009487	L0-BENTOMAT ST	150	2250	2741	7893805		B863840A		081700B
00009526	L0-BENTOMAT ST	150	2250	2757	8001453		B863869A		081800A
00009527	L0-BENTOMAT ST	150	2250	2761	8001453		B863869A		081800A
00009528	L0-BENTOMAT ST	150	2250	2765	8001453		B863869A		081800A
00009529	L0-BENTOMAT ST	150	2250	2764	8001453		B863869A		081800A
00009530	L0-BENTOMAT ST	150	2250	2762	8001453		B863869A		081800A
00009531	L0-BENTOMAT ST	150	2250	2762	8001453		B863855A		081800A
00009536	L0-BENTOMAT ST	150	2250	2772	8001453		B863855A		081800A
00009537	L0-BENTOMAT ST	150	2250	2776	8001453		B863855A		081800A
00009538	L0-BENTOMAT ST	150	2250	2784	8001453		B863855A		081800A
00009539	L0-BENTOMAT ST	150	2250	2779	8001453		B863855A		081800A
00009540	L0-BENTOMAT ST	150	2250	2780	8001453		B863860A		081800A

TOTAL SQUARE FEET..... 36,000

TOTAL PAGES 1

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

Date: August 23, 2000
PO: 2732-000-OD
Order #: 131565

Mary Cruthirds,
GSE Lining Technology, Inc.
19103 Gundle Road
Houston TX. 77073
800-435-2008

Dear Mary Cruthirds,

Please find enclosed the MQA/MQC Data Package for BENTOMAT ST shipments to GSE Lining Technology, Inc. . These shipments left our CETCO - Lovell, Wy. plant on 8/22 .

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 ST

MANUFACTURING
QA / QC DATA PACKAGE

PROJECT NAME: **Wyerhauser Cell 1A**
Plymouth, NC. 27962

CUSTOMER P.O.: **2732-000-OD**

PREPARED FOR: **GSE Lining Technology, Inc.**
19103 Gundle Road
Houston TX. 77073
Telephone # : **800-435-2008**

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: **ngarc@cetco.com**

BENTOMAT ST

DAILY MANUFACTURING
QA / QC DATA

FOR ALL GCL MANUFACTURED ON:

Project Name:	Wyerhauser Cell 1A
Prepared For:	GSE Lining Technology, Inc.
Customer PO:	2732-000-OD
Order Number:	131565
Ship Date:	8/22

CONTENTS:

1. DAILY GCL PRODUCTION CERTIFICATION
2. NEEDLE DETECTION CERTIFICATION
3. BENTONITE CLAY CERTIFICATION
4. WOVEN GEOTEXTILE MANUFACTURER'S CERTIFICATION
5. NON-WOVEN GEOTEXTILE MANUFACTURER'S CERTIFICATION
6. GCL MANUFACTURING CERTIFICATION AND TEST RESULTS
7. GCL MQA TRACKING FORM

DAILY BENTOMAT ST PRODUCTION
PRODUCTION CERTIFICATION

BENTOMAT ST
MANUFACTURING CERTIFICATION

Project Name:	Wyerhauser Cell 1A
Prepared For:	GSE Lining Technology, Inc.
Customer PO:	2732-000-OD
Order Number:	131565
Ship Date:	22-Aug

Colloid Environmental Technologies Company (**CETCO**) hereby affirms and certifies that all of the BENTOMAT ST 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 23rd day of August 2000.

A. Christine Somer
Notary-Public

A. CHRISTINE SOMER - Notary Public
County of Big Horn
State of Wyoming
My Commission Expires 8-22-2002

NEEDLE DETECTION CERTIFICATION

CERTIFICATION STATEMENT

Project Name:	Wyerhauser Cell 1A
Prepared For:	GSE Lining Technology, Inc.
Customer PO:	2732-000-OD
Order Number:	131565
Ship Date:	22-Aug

This statement is to certify that all components of the BENTOMAT ST 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 23rd day of August 2000.

A. Christine Somer
NOTARY PUBLIC

A. CHRISTINE SOMER - Notary Public
County of Big Horn
State of Wyoming
My Commission Expires 8-22-2002

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

BENTONITE
CERTIFICATE OF ANALYSIS

CETCO
92 HWY. 37
LOVELL, WY 82431

TO: **GSE Lining Technology, Inc.** DATE: **8/22/00**

ATTN: **Mary Cruthirds,**

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 **082200A** 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**
Bentonite Free Swell	ASTM D 5890	24 mL / 2g MIN.	**26.0**
Bentonite Fluid Loss	ASTM D 5891	18.0 mL (MAX)	**16.0**
Moisture	ASTM D 2216	12.0 % (MAX)	**8.0**
Passing 200 Mesh	ASTM D 421	1 % (Max)	**0.2**

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: **RP, SF, JT**

Approved By: **Noe Garcia**

In any correspondence regarding this shipment, please refer to our Order Numbers listed below.
131565

WOVEN GEOTEXTILE
MANUFACTURER'S CERTIFICATION

TECHNICAL DATA SHEET

ORIGIN INFORMATION

WOVEN GEOTEXTILE

Manufacturer: **Synthetic Industries Inc.**

PRODUCTION

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

Contact: Randy Johnson

Brand Name: 82 Tex.

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/21/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80061459 PO 75690
Ref:

This is to certify that Product 82TEX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				()		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kpa)	265			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.5)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.48		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely

Patti Weaver
Technical Manager
Geosynthetics Products 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 specification named hereon. ANY IMPLIED WARRANTY FOR FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 or 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 8/20/2000

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

Bill Of Lading # 80061459

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4632 GRAB ELONGATION (%) W x F	ASTM D-3786 MULLEN BURST PSI	ASTM D-5261 MASS/UNIT AREA OZ/SQ YARD
Product :	**82-TEX**			
7851272	168 x 137	22 x 23	322	3.4
7851322	152 x 142	19 x 20	322	3.5
7861084	153 x 138	20 x 23	294	3.4
7862367	159 x 135	20 x 21	318	3.4
7865046	164 x 135	23 x 24	321	3.4
7865052	168 x 135	23 x 24	292	3.4
7866768	167 x 141	22 x 22	329	3.5
7867669	167 x 135	23 x 22	319	3.5
7868179	170 x 140	23 x 24	307	3.5
7868966	173 x 141	22 x 23	337	3.5
7869272	171 x 135	23 x 22	317	3.4
7874591	149 x 135	22 x 23	302	3.4
7874592	151 x 136	22 x 24	321	3.4
7874595	151 x 135	20 x 21	305	3.4
7874601	149 x 135	19 x 20	315	3.4
7876072	157 x 135	20 x 21	286	3.4
7878662	159 x 135	20 x 21	285	3.4
7880720	157 x 135	20 x 22	319	3.5
7880929	169 x 143	22 x 23	307	3.4
7882860	171 x 141	21 x 23	323	3.4
7882861	170 x 135	23 x 20	307	3.5
7884436	167 x 136	23 x 22	313	3.5
7884437	163 x 143	22 x 20	309	3.4
7884480	165 x 135	21 x 21	311	

Patti Weaver

NON-WOVEN GEOTEXTILE MANUFACTURER'S CERTIFICATION

TECHNICAL DATA SHEET

ORIGIN INFORMATION

NON-WOVEN GEOTEXTILE

Manufacturer:	**Colloid Environmental Technologies Co.**
PRODUCTION FACILITY:	**Colloid Environmental Technologies Co.** **102 Conners Road** **Villa Rica, GA 30180**
CONTACT:	Debbie Bivins 404-459-4995
BRAND NAME:	Standard

NON-WOVEN GEOTEXTILE MANUFACTURING CERTIFICATION

Project Name:	Wyerhauser Cell 1A
Prepared For:	GSE Lining Technology, Inc.
Customer PO:	2732-000-OD
Order Number:	131565
Ship Date:	22-Aug

CETCO hereby affirms and certifies that the Non-Woven geotextile in the **BENTOMAT ST** product for the above project has been manufactured to meet the following physical properties.

PROPERTY	TEST METHOD	MINIMUM VALUE
Mass / Area	ASTM D-5261	6.0 OZ./SQ.YD.
Grab Strength	ASTM D-4632	6.0 Lbs.

COLLOID ENVIRONMENTAL TECHNOLOGIES CO. (**CETCO**)

Subscribed and sworn to before me this 23rd day of August 2000.

A. Christine Somer
NOTARY PUBLIC

A. CHRISTINE SOMER - Notary Public
County of Big Horn
State of Wyoming
My Commission Expires 8-22-2002

COLLOID ENVIRONMENTAL TECH CO
GEOTEXTILE QC DATA

LOVELL AMERICAN COLLOID

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

O R D E R # 000131565

MATERIAL	LOT#	ROLL#	GEOTEXTILE 6.0oz/sy mv ASTM D 5261	GRAB STRENGTH 6.0 lbs marv ASTM D 4632
LO-NON-WOVEN	200028VR	00001030	6.5	14.2
LO-NON-WOVEN	200028VR	00001032	6.5	14.2

TOTAL PAGES 1

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

8/17/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80060996 PO 75688
Ref:

This is to certify that Product GEOTEX 650 , a nonwoven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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	MARV		SI Unit	
Mass Per Unit Area	ASTM D-5261	6.0	oz/yd2	(203.4)	g/m2
Thickness	ASTM D-5199	120	mils	(3.048)	mm
Tensile Strength	ASTM D-4632	45	lbs	(200.25)	N
Elongation	ASTM D-4632	90	%	90	%
Trapezoidal Tear	ASTM D-4533	25	lbs	(111.25)	N
Mullen Burst	ASTM D-3786	190	psi	(1309.8	kPa
Puncture Strength	ASTM D-4833	50	lbs	(222.5)	N
A.O.S.	ASTM D-4751		Sieve		mm
Permittivity	ASTM D-4491		sec-1		sec-1
Permeability	ASTM D-4491		cm/sec		cm/sec
Water Flow Rate	ASTM D-4491		gpm/ft2	()	lpm/m2
UV Resistance	ASTM D-4355		%		%

Strength Retained after 500 hours exposure in Xenon Arc Weatherometer

Sincerely

Patti Weaver

Patti Weaver
Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF IT IS CONTRARY TO THE FOREGOING CONTENDS 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 8/24/2000

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: 80060996

PoNumber: 75688
ShpDate: 8/15/2000
CustomerNumber: 4853

Roll Number	Style	Mass	Thickness	Tensile		Elongation		Trap Tear		Burst	Puncture
				MD	CD	MD	CD	MD	CD		
		Osy	mils	lbs	lbs	%	%	lbs	lbs	psi	lbs
		D5261	D5199	D4632	D4632	D4632	D4632	D4533	D4533	D3786	D4833
B863853A	650	6.8	147	79	116	133	118	42	41	196	68
B863868A	650	6.7	147	83	158	129	125	45	45	230	74
B863885A	650	7.6	148	97	164	162	118	50	62	236	67
B863891A	650	7.4	147	91	171	130	123	65	72	251	91
B863925A	650	6.9	135	92	146	139	118	60	52	221	73

Patti Weaver

BENTOMAT ST
QUALITY TEST RESULTS

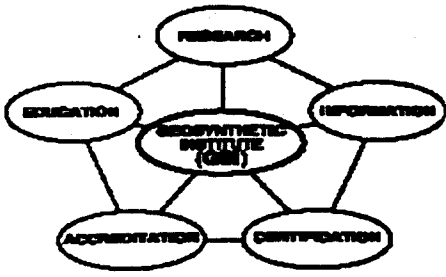
BENTOMAT ST
MANUFACTURING CERTIFICATION

Project Name:	Wyerhauser Cell 1A
Prepared For:	GSE Lining Technology, Inc.
Customer PO:	2732-000-OD
Order Number:	131565
Ship Date:	22-Aug

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

PROPERTY	TEST METHOD	MINIMUM VALUE
Peel Strength	ASTM D 4632	**15 lbs (65 N)**
Bentonite Free Swell	ASTM D 5890	**24 mL / 2g MIN.**
Bentonite Fluid Loss	ASTM D 5891	**18.0 mL (MAX)**
Bentonite Mass / Area	ASTM D 5993	*** .75 lb/sq.ft. (Min.)**
Grab Strength	ASTM D 4632	**90 lbs. (400 N)**
Grab Elongation	ASTM D 4632	**15 Percent Typical**
Permeability	ASTM D 5084	**5 x 10 (-9) cm/sec. (Max)**
Index Flux	ASTM D 5887	**1.0 x 10 (-8) m(3)/m(2)/sec. (max.)**

*** 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 23rd day of August 2000.

Notary Public

A. CHRISTINE SOMER - Notary Public
County of Big Horn State of Wyoming
My Commission Expires: 8-22-2002

QCG8FT2 QCT8FT2
8/23/00 9:49:11

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL AMERICAN COLLOID

SHIP TO: WYERHAUSER
GSI/RYAN I
PLYMOUTH

O R D E R # 000131565

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632
LO-BENTOMAT ST	200035LO	00009859	.87	117.90	53.70
LO-BENTOMAT ST	200035LO	00009858	.87	117.90	53.70
LO-BENTOMAT ST	200035LO	00009857	.87	117.90	53.70
LO-BENTOMAT ST	200035LO	00009856	.87	117.90	53.70
LO-BENTOMAT ST	200035LO	00009854	.87*	117.90	53.70*
LO-BENTOMAT ST	200035LO	00009853	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009852	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009851	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009850	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009849	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009848	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009847	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009846	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009845	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009844	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009843	.88	117.90	48.60

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 ST
MQA TRACKING FORMS

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

ORDER NUMBER 000131565

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
LOT# 200035L0									
00009843	L0-BENTOMAT ST	150	2250	2777	7872595		200028VR	00001032	082200A
00009844	L0-BENTOMAT ST	150	2250	2774	7872595		200028VR	00001032	082200A
00009845	L0-BENTOMAT ST	150	2250	2776	7872595		200028VR	00001032	082200A
00009846	L0-BENTOMAT ST	150	2250	2781	7872595		200028VR	00001032	082200A
00009847	L0-BENTOMAT ST	150	2250	2771	7872595		200028VR	00001032	082200A
00009848	L0-BENTOMAT ST	150	2250	2779	7872595		200028VR	00001032	082200A
00009849	L0-BENTOMAT ST	150	2250	2788	7872595		200028VR	00001032	082200A
00009850	L0-BENTOMAT ST	150	2250	2766	7872595		200028VR	00001032	082200A
00009851	L0-BENTOMAT ST	150	2250	2730	7872595		B863873A		082200A
00009852	L0-BENTOMAT ST	150	2250	2751	7872595		B863873A		082200A
00009853	L0-BENTOMAT ST	150	2250	2754	7872595		B863873A		082200A
00009854	L0-BENTOMAT ST	150	2250	2745	7876072		B863873A		082200A
00009856	L0-BENTOMAT ST	150	2250	2777	7876072		B863873A		082200A
00009857	L0-BENTOMAT ST	150	2250	2744	7876072		B863873A		082200A
00009858	L0-BENTOMAT ST	150	2250	2739	7876072		B863873A		082200A
00009859	L0-BENTOMAT ST	150	2250	2725	7876072		200028VR	00001030	082200A

TOTAL SQUARE FEET..... 36,000

TOTAL PAGES 1

GSE Lining Technology, Inc.

LETTER OF TRANSMITTAL

02
Randy Flatt
GSI
W239 N 428 Pewaukee Road
Waukesha, WI 53188

DATE: August 25, 2000
JOB NO: SO14021
JOB NAME: Weyerhauser Cell
RE: MQA/MQC Data Package

COPIES	DESCRIPTION
1	Bentomat ST 8/22/00 and Woven Geotextile Manufacturer's Certification.

TRANSMIT VIA:

U.S. Mail

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

SIGNED: Mary Cruthirds
DATE: August 25, 2000

WOVEN GEOTEXTILE
MANUFACTURER'S CERTIFICATION

TECHNICAL DATA SHEET

ORIGIN INFORMATION

WOVEN GEOTEXTILE

Manufacturer: **Synthetic Industries Inc.**

PRODUCTION

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

Contact: Randy Johnson

Brand Name: 82 Tex.

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/17/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80061016 PO 75689
Ref:

This is to certify that Product 82TEX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				()		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kpa)	265			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.5)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.46		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely

Patti Weaver

Patti Weaver
Technical Manager
Geosynthetics Products Division

Seller makes no warranty express or implied concerning the product furnished hereunder other than as 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 IF 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 sold product are believed reliable and Seller makes no warranty or implies in its reliance. If the products 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 8/29/2000

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7610 • 1-800-621 0444

Bill Of Lading # 80061016

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4632 GRAB ELONGATION (%) W x F	ASTM D-378G MULLEN BURST PSI	ASTM D-5261 MASS/UNIT AREA OZ/SQ YARD
Product :	82-TEX			
7860869	166 x 135	21 x 22	312	3.4
7868650	162 x 136	21 x 22	297	4.1
7868959	157 x 142	21 x 20	346	3.5
7869269	169 x 152	24 x 20	347	3.6
7887517	160 x 150	21 x 24	317	3.5
7891117	175 x 138	23 x 23	318	3.5
7892273	154 x 135	22 x 22	301	3.4
7893796	157 x 135	22 x 24	314	3.5
7893805	154 x 139	20 x 26	298	3.5
7894138	161 x 135	22 x 21	279	3.5
7897976	151 x 138	21 x 23	282	3.5
7897977	160 x 149	23 x 25	301	3.7
7897978	155 x 135	20 x 31	316	3.6
7897979	163 x 135	22 x 23	288	3.5
7899024	175 x 140	23 x 23	321	3.6
7901353	172 x 139	23 x 24	313	3.5
7901960	159 x 139	21 x 22	308	3.4
7901961	178 x 146	23 x 22	335	3.7
7901965	170 x 143	22 x 21	320	3.5
7902431	151 x 138	20 x 22	310	3.4
7902432	175 x 139	23 x 23	317	3.5
7910245	156 x 135	20 x 23	285	3.5
7912390	155 x 135	21 x 24	308	3.4
8001453	154 x 135	22 x 24	300	3.5

Patti Weaver

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/4/2000

American Colloid Cetco WY
Noe Garcia
PO Box 426
Lovell WY 82431
BOL 80058649 PO 75880
Ref:

This is to certify that Product 62TEX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				()		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kpa)	265			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.5)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.46		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely,

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 type and is subject to change without notice. The effective date for this product data is 8/28/2000

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

Bill Of Lading # 80058644

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4632 GRAB ELONGATION (%) W x F	ASTM D-3786 MULLEN BURST PSI	ASTM D-5261 MASS/UNIT AREA OZ/SQ YARD
Product :	**82-TEX**			
7850784	176 x 144	23 x 21	326	3.4
7866240	164 x 136	23 x 22	297	3.4
7868651	162 x 145	21 x 23	322	3.4
7868658	176 x 137	23 x 20	332	3.6
7868967	171 x 147	24 x 23	323	3.4
7869526	167 x 150	22 x 26	338	3.4
7874594	158 x 139	20 x 32	312	3.4
7874598	147 x 135	19 x 23	308	3.3
7874599	152 x 143	20 x 22	282	3.4
7876068	169 x 135	22 x 20	329	3.4
7880038	159 x 138	21 x 24	293	3.4
7880183	163 x 136	22 x 22	312	3.3
7885336	157 x 135	21 x 21	288	3.3
7893797	157 x 140	22 x 24	327	3.5
7896335	156 x 135	21 x 24	313	3.4
7897981	160 x 135	20 x 23	296	3.6
7899022	166 x 135	22 x 22	293	3.5
7899693	178 x 155	24 x 24	340	3.7
7899695	168 x 150	23 x 23	312	3.5
7901790	178 x 137	24 x 22	310	3.4
7901963	170 x 135	22 x 22	325	3.5
7903642	166 x 141	21 x 22	303	3.4
7912347	142 x 138	22 x 29	307	3.5
7912436	161 x 135	21 x 24	299	3.5

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/4/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
ROI 80057411 PO 75680
Ref:

This is to certify that Product 8ZTEX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				()		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kpa)	265			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.5)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.46		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely,

Warren Sickler
Senior Technical Manager
Geosynthetics Products Division

Seller makes no warranty express or implied concerning the product furnished hereunder other than as the time of delivery it shall be of the quality and specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 but 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 8/28/2000

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

Bill Of Lading # 80057411

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4632 GRAB ELONGATION (%) W x F	ASTM D-3786 MULLEN BURST PSI	ASTM D-5261 MASS/UNIT AREA OZ/SQ YARD
Product :	82-TEX			
7866239	169 x 135	22 x 25	307	3.4
7867675	151 x 137	20 x 23	299	3.5
7868173	155 x 146	20 x 22	302	3.5
7868653	172 x 144	23 x 22	316	3.5
7871169	159 x 143	22 x 22	321	3.5
7873869	148 x 136	19 x 22	299	3.3
7873872	155 x 145	20 x 23	295	3.4
7874593	138 x 135	18 x 24	292	3.4
7874600	160 x 135	20 x 22	281	3.5
7876071	145 x 135	19 x 20	305	3.3
7876073	150 x 135	19 x 22	295	3.3
7877445	173 x 151	23 x 23	313	3.5
7877445	168 x 145	24 x 25	320	3.5
7878660	159 x 140	21 x 26	309	3.4
7878661	156 x 135	20 x 19	290	3.3
7880036	161 x 145	20 x 27	298	3.5
7880059	156 x 135	20 x 23	298	3.4
7880628	168 x 142	23 x 30	316	3.5
7884619	175 x 143	23 x 23	325	3.5
7884620	163 x 135	22 x 22	304	3.5
7885252	164 x 135	22 x 21	292	3.4
7901356	170 x 144	23 x 23	302	3.5
7902435	171 x 138	21 x 23	319	3.4
7903641	163 x 141	21 x 23	313	3.5

Karen Gibbs

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

7/25/2000

American Colloid Cetco W
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80055438 PO 75671
Ref:

This is to certify that Product 82TEX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				()		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kpa)	265			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.3)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.46		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely,

Warren Sickler
Senior Technical Manager
Geosynthetics Products Division

Seller makes no warranty express or implied concerning the product furnished hereunder either than at the time of delivery it shall be of the quality and specification 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 normal published specifications, and the Purchaser 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 6/29/2000

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7019 • 1-800-621-0444

Bill Of Lading # 80055438

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4632 GRAB ELONGATION (%) W x F	ASTM D-3786 MULLEN BURST PSI	ASTM D-5261 MASS/UNIT AREA OZ/SQ YARD
Product :	**82-TEX**			
7878667	168 x 144	22 x 24	315	3.7
7882867	153 x 135	19 x 21	326	3.4
7884440	167 x 138	23 x 22	301	3.5
7884626	168 x 135	22 x 22	310	3.5
7885267	154 x 138	22 x 23	312	3.4
7885341	162 x 142	23 x 22	302	3.6
7887512	154 x 144	20 x 24	328	3.5
7887513	162 x 145	20 x 23	314	3.4
7892267	158 x 135	24 x 25	306	3.5
7892268	162 x 135	21 x 22	326	3.5
7893792	168 x 153	21 x 21	303	3.6
7893799	140 x 137	18 x 23	296	3.4
7894135	167 x 137	22 x 22	306	3.5
7894588	167 x 148	20 x 24	315	3.5
7896339	162 x 135	22 x 23	302	3.5
7910263	161 x 135	21 x 21	318	3.5
8017978	145 x 135	20 x 22	347	3.3
8072004	166 x 144	24 x 25	337	3.5
8160979	159 x 135	21 x 17	337	3.5
8160979	163 x 135	23 x 15	347	3.5
Product :	**82TEX184**			
8202101	160 x 172	21 x 16	423	3.6
8206708	168 x 159	20 x 16	370	3.7
8215680	165 x 146	20 x 15	370	3.4
8215684	171 x 142	20 x 15	357	3.6
8223646	165 x 158	21 x 17	360	3.6

Warren Sibley

8/3/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80056348 PO
Ref:

This is to certify that Product 82TFX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				0		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kps)	285			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.5)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.46		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 6/29/2000

Bill Of Lading # 80056348

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4632 GRAB ELONGATION (%) W x F	ASTM D-3786 MULLEN BURST PSI	ASTM D-5261 MASS/UNIT AREA OZ/SQ YARD
Product :	**82-TEX**			
7884443	172 x 148	22 x 23	318	3.5
7884627	160 x 143	22 x 22	316	3.5
7900350	171 x 143	25 x 29	311	3.6
7909683	156 x 135	20 x 23	310	3.4
8070715	149 x 138	18 x 23	330	3.5
8085606	164 x 152	23 x 16	354	3.7
8104263	157 x 153	22 x 18	353	3.8
8109548	174 x 142	23 x 16	380	3.6
8109549	172 x 180	23 x 18	373	3.8
8110821	166 x 156	21 x 16	370	3.7
8128342	173 x 142	24 x 15	363	3.7
8177234	151 x 149	21 x 16	360	3.7
8179962	174 x 141	21 x 17	367	3.5
8181170	171 x 135	21 x 16	360	3.5
8182791	172 x 160	22 x 17	362	3.7
8186838	171 x 158	25 x 17	370	3.7
Product :	**82TEX184**			
8218836	159 x 149	20 x 17	350	3.6
8218838	175 x 146	21 x 16	373	3.6
8219139	156 x 147	19 x 15	348	3.7
8223647	159 x 151	20 x 16	355	3.7
8228953	159 x 149	20 x 15	360	3.7
8228954	163 x 140	22 x 16	320	3.6
8231445	149 x 137	18 x 16	317	3.6
8238433	160 x 151	20 x 16	348	3.7

BENTOMAT ST
QUALITY TEST RESULTS

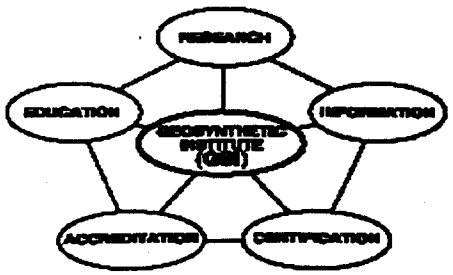
BENTOMAT ST
MANUFACTURING CERTIFICATION

Project Name:	Wyerhauser Cell 1A
Prepared For:	GSE Lining Technology, Inc.
Customer PO:	2732-000-OD
Order Number:	131565
Ship Date:	22-Aug

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

PROPERTY	TEST METHOD	MINIMUM VALUE
Peel Strength	ASTM D 4632	**15 lbs (65 N)**
Bentonite Free Swell	ASTM D 5890	**24 mL / 2g MIN.**
Bentonite Fluid Loss	ASTM D 5891	**18.0 mL (MAX)**
Bentonite Mass / Area	ASTM D 5993	*** .75 lb/sq.ft. (Min.)**
Grab Strength	ASTM D 4632	**90 lbs. (400 N)**
Grab Elongation	ASTM D 4632	**15 Percent Typical**
Permeability	ASTM D 5084	**5 x 10 (-9) cm/sec. (Max)**
Index Flux	ASTM D 5887	**1.0 x 10 (-8) m(3)/m(2)/sec. (max.)**

*** 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 23rd day of August 2000.

A. Christine Somer
Notary Public

A. CHRISTINE SOMER - Notary Public
County of Big Horn
State of Wyoming
My Commission Expires: 8-22-2002

QCG#FT2 QCT#FT2
8/23/00 9:49:11

COLLOID ENVIRONMENTAL TECH CO

GCL QUALITY DATA

LOVELL AMERICAN COLLOID

SHIP TO: WYERHAUSER
GSI/RYAN I
PLYMOUTH

O R D E R # 000131565

MATERIAL	LOT No.	ROLL No	BENTONITE MASS/AREA 0.75 lb/sqft ASTM D 5993	GRAB STRENGTH 90 lbs ASTM D 4632	PEEL STRENGTH 15 lbs ASTM D 4632
LO-BENTOMAT ST	200035LO	00009859	.87	117.90	53.70
LO-BENTOMAT ST	200035LO	00009858	.87	117.90	53.70
LO-BENTOMAT ST	200035LO	00009857	.87	117.90	53.70
LO-BENTOMAT ST	200035LO	00009856	.87	117.90	53.70
LO-BENTOMAT ST	200035LO	00009854	.87*	117.90	53.70*
LO-BENTOMAT ST	200035LO	00009853	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009852	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009851	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009850	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009849	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009848	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009847	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009846	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009845	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009844	.88	117.90	48.60
LO-BENTOMAT ST	200035LO	00009843	.88	117.90	48.60

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 ST
MQA TRACKING FORMS

COLLOID ENVIRONMENTAL TECH CO
GCL MQA/MQC TRACKING FORM

SHIP TO: WYERHAUSER CELL 1A & HAUL RD
GSI/RYAN INC.
PLYMOUTH NC

ORDER NUMBER 000131565

ROLL#	MATERIAL	ROLL LENGTH	SQUARE FEET	ROLL WEIGHT	GEOTEXTILE TOP LOT#	GEOTEXTILE TOP ROLL#	GEOTEXTILE BOTTOM LOT#	GEOTEXTILE BOTTOM ROLL#	CLAY LOT#
LOT# 200035L0									
00009843	L0-BENTOMAT ST	150	2250	2777	7872595		200028VR	00001032	082200A
00009844	L0-BENTOMAT ST	150	2250	2774	7872595		200028VR	00001032	082200A
00009845	L0-BENTOMAT ST	150	2250	2776	7872595		200028VR	00001032	082200A
00009846	L0-BENTOMAT ST	150	2250	2781	7872595		200028VR	00001032	082200A
00009847	L0-BENTOMAT ST	150	2250	2771	7872595		200028VR	00001032	082200A
00009848	L0-BENTOMAT ST	150	2250	2779	7872595		200028VR	00001032	082200A
00009849	L0-BENTOMAT ST	150	2250	2788	7872595		200028VR	00001032	082200A
00009850	L0-BENTOMAT ST	150	2250	2766	7872595		200028VR	00001032	082200A
00009851	L0-BENTOMAT ST	150	2250	2730	7872595		B863873A		082200A
00009852	L0-BENTOMAT ST	150	2250	2751	7872595		B863873A		082200A
00009853	L0-BENTOMAT ST	150	2250	2754	7872595		B863873A		082200A
00009854	L0-BENTOMAT ST	150	2250	2745	7876072		B863873A		082200A
00009856	L0-BENTOMAT ST	150	2250	2777	7876072		B863873A		082200A
00009857	L0-BENTOMAT ST	150	2250	2744	7876072		B863873A		082200A
00009858	L0-BENTOMAT ST	150	2250	2739	7876072		B863873A		082200A
00009859	L0-BENTOMAT ST	150	2250	2725	7876072		200028VR	00001030	082200A

TOTAL SQUARE FEET..... 36,000

TOTAL PAGES 1

GSE Lining Technology, Inc.

LETTER OF TRANSMITTAL

02
Randy Flatt
GSI
W239 N 428 Pewaukee Road
Waukesha, WI 53188

DATE: August 25, 2000
JOB NO: SO14021
JOB NAME: Weyerhauser Cell
RE: MQA/MQC Data Package

COPIES	DESCRIPTION
1	Bentomat ST 8/22/00 and Woven Geotextile Manufacturer's Certification.

TRANSMIT VIA:

U.S. Mail

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

SIGNED: Mary Cruthirds
DATE: August 25, 2000

WOVEN GEOTEXTILE
MANUFACTURER'S CERTIFICATION

TECHNICAL DATA SHEET

ORIGIN INFORMATION

WOVEN GEOTEXTILE

Manufacturer: **Synthetic Industries Inc.**

PRODUCTION

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

Contact: Randy Johnson

Brand Name: 82 Tex.

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/17/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80061016 PO 75689
Ref:

This is to certify that Product 82TEX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				()		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kpa)	265			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.5)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.46		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely

Patti Weaver

Patti Weaver
Technical Manager
Geosynthetics Products 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 IF 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 in its obtained. If this revision 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 8/28/2000

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7610 • 1-800-621 0444

Bill Of Lading # 80061016

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4622 GRAB ELONGATION (%) W x F	ASTM D-3786 MULLEN BURST PSI	ASTM D-5261 MASS/UNIT AREA OZ/SQ YARD
Product :	82-TEX			
7860869	166 x 135	21 x 22	312	3.4
7868650	162 x 136	21 x 22	297	4.1
7868959	157 x 142	21 x 20	346	3.5
7869269	169 x 152	24 x 20	347	3.6
7887517	160 x 150	21 x 24	317	3.5
7891117	175 x 138	23 x 23	318	3.5
7892273	154 x 135	22 x 22	301	3.4
7893796	157 x 135	22 x 24	314	3.5
7893805	154 x 139	20 x 26	298	3.5
7894138	161 x 135	22 x 21	279	3.5
7897976	151 x 138	21 x 23	282	3.5
7897977	160 x 149	23 x 25	301	3.7
7897978	155 x 135	20 x 31	316	3.6
7897979	163 x 135	22 x 23	288	3.5
7899024	175 x 140	23 x 23	321	3.6
7901353	172 x 139	23 x 24	313	3.5
7901960	159 x 139	21 x 22	308	3.4
7901961	178 x 146	23 x 22	335	3.7
7901965	170 x 143	22 x 21	320	3.5
7902431	151 x 138	20 x 22	310	3.4
7902432	175 x 139	23 x 23	317	3.5
7910245	156 x 135	20 x 23	285	3.5
7912390	155 x 135	21 x 24	308	3.4
8001453	154 x 135	22 x 24	300	3.5

Patti Weaver

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/4/2000

American Colloid Cetco WY
Noe Garcia
PO Box 426
Lovell WY 82431
BOL 80058649 PO 75680
Ref:

This is to certify that Product 62TEX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				()		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kpa)	265			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.5)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.46		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely

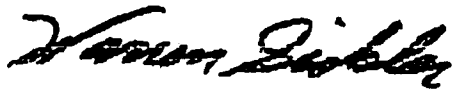
Warren Sickler
Senior Technical Manager
Geosynthetics Products Division

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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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' then 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 8/28/2000

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

Bill Of Lading # 80058644

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4632 GRAB ELONGATION (%) W x F	ASTM D-3786 MULLEN BURST PSI	ASTM D-5261 MASS/UNIT AREA OZ/SQ YARD
Product :	**82-TEX**			
7850784	176 x 144	23 x 21	326	3.4
7866240	164 x 136	23 x 22	297	3.4
7868651	162 x 145	21 x 23	322	3.4
7868658	176 x 137	23 x 20	332	3.6
7868967	171 x 147	24 x 23	323	3.4
7869526	167 x 150	22 x 26	338	3.4
7874594	158 x 139	20 x 32	312	3.4
7874598	147 x 135	19 x 23	308	3.3
7874599	152 x 143	20 x 22	282	3.4
7876068	169 x 135	22 x 20	329	3.4
7880038	159 x 138	21 x 24	293	3.4
7880183	163 x 136	22 x 22	312	3.3
7885336	157 x 135	21 x 21	288	3.3
7893797	157 x 140	22 x 24	327	3.5
7896335	156 x 135	21 x 24	313	3.4
7897981	160 x 135	20 x 23	296	3.6
7899022	166 x 135	22 x 22	293	3.5
7899693	178 x 155	24 x 24	340	3.7
7899695	168 x 150	23 x 23	312	3.5
7901790	178 x 137	24 x 22	310	3.4
7901963	170 x 135	22 x 22	325	3.5
7903642	166 x 141	21 x 22	303	3.4
7912347	142 x 138	22 x 29	307	3.5
7912436	161 x 135	21 x 24	299	3.5



SYNTHETIC INDUSTRIES

Geosynthetic Products Division

8/4/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
ROI 80057411 PO 75680
Ref:

This is to certify that Product 82TEX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				()		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kpa)	266			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.5)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.46		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 8/28/2000

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

Bill Of Lading # 80057411

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4632 GRAB ELONGATION (%) W x F	ASTM D-3786 MULLEN BURST PSI	ASTM D-5261 MASS/UNIT AREA OZ/SQ YARD
Product :	**82-TEX**			
7866239	169 x 135	22 x 25	307	3.4
7867675	151 x 137	20 x 23	299	3.5
7868173	155 x 146	20 x 22	302	3.5
7868653	172 x 144	23 x 22	316	3.5
7871169	159 x 143	22 x 22	321	3.5
7873869	148 x 136	19 x 22	299	3.3
7873872	155 x 145	20 x 23	295	3.4
7874593	138 x 135	18 x 24	292	3.4
7874600	160 x 135	20 x 22	281	3.5
7876071	145 x 135	19 x 20	305	3.3
7876073	150 x 135	19 x 22	295	3.3
7877445	173 x 151	23 x 23	313	3.5
7877445	168 x 145	24 x 25	320	3.5
7878660	159 x 140	21 x 26	309	3.4
7878661	156 x 135	20 x 19	290	3.3
7880036	161 x 145	20 x 27	298	3.5
7880059	156 x 135	20 x 23	298	3.4
7880626	168 x 142	23 x 30	316	3.5
7884619	175 x 143	23 x 23	325	3.5
7884620	163 x 135	22 x 22	304	3.5
7885252	164 x 135	22 x 21	292	3.4
7901356	170 x 144	23 x 23	302	3.5
7902435	171 x 138	21 x 23	319	3.4
7903641	163 x 141	21 x 23	313	3.5

Karen Sibley

SYNTHETIC INDUSTRIES

Geosynthetic Products Division

7/25/2000

American Colloid Cetco W
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80055438 PO 75671
Ref:

This is to certify that Product 82TEX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				()		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kpa)	265			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.5)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.46		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely,

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF IT IS CONTRARY TO THIS STATEMENT 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 normal published specifications, and the Customer gives notice to Applicable 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 6/29/2000

Synthetic Industries, Inc.
4019 Industry Drive • Chattanooga, Tennessee • 37416 • USA
Telephone • 423-899-0444 • Fax • 423-899-7019 • 1-800-621-0444

Bill Of Lading # 80055438

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4632 GRAB ELONGATION (%) W x F	ASTM D-3786 MULLEN BURST PSI	ASTM D-3261 MASS/UNIT AREA OZ/SQ YARD
Product :	**82-TEX**			
7878667	168 x 144	22 x 24	315	3.7
7882867	153 x 135	19 x 21	326	3.4
7884440	167 x 138	23 x 22	301	3.5
7884626	168 x 135	22 x 22	310	3.5
7885267	154 x 138	22 x 23	312	3.4
7885341	162 x 142	23 x 22	302	3.6
7887512	154 x 144	20 x 24	328	3.5
7887513	162 x 145	20 x 23	314	3.4
7892267	158 x 135	24 x 25	306	3.5
7892268	162 x 135	21 x 22	326	3.5
7893792	168 x 153	21 x 21	303	3.6
7893799	140 x 137	18 x 23	296	3.4
7894135	167 x 137	22 x 22	306	3.5
7894588	167 x 148	20 x 24	315	3.5
7896339	162 x 135	22 x 23	302	3.5
7910263	161 x 135	21 x 21	318	3.5
8017978	145 x 135	20 x 22	347	3.3
8072004	166 x 144	24 x 25	337	3.5
8160979	159 x 135	21 x 17	337	3.5
8160979	163 x 135	23 x 15	347	3.5
Product :	**82TEX184**			
8202101	168 x 172	21 x 16	423	3.6
8206708	168 x 159	20 x 16	370	3.7
8215680	165 x 146	20 x 15	370	3.4
8215684	171 x 142	20 x 15	357	3.6
8223646	165 x 158	21 x 17	360	3.6

Vernon Sibley

8/3/2000

American Colloid Cetco WY
Noe Garcia
PO Box 428
Lovell WY 82431
BOL 80056348 PO
Ref:

This is to certify that Product 8?TFX , a woven polypropylene geotextile produced by Synthetic Industries, will meet the following certifiable minimum average 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		MARV			SI Units		
Mass Per Unit Area	ASTM D-5261	oz/yd2 - (g/m2)	3.20			(108.48)		
Thickness	ASTM D-5199	mils - (mm				()		
Tensile Strength (Grab	ASTM D-4632	lb - (N)	135	X	135	(600.75	X	(600.75)
Elongation	ASTM D-4632	%	15	X	15			
Trapezoidal Tear	ASTM D-4533	lb - (N)	45	X	45	(200.25	X	(200.25)
Mullen Burst	ASTM D-3786	psi - (Kps)	265			(1826.9		
Puncture Strength	ASTM D-4833	lb - (N)	70			(311.5)		
AOS	ASTM D-4751	US Sieve - (mm	40			0.425		
Permittivit	ASTM D-4491	SEC-1	0.08					
Permeability -	ASTM D-4491	cm - (sec)	0.004					
Water Flow Rate	ASTM D-4491	gpm/ft - (lpm/m2)	6			(244.46		
UV Resistance-4	ASTM D-4355	% Retained	90					

Sincerely

Warren Sickler
Senior Technical Manager
Geosynthetics Products 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 specification stated herein. ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS EXPRESSLY EXCLUDED AND TO THE EXTENT THAT IF 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 6/29/2000

Bill Of Lading # 80056348

Roll #	ASTM D-4632 GRAB TENSILE (LBS) W X F	ASTM D-4632 GRAB ELONGATION (%) W x F	ASTM D-378G MULLEN BURST PSI	ASTM D-5261 MASS/UNIT AREA OZ/SQ YARD
Product :	**82-TEX**			
7884443	172 x 148	22 x 23	318	3.5
7884627	160 x 143	22 x 22	316	3.5
7900350	171 x 143	25 x 29	311	3.6
7909683	156 x 135	20 x 23	310	3.4
8070715	149 x 138	18 x 23	330	3.5
8085606	164 x 152	23 x 16	354	3.7
8104263	157 x 153	22 x 18	353	3.8
8109548	174 x 142	23 x 16	380	3.6
8109549	172 x 180	23 x 18	373	3.8
8110821	166 x 156	21 x 16	370	3.7
8128342	173 x 142	24 x 15	363	3.7
8177234	151 x 149	21 x 16	360	3.7
8179962	174 x 141	21 x 17	367	3.5
8181170	171 x 135	21 x 16	360	3.5
8182791	172 x 160	22 x 17	362	3.7
8186838	171 x 158	25 x 17	370	3.7
Product :	**82TEX184**			
8218836	159 x 149	20 x 17	350	3.6
8218838	175 x 146	21 x 16	373	3.6
8219139	156 x 147	19 x 15	348	3.7
8223647	159 x 151	20 x 16	355	3.7
8228953	159 x 149	20 x 15	360	3.7
8228954	163 x 140	22 x 16	320	3.6
8231445	149 x 137	18 x 16	317	3.6
8238433	160 x 151	20 x 16	348	3.7

Appendix K
Geosynthetic Clay Liner and Geomembrane Material Inventory Forms

WEYERHAEUSER COMPANY
LANDFILL CELL 3 PHASE 1A
PLYMOUTH, NORTH CAROLINA

GSI QAQC PAPERWORK JOB #20040

MATERIAL INVENTORY CHECKLISTS

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/17/2000	Q.C. NAME: Ruth Cox
PROJECT NAME: WEYERHAUSER	MAT. TYPE: 60 mil HDPE TEXT
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH NC	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
114103161	23.5 X 485	11397.5	
114105366	23.5 X 470	11045	8/23 8/24 57'
114107316	23.5 X 474'	11139	
114105185	23.5 X 474'	11139	8/21 8/22 8/24 FACTORY CREASE AT END OF ROLL 10'
114104074	23.5 X 485'	11397.5	8/24 206' left
114107538	23.5 X 474'	11139	8/20 25' left
114107315	23.5 X 474'	11139	8/22 8/23 8/24 21' left
114107241	23.5 X 472'	11092	8/21 22' left
114104353	23.5 X 474'	11139	
114107321	23.5 X 474'	11139	8/22 12' left
114103611	23.5 X 474'	11139	
	TOTAL	122905	
114107245	23.5 X 474'	11139	

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/17/2000	Q.C. NAME: RUTH COX
PROJECT NAME: WEYERHAUSER	MAT. TYPE: 60 mil HDPE SMOOTH
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH NC	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
115116303	23.5 X 480'	11280	8/26 412' left
115116305	23.5 X 480'	11280	
115116302	23.5 X 480'	11280	
115116289	23.5 X 480'	11280	
115116297	23.5 X 480'	11280	
115116309	23.5 X 480'	11280	
115116284	23.5 X 480'	11280	
115116288	23.5 X 480'	11280	
115116308	23.5 X 480'	11280	
115116290	23.5 X 480'	11280	
115116310	23.5 X 480'	11280	
115116287	23.5 X 480'	11280	
115116295	23.5 X 480'	11280	
115116285	23.5 X 480'	11280	
115116283	23.5 X 480'	11280	
115116304	23.5 X 480'	11280	
115116298	23.5 X 480'	11280	
115116291	23.5 X 480'	11280	
115116293	23.5 X 480'	11280	
115116282	23.5 X 480'	11280	

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/17/2000	Q.C. NAME: RUTH COX
PROJECT NAME: WEYERHAUSER	MAT. TYPE: 60 mil HDPE SMOOTH
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH NC	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
115116306	23.5 X 480'	11280	8/26
115116286	23.5' X 480'	11280	
115116296	23.5' X 480'	11280	
115116315	23.5' X 480'	11280	
115116292	23.5' X 480'	11280	
115116307	23.5' X 480'	11280	
115116294	23.5' X 480'	11280	
115116316	23.5 X 480'	11280	
115116313	23.5' X 480'	11280	
115116312	23.5' X 480'	11280	8/26
115116314	23.5' X 480'	11280	8/26
115116311	23.5' X 480'	11280	8/26
11511	TOTAL	360,960	

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/17/2000	Q.C. NAME: Ruth Cof
PROJECT NAME: WEYHAUSER	MAT. TYPE: Geotextile 32oz
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH N.C.	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
200101673	14'X 150'	2100	9/25
200101692	14'X 150'	2100	9/25
200101697	14'X 150'	2100	9/22
200101698	14'X 150'	2100	9/25
200101693	14'X 150'	2100	9/25
200101648	14'X 150'	2100	9/22
200101700	14'X 150'	2100	9/22
200101660	14'X 150'	2100	9/22
200101661	14'X 150'	2100	9/22
200101658	14'X 150'	2100	9/22
200101695	14'X 150'	2100	9/22
200101671	14'X 150'	2100	9/22
200101659	14'X 150'	2100	9/22
200101677	14'X 150'	2100	9/22
200101676	14'X 150'	2100	9/22
200101681	14'X 150'	2100	9/25
200101680	14'X 150'	2100	9/22
200101706	14'X 150'	2100	9/25
200101672	14'X 150'	2100	9/22
200101667	14'X 150'	2100	9/25

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/17/2000	Q.C. NAME: Ruth Cox
PROJECT NAME: WEYERHAUSER	MAT. TYPE: Geotextile 32 oz
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH N.C.	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
200101678	14'X150'	2100	9/25
200101707	14'X150'	2100	9/25
200101679	14'X150'	2100	9/20
200101666	14'X150'	2100	9/25
200101714	14'X150'	2100	9/22
200101704	14'X150'	2100	9/27
200101647	14'X150'	2100	9/27
200101665	14'X150'	2100	9/27
200101708	14'X150'	2100	9/27
200101713	14'X150'	2100	9/27
200101702	14'X150'	2100	9/27
200101709	14'X150'	2100	9/27
200101703	14'X150'	2100	9/27
200101705	14'X150'	2100	9/27
200101669	14'X150'	2100	9/27
200101670	14'X150'	2100	9/27
200101668	14'X150'	2100	9/27
200101663	14'X150'	2100	9/27
200101715	14'X150'	2100	9/25
200101701	14'X150'	2100	9/25

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/17/2000	Q.C. NAME: Ruth Cox
PROJECT NAME: WEYERHAEUSER	MAT. TYPE: Geotextile 32 oz
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH N.C.	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
200101699	14' X 150'	2100	9/25
200101646	14' X 150'	2100	9/25
200101662	14' X 150'	2100	9/25
200101664	14' X 150'	2100	9/25
200101649	14' X 150'	2100	9/27
9/18 200101723	14' X 150'	2100	9/25
200101729	14' X 150'	2100	9/25
200101724	14' X 150'	2100	9/27
200101740	14' X 150'	2100	9/27
200101657	14' X 150'	2100	9/27
200101721	14' X 150'	2100	9/27
200101722	14' X 150'	2100	9/27
200101728	14' X 150'	2100	9/27
200101725	14' X 150'	2100	9/27
200101741	14' X 150'	2100	9/27
200101726	14' X 150'	2100	9/25
200101738	14' X 150'	2100	9/27
200101730	14' X 150'	2100	9/27
200101727	14' X 150'	2100	9/25
200101739	14' X 150'	2100	9/27

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/18/2000	Q.C. NAME: Ruth Cox
PROJECT NAME: WEYERHAEUSER	MAT. TYPE: GEOTEXTILE 32 oz
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH NC.	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
200101710	14'X150'	2100	9/27
200101743	14'X150'	2100	9/27
200101737	14'X150'	2100	9/27
200101744	14'X150'	2100	9/27
200101654	14'X150'	2100	9/27
200101656	14'X150'	2100	9/25
200101655	14'X150'	2100	9/25
200101653	14'X150'	2100	9/25
200101720	14'X150'	2100	9/25
200101736	14'X150'	2100	9/25
200101719	14'X150'	2100	9/25
200101696	14'X150'	2100	9/22
200101682	14'X150'	2100	9/25
200101742	14'X150'	2100	9/25
200101683	14'X150'	2100	9/25
200101652	14'X150'	2100	9/22
200101712	14'X150'	2100	9/22
200101651	14'X150'	2100	9/25
200101735	14'X150'	2100	9/25
200101687	14'X150'	2100	9/25

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/18/2000	Q.C. NAME: Ruth Cox
PROJECT NAME: WEYERHAEUSER	MAT. TYPE: GEOTEXTILE 32 oz
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH N.C.	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
200101686	14' X 150'	2100	9/25
200101684	14' X 150'	2100	9/25
200101685	14' X 150'	2100	9/22
200101688	14' X 150'	2100	9/22
200101689	14' X 150'	2100	9/22
200101690	14' X 150'	2100	9/25
200101734	14' X 150'	2100	9/22
200101711	14' X 150'	2100	9/22
200101691	14' X 150'	2100	9/22
200101694	14' X 150'	2100	9/22
200101754	14' X 150'	2100	9/28
200101753	14' X 150'	2100	9/27
200101752	14' X 150'	2100	9/27
200101650	14' X 150'	2100	9/27
200101746	14' X 150'	2100	9/29
200101767	13.8' X 150'	2025	9/28
200101745	14' X 150'	2100	9/28
200101748	14' X 150'	2100	9/28
200101764	14' X 150'	2100	9/28
200101731	14' X 150'	2100	9/28

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 9/22	Q.C. NAME: Ruth Cox
PROJECT NAME: WEYERHAEUSER	MAT. TYPE: GEOTEXTILE 32 oz
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH N.C.	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
200101747	14' X 150'	2100	9/27
200101802	14' X 150'	2100	9/28
200101803	14' X 150'	2100	9/28
200101801	14' X 150'	2100	9/29
200101827	14' X 150'	2100	9/28
200101826	14' X 150'	2100	9/27
200101823	14' X 150'	2100	9/27
200101825	14' X 150'	2100	9/27
200101824	14' X 150'	2100	9/7
200101812	14' X 150'	2100	9/28
200101828	14' X 150'	2100	9/28 NO TAG DATE
200101757	14' X 150'	2100	9/29
200101830	14' X 150'	2100	9/28
200101829	14' X 150'	2100	9/28
200101758	14' X 150'	2100	9/27
200101759	14' X 150'	2100	9/27
200101761	14' X 150'	2100	9/28
200101760	14' X 150'	2100	9/29
200101811	14' X 150'	2100	9/29
200101810	14' X 150'	2100	9/14

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/22	Q.C. NAME: RUTH COX
PROJECT NAME: WEYERHAEUSER	MAT. TYPE: GEOTEXTILE 32oz
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH N.C.	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
200101808	14' X 150'	2100	9/29
200101756	14' X 150'	2100	9/30
200101762	14' X 150'	2100	9/29
200101807	14' X 150'	2100	9/29
200101755	14' X 150'	2100	9/28
200101806	14' X 150'	2100	9/30
200101749	14' X 150'	2100	9/28
200101809	14' X 150'	2100	9/28
200101805	14' X 150'	2100	9/27
200101766	14' X 150'	2100	9/27
200101732	14' X 150'	2100	9/28
200101763	14' X 150'	2100	9/27
200101733	14' X 150'	2100	9/29
200101751	14' X 150'	2100	9/28
200101750	14' X 150'	2100	9/28
200101832	14' X 150'	2100	9/25
200101883	14' X 150'	2100	9/7
200101831	14' X 150'	2100	9/7
200101847	14' X 150'	2100	9/25
200101881	14' X 150'	2100	9/7

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/25	Q.C. NAME: Ruth Cox
PROJECT NAME: Weyerhaeuser	MAT. TYPE: Geotextile 32 oz
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: Plymouth N.C.	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
200101845	14' X 150'	2100	9/25
200101848	14' X 150'	2100	9/25
200101851	14' X 150'	2100	9/25
200101849	14' X 150'	2100	9/7
200101844	14' X 150'	2100	9/7
200101842	14' X 150'	2100	9/7
200101843	14' X 150'	2100	9/7
200101850	14' X 150'	2100	9/7
200101852	14' X 150'	2100	9/27
200101854	14' X 150'	2100	9/7
200101882	14' X 150'	2100	9/7
200101856	14' X 150'	2100	9/25
200101846	14' X 150'	2100	9/20
200101841	14' X 150'	2100	9/20
200101862	14' X 150'	2100	9/20
200101857	14' X 150'	2100	9/20
200101860	14' X 150'	2100	9/20
200101853	14' X 150'	2100	9/15
200101840	14' X 150'	2100	9/28
200101855	14' X 150'	2100	9/20

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/25/2000	Q.C. NAME: Ruth M. Cox
PROJECT NAME: WEYERAEUSER	MAT. TYPE: GEOTEXTILE 32 oz
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH N.C.	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
200101880	14 x 150'	2100	9/20
200101888	14' X 150'	2100	9/16
200101839	14' X 150'	2100	9/14
200101887	14' X 150'	2100	9/15
200101858	14' X 150'	2100	9/25
200101861	14' X 150'	2100	9/14
200101879	14' X 150'	2100	9/28
200101859	14' X 150'	2100	9/15
200101878	14' X 150'	2100	9/13
200101884	14' X 150'	2100	9/29
200101864	14' X 150'	2100	9/30
200101866	14' X 150'	2100	9/15
200101874	14' X 150'	2100	9/16
200101886	14' X 150'	2100	9/14
200101877	14' X 150'	2100	9/27 USED ON SUBGRADE
200101885	14' X 150'	2100	9/28
200101876	14' X 150'	2100	9/15
200101865	14' X 150'	2100	9/15
200101863	14' X 150'	2100	10/3
200101875	14' X 150'	2100	10/2

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/27/2000	Q.C. NAME: Ruth Cox
PROJECT NAME: Weyerhauser	MAT. TYPE: Geotextile 32 oz
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: Plymouth NC	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
200101892	14'X 150'	2100	9/20 ? NO TAG DATE
200101867	14'X 150'	2100	9/7
200101872	14'X 150'	2100	9/7
200101870	14'X 150'	2100	9/29
200101873	14'X 150'	2100	9/3
200101871	14'X 150'	2100	9/30
200101894	14'X 150'	2100	9/28
200101868	14'X 150'	2100	9/30
200101907	14'X 150'	2100	9/30
200101896	14'X 150'	2100	9/20
200101869	14'X 150'	2100	9/29
200101905	14'X 150'	2100	9/15
200101904	14'X 150'	2100	9/15
200101900	14'X 150'	2100	9/28
200101891	14'X 150'	2100	9/28
200101922	14'X 150'	2100	9/15
200101918	14'X 150'	2100	9/15
200101920	14'X 174.9	2450	9/22
200101917	14'X 150'	2100	10/3 TWO
200101916	14'X 150'	2100	9/14

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 9/27	Q.C. NAME: Ruth Cox
PROJECT NAME: WEYERHAEUSER	MAT. TYPE: GEOTEXTILE 32oz
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH NC	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
200101902	14' x 150'	2,100	9/15
200101913	14' X 150'	2100	9/15
200101895	14' X150'	2100	9/30
200101899	14' X150'	2100	9/15
200101909	14' X 150'	2100	9/7
200101908	14' X 150'	2100	9/7
200101923	14' X 159.9	2240	9/13
200101921	14' X 150'	2100	9/13 ?
200101893	14' X 150'	2100	9/7
200101914	14' X 150'	2100	9/7
200101915	14' X 150'	2100	9/7
200101901	14' X 150'	2100	9/7
200101897	14' X 150'	2100	9/7
200101910	14' X 150'	2100	9/7
200101903	14' X 150'	2100	9/7
200101912	14' X 150'	2100	9/7
200101924	14' X 150'	2100	9/7
200101906	14' X 150'	2100	9/7
200101911	14' X 150'	2100	9/20
200101898	14' X 150'	2100	9/20

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8-27-2000	Q.C. NAME: RUTH COX
PROJECT NAME: WEYERHAEUSER	MAT. TYPE: GEOTEXTILE 32 oz
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH NC	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
200101919	14' X 150'	2100	9/22
0405430	14' X 150'	2100	9/13
0405441	14' X 194.9	2730	10/3
1804			ON PACKING LIST

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/17/2000	Q.C. NAME: Ruth M. Cox
PROJECT NAME: Weyerhaeuser	MAT. TYPE: Bentomat
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: Plymouth N.C.	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
✓ 7016	15' X 150'	2250	8/22
✓ 7286	15' X 150'	2250	140' 8/21 8/22
✓ 7297	15' X 150'	2250	8/22
✓ 7017	15' X 150'	2250	8/24
✓ 7290	15' X 150'	2250	8/24
✓ 7301	15' X 150'	2250	8/22
✓ 7296	15' X 150'	2250	8/22
✓ 7281	15' X 150'	2250	8/22
✓ 7299	15' X 150'	2250	8/21 8/22
✓ 7282	15' X 150'	2250	8/23
✓ 7300	15' X 150'	2250	8/24
✓ 7302	15' X 150'	2250	8/23
✓ 7292	15' X 150'	2250	8/23
✓ 7298	15' X 150'	2250	8/23
✓ 7280	15' X 150'	2250	8/23
✓ 7283	15' X 150'	2250	8/24
✓ 7303	15' X 150'	2250	8/21
7314	15' X 150'	2250	8/22
7316	15' X 150	2250	8/22 8/23
7308	15' X 150'	2250	8/21

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/17/2000	Q.C. NAME: Ruth M. Cox
PROJECT NAME: Weyerhauser	MAT. TYPE: Bentomat
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: Plymouth N.C.	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
7312	15' X 150'	2250	8/21
7310	15' X 150'	2250	8/21
7313	15' X 150'	2250	8/21
7315	15' X 150'	2250	8/21
7305	15' X 150'	2250	8/21
7277	15' X 150'	2250	8/20
7309	15' X 150'	2250	8/20 8/21
7304	15' X 150'	2250	8/20 REJECTED BY BRUCE URBAN FULL OF WATER
7279	15' X 150'	2250	8/20
7306	15' X 150'	2250	8/20 FIRST 2' REJECTED (WET) BOTTOM WET
7307	15' X 150'	2250	8/20
9537	15' X 150'	2250	8/26
9536	15' X 150'	2250	8/26
7881	15' X 150'	2250	8/26
7860	15' X 150'	2250	8/26
9531	15' X 150'	2250	8/26
7905	15' X 150'	2250	8/26
7885	15' X 150'	2250	8/26
7882	15' X 150'	2250	8/26
7883	15' X 150'	2250	8/26

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/25/2000	Q.C. NAME: Ruth Cox
PROJECT NAME: WEYERHAEUSER	MAT. TYPE: Bentomat
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH N.C.	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
✓7907	15'X150'	2250	8/26
✓7904	15'X150'	2250	8/26
✓7884	15'X150'	2250	8/26
✓7903	15'X150'	2250	8/26
✓9214	15'X150'	2250	8/26
✓9906	15'X150'	2250	8/26
✓7858	15'X150'	2250	8/26
✓7857	15'X150'	2250	8/26
✓7837	15'X150'	2250	8/26
✓9538	15'X150'	2250	8/26
✓9529	15'X150'	2250	8/26
✓7838	15'X150'	2250	9/9
✓7859	15'X150'	2250	9/9
✓9530	15'X150'	2250	9/9
9843	15'X150'	2250	9/9
9844	15'X150'	2250	9/8
9857	15'X150'	2250	9/8
9846	15'X150'	2250	9/8
9845	15'X150'	2250	9/8
9847	15'X150'	2250	9/8

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/25/2000	Q.C. NAME: RUTH COX
PROJECT NAME: WEYERHAEUSER	MAT. TYPE: BENTOMAT
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH N.C.	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
9859	15' X 150'	2250	9/8
9848	15' X 150'	2250	9/8
9849	15' X 150'	2250	9/8
9850	15' X 150'	2250	9/8
9853	15' X 150'	2250	9/8
9851	15' X 150'	2250	9/8
9852	15' X 150'	2250	9/8
9856	15' X 150'	2250	9/8
9854	15' X 150'	2250	9/8 TAG WASHED OFF
9858	15' X 150'	2250	9/8
9484	15' X 150'	2250	9/8
9562	15' X 150'	2250	9/11
9487	15' X 150'	2250	9/9
9486	15' X 150'	2250	9/9
9485	15' X 150'	2250	9/9
9527	15' X 150'	2250	9/9
9539	15' X 150'	2250	9/9
9528	15' X 150'	2250	9/9
9482	15' X 150'	2250	9/9
9605	15' X 150'	2250	9/9

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/25/2000	Q.C. NAME: Ruth Cox
PROJECT NAME: Weyerhaeuser	MAT. TYPE: Bentomat
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: Plymouth N.C.	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
✓9607	15'X150'	2250	9/9
✓9604	15'X150'	2250	9/9
✓9602	15'X150'	2250	9/9
✓9540	15'X150'	2250	9/9
✓9594	15'X150'	2250	9/10
✓9600	15'X150'	2250	9/10
✓9526	15'X150'	2250	9/10
✓9601	15'X150'	2250	9/10
✓9606	15'X150'	2250	9/10
✓9598	15'X150'	2250	9/10
✓9597	15'X150'	2250	9/10
✓9595	15'X150'	2250	9/10
✓9603	15'X150'	2250	9/10
✓8947	15'X150'	2250	9/10
✓9593	15'X150'	2250	9/10
✓9592	15'X150'	2250	9/10
✓9596	15'X150'	2250	9/10
✓9559	15'X150'	2250	9/11
✓9551	15'X150'	2250	9/11
✓9561	15'X150'	2250	9/11

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/25/2000	Q.C. NAME: RUTH COX
PROJECT NAME: WEYERHAEUSER	MAT. TYPE: BENTOMAT
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH NC	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
✓ 8936	15' x 150'	2250	9/11
✓ 8935	15' x 150'	2250	9/11
✓ 8939	15' x 150'	2250	9/11
✓ 8934	15' x 150'	2250	9/11
✓ 8940	15' x 150'	2250	9/11
✓ 8933	15' x 150'	2250	9/11
✓ 8948	15' x 150'	2250	9/11
✓ 8938	15' x 150'	2250	9/11
✓ 8937	15' x 150'	2250	9/11
✓ 8946	15' x 150'	2250	9/11
✓ 9150	15' x 150'	2250	9/11
✓ 8942	15' x 150'	2250	9/11
✓ 8941	15' x 150'	2250	9/11
✓ 9560	15' x 150'	2250	9/11
✓ 8943	15' x 150'	2250	9/11
✓ 9149	15' x 150'	2250	9/11
✓ 8944	15' x 150'	2250	9/11
✓ 9525	15' x 150'	2250	9/12
✓ 7908	15' x 150'	2250	9/12
✓ 9588	15' x 150'	2250	9/12 HARD TO READ #

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/25/2000	Q.C. NAME: Ruth Cox
PROJECT NAME: WEYERHAEUSER	MAT. TYPE: BENTOMAT
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH N.C.	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
✓ 9450	15' x 150'	2250	9/12
✓ 9553	15' x 150'	2250	9/12
✓ 9589	15' x 150'	2250	9/12
✓ 9543	15' x 150'	2250	9/12
✓ 9533	15' x 150'	2250	9/12
✓ 9544	15' x 150'	2250	9/12
✓ 9541	15' x 150'	2250	9/12
✓ 9216	15' x 150'	2250	9/12
✓ 7909	15' x 150'	2250	9/12
✓ 9542	15' x 150'	2250	9/12
✓ 9217	15' x 150'	2250	9/12
✓ 9114	15' x 150'	2250	9/12
✓ 9504	15' x 150'	2250	9/12
✓ 9549	15' x 150'	2250	9/12
✓ 9550	15' x 150'	2250	9/12
✓ 9501	15' x 150'	2250	9/12
✓ 9502	15' x 150'	2250	9/12
✓ 9535	15' x 150'	2250	9/12
✓ 9534	15' x 150'	2250	9/12
✓ 9215	15' x 150'	2250	9/12

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/25/2000	Q.C. NAME: RUTH COX
PROJECT NAME: WEYERHAEUSER	MAT. TYPE: BENTOMAT
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH NC	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
✓ 9449	15' X 150'	2250	9/12
✓ 9532	15' X 150'	2250	9/12
✓ 9576	15' X 150'	2250	9/13
✓ 8853	15' X 150'	2250	9/13
✓ 8821	15' X 150'	2250	9/13
✓ 8858	15' X 150'	2250	9/13
✓ 9599	15' X 150'	2250	9/15
✓ 9573	15' X 150'	2250	9/15
✓ 8825	15' X 150'	2250	9/15
✓ 7888	15' X 150'	2250	9/15
✓ 9575	15' X 150'	2250	9/15
✓ 9577	15' X 150'	2250	9/15
✓ 7886	15' X 150'	2250	9/16
✓ 9515	15' X 150'	2250	9/16
✓ 7887	15' X 150'	2250	9/16
✓ 9522	15' X 150'	2250	9/16
✓ 9572	15' X 150'	2250	9/16
✓ 8854	15' X 150'	2250	9/16
✓ 9513	15' X 150'	2250	9/16
✓ 8824	15' X 150'	2250	9/16

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/25/2000	Q.C. NAME: Ruth Cox
PROJECT NAME: WEYERHAEUSER	MAT. TYPE: 60 mil HDPE
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: PLYMOUTH NC	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
✓ 8851	15' X 150'	2250	9/16
✓ 9453	15' X 150'	2250	9/16
✓ 8826	15' X 150'	2250	9/16
✓ 9556	15' X 150'	2250	9/16 NOT READABLE?
✓ 9512	15' X 150'	2250	9/16
✓ 8859	15' X 150'	2250	9/16
✓ 9462	15' X 150'	2250	9/16
✓ 9557	15' X 150'	2250	9/16
✓ 8856	15' X 150'	2250	9/16
✓ 9519	15' X 150'	2250	9/16
✓ 9452	15' X 150'	2250	9/16
✓ 8855	15' X 150'	2250	9/16
✓ 9546	15' X 150'	2250	9/16
✓ 9451	15' X 150'	2250	9/16
✓ 9567	15' X 150'	2250	9/16
✓ 9463	15' X 150'	2250	9/16
✓ 9510	15' X 150'	2250	9/16
✓ 9574	15' X 150'	2250	9/16
✓ 9548	15' X 150'	2250	9/16
✓ 9566	15' X 150'	2250	9/16

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/25/2000	Q.C. NAME: Ruth Cox
PROJECT NAME: Weyerhaeuser	MAT. TYPE: Bentomat
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: Plymouth NC	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
✓9098	15'X150	2250	9/17
✓7824	15' X 150'	2250	9/17
✓9447	15' X 150'	2250	9/17
✓9457	15' X 150'	2250	9/17
✓9459	15' X 150'	2250	9/17
✓9464	15' X 150'	2250	9/17
✓9465	15' X 150'	2250	9/17
✓9466	15'X 150'	2250	9/17
✓9458	15'X 150'	2250	9/17
✓9514	15'X 150'	2250	9/17
✓9516	15'X 150'	2250	9/17
✓9517	15'X 150'	2250	9/17
✓9520	15'X 150'	2250	9/17
✓9545	15' X 150'	2250	9/17
✓9547	15'X 150'	2250	9/17
✓9552	15' X 150'	2250	9/17
✓9554	15'X 150'	2250	9/17
✓9555	15'X 150'	2250	9/17
✓9558	15'X 150'	2250	9/17
✓9563	15'X 150'	2250	9/17

GSI
MATERIAL DELIVERY / INVENTORY CHECKLIST

DATE: 8/25/2000	Q.C. NAME: Ruth Coy
PROJECT NAME: Weyerhaeuser	MAT. TYPE: Bentomat
PROJECT NUMBER: 20040	TRUCK #:
LOCATION: Plymouth N.C.	BILL OF LADING #:

PANEL/ROLL NUMBER	PANEL/ROLL SIZE	SQUARE FOOT	COMMENTS
✓9564	15'X150'	2250	9/17
✓9565	15'X150'	2250	9/17
✓9568	15'X150'	2250	9/17
✓9460	15'X150'	2250	9/18
✓9101	15'X150'	2250	9/18
✓9099	15'X150'	2250	9/21
✓9100	15'X150'	2250	9/21
9521	15'X150'	2250	No TAG ?. DATE 9/28
8647	15'X150'	2250	9/28
EXTRAS 8716	15'X150'	2250	9/28
0159	15'X150'	2250	9/28

Appendix L
Geomembrane Panel Placement Forms

WEYERHAEUSER COMPANY
LANDFILL CELL 3 PHASE 1A
PLYMOUTH, NORTH CAROLINA

GSI QAQC PAPERWORK JOB #20040

PANEL PLACEMENT REPORTS

GSI
PANEL PLACEMENT FORM

PROJECT NAME: WEYERHAEUSER					JOB NUMBER: 20040		MAT'L TYPE: 60 mil HDPE
DATE	TIME	PANEL NO.	PANEL LENGTH (FT)	PANEL WIDTH (FT)	WEATHER WIND/TEMP (MPH/°F)	ROLL NO.	COMMENTS
8/20	12:45	1	63'	23.5	MSTLY cloudy 76° 3-10	114107538	TEXT
8/20	12:55	2	65'	23.5	mstly cloudy 76° 3-7	114107538	TEXT
8/20	1:09	3	64'	23.5	Mstly cloudy 76° 3-7	114107538	TEXT
8/20	1:17	4	65'	23.5	MSTLY cloudy 76° 3-7	114107538	TEXT
8/20	1:57	5	64'	23.5	Cloudy 81° 3-7	114107538	TEXT
8/20	3:04	6	64'	23.5	cloudy 81° 3-7	114107538	TEXT
8/20	5:10	7	64'	23.5	Cloudy 81° 3-7	114107538	TEXT
	5:17						
8/21	2:45	8	64'	23.5	mstly sunny 81° 15-20	114107241	TEXT
8/21	3:00	9	65'	23.5	mstly sunny 81°	114107241	TEXT
8/21	3:07	10	64'	23.5	mstly sunny 81° 15-20	114107241	TEXT
8/21	4:26	11	64'	23.5	mstly sunny 81° 15-20	114107241	TEXT
8/21	4:34	12	64'	23.5	mstly sunny 81° 15-20	114107241	TEXT
8/21	4:39	13	64'	23.5	mstly sunny 81° 15-20	114107241	TEXT
8/21	5:20	14	65'	23.5	mstly sunny 81° 5-10	114107241	TEXT
8/21	5:53	15	63'	23.5	sunny 81° 5-10	114105185	TEXT
8/21	5:57	16	63'	23.5	mstly sunny 81° 3-10	114105185	TEXT
8/21	6:05	17	63'	23.5	mstly sunny 81° 3-10	114105185	TEXT
8/21	6:10	18	62'	23.5	mstly sunny 81° 3-10	114105185	TEXT

GSI
PANEL PLACEMENT FORM

PROJECT NAME: WEYERHAEUSER					JOB NUMBER: 20040		MAT'L TYPE: 60 mil HDPE
DATE	TIME	PANEL NO.	PANEL LENGTH (FT)	PANEL WIDTH (FT)	WEATHER WIND/TEMP (MPH/°F)	ROLL NO.	COMMENTS
8/21	6:18	19	62'	23.5	sunny 80° 3-10	114105185	TEXT
		20					
8/22	4:51	20	62'	23.5	prtly cloudy 80° 3-7	114105185	TEXT
8/22	5:00	21	63'	23.5	prtly cloudy 80° 3-7	114105185	TEXT FACTORY CREASE
8/22	5:28	22	62'	23.5	prtly cloudy 80° 3-7	114107321	TEXT
8/22	5:35	23	38'	23.5	prtly cloudy 80° 3-7	114107321	TEXT
8/22	5:40	24	39'	23.5	prtly cloudy 80° 3-7	114107321	TEXT
8/22	5:50	25	39'	23.5	prtly cloudy 80° 3-7	114107321	TEXT
8/22	5:59	26	39'	23.5	prtly cloudy 80° 3-7	114107321	TEXT
8/22	6:04	27	39'	23.5	prtly cloudy 80° 3-7	114107321	TEXT
8/22	6:10	28	40'	23.5	prtly cloudy 80° 3-7	114107321	TEXT
8/22	6:20	29	40'	23.5	prtly cloudy 80° 3-7	114107321	TEXT
8/22	6:25	30	41'	23.5	prtly cloudy 80° 3-7	114107321	TEXT
8/22	6:30	31	42'	23.5	prtly cloudy 80° 3-7	114107321	TEXT
8/22	6:34	32	43'	23.5	prtly cloudy 79 3-7	114107321	TEXT
8/22	6:52	33	44'	23.5	prtly cloudy 77° 3-7	114107315	TEXT
8/22	7:02	34	44'	23.5	prtly cloudy 77° 3-7	114107315	TEXT
8/23	3:03	35	47'	23.5	prtly cloudy 90° 0-7	114107315	TEXT
8/23	3:08	36	46'	23.5	prtly cloudy 90° 0-7	114107315	TEXT

GSI
PANEL PLACEMENT FORM

PROJECT NAME: WEYERHAEUSER					JOB NUMBER: 20040		MAT'L TYPE: 60 mil HDPE
DATE	TIME	PANEL NO.	PANEL LENGTH (FT)	PANEL WIDTH (FT)	WEATHER WIND/TEMP (MPH/°F)	ROLL NO.	COMMENTS
8/23	3:16	37	47'	23.5	prtly cloudy 90° 3-10	1141073.15	TEXT
8/23	3:23	38	47'	23.5	prtly cloudy 90° 3-10	1141073.15	TEXT
8/23	3:30	39	49'	23.5	prtly cloudy 90° 3-10	1141073.15	TEXT
8/23	3:40	40	50'	23.5	prtly cloudy 90° 3-10	1141073.15	TEXT
8/23	3:45	41	51'	23.5	prtly cloudy 90° 3-10	1141073.15	TEXT
8/23	4:10	42	50'	23.5	prtly cloudy 90° 3-10	1141053.66	TEXT
8/23	4:17	43	51'	23.5	prtly cloudy 90° 3-10	1141053.66	TEXT
8/23	4:24	44	51'	23.5	prtly cloudy 90° 3-10	1141053.66	TEXT
8/23	4:29	45	51'	23.5	prtly cloudy 90° 3-10	1141053.66	TEXT
8/23	4:35	46	51'	23.5	prtly cloudy 90° 3-10	1141053.66	TEXT
8/23	4:43	47	52'	23.5	prtly cloudy 90° 3-10	1141053.66	TEXT
8/24	11:42	48	26'	23.5	prtly sunny 87° 7-15	1141053.85	TEXT
8/24	11:53	49	28'	23.5	prtly sunny 87° 7-15	1141073.15	TEXT
8/24	12:06	50	29'	23.5	prtly sunny 87° 7-15	1141053.66	TEXT
8/24	12:10	51	30'	23.5	prtly sunny 87° 7-15	1141053.66	TEXT
8/24	12:15	52	31'	23.5	prtly sunny 87° 7-15	1141053.66	TEXT
8/24	12:20	53	31'	23.5	prtly sunny 87° 7-15	1141053.66	TEXT
8/24	12:25	54	32'	23.5	prtly sunny 87° 7-15	1141053.66	TEXT
8/24	12:42	55	32'	23.5	mstly sunny 87° 7-15	1141040.74	TEXT

GSI
PANEL PLACEMENT FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE	TIME	PANEL NO.	PANEL LENGTH (FT)	PANEL WIDTH (FT)	WEATHER WIND/TEMP (MPH/°F)	ROLL NO	COMMENTS
8/24	12:50	56	34'	23.5	mstly cloudy 87° 7-15	114104074	TEXT
8/24	12:56	57	34'	23.5	mstly cloudy 87° 7-15	114104074	TEXT
8/24	1:04	58	34'	23.5	cloudy 87° 7-15	114104074	TEXT
8/24	1:12	59	35'	23.5	cloudy 87° 7-15	114104074	TEXT
8/24	1:20	60	36'	23.5	87° 7-15	114104074	TEXT
8/24	1:25	61	37'	23.5	87° 7-15	114104074	TEXT
8/24	1:31	62	37'	23.5	87° 7-15	114104074	TEXT
8/26	12:20	63	476'	23.5	sunny 90° 3-7	115116306	SMOOTH
8/26	2:40	64	21'	23.5	sunny 90° 3-7	115116311	SMOOTH
8/26	5:43	65	453'	23.5	sunny 87° 3-7	115116311	SMOOTH
8/26	5:55	66	36'	23.5	sunny 87° 3-7	115116314	SMOOTH
8/26	6:10	67	437'	23.5	sunny 87° 3-7	115116314	SMOOTH
8/26	6:15	68	54'	23.5	sunny 85° 3-7	115116312	SMOOTH
8/26	6:35	69	419	23.5	sunny 85° 3-7	115116312	SMOOTH
8/26	6:45	70	66'	23.5	sunny 83° 3-7	115116303	SMOOTH
9/8	4:10	71	474'	23.5	mstly sunny 86° 3-7	115116313	SMOOTH
9/8	4:35	72	474'	23.5	mstly sunny 86° 3-7	115116307	
9/8	5:05	73	473'	23.5	mstly sunny 86° 3-7	115116294	
9/8	5:10	74	8'	23.5	mstly sunny 86° 3-7	115116303	

GSI
PANEL PLACEMENT FORM

PROJECT NAME: WEYERHAEUSER						JOB NUMBER: 600410	MAT'L TYPE: 60mil HDPE
DATE	TIME	PANEL NO.	PANEL LENGTH (FT)	PANEL WIDTH (FT)	WEATHER WIND/TEMP (MPH/°F)	ROLL NO.	COMMENTS
9/8	5:20	75	7'	23.5	mstly sunny 86° 3-7	115116303	SMOOTH
9/8	5:25	76	7'	23.5	mstly sunny 86° 3-7	115116303	SMOOTH
9/9	3:15	77	475'	23.5	ptly cloudy 88° 0-5	115116296	SMOOTH
9/9	3:50	78	474'	23.5	ptly cloudy 88° 0-5	115116292	SMOOTH
9/9	4:15	79	474'	23.5	ptly cloudy 88° 0-5	115116316	SMOOTH
9/10	11:50	80	475'	23.5	sunny 82° 7-12	115116315	SMOOTH
9/10	12:14	81	472'	23.5	sunny 82° 7-12	115116286	SMOOTH
9/10	12:40	82	470'	23.5	sunny 82° 7-12	115116304	SMOOTH
9/11	3:23	83	471'	23.5	ptly sunny 86° 7-15	115116287	SMOOTH
9/11	3:50	84	468'	23.5	ptly sunny 85° 7-15	115116287	SMOOTH
9/11	4:25	85	467'	23.5	ptly sunny 84° 7-15	115116290	SMOOTH
9/11	4:55	86	469'	23.5	ptly sunny 83° 7-15	115116310	SMOOTH
9/12	2:55	87	467'	23.5	mstly sunny 92° 0-5	115116295	SMOOTH
9/12	3:20	88	463'	23.5	mstly sunny 92° 0-5	115116288	SMOOTH
9/12	3:50	89	465'	23.5	mstly sunny 89° 0-5	115116289	SMOOTH
9/12	4:20	90	462'	23.5	mstly cloudy 88° 0-5	115116302	SMOOTH
9/12	4:45	91	462'	23.5	mstly cloudy 86° 0-5	115116309	SMOOTH
9/13	10:10	92	37'	23.5	ptly cloudy 87° 0-5	114103161	TEXT
9/13	10:19	93	38'	23.5	ptly cloudy 87° 0-5	114103161	TEXT

GSI
PANEL PLACEMENT FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 2040 | MAT'L TYPE: 60 mil HDPE

DATE	TIME	PANEL NO.	PANEL LENGTH (FT)	PANEL WIDTH (FT)	WEATHER WIND/TEMP (MPH/°F)	ROLL NO.	COMMENTS
9/13	10:29	94	39'	23.5	Pt'ly cloudy 87° 0-5	114103161	TEXT
9/13	10:37	95	40'	23.5	pt'ly cloudy 87° 0-5	114103161	TEXT
9/13	10:44	96	41'	23.5	pt'ly cloudy 89° 0-5	114103161	TEXT
9/13	10:50	97	43'	23.5	pt'ly cloudy 89° 0-5	114103161	TEXT
9/13	10:59	98	43'	23.5	pt'ly cloudy 89° 0-5	114103161	TEXT
9/13	11:00	99	45'	23.5	pt'ly cloudy 89° 0-5	114103161	TEXT
9/13	11:06	100	46'	23.5	pt'ly cloudy 89° 0-5	114103161	TEXT
9/15	11:00	101	53'	23.5	PC 81° 5-10	114107316	TEXT
9/15	11:10	102	52'	23.5	PC 81° 5-10	114107316	TEXT
9/15	11:15	103	52'	23.5	PC 81° 5-10	114107316	TEXT
9/15	11:21	104	51'	23.5	PC 81° 5-10	114107316	TEXT
9/15	11:30	105	52'	23.5	PC 81° 5-10	114107316	"
9/15	11:40	106	50'	23.5	PC 81° 5-10	114107316	"
9/15	3:25	107	47'	23.5	PC 81° 5-10	114104074	"
9/15	3:34	108	48'	23.5	PC 81° 5-10	114104074	"
9/15	3:37	109	52'	23.5	PC 81° 5-10	114104074	"
9/15	3:45	110	52'	23.5	PC 81° 5-10	114104074	"
9/16	1:35	111	461'	23.5	MS 74° 10-15	115116308	SMOOTH
9/16	1:55	112	459'	23.5	MS 74° 10-15	115116285	SMOOTH

GSI
PANEL PLACEMENT FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE	TIME	PANEL NO.	PANEL LENGTH (FT)	PANEL WIDTH (FT)	WEATHER WIND/TEMP (MPH/F)	ROLL NO.	COMMENTS
9/16	2:15	113	458'	23.5	MS 74° 10-15	115116298	SMOOTH
9/16	4:15	114	457'	23.5	MS 74° 10-15	115116297	SMOOTH
9/16	4:32	115	456'	23.5	MS 74° 10-15	115116293	SMOOTH
9/16	4:50	116	454'	23.5	MS 74° 10-15	115116283	SMOOTH
9/17	3:00	117	452'	23.5	PC 77° 0-5	115116284	SMOOTH
9/17	3:20	118	452'	23.5	PC 78° 0-5	115116305	SMOOTH
9/17	3:40	119	450'	23.5	PC 76° 0-5	115116291	SMOOTH
9/17	6:35	120	53'	23.5	PC 64° 0-5	114104353	TEXT
9/17	6:43	121	53'	23.5	PC 64° 0-5	114104353	TEXT
9/17	6:45	122	53'	23.5	PC 64° 0-5	114104353	TEXT
9/17	6:50	123	44'	23.5	PC 64° 0-5	114104353	TEXT
9/17	7:00	124	30'	23.5	PC 64° 0-5	114104353	TEXT
9/17	7:02	125	50'	23.5	PC 64° 0-5	114104353	TEXT
9/17	7:08	126	50'	23.5	PC 64° 0-5	114104353	TEXT
9/17	7:11	127	50'	23.5	PC 64° 0-5	114104353	TEXT
9/17	7:14	128	50'	23.5	PC 63° 0-5	114104353	TEXT
9/17	7:30	129	50'	23.5	DUSK 63° 0-5	114103611	TEXT
9/17	7:33	130	50'	23.5	DUSK 63° 0-5	114103611	
9/17	7:36	131	50'	23.5	DUSK 63° 0-5	114103611	

GSI
PANEL PLACEMENT FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 2834.0 | MATL TYPE: 60 mil HDPE

DATE	TIME	PANEL NO.	PANEL LENGTH (FT)	PANEL WIDTH (FT)	WEATHER WIND/TEMP (MPH/°F)	ROLL NO.	COMMENTS
9/17	7:40	132	51'	23.5	Dusk 63° 0-5	1141036 11	
9/17	7:43	133	51'	23.5	Dusk 63° 0-5	1141036 11	
9/17	7:47	134	51'	23.5	Dusk 63° 0-5	1141036 11	
9/17	7:52	135	51'	23.5	Dusk 63° 0-5	1141036 11	
9/18	8:55	136	54'	23.5	C 69° 0-5	1141064074	
9/18	9:10	137	54'	23.5	C 69° 0-5	1141064074	
9/18	9:30	138	56'	23.5	C 71° 0-5	1141036 11	
9/18	10:35	139	58'	23.5	C Partly 71° 0-5	1141036 11	
9/18	10:40	140	40'	23.5	C Partly 71° 0-5	1141036 11	
9/21	8:50	141	53'	23.5	C 74° 10-15	1141070245	
9/21	9:00	142	52'	23.5	C 74° 10-15	1141070245	
9/21	9:03	143	52'	23.5	C 74° 10-15	1141070245	
9/21	9:10	144	52'	23.5	C 74° 10-15	1141070245	
9/28	5:15	145	50'	23.5	S 73° 3-7	1141070245	
9/28	5:18	146	50'	23.5	S 73° 3-7	1141070245	
9/28	5:23	147	50'	23.5	S 72° 3-7	1141070245	
9/28	5:26	148	50'	23.5	S 72° 3-7	1141070245	
9/28	5:30	149	50	23.5	S 72° 3-7	1141070245	
9/28	6:00	150'	52	23.5	S 72° 3-7	1141041353	

Appendix M
Trial Seam Information Forms

WEYERHAEUSER COMPANY
LANDFILL CELL 3 PHASE 1A
PLYMOUTH, NORTH CAROLINA

GSI QAQC PAPERWORK JOB #20040

TRIAL WELD TESTING REPORTS

GSI
TRIAL WELD TESTING REPORT FORM

PROJECT NAME: WEYERHAEUSER — **JOB NUMBER:** 20040 — **MAT'L TYPE:** 60 mil HDPE

TENSIOMETER ID: 89015

DATE	SAMPLE I.D. (TW#)	TIME	AMB. TEMP (°F)	WEATHER (CLOUDY / SUNNY)	QC INT	MACH NO.	SEAMER INT	EXTRUSION BARREL/ PREHEAT	FUSION WEDGE/ SET SPEED	FIELD VALUES PEEL (PPI)					FIELD VALUES SHEAR (PPI)			P/F	COMMENTS
8/20		10:30 AM	74°	mstly cloudy	RC	5899	MA	B:	W: 750°	128	129	132	129	132	152	158	164	P	
								P:	S: 12'	125	131	117	134	127	169	163			
8/20		4:55 PM	81°	cloudy	RC	5899	MA	B:	W: 750°	115	127	124	118	122	156	152	157	P	
								P:	S: 12'	113	125	120	121	115	151	154			
								B:	W:										
								P:	S:										
8/21		3:27 PM	84°	mstly sunny	RC	5899	MA	B:	W: 750°	127	133	138	130	131	152	150	149	P	
								P:	S: 12'	125	132	136	125	131	149	150			
								B:	W:										
								P:	S:										
8/22		3:50	88°	SUNNY	RC	5899	MA	B:	W: 750°	127	120	120	121	117	141	143	149	P	
								P:	S: 12'	126	121	127	119	124	148	151			
8/22		7:30	74	CLOUDY	RC	5899	MA	B:	W: 750°	123	142	125	122	117	151	158	153	P	
								P:	S: 12'	137	137	113	121	123	154	156			
								B:	W:										
								P:	S:										
8/23		2:45	90°	mstly cloudy	RC	5899	MA	B:	W: 750°	132	120	126	121	119	138	145	143	P	
								P:	S: 12'	127	119	119	122	120	149	153			

GSI
TRIAL WELD TESTING REPORT FORM

PROJECT NAME: WEYERHAEUSER | **JOB NUMBER:** 20040 | **MAT'L TYPE:** 60 mil HDPE

TENSIOMETER ID: 89015

DATE	SAMPLE I.D. (TW#)	TIME	AMB. TEMP (°F)	WEATHER (CLOUDY / SUNNY)	QC INT	MACH NO.	SEAMER INT	EXTRUSION BARREL/ PREHEAT	FUSION WEDGE/ SET SPEED	FIELD VALUES PEEL (PPI)					SHEAR (PPI)			P/F	COMMENTS
8/24		10:50 AM	84°	mstly sunny	PC	5879	MA	B: P:	W: 750° S: 12'	122/116	116/122	118/121	123/116	128/133	152 / 153	151 / 149	150	P	SMOOTH - TEXT
8/24		11:00 AM	84°	mstly sunny	PC	5879	MA	B: P:	W: 750' S: 12'	124/123	124/133	115/120	119/121	116/119	142 / 145	140 / 144	149	P	S-S
8/26		6:00 PM	87°	sunny	PC	5879	MA	B: P:	W: 750° S: 12'	134/114	123/113	116/121	115/124	122/119	132 / 137	135 / 136	141	P	S-S
8/26		7:00 PM	84°	DISK	PC	1899	BS	B: P:	W: 750' S: 12'	123/118	121/132	116/118	119/104	117/119	153 / 151	153 / 153	149	P	S-S
8/27		8:15	71°	cloudy	PC	7363	RM	B: 450 P: 460	W: S:	107	109	113	111	98	159 / 161	161 / 169	158	P	S-S
8/27		8:10	74°	cloudy	PC	7363	RM	B: 450 P: 460	W: S:	106	128	135	121	121	153 / 160	163 / 134	159	P	T-T
8/27		9:00	76°	cloudy	PC	7363	RM	B: 450 P: 460	W: S:	114	128	121	144	125	158 / 163	158 / 161	154	P	S-T
8/27		3:20	89°	cloudy	PC	7363	RM	B: 450 P: 460	W: S:	129	130	132	132	133	115 / 139	137 / 141	153	P	S-T
8/27		3:30	89°	cloudy	PC	7363	RM	B: 450 P: 460	W: S:	114	104	124	135	125	137 / 145	142 / 146	142	P	S-S

GSI
TRIAL WELD TESTING REPORT FORM

PROJECT NAME: WEYERHAEUSER | **JOB NUMBER:** 20040 | **MAT'L TYPE:** 60 mil HDPE

TENSIOMETER ID: 89015

DATE	SAMPLE I.D. (TW#)	TIME	AMB. TEMP (°F)	WEATHER (CLOUDY / SUNNY)	QC INT	MACH NO.	SEAMER INT	EXTRUSION BARREL/ PREHEAT	FUSION WEDGE/ SET SPEED	FIELD VALUES PEEL (PPI)					SHEAR (PPI)			P/F	COMMENTS
8/27		3:40	89°	cloudy	RC	7363	RM	B: 440°	W:	124	130	132	128	131	145	142	144	P	T-T
								P: 460°	S:						139	141			
8/28		2:00	86°	cloudy	RC	7363	PM	B: 475°	W:	147	115	107	126	129	139	142	147	P	T-T
								P: 473°	S:						141	144			
8/28		2:35	86°	cloudy	RC	7363	RM	B: 475°	W:	125	131	132	130	124	145	148	150	P	T-T
								P: 475°	S:						150	151			
8/28		2:45	86°	cloudy	RC	7363	RM	B: 475°	W:	123	118	115	123	101	151	147	151	P	S-S
								P: 475°	S:						151	148			
9/1		8:25	82°	cloudy	RC	7363	RM	B: 475	W:	111	119	110	132	129	160	152	154	P	S-T
								P: 475	S:						150	153			
9/1		8:45	84°	cloudy	RC	7363	RM	B: 475°	W:	120	117	123	127	124	159	161	158	P	T T
								P: 475°	S:						154	156			
9/1		9:00	81°	cloudy	RC	7363	RM	B: 475°	W:	115	112	117	118	117	156	152	147	P	S S
								P: 475°	S:						151	151			
9/8		3:55	87°	mstly sunny	RC	5879	MA	B:	W: 750°	116/ 116	113/ 116	120/ 122	121/ 120	122/ 120	143	152	149	P	S-S
								P:	S: 12'						143	148			
9/9		2:45	88°	mstly sunny	RC	5879	MA	B:	W: 750°	124/ 123	126/ 124	132/ 124	125/ 124	126/ 123	155	145	149	P	S-S
								P:	S: 12'						141	153			

GSI
TRIAL WELD TESTING REPORT FORM

PROJECT NAME: WEYERHAEUSER | **JOB NUMBER:** 20040 | **MAT'L TYPE:** 60 mil HDPE

TENSIOMETER ID: 89015

DATE	SAMPLE I.D. (TW#)	TIME	AMB. TEMP (°F)	WEATHER (CLOUDY / SUNNY)	QC INT	MACH NO.	SEAMER INT	EXTRUSION BARREL/ PREHEAT	FUSION WEDGE / SET SPEED	FIELD VALUES PEEL (PPI)					FIELD VALUES SHEAR (PPI)			P/F	COMMENTS
9/10		12:15	82°	CLOUDY	[illegible]	[illegible]	TA	B: P:	W: 750° S: 12'	120/121	122/125	124/123	123/124	126/127	145 / 149	147 / 147	141	P	S-S
9/11		3:20	84°	prtly sunny	RC	5899	MA	B: P:	W: 750° S: 12'	119/119	120/115	119/115	118/113	133/127	135 / 141	142 / 141	139	P	S-S
9/12		3:00	91°	MSTLY SUNNY	RC	[illegible]	MA	B: P:	W: 750° S: 12'	124/119	116/120	113/111	115/112	114/114	136 / 141	137 / 137	139	P	S-S
9/13		12:10	82°	PRTLY cloudy	RC	[illegible]	MA	B: P:	W: 750° S: 12'	118/120	117/116	122/122	113/125	118/121	137 / 148	139 / 145	141	P	S-S
9/13		10:40	80°	PRTLY cloudy	RC	[illegible]	MA	B: P:	W: 750° S: 12'	121/126	127/131	122/119	123/119	120/123	145	146		P	NO WELDING S-S
9/13		3:45	86°	PRTLY cloudy	RC	[illegible]	RM	B: 475 P: 475	W: S:	105	106	130	123	115	129 / 151	148 / 155	151	P	S-T
9/14		3:58	76°	MSTLY SUNNY	RC	[illegible]	RM	B: 475 P: 475	W: S:	101	107	109	101	126	145 / 136	150 / 145	143	P	S-T
9/14		9:28	77°	MSTLY SUNNY	RC	[illegible]	RM	B: 475 P: 475	W: S:	128	138	109	108	106	146 / 144	146 / 148	150	P	S-S
9/14		9:51	78°	MSTLY SUNNY	RC	[illegible]	RM	B: 475 P: 475	W: S:	133	133	122	125	127	149 / 150	150 / 147	144	P	T-T

GSI
TRIAL WELD TESTING REPORT FORM

PROJECT NAME: WEYERHAEUSER | **JOB NUMBER:** 20040 | **MAT'L TYPE:** 60 mil HDPE

TENSIOMETER ID: 89015

DATE	SAMPLE I.D. (TW#)	TIME	AMB. TEMP (°F)	WEATHER (CLOUDY / SUNNY)	QC INT	MACH NO.	SEAMER INT	EXTRUSION BARREL/ PREHEAT	FUSION WEDGE/ SET SPEED	FIELD VALUES PEEL (PPI)					SHEAR (PPI)			P/F	COMMENTS
9/14		6:00 PM	80°	PC	RC	7363	RM	B: 475° P: 475°	W: S:	109	103	108	118	124	143 147	145 141	146	P	S-T
9/14		6:20 PM	80°	PC	RC	7363	RM	B: 475° P: 475°	W: S:	119	119	119	115	121	143 140	135 144	142	P	S-S
9/15		9:01 AM	72°	OC	RC	5899	MN	B: P:	W: 750° S: 12'	134/131	132/132	135/130	136/123	126/131	155 161	161 154	158	P	S-S
9/15		5:30 PM	81°	PC	RC	7363	RM	B: 475° P: 475°	W: S:	119	124	138	141	127	152 157	153 178	149	P	S-T
9/15		2:50 PM	84°	PC	RC	5899	MN	B: P:	W: 750° S: 12'	120/122	121/122	123/115	135/116	118/124	147 145	143 147	151	P	S-S
9/15		5:45 PM	81°	PC	RC	7363	RM	B: 475° P: 475°	W: S:	119	94	95	137	109	160 151	148 171	147	P	S-S
9/16		8:35 AM	64°	M.S.	RC	7363	RM	B: 475° P: 475°	W: S:	153	134	127	136	131	178 169	169 177	174	P	S-T
9/16		12:00	74°	M.S.	RC	5899	MA	B: P:	W: 750° S: 12'	129/132	134/124	128/122	139/133	137/130	157 148	154 157	159	P	S-S
9/17		8:52	64°	MS	RC	7363	RM	B: 475° P: 475°	W: S:	117	110	117	114	113	179 171	180 187	177	P	S-T

GSI
TRIAL WELD TESTING REPORT FORM

PROJECT NAME: Weyerhaeuser

JOB NUMBER: 20040

MAT'L TYPE: 60 mil HDPE

TENSIOMETER ID: 89015

DATE	SAMPLE I.D. (TW#)	TIME	AMB. TEMP (°F)	WEATHER (CLOUDY / SUNNY)	QC INT	MACH NO.	SEAMER INT	EXTRUSION BARREL/ PREHEAT	FUSION WEDGE/ SET SPEED	FIELD VALUES PEEL (PPI)					SHEAR (PPI)			P/F	COMMENTS
9/17		9:05	66°	MC	RC	7363	RM	B: 475° P: 475°	W: S:	125	108	126	117	130	182 184	181 181	179	P	S-S
9/17		1:10	72°	MC	RC	5899	MA	B: P:	W: 750° S: 12'	135/137	138/141	134/131	130/135	137/133	163 167	166 161	164	P	S-S
9/17		4:05	72°	MC	RC	7363	RM	B: 475° P: 475°	W: S:	105	117	109	117	113	161 167	165 163	171	P	S-T
9/17		4:25	72°	MC	RC	7363	RM	B: 475° P: 475°	W: S:	101	120	108	118	107	155 154	155 158	161	P	S-S
9/18		8:15	66°	MC	RC	5899	MA	B: P:	W: 750° S: 12'	134/140	146/135	136/146	144/133	135/142	171 154	150 167	163	P	S-S
9/18		9:05	67°	MC	RC	7363	RM	B: 475° P: 475°	W: S:	129	111	114	109	131	155 180	180 177	174	P	S-T
9/20		8:15	76°	MS	RC	7363	RM	B: 475° P: 475°	W: S:	111	125	110	118	116	155 153	158 152	147	P	[illegible]
9/20		3:00	88	MS	RC	7363	RM	B: 475° P: 475°	W: S:	125	119	115	115	117	135 154	156 156	147	P	[illegible]-T
9/20		3:25	88	MS	RC	7363	RM	B: 475° P: 475°	W: S:	123	101	119	129	154	149 147	160 142	156	P	S-S

GSI
TRIAL WELD TESTING REPORT FORM

PROJECT NAME: WEYERHAEUSER | **JOB NUMBER:** 20040 | **MAT'L TYPE:** 60mil HDPE

TENSIOMETER ID: 89015

DATE	SAMPLE I.D. (TW#)	TIME	AMB. TEMP (°F)	WEATHER (CLOUDY / SUNNY)	QC INT	MACH NO.	SEAMER INT	EXTRUSION BARREL/ PREHEAT	FUSION WEDGE/ SET SPEED	FIELD VALUES PEEL (PPI)					SHEAR (PPI)			P/F	COMMENTS
9/20		3:50	88°	MS	RC	7363	RM	B: 475°	W:	122	122	126	122	124	151	153	154	P	
								P: 475°	S:						153	152			
9/21		8:00	74°	C	RC	5899	MA	B:	W: 750°	132/132	141/123	129/134	138/159	134/124	159	157	161	P	
								P:	S: 12'						157	161			
9/21		8:30	74°	C	RC	7363	RM	B: 475°	W:	132	139	160	130	131	171	144	165	P	
								P: 475°	S:						156	160			
9/21		1:00	86°	P-S	RC	7363	RM	B: 475°	W:	102	111	123	121	115	149	149	151	P	
								P: 475°	S:						150	153			
9/21		4:18	88°	M-S	RC	7363	RM	B: 475°	W:	105	104	117	110	115	138	150	152	P	
								P: 475°	S:						155	154			
9/22		8:00	74°	M S	RC	7363	RM	B: 475°	W:	110	118	118	127	119	167	178	173	P	
								P: 475°	S:						171	173			
9/28		9:45	60°	P.S.	RC	7363	RM	B: 475°	W:	111	122	116	137	124	155	180	161	P	
								P: 475°	S:						172	157			
9/28		2:30	72°	M S	RC	5899	MA	B:	W: 750°	126/123	121/121	127/125	122/125	127/136	148	150	149	P	
								P:	S: 12'						153	150			
9/29		8:50	65°	S	RC	7363	RM	B: 475°	W:	93	112	133	107	104	168	169	171	P	
								P: 475°	S:						165	168			

GSI
TRIAL WELD TESTING REPORT FORM

PROJECT NAME: WEYERHAEUSER | **JOB NUMBER:** 30040 | **MAT'L TYPE:** 60 mil HDPE

TENSIOMETER ID: 89015

DATE	SAMPLE I.D. (TW#)	TIME	AMB. TEMP (°F)	WEATHER (CLOUDY / SUNNY)	QC INT	MACH NO.	SEAMER INT	EXTRUSION BARREL/ PREHEAT	FUSION WEDGE/ SET SPEED	FIELD VALUES PEEL (PPI)					SHEAR (PPI)			P/F	COMMENTS
9/29		9:10	65°	S	RC	7363	RM	B: 475° P: 475°	W: S:	122	127	122	119	127	161 159	179 165	174	P	
9/29		9:25	65°	S	RC	7363	RM	B: 475° P: 475°	W: S:	111	121	110	119	116	176 172	175 177	169	P	
9/30		9:00	65°	PC	RC	7363	RM	B: 475° P: 475°	W: S:	115	123	119	127	121	171 160	172 170	166	P	
9/30		9:20	65°	PC	RC	7363	RM	B: 475° P: 475°	W: S:	127	117	127	111	114	160 166	158 159	174	P	
9/30		3:50	76°	PC	RC	7363	RM	B: 475° P: 475°	W: S:	120	122	120	120	121	147 161	146 158	161	P	
10/2		10:45	64°	MC	RC	7363	RM	B: 475° P: 475°	W: S:	111	106	117	116	112	153 166	162 157	156	P	
10/2		2:45	78	MS	RC	7363	RM	B: 475° P: 475°	W: S:	158	117	123	120	143	169 164	169 166	156	P	
10/3		7:30	60°	S	RC	7363	RM	B: 475° P: 475°	W: S:	105	106	102	113	125	170 178	171 170	177	P	T-T
								B: P:	W: S:										

Appendix N
Geomembrane Production Seaming Forms

WEYERHAEUSER COMPANY
LANDFILL CELL 3 PHASE 1A
PLYMOUTH, NORTH CAROLINA

GSI QAQC PAPERWORK JOB #20040

PANEL SEAMING REPORTS

GSI

PAGE: 1

PANEL SEAMING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE	TIME	SEAM NO.	PANEL NO.	SEAM LENGTH	SEAMER INT	SET TEMP	SET SPEED	MACH. NO.	WEATHER WIND/TEMP (MPH/°F)	BEGINNING SAMPLE TEST RESULT	ENDING SAMPLE TEST RESULT
8/20	1:20	1-2	1-2	63'	MA	750°	12'	5899	mstly cloudy 76° 3-7		
8/20	1:30	2-3	2-3	64'	MA	750°	12'	5899	mstly cloudy 76° 3-7		
8/20	1:40	3-4	3-4	64'	MA	750°	12'	5899	mstly sunny 78° 3-7		
8/20	5:13	4-5	4-5	64	MA	750°	12'	5899	Cloudy 81° 3-7		
8/20	5:20	5-6	5-6	63'	MA	750°	12'	5899	Cloudy 81° 3-7		
8/20	5:27	6-7	6-7	63'	MA	750°	12'	5899	Cloudy 80° 3-7		
8/21	3:35	7-8	7-8	63'	MA	750°	12'	5899	mstly sunny 81° 15-20		
8/21	3:43	8-9	8-9	64'	MA	750°	12'	5899	mstly sunny 81° 15-20		
8/21	3:50	9-10	9-10	64'	MA	750°	12'	5899	mstly sunny 81° 15-20		
8/21	4:45	10-11	10-11	63'	MA	750°	12'	5899	mstly sunny 81° 15-20		
8/21	4:54	11-12	11-12	63'	MA	750°	12'	5899	mstly sunny 81° 15-20		
8/21	5:02	12-13	12-13	63'	MA	750°	12'	5899	mstly sunny 81° 15-20		
8/21	5:21	13-14	13-14	64'	MA	750°	12'	5899	mstly sunny 80° 5-10		
8/21	6:23	14-15	14-15	63'	MA	750°	12'	5899	mstly sunny 80° 5-10		
8/21	6:31	15-16	15-16	63'	MA	750°	12'	5899	mstly sunny 80° 5-10		
8/21	6:38	16-17	16-17	62'	MA	750°	12'	5899	mstly sunny 80° 5-10		
8/21	6:49	17-18	17-18	62'	MA	750°	12'	5899	mstly sunny 78° 5-10		
8/21	6:53	18-19	18-19	61'	MA	750°	12'	5899	mstly sunny 78° 5-10		

GSI
PANEL SEAMING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 80040 | MAT'L TYPE: 60 mil HDPE

DATE	TIME	SEAM NO.	PANEL NO.	SEAM LENGTH	SEAMER INT	SET TEMP	SET SPEED	MACH. NO.	WEATHER WIND/TEMP (MPH/°F)	BEGINNING SAMPLE TEST RESULT	ENDING SAMPLE TEST RESULT
8/22	5:00	19-20	19-20	61'	MA	750°	12'	5899	ptly cloudy 80° 3-7		
8/22	5:08	20-21	20-21	62'	MA	750°	12'	5899	ptly cloudy 80° 3-7		
8/22	5:35	21-22	21-22	62'	MA	750°	12'	5899	ptly cloudy 80° 3-7		
8/22	5:59	23-24	23-24	38'	MA	750°	12'	5899	ptly cloudy 80° 3-7		
8/22	6:06	23-25	23-25	38'	MA	750°	12'	5899	ptly cloudy 80° 3-7		
8/22	6:16	25-26	25-26	38'	MA	750°	12'	5899	ptly cloudy 80° 3-7		
8/22	6:27	26-27	26-27	38'	MA	750°	12'	5899	ptly cloudy 80° 3-7		
8/22	6:32	27-28	27-28	39'	MA	750°	12'	5899	ptly cloudy 80° 3-7		
8/22	6:37	28-29	28-29	39'	MA	750°	12'	5899	ptly cloudy 79° 3-7		
8/22	6:43	29-30	29-30	40'	MA	750°	12'	5899	ptly cloudy 79 3-7		
8/22	6:47	30-31	30-31	41'	MA	750°	12'	5899	ptly cloudy 79 3-7		
8/22	6:52	31-32	31-32	42'	MA	750°	12'	5899	ptly cloudy 77° 3-7		
8/22	6:58	32-33	32-33	43'	MA	750°	12'	5899	ptly cloudy 77° 3-7		
8/22	7:04	33-34	33-34	43'	MA	750°	12'	5899	ptly cloudy 77° 3-7		
8/22	7:42	22-24	22-24	12'	MA	750°	12'	5899	dusk 74° 3-7		
8/22	7:44	22-23	22-23	23'	MA	750°	12'	5899	DUSK 74° 3-7		
8/22	7:46	22-25	22-25	23'	MA	750°	12'	5899	DUSK 74° 3-7		
8/22	7:48	22-26	22-26	3'	MA	750°	12'	5899	DUSK 74° 3-7		
8/23	3:12	34-35	34-35	44'	MA	750°	12'	5899	ptly cloudy 90° 3-7		

GSI
PANEL SEAMING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20240 | MAT'L TYPE: 60 MIL HDPE

DATE	TIME	SEAM NO.	PANEL NO.	SEAM LENGTH	SEAMER INT	SET TEMP	SET SPEED	MACH. NO.	WEATHER WIND/TEMP (MPH/°F)	BEGINNING SAMPLE TEST RESULT	ENDING SAMPLE TEST RESULT
8/23	3:18	35-36	35-36	46'	MA	750°	12'	5899	prtly cloudy 90° 3-10		
8/23	3:26	36-37	36-37	46'	MA	750°	12'	5899	prtly cloudy 90° 3-10		
8/23	3:32	37-38	37-38	46'	MA	750°	12'	5899	prtly cloudy 90° 3-10		
8/23	3:40	38-39	38-39	47'	MA	750°	12'	5899	prtly cloudy 90° 3-10		
8/23	3:47	39-40	39-40	49'	MA	750°	12'	5899	prtly cloudy 90° 3-10		
8/23	3:57	40-41	40-41	50'	MA	750°	12'	5899	prtly cloudy 90° 3-10		
8/23	4:22	41-42	41-42	50'	MA	750°	12'	5899	prtly cloudy 90° 3-10		
8/23	4:30	42-43	42-43	50'	MA	750°	12'	5899	prtly cloudy 90° 3-10		
8/23	4:35	43-44	43-44	50'	MA	750°	12'	5899	partly cloudy 90° 3-10		
8/23	4:40	44-45	44-45	50'	MA	750°	12'	5899	prtly cloudy 90° 3-10		
8/23	4:45	45-46	45-46	50'	MA	750°	12'	5899	prtly cloudy 90° 3-10		
8/23	4:59	46-47	46-47	51'	MA	750°	12'	5899	prtly cloudy 90° 3-10		
8/24	11:56	1-48	1-48	24'	MA	750°	12'	5899	prtly sunny 87° 7-15		
8/24	12:03	48-49	48-49	26'	MA	750°	12'	5899	prtly sunny 87° 7-15		
8/24	12:14	49-50	49-50	28'	MA	750°	12'	5899	prtly sunny 87° 7-15		
8/24	12:19	50-51	50-51	29'	MA	750°	12'	5899	prtly sunny 87° 7-15		
8/24	12:25	51-52	51-52	30'	MA	750°	12'	5899	prtly sunny 87° 7-15		
8/24	12:29	52-53	52-53	30'	MA	750°	12'	5899	prtly sunny 87° 7-15		
8/24	12:32	53-54	53-54	31'	MA	750°	12'	5899	prtly sunny 87° 7-15		

GSI
PANEL SEAMING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE	TIME	SEAM NO.	PANEL NO.	SEAM LENGTH	SEAMER INT	SET TEMP.	SET SPEED	MACH. NO.	WEATHER WIND/TEMP (MPH/°F)	BEGINNING SAMPLE TEST RESULT	ENDING SAMPLE TEST RESULT
8/24	12:53	54-55	54-55	31'	MA	750°	12'	5899	MSTLY SUNNY 87° 7-15		
8/24	1:00	55-56	55-56	32	MA	750°	12'	5899	MSTLY SUNNY 87° 7-15		
8/24	1:09	56-57	56-57	33'	MA	750°	12'	5899	MSTLY SUNNY 87° 7-15		
8/24	1:16	57-58	57-58	34'	MA	750°	12	5899	MSTLY SUNNY 87° 7-15		
8/24	1:24	58-59	58-59	33'	MA	750°	12	5899	MSTLY SUNNY 87° 7-15		
8/24	1:33	59-60	59-60	35'	MA	750°	12	5899	MSTLY SUNNY 87° 7-15		
8/24	1:38	60-61	60-61	36'	MA	750°	12	5899	MSTLY SUNNY 87° 7-15		
8/24	1:43	61-62	61-62	36'	MA	750°	12	5899	MSTLY SUNNY 87° 7-15		
8/26	6:02	63-64	63-64	21'	MA	750°	12	5899	85° SUNNY 3-7		
8/26	6:08	65-66	65-66	23'	MA	750°	12	5899	85° SUNNY 3-7		
8/26	6:13	64-66	64-66	18'	MA	750°	12	5899	83° SUNNY 3-7		
8/26	6:15	63-66	63-66	16'	MA	750°	12	5899	83° SUNNY 3-7		
8/26	6:16	63-65	63-65	452'	MA	750°	12	5899	83° SUNNY 3-7		
8/26	6:57	67-68	67-68	23'	MA	750°	12	5899	81° SUNNY calm		
8/26	7:03	66-68	66-68	35'	MA	750°	12	5899	81° SUNNY calm		
8/26	7:05	65-68	65-68	15'	MA	750°	12	5899	80° SUNNY calm		
8/26	7:06	65-67	65-67	436'	MA	750°	12	5899	78° SUNNY calm		
8/26	7:33	69-70	69-70	23'	BS	750°	12	5899	79° DUSK calm		
8/26	7:37	68-70	68-70	49'	BS	750°	12	5899	77° DUSK calm		

GSI
PANEL SEAMING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE	TIME	SEAM NO.	PANEL NO.	SEAM LENGTH	SEAMER INT	SET TEMP	SET SPEED	MACH. NO.	WEATHER WIND/TEMP (MPH/°F)	BEGINNING SAMPLE TEST RESULT	ENDING SAMPLE TEST RESULT
8/26	7:41	67-70	67-70	17'	BS	750°	12'	1899	77° DUSK calm		
8/26	7:43	67-69	67-69	418'	BS	750°	12'	1899	77° Dusk calm		
8/27	9:10	4-63	4-63	23'	RM	450°	460°	7363	76° 10C 3-7		
8/27	9:21	5-63	5-63	23'	RM	450°	460°	7363	76° 10C 3-7		
8/27	9:32	6-63	6-63	23'	RM	450°	460°	7363	78° 0C 3-7		
8/27	9:44	7-63	7-63	23'	RM	450°	460°	7363	78° 0C 3-7		
8/27	9:51	8:63	8-63	23'	RM	450°	460°	7363	mstly cloudy 80° 3-7		
8/27	10:04	9-63	9-63	23'	RM	450°	460°	7363	mstly cloudy 80° 3-7		
8/27	10:13	10-63	10-63	23'	RM	450°	460°	7363	mstly cloudy 80° 7-15		
8/27	10:35	11-63	11-63	23'	RM	450°	460°	7363	mstly cloudy 82° 7-15		
8/27	10:46	12-63	12-63	23'	RM	450°	460°	7363	mstly cloudy 82° 7-15		
8/27	10:55	13-63	13-63	23'	RM	450°	460°	7363	mstly cloudy 82° 7-15		
8/27	11:02	14-63	14-63	23'	RM	450°	460°	7363	mstly cloudy 84° 7-15		
8/27	11:19	15-63	15-63	23'	RM	450°	460°	7363	mstly cloudy 84° 7-15		
8/27	11:25	16-63	16-63	23'	RM	450°	460°	7363	mstly cloudy 84° 7-15		
8/27	11:48	17-63	17-63	23'	RM	450°	460°	7363	mstly cloudy 86° 7-15		
8/27	11:55	18-63	18-63	23'	RM	450°	460°	7363	mstly cloudy 86° 7-15		
8/27	12:09	19-63	19-63	23'	RM	450°	460°	7363	mstly cloudy 86° 7-15		
8/27	12:15	20-63	20-63	23'	RM	450°	460°	7363	mstly cloudy 87° 7-15		

GSI
PANEL SEAMING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 2040 | MAT'L TYPE: 60mil HDPE

DATE	TIME	SEAM NO.	PANEL NO.	SEAM LENGTH	SEAMER INT	SET TEMP	SET SPEED	MACH NO.	WEATHER WIND/TEMP (MPH/°F)	BEGINNING SAMPLE TEST RESULT	ENDING SAMPLE TEST RESULT
9/27	12:39	21-63	21-63	23'	RM	450°	460°	7363	mstly cloudy 87° 7-15		
9/27	1:01	22-63	22-63	23'	RM	450°	460°	7363	mstly cloudy 87° 7-15		
9/27	3:46	26-63	26-63	20'	RM	450°	460°	7363	mstly cloudy 87° 7-15		
9/28	2:23	48-64	48-64	18'	RM	475°	475°	7363	Cloudy 88° 0-5		
9/28	2:29	48-66	48-66	3'	RM	475°	475°	7363	Cloudy 88° 0-5		
9/28	2:31	49-66	49-66	20'	RM	475°	475°	7363	Cloudy 88° 0-5		
9/28	2:40	49-68	49-68	3'	RM	475°	475°	7363	cloudy 88° 0-5		
9/28	2:42	50-68	50-68	20'	RM	475°	475°	7363	Cloudy 88° 0-5		
9/28	2:51	50-70	50-70	3'	RM	475°	475°	7363	Cloudy 88° 0-5		
9/28	2:53	51-70	51-70	16'	RM	475°	475°	7363	Cloudy 88° 0-5		
9/28	3:09	2-64	2-64	16'	RM	475°	475°	7363	Cloudy 88° 0-5		
9/28	3:14	2-63	2-63	6'	RM	475°	475°	7363	Cloudy 88° 0-5		
9/28	3:17	3-63	3-63	23'	RM	475°	475°	7363	Cloudy 88° 0-5		
9/1	8:58	27-65	27-65	23'	RM	475°	475°	7363	Cloudy 80° 0-5		
9/1	9:07	28-67	28-67	23'	RM	475°	475°	7363	Cloudy 82° 0-5		
9/1	9:15	29-69	29-69	23'	RM	475°	475°	7363	Cloudy 84° 0-5		
9/8	5:22	71-74	71-74	23'	MA	750°	12	5899	mstly sunny 83° 3-7		
9/8	5:28	72-75	72-75	23'	MA	750°	12	5899	mstly sunny 83° 3-7		
9/8	5:34	73-76	73-76	23'	MA	750°	12	5899	mstly sunny 83° 3-7		

GSI
PANEL SEAMING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE	TIME	SEAM NO.	PANEL NO.	SEAM LENGTH	SEAMER INT	SET TEMP	SET SPEED	MACH. NO.	WEATHER WIND/TEMP (MPH/°F)	BEGINNING SAMPLE TEST RESULT	ENDING SAMPLE TEST RESULT
9/8	5:51	69-70	69-70	415'	MA	750°	12'	5899	MS 80° calm		
9/8	5:45	70-74	70-74	7'	MA	750°	12'	5899	mstly sunny 80° calm		
9/8	5:46	70-71	70-71	5.6'	MA	750°	12'	5899	mstly sunny 80° calm		
9/8	6:32	74-75	74-75	6'	MA	750°	12'	5899	Dusk 74° calm		
9/8	6:33	72-74	72-74	2'	MA	750°	12'	5899	Dusk 74° calm		
9/8	6:33	71-72	71-72	473'	MA	750°	12'	5899	Dusk 74° calm		
9/8	7:20	75-76	75-76	6'	MA	750°	12'	5899	Dusk 70° calm		
9/8	7:21	72-73	72-73	473'	MA	750°	12'	5899	Dusk 70° calm		
9/9	4:34	76-77	76-77	4'	MA	750°	12'	5899	mstly sunny 85° 0-5		
9/9	4:34	73-77	73-77	471'	MA	750°	12'	5899	mstly sunny 85° 0-5		
9/9	5:22	77-78	77-78	474'	MA	750°	12'	5899	mstly sunny 85° 0-5		
9/9	6:03	78-79	78-79	473'	MA	750°	12'	5899	mstly sunny 85° 0-5		
9/10	12:49	79-80	79-80	472'	MA	750°	12'	5899	sunny 86° 7-12		
9/10	1:40	80-81	80-81	471'	MA	750°	12'	5899	sunny 86° 7-12		
9/10	2:25	81-82	81-82	469'	MA	750°	12'	5899	sunny 86° 7-12		
9/11	3:30	82-83	82-83	467'	MA	750°	12'	5899	ptly cloudy 85° 7-15		
9/11	4:19	83-84	83-84	467'	MA	750°	12'	5899	ptly cloudy 83° 7-15		
9/11	5:15	84-85	84-85	466'	MA	750°	12'	5899	ptly cloudy 81° 7-15		
9/11	6:09	85-86	85-86	466'	MA	750°	12'	5899	ptly cloudy 81° 7-15		
9/12	3:15	86-87	86-87	463'	MA	750°	12'	5899	mstly sunny 93° 0-5		

GSI
PANEL SEAMING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60mil HDPE

DATE	TIME	SEAM NO.	PANEL NO.	SEAM LENGTH	SEAMER INT	SET TEMP	SET SPEED FPM	MACH NO	WEATHER WIND/TEMP (MPH/°F)	BEGINNING SAMPLE TEST RESULT	ENDING SAMPLE TEST RESULT
9/12	4:05	87-88	87-88	463'	MA	750°	12	5899	mstly cloudy 89° 0-5		
9/12	4:55	88-89	88-89	462'	MA	750°	12	5899	mstly sunny 89° 0-5		
9/12	5:42	89-90	89-90	462'	MA	750°	12	5899	mstly cloudy 86 calm		
9/12	6:27	90-91	90-91	461'	MA	750°	12	5899	Dusk 84° calm		
9/13	10:50	62-92	62-92	36'	MA	750°	12	5899	ptly cloudy 89° 0-5		
9/13	12:14	92-93	92-93	37'	MA	750°	12	5899	ptly cloudy 91° 0-5		
9/13	12:21	93-94	93-94	38'	MA	750°	12	5899	ptly cloudy 91° 0-5		
9/13	12:28	94-95	94-95	39'	MA	750°	12	5899	ptly cloudy 91° 0-5		
9/13	12:35	95-96	95-96	40'	MA	750°	12	5899	ptly cloudy 91° 0-5		
9/13	12:42	96-97	96-97	41'	MA	750°	12	6899	ptly cloudy 91° 0-5		
9/13	12:49	97-98	97-98	43'	MA	750°	12	6899	ptly cloudy 91° 0-5		
9/13	12:55	98-99	98-99	43'	MA	750°	12	5899	ptly cloudy 91° 0-5		
9/13	1:03	99-100	99-100	45'	MA	750°	12	5899	ptly cloudy 91° 0-5		
9/13	4:15	70-51	70-51	4'	RM	475°	475°	7363	PC 88° 3-7		
9/13	4:17	51-74	51-74	3'	RM	475°	475°	7363	PC 88° 3-7		
9/13	4:19	52-74	52-74	20'	RM	475°	475°	7363	PC 88° 3-7		
9/13	4:30	52-75	52-75	3'	RM	475°	475°	7363	PC 88° 3-7		
9/13	4:31	53-75	53-75	20'	RM	475°	475°	7363	PC 88° 3-7		
9/13	4:40	53-76	53-76	3'	RM	475°	475°	7363	PC 88° 3-7		

GSI
PANEL SEAMING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60mil HDPE

DATE	TIME	SEAM NO.	PANEL NO.	SEAM LENGTH	SEAMER INT	SET TEMP	SET SPEED FPM	MACH. NO	WEATHER WIND/TEMP (MPH/°F)	BEGINNING SAMPLE TEST RESULT	ENDING SAMPLE TEST RESULT
9/13	4:41	54-76	54-76	20'	RM	475°	475°	7363	PC 86° 3-7		
9/13	5:16	54-77	54-77	3'	RM	475°	475°	7363	PC 86° 3-7		
9/13	5:11	55-77	55-77	20'	RM	475°	475°	7363	PC 86° 3-7		
9/13	5:17	55-78	55-78	3'	RM	475°	475°	7363	PC 86° 3-7		
9/13	5:18	56-78	56-78	20'	RM	475°	475°	7363	PC 86° 3-7		
9/13	5:27	56-79	56-79	3'	RM	475°	475°	7363	PC 86° 3-7		
9/13	5:28	57-79	57-79	20'	RM	475°	475°	7363	PC 86° 3-7		
9/13	5:38	57-80	57-80	3'	RM	475°	475°	7363	PC 84° 3-7		
9/13	5:39	58-80	58-80	20'	RM	475°	475°	7363	PC 84° 3-7		
9/13	5:47	58-81	58-81	3'	RM	475°	475°	7363	PC 84° 3-7		
9/13	5:48	59-81	59-81	20'	RM	475°	475°	7363	PC 84° 3-7		
9/13	5:56	59-82	59-82	3'	RM	475°	475°	7363	PC 84° 3-7		
9/13	5:57	60-82	60-82	20'	RM	475°	475°	7363	PC 84° 3-7		
9/13	6:03	60-83	60-83	3'	RM	475°	475°	7363	PC 84° 3-7		
9/14	9:47	61-83	61-83	20'	RM	475°	475°	7363	PC 81° 0-5		
9/14	9:55	61-84	61-84	3'	RM	475°	475°	7363	PC 81° 0-5		
9/14	9:56	62-84	62-84	20'	RM	475°	475°	7363	PC 81° 0-5		
9/14	10:05	62-85	62-85	3'	RM	475°	475°	7363	PC 81° 0-5		
9/14	10:06	85-92	92-85	20'	RM	475°	475°	7363	PC 81° 0-5		

GSI
PANEL SEAMING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 30040 | MAT'L TYPE: 60 mil HDPE

DATE	TIME	SEAM NO.	PANEL NO.	SEAM LENGTH	SEAMER INT	SET TEMP.	SET SPEED	MACH. NO.	WEATHER WIND/TEMP (MPH/°F)	BEGINNING SAMPLE TEST RESULT	ENDING SAMPLE TEST RESULT
9/14	10:29	86-92	86-92	3'	RM	475°	475°	7363	P.C. 81° 0-5		
9/14	10:30	86-93	86-93	20'	RM	475°	475°	7363	P.C. 82° 0-5		
9/14	10:36	87-93	87-93	3'	RM	475°	475°	7363	P.C. 82° 0-5		
9/14	10:37	87-94	87-94	20'	RM	475°	475°	7363	P.C. 82° 0-5		
9/14	11:17	88-94	88-94	3'	RM	475°	475°	7363	P.C. 83° 0-5		
9/14	11:18	88-95	88-95	20'	RM	475°	475°	7363	P.C. 83° 0-5		
9/14	11:27	89-95	89-95	3'	RM	475°	475°	7363	P.C. 83° 0-5		
9/14	11:28	89-96	89-96	20'	RM	475°	475°	7363	P.C. 83° 0-5		
9/14	11:35	90-96	90-96	3	RM	475°	475°	7363	P.C. 84° 0-5		
9/14	11:36	90-97	90-97	20'	RM	475°	475°	7363	P.C. 84° 0-5		
9/14	11:53	91-97	91-97	3'	RM	475°	475°	7363	P.C. 84° 0-5		
9/14	11:55	91-98	91-98	16'	RM	475°	475°	7363	P.C. 84° 0-5		
9/15	11:15	47?-101	47-101	52'	MA	750°	12'	5899	P.C. 81° 5-10		
9/15	11:21	101-102	101-102	52'	MA	750°	12'	5899	P.C. 81° 5-10		
9/15	11:29	102-103	102-103	51'	MA	750°	12'	5899	P.C. 81° 5-10		
9/15	11:58	103-104	103-104	51'	MA	750°	12'	5899	P.C. 81° 5-10		
9/15	12:05	104-105	104-105	51'	MA	750°	12'	5899	P.C. 81° 5-10		
9/15	12:12	105-106	105-106	50	MA	750°	12'	5899	P.C. 81° 5-10		
9/15	3:30	100-107	100-107	46'	MA	750°	12'	5899	P.C. 81° 5-10		

GSI
PANEL SEAMING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60mil HDPE

DATE	TIME	SEAM NO.	PANEL NO.	SEAM LENGTH	SEAMER INT	SET TEMP	SET SPEED	MACH. NO.	WEATHER WIND/TEMP (MPH/°F)	BEGINNING SAMPLE TEST RESULT	ENDING SAMPLE TEST RESULT
9/15	3:38	107-108	107-108	47'	MA	750°	12'	5899	PC 81° 5-10		
9/15	3:47	108-109	108-109	48'	MA	750°	12'	5899	PC 81° 5-10		
9/15	4:03	109-110	109-110	51'	MA	750°	12'	5899	PC 81° 5-10		
9/14	6:35	29-69	29-69	23'	RM	475°	475°	7363	PC 78° 5-10		
9/14	6:42	30-71	30-71	23'	RM	475°	475°	7363	PC 78° 5-10		
9/14	6:59	31-72	31-72	23'	RM	475°	475°	7363	PC 78° 5-10		
9/14	7:15	32-73	32-73	23'	RM	475°	475°	7363	PC 78° 5-10		
9/14	7:30	33-77	33-77	23'	RM	475°	475°	7363	PC 76° 5-10		
9/15	5:50	34-78	34-78	23'	RM	475°	475°	7363	PC 76° 5-10		
9/15	5:56	35-79	35-79	23'	RM	475°	475°	7363	PC 79° 5-10		
9/15	6:13	36-80	36-80	23'	RM	475°	475°	7363	PC 79° 5-10		
9/15	6:30	37-81	37-81	23'	RM	475°	475°	7363	PC 79° 5-10		
9/15	6:38	38-82	38-82	23'	RM	475°	475°	7363	PC 77° 5-10		
9/15	6:50	39-83	39-83	23'	RM	475°	475°	7363	PC 77° 5-10		
9/15	7:04	40-84	40-84	23'	RM	475°	475°	7363	PC 77° 5-10		
9/15	7:15	41-85	41-85	23'	RM	475°	475°	7363	PC 75° 5-10		
9/15	7:30	42-86	42-86	23'	RM	475°	475°	7363	PC 75° 5-10		
9/16	9:00	43-87	43-87	23'	RM	475°	475°	7363	PC 75° 5-10		
9/16	9:06	44-88	44-88	23'	RM	475°	475°	7363	MS 68° 10-15		
									MS 68 10-15		

GSI
PANEL SEAMING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE	TIME	SEAM NO.	PANEL NO.	SEAM LENGTH	SEAMER INT	SET TEMP	SET SPEED	MACH. NO.	WEATHER WIND/TEMP (MPH/°F)	BEGINNING SAMPLE TEST RESULT	ENDING SAMPLE TEST RESULT
9/16	10:00	45-89	45-89	23'	RM	475°	475°	7363	MS 68° 10-15		
9/16	10:11	46-90	46-90	23'	RM	475°	475°	7363	MS 68° 10-15		
9/16	10:26	47-91	47-91	18'	RM	475°	475°	7363	MS 68° 10-15	NOT DONE	
9/16	9:10	91-111	91-111	461'	MA	750°	12	5899	MS 74° 10-15		
9/16	2:06	111-112	111-112	459'	MA	750°	12	5899	MS 74° 10-15		
9/16	3:01	112-113	112-113	458'	MA	750°	12	5899	MS 74° 10-15		
9/16	4:22	113-114	113-114	456"	MA	750°	12	5899	MS 74° 10-15		
9/16	5:55	114-115	114-115	455'	MA	750°	12	5899	MS 74° 10-15		
9/16	6:39	115-116	115-116	454'	MA	750°	12	5899	MS 74° 10-15		
9/17	5:19	116-117	116-117	452'	MA	750°	12	5899	PC 64° 0-5		
9/17	3:30	117-118	117-118	452'	MA	750°	12	5899	PC 64° 0-5		
9/17	4:25	118-119	118-119	450'	MA	750°	12	5899	PC 62° 0-5		
9/17	6:42	110-120	110-120	52'	MA	750°	12	5899	PC 62° 0-5		
9/17	6:59?	120-121	120-121	53'	MA	750°	12	5899	PC 62° 0-5		
9/17	6:56?	121-122	121-122	53'	MA	750°	12	5899	PC 62° 0-5		
9/17	7:03	122-123	122-123	44'	MA	750°	12	5899	PC 62° 0-5		
9/17	7:11	123-124	123-124	30'	MA	750°	12	5899	PC 62° 0-5		
9/17	7:16	125-126	125-126	50'	MA	750°	12	5899	PC 62° 0-5		
9/17	7:22	126-127	126-127	50'	MA	750°	12	5899	PC 62° 0-5		

GSI
PANEL SEAMING FORM

PROJECT NAME: WEYERHAUESER | JOB NUMBER: 20040 | MAT'L TYPE: 60mil HDPE

DATE	TIME	SEAM NO.	PANEL NO.	SEAM LENGTH	SEAMER INT	SET TEMP	SET SPEED	MACH. NO.	WEATHER WIND/TEMP (MPH/°F)	BEGINNING SAMPLE TEST RESULT	ENDING SAMPLE TEST RESULT
9/17	7:28	127-128	127-128	50'	MA	750°	12'	5899	60° Dusk calm		
9/17	7:35	128-129	128-129	50	MA	750°	12'	5899	60° Dusk calm		
9/17	7:42	129-130	129-130	50'	MA	750°	12'	5899	60° Dusk calm		
9/17	7:49	130-131	130-131	50	MA	750°	12'	5899	60° Dusk calm		
9/17	7:55	131-132	131-132	50'	MA	750°	12'	5899	60° Dusk 0		
9/17	8:05	132-133	132-133	51'	MA	750°	12'	5899	60° Dusk 0		
9/17	8:12	133-134	133-134	51'	MA	750°	12'	5899	60° Dusk 0		
9/17	8:19	134-135	134-135	51'	MA	750°	12'	5899	60° Dusk 0		
9/18	9:15	106-136	106-136	52'	MA	750°	12'	5899	71° C 0-5		
9/18	9:22	136-137	136-137	53'	MA	750°	12'	5899	71° C 0-5		
9/18	9:36	137-138	137-138	54'	MA	750°	12'	5899	71° C 0-5		
9/18	10:36	138-139	138-139	56'	MA	750°	12'	5899	71° C sprinkles		
9/18	10:42	139-140	139-140	40'	MA	750°	12'	5899	71° C sprinkles 0-5		
9/17	12:45	91-98	91-98	10'	RM	475°	475°	7363	88° MS 0-5		
9/17	12:51	98-111	98-111	3'	RM	475°	475°	7363	88° MS 5-10		
9/17	12:52	99-111	99-111	20'	RM	475°	475°	7363	88° MS 5-10		
9/17	1:02	99-112	99-112	3'	RM	475°	475°	7363	MS 88 5-10		
9/17	1:03	100-112	100-112	20'	RM	475°	475°	7363	MS 88 5-10		
9/17	1:14	100-113	100-113	3'	RM	475°	475°	7363	MS 88 5-10		

GSI
PANEL SEAMING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60mil HDPE

DATE	TIME	SEAM NO.	PANEL NO.	SEAM LENGTH	SEAMER INT	SET TEMP	SET SPEED	MACH. NO.	WEATHER WIND/TEMP (MPH/°F)	BEGINNING SAMPLE TEST RESULT	ENDING SAMPLE TEST RESULT
9/17	1:15	107-113	107-113	20'	RM	475°	475°	7303°	MS 88 5-10		
9/17	1:25	107-114	107-114	3'	RM	475°	475°	7363	MS 88 5-10		
9/17	1:26	108-114	108-114	20	RM	475°	475°	7363	MS 88° 5-10		
9/17	1:34	108-115	108-115	3	RM	475°	475°	7363	MS 88° 5-10		
9/17	1:35	109-115	109-115	20	RM	475°	475°	7363	MS 88° 5-10		
9/17	7:55 PM	109-116	109-116	3'	RM	475°	475°	7363	DUSK 80° 0-7		
9/17	7:56	110-116	110-116	20'	RM	475°	475°	7363	DUSK 80° 0-7		
9/17	8:10	110-117	110-117	3'	RM	475°	475°	7363	D 80 0-7		
9/17	8:11	117-120	117-120	20'	RM	475°	475°	7363	D 80 0-7		
9/17	8:30	118-120	118-120	3'	RM	475°	475°	7363	D 80 0-7		
9/17	8:51	118-121	118-121	20'	RM	475°	475°	7363	D 78 0-7		
9/17	9:04	119-121	119-121	3'	RM	475°	475°	7363	D 78 0-7		
9/17	9:05	119-122	119-122	20'	RM	475°	475°	7363	D 78 0-7		
9/17	8:28	119-135	119-135	20'	MA	750°	12	5899	D 78 0-7		
9/17	8:30	119-134	119-134	23'	MA	750°	12	5899	D 78 0-7		
9/17	8:32	119-133	119-133	23'	MA	750°	12	5899	D 78 0-7		
9/17	8:34	119-132	119-132	23'	MA	750°	12	5899	D 78 0-7		
9/17	8:36	119-131	119-131	23'	MA	750°	12	5899	D 78 0-7		
9/17	8:38	119-130	119-130	23'	MA	750°	12	5899	D 78 0-7		

GSI
PANEL SEAMING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE	TIME	SEAM NO.	PANEL NO.	SEAM LENGTH	SEAMER INT	SET TEMP	SET SPEED	MACH. NO.	WEATHER WIND/TEMP (MPH/°F)	BEGINNING SAMPLE TEST RESULT	ENDING SAMPLE TEST RESULT
9/17	8:40	119-129	119-129	23	MA	750°	12'	5899	DUSK 74 calm		
9/17	8:42	119-128	119-128	23	MA	750°	12'	5899	DUSK 74° calm		
9/17	8:44	119-127	119-127	23	MA	750°	12'	5899	DUSK 72 calm		
9/17	8:46	119-126	119-126	23	MA	750°	12'	5899	DUSK 72° calm		
9/17	8:50	119-125	119-125	5'	MA	750°	12'	5899	DUSK 72° calm		
9/17	8:50	122-125	122-125	10'	MA	750°	12'	5899	DUSK 72° calm		
9/17	8:51	123-125	123-125	14'	MA	750°	12'	5899	DUSK 72° calm		
9/17	8:52	123-124	123-124	26'	MA	750°	12'	5899	DUSK 72° calm		
9/21	9:02	135-141	135-141	52	MA	750°	12'	5899	C 74° 10-15		
9/21	9:09	141-142	141-142	51	MA	750°	12'	5899	C 74° 10-15		
9/21	9:16	142-143	142-143	51	MA	750°	12'	5899	C 74° 10-15		
9/21	9:22	143-144	143-144	51	MA	750°	12'	5899	C 74° 10-15		
9/17	6:03	47-91	47-91	10'	RM	475°	475°	7363	MS 70° 3-7		
9/17	6:05	101-111	101-111	23'	RM	475°	475°	7363	MS 70° 3-7		
9/17	6:16	102-112	102-112	23'	RM	475°	475°	7363	MS 70° 3-7		
9/17	6:24	103-113	103-113	23'	RM	475°	475°	7363	MS 70° 3-7		
9/17	6:35	104-114	104-114	23'	RM	475°	475°	7363	MS 70° 3-7		
9/17	6:49	105-115	105-115	23'	RM	475°	475°	7363	MS 70° 3-7		
9/17	7:05	106-116	106-116	23'	RM	475°	475°	7363	MS 70° 3-7		

GSI
PANEL SEAMING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 MIL HDPE

DATE	TIME	SEAM NO.	PANEL NO.	SEAM LENGTH	SEAMER INT.	SET TEMP	SET SPEED	MACH. NO.	WEATHER WIND/TEMP (MPH/°F)	BEGINNING SAMPLE TEST RESULT	ENDING SAMPLE TEST RESULT
9/18	9:47	117 - 136	117 - 136	23'	RM	475°	475°	7363	C 65° 0-5		
9/18	9:50'	118 - 137	118 - 137	23'	RM	475°	475°	7363	C 65° 0-5		
9/18	9:53	119 - 138	119-138	23'	RM	475°	475°	7363	C 65° 0-5		
9/22	10:22	119-141	119-141	23'	RM	475°	475°	7363	MS 70° 0-7		
9/22	3:06	119-142	119-142	23'	RM	475°	475°	7363	MC 72° 3-10		
9/22	3:16	119-143	119-143	23'	RM	475°	475°	7363	MC 72° 3-10		
9/22	3:27	119-144	119-144	19'	RM	475°	475°	7363	MC 72° 3-10		
9/29	10:00	119-144	119-114	4'	RM	475°	475°	7363	S 79 7-15		
9/28	5:26	144-145	144-145	50'	MA	750°	12	5899	S 73° 3-7		
9/28	5:33	145-146	145-146	50'	MA	750°	12	5899	S 72° 3-7		
9/28	5:39	146-147	146-147	50'	MA	750°	12	5899	S 72° 3-7		
9/28	5:46	147-148	147-148	50'	MA	750°	12	5899	S 72° 3-7		
9/28	5:55	148-149	148-149	50'	MA	750°	12	5899	S 72° 3-7		
9/28	6:16	149-150	149-150	50'	MA	750°	12	5899	S 72° 3-7		
9/29	10:03	119-145	119-145	23'	RM	750°	12	5899	S 69° 7-15+		
9/29	10:15	119-146	119-146	23'	RM	750°	12	5899	S 69° 7-15+		
9/29	10:22	119-147	119-147	23	RM	750°	12	5899	S 69° 7-15+		
9/29	10:33	119-148	119-148	23	RM	750°	12	5899	S 69° 7-15+		
9/29	10:48	119-149	119-149	20'		750°	12	5899	S 69 7-15+		

GSI
PANEL SEAMING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE	TIME	SEAM NO.	PANEL NO.	SEAM LENGTH	SEAMER INT	SET TEMP	SET SPEED	MACH. NO.	WEATHER WIND/TEMP (MPH/°F)	BEGINNING SAMPLE TEST RESULT	ENDING SAMPLE TEST RESULT
9/29	10:51	138-149	138-149	3'	RM	475°	475°	7363	S 69° 7-15		
9/29	10:53	138-150	138-150	4'	RM	475°	475°	7363	S 70° 7-15+		
9/29	11:21	139-150	139-150	33'	RM	475°	475°	7363	S 70° 7-15+		
9/29	11:32	140-150	140-150	17'	RM	475°	475°	7363	S 70° 7-15+		
		141-150									

Appendix O
Geomembrane Seam and Panel Repair Logs

WEYERHAEUSER COMPANY
LANDFILL CELL 3 PHASE 1A
PLYMOUTH, NORTH CAROLINA

GSI QAQC PAPERWORK JOB #20040

GEOMEMBRANE REPAIR REPORTS

GSI

GEOMEMBRANE REPAIR REPORT

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 Mil HDPE

FIELD SEAM	PANEL NO.	REPAIR CREW	MACH NO.	TEST DATE	TESTER INT	REPAIR DESCRIPTION AND SIZE (Patch, Bead, Ext Weld, Cap Strip, DT)	REPAIR DATE	LOCATION OF REPAIR	V BOX PASS
½-48/64		RM	7363	9/1	MA	4X6 PATCH	8/28	AT JUNC.	P
2-63/64		RM	7363	9/1	MA	1X1 PATCH	8/28	AT JUNC.	P
63-2/3		RM	7363	9/1	MA	1X1 PATCH	8/28	AT JUNC	P
63-3/4		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
63-4/5		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
63-5/6		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
63-6/7		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
63-7/8		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
7-8		RM	7363	9/1	MA	2X6 DT (1)	8/27	28' S. OF JUNC, 63-7/8	P
63-8/9		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
63-9/10		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
63-10/11		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
63-11/12		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
63-12/13		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
63-13/14		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
13-14		RM	7363	9/1	MA	2X6 DT (2)	8/27	7' S. OF JUNC 63-13/14	P
63-14/15		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P

GSI
GEOMEMBRANE REPAIR REPORT

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 2040 | MAT'L TYPE: 60 mil HDPE

	FIELD SEAM	PANEL NO.	REPAIR CREW	MACH NO.	TEST DATE	TESTER INT	REPAIR DESCRIPTION AND SIZE (Patch, Bead, Ext Weld, Cap Strip, DT)	REPAIR DATE	LOCATION OF REPAIR	V BOX PASS
✓	63-15/16		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC.	P
✓	63-16/17		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
✓	63-17/18		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
✓	63-18/19		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
✓	63-19/20		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
✓	63-20/21		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
✓		21	RM	7363	9/1	MA	1X37' PATCH	9/1	9½' W. OF JUNC 63-21/22 1-37' S. OF SEAM 21-63	P
✓	63-21/22		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
✓	21-22		RM	7363	9/1	MA	2X6 DT (3)	8/27	53' S. OF JUNC 63-21/22	P
✓	22-23/24		RM	7363	9/1	MA	2X2 PATCH	8/27	AT JUNC	P
✓	22-23		RM	7363	9/1	MA	2X2 PATCH	8/27	4' S. OF JUNC 22-23/25	P
✓	22-23/25		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
✓	22-25/26		RM	7363	9/1	MA	1X5 PATCH	8/27	AT JUNC	P
✓	22-26		RM	7363	9/1	MA	1X3 PATCH	8/27	LENGTH OF SEAM	P
✓	26-22/63		RM	7363	9/1	MA	1X1 PATCH	8/27	AT JUNC	P
✓	25-26		RM	7363	9/1	MA	2X3 PATCH	8/27	3' W. OF ANCHOR TRENCH	P
✓	26/27-63/65		RM	7363	9/1	MA	1X2 PATCH	9/1	AT JUNC	P

GSI
GEOMEMBRANE REPAIR REPORT

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

	FIELD SEAM	PANEL NO.	REPAIR CREW	MACH NO.	TEST DATE	TESTER INT	REPAIR DESCRIPTION AND SIZE (Patch, Bead, Ext Weld, Cap Strip, DT)	REPAIR DATE	LOCATION OF REPAIR	V BOX PASS
✓	63-65		RM	7363	9/1	MA	2X6 DT (8)	8/28	344' W OF JUNC. 27/27 - 63/65	P
✓	66-63/64		RM	7363	9/1	MA	1X1 PATCH	8/28	AT JUNC.	P
✓	48-64/66		RM	7363	9/1	MA	1X1 PATCH	8/28	AT JUNC.	P
✓	66-48/49		RM	7363	9/1	MA	1X1 PATCH	8/28	AT JUNC.	P
✓	63-64		RM	7363	9/1	MA	2X6 DT (7)	8/28	7' S. OF JUNC. 63-64/66	P
✓	63-65/66		RM	7363	9/1	MA	1X1 PATCH	8/28	AT JUNC.	P
✓		48	RM	7363	9/1	MA	1X1 PATCH	9/1	9' S OF JUNC 48-64/66 1-2' W. OF SEAM 48-64	P
✓	49-66/68		RM	7363	9/1	MA	1X1 PATCH	8/28	AT JUNC.	P
✓	68-49/50		RM	7363	9/1	MA	1X1 PATCH	8/28	AT JUNC.	P
✓	68-65/66		RM	7363	9/1	MA	1X1 PATCH	8/28	AT JUNC.	P
✓	65-67/68		RM	7363	9/1	MA	1X1 PATCH	8/28	AT JUNC.	P
✓	65-67		RM	7363	9/1	MA	2X6 DT (9)	8/28	288' W. OF JUNC 27/28 - 65/67	P
✓	27/28-65/67		RM	7363	9/1	MA	1X1 PATCH	9/1	AT JUNC	P
✓	28/29-67/69		RM	7363	9/1	MA	1X1 PATCH	9/1	AT JUNC	P
✓	67-69		RM	7363	9/1	MA	2X6 DT (10)	8/28	99' W. OF JUNC 28/29 - 67/69	P
✓	67-69/70		RM	7363	9/1	MA	1X1 PATCH	8/28	AT JUNC.	P
✓	70-67/68		RM	7363	9/1	MA	1X1 PATCH	8/28	AT JUNC	P

GSI
GEOMEMBRANE REPAIR REPORT

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

	FIELD SEAM	PANEL NO.	REPAIR CREW	MACH NO.	TEST DATE	TESTER INT	REPAIR DESCRIPTION AND SIZE (Patch, Bead, Ext Weld, Cap Strip, DT)	REPAIR DATE	LOCATION OF REPAIR	V BOX PASS
✓	50-68/70		RM	7363	9/1	MA	1X1 PATCH	8/28	AT JUNC	P
✓	70-50/51		RM	7363	9/1	MA	1X1 PATCH	8/28	AT JUNC	P
✓	33-34		RM	7363	9/1	MA	2X6 DT (4)	9/1	3' W. OF ANCHOR TRENCH	P
✓	43-44		RM	7363	9/1	MA	2X6 DT (5)	9/1	16' W. OF ANCHOR TRENCH	P
✓	59-60		RM	7363	9/1	MA	2X6 DT (6)	9/1	25' E. OF ANCHOR TRENCH	P
✓	51-70/74		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC.	P
✓	74-51/52		RM	7363	9/20	MA	1X1 PATCH	9/16	AT JUNC	P
✓	70-71/74		RM	7363	9/20	MA	1X1 PATCH	9/16	AT JUNC.	P
✓	71-69/70		RM	7363	9/20	MA	1X1 PATCH	9/16	AT JUNC	P
✓	69-71		RM	7363	9/20	MA	2X6 DT (11)	9/20	10' W. OF JUNC 29/30-69/71	P
✓	29-69		RM	7363	9/20	MA	1X1 PATCH	9/14	1' S. OF JUNC. 29/30-69/71	P
✓	29/30-69/71		RM	7363	9/20	MA	1X1 PATCH	9/14	AT JUNC	P
✓	52-74/75		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC	P
✓	75-52/53		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC	P
✓	74-72/75		RM	7363	9/20	MA	1X1 PATCH	9/20	AT JUNC	P
✓	72-71/74		RM	7363	9/20	MA	1X1 PATCH	9/16	AT JUNC	P
✓	72-75		RM	7363	9/20	MA	1X1 PATCH	9/17	2' N. OF JUNC, 74-72/75	P

GSI
GEOMEMBRANE REPAIR REPORT

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60mil HDPE

	FIELD SEAM	PANEL NO.	REPAIR CREW	MACH NO.	TEST DATE	TESTER INT	REPAIR DESCRIPTION AND SIZE (Patch, Bead, Ext Weld, Cap Strip, DT)	REPAIR DATE	LOCATION OF REPAIR	V BOX PASS
✓	72-75		RM	7363	9/20	MA	1' EXT WELD	9/20	1' N. OF JUNC 74-72/75	P
✓	71-72		RM	7363	9/20	MA	2X6 DT (42)	9/20	219' W. OF JUNC, 30/31-71/72	P
✓	30/31-74/72		RM	7363	9/20	MA	1X1 PATCH	9/14	AT JUNC	P
✓	30-71		RM	7363	9/20	MA	1X1 PATCH	9/14	1'S. OF JUNC 30/31-71/72	P
✓		71	RM	7363	9/20	MA	1X1 PATCH	9/14	10' N. OF SEAM 69-71 8' W. OF SEAM 30-71	P
✓	53-75/76		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC	P
✓	76-53/54		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC.	P
✓	72/73-75/76		RM	7363	9/20	MA	1X2 PATCH	9/17	AT JUNC.	P
✓	72-73		RM	7363	9/20	MA	2X6 DT (13)	9/20	360' W. OF JUNC 31/32-72/73	P
✓	31-72/32-73		RM	7363	9/20	MA	1X1 PATCH	9/14	AT JUNC	P
✓	54-76/77		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC	P
✓	77-54/55		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC	P
✓	77-73/76		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC	P
✓	73-77		RM	7363	9/20	MA	2X6 DT (14)	9/20	286' W. OF JUNC 32/33-73/77	P
✓	32/33-73/77		RM	7363	9/20	MA	2X3 PATCH	9/14	AT JUNC	P
✓	55-77/78		RM	7363	9/20	MA	1X1 PATCH	9/16	AT JUNC	P
✓	78-55/56		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC	P

GSI
GEOMEMBRANE REPAIR REPORT

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

	FIELD SEAM	PANEL NO.	REPAIR CREW	MACH NO.	TEST DATE	TESTER INT	REPAIR DESCRIPTION AND SIZE (Patch, Bead, Ext Weld, Cap Strip, DT)	REPAIR DATE	LOCATION OF REPAIR	V BOX PASS
✓	77-78		RM	7363	9/20	MA	2X6 DT (15)	9/20	135' W. OF JUNC 33/34-77/78	P
✓	33/34-77/78		RM	7363	9/20	MA	1X2 PATCH	9/14	AT JUNC	P
✓	56-78/79		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC	P
✓	79-56/57		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC	P
✓	78-79		RM	7363	9/20	MA	2X6 DT (16)	9/20	60' W. OF JUNC 34/35-78/79	P
✓	34/35-78/79		RM	7363	9/20	MA	1X1 PATCH	9/15	AT JUNC	P
✓	35-79		RM	7363	9/20	MA	1X1 PATCH	9/15	1' N. OF JUNC 34/35-78/79	P
✓		79	RM	7363	9/20	MA	1X1 PATCH	9/15	2' N. OF SEAM 78-79 2' W. OF SEAM 35-79	P
✓	57-79/80		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC	P
✓	80-57/58		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC	P
✓	79-80		RM	7363	9/20	MA	2X6 DT (17)	9/20	199' W. OF JUNC 35/36-79/80	P
✓	35/36-79/80		RM	7363	9/20	MA	2X2 PATCH	9/15	AT JUNC	P
✓		80	RM	7363	9/20	MA	1X5 PATCH	9/20	1' S. OF SEAM 80-81 196' E. OF SEAM 58-80	P
✓	58-80/81		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC	P
✓	81-58/59		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC	P
✓	80-81		RM	7363	9/20	MA	2X6 DT (18)	9/20	389' W. OF JUNC 36/37-80/81	P
✓		80	RM	7363	9/20	MA	1X1 PATCH	9/15	1' W. OF SEAM 36-80 3.5' OF SEAM 80-81	P

GSI
GEOMEMBRANE REPAIR REPORT

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

	FIELD SEAM	PANEL NO.	REPAIR CREW	MACH NO.	TEST DATE	TESTER INT	REPAIR DESCRIPTION AND SIZE (Patch, Bead, Ext Weld, Cap Strip, DT)	REPAIR DATE	LOCATION OF REPAIR	V BOX PASS
✓	36/37-89/81		RM	7363	9/20	MA	1X2 PATCH	9/15	AT JUNC	4
✓	59-81/82		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC	4
✓	82-59/60		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUN	P
✓	81-82		RM	7363	9/20	MA	2X6 DT (19)	9/20	275' W. OF JUNC. 37/38-81/82	4
✓	37/38-81/82		RM	7363	9/20	MA	2X2 PATCH	9/15	AT JUNC	P
✓	60-82/83		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC	P
✓	83-60/61		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC	P
✓	82-83		RM	7363	9/20	MA	2X6 DT (20)	9/20	39' W. OF JUNC. 38/39-82/83	P
✓	38/39-82/83		RM	7363	9/20	MA	2X2 PATCH	9/15	AT JUNC	P
✓		82	RM	7363	9/20	MA	1X1 PATCH	9/15	11' S. OF SEAM 82-83 2' W. OF SEAM 38-82	P
✓		82	RM	7363	9/20	MA	1X1 PATCH	9/20	11' S. OF SEAM 82-83 8' W. OF SEAM 38-82	P
✓	61-83/84		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC	P
✓	84-61/62		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC.	P
✓	83-84		RM	7363	9/20	MA	2X6 DT (21)	9/20	193' W. OF JUNC 39/40-83/84	P
✓	39/40-83/84		RM	7363	9/20	MA	2X2 PATCH	9/15	AT JUNC.	P
✓	62-84/85		RM	7363	9/20	MA	1X1 PATCH	9/17	AT JUNC.	P
✓	85-62/92		RM	7363	9/20	MA	1X1 PATCH	9/20	AT JUNC.	P

GSI
GEOMEMBRANE REPAIR REPORT

PROJECT NAME:	JOB NUMBER:	MAT'L TYPE:

FIELD SEAM	PANEL NO.	REPAIR CREW	MACH NO.	TEST DATE	TESTER INT	REPAIR DESCRIPTION AND SIZE (Patch, Bead, Ext Weld, Cap Strip, DT)	REPAIR DATE	LOCATION OF REPAIR	V BOX PASS
84-85		RM	7363	9/20	MA	2X6 DT (22)	9/20	410' W. OF JUNC. 40/41 - 84/85	P
40/41 - 84/85		RM	7363	9/20	MA	2X2 PATCH	9/15	AT JUNC	P
	85	RM	7363	9/20	MA	1X1 PATCH	9/15	7' N. OF SEAM 84-85 1' W. OF SEAM 41-85	P
	92	RM	7363	9/20	MA	1X1 PATCH	9/20	4' S. OF SEAM 92-93 1' W. OF SEAM 85-92	P
	92	RM	7363	9/20	MA	1X1 PATCH	9/20	4' S. OF SEAM 84-85 8' W. OF SEAM 85-92	P
	92	RM	7363	9/20	MA	1X1 PATCH	9/20	4' S. OF SEAM 84-85 15' W. OF SEAM 85-92	P
	92	RM	7363	9/20	MA	1X1 PATCH	9/20	4' S. OF SEAM 84-85 21' W. OF SEAM 85-92	P
	92	RM	7363	9/20	MA	1X1 PATCH	9/20	4' W. OF SEAM 85-92 10' N. OF SEAM 62-92	P
92-85/86		RM	7363	9/20	MA	1X1 PATCH	9/20	AT JUNC	P
86-92/93		RM	7363	9/20	MA	1X1 PATCH	9/20	AT JUNC	P
85-86		RM	7363	9/20	MA	2X6 DT (23)	9/20	160' W. OF JUNC. 41/42 - 85/86	P
41/42 - 85/86		RM	7363	9/20	MA	1X2 PATCH	9/15	AT JUNC	P
93-86/87		RM	7363	9/20	MA	1X1 PATCH	9/20	AT JUNC	P
87-93/94		RM	7363	9/20	MA	1X1 PATCH	9/20	AT JUNC	P
86-87		RM	7363	9/20	MA	2X6 DT (64)	9/20	22' W. OF JUNC 42/43 - 86/87	P
42/43 - 86/87		RM	7363	9/20	MA	1X2 PATCH	9/15	AT JUNC	P
94-87/88		RM	7363	9/20	MA	1X1 PATCH	9/20	AT JUNC	P

GSI
GEOMEMBRANE REPAIR REPORT

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

FIELD SEAM	PANEL NO.	REPAIR CREW	MACH NO.	TEST DATE	TESTER INT	REPAIR DESCRIPTION AND SIZE (Patch, Bead, Ext Weld, Cap Strip, DT)	REPAIR DATE	LOCATION OF REPAIR	V BOX PASS
88-94/95		RM	7363	9/20	MA	1X1 PATCH	9/20	AT JUNC.	P
87-88		RM	7363	9/20	MA	2X6 DT (25)	9/20	94' W. OF JUNC 43/44-87/88	P
43/43 87/88		RM	7363	9/20	MA	1X2 PATCH	9/16	AT JUNC.	P
95-89/89		RM	7363	9/20	MA	1X1 PATCH	9/20	AT JUNC.	P
89-95/96		RM	7363	9/20	MA	1X1 PATCH	9/20	AT JUNC.	P
88-89		RM	7363	9/20	MA	2X6 DT (26)	9/20	216' W. OF JUNC. 44/45-88/89	P
44/45-88/89		RM	7363	9/20	MA	2X2 PATCH	9/16	AT JUNC.	P
96-89/90		RM	7363	9/20	MA	1X1 PATCH	9/20	AT JUNC.	P
90-96/97		RM	7363	9/20	MA	1X1 PATCH	9/20	AT JUNC.	P
89-90		RM	7363	9/20	MA	2X6 DT (27)	9/20	367' W. OF JUNC. 45/46-89/90	P
45/46 89/90		RM	7363	9/20	MA	2X2 PATCH	9/16	AT JUNC.	P
97-90/91		RM	7363	9/20	MA	1X1 PATCH	9/20	AT JUNC	P
91-97/98		RM	7363	9/20	MA	1X1 PATCH	9/20	AT JUNC	P
90-91		RM	7363	9/20	MA	2X6 DT (28)	9/20	82' W OF JUNC 46/47-90/91	P
46/47-90/91		RM	7363	9/20	MA	2X2 PATCH	9/16	AT JUNC	P
	98	RM	7363	9/27	MA	1X4 PATCH	9/20	FROM SEAM 91-98 TO 4' W. N.S. OF JUNC 98-91/111	P
91-98		RM	7363	9/27	MA	1X1 PATCH		5' S. OF JUNC 98-91/111	P

GSI
GEOMEMBRANE REPAIR REPORT

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

FIELD SEAM	PANEL NO.	REPAIR CREW	MACH NO.	TEST DATE	TESTER INT	REPAIR DESCRIPTION AND SIZE (Patch, Bead, Ext Weld, Cap Strip, DT)	REPAIR DATE	LOCATION OF REPAIR	V BOX PASS
98-99		RM	7363	9/27	MA	1X2 PATCH	9/20	37' E. OF ANCHOR TRENCH	P
111-98/99		RM	7363	9/27	MA	1X1 PATCH	9/20	AT JUNC.	P
98-91/111		RM	7363	9/27	MA	1X1 PATCH	9/20	AT JUNC.	P
91-111		RM	7363	9/27	MA	2X6 DT (30)	9/21	395' W. OF JUNC 47/101-91/111	P
	47	RM	7363	9/27	MA	2X11 PATCH	9/22	4' S OF JUNC 47/101-91/111 FROM SEAM 47-91 TO 11' E. up SLOPE	P
47/101-91/111		RM	7363	9/27	MA	1X1 PATCH	9/22	AT JUNC.	P
47/101-91/111		RM	7363	9/27	MA	1X1 PATCH	9/22	AT JUNC.	P
	101	RM	7363	9/27	MA	1X1 PATCH	9/22	5'E. OF SEAM 101-111 3' N. OF SEAM 47-101	P
99-111/112		RM	7363	9/27	MA	1X1 PATCH	9/20	AT JUNC.	P
112-99/100		RM	7363	9/27	MA	1X1 PATCH	9/20	AT JUNC.	P
111-112		RM	7363	9/27	MA	2X6 DT (31)	9/21	256' W. OF JUNC 111/112-101/102	P
111-112		RM	7363	9/27	MA	1X1 PATCH	9/21	68' W. OF JUNC 111/112-101/102	P
101/102-111/112		RM	7363	9/27	MA	1X1 PATCH	9/22	AT JUNC.	P
101/102-111/112		RM	7363	9/27	MA	1X1 PATCH	9/20	AT JUNC.	P
100-107		RM	7363	9/27	MA	2X6 DT (29)	9/20	22' W. OF ANCHOR TRENCH	P
100-112/113		RM	7363	9/27	MA	1X1 PATCH	9/20	AT JUNC.	P
113-109/107		RM	7363	9/27	MA	1X1 PATCH	9/20	AT JUNC	P

GSI
GEOMEMBRANE REPAIR REPORT

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60mil HDPE

FIELD SEAM	PANEL NO.	REPAIR CREW	MACH NO.	TEST DATE	TESTER INT	REPAIR DESCRIPTION AND SIZE (Patch, Bead, Ext Weld, Cap Strip, DT)	REPAIR DATE	LOCATION OF REPAIR	V BOX PASS
112-113		RM	7363	9/27	MA	2x6 DT (32)	9/21	36' W. OF JUNC 102/103-112/113	P
102-112/103-113		RM	7363	9/27	MA	1x1 PATCH	9/22	AT JUNC	P
102-112/103-113		RM	7363	9/27	MA	1x1 PATCH	9/22	AT JUNC	P
107-108		RM	7363	9/27	MA	1x2 PATCH	9/20	4'E. OF ANCHOR TRENCH	P
107-113/114		RM	7363	9/27	MA	1x1 PATCH	9/20	AT JUNC.	P
114-107/108		RM	7363	9/27	MA	1x1 PATCH	9/20	At JUNC.	P
113-114		RM	7363	9/27	MA	2x6 DT (33)	9/21	185'W. OF JUNC 103/104-113/114	P
103/104-113/114		RM	7363	9/27	MA	2x2 PATCH	9/22	AT JUNC	P
	114	RM	7363	9/27	MA	1x1 PATCH	9/22	4'W. OF SEAM 104-114 6'N. OF SEAM 113-114	P
108-114/115		RM	7363	9/27	MA	1x1 PATCH	9/20	AT JUNC	P
115-109/109		RM	7363	9/27	MA	1x1 PATCH	9/20	AT JUNC	P
114-115		RM	7363	9/27	MA	2x6 DT (34)	9/21	374' W. OF JUNC 104/105-114/115	P
104/105-114/115		RM	7363	9/27	MA	2x2 PATCH	9/22	AT JUNC	P
109-115/116		RM	7363	9/27	MA	1x1 PATCH	9/20	AT JUNC	P
109-116		RM	7363	9/27	MA	1x1 PATCH	9/22	1'S. OF JUNC 116-109/110	P
116-109/110		RM	7363	9/27	MA	1x1 PATCH	9/20	AT JUNC	P
115-116		RM	7363	9/27	MA	2x6 DT (35)	9/21	254' W. OF JUNC 105/106-115/116	P

GSI
GEOMEMBRANE REPAIR REPORT

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60mil HDPE

	FIELD SEAM	PANEL NO.	REPAIR CREW	MACH NO.	TEST DATE	TESTER INT	REPAIR DESCRIPTION AND SIZE (Patch, Bead, Ext Weld, Cap Strip, DT)	REPAIR DATE	LOCATION OF REPAIR	V BOX PASS
✓	105-115/106-116		RM	7363	9/27	MA	2X2 PATCH	9/22	AT JUNC	P
✓	110-116/117		RM	7363	9/27	MA	1X1 PATCH	9/20	AT JUNC	P
✓	117-110/120		RM	7363	9/27	MA	1X1 PATCH	9/20	AT JUNC	P
✓	116-117		RM	7363	9/27	MA	2X6 DT (36)	9/21	69' W. OF JUNC 106/136-116/117	P
✓	106/136-116/10		RM	7363	9/27	MA	2X2 PATCH	9/22	AT JUNC	P
✓	120-117/118		RM	7363	9/27	MA	1X1 PATCH	9/20	AT JUNC	P
✓	118-120/121		RM	7363	9/27	MA	1X1 PATCH	9/20	AT JUNC	P
✓	117-118		RM	7363	9/27	MA	2X6 DT (37)	9/21	310' W. OF JUNC 136/137-117/118	P
✓	117/118-136/137		RM	7363	9/27	MA	2X2 PATCH	9/22	AT JUNC	P
✓	121-118/119		RM	7363	9/29	MA	1X1 PATCH	9/29	AT JUNC	P
✓	119-121/122		RM	7363	9/29	MA	1X1 PATCH	9/29	AT JUNC	P
✓	121-122		RM	7363	9/29	MA	1X1 PATCH	9/28	45' FROM E. ANCHOR TRENCH	P
✓	118-119		RM	7363	9/29	MA	5X5 PATCH	9/19	16' E. OF JUNC. 121-118/119 (SUMA AREA)	P
✓	118-119		RM	7363	9/29	MA	1X1 PATCH	9/28	21' E. OF JUNC 121-118/119	P
✓	118-119		RM	7363	9/29	MA	1X1 PATCH	9/28	304' W. OF JUNC 118/119-137/138	P
✓	118-119		AM	7363	9/29	MA	2X6 DT (38)	9/21	199' W. OF JUNC. 118/119-137/138	P
✓	118-119		RM	7363	9/29	MA	1X1 PATCH	9/28	195' W. OF JUNC 118/119-137/138	P

GSI
GEOMEMBRANE REPAIR REPORT

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MATL TYPE: 60 MIL HDPE

FIELD SEAM	PANEL NO.	REPAIR CREW	MACH NO.	TEST DATE	TESTER INT	REPAIR DESCRIPTION AND SIZE (Patch, Bead, Ext Weld, Cap Strip, DT)	REPAIR DATE	LOCATION OF REPAIR	V BOX PASS
118-119		RM	7363	9/29	MA	1X1 PATCH	9/28	20' W. OF JUNC 119/119 - 137/138	P
119/119 - 137/138		RM	7363	9/29	MA	2X2 PATCH	9/29	AT JUNC	P
137-138		RM	7363	9/29	MA	1X1 PATCH	9/29	ON E. ANCHOR TRENCH	P
137-138		RM	7363	9/29	MA	2X6 DT (42)	9/29	17' FROM E. ANCHOR TRENCH	P
137-138		RM	7363	9/29	MA	1X1 PATCH	9/29	43' FROM E. ANCHOR TRENCH	P
	119	RM	7363	9/29	MA	1X1 PATCH	9/17	1'E. OF SEAM 119-122 8' N. OF SEAM 118-119 (SUMP AREA)	P
119-122/125		RM	7363	9/29	MA	1X1 PATCH	9/28	AT JUNC.	P
125-122/123		RM	7363	9/29	MA	1X1 PATCH	9/28	AT JUNC	P
123-124/125		RM	7363	9/29	MA	1X1 PATCH	9/28	AT JUNC.	P
124-125		RM	7363	9/29	MA	1X1 PATCH	9/28	ON N. ANCHOR TRENCH	P
119-125/126		RM	7363	9/29	MA	1X1 PATCH	9/28	AT JUNC	P
119-126/127		RM	7363	9/29	MA	1X1 PATCH	9/28	AT JUNC.	P
119-127/128		RM	7363	9/29	MA	1X1 PATCH	9/28	AT JUNC	P
128-129		RM	7363	9/29	MA	1X1 PATCH	9/28	19' FROM N. ANCHOR TRENCH	P
128-129		RM	7363	9/29	MA	2X6 DT (39)	9/2	24' FROM N. ANCHOR TRENCH	P
128-129		RM	7363	9/29	MA	1X1 PATCH	9/28	28' FROM N. ANCHOR TRENCH	P
119-129/129		RM	7363	9/29	MA	1X1 PATCH	9/28	AT JUNC	P

GSI
GEOMEMBRANE REPAIR REPORT

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60mil HDPE

	FIELD SEAM	PANEL NO.	REPAIR CREW	MACH NO.	TEST DATE	TESTER INT	REPAIR DESCRIPTION AND SIZE (Patch, Bead, Ext Weld, Cap Strip, DT)	REPAIR DATE	LOCATION OF REPAIR	V BOX PASS
✓	119-129/130		RM	7363	9/29	MA	1X1 PATCH	9/28	AT JUNC.	P
✓	119-130/131		RM	7363	9/29	MA	1X1 PATCH	9/28	AT JUNC	P
✓	119-131/132		RM	7363	9/29	MA	1X1 PATCH	9/28	AT JUNC	P
✓	119-132/133		RM	7363	9/29	MA	1X1 PATCH	9/28	AT JUNC.	P
✓	133-134		RM	7363	9/29	MA	1X1 PATCH	9/28	ON N. ANCHOR TRENCH	P
✓	133-134		RM	7363	9/29	MA	4' EXT WELD	9/28	1.5' FROM N ANCHOR TRENCH	P
✓	133-134		RM	7363	9/29	MA	1X1 PATCH	9/28	5 FROM N. ANCHOR TRENCH	P
✓	119-133/134		RM	7363	9/29	MA	1X1 PATCH	9/28	AT JUNC	P
✓	119-134/135		RM	7363	9/29	MA	1X1 PATCH	9/28	AT JUNC	P
✓	135-141		RM	7363	9/29	MA	1X1 PATCH	9/22	44' FROM N. ANCHOR TRENCH	P
✓	119-135		RM	7363	9/29	MA	1X5 PATCH	9/21	FROM JUNC 119-135/141 TO 5' W	P
✓		119	RM	7363	9/29	MA	1X4 PATCH	9/21	#34 FROM SEAM 119-122 FROM SEAM 119-135 TO 4'S.	P
✓	119-141/2	119	RM	7363	9/29	MA	1X1 PATCH	9/21	#4 FROM SEAM 119-135 #33 FROM SEAM 119-122	P
✓	119-141/142		RM	7363	9/29	MA	1X1 PATCH	9/22	AT JUNC.	P
✓	119-142/143		RM	7363	9/29	MA	1X1 PATCH	9/22	AT JUNC.	P
✓	143-144		RM	7363	9/29	MA	2X6 DT (4D)	9/29	13' FROM N. ANCHOR TRENCH	P
✓	119-143/144		RM	7363	9/29	MA	1X1 PATCH	9/22	AT JUNC	P

GSI
GEOMEMBRANE REPAIR REPORT

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 2004D | MAT'L TYPE: 60 MIL HDPE

	FIELD SEAM	PANEL NO.	REPAIR CREW	MACH NO.	TEST DATE	TESTER INT	REPAIR DESCRIPTION AND SIZE (Patch, Bead, Ext Weld, Cap Strip, DT)	REPAIR DATE	LOCATION OF REPAIR	V BOX PASS
✓		119	RM	7363	9/29	MA	1X7 PATCH	9/29	FROM JUNC 119-144/145 TO 5'S.	P
✓		119	RM	7363	9/29	MA	1X9 PATCH	9/29	18' W. OF SEAM 119-138 5'S. OF SEAM 119-144	P
✓	119-144		RM	7363	9/29	MA	1X1 PATCH	9/29	4' W. OF JUNC 119-144/145	P
✓	119-145		RM	7363	9/29	MA	1X1 PATCH	9/29	1'E OF JUNC 119-144/145	P
✓	119-145/146		RM	7363	9/29	MA	1X1 PATCH	9/29	AT JUNC.	P
✓	119-146/147		RM	7363	9/29	MA	1X1 PATCH	9/29	AT JUNC	P
✓	119-147		RM	7363	9/29	MA	2X6 DT (41)	9/29	8'E. OF JUNC 119-146/147	P
✓	119-147/148		RM	7363	9/29	MA	1X1 PATCH	9/29	AT JUNC	P
✓	119-MB/149		RM	7363	9/29	MA	1X1 PATCH	9/29	AT JUNC	P
✓	140-150/139		RM	7363	9/29	MA	1X1 PATCH	9/29	AT JUNC	P
✓	139-140		RM	7363	9/29	MA	1X1 PATCH	9/29	ON E. ANCHOR TRENCH	P
✓	150-138/139		RM	7363	9/29	MA	1X1 PATCH	9/29	AT JUNC	P
✓	138-149/150		RM	7363	9/29	MA	1X1 PATCH	9/29	AT JUNC	P
✓	138-139		RM	7363	9/29	MA	1X9 PATCH	9/29	7' ON E. ANCHOR TRENCH 0'S FROM E. ANCHOR TRENCH	P
✓	119-138		RM	7363	9/29	MA	1X6 PATCH	9/29	FROM JUNC 119-138/149 TO 5'S	P
✓	119-138		RM	7363	9/29	MA	2X2 PATCH	9/29	6'S. OF JUNC 119-138/149	P
✓		138	RM	7363	9/29	MA	1X3	9/29	FROM SEAM 119-138 TO 3'E 15'N. OF SEAM 137-138	P

GSI

GEOMEMBRANE REPAIR REPORT

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60mil HDPE

	FIELD SEAM	PANEL NO.	REPAIR CREW	MACH NO.	TEST DATE	TESTER INT	REPAIR DESCRIPTION AND SIZE (Patch, Bead, Ext Weld, Cap Strip, DT)	REPAIR DATE	LOCATION OF REPAIR	V BOX PASS
✓		138	RM	7363	9/29	MA	1X4 PATCH	9/29	4'E OF SEAM 119-138 12'N. OF SEAM 137-138	P
✓		119	RM	7363	9/30	MA	23X 27 PATCH	9/30	E. Sump	P
✓	118-119		RM	7363	9/30	MA	1X1 PATCH	9/30	ON W. EDGE OF LG SUMP PATCH 16'F	P
✓	137-139		RM	7363	9/30	MA	1X1 PATCH	9/30	ON E EDGE OF LG SUMP PATCH	P
✓	LG. PATCH IN E. SUMP		RM	7363	9/30	MA	1X1 PATCH	9/30	9'FROM N EDGE OF LG SUMP PATCH 8'FROM E. EDGE OF LG SUMP PATCH	P
✓	LG. PATCH IN E. SUMP		RM	7363	9/30	MA	2' EXT WELD	9/30	FROM N EDGE OF LG. SUMP PATCH TO ABOVE PATCH	P
✓	LG PATCH IN E. SUMP		RM	7363	9/30	MA	1X1 PATCH	9/30	1'FROM E EDGE OF LG SUMP PATCH 4'FROM S. EDGE OF LG. SUMP PATCH	P
✓	LG. PATCH IN E. SUMP		RM	7363	9/30	MA	3' EXT WELD	9/30	FROM S EDGE OF LG SUMP PATCH TO ABOVE PATCH	P
✓	LG PATCH IN E. SUMP		RM	7363	9/30	MA	3X3 PATCH	9/30	7'FROM N. EDGE OF LG SUMP PATCH 7'FROM W EDGE OF LG SUMP PATCH	P
✓	LG. PATCH IN E. SUMP		RM	7363	9/30	MA	6' EXT WELD	9/30	FROM W EDGE OF LG SUMP PATCH TO ABOVE PATCH	P
✓		1	RM	7363	10/3	MA	1X65 PATCH	10/3	LENGTH OF PANEL 8'W. OF SEAM 1-2	P
✓		2	RM	7363	10/3	MA	1X65 PATCH	10/3	LENGTH OF PANEL 6'E OF SEAM 1-2	P
✓		2	RM	7363	10/3	MA	1X65 PATCH	10/3	LENGTH OF PANEL 3'W. OF SEAM 2-3	P
✓		3	RM	7363	10/2	MA	1X65 PATCH	10/2	LENGTH OF PANEL 12'W. OF SEAM 3-4	P
✓		4	RM	7363	10/2	MA	1X65 PATCH	10/2	LENGTH OF PANEL 4'E. OF SEAM 3-4	P
✓		4	RM	7363	10/2	MA	1X65' PATCH	10/2	LENGTH OF PANEL 5'W. OF SEAM 4-5	P
✓		5	RM	7363	10/2	MA	1X65 PATCH	10/2	LENGTH OF PANEL 7'E OF SEAM 4-5	P

GSI
GEOMEMBRANE REPAIR REPORT

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 220040 | MAT'L TYPE: 60 mil HDPE

	FIELD SEAM	PANEL NO.	REPAIR CREW	MACH NO.	TEST DATE	TESTER INT	REPAIR DESCRIPTION AND SIZE (Patch, Bead, Ext Weld, Cap Strip, DT)	REPAIR DATE	LOCATION OF REPAIR	V BOX PASS
✓		6	RM	7363	10/2	MA	1X65 PATCH	10/2	LENGTH OF PANEL 1'E OF SEAM 5-6	P
✓		6	RM	7363	10/2	MA	1X65 PATCH	10/2	LENGTH OF PANEL 8'W. OF SEAM 6-7	P
✓		7	RM	7363	10/2	MA	1X65 PATCH	10/2	LENGTH OF PANEL 7'E OF SEAM 6-7	P
✓		7	RM	7363	10/2	MA	1X65 PATCH	10/2	LENGTH OF PANEL 2'W. OF SEAM 7-8	P

Appendix P
Nondestructive Testing Logs

WEYERHAEUSER COMPANY
LANDFILL CELL 3 PHASE 1A
PLYMOUTH, NORTH CAROLINA

GSI QAQC PAPERWORK JOB #20040

NON-DESTRUCTIVE SEAM TESTING REPORTS

GSI NON-DESTRUCTIVE TESTING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE TESTED	SEAM LENGTH TESTED	SEAM#	TESTER INITIAL	AIR PRESSURE TEST					VACUUM TEST	COMMENTS
				TIME		PRESSURE (PSI)				
				START	END	START	END	P/F	P/F	
8/23	63'	1-2	RC	11:52	11:57	29	29	P		
8/23	64'	2-3	RC	11:52	11:57	32	32	P		
8/23	64'	3-4	RC	11:53	11:58	33	33	P		
8/23	64'	4-5	RC	11:53	11:58	28	28	P		
8/23	63'	5-6	RC	11:54	11:59	32	32	P		
8/23	63'	6-7	RC	11:55	12:00	32	32	P		
8/23	63'	7-8	RC	12:12	12:17	34	33	P		
8/23	64'	8-9	RC	12:13	12:18	29	27	P		
8/23	64'	9-10	RC	12:14	12:19	32	32	P		
8/23	63'	10-11	RC	12:14	12:19	30	28	P		
8/23	63'	11-12	RC	12:15	12:20	34	33	P		
8/23	63'	12-13	RC	12:15	12:20	34	33	P		
8/23	64'	13-14	RC	12:38	12:43	29	29	P		
8/23	63'	14-15	RC	12:38	12:43	33	32	P		
8/23	62'	15-16	RC	12:38	12:43	34	34	P		
8/23	62'	16-17	RC	12:39	12:44	32	31	P		
8/23	62'	17-18	RC	12:39	12:44	34	34	P		
8/23	61'	18-19	RC	12:40	12:45	30	30	P		
8/23	61'	19-20	RC	3:03	3:08	31	31	P		
8/23	62'	20-21	RC	3:03	3:08	30	30	P		
8/23	62'	21-22	RC	3:04	3:09	34	34	P		
9/1	12'	22-24	MA						P	

GSI NON-DESTRUCTIVE TESTING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 MIL HDPE

DATE TESTED	SEAM LENGTH TESTED	SEAM#	TESTER INTITIAL	AIR PRESSURE TEST TIME START	AIR PRESSURE TEST TIME END	AIR PRESSURE TEST PRESSURE (PSI) START	AIR PRESSURE TEST PRESSURE (PSI) END	AIR PRESSURE TEST P/F	VACUUM TEST P/F	COMMENTS
8/23	38'	23-24	DL	5:39	5:44	29	29	P		
8/23	19'	22-23	DL	5:29	5:34	33	33	P		
8/23	4'	22-23	DL	6:48	6:53	42	41	P		
8/23	38'	23-25	DL	6:48	6:53	30	29	P		
8/23	23'	22-25	DL	6:48	6:53	34	33	P		
9/1	3'	22-26	MA						P	
8/23	38'	25-26	DL	6:57	7:02	39	39	P		
8/23	38'	26-27	DL	6:58	7:03	30	29	P		
8/23	39'	27-28	DL	6:58	7:03	34	34	P		
8/23	39'	28-29	DL	6:58	7:03	41	41	P		
8/23	40'	29-30	DL	6:58	7:03	34	34	P		
8/23	41'	30-31	DL	7:09	7:14	29	29	P		
8/23	42'	31-32	DL	7:09	7:14	39	39	P		
8/23	43'	32-33	DL	7:09	7:14	40	40	P		
8/24	43'	33-34	RC	8:20	8:25	28	27	P		
8/24	44'	34-35	RC	8:10	8:15	32	32	P		
8/24	46'	35-36	RC	8:10	8:15	30	28	P		
8/24	46'	36-37	RC	8:11	8:16	32	32	P		
8/24	46'	37-38	RC	8:26	8:31	32	32	P		
8/24	47'	38-39	RC	8:27	8:32	30	30	P		
8/24	49'	39-40	RC	8:28	8:33	33	33	P		
8/24	50'	40-41	RC	8:37	8:42	32	32	P		

GSI NON-DESTRUCTIVE TESTING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE TESTED	SEAM LENGTH TESTED	SEAM#	TESTER INITIAL	AIR PRESSURE TEST TIME START	TIME END	PRESSURE (PSI) START	PRESSURE (PSI) END	P/F	VACUUM TEST P/F	COMMENTS
8/24	50'	41-42	RC	8:38	8:43	32	32	P		
8/24	50'	42-43	RC	8:39	8:44	32	32	P		
8/24	50'	43-44	RC	8:49	8:54	32	32	P		
8/24	50'	44-45	RC	8:49	8:54	34	34	P		
8/24	50'	45-46	RC	8:50	8:55	34	34	P		
8/24	51'	46-47	RC	8:58	9:03	32	32	P		
8/25	22'	1-48	RC	9:33	9:38	32	32	P		
8/25	26'	48-49	RC	9:20	9:25	36	36	P		
8/25	28'	49-50	RC	9:20	9:25	28	28	P		
8/25	29'	50-51	RC	9:21	9:26	30	30	P		
8/25	30'	51-52	RC	9:22	9:27	34	34	P		
8/25	30'	52-53	RC	9:22	9:27	34	34	P		
8/25	31'	53-54	RC	9:48	9:53	30	30	P		
8/25	31'	54-55	RC	9:49	9:54	34	34	P		
8/25	32'	55-56	RC	10:12	10:17	34	33	P		
8/25	33'	56-57	RC	9:50	9:55	35	33	P		
8/25	34'	57-58	RC	10:07	10:12	34	34	P		
8/25	33'	58-59	RC	10:08	10:13	30	30	P		
8/25	35'	59-60	RC	10:08	10:13	34	34	P		
8/25	36'	60-61	RC	10:23	10:28	34	34	P		
8/25	36'	61-62	RC	10:24	10:29	33	33	P		
8/27	21'	63-64	DL	11:10	11:15	34	34	P		

GSI NON-DESTRUCTIVE TESTING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE TESTED	SEAM LENGTH TESTED	SEAM#	TESTER INITIAL	AIR PRESSURE TEST					VACUUM TEST	COMMENTS
				TIME		PRESSURE (PSI)				
				START	END	START	END	P/F	P/F	
8-27	18'	64-66	DL	11:10	11:15	32	32	P		
8-27	16'	63-66	DL	11:10	11:15	32	32	P		
8-27	452'	63-65	DL	11:15	11:20	34	34	P		
8-27	23'	65-66	DL	11:49	11:54	34	34	P		
8-27	35	66-68	DL	11:49	11:54	34	34	P		
8-27	15'	65-68	DL	11:49	11:54	34	34	P		
8-27	436'	65-67	DL	11:51	11:56	34	32	P		
8-27	23'	67-68	DL	12:08	12:13	34	34	P		
8-27	494'	68-70	DL	12:08	12:13	34	34	P		
8-27	17'	67-70	DL	12:08	12:13	34	32	P		
8-27	418'	67-69	DL	12:14	12:19	30	30	P		
9/1	2'	2-48	MA						P	
9/14	23'	69-70	DL	11:19	11:24	36	36	P		
9/20	4'	51-70	MA						P	
9/20	5'	74-70	MA						P	
9/20	3'	51-74	MA						P	
9/20	20'	52-74	MA						P	
9/20	23'	71-74	MA						P	
9/14	56'	70-71	DL	11:04	11:09	36	36	P	P	
9/14	415'	69-71	DL	11:19	11:24	36	36	P	P	
9/20	4'	74-75	MA						P	
9/20	2'	72-74	MA						P	

GSI NON-DESTRUCTIVE TESTING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 90040 | MAT'L TYPE: 60 mil HDPE

DATE TESTED	SEAM LENGTH TESTED	SEAM#	TESTER INITIAL	AIR PRESSURE TEST					VACUUM TEST	COMMENTS
				TIME		PRESSURE (PSI)				
				START	END	START	END	P/F	P/F	
9/20	3	72-75	MA						P	
9/14	20	72-75	DL	11:45	11:50	34	34	P		
9/20	3'	52-75	MA						P	
9/20	20'	53-75	MA						P	
9/14	469'	71-72	DL	11:45	11:50	34	34	P		
9/14	471'	72-73	DL	11:51	11:56	33	33	P		
9/20	4'	75-76	MA						P	
9/20	3'	53-76	MA						P	
9/20	20'	54-76	MA						P	
9/14	23'	73-76	DL	11:51	11:56	30	29	P		
9/20	4'	76-77	MA						P	
9/15	469'	73-77	DL	5:30	5:35	30	30	P		
9/14	471'	77-78	DL	12:01	12:06	34	34	P		
9/20	3'	54-77	MA						P	
9/20	20'	55-77	MA						P	
9/20	3'	55-78	MA						P	
9/20	20'	56-78	MA						P	
9/20	3'	56-79	MA						P	
9/20	20'	57-79	MA						P	
9/14	470'	78-79	DL	12:01	12:06	36	35	P		
9/14	467'	79-80	DL	5:17	5:22	28	28	P		
9/20	3'	57-80	MA						P	

GSI NON-DESTRUCTIVE TESTING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE TESTED	SEAM LENGTH TESTED	SEAM#	TESTER INTITIAL	AIR PRESSURE TEST					VACUUM TEST	COMMENTS
				TIME		PRESSURE (PSI)				
				START	END	START	END	P/F	P/F	
9/20	20'	58-80	MA						P	
9/20	3'	58-81	MA						P	
9/20	20'	59-81	MA						P	
9/14	465'	80-81	DL	5:17	5:22	33	32	P		
9/20	3'	59-82	MA						P	
9/20	20'	60-82	MA						P	
9/14	463'	81-82	DL	5:17	5:22	30	28	P		
9/20	3'	60-83	MA						P	
9/20	20'	61-83	MA						P	
9/14	461'	82-83	DL	5:17	5:22	33	33	P		
9/20	3'	61-84	MA						P	
9/20	20'	62-84	MA						P	
9/14	459'	83-84	DL	5:36	5:41	34	34	P		
9/20	3'	62-85	MA						P	
9/20	20'	92-85	MA						P	
9/14	459'	84-85	DL	5:36	5:41	38	36	P		
9/20	3'	92-86	MA						P	
9/20	20'	93-86	MA						P	
9/14	458'	85-86	DL	5:54	5:59	33	33	P		
9/20	3'	93-87	MA						P	
9/20	20'	94-87	MA						P	
14	458'	86-87	DL	5:54	5:59	38	36	P		
9/14	458'	87-88	DL	5:54	5:59	38	38	P		

GSI NON-DESTRUCTIVE TESTING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE TESTED	SEAM LENGTH TESTED	SEAM#	TESTER INITIAL	AIR PRESSURE TEST					VACUUM TEST	COMMENTS
				TIME		PRESSURE (PSI)				
				START	END	START	END	P/F	P/F	
9/1	20'	51-70'	MA						P	
9/1	3'	50-70	MA						P	
9/1	20'	50-68	MA						P	
9/1	3'	49-68	MA						P	
9/1	20'	49-66	MA						P	
9/1	3'	48-66	MA						P	
9/1	18'	48-64	MA						P	
9/1	16'	2-64	MA						P	
9/1	6'	2-63	MA						P	
9/1	23'	3-63	MA						P	
9/1	23'	4-63	MA						P	
9/1	23'	5-63	MA						P	
9/1	23'	6-63	MA						P	
9/1	23'	7-63	MA						P	
9/1	23'	8-63	MA						P	
9/1	23'	9-63	MA						P	
9/1	23'	10-63	MA						P	
9/1	23'	11-63	MA						P	
9/1	23'	12-63	MA						P	
9/1	23'	13-63	MA						P	
9/1	23'	14-63	MA						P	
9/1	23'	15-63	MA						P	

GSI NON-DESTRUCTIVE TESTING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE TESTED	SEAM LENGTH TESTED	SEAM#	TESTER INITIAL	AIR PRESSURE TEST					VACUUM TEST	COMMENTS
				TIME		PRESSURE (PSI)				
				START	END	START	END	P/F	P/F	
9/1	23'	16-63	MA						P	
9/1	23'	17-63	MA						P	
9/1	23'	18-63	MA						P	
9/1	23'	19-63	MA						P	
9/1	23'	20-63	MA						P	
9/1	23'	21-63	MA						P	
9/1	23'	22-63	MA						P	
9/1	23'	26-63	MA						P	
9/1	23'	27-65	MA						P	
9/1	23'	28-67	MA						P	
9/1	23'	29-69	MA						P	
9/20	23'	30-71	MA						P	
9/20	23'	31-72	MA						P	
9/20	23'	32-73	MA						P	
9/20	23'	33-77	MA						P	
9/20	23'	34-78	MA						P	
9/20	23'	35-79	MA						P	
9/20	23'	36-80	MA						P	
9/20	23'	37-81	MA						P	
9/20	23'	38-82	MA						P	
9/20	23'	39-83	MA						P	
9/20	23'	40-84	MA						P	

GSI NON-DESTRUCTIVE TESTING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE TESTED	SEAM LENGTH TESTED	SEAM#	TESTER INITIAL	AIR PRESSURE TEST					VACUUM TEST	COMMENTS
				TIME		PRESSURE (PSI)				
				START	END	START	END	P/F	P/F	
9/20	23'	41-85	MA						P	
9/20	23'	42-86	MA						P	
9/20	23'	43-87	MA						P	
9/20	23'	44-88	MA						P	
9/20	23'	45-89	MA						P	
9/20	23'	46-90	MA						P	
9/20	13'	47-91	MA						P	
9/27	10'	47-91	MA						P	
9/27	34'	88-94	MA						P	
9/27	20'	88-95	MA						P	
9/14	457'	88-89	DL	5:54	5:59	30	30	P		
9/27	3'	89-95	MA						P	
9/27	20'	89-96	MA						P	
9/14	457'	89-90	DL	5:07	5:12	38	38	P		
9/27	3'	90-96	MA						P	
9/27	20'	90-97	MA						P	
9/14	455'	90-91	DL	5:07	5:12	30	30	P		
9/27	3'	91-97	MA						P	
9/27	20'	91-98	MA						P	
9/20	36'	62-92	DL	4:20	4:25	34	34	P		
9/20	37'	92-93	DL	4:20	4:25	28	28	P		
9/20	38'	93-94	DL	4:20	4:25	34	34	P		

GSI NON-DESTRUCTIVE TESTING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60mil HDPE

DATE TESTED	SEAM LENGTH TESTED	SEAM#	TESTER INITIAL	AIR PRESSURE TEST					VACUUM TEST	COMMENTS
				TIME		PRESSURE (PSI)				
				START	END	START	END	P/F	P/F	
9/20	39'	94-95	DL	4:20	4:25	34	32	P		
9/20	41'	95-96	DL	4:36	4:41	32	32	P		
9/20	42'	96-97	DL	4:36	4:41	30	30	P		
9/20	43'	97-98	DL	4:46	4:51	30	29	P		
9/20	44'	98-99	DL	4:56	5:01	32	30	P		
9/20	45'	99-100	DL	5:21	5:26	30	30	P		
9/20	47'	100-107	DL	5:39	5:44	36	36	P		
9/20	48'	107-108	DL	6:13	6:18	29	29	P		
9/20	49'	108-109	DL	6:13	6:18	38	38	P		
9/20	50'	109-110	DL	6:14	6:19	33	33	P		
9/20	51'	110-120	DL	6:32	6:37	34	33	P		
9/20	51'	120-121	DL	6:32	6:37	35	35	P		
9/20	3'	91-97	MA					P	P	
9/27	20'	91-98	MA					P	P	
9/27	3'	98-111	MA					P	P	
9/27	20'	99-111	MA					P	P	
9/20	453'	91-111	DL	5:13	5:18	30	30	P		
9/20	68'	111-112	DL	5:22	5:27	30	30	P		
9/20	384'	111-112	DL	5:13	5:18	32	30	P		
9/27	3'	99-112	MA					P	P	
9/27	20'	100-112	MA					P	P	
9/20	451'	112-113	DL	5:39	5:44	30	30	P		

GSI NON-DESTRUCTIVE TESTING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE TESTED	SEAM LENGTH TESTED	SEAM#	TESTER INITIAL	AIR PRESSURE TEST					VACUUM TEST	COMMENTS
				TIME		PRESSURE (PSI)				
				START	END	START	END	P/F	P/F	
9/27	3'	100-113	MA						P	
9/27	20'	107-113	MA						P	
9/20	449'	113-114	DL	5:55	6:00	30	30	P		
9/27	3'	107-114	MA						P	
9/27	20'	108-114	MA						P	
9/20	449'	114-115	DL	5:55	6:00	36	36	P		
9/27	3'	108-115	MA						P	
9/27	20'	109-115	MA						P	
9/20	446'	115-116	DL	5:55	6:00	36	34	P		
9/27	3'	109-116	MA						P	
9/27	10'	110-116	MA						P	
9/20	445'	116-117	DL	6:32	6:37	30	29	P		
9/27	3'	110-117	MA						P	
9/27	20'	120-117	MA						P	
9/20	445'	117-118	DL	6:32	6:37	35	35	P		
9/27	3'	118-120	MA						P	
9/27	20'	118-121	MA						P	
9/27	10'	47-91	MA						P	
9/22	51'	47-101	DL	11:15	11:20	36	36	P		
9/27	23'	101-111	MA						P	
9/22	51'	101-102	DL	11:15	11:20	36	36	P		
9/27	23'	102-112	MA						P	

GSI NON-DESTRUCTIVE TESTING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 90040 | MAT'L TYPE: 60 mil HDPE

DATE TESTED	SEAM LENGTH TESTED	SEAM#	TESTER INTITIAL	AIR PRESSURE TEST					VACUUM TEST	COMMENTS
				TIME		PRESSURE (PSI)				
				START	END	START	END	P/F	P/F	
9/22	50'	102-103	DL	11:15	11:20	30	29	P		
9/27	23'	103-113	MA						P	
9/22	51'	103-104	DL	11:15	11:20	36	34	P		
9/27	23'	104-114	MA						P	
9/22	51'	104-105	DL	11:27	11:32	35	35	P		
9/27	23'	105-115	MA						P	
9/22	52'	105-106	DL	11:27	11:32	34	34	P		
9/27	23'	106-116	MA						P	
9/22	52'	106-136	DL	11:27	11:32	35	35	P		
9/27	23'	117-136	MA						P	
9/22	52'	136-137	DL	11:27	11:32	30	29	P		
9/27	23'	118-137	MA						P	
9/22	49'	143-144	DL	12:28	12:33	30	30	P		
9/29	23'	119-144	MA						P	
9/29	23'	119-143	MA						P	
9/22	50'	142-143	DL	12:30	12:35	30	30	P		
9/29	23'	119-142	MA						P	
9/29	23'	119-141	MA						P	
9/28	51'	141-142	DL	12:40	12:45	30	28	P		
9/22	49'	136-141	DL	12:48	12:53	35	34	P		
9/28	23'	119-135	DL	10:09	10:14	30	30	P		
9/28	49'	134-135	DL	10:09	10:14	32	31	P		

GSI NON-DESTRUCTIVE TESTING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE TESTED	SEAM LENGTH TESTED	SEAM#	TESTER INTITIAL	AIR PRESSURE TEST TIME START	AIR PRESSURE TEST TIME END	AIR PRESSURE TEST PRESSURE (PSI) START	AIR PRESSURE TEST PRESSURE (PSI) END	AIR PRESSURE TEST P/F	VACUUM TEST P/F	COMMENTS
9/28	23'	119-134	DL	10:09	10:14	30	30	P	P	
9/28	39'	133-134	DL	10:45	10:50	30	30	P		
9/29	10'	133-134	MA						P	
9/28	23'	119-133	DL	10:45	10:50	30	30	P		
9/28	49'	132-133	DL	10:52	10:57	30	30	P		
9/28	23'	119-132	DL	10:52	10:57	30	30	P		
9/28	49'	131-132	DL	11:00	11:05	32	32	P		
9/28	23'	119-131	DL	11:00	11:05	36	35	P		
9/28	49'	130-131	DL	11:07	11:13	32	32	P		
9/28	23'	119-130	DL	11:07	11:12	34	34	P		
9/28	49'	129-130	DL	11:15	11:20	34	34	P		
9/28	23'	119-129	DL	11:15	11:20	32	32	P		
9/28	21'	128-129	DL	11:25	11:30	30	30	P		
9/28	27'	128-129	DL	11:25	11:30	30	30	P		
9/28	23'	119-128	DL	11:25	11:30	30	30	P		
9/28	48'	127-128	DL	11:40	11:45	34	33	P		
9/28	23'	119-127	DL	11:40	11:45	32	32	P		
9/28	48'	126-127	DL	11:48	11:53	34	33	P		
9/28	23'	119-126	DL	11:48	11:53	30	30	P		
9/28	49'	125-126	DL	12:01	12:06	30	30	P		
9/29	5'	119-125	MA						P	
9/29	10'	122-125	MA						P	

GSI NON-DESTRUCTIVE TESTING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

DATE TESTED	SEAM LENGTH TESTED	SEAM#	TESTER INTITIAL	AIR PRESSURE TEST					VACUUM TEST	COMMENTS
				TIME		PRESSURE (PSI)				
				START	END	START	END	P/F	P/F	
9/28	40'	122-123	DL	12:08	12:13	32	32	P		
9/28	14'	123-125	DL	12:08	12:13	30	30	P		
9/28	26'	123-124	DL	12:16	12:21	30	30	P		
9/28	29'	124-125	DL	12:16	12:21	30	30	P		
9/28	50'	121-122	DL	12:25	12:30	32	32	P		
9/29	21'	118-119	MA						P	
9/28	225'	118-119	DL	12:45	12:50	30	30	P		
9/28	179'	118-119	DL	2:45	2:50	30	30	P		
9/29	20'	118-119	MA						P	
9/29	3'	119-121	MA						P	
9/29	19'	119-122	MA						P	
9/29	50'	144-145	DL	8:25	8:30	30	30	P		
9/29	23'	119-145	MA						P	
9/29	51'	145-146	DL	8:25	8:30	36	36	P		
9/29	23'	119-146	MA						P	
9/29	50'	146-147	DL	8:25	8:30	36	36	P		
9/29	23'	119-147	MA						P	
9/29	50'	147-148	DL	8:25	8:30	30	30	P		
9/29	23'	119-148	MA						P	
9/29	50'	148-149	DL	8:37	8:42	30	30	P		
9/29	20'	119-149	MA						P	
9/29	51'	149-150	DL	8:37	8:42	32	32	P		

GSI NON-DESTRUCTIVE TESTING FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60mil HDPE

DATE TESTED	SEAM LENGTH TESTED	SEAM#	TESTER INITIAL	AIR PRESSURE TEST					VACUUM TEST	COMMENTS
				TIME		PRESSURE (PSI)				
				START	END	START	END	P/F	P/F	
9/29	48'	138-139	DL	8:37	8:42	30	30	P		
9/29	48'	137-138	DL	9:05	9:10	32	32	P		
9/29	4'	138-150	MA						P	
9/29	17'	139-140	DL	8:55	9:00	30	30	P		
9/29		119-138	MA						P	
9/29	3'	138-149	MA						P	
9/29	4'	138-150	MA						P	
9/29	33'	139-150	MA						P	
9/29	17'	140-150	MA						P	

Appendix Q
Geomembrane Submittals

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

January 21, 2000

KSL# 1856-00

FAX: 281-230-2510

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

Don Bohac

This letter will certify that the Marlex* resin shown below, as supplied by Phillips Chemical Company, conforms to our manufacturing specification.

Type:	HHM TR-305
Lot Number:	8191631
P.O. Number:	
Date Shipped:	01/21/00
Package:	PSPX 6274
Quantity:	179000 LBS.
HLMI Flow Rate,ASTM D1238:	20. G/10 MIN
Density, ASTM D1505:	.937 G/CC

Karen S. Lively
Quality Assurance Manager

For COA questions call Linda Murray, 713-475-3625

* Reg. U.S. Pat. Off.

cc: QA-File-RC

TOTAL P.01

TOTAL P.01

Shipping Order - Packing List - Original - Not Negotiable

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Order Form

GSE Lining Technology, Inc. at HOUSTON,TEXAS

SHIPPERS NO. 13851

Received at Houston, Texas from GSE Lining Technology, Inc. the property described below, in apparent good order, except as noted (contents and condition of packages unknown), marked, consigned, and destined as indicated below, which said Carrier (the word "Carrier" being understood throughout this Shipping Order as meaning the person or corporation in possession of the property) agrees to to the place of delivery at said destination. It is mutually agreed as to each Carrier of all or any of said property, over all or any portion of said route to destination, and as to each party at any interested in all or any of said property, that every service performed hereunder shall be subject to either: (a) if the Shipper noted herein is GSE Lining Technology, Inc. as indicated by the gnation of the "Shipper" to be GSE Lining technology, Inc., then the Shipper and Carrier are subject to the terms and conditions contained in the Contract for Truck Transportation existing between parties, or (b) if the Shipper noted herein is not GSE Lining Technology, Inc., then GSE Lining Technology, Inc. is acting solely as the agent for the denoted Shipper, and thus every aspect of the service to be performed hereunder between the Shipper and the Carrier shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Official, Southern, Western, and Illinois Freight Classifications in effect on the date hereof, if this is a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment. When acting in the capacity of an agent for a Shipper in placing the material in transit on behalf of a Shipper, GSE Lining Technology, Inc. accepts no liability for loss of cargo, damage to containers, or any other consequences occuring during transportation, Carrier having agreed that the transportation arrangement was initiated by the Shipper and not by GSE Lining Technology, Inc.

Subject to the above terms and conditions as to which party is the Shipper, Shipper hereby certifies that he is familiar with the terms and conditions that govern the transportation of this shipment, and the said terms and conditions are hereby agreed and accepted for himself and his assigns.

Ship To: Weyerhaeuser Cell 1A & Haul Road
GSI/Ryan Inc.
Main Street Extension
Attn: Randy Flatt (262)524-7979
Plymouth NC 27962

Date: 08/03/00

Shipping Instructions: 7979 24 Hrs Prior to Shipping Contact Randy Flatt@262/524

Sales Order 14021

Project# 505141

No. Line	Roll #	QTY Shipped	UM	Kind of Package, Description of Articles, Special Marks, and Exceptions	Weight
1	114103161	11398	SF	HMT060A004 60 mil Avg HyperFrictionF Blk, HD, 2 Side Tex, 23.5	3,624.00
2	114103611	11139	SF	HMT060A004 60 mil Avg HyperFrictionF Blk, HD, 2 Side Tex, 23.5	3,576.00
3	114104074	11398	SF	HMT060A004 60 mil Avg HyperFrictionF Blk, HD, 2 Side Tex, 23.5	3,638.00
4	114104353	11139	SF	HMT060A004 60 mil Avg HyperFrictionF Blk, HD, 2 Side Tex, 23.5	3,550.00
5	114105185	11139	SF	HMT060A004 60 mil Avg HyperFrictionF Blk, HD, 2 Side Tex, 23.5	3,480.00
6	114105366	11045	SF	HMT060A004 60 mil Avg HyperFrictionF Blk, HD, 2 Side Tex, 23.5	3,512.00
7	114107241	11092	SF	HMT060A004 60 mil Avg HyperFrictionF Blk, HD, 2 Side Tex, 23.5	3,598.00
8	114107315	11139	SF	HMT060A004 60 mil Avg HyperFrictionF Blk, HD, 2 Side Tex, 23.5	3,578.00
9	114107316	11139	SF	HMT060A004 60 mil Avg HyperFrictionF Blk, HD, 2 Side Tex, 23.5	3,578.00
10	114107321	11139	SF	HMT060A004 60 mil Avg HyperFrictionF Blk, HD, 2 Side Tex, 23.5	3,558.00
11	114107538	11139	SF	HMT060A004 60 mil Avg HyperFrictionF Blk, HD, 2 Side Tex, 23.5	3,552.00

Total Quantity 122,906 Total Weight LB 39,244.00

TERMS: 016
Prepaid / Collect

Customer P.O. #: 5764-00

Section 7

Load Verification

Signed

X

Pick Up # 7184

Seal #

Truckers P.O. #

Driver Requirements:

1) Driver must pre call 24 hrs prior to delivery and on Friday for Monday delivery.
2) Driver must call (281) 230-6781 when unloaded.
3) Driver must call and advise any delay in transit.
4) A copy of this B/L must accompany Freight Invoice.

CARRIER NAME: _____

CARRIER SIGNATURE: _____

DATE: _____

Sign Here For Shipper

Shipper: _____

Address: GSE Lining Technology Inc.
19103 Gundle Rd.
Houston, Tx. 77073-3598

Sign Here For Agent Of Shipper

Agent for Shipper: _____

(GSE LINING TECHNOLOGY, INC.
APPROVED AGENT FOR SHIPPER)

Agent must sign, detach and retain a copy of this Shipping Order

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114103161

ROLL IDENTIFICATION

Roll Number	114103161	
Product Name	HMT060A004	
Production Date	8/27/99	
Length ≈(+/- 1%)	485 148	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,398 1,059	sq. feet sq. meters
Weight	3,624 1,644	pounds kilograms

RESIN INFORMATION

Lot Number	A45692
Type	HDA601
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	0.62

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5994					
Average		every roll	60	(1.5)	60	(1.5)
Minimum		every roll	54	(1.4)	59	(1.5)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	158	(277)
- MD		every roll	126	(221)	157	(274)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	303	(530)
- MD		every roll	228	(399)	272	(476)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		18	
- MD	(33 mm)	every roll	12		20	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		854	
- MD	(51 mm)	every roll	700		706	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	53	(236)
- MD		every roll	39	(174)	54	(239)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	145	(643)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	93	(415)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.6	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	
Asperity Height	GRI GM 12					
Average (mils)		every 2nd	10		10	

Order No.	14021
Customer Name	WEYERHAEUSER PAPER
Location	PLYMOUTH, N CAROLINA

APPROVED
J.Y.
7/31/00
QA

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114103611

ROLL IDENTIFICATION

Roll Number	114103611
Product Name	HMT060A004
Production Date	9/29/99

Length ≈(+/- 1%)	474 144	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,139 1,035	sq. feet sq. meters
Weight	3,576 1,622	pounds kilograms

RESIN INFORMATION

Lot Number	A45699
Type	HDA601
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.934
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	0.57

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5994					
Average		every roll	60	(1.5)	61	(1.5)
Minimum		every roll	54	(1.4)	59	(1.5)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	157	(275)
- MD		every roll	126	(221)	157	(275)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	320	(559)
- MD		every roll	228	(399)	282	(493)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		885	
- MD	(51 mm)	every roll	700		768	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	53	(234)
- MD		every roll	39	(174)	55	(245)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	149	(663)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	98	(436)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.6	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	
Asperity Height	GRI GM 12					
Average (mils)		every 2nd	10		10	

Order No.	14021
Customer Name	WEYERHAEUSER PAPER
Location	PLYMOUTH, N CAROLINA

APPROVED
J.Y.
7/31/00
QA

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114104074

ROLL IDENTIFICATION

Roll Number	114104074	
Product Name	HMT060A004	
Production Date	10/31/99	
Length ≈(+/- 1%)	485 148	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,398 1,059	sq. feet sq. meters
Weight	3,638 1,650	pounds kilograms

RESIN INFORMATION

Lot Number	A61763
Type	HDA601
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.934
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	0.63

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5994					
Average		every roll	60	(1.5)	61	(1.5)
Minimum		every roll	54	(1.4)	57	(1.4)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	147	(257)
- MD		every roll	126	(221)	151	(263)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	312	(547)
- MD		every roll	228	(399)	300	(525)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		22	
- MD	(33 mm)	every roll	12		20	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		840	
- MD	(51 mm)	every roll	700		789	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	53	(234)
- MD		every roll	39	(174)	54	(240)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	158	(703)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	99	(440)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.941	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.5	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	
Asperity Height	GRI GM 12					
Average (mils)		every 2nd	10		27	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
J.Y.
7/31/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114104353

ROLL IDENTIFICATION

Roll Number	114104353	
Product Name	HMT060A004	
Production Date	11/19/99	
Length ≈(+/- 1%)	474 144	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,139 1,035	sq. feet sq. meters
Weight	3,550 1,610	pounds kilograms

RESIN INFORMATION

Lot Number	A61773
Type	HDA601
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.934
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5994					
Average		every roll	60	(1.5)	61	(1.5)
Minimum		every roll	54	(1.4)	59	(1.5)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	155	(271)
- MD		every roll	126	(221)	152	(266)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	310	(542)
- MD		every roll	228	(399)	294	(514)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		839	
- MD	(51 mm)	every roll	700		779	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	53	(237)
- MD		every roll	39	(174)	54	(241)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	136	(603)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	100	(444)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.942	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.5	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	
Asperity Height	GRI GM 12					
Average (mils)		every 2nd	10		18	

Order No.	14021
Customer Name	WEYERHAEUSER PAPER
Location	PLYMOUTH, N CAROLINA

APPROVED
J.Y.
7/31/00
QA

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114105185

ROLL IDENTIFICATION

Roll Number	114105185
Product Name	HMT060A004
Production Date	1/23/00

Length ≈(+/- 1%)	474 144	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,139 1,035	sq. feet sq. meters
Weight	3,480 1,579	pounds kilograms

RESIN INFORMATION

Lot Number	A62204
Type	HDA601
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	0.59

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5994					
Average		every roll	60	(1.5)	60	(1.5)
Minimum		every roll	54	(1.4)	58	(1.5)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	149	(262)
- MD		every roll	126	(221)	158	(276)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	277	(485)
- MD		every roll	228	(399)	274	(480)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		22	
- MD	(33 mm)	every roll	12		20	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		777	
- MD	(51 mm)	every roll	700		715	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	52	(233)
- MD		every roll	39	(174)	57	(253)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	163	(723)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	114	(506)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.943	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.6	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	
Asperity Height	GRI GM 12					
Average (mils)		every 2nd	10		15	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
J.Y.
7/31/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114105366

ROLL IDENTIFICATION

Roll Number	114105366
Product Name	HMT060A004
Production Date	2/4/00

Length ≈(+/- 1%)	470 143	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,045 1,026	sq. feet sq. meters
Weight	3,512 1,593	pounds kilograms

RESIN INFORMATION

Lot Number	8191631
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.937
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5994					
Average		every roll	60	(1.5)	60	(1.5)
Minimum		every roll	54	(1.4)	56	(1.4)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	162	(284)
- MD		every roll	126	(221)	163	(285)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	274	(479)
- MD		every roll	228	(399)	268	(469)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		19	
- MD	(33 mm)	every roll	12		17	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		782	
- MD	(51 mm)	every roll	700		718	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	52	(232)
- MD		every roll	39	(174)	54	(239)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	152	(676)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	100	(445)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.943	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	
Asperity Height	GRI GM 12					
Average (mils)		every 2nd	10		17	

Order No.	14021
Customer Name	WEYERHAEUSER PAPER
Location	PLYMOUTH, N CAROLINA

APPROVED
J.Y.
7/31/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114107241

ROLL IDENTIFICATION

Roll Number	114107241	
Product Name	HMT060A004	
Production Date	6/8/00	
Length ≈(+/- 1%)	472 144	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,092 1,030	sq. feet sq. meters
Weight	3,598 1,632	pounds kilograms

RESIN INFORMATION

Lot Number	B61006
Type	HDA601
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	0.56

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5994					
Average		every roll	60	(1.5)	61	(1.5)
Minimum		every roll	54	(1.4)	58	(1.5)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	158	(277)
- MD		every roll	126	(221)	164	(287)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	331	(578)
- MD		every roll	228	(399)	320	(561)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		23	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		843	
- MD	(51 mm)	every roll	700		785	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	53	(237)
- MD		every roll	39	(174)	52	(232)
Puncture Resistance, lb. (N)	ASTM D 4833	every roll	108	(481)	160	(712)
Puncture Resistance, lb. (N)	FTMS 101C/2065	every 5th	80	(356)	103	(457)
Density, g/cc	ASTM D 1505	every 5th	0.940		0.941	
Carbon Black Content, %	ASTM D 1603	every 5th	2.0		2.5	
Carbon Black Dispersion	ASTM D 3015	every 5th	A2		A2	
Carbon Black Dispersion Views in Cat1 - Cat2	ASTM D 5596	every 5th	10		10	
Asperity Height Average (mils)	GRI GM 12	every 2nd	10		13	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED J.Y. 7/31/00 QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114107315

ROLL IDENTIFICATION

Roll Number	114107315	
Product Name	HMT060A004	
Production Date	6/13/00	
Length ≈(+/- 1%)	474	feet
	144	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	11,139	sq. feet
	1,035	sq. meters
Weight	3,578	pounds
	1,623	kilograms

RESIN INFORMATION

Lot Number	B60996
Type	HDA601
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	0.55

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5994					
Average		every roll	60	(1.5)	60	(1.5)
Minimum		every roll	54	(1.4)	58	(1.5)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	158	(276)
- MD		every roll	126	(221)	157	(275)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	340	(595)
- MD		every roll	228	(399)	304	(533)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		24	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		883	
- MD	(51 mm)	every roll	700		768	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	50	(223)
- MD		every roll	39	(174)	52	(232)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	159	(707)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	103	(457)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.941	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.5	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	
Asperity Height	GRI GM 12					
Average (mils)		every 2nd	10		15	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
J.Y.
7/31/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114107316

ROLL IDENTIFICATION

Roll Number	114107316	
Product Name	HMT060A004	
Production Date	6/14/00	
Length ≈(+/- 1%)	474	feet
	144	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	11,139	sq. feet
	1,035	sq. meters
Weight	3,578	pounds
	1,623	kilograms

RESIN INFORMATION

Lot Number	B60996
Type	HDA601
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	0.55

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5994					
Average		every roll	60	(1.5)	60	(1.5)
Minimum		every roll	54	(1.4)	58	(1.5)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	149	(260)
- MD		every roll	126	(221)	149	(261)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	309	(540)
- MD		every roll	228	(399)	326	(571)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		21	
- MD	(33 mm)	every roll	12		20	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		825	
- MD	(51 mm)	every roll	700		862	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	49	(220)
- MD		every roll	39	(174)	51	(228)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	156	(694)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	103	(457)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.941	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.5	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	
Asperity Height	GRI GM 12					
Average (mils)		every 2nd	10		17	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
J.Y.
7/31/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 114107321

ROLL IDENTIFICATION

Roll Number	114107321
Product Name	HMT060A004
Production Date	6/14/00

Length ≈(+/- 1%)	474	feet
	144	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	11,139	sq. feet
	1,035	sq. meters
Weight	3,558	pounds
	1,614	kilograms

RESIN INFORMATION

Lot Number	B60996
Type	HDA601
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	0.55

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5994					
Average		every roll	60	(1.5)	60	(1.5)
Minimum		every roll	54	(1.4)	58	(1.5)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	155	(272)
- MD		every roll	126	(221)	158	(276)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	365	(638)
- MD		every roll	228	(399)	316	(553)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		24	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		952	
- MD	(51 mm)	every roll	700		792	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	50	(225)
- MD		every roll	39	(174)	52	(233)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	165	(734)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	94	(420)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.941	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.3	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	
Asperity Height	GRI GM 12					
Average (mils)		every 2nd	10		12	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
J.Y.
7/31/00
QA

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 114107538

ROLL IDENTIFICATION

Roll Number	114107538
Product Name	HMT060A004
Production Date	6/29/00

Length ≈(+/- 1%)	474 144	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,139 1,035	sq. feet sq. meters
Weight	3,552 1,611	pounds kilograms

RESIN INFORMATION

Lot Number	B60997
Type	HDA601
Supplier	Mobil

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.935
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	0.56

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5994					
Average		every roll	60	(1.5)	61	(1.5)
Minimum		every roll	54	(1.4)	59	(1.5)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	160	(281)
- MD		every roll	126	(221)	164	(288)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	359	(628)
- MD		every roll	228	(399)	324	(566)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		21	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		906	
- MD	(51 mm)	every roll	700		813	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	51	(227)
- MD		every roll	39	(174)	51	(228)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	158	(703)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	103	(459)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.942	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.8	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	
Asperity Height	GRI GM 12					
Average (mils)		every 2nd	10		20	

Order No.	14021
Customer Name	WEYERHAEUSER PAPER
Location	PLYMOUTH, N CAROLINA

APPROVED
J.Y.
7/31/00
QA

MOBIL CHEMICAL
CERTIFICATE OF ANALYSIS
QUALITY PEOPLE MAKING QUALITY PRODUCTS

DENISE ADAMS 08/19/1999
GSE LINING TECHNOLOGY INC
19103 GUNDLE ROAD
HOUSTON, TX 77073

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 HOUSTON, TX Phone: .

Resin Identification		Resin Analysis Test	Lot Data
Product Type	HDA601	Density (gms/cc)	0.9346
Lot Number	A-45692	Melt Index (gm/10 min) I2	0.62
Hopper Car Number	ACFX-053686		
Quantity Shipped	172,800 LB		
Date Manufactured	07/07/1999		
Delivery Note	0080066464		
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
JD
DON BOHAC

MOBIL CHEMICAL
CERTIFICATE OF ANALYSIS
QUALITY PEOPLE MAKING QUALITY PRODUCTS

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

09/16/1999

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 HOUSTON, TX Phone: .

Resin Identification		Resin Analysis Test	Lot Data
Product Type	HDA601	Density (gms/cc)	0.9342
Lot Number	A-45699	Melt Index (gm/10 min) I2	0.57
Hopper Car Number	MOBX-052926		
Quantity Shipped	165,000 LB		
Date Manufactured	07/09/1999		
Delivery Note	0080068682		
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
JD
DON BOHAC

MOBIL CHEMICAL
CERTIFICATE OF ANALYSIS
QUALITY PEOPLE MAKING QUALITY PRODUCTS

10/08/1999

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

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 HOUSTON, TX Phone: .

Resin Identification		Resin Analysis Test	Lot Data
Product Type	HDA601	Density (gms/cc)	0.9341
Lot Number	A-61763	Melt Index (gm/10 min) I2	0.63
Hopper Car Number	MBLX-053974		
Quantity Shipped	195,600 LB		
Date Manufactured	10/06/1999		
Delivery Note	0080070550		
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
JD
DON BOHAC

MOBIL CHEMICAL
CERTIFICATE OF ANALYSIS
QUALITY PEOPLE MAKING QUALITY PRODUCTS

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

11/11/1999

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 HOUSTON, TX Phone: .

Resin Identification		Resin Analysis Test	Lot Data
Product Type	HDA601	Density (gms/cc)	0.9341
Lot Number	A-61773	Melt Index (gm/10 min) I2	0.59
Hopper Car Number	MBLX-053884		
Quantity Shipped	195,650 LB		
Date Manufactured	10/07/1999		
Delivery Note	0080072931		
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
JD

MOBIL CHEMICAL
CERTIFICATE OF ANALYSIS
QUALITY PEOPLE MAKING QUALITY PRODUCTS

01/12/2000

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

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 HOUSTON, TX Phone: .

Resin Identification		Resin Analysis Test	Lot Data
Product Type	HDA601	Density (gms/cc)	0.9347
Lot Number	A-62204	Melt Index (gm/10 min) I2	0.59
Hopper Car Number	TLCX-038445		
Quantity Shipped	182,650 LB		
Date Manufactured	12/12/1999		
Delivery Note	0080077527		
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
JD
DON BOHAC

MOBIL CHEMICAL
CERTIFICATE OF ANALYSIS
QUALITY PEOPLE MAKING QUALITY PRODUCTS

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

05/23/2000

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 HOUSTON, TX Phone: .

Resin Identification		Resin Analysis Test	Lot Data
Product Type	HDA601	Density (gms/cc)	0.9350
Lot Number	B-60996	Melt Index (gm/10 min) I2	0.55
Hopper Car Number	MBLX-053666		
Quantity Shipped	195,900 LB		
Date Manufactured	05/02/2000		
Delivery Note	0080088176		
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

MOBIL CHEMICAL
CERTIFICATE OF ANALYSIS
QUALITY PEOPLE MAKING QUALITY PRODUCTS

05/25/2000

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

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 HOUSTON, TX Phone: .

Resin Identification		Resin Analysis Test	Lot Data
Product Type	HDA601	Density (gms/cc)	0.9350
Lot Number	B-60997	Melt Index (gm/10 min) I2	0.56
Hopper Car Number	TLCX-038196		
Quantity Shipped	180,400 LB		
Date Manufactured	05/02/2000		
Delivery Note	0080088346		
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

MOBIL CHEMICAL
CERTIFICATE OF ANALYSIS
QUALITY PEOPLE MAKING QUALITY PRODUCTS

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

05/18/2000

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 HOUSTON, TX Phone: .

Resin Identification		Resin Analysis Test	Lot Data
Product Type	HDA601	Density (gms/cc)	0.9360
Lot Number	B-61006	Melt Index (gm/10 min) I2	0.53
Hopper Car Number	MBLX-053677		
Quantity Shipped	195,900 LB		
Date Manufactured	05/04/2000		
Delivery Note	0080087840		
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

Shipping Order - Packing List - Original - Not Negotiable

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Order Form

GSE Lining Technology, Inc. at HOUSTON,TEXAS

SHIPPERS NO. 13848

Received at Houston, Texas from GSE Lining Technology, Inc. the property described below, in apparent good order, except as noted (contents and condition of packages unknown), marked, consigned, and destined as indicated below, which said Carrier (the word "Carrier" being understood throughout this Shipping Order as meaning the person or corporation in possession of the property) agrees to carry to the place of delivery at said destination. It is mutually agreed as to each Carrier of all or any of said property, over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service performed hereunder shall be subject to either: (a) if the Shipper noted herein is GSE Lining Technology, Inc. as indicated by the designation of the "Shipper" to be GSE Lining technology, Inc., then the Shipper and Carrier are subject to the terms and conditions contained in the Contract for Truck Transportation existing between the parties, or (b) if the Shipper noted herein is not GSE Lining Technology, Inc., then GSE Lining Technology, Inc. is acting solely as the agent for the denoted Shipper, and thus every aspect of the service to be performed hereunder between the Shipper and the Carrier shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Official, Southern, Western, and Illinois Freight Classifications in effect on the date hereof, if this is a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment. When acting in the capacity of an agent for a Shipper in placing the material in transit on behalf of a Shipper, GSE Lining Technology, Inc. accepts no liability for loss of cargo, damage to containers, or any other consequences occuring during transportation, Carrier having agreed that the transportation arrangement was initiated by the Shipper and not by GSE Lining Technology, Inc.

Subject to the above terms and conditions as to which party is the Shipper, Shipper hereby certifies that he is familiar with the terms and conditions that govern the transportation of this shipment, and the said terms and conditions are hereby agreed and accepted for himself and his assigns.

Roll Certifications Included

Ship To: Weyerhaeuser Cell 1A & Haul Road
GSI/Ryan Inc.
Main Street Extension
Attn: Randy Flatt (262)524-7979
Plymouth NC 27962

Date: 08/03/00

Shipping Instructions: 7979 24 Hrs Prior to Shipping Contact Randy Flatt@262/524

Sales Order 14021

No. Line	Roll #	QTY Shipped	UM	Kind of Package, Description of Articles, Special Marks, and Exceptions	Weight
1	115116282	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,380.00
2	115116283	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,384.00
3	115116284	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,370.00
4	115116285	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,362.00
5	115116286	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,380.00
6	115116291	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,398.00
7	115116292	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,390.00
8	115116293	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,396.00
9	115116294	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,392.00
10	115116295	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,394.00
11	115116296	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,386.00
12	115116297	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,392.00

Total Quantity 146,640 Total Weight 44,010.00

Project# 505141

TERMS: 016
Prepaid / Collect

Customer P.O. #: 5764-00

Section 7

Load Verification Signed

X

Pick Up # 7182

Seal #

Truckers P.O. #

Driver Requirements:

1) Driver must pre call 24 hrs prior to delivery and on Friday for Monday delivery.
2) Driver must call (281) 230-6781 when unloaded.
3) Driver must call and advise any delay in transit.
4) A copy of this B/L must accompany Freight Invoice.

CARRIER NAME: _____
CARRIER SIGNATURE: _____
DATE: _____

Sign Here For Shipper
Shipper: _____
Address: GSE Lining Technology Inc.
19103 Gundle Rd.
Houston, Tx. 77073-3598

Sign Here For Agent Of Shipper
Agent for Shipper: _____
(GSE LINING TECHNOLOGY, INC.
APPROVED AGENT FOR SHIPPER)

Agent must sign, detach and retain a copy of this Shipping Order.

Shipping Order - Packing List - Original - Not Negotiable

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Order Form

GSE Lining Technology, Inc. at HOUSTON,TEXAS

SHIPPERS NO. 13848

Received at Houston, Texas from GSE Lining Technology, Inc. the property described below, in apparent good order, except as noted (contents and condition of packages unknown), marked, consigned, and destined as indicated below, which said Carrier (the word "Carrier" being understood throughout this Shipping Order as meaning the person or corporation in possession of the property) agrees to carry to the place of delivery at said destination. It is mutually agreed as to each Carrier of all or any of said property, over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service performed hereunder shall be subject to either: (a) if the Shipper noted herein is GSE Lining Technology, Inc. as indicated by the designation of the "Shipper" to be GSE Lining technology, Inc., then the Shipper and Carrier are subject to the terms and conditions contained in the Contract for Truck Transportation existing between said parties, or (b) if the Shipper noted herein is not GSE Lining Technology, Inc., then GSE Lining Technology, Inc. is acting solely as the agent for the denoted Shipper, and thus every aspect of the service to be performed hereunder between the Shipper and the Carrier shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Official, Southern, Western, and Illinois Freight Classifications in effect on the date hereof, if this is a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment. When acting in the capacity of an agent for a Shipper in placing the material in transit on behalf of a Shipper, GSE Lining Technology, Inc. accepts no liability for loss of cargo, damage to containers, or any other consequences occuring during transportation, Carrier having agreed that the transportation arrangement was initiated by the Shipper and not by GSE Lining Technology, Inc.

Subject to the above terms and conditions as to which party is the Shipper, Shipper hereby certifies that he is familiar with the terms and conditions that govern the transportation of this shipment, and the said terms and conditions are hereby agreed and accepted for himself and his assigns.

Ship To: Weyerhaeuser Cell 1A & Haul Road
GSI/Ryan Inc.
Main Street Extension
Attn: Randy Flatt (262)524-7979
Plymouth NC 27962

Date: 08/03/00

Shipping Instructions: 7979 24 Hrs Prior to Shipping Contact Randy Flatt@262/524

Sales Order 14021

No. Line	Roll #	QTY Shipped	UM	Kind of Package, Description of Articles, Special Marks, and Exceptions	Weight
13	115116298	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,386.00

Project# 505141

TERMS: 016
Prepaid / Collect

Customer P.O. #: 5764-00

Section 7

Load Verification

Signed

X

Pick Up # 7182

Seal #

Truckers P.O. #

Total Quantity 146,640 Total Weight 44,010.00

Driver Requirements:

1) Driver must pre call 24 hrs prior to delivery and on Friday for Monday delivery.
2) Driver must call (281) 230-6781 when unloaded.
3) Driver must call and advise any delay in transit.
4) A copy of this B/L must accompany Freight Invoice.

CARRIER NAME: _____
CARRIER SIGNATURE: _____
DATE: _____

Sign Here For Shipper
Shipper: _____
Address: GSE Lining Technology, Inc.
19103 Gundle Rd.
Houston, Tx. 77073-3598

Sign Here For Agent Of Shipper
Agent for Shipper: _____
(GSE LINING TECHNOLOGY, INC.
APPROVED AGENT FOR SHIPPER)

Agent must sign, detach and retain a copy of this Shipping Order

Marlex®

Marlex Polyethylene Certification of Analysis (COA)

July 19, 2000

KSL# 18422-00

FAX: 281-230-2510

GSE Lining Technology
13827 Hardy Street
Houston, TX 77060

Don Bohac

This letter will certify that the Marlex* resin shown below, as supplied by Chevron Phillips Chemical Company, conforms to our manufacturing specification.

Type:	HHM TR-305
Lot Number:	8100880
P.O. Number:	
Date Shipped:	07/19/00
Package:	PSPX 9171
Quantity:	180800 LBS.
HLMI Flow Rate,ASTM D1238:	20. G/10 MIN
Density, ASTM D1505:	.938 G/CC
Color:	184.000

Karen S. Lively
Quality Assurance Manager

For COA questions call Connie Buckner, 713-475-3625

* Reg. U.S. Pat. Off.

cc: QA-File-RC

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 115116282

ROLL IDENTIFICATION

Roll Number	115116282	
Product Name	HME060A004	
Production Date	7/28/00	
Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,380 1,533	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.52)
Minimum		every roll	54	(1.36)	55	(1.40)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	153	(267)
- MD		every roll	126	(221)	144	(252)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	314	(549)
- MD		every roll	228	(399)	301	(527)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		18	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		902	
- MD	(51 mm)	every roll	700		841	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	46	(207)
- MD		every roll	39	(174)	47	(211)
Puncture Resistance, lb. (N)	ASTM D 4833	every roll	108	(481)	147	(653)
Puncture Resistance, lb. (N)	FTMS 101C/2065	every 5th	80	(356)	115	(510)
Density, g/cc	ASTM D 1505	every 5th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603	every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015	every 5th	A2		A2	
Carbon Black Dispersion Views in Cat1 - Cat2	ASTM D 5596	every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
D.S.
7/28/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116283

ROLL IDENTIFICATION

Roll Number	115116283
Product Name	HME060A004
Production Date	7/28/00

Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,384 1,535	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.54)
Minimum		every roll	54	(1.36)	55	(1.40)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	153	(267)
- MD		every roll	126	(221)	144	(252)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	314	(549)
- MD		every roll	228	(399)	301	(527)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		18	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		902	
- MD	(51 mm)	every roll	700		841	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	46	(207)
- MD		every roll	39	(174)	47	(211)
Puncture Resistance, lb. (N)	ASTM D 4833	every roll	108	(481)	147	(653)
Puncture Resistance, lb. (N)	FTMS 101C/2065	every 5th	80	(356)	115	(510)
Density, g/cc	ASTM D 1505	every 5th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603	every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015	every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No.	14021
Customer Name	WEYERHAEUSER PAPER
Location	PLYMOUTH, N CAROLINA

APPROVED
D.S.
7/28/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116284

ROLL IDENTIFICATION

Roll Number	115116284	
Product Name	HME060A004	
Production Date	7/28/00	
Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,370 1,529	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.52)
Minimum		every roll	54	(1.36)	54	(1.38)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	152	(266)
- MD		every roll	126	(221)	143	(250)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	319	(558)
- MD		every roll	228	(399)	300	(525)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		18	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		915	
- MD	(51 mm)	every roll	700		839	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	47	(208)
- MD		every roll	39	(174)	47	(209)
Puncture Resistance, lb. (N)	ASTM D 4833	every roll	108	(481)	147	(652)
Puncture Resistance, lb. (N)	FTMS 101C/2065	every 5th	80	(356)	115	(510)
Density, g/cc	ASTM D 1505	every 5th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603	every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015	every 5th	A2		A2	
Carbon Black Dispersion Views in Cat1 - Cat2	ASTM D 5596	every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
D.S.
7/28/00
QA

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 115116285

ROLL IDENTIFICATION

Roll Number	115116285
Product Name	HME060A004
Production Date	7/28/00

Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,362 1,525	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.52)
Minimum		every roll	54	(1.36)	58	(1.47)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	151	(264)
- MD		every roll	126	(221)	145	(254)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	324	(567)
- MD		every roll	228	(399)	304	(532)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		19	
- MD	(33 mm)	every roll	12		18	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		922	
- MD	(51 mm)	every roll	700		853	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	47	(210)
- MD		every roll	39	(174)	47	(210)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	145	(646)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	115	(510)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
D.S.
7/28/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116286

ROLL IDENTIFICATION

Roll Number	115116286	
Product Name	HME060A004	
Production Date	7/28/00	
Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,380 1,533	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	61	(1.54)
Minimum		every roll	54	(1.36)	58	(1.48)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	150	(262)
- MD		every roll	126	(221)	144	(252)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	313	(549)
- MD		every roll	228	(399)	307	(538)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		19	
- MD	(33 mm)	every roll	12		18	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		891	
- MD	(51 mm)	every roll	700		862	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	47	(209)
- MD		every roll	39	(174)	47	(210)
Puncture Resistance, lb. (N)	ASTM D 4833	every roll	108	(481)	145	(644)
Puncture Resistance, lb. (N)	FTMS 101C/2065	every 5th	80	(356)	107	(474)
Density, g/cc	ASTM D 1505	every 5th	0.940		0.943	
Carbon Black Content, %	ASTM D 1603	every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015	every 5th	A2		A2	
Carbon Black Dispersion Views in Cat1 - Cat2	ASTM D 5596	every 5th	10		10	

Order No.	14021
Customer Name	WEYERHAEUSER PAPER
Location	PLYMOUTH, N CAROLINA

APPROVED
D.S.
7/28/00
QA

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 115116291

ROLL IDENTIFICATION

Roll Number	115116291
Product Name	HME060A004
Production Date	7/28/00

Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,398 1,541	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	56	(1.42)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	156	(273)
- MD		every roll	126	(221)	145	(253)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	316	(552)
- MD		every roll	228	(399)	303	(530)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		21	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		891	
- MD	(51 mm)	every roll	700		889	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	48	(215)
- MD		every roll	39	(174)	48	(212)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	146	(652)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	107	(477)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 115116292

ROLL IDENTIFICATION

Roll Number	115116292	
Product Name	HME060A004	
Production Date	7/28/00	
Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,390 1,538	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	58	(1.46)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	158	(276)
- MD		every roll	126	(221)	143	(249)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	311	(543)
- MD		every roll	228	(399)	301	(526)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		880	
- MD	(51 mm)	every roll	700		879	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	49	(217)
- MD		every roll	39	(174)	48	(213)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	147	(653)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	107	(477)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116293

ROLL IDENTIFICATION

Roll Number	115116293
Product Name	HME060A004
Production Date	7/28/00

Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,396 1,540	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	57	(1.44)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	159	(278)
- MD		every roll	126	(221)	144	(252)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	309	(541)
- MD		every roll	228	(399)	306	(536)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		875	
- MD	(51 mm)	every roll	700		877	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	49	(217)
- MD		every roll	39	(174)	48	(215)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	146	(650)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	107	(477)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116294

ROLL IDENTIFICATION

Roll Number	115116294	
Product Name	HME060A004	
Production Date	7/28/00	
Length ≈(+/- 1%)	480	feet
	146	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	11,280	sq. feet
	1,048	sq. meters
Weight	3,392	pounds
	1,539	kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	57	(1.45)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	159	(278)
- MD		every roll	126	(221)	145	(253)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	311	(545)
- MD		every roll	228	(399)	309	(541)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		18	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		875	
- MD	(51 mm)	every roll	700		868	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	48	(215)
- MD		every roll	39	(174)	48	(213)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	146	(649)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	107	(477)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 115116295

ROLL IDENTIFICATION

Roll Number	115116295	
Product Name	HME060A004	
Production Date	7/29/00	
Length ≈(+/- 1%)	480	feet
	146	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	11,280	sq. feet
	1,048	sq. meters
Weight	3,394	pounds
	1,540	kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	59	(1.49)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	160	(279)
- MD		every roll	126	(221)	149	(260)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	312	(545)
- MD		every roll	228	(399)	307	(537)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		871	
- MD	(51 mm)	every roll	700		860	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	49	(216)
- MD		every roll	39	(174)	48	(215)
Puncture Resistance, lb. (N)	ASTM D 4833	every roll	108	(481)	147	(656)
Puncture Resistance, lb. (N)	FTMS 101C/2065	every 5th	80	(356)	107	(477)
Density, g/cc	ASTM D 1505	every 5th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603	every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015	every 5th	A2		A2	
Carbon Black Dispersion Views in Cat1 - Cat2	ASTM D 5596	every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 115116296

ROLL IDENTIFICATION

Roll Number	115116296	
Product Name	HME060A004	
Production Date	7/29/00	
Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,386 1,536	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	57	(1.44)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	159	(278)
- MD		every roll	126	(221)	151	(264)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	312	(545)
- MD		every roll	228	(399)	306	(536)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		871	
- MD	(51 mm)	every roll	700		861	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	48	(215)
- MD		every roll	39	(174)	49	(218)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	148	(657)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	96	(428)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.942	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.3	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 115116297

ROLL IDENTIFICATION

Roll Number	115116297
Product Name	HME060A004
Production Date	7/29/00

Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,392 1,539	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.52)
Minimum		every roll	54	(1.36)	57	(1.44)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	158	(277)
- MD		every roll	126	(221)	151	(264)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	322	(564)
- MD		every roll	228	(399)	303	(529)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		894	
- MD	(51 mm)	every roll	700		861	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	48	(214)
- MD		every roll	39	(174)	49	(219)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	148	(658)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	96	(428)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.942	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.3	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 115116298

ROLL IDENTIFICATION

Roll Number	115116298	
Product Name	HME060A004	
Production Date	7/29/00	
Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,386 1,536	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	58	(1.48)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	157	(274)
- MD		every roll	126	(221)	150	(262)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	328	(574)
- MD		every roll	228	(399)	297	(519)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		912	
- MD	(51 mm)	every roll	700		860	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	48	(213)
- MD		every roll	39	(174)	49	(218)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	148	(659)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	96	(428)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.942	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.3	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

GSE

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Order Form

GSE Lining Technology, Inc. at HOUSTON, TEXAS

SHIPPERS NO. 13850

Received at Houston, Texas from GSE Lining Technology, Inc. the property described below, in apparent good order, except as noted (contents and condition of packages unknown), marked, consigned, and destined as indicated below, which said Carrier (the word "Carrier" being understood throughout this Shipping Order as meaning the person or corporation in possession of the property) agrees to carry to the place of delivery at said destination. It is mutually agreed as to each Carrier of all or any of said property, over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service performed hereunder shall be subject to either: (a) if the Shipper noted herein is GSE Lining Technology, Inc. as indicated by the designation of the "Shipper" to be GSE Lining technology, Inc., then the Shipper and Carrier are subject to the terms and conditions contained in the Contract for Truck Transportation existing between the parties, or (b) if the Shipper noted herein is not GSE Lining Technology, Inc., then GSE Lining Technology, Inc. is acting solely as the agent for the denoted Shipper, and thus every aspect of the service to be performed hereunder between the Shipper and the Carrier shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Official, Southern, Western, and Illinois Freight Classifications in effect on the date hereof, if this is a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment. When acting in the capacity of an agent for a Shipper in placing the material in transit on behalf of a Shipper, GSE Lining Technology, Inc. accepts no liability for loss of cargo, damage to containers, or any other consequences occuring during transportation, Carrier having agreed that the transportation arrangement was initiated by the Shipper and not by GSE Lining Technology, Inc.

Subject to the above terms and conditions as to which party is the Shipper, Shipper hereby certifies that he is familiar with the terms and conditions that govern the transportation of this shipment, and the said terms and conditions are hereby agreed and accepted for himself and his assigns.

Ship To: Weyerhaeuser Cell 1A & Haul Road
GSI/Ryan Inc.
Main Street Extension
Attn: Randy Flatt (262)524-7979
Plymouth NC 27962

Roll Certifications Included

Date: 08/03/00

Shipping Instructions: 7979 24 Hrs Prior to Shipping — Contact Randy Flatt@262/524

Sales Order 14021

No. Line	Roll #	QTY Shipped	UM	Kind of Package, Description of Articles, Special Marks, and Exceptions	Weight
1	115116287	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,394.00
2	115116288	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,374.00
3	115116289	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,400.00
4	115116290	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,388.00
5	115116302	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,388.00
6	115116303	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,392.00
7	115116304	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,384.00
8	115116305	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,394.00
9	115116306	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,394.00
10	115116307	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,382.00
11	115116308	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,386.00
12	115116309	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,382.00

Total Quantity 146,640 SF — Total Weight 44,040.00

Project# 505141

TERMS: 016 Prepaid / Collect

Customer P.O. #: 5764-00

Section 7

Load Verification

Signed

X

Pick Up # 7183

Seal #

Truckers P.O. #

Driver Requirements:

1) Driver must pre call 24 hrs prior to delivery and on Friday for Monday delivery.
2) Driver must call (281) 230-6781 when unloaded.
3) Driver must call and advise any delay in transit.
4) A copy of this B/L must accompany Freight Invoice.

CARRIER NAME: _____

CARRIER SIGNATURE: _____

DATE: _____

Sign Here For Shipper

Shipper: _____

Address: GSE Lining Technology Inc.
19103 Gundle Rd.
Houston, Tx. 77073-3598

Sign Here For Agent Of Shipper

Agent for Shipper: _____

(GSE LINING TECHNOLOGY, INC.
APPROVED AGENT FOR SHIPPER)

Agent must sign, detach and retain a copy of this Shipping Order

Shipping Order - Packing List - Original - Not Negotiable

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Order Form

GSE Lining Technology, Inc. at HOUSTON,TEXAS

SHIPPERS NO. 13850

Received at Houston, Texas from GSE Lining Technology, Inc. the property described below, in apparent good order, except as noted (contents and condition of packages unknown), marked, consigned, and destined as indicated below, which said Carrier (the word "Carrier" being understood throughout this Shipping Order as meaning the person or corporation in possession of the property) agrees to carry to the place of delivery at said destination. It is mutually agreed as to each Carrier of all or any of said property, over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service performed hereunder shall be subject to either: (a) if the Shipper noted herein is GSE Lining Technology, Inc. as indicated by the designation of the "Shipper" to be GSE Lining technology, Inc., then the Shipper and Carrier are subject to the terms and conditions contained in the Contract for Truck Transportation existing between the parties, or (b) if the Shipper noted herein is not GSE Lining Technology, Inc., then GSE Lining Technology, Inc. is acting solely as the agent for the denoted Shipper, and thus every aspect of the service to be performed hereunder between the Shipper and the Carrier shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Official, Southern, Western, and Illinois Freight Classifications in effect on the date hereof, if this is a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment. When acting in the capacity of an agent for a Shipper in placing the material in transit on behalf of a Shipper, GSE Lining Technology, Inc. accepts no liability for loss of cargo, damage to containers, or any other consequences occuring during transportation, Carrier having agreed that the transportation arrangement was initiated by the Shipper and not by GSE Lining Technology, Inc.

Subject to the above terms and conditions as to which party is the Shipper, Shipper hereby certifies that he is familiar with the terms and conditions that govern the transportation of this shipment, and the said terms and conditions are hereby agreed and accepted for himself and his assigns.

Ship To: Weyerhaeuser Cell 1A & Haul Road
GSI/Ryan Inc.
Main Street Extension
Attn: Randy Flatt (262)524-7979
Plymouth NC 27962

Date: 08/03/00

Shipping Instructions: 7979 24 Hrs Prior to Shipping Contact Randy Flatt@262/524

Sales Order 14021

No. Line	Roll #	QTY Shipped	UM	Kind of Package, Description of Articles, Special Marks, and Exceptions	Weight
13	1151163104	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,382.00

Project# 505141

TERMS: 016
Prepaid / Collect

Customer P.O. #: 5764-00

Section 7

Load Verification

Signed

X

Pick Up # 7183

Seal #

Truckers P.O. #

Total Quantity 146,640 Total Weight 44,040.00

Driver Requirements:

1) Driver must pre call 24 hrs prior to delivery and on Friday for Monday delivery.
2) Driver must call (281) 230-6781 when unloaded.
3) Driver must call and advise any delay in transit.
4) A copy of this B/L must accompany Freight Invoice.

CARRIER NAME: _____
CARRIER SIGNATURE: _____
DATE: _____

Sign Here For Shipper
Shipper: _____
Address: GSE Lining Technology Inc.
19103 Gundle Rd.
Houston, Tx. 77073-3598

Sign Here For Agent Of Shipper
Agent for Shipper: _____
(GSE LINING TECHNOLOGY, INC.
APPROVED AGENT FOR SHIPPER)

Agent must sign, detach and retain a copy of this Shipping Order

Marlex

Marlex Polyethylene Certification of Analysis (COA)

July 19, 2000

KSL# 18422-00

FAX: 281-230-2510

GSE Lining Technology
13827 Hardy Street
Houston, TX 77060

Don Bohac

This letter will certify that the Marlex* resin shown below, as supplied by Chevron Phillips Chemical Company, conforms to our manufacturing specification.

Type:	HHM TR-305
Lot Number:	8100880
P.O. Number:	
Date Shipped:	07/19/00
Package:	PSPX 9171
Quantity:	180800 LBS.
HLMI Flow Rate,ASTM D1238:	20. G/10 MIN
Density, ASTM D1505:	.938 G/CC
Color:	184.000

Karen S. Lively
Quality Assurance Manager

For COA questions call Connie Buckner, 713-475-3625

* Reg. U.S. Pat. Off.

cc: QA-File-RC

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116287

ROLL IDENTIFICATION

Roll Number	115116287	
Product Name	HME060A004	
Production Date	7/28/00	
Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,394 1,540	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	61	(1.54)
Minimum		every roll	54	(1.36)	57	(1.46)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	150	(263)
- MD		every roll	126	(221)	147	(257)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	315	(551)
- MD		every roll	228	(399)	312	(547)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		18	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		890	
- MD	(51 mm)	every roll	700		876	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	47	(210)
- MD		every roll	39	(174)	47	(211)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	145	(645)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	107	(474)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.943	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
D.S.
7/28/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116288

ROLL IDENTIFICATION

Roll Number	115116288	
Product Name	HME060A004	
Production Date	7/28/00	
Length ≈(+/- 1%)	480	feet
	146	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	11,280	sq. feet
	1,048	sq. meters
Weight	3,374	pounds
	1,530	kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	57	(1.44)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	153	(267)
- MD		every roll	126	(221)	146	(255)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	315	(552)
- MD		every roll	228	(399)	307	(537)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		896	
- MD	(51 mm)	every roll	700		883	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	47	(210)
- MD		every roll	39	(174)	47	(208)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	145	(643)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	107	(474)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.943	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116289

ROLL IDENTIFICATION

Roll Number	115116289
Product Name	HME060A004
Production Date	7/28/00

Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,400 1,542	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	55	(1.39)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	154	(269)
- MD		every roll	126	(221)	147	(257)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	311	(545)
- MD		every roll	228	(399)	307	(537)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		21	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		886	
- MD	(51 mm)	every roll	700		895	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	48	(212)
- MD		every roll	39	(174)	47	(211)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	145	(645)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	107	(474)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.943	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116290

ROLL IDENTIFICATION

Roll Number	115116290
Product Name	HME060A004
Production Date	7/28/00

Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,388 1,537	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.52)
Minimum		every roll	54	(1.36)	55	(1.41)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	154	(269)
- MD		every roll	126	(221)	144	(252)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	311	(544)
- MD		every roll	228	(399)	308	(539)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		21	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		881	
- MD	(51 mm)	every roll	700		895	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	48	(212)
- MD		every roll	39	(174)	48	(212)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	146	(650)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	107	(474)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.943	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
C.B.
7/29/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116302

ROLL IDENTIFICATION

Roll Number	115116302	
Product Name	HME060A004	
Production Date	7/29/00	
Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,388 1,537	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	57	(1.44)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	149	(261)
- MD		every roll	126	(221)	145	(254)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	318	(557)
- MD		every roll	228	(399)	306	(536)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		915	
- MD	(51 mm)	every roll	700		870	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	47	(211)
- MD		every roll	39	(174)	48	(215)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	147	(655)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	102	(452)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.945	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.5	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No.	14021
Customer Name	WEYERHAEUSER PAPER
Location	PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

GSE *Lining Technology, Inc.*

Roll Test Data Report

Roll No. 115116303

ROLL IDENTIFICATION

Roll Number	115116303	
Product Name	HME060A004	
Production Date	7/29/00	
Length ≈(+/- 1%)	480	feet
	146	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	11,280	sq. feet
	1,048	sq. meters
Weight	3,392	pounds
	1,539	kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	*Test Method*	*Results*
Density, g/cc	*ASTM D 1505*	0.938
Melt index, g/10 min.	*ASTM D 1238 (190/2.16)*	

Physical Property	*Test Method*	*Test Frequency*	*Customer Minimum* English	Metric	*Test Results* English	Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	57	(1.46)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	148	(260)
- MD		every roll	126	(221)	147	(256)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	311	(544)
- MD		every roll	228	(399)	310	(542)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		898	
- MD	(51 mm)	every roll	700		873	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	47	(209)
- MD		every roll	39	(174)	49	(217)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	148	(656)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	102	(452)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.945	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.5	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116304

ROLL IDENTIFICATION

Roll Number	115116304	
Product Name	HME060A004	
Production Date	7/29/00	
Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,384 1,535	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	58	(1.47)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	150	(263)
- MD		every roll	126	(221)	146	(255)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	313	(547)
- MD		every roll	228	(399)	311	(543)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		897	
- MD	(51 mm)	every roll	700		874	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	47	(211)
- MD		every roll	39	(174)	49	(216)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	148	(658)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	102	(452)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.945	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.5	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
D.S.
7/29/00
QA

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 115116305

ROLL IDENTIFICATION

Roll Number	115116305
Product Name	HME060A004
Production Date	7/29/00

Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,394 1,540	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	56	(1.42)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	152	(266)
- MD		every roll	126	(221)	145	(255)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	316	(553)
- MD		every roll	228	(399)	304	(532)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		903	
- MD	(51 mm)	every roll	700		867	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	48	(212)
- MD		every roll	39	(174)	49	(218)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	146	(650)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	102	(452)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.945	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.5	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
D.S.
7/29/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116306

ROLL IDENTIFICATION

Roll Number	115116306
Product Name	HME060A004
Production Date	7/29/00

Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,394 1,540	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	58	(1.47)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	152	(265)
- MD		every roll	126	(221)	145	(253)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	312	(545)
- MD		every roll	228	(399)	297	(519)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		21	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		889	
- MD	(51 mm)	every roll	700		856	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	48	(211)
- MD		every roll	39	(174)	49	(217)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	145	(645)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	100	(444)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.2	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No.	14021
Customer Name	WEYERHAEUSER PAPER
Location	PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116307

ROLL IDENTIFICATION

Roll Number	115116307
Product Name	HME060A004
Production Date	7/29/00

Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,382 1,534	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.54)
Minimum		every roll	54	(1.36)	59	(1.49)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	151	(265)
- MD		every roll	126	(221)	145	(253)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	305	(534)
- MD		every roll	228	(399)	300	(524)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		869	
- MD	(51 mm)	every roll	700		855	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	47	(211)
- MD		every roll	39	(174)	49	(218)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	145	(645)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	100	(444)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.2	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116308

ROLL IDENTIFICATION

Roll Number	115116308	
Product Name	HME060A004	
Production Date	7/29/00	
Length ≈(+/- 1%)	480	feet
	146	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	11,280	sq. feet
	1,048	sq. meters
Weight	3,386	pounds
	1,536	kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	57	(1.44)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	153	(268)
- MD		every roll	126	(221)	147	(257)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	313	(548)
- MD		every roll	228	(399)	302	(529)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		19	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		896	
- MD	(51 mm)	every roll	700		857	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	48	(214)
- MD		every roll	39	(174)	49	(219)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	144	(642)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	100	(444)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.2	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED G.B. 7/29/00 QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116309

ROLL IDENTIFICATION

Roll Number	115116309	
Product Name	HME060A004	
Production Date	7/29/00	
Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,382 1,534	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.54)
Minimum		every roll	54	(1.36)	58	(1.47)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	154	(269)
- MD		every roll	126	(221)	150	(262)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	323	(565)
- MD		every roll	228	(399)	307	(537)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		20	
- MD	(33 mm)	every roll	12		18	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		922	
- MD	(51 mm)	every roll	700		857	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	48	(214)
- MD		every roll	39	(174)	49	(220)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	144	(640)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	100	(444)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.2	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No.	14021
Customer Name	WEYERHAEUSER PAPER
Location	PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 115116310

ROLL IDENTIFICATION

Roll Number	115116310	
Product Name	HME060A004	
Production Date	7/29/00	
Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,382 1,534	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	57	(1.44)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	156	(273)
- MD		every roll	126	(221)	153	(269)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	328	(573)
- MD		every roll	228	(399)	314	(550)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		19	
- MD	(33 mm)	every roll	12		18	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		938	
- MD	(51 mm)	every roll	700		863	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	49	(217)
- MD		every roll	39	(174)	50	(221)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	145	(644)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	100	(444)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.2	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

Shipping Order - Packing List - Original - Not Negotiable

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Order Form

GSE Lining Technology, Inc. at HOUSTON,TEXAS

SHIPPERS NO. 13867

eived at Houston, Texas from GSE Lining Technology, Inc. the property described below, in apparent good order, except as noted (contents and condition of packages unknown), marked, consigned, destined as indicated below, which said Carrier (the word "Carrier" being understood throughout this Shipping Order as meaning the person or corporation in possession of the property) agrees to carry to the place of delivery at said destination. It is mutually agreed as to each Carrier of all or any of said property, over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service performed hereunder shall be subject to either: (a) if the Shipper noted herein is GSE Lining Technology, Inc. as indicated by the designation of the "Shipper" to be GSE Lining technology, Inc., then the Shipper and Carrier are subject to the terms and conditions contained in the Contract for Truck Transportation existing between the parties, or (b) if the Shipper noted herein is not GSE Lining Technology, Inc., then GSE Lining Technology, Inc. is acting solely as the agent for the denoted Shipper, and thus every aspect of the service to be performed hereunder between the Shipper and the Carrier shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Official, Southern, Western, and Illinois Freight Classifications in effect on the date hereof, if this is a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment. When acting in the capacity of an agent for a Shipper in placing the material in transit on behalf of a Shipper, GSE Lining Technology, Inc. accepts no liability for loss of cargo, damage to containers, or any other consequences occuring during transportation, Carrier having agreed that the transportation arrangement was initiated by the Shipper and not by GSE Lining Technology, Inc.

Subject to the above terms and conditions as to which party is the Shipper, Shipper hereby certifies that he is familiar with the terms and conditions that govern the transportation of this shipment, and the said terms and conditions are hereby agreed and accepted for himself and his assigns.

Ship To: Weyerhaeuser Cell 1A & Haul Road
GSI/Ryan Inc.
Main Street Extension
Attn: John Knoth(252)799-8289
Plymouth NC 27962

Date: 08/04/00

Shipping Instructions: 7979 24 Hrs Prior to Shipping Contact Randy Flatt@262/524

Sales Order 14021

Project# 505141

No. Line	Roll #	QTY Shipped	UM	Kind of Package, Description of Articles, Special Marks, and Exceptions	Weight
1	115116311	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,378.00
2	115116312	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,378.00
3	115116313	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,376.00
4	115116314	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,376.00
5	115116315	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,372.00
6	115116316	11280	SF	HME060A004 60 mil Avg HyperFlex Blk, HD, Smooth, 23.5'	3,372.00

TERMS: 016
Prepaid / Collect

Customer P.O. #: 5764-00

Section 7

Load Verification

Signed

X

Pick Up # 7190

Seal #

Truckers P.O. # 5516925

Total Quantity 67,680 Total Weight LB 20,252.00

Driver Requirements:

1) Driver must pre call 24 hrs prior to delivery and on Friday for Monday delivery.
2) Driver must call (281) 230-6781 when unloaded.
3) Driver must call and advise any delay in transit.
4) A copy of this B/L must accompany Freight Invoice.

CARRIER NAME: Rud Smith

CARRIER SIGNATURE: _____

DATE: _____

Sign Here For Agent Of Shipper

Agent for Shipper: _____

(GSE LINING TECHNOLOGY, INC.
APPROVED AGENT FOR SHIPPER)

chnology Inc.
e Rd.
. 77073-3598

Agent must sign, detach and retain a copy of this Shipping Order

ORIGINAL

REV - Date 06/00

Marlex

Marlex Polyethylene Certification of Analysis (COA)

July 19, 2000

KSL# 18422-00

FAX: 281-230-2510

GSE Lining Technology
13827 Hardy Street
Houston, TX 77060

Don Bohac

This letter will certify that the Marlex* resin shown below, as supplied by Chevron Phillips Chemical Company, conforms to our manufacturing specification.

Type:	HHM TR-305
Lot Number:	8100880
P.O. Number:	
Date Shipped:	07/19/00
Package:	PSPX 9I71
Quantity:	180800 LBS.
HLMI Flow Rate,ASTM D1238:	20. G/10 MIN
Density, ASTM D1505:	.938 G/CC
Color:	184.000

Karen S. Lively
Quality Assurance Manager

For COA questions call Connie Buckner, 713-475-3625

* Reg. U.S. Pat. Off.

cc: QA-File-RC

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116311

ROLL IDENTIFICATION

Roll Number	115116311	
Product Name	HME060A004	
Production Date	7/29/00	
Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,378 1,532	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	57	(1.45)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	160	(280)
- MD		every roll	126	(221)	157	(275)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	338	(591)
- MD		every roll	228	(399)	324	(567)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		19	
- MD	(33 mm)	every roll	12		18	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		966	
- MD	(51 mm)	every roll	700		878	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	49	(218)
- MD		every roll	39	(174)	50	(224)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	145	(646)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	100	(444)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.945	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116312

ROLL IDENTIFICATION

Roll Number	115116312	
Product Name	HME060A004	
Production Date	7/29/00	
Length ≈(+/- 1%)	480	feet
	146	meters
Width (Nominal)	23.5	feet
	7.2	meters
Sheet Area	11,280	sq. feet
	1,048	sq. meters
Weight	3,378	pounds
	1,532	kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.54)
Minimum		every roll	54	(1.36)	57	(1.44)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	162	(284)
- MD		every roll	126	(221)	161	(281)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	348	(608)
- MD		every roll	228	(399)	330	(578)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		19	
- MD	(33 mm)	every roll	12		18	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		993	
- MD	(51 mm)	every roll	700		890	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	50	(220)
- MD		every roll	39	(174)	50	(224)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	145	(646)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	100	(444)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.945	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No.	14021
Customer Name	WEYERHAEUSER PAPER
Location	PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116313

ROLL IDENTIFICATION

Roll Number	115116313
Product Name	HME060A004
Production Date	7/29/00

Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,376 1,531	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	57	(1.44)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	164	(287)
- MD		every roll	126	(221)	163	(285)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	342	(599)
- MD		every roll	228	(399)	335	(586)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		19	
- MD	(33 mm)	every roll	12		18	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		972	
- MD	(51 mm)	every roll	700		885	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	50	(221)
- MD		every roll	39	(174)	51	(225)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	146	(649)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	100	(444)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.945	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED G.B. 7/29/00 QA

Roll Test Data Report

GSE Lining Technology, Inc.

Roll No. 115116314

ROLL IDENTIFICATION

Roll Number	115116314	
Product Name	HME060A004	
Production Date	7/29/00	
Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,376 1,531	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	58	(1.48)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	165	(288)
- MD		every roll	126	(221)	162	(284)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	341	(597)
- MD		every roll	228	(399)	333	(582)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		19	
- MD	(33 mm)	every roll	12		18	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		960	
- MD	(51 mm)	every roll	700		878	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	50	(222)
- MD		every roll	39	(174)	51	(225)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	147	(653)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	100	(444)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.945	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116315

ROLL IDENTIFICATION

Roll Number	115116315	
Product Name	HME060A004	
Production Date	7/29/00	
Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,372 1,530	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	ASTM D 1505	0.938
Melt index, g/10 min.	ASTM D 1238 (190/2.16)	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	56	(1.42)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	166	(291)
- MD		every roll	126	(221)	162	(284)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	336	(587)
- MD		every roll	228	(399)	333	(582)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		19	
- MD	(33 mm)	every roll	12		18	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		948	
- MD	(51 mm)	every roll	700		877	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	50	(222)
- MD		every roll	39	(174)	51	(226)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	147	(653)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	100	(444)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.945	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.4	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

GSE Lining Technology, Inc.

Roll Test Data Report

Roll No. 115116316

ROLL IDENTIFICATION

Roll Number	115116316	
Product Name	HME060A004	
Production Date	7/29/00	
Length ≈(+/- 1%)	480 146	feet meters
Width (Nominal)	23.5 7.2	feet meters
Sheet Area	11,280 1,048	sq. feet sq. meters
Weight	3,372 1,530	pounds kilograms

RESIN INFORMATION

Lot Number	8100880
Type	TR305
Supplier	Phillips

GSE RESIN TEST DATA

Property	Test Method	Results
Density, g/cc	**ASTM D 1505**	0.938
Melt index, g/10 min.	**ASTM D 1238 (190/2.16)**	

Physical Property	Test Method	Test Frequency	Customer Minimum English	Customer Minimum Metric	Test Results English	Test Results Metric
Thickness, mil (mm)	ASTM D 5199					
Average		every roll	60	(1.51)	60	(1.53)
Minimum		every roll	54	(1.36)	58	(1.48)
Tensile Properties:	ASTM D 638, Type IV					
Yield Strength, ppi (N/cm) - TD		every roll	126	(221)	165	(289)
- MD		every roll	126	(221)	162	(283)
Break Strength, ppi (N/cm) - TD		every roll	228	(399)	333	(582)
- MD		every roll	228	(399)	329	(575)
Yield Elongation, % - TD	gauge length = 1.3"	every roll	12		19	
- MD	(33 mm)	every roll	12		18	
Break Elongation, % - TD	gauge length = 2.0"	every roll	700		939	
- MD	(51 mm)	every roll	700		868	
Tear Resistance, lb. (N)	ASTM D 1004					
- TD		every roll	39	(174)	50	(222)
- MD		every roll	39	(174)	51	(226)
Puncture Resistance, lb. (N)	ASTM D 4833					
		every roll	108	(481)	147	(653)
Puncture Resistance, lb. (N)	FTMS 101C/2065					
		every 5th	80	(356)	102	(453)
Density, g/cc	ASTM D 1505					
		every 5th	0.940		0.944	
Carbon Black Content, %	ASTM D 1603					
		every 5th	2.0		2.5	
Carbon Black Dispersion	ASTM D 3015					
		every 5th	A2		A2	
Carbon Black Dispersion	ASTM D 5596					
Views in Cat1 - Cat2		every 5th	10		10	

Order No. 14021
Customer Name WEYERHAEUSER PAPER
Location PLYMOUTH, N CAROLINA

APPROVED
G.B.
7/29/00
QA

THICKNESS

ASTM D5994 (1)

Project Name:	RMT - WEYERHAEUSER LF NO.3 / PHASE 1A
Project Number:	GTX-G0135
Client Project Number:	
Client/Site ID:	ROLL#: 114107538
Sample Number:	3462
Material Type:	60 MIL TEXTURED HDPE
Expected/Specified Value:	
Date Received:	10/9/00

Specimen Number	Thickness		
	(in)	(mil)	(mm)
1	0.0660	66.0	1.68
2	0.0705	70.5	1.79
3	0.0695	69.5	1.77
4	0.0640	64.0	1.63
5	0.0645	64.5	1.64
6	0.0630	63.0	1.60
7	0.0620	62.0	1.57
8	0.0665	66.5	1.69
9	0.0640	64.0	1.63
10	0.0610	61.0	1.55
Avg.	0.0651	65.1	1.65
S.D.	0.0031	3.1	0.08

Notes:

(1) Deviations:

Laboratory temperature at 22±3 °C, laboratory humidity at 50±15 %.

The test sample is conditioned in the above mentioned laboratory temperature and humidity conditions for a minimum of 3 hours prior to testing.

10/11/00

THICKNESS

ASTM D5994 (1)

Project Name:	RMT - WEYERHAEUSER LF NO.3 / PHASE IA
Project Number:	GTX-G0135
Client Project Number:	
Client/Site ID:	ROLL#: 115116285
Sample Number:	3463
Material Type:	60 MIL SMOOTH HDPE
Expected/Specified Value:	
Date Received:	10/9/00

Specimen Number	Thickness		
	(in)	(mil)	(mm)
1	0.0675	67.5	1.71
2	0.0665	66.5	1.69
3	0.0675	67.5	1.71
4	0.0650	65.0	1.65
5	0.0665	66.5	1.69
6	0.0675	67.5	1.71
7	0.0665	66.5	1.69
8	0.0675	67.5	1.71
9	0.0665	66.5	1.69
10	0.0705	70.5	1.79
Avg.	0.0672	67.2	1.71
S.D.	0.0014	1.4	0.04

Notes:

(1) Deviations:

Laboratory temperature at 22±3 °C, laboratory humidity at 50±15 %.

The test sample is conditioned in the above mentioned laboratory temperature and humidity conditions for a minimum of 4 hours prior to testing.

10/11/00

INDEX PUNCTURE RESISTANCE

ASTM D4833 (1)

Project Name:	RMT-WEYERHAEUSER LANDFILL NO.3 / PHASE 1A
Project Number:	GTX-G0135
Client Project Number:	
Client/Site ID:	ROLL#: 114107538
Sample Number:	3462
Material Type:	60 MIL TEXTURED HDPE
Expected/Specified Value:	
Date Received:	10/9/00

Specimen Number	Thickness (2)		Puncture Resistance		Puncture Strength (2)	
	(in)	(mm)	(lb)	(N)	(lb/in)	(N/mm)
1			144.1	641.0		
2			152.0	676.1		
3			145.4	646.8		
4			143.2	637.0		
5			151.1	672.1		
6			148.9	662.3		
7			140.9	626.8		
8			145.9	649.0		
9			149.3	664.1		
10			148.0	658.3		
11			140.9	626.8		
12			140.9	626.8		
13			146.3	650.8		
14			139.3	619.6		
15			148.6	661.0		
Avg.			145.7	647.9		
S.D.			4.0	17.8		

Notes:

(2) Not required by the standard. Applicable only per request.

(1) Deviations:
Laboratory temperature at 22±3 °C, laboratory humidity at 50±15 %.
The test sample is conditioned in the above mentioned laboratory temperature and humidity conditions for a minimum of 3 hours prior to testing.

MT
10/11/00

INDEX PUNCTURE RESISTANCE

ASTM D4833 [1]

Project Name:	RMT-WEYERHAEUSER LANDFILL NO.3 / PHASE 1A
Project Number:	GTX-G0135
Client Project Number:	
Client/Site ID:	ROLL#: 115116285
Sample Number:	3463
Material Type:	60 MIL SMOOTH HDPE
Expected/Specified Value:	
Date Received:	10/9/00

Specimen Number	Thickness [2]		Puncture Resistance		Puncture Strength [2]	
	(in)	(mm)	(lb)	(N)	(lb/in)	(N/mm)
1			149.3	664.1		
2			140.8	626.3		
3			141.8	630.8		
4			145.6	647.7		
5			142.3	633.0		
6			141.4	629.0		
7			136.7	608.1		
8			139.6	621.0		
9			136.9	609.0		
10			134.8	599.6		
11			139.0	618.3		
12			133.9	595.6		
13			134.8	599.6		
14			137.5	611.6		
15			142.3	633.0		
Avg.			139.8	621.8		
S.D.			4.2	18.9		

Notes:

(2) Not required by the standard. Applicable only per request.

(1) Deviations:

Laboratory temperature at 22±3 °C, laboratory humidity at 50±15 %.

The test sample is conditioned in the above mentioned laboratory temperature and humidity conditions for a minimum of 3 hours prior to testing.

MT 10/11/00

JRM 10/14/00

TENSILE PROPERTIES

ASTM D638 (1)

Project Name:	RMT - WEYERHAEUSER LANDFILL NO.3 / PHASE 1A
Project Number:	GTX-G0135
Client Project Number:	
Client/Site ID:	ROLL#: 114107538
Sample Number:	3462
Material Type:	60 MIL TEXTURED HDPE
Expected/Specified Value:	
Date Received:	10/9/00

Spec. #	Roll Direction											
	Thickness		Yield					Break				
			Tension		Stress		Elongation	Tension		Stress		Elongation
	(in)	(mm)	(lb/in)	(N/mm)	(psi)	(N/mm^2)	(%)	(lb/in)	(N/mm)	(psi)	(N/mm^2)	(%)
1	0.0660	1.68	140.3	24.6	2125	14.7	19.7	282.2	49.4	4275	29.5	807.8
2	0.0705	1.79	152.1	26.6	2158	14.9	18.3	275.5	48.2	3908	26.9	753.7
3	0.0695	1.77	146.2	25.6	2104	14.5	18.7	289.1	50.6	4160	28.7	800.6
4	0.0640	1.63	138.4	24.2	2163	14.9	18.6	275.6	48.3	4306	29.7	800.6
5	0.0645	1.64	143.7	25.2	2228	15.4	18.4	253.9	44.5	3937	27.1	743.8
Avg.			144.2	25.2	2156	14.9	18.7	275.3	48.2	4117	28.4	781.3
S.D.			5.4	0.9	47	0.3	0.6	13.2	2.3	186	1.3	30.1

Spec. #	Cross-Roll Direction											
	Thickness		Yield					Break				
			Tension		Stress		Elongation	Tension		Stress		Elongation
	(in)	(mm)	(lb/in)	(N/mm)	(psi)	(N/mm^2)	(%)	(lb/in)	(N/mm)	(psi)	(N/mm^2)	(%)
1	0.0630	1.60	136.5	23.9	2166	14.9	17.7	275.9	48.3	4380	30.2	817.1
2	0.0620	1.57	136.8	24.0	2206	15.2	18.6	270.3	47.3	4360	30.1	803.2
3	0.0645	1.64	144.2	25.3	2236	15.4	20.2	254.6	44.6	3947	27.2	758.3
4	0.0640	1.63	133.6	23.4	2088	14.4	18.7	269.0	47.1	4203	29.0	813.1
5	0.0610	1.55	126.2	22.1	2069	14.3	18.4	270.9	47.4	4441	30.6	866.6
Avg.			135.5	23.7	2153	14.8	18.7	268.1	47.0	4266	29.4	811.7
S.D.			6.5	1.1	73	0.5	0.9	8.0	1.4	199	1.4	38.6

Notes:

All tests are performed on Type IV specimens at a test speed of 2 in./min.

(1) Deviations:
Laboratory temperature at 22±3 °C, laboratory humidity at 50±15 %.
The test sample is conditioned in the above mentioned laboratory temperature and humidity conditions for a minimum of 3 hours prior to testing.
Thickness measurements are performed in accordance with ASTM D5199 and D5994 for smooth and textured membranes, respectively.
Yield and break elongation values are calculated based on the total cross-head displacement using gauge length values of 33 mm (1.3 in.) and 50 mm (1.97 in.), respectively.
Modulus of elasticity values are not presented.

10/10/00

TENSILE PROPERTIES

ASTM D638 (1)

Project Name:	RMT - WEYERHAEUSER LANDFILL NO.3 / PHASE 1A
Project Number:	GTX-G0135
Client Project Number:	
Client/Site ID:	ROLL#: 115116285
Sample Number:	3463
Material Type:	60 MIL SMOOTH HDPE
Expected/Specified Value:	
Date Received:	10/9/00

Spec. #	Roll Direction											
	Thickness		Yield					Break				
			Tension		Stress		Elongation	Tension		Stress		Elongation
	(in)	(mm)	(lb/in)	(N/mm)	(psi)	(N/mm^2)	(%)	(lb/in)	(N/mm)	(psi)	(N/mm^2)	(%)
1	0.0675	1.71	141.5	24.8	2096	14.5	18.7	286.6	50.2	4246	29.3	858.7
2	0.0665	1.69	136.7	23.9	2055	14.2	19.0	262.0	45.9	3940	27.2	788.0
3	0.0675	1.71	138.0	24.2	2045	14.1	18.9	238.2	41.7	3529	24.3	735.9
4	0.0650	1.65	133.3	23.3	2051	14.1	18.7	263.1	46.1	4047	27.9	822.4
5	0.0665	1.69	137.4	24.1	2066	14.2	19.3	248.9	43.6	3743	25.8	770.9
Avg.			137.4	24.1	2063	14.2	18.9	259.8	45.5	3901	26.9	795.2
S.D.			2.9	0.5	20	0.1	0.2	18.2	3.2	276	1.9	47.2

Spec. #	Cross-Roll Direction											
	Thickness		Yield					Break				
			Tension		Stress		Elongation	Tension		Stress		Elongation
	(in)	(mm)	(lb/in)	(N/mm)	(psi)	(N/mm^2)	(%)	(lb/in)	(N/mm)	(psi)	(N/mm^2)	(%)
1	0.0675	1.71	140.9	24.7	2087	14.4	17.4	278.9	48.8	4132	28.5	904.9
2	0.0665	1.69	141.0	24.7	2121	14.6	18.8	260.1	45.5	3911	27.0	811.1
3	0.0675	1.71	138.5	24.3	2052	14.1	18.2	254.9	44.6	3776	26.0	809.2
4	0.0665	1.69	135.6	23.7	2039	14.1	18.2	266.3	46.6	4004	27.6	856.0
5	0.0705	1.79	130.8	22.9	1855	12.8	19.4	230.4	40.3	3268	22.5	750.4
Avg.			137.4	24.1	2031	14.0	18.4	258.1	45.2	3818	26.3	826.3
S.D.			4.3	0.8	103	0.7	0.7	17.9	3.1	334	2.3	57.7

Notes:

All tests are performed on Type IV specimens at a test speed of 2 in./min.

(1) Deviations:

Laboratory temperature at 22±3 °C, laboratory humidity at 50±15 %.
The test sample is conditioned in the above mentioned laboratory temperature and humidity conditions for a minimum of 3 hours prior to testing.
Thickness measurements are performed in accordance with ASTM D5199 and D5994 for smooth and textured membranes, respectively.
Yield and break elongation values are calculated based on the total cross-head displacement using gauge length values of 33 mm (1.3 in.) and 50 mm (1.97 in.), respectively.
Modulus of elasticity values are not presented.

INITIAL TEAR RESISTANCE
ASTM D1004 (1)

Project Name:	RMT - WEYERHAEUSER LANDFILL NO.3 / PHASE 1A
Project Number:	GTX-G0135
Client Project Number:	
Client/Site ID:	ROLL#: 114107538
Sample Number:	3462
Material Type:	60 MIL TEXTURED HDPE
Expected/Specified Value:	
Date Received:	10/9/00

Spec. #	Thickness				Tear Resistance				Tear Strength			
	RD		XD		RD		XD		RD		XD	
	(in)	(mm)	(in)	(mm)	(lb)	(N)	(lb)	(N)	(lb/in)	(N/mm)	(lb/in)	(N/mm)
1	0.0675	1.71	0.0635	1.61	75.4	335.3	67.2	298.7	1116.6	195.5	1057.5	185.2
2	0.0670	1.70	0.0640	1.63	65.6	291.7	54.4	241.8	978.7	171.4	849.5	148.8
3	0.0650	1.65	0.0650	1.65	60.7	270.0	61.3	272.5	933.8	163.5	942.6	165.1
4	0.0645	1.64	0.0655	1.66	60.3	268.2	65.6	291.9	934.9	163.7	1001.8	175.4
5	0.0675	1.71	0.0640	1.63	65.9	293.1	62.7	278.9	976.3	171.0	979.7	171.6
6	0.0680	1.73	0.0645	1.64	68.0	302.3	57.2	254.2	999.6	175.0	886.0	155.2
7	0.0640	1.63	0.0630	1.60	69.1	307.1	58.3	259.1	1078.9	188.9	924.6	161.9
8	0.0635	1.61	0.0625	1.59	61.0	271.1	57.4	255.4	959.8	168.1	918.7	160.9
9	0.0650	1.65	0.0655	1.66	57.7	256.4	73.3	325.9	886.9	155.3	1118.6	195.9
10	0.0630	1.60	0.0625	1.59	60.2	267.8	64.5	287.0	955.6	167.3	1032.3	180.8
Avg.	0.0655	1.66	0.0640	1.63	64.4	286.3	62.2	276.6	982.1	172.0	971.1	170.1
S.D.	0.0018	0.05	0.0011	0.03	5.4	24.1	5.7	25.3	68.8	12.1	82.8	14.5

Notes:

RD: Roll Direction
XD: Cross-Roll Direction

(1) Deviations:
Laboratory temperature at 22±3 °C, laboratory humidity at 50±15 %.
The test sample is conditioned in the above mentioned laboratory temperature and humidity conditions for a minimum of 3 hours prior to testing.
Thickness measurements are performed in accordance with ASTM D5199 and D5994 for smooth and textured membranes, respectively.

JSM 10/13/00

INITIAL TEAR RESISTANCE

ASTM D1004 (1)

Project Name:	RMT - WEYERHAEUSER LANDFILL NO.3 / PHASE 1A
Project Number:	GTX-G0135
Client Project Number:	
Client/Site ID:	ROLL#: 115116285
Sample Number:	3463
Material Type:	60 MIL SMOOTH HDPE
Expected/Specified Value:	
Date Received:	10/9/00

Spec. #	Thickness				Tear Resistance				Tear Strength			
	RD		XD		RD		XD		RD		XD	
	(in)	(mm)	(in)	(mm)	(lb)	(N)	(lb)	(N)	(lb/in)	(N/mm)	(lb/in)	(N/mm)
1	0.0635	1.61	0.0630	1.60	60.0	267.0	62.2	276.5	945.2	165.5	986.8	172.8
2	0.0630	1.60	0.0665	1.69	60.5	269.1	61.5	273.3	960.3	168.2	924.1	161.8
3	0.0620	1.57	0.0645	1.64	55.1	244.9	63.5	282.3	887.9	155.5	984.0	172.3
4	0.0635	1.61	0.0645	1.64	62.1	276.3	62.5	278.0	978.3	171.3	969.0	169.7
5	0.0620	1.57	0.0620	1.57	61.2	272.2	59.5	264.7	987.1	172.9	959.7	168.1
6	0.0630	1.60	0.0640	1.63	70.0	311.4	56.3	250.4	1111.1	194.6	879.7	154.1
7	0.0640	1.63	0.0640	1.63	59.3	263.8	65.7	292.0	926.6	162.3	1025.8	179.6
8	0.0635	1.61	0.0620	1.57	59.6	265.1	60.4	268.5	938.6	164.4	973.7	170.5
9	0.0645	1.64	0.0665	1.69	58.3	259.3	65.3	290.3	903.9	158.3	981.5	171.9
10	0.0640	1.63	0.0620	1.57	57.8	257.0	62.7	278.9	902.7	158.1	1011.3	177.1
Avg.	0.0633	1.61	0.0639	1.62	60.4	268.6	61.9	275.5	954.2	167.1	969.6	169.8
S.D.	0.0008	0.02	0.0017	0.04	3.9	17.4	2.8	12.3	64.1	11.2	41.9	7.3

Notes:

RD: Roll Direction
XD: Cross-Roll Direction

(1) Deviations:
Laboratory temperature at 22±3 °C, laboratory humidity at 50±15 %.
The test sample is conditioned in the above mentioned laboratory temperature and humidity conditions for a minimum of 3 hours prior to testing.
Thickness measurements are performed in accordance with ASTM D5199 and D5994 for smooth and textured membranes, respectively.

10/13/00

CARBON BLACK DISPERSION
ASTM D5596

Project Name:	RMT - WEYERHAEUSER LANDFILL NO.3 / PHASE 1A
Project Number:	GTX-G0135
Client Project Number:	
Client/Site ID:	ROLL#: 114107538
Sample Number:	3462
Material Type:	60 MIL TEXTURED HDPE
Expected/Specified Value:	
Date Received:	10/9/00

Specimen Designation	Random Field of View (RI)	Classification of Carbon Black Dispersion (-)
1	1	Cat.-1
	2	Cat.-1
2	1	Cat.-1
	2	Cat.-1
3	1	Cat.-1
	2	Cat.-1
4	1	Cat.-1
	2	Cat.-1
5	1	Cat.-1
	2	Cat.-1

Notes:

JBM 10/14/00

CARBON BLACK DISPERSION

ASTM D5596

Project Name:	RMT - WEYERHAEUSER LANDFILL NO.3 / PHASE 1A
Project Number:	GTX-G0135
Client Project Number:	
Client/Site ID:	ROLL#: 115116285
Sample Number:	3463
Material Type:	60 MIL SMOOTH HDPE
Expected/Specified Value:	
Date Received:	10/9/00

Specimen Designation	Random Field of View (RF)	Classification of Carbon Black Dispersion (-)
1	1	Cat.-1
	2	Cat.-1
2	1	Cat.-1
	2	Cat.-1
3	1	Cat.-1
	2	Cat.-1
4	1	Cat.-1
	2	Cat.-1
5	1	Cat.-1
	2	Cat.-1

Notes:

gfm 10/14/00

CARBON BLACK CONTENT

ASTM D1603 [1]

Project Name:	RMT - WEYERHAEUSER LANDFILL NO.3 / PHASE 1A
Project Number:	GTX-G0135
Client Project Number:	
Client/Site ID:	ROLL#: 114107538
Sample Number:	3462
Material Type:	60 MIL TEXTURED HDPE
Expected/Specified Value:	2-3%
Date Received:	10/9/00

Specimen Number	Specimen Mass (g)	Crucible Mass (g)	Residue + Crucible Mass After Burning in N_2 (g)	Carbon Black Content (%)
1	0.2502	2.2261	2.2324	2.52
2	0.2500	2.1806	2.1872	2.64
Average				2.58

Notes:

(1) Deviations:
Each test specimen is 0.25±0.05 g.

MT 10/13/00

DSM 10/16/00

CARBON BLACK CONTENT

ASTM D1603 (1)

Project Name:	RMT - WEYERHAEUSER LANDFILL NO.3 / PHASE 1A
Project Number:	GTX-G0135
Client Project Number:	
Client/Site ID:	ROLL#: 115116285
Sample Number:	3463
Material Type:	60 MIL SMOOTH HDPE
Expected/Specified Value:	2-3%
Date Received:	10/9/00

Specimen Number	Specimen Mass (g)	Crucible Mass (g)	Residue + Crucible Mass After Burning in N_2 (g)	Carbon Black Content (%)
1	0.2409	2.2005	2.2063	2.41
2	0.2411	2.1235	2.1294	2.45
Average				2.43

Notes:

(1) Deviations:
Each test specimen is 0.25 ±0.05 g.

DENSITY BY GRADIENT - COLUMN

ASTM D1505[1]

Project Name:	RMT - WEYERHAEUSER LANDFILL NO.3 / PHASE 1A
Project Number:	GTX-G0135
Client Project Number:	
Client/Site ID:	ROLL#: 114107538
Sample Number:	3462
Material Type:	60 MIL TEXTURED HDPE
Expected/Specified Value:	
Date Received:	10/9/00

Specimen Number	Density @ 23°C (g/cc)
1	0.943
2	0.942
3	0.942
Avg.	0.943

Notes:

(1) Deviations:
Laboratory temperature at 22±3 °C, laboratory humidity at 50±15 %.
The test sample is conditioned in the above mentioned laboratory temperature and humidity conditions for a minimum of 3 hours prior to testing.

10/14/00

DENSITY BY GRADIENT - COLUMN

ASTM D1505[1]

Project Name:	RMT - WEYERHAEUSER LANDFILL NO.3 / PHASE 1A
Project Number:	GTX-G0135
Client Project Number:	
Client/Site ID:	ROLL#: 115116285
Sample Number:	3463
Material Type:	60 MIL SMOOTH HDPE
Expected/Specified Value:	
Date Received:	10/9/00

Specimen Number	Density @ 23°C (g/cc)
1	0.944
2	0.944
3	0.944
Avg.	0.944

Notes:

(1) Deviations:
Laboratory temperature at 22±3 °C, laboratory humidity at 50±15 %.
The test sample is conditioned in the above mentioned laboratory temperature and humidity conditions for a minimum of 3 hours prior to testing.

10/14/00

Notched Constant Load Test per ASTM D 5397

(Single Point)

Tested: 10/20/2000

Sample ID	Spec. #	% of Yield Stress	Time for 5 Specimens
Roll # 114107538	1	30	> 200 Hours*
Sample # 3462	2	30	> 200 Hours
	3	30	> 200 Hours
	4	30	> 200 Hours
	5	30	> 200 Hours

*** No specimens had failed after 212 hours.**

Sample ID	Spec. #	% of Yield Stress	Time for 5 Specimens
Roll # 115116285	1	30	> 200 Hours*
Sample # 3463	2	30	> 200 Hours
	3	30	> 200 Hours
	4	30	> 200 Hours
	5	30	> 200 Hours

*** No specimens had failed after 212 hours.**

10-20-00

Appendix R
Field Destructive Seam Test Logs

WEYERHAEUSER COMPANY
LANDFILL CELL 3 PHASE 1A
PLYMOUTH, NORTH CAROLINA

GSI QAQC PAPERWORK JOB #20040

DESTRCUTIVE SEAM TESTING REPORTS

GSI
DESTRUCTIVE TESTING REPORT FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil. HDPE

TENSIOMETER ID:: 89015

SAMPLE I.D. (DT#)	SEAM NO.	Q.C. INT.	MACH NO.	SEAMER INT	EXTRUSION BARREL / PREHEAT	FUSION WEDGE / SET SPEED	FIELD VALUES PEEL (PPI)					SHEAR (PPI)			P/F	LOCATION OF DESTRUCTIVE TEST
DS-1	7-8	RC	5899	MA	B:	W: 750°	136	134	142	140	139	163	158	158	P	28' S. OF JUNC 63-7/8
					P:	S: 12'	138	135	132	131	135	160	159			
DS-2	14-15	RC	5899	MA	B:	W: 750°	140	133	134	136	134	152	151	150	P	7' S. OF JUNC 63-13/14
					P:	S: 12'	136	134	135	134	132	151	141			
DS-3	21-22	RC	5899	MA	B:	W: 750°	135	133	130	127	136	153	151	156	P	53' S. OF JUNC. 63-21/22
					P:	S: 12'	128	130	131	134	129	151	154			
DS-4	33-34	RC	5899	MA	B:	W: 750°	130	134	132	134	130	143	152	150	P	31' W. OF ANCHOR TRENCH
					P:	S: 12'	131	130	129	131	133	151	147			
DS-5	43-44	RC	5899	MA	B:	W: 750°	122	107	109	121	106	151	154	154	P	16' W. OF ANCHOR TRENCH
					P:	S: 12'	126	101	111	106	115	151	155			
DS-6	59-60	RC	5899	MA	B:	W: 750°	124	128	129	128	131	145	149	147	P	25' E. OF ANCHOR TRENCH
					P:	S: 12'	125	134	129	129	127	151	145			
DS-7	63-64	RC	5899	MA	B:	W: 750°	110	121	122	125	122	146	145	147	P	7' S. OF JUNC 63-64/66
					P:	S: 12'	118	118	123	121	119	151	150			
DS-8	63-65	RC	5899	MA	B:	W: 750°	116	112	116	120	119	140	145	151	P	344' W. OF JUNC 24/27 - 63/65
					P:	S: 12'	112	109	112	108	108	143	144			
DS-9	65-67	RC	5899	MA	B:	W: 750°	119	117	117	115	122	144	141	144	P	228' W. OF JUNC 27/28 - 65/67
					P:	S: 12'	114	114	110	120	119	145	142			

GSI
DESTRUCTIVE TESTING REPORT FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

TENSIOMETER ID:: 89015

SAMPLE I.D. (DT#)	SEAM NO.	Q.C. INT.	MACH NO.	SEAMER INT	EXTRUSION BARREL / PREHEAT	FUSION WEDGE / SET SPEED	FIELD VALUES PEEL (PPI)					SHEAR (PPI)			P/F	LOCATION OF DESTRUCTIVE TEST
DS 10	67-69	RC	1899	BS	B:	W: 750°	115	112	121	139	130	173	171	168	P	99' W. OF JUNC 28/29 - 67/69
					P:	S: 12'	112	107	104	125	125	171	167			
DS 11	70-71	RC	5899	MA	B:	W: 750°	144	136	123	126	135	179	182	176	P	106' W. OF JUNC 29/30 - 69/71
					P:	S: 12'	127	122	146	139	122	179	179			
DS 12	71-72	RC	5899	MA	B:	W: 750°	129	132	139	143	144	189	185	186	P	219' W. OF JUNC 30/31 - 71/72
					P:	S: 12'	132	124	145	126	139	181	189			
DS 13	72-73	RC	5899	MA	B:	W: 750'	152	133	137	134	141	192	189	187	P	360' W. OF JUNC. 31/32 - 72/73
					P:	S: 12'	133	142	129	133	129	191	189			
DS 14	73-77	RC	5899	MA	B:	W: 750°	121	134	134	116	118	181	186	185	P	286' W. OF JUNC 32/33 - 73/77
					P:	S: 12'	121	124	125	135	132	179	183			
DS 15	77-78	RC	5899	MA	B:	W: 750°	131	118	118	123	126	178	171	179	P	135' W. OF JUNC 33/34 - 77/78
					P:	S: 12'	129	132	121	102	116	174	174			
DS 16	78-79	RC	5899	MA	B:	W: 750°	135	131	142	142	136	184	187	181	P	60' W. OF JUNC 34/35 - 78/79
					P:	S: 12'	142	135	141	118	140	174	179			
DS 17	79-80	RC	5899	MA	B:	W: 750°	115	132	120	130	120	178	181	175	P	199' W. OF JUNC 35/36 - 79/80
					P:	S: 12'	132	124	136	118	119	174	175			
DS 18	80-81	RC	5899	MA	B:	W: 750°	120	110	136	121	131	170	174	180	P	389' W. OF JUNC 36/37 - 80/81
					P:	S: 12'	129	133	147	142	149	179	181			

GSI
DESTRUCTIVE TESTING REPORT FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 26040 | MAT'L TYPE: 60 mil HDPE

TENSIOMETER ID:: 89015

SAMPLE I.D. (DT#)	SEAM NO.	Q.C. INT.	MACH NO.	SEAMER INT	EXTRUSION BARREL / PREHEAT	FUSION WEDGE / SET SPEED	FIELD VALUES PEEL (PPI)					SHEAR (PPI)			P/F	LOCATION OF DESTRUCTIVE TEST
DS 19	81-82	RC	5899	MA	B:	W: 750°	133	120	145	125	125	178	174	174	P	275' W. OF JUNC 37/38 - 81/82
					P:	S: 12'	123	133	125	135	141	176	181			
DS 20	82-83	RC	5899	MA	B:	W: 750'	119	122	124	124	127	171	175	169	P	39' W. OF JUNC 38/39 - 82/83
					P:	S: 12'	127	124	127	123	120	174	174			
DS 21	83-84	RC	5899	MA	B:	W: 750'	121	135	123	122	138	177	177	177	P	193' W. OF JUNC 39/40 - 83/84
					P:	S: 12'	134	133	132	131	134	171	175			
DS 22	84-85	RC	5899	MA	B:	W: 750°	110	110	118	93	133	181	179	177	P	410' W. OF JUNC 40/41 - 84/85
					P:	S: 12'	100	113	131	119	134	181	179			
DS 23	85-86	RC	5899	MA	B:	W: 750°	123	128	122	124	121	172	169	174	P	160' W. OF JUNC 41/42 - 85/86
					P:	S: 12'	121	125	134	130	126	171	168			
DS 24	86-87	RC	5899	MA	B:	W: 750°	126	118	122	124	111	156	163	159	P	22' W. OF JUNC 42/43 - 86/87
					P:	S: 12'	105	109	113	109	112	145	149			
DS 25	87-88	RC	5899	MA	B:	W: 750°	122	114	123	111	129	156	159	161	P	94' W. OF JUNC 43/44 - 87/88
					P:	S: 12'	111	118	110	111	112	157	157			
DS 26	88-89	RC	5899	MA	B:	W: 750°	116	123	121	114	122	154	157	151	P	216' W. OF JUNC 44/45 - 88/89
					P:	S: 12'	104	107	106	109	107	154	154			
DS 27	89-90	RC	5899	MA	B:	W: 750°	115	114	111	139	125	163	165	167	P	367' W. OF JUNC 45/46 - 89/90
					P:	S: 12'	123	124	121	135	121	161	160			

GSI
DESTRUCTIVE TESTING REPORT FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

TENSIOMETER ID:: 89015

SAMPLE I.D. (DT#)	SEAM NO.	Q.C. INT.	MACH NO.	SEAMER INT	EXTRUSION BARREL / PREHEAT	FUSION WEDGE / SET SPEED	FIELD VALUES PEEL (PPI)					SHEAR (PPI)			P/F	LOCATION OF DESTRUCTIVE TEST
DS 28	90-91	RC	5899	MA	B:	W: 750°	113	117	131	127	126	161	156	159	P	82' W. OF JUNC 46/47 - 90/91
					P:	S: 12'	114	116	114	114	113	155	157			
DS 29	100-107	RC	5899	MA	B:	W: 750°	143	145	143	137	147	160	164	161	P	22'E. OF JUNC ANCHOR TRENCH
					P:	S: 12'	126	125	122	126	123	161	165			
DS 30	91-111	RC	5899	MA	B:	W: 750°	122	142	130	136	131	169	166	167	P	395' W. OF JUNC H71/101 - 91/111
					P:	S: 12'	124	121	113	114	92	169	171			
DS 31	111-112	RC	5899	MA	B:	W: 750°	124	129	126	123	121	164	171	169	P	256' W. OF JUNC 101/102 - 111/112
					P:	S: 12'	115	116	115	125	122	168	164			
DS 32	112-113	RC	5899	MA	B:	W: 750°	118	121	127	125	119	173	169	171	P	36' W. OF JUNC 102/103 - 112/113
					P:	S: 12'	128	124	124	119	122	173	172			
DS 33	113-114	RC	5899	MA	B:	W: 750°	137	131	133	123	130	172	176	176	P	185' W. OF JUNC 103/104 - 113/114
					P:	S: 12'	121	119	120	122	130	174	171			
DS 34	114-115	RC	5899	MA	B:	W: 750°	129	138	130	131	129	177	177	175	P	374'-W OF JUNC 104/105 - 114/115
					P:	S: 12'	135	115	126	120	119	173	177			
DS 35	115-116	RC	5899	MA	B:	W: 750°	123	124	126	131	130	172	163	167	P	254' W. OF JUNC 105/106 - 115/116
					P:	S: 12'	122	122	124	125	124	164	171			
DS 36	116-117	RC	5899	MA	B:	W: 750°	132	131	118	130	126	171	171	174	P	69' W. OF JUNC 106/136 - 116/117
					P:	S: 12'	124	119	122	122	128	174	174			

GSI
DESTRUCTIVE TESTING REPORT FORM

PROJECT NAME: WEYERHAEUSER | JOB NUMBER: 20040 | MAT'L TYPE: 60 mil HDPE

TENSIOMETER ID:: 89015

SAMPLE I.D. (DT#)	SEAM NO.	Q.C. INT.	MACH NO.	SEAMER INT	EXTRUSION BARREL / PREHEAT	FUSION WEDGE / SET SPEED	FIELD VALUES PEEL (PPI)					SHEAR (PPI)			P/F	LOCATION OF DESTRUCTIVE TEST
DS 37	117-118	RC	5899	MA	B:	W: 750°	123	120	130	119	138	165	167	169	P	310' W. OF JUNC 136/137 - 117/118
					P:	S: 12'	117	121	119	122	122	171	167			
DS 38	118-119	RC	5899	MA	B:	W: 750°	114	116	120	123	117	171	173	169	P	' W. OF JUNC
					P:	S: 12'	123	116	120	124	117	171	168			
DS 39	128-129	RC	5899	MA	B:	W: 750°	137	141	139	146	136	166	166	166	P	19' S. OF ANCHOR TRENCH
					P:	S: 12'	135	140	142	141	140	169	167			
DS 40	143-144	RC	5899	MA	B:	W: 750°	143	131	147	140	147	168	169	171	P	13' S. OF ANCHOR TRENCH
					P:	S: 12'	142	141	143	144	144	167	170			
DS 41	119-147	RC	7363	RM	B: 475°	W:	130	128	122	117	122	156	155	164	P	8' E OF JUNC 119-146/147
					P: 475°	S:						161	159			
DS 42	137-138	RC	5899	MA	B:	W: 750°	136	136	136	139	145	155	154	159	P	17' W. OF ANCHOR TRENCH
					P:	S: 12'	141	133	141	147	144	161	156			
					B:	W:										
					P:	S:										
					B:	W:										
					P:	S:										
					B:	W:										
					P:	S:										

Appendix S
Destructive Seam Laboratory Results

RMT, Inc.
Destructive Seam Analysis

Date : 29-Aug-00 | Longyear Model LG-200 Tensiometer

Project: Weyerhaeuser | Geomembrane Type: HDPE, 60 mil | QC:

Project No.: 5108.08 | Seam Type: DHW | QA:

Strain Rate: 2.00 ipm

		PEEL (outer weld)					PEEL (inner weld)					SHEAR					
		Strength		Peel	Break		Strength		Peel	Break		Strength		Elongation		Break	
	Rep	@yld	@brk	%	Code	Class	@yld	@brk	%	Code	Class	@yld	@brk	@yld	@brk	Code	Class.
Sample #: DS-1, 7/8	1	145		0	SE1	FTB						144			>100	NO BRK	FTB
	2	142		0	SE1	FTB						143			>100	NO BRK	FTB
Gauge	3	135		0	SE1	FTB						144			>100	NO BRK	FTB
Length: 2.00"	4	145		0	SE1	FTB						145			>100	NO BRK	FTB
	5	118		28	AD-BRK	FTB						143			>100	NO BRK	FTB
	AVG	137										144					
Comments:																	
Sample #: DS-2, 14/15	1	129		0	SE1	FTB						147			>100	NO BRK	FTB
	2	128		0	SE1	FTB						147			>100	NO BRK	FTB
Gauge	3	129		0	SE1	FTB						146			>100	NO BRK	FTB
Length: 2.00"	4	134		0	SE1	FTB						147			>100	NO BRK	FTB
	5	135		0	SE1	FTB						146			>100	NO BRK	FTB
	AVG	131										147					
Comments:																	
Sample #: DS-3, 21/22	1	135		0	SE1	FTB						145			>100	NO BRK	FTB
	2	127		0	SE1	FTB						143			>100	NO BRK	FTB
Gauge	3	130		0	SE1	FTB						144			>100	NO BRK	FTB
Length: 2.00"	4	135		0	SE1	FTB						144			>100	NO BRK	FTB
	5	130		0	SE1	FTB						144			>100	NO BRK	FTB
	AVG	131										144					
Comments:																	

RMT, Inc.
Destructive Seam Analysis

Date : 29-Aug-00 | Longyear Model LG-200 Tensiometer

Project: Weyerhaeuser | Geomembrane Type: HDPE, 60 mil | QC:

Project No.: 5108.08 | Seam Type: DHW | QA:

Strain Rate: 2.00 ipm

		PEEL (outer weld)					PEEL (inner weld)					SHEAR					
		Strength		Peel	Break		Strength		Peel	Break		Strength		Elongation		Break	
	Rep	@yld	@brk	%	Code	Class	@yld	@brk	%	Code	Class	@yld	@brk	@yld	@brk	Code	Class.
Sample #: DS-4, 33/34	1	134		0	SE1	FTB						140			>100	NO BRK	FTB
	2	135		0	SE1	FTB						140			>100	NO BRK	FTB
Gauge	3	138		0	SE1	FTB						140			>100	NO BRK	FTB
Length: 2.00"	4	132		0	SE1	FTB						139			>100	NO BRK	FTB
	5	131		0	SE1	FTB						139			>100	NO BRK	FTB
	AVG	134										140					
Comments:																	
Sample #: DS-5, 43/44	1	110		0	SE1	FTB						151			>100	NO BRK	FTB
	2	113		0	SE1	FTB						151			>100	NO BRK	FTB
Gauge	3	120		0	SE1	FTB						150			>100	NO BRK	FTB
Length: 2.00"	4	108		0	SE1	FTB						151			>100	NO BRK	FTB
	5	109		0	SE1	FTB						150			>100	NO BRK	FTB
	AVG	112										151					
Comments:																	
Sample #: DS-6, 59/60	1	130		0	SE1	FTB						141			>100	NO BRK	FTB
	2	125		0	SE1	FTB						139			>100	NO BRK	FTB
Gauge	3	130		0	SE1	FTB						138			>100	NO BRK	FTB
Length: 2.00"	4	128		0	SE1	FTB						138			>100	NO BRK	FTB
	5	135		0	SE1	FTB						139			>100	NO BRK	FTB
	AVG	130										139					
Comments:																	

RMT, Inc.
Destructive Seam Analysis

Date : 29-Aug-00 — Longyear Model LG-200 Tensiometer — QC: — QA:

Project: Weyerhaeuser — Geomembrane Type: HDPE, 60 mil

Project No.: 5108.08 — Seam Type: DHW

Strain Rate: 2.00 ipm

		PEEL (outer weld)					PEEL (inner weld)					SHEAR					
		Strength		Peel	Break		Strength		Peel	Break		Strength		Elongation		Break	
	Rep	@yld	@brk	%	Code	Class	@yld	@brk	%	Code	Class	@yld	@brk	@yld	@brk	Code	Class.
Sample #: DS-7, 63/64	1	120		0	SE1	FTB						146			>100	NO BRK	FTB
	2	122		0	SE1	FTB						144			>100	NO BRK	FTB
Gauge	3	115		0	SE1	FTB						145			>100	NO BRK	FTB
Length: 2.00"	4	124		0	SE1	FTB						142			>100	NO BRK	FTB
	5	127		0	SE1	FTB						141			>100	NO BRK	FTB
	AVG	122										144					
Comments:																	
Sample #: DS-8, 63/65	1						139		0	SE1	FTB	146			>100	NO BRK	FTB
	2						100		0	SE1	FTB	145			>100	NO BRK	FTB
Gauge	3						138		0	SE1	FTB	146			>100	NO BRK	FTB
Length: 2.00"	4						115		0	SE1	FTB	146			>100	NO BRK	FTB
	5						117		0	SE1	FTB	146			>100	NO BRK	FTB
	AVG						122					146					
Comments: Overlap too small to run peel on outer track.																	
Sample #: DS-9, 65/67	1						126		0	SE1	FTB	150			>100	NO BRK	FTB
	2						128		0	SE1	FTB	148			>100	NO BRK	FTB
Gauge	3						128		0	SE1	FTB	148			>100	NO BRK	FTB
Length: 2.00"	4						127		0	SE1	FTB	147			>100	NO BRK	FTB
	5						124		0	SE1	FTB	147			>100	NO BRK	FTB
	AVG						127					148					
Comments: Overlap too small to run peel on outer track.																	

RMT, Inc.

Destructive Seam Analysis

Date : 29-Aug-00 | Longyear Model LG-200 Tensiometer

Project: Weyerhaeuser | Geomembrane Type: HDPE, 60 mil | QC:

Project No.: 5108.08 | Seam Type: DHW | QA:

Strain Rate: 2.00 ipm

		PEEL (outer weld)					PEEL (inner weld)					SHEAR					
		Strength		Peel	Break		Strength		Peel	Break		Strength		Elongation		Break	
	Rep	@yld	@brk	%	Code	Class	@yld	@brk	%	Code	Class	@yld	@brk	@yld	@brk	Code	Class.
Sample #: DS-10, 67/69	1	112		0	SE1	FTB						147			>100	NO BRK	FTB
	2	116		0	SE1	FTB						146			>100	NO BRK	FTB
Gauge	3	114		0	SE1	FTB						146			>100	NO BRK	FTB
Length: 2.00"	4	113		0	SE1	FTB						145			>100	NO BRK	FTB
	5	114		0	SE1	FTB						144			>100	NO BRK	FTB
	AVG	114										146					

Comments:

Sample #:	1																
	2																
Gauge	3																
Length:	4																
	5																
	AVG																

Comments:

Sample #:	1																
	2																
Gauge	3																
Length:	4																
	5																
	AVG																

Comments:

RMT, Inc.

Destructive Seam Analysis

Date :	19-Sep-00	Longyear Model LG-200 Tensiometer	
Project:	Weyerhaeuser	Geomembrane Type: HDPE, 60 mil	QC: HW
Project No.:	5108.08	Seam Type: DHW	QA: DH

Strain Rate: 2.00 ipm		PEEL (outer weld)					PEEL (inner weld)					SHEAR					
		Strength		Peel	Break		Strength		Peel	Break		Strength		Elongation		Break	
	Rep	@yld	@brk	%	Code	Class	@yld	@brk	%	Code	Class	@yld	@brk	@yld	@brk	Code	Class.
Sample #: DS-11, 70/71	1	130		0	SE1	FTB						150			>100	NO BRK	FTB
	2	137		0	SE1	FTB						148			>100	NO BRK	FTB
Gauge	3	131		0	SE1	FTB						149			>100	NO BRK	FTB
Length: 2.00"	4	132		0	SE1	FTB						149			>100	NO BRK	FTB
	5	128		0	SE1	FTB						149			>100	NO BRK	FTB
	AVG	132										149					
Comments:																	
Sample #: DS-12, 71/72	1	134		0	SE1	FTB						148			>100	NO BRK	FTB
	2	122		0	SE1	FTB						146			>100	NO BRK	FTB
Gauge	3	130		0	SE1	FTB						148			>100	NO BRK	FTB
Length: 2.00"	4	123		0	SE1	FTB						148			>100	NO BRK	FTB
	5	124		0	SE1	FTB						148			>100	NO BRK	FTB
	AVG	127										148					
Comments:																	
Sample #: DS-13, 72/73	1						121		0	SE1	FTB	151			>100	NO BRK	FTB
	2						119		0	SE1	FTB	152			>100	NO BRK	FTB
Gauge	3						125		0	SE1	FTB	153			>100	NO BRK	FTB
Length: 2.00"	4						127		0	SE1	FTB	152			>100	NO BRK	FTB
	5						126		0	SE1	FTB	151			>100	NO BRK	FTB
	AVG						124					152					

Comments: Overlap too small to run peel on outer track.

RMT, Inc.
Destructive Seam Analysis

Date : 19-Sep-00 — Longyear Model LG-200 Tensiometer

Project: Weyerhaeuser — Geomembrane Type: HDPE, 60 mil — QC: HJW

Project No.: 5108.08 — Seam Type: DHW — QA: JDH

Strain Rate: 2.00 ipm

			PEEL (outer weld)						PEEL (inner weld)						SHEAR					
			Strength		Peel	Break			Strength		Peel	Break			Strength		Elongation		Break	
		Rep	@yld	@brk	%	Code	Class		@yld	@brk	%	Code	Class		@yld	@brk	@yld	@brk	Code	Class.
Sample #:	DS-14, 73/77	1	118		0	SE1	FTB								148			>100	NO BRK	FTB
		2	125		0	SE1	FTB								148			>100	NO BRK	FTB
Gauge		3	125		0	SE1	FTB								149			>100	NO BRK	FTB
Length:	2.00"	4	122		0	SE1	FTB								147			>100	NO BRK	FTB
		5	127		0	SE1	FTB								148			>100	NO BRK	FTB
		AVG	123												148					
Comments:																				
Sample #:	DS-15, 77/78	1	116		0	SE1	FTB								148			>100	NO BRK	FTB
		2	117		0	SE1	FTB								148			>100	NO BRK	FTB
Gauge		3	107		0	SE1	FTB								149			>100	NO BRK	FTB
Length:	2.00"	4	116		0	SE1	FTB								145			>100	NO BRK	FTB
		5	112		0	SE1	FTB								144			>100	NO BRK	FTB
		AVG	114												147					
Comments:																				
Sample #:	DS-16, 78/79	1	118		0	SE1	FTB								149			>100	NO BRK	FTB
		2	124		0	SE1	FTB								149			>100	NO BRK	FTB
Gauge		3	126		0	SE1	FTB								150			>100	NO BRK	FTB
Length:	2.00"	4	125		0	SE1	FTB								149			>100	NO BRK	FTB
		5	123		0	SE1	FTB								147			>100	NO BRK	FTB
		AVG	123												149					
Comments:																				

RMT, Inc.
Destructive Seam Analysis

Date : 19-Sep-00 — Longyear Model LG-200 Tensiometer

Project: Weyerhaeuser — Geomembrane Type: HDPE, 60 mil — QC: HM

Project No.: 5108.08 — Seam Type: DHW — QA: JM

Strain Rate: 2.00 ipm

		PEEL (outer weld)					PEEL (inner weld)					SHEAR					
		Strength		Peel	Break		Strength		Peel	Break		Strength		Elongation		Break	
	Rep	@yld	@brk	%	Code	Class	@yld	@brk	%	Code	Class	@yld	@brk	@yld	@brk	Code	Class.
Sample #: DS-17, 79/80	1	123		0	SE1	FTB						147			>100	NO BRK	FTB
	2	122		0	SE1	FTB						148			>100	NO BRK	FTB
Gauge	3	123		0	SE1	FTB						150			>100	NO BRK	FTB
Length: 2.00"	4	122		0	SE1	FTB						148			>100	NO BRK	FTB
	5	125		0	SE1	FTB						149			>100	NO BRK	FTB
	AVG	123										148					
Comments:																	
Sample #: DS-18, 80/81	1	115		0	SE1	FTB						148			>100	NO BRK	FTB
	2	139		0	SE1	FTB						147			>100	NO BRK	FTB
Gauge	3	121		0	SE1	FTB						147			>100	NO BRK	FTB
Length: 2.00"	4	110		0	SE1	FTB						147			>100	NO BRK	FTB
	5	134		0	SE1	FTB						147			>100	NO BRK	FTB
	AVG	124										147					
Comments:																	
Sample #: DS-19, 81/82	1	114		0	SE1	FTB						150			>100	NO BRK	FTB
	2	118		0	SE1	FTB						150			>100	NO BRK	FTB
Gauge	3	120		0	SE1	FTB						149			>100	NO BRK	FTB
Length: 2.00"	4	118		0	SE1	FTB						148			>100	NO BRK	FTB
	5	120		0	SE1	FTB						147			>100	NO BRK	FTB
	AVG	118										149					
Comments:																	

RMT, Inc.
Destructive Seam Analysis

Date : 19-Sep-00 — Longyear Model LG-200 Tensiometer

Project: Weyerhaeuser — Geomembrane Type: HDPE, 60 mil — QC: HJH

Project No.: 5108.08 — Seam Type: DHW — QA: [signature]

Strain Rate: 2.00 ipm

			PEEL (outer weld)					PEEL (inner weld)					SHEAR					
			Strength		Peel	Break		Strength		Peel	Break		Strength		Elongation		Break	
		Rep	@yld	@brk	%	Code	Class	@yld	@brk	%	Code	Class	@yld	@brk	@yld	@brk	Code	Class.
Sample #:	DS-20, 82/83	1	129		0	SE1	FTB						150			>100	NO BRK	FTB
		2	127		0	SE1	FTB						148			>100	NO BRK	FTB
Gauge		3	122		0	SE1	FTB						147			>100	NO BRK	FTB
Length:	2.00"	4	113		0	SE1	FTB						148			>100	NO BRK	FTB
		5	112		0	SE1	FTB						148			>100	NO BRK	FTB
		AVG	121										148					
Comments:																		
Sample #:	DS-21, 83/84	1	124		0	SE1	FTB						148			>100	NO BRK	FTB
		2	113		0	SE1	FTB						148			>100	NO BRK	FTB
Gauge		3	117		0	SE1	FTB						148			>100	NO BRK	FTB
Length:	2.00"	4	113		0	SE1	FTB						146			>100	NO BRK	FTB
		5	122		0	SE1	FTB						146			>100	NO BRK	FTB
		AVG	118										147					
Comments:																		
Sample #:	DS-22, 84/85	1	117		0	SE1	FTB						142			>100	NO BRK	FTB
		2	116		0	SE1	FTB						141			>100	NO BRK	FTB
Gauge		3	105		0	SE1	FTB						142			>100	NO BRK	FTB
Length:	2.00"	4	109		0	SE1	FTB						143			>100	NO BRK	FTB
		5	111		0	SE1	FTB						145			>100	NO BRK	FTB
		AVG	112										143					
Comments:																		

RMT, Inc.
Destructive Seam Analysis

Date : 19-Sep-00 Longyear Model LG-200 Tensiometer

Project: Weyerhaeuser | Geomembrane Type: HDPE, 60 mil | QC: HJW

Project No.: 5108.08 | Seam Type: DHW | QA: [illegible]

Strain Rate: 2.00 ipm

		PEEL (outer weld)					PEEL (inner weld)					SHEAR					
		Strength		Peel	Break		Strength		Peel	Break		Strength		Elongation		Break	
	Rep	@yld	@brk	%	Code	Class	@yld	@brk	%	Code	Class	@yld	@brk	@yld	@brk	Code	Class.
Sample #: DS-23, 85/86	1						115		0	SE1	FTB	150			>100	NO BRK	FTB
	2						115		0	SE1	FTB	147			>100	NO BRK	FTB
Gauge	3						111		0	SE1	FTB	148			>100	NO BRK	FTB
Length: 2.00"	4						114		0	SE1	FTB	148			>100	NO BRK	FTB
	5						116		0	SE1	FTB	149			>100	NO BRK	FTB
	AVG						114					148					

Comments: Overlap too small to run peel on outer track.

Sample #:	1																
	2																
Gauge	3																
Length:	4																
	5																
	AVG																

Comments:

Sample #:	1																
	2																
Gauge	3																
Length:	4																
	5																
	AVG																

Comments:

RMT, Inc.

Destructive Seam Analysis

Date :	22-Sep-00	Longyear Model LG-200 Tensiometer	
Project:	Weyerhaeuser	Geomembrane Type: HDPE, 60 mil	QC: HJW
Project No.:	5108.08	Seam Type: DHW	QA: JPB

Strain Rate: 2.00 ipm		PEEL (outer weld)					PEEL (inner weld)					SHEAR					
		Strength		Peel	Break		Strength		Peel	Break		Strength		Elongation		Break	
	Rep	@yld	@brk	%	Code	Class	@yld	@brk	%	Code	Class	@yld	@brk	@yld	@brk	Code	Class.
Sample #: DS-24, 86/87	1						109		0	SE1	FTB	147			>100	NO BRK	FTB
	2						109		0	SE1	FTB	147			>100	NO BRK	FTB
Gauge	3						112		0	SE1	FTB	146			>100	NO BRK	FTB
Length: 2.00"	4						112		0	SE1	FTB	143			>100	NO BRK	FTB
	5						113		0	SE1	FTB	145			>100	NO BRK	FTB
	AVG						111					146					
Comments: Overlap too small to run peel on outer track.																	
Sample #: DS-25, 86/87	1						114		0	SE1	FTB	146			>100	NO BRK	FTB
	2						112		0	SE1	FTB	147			>100	NO BRK	FTB
Gauge	3						115		0	SE1	FTB	147			>100	NO BRK	FTB
Length: 2.00"	4						111		0	SE1	FTB	147			>100	NO BRK	FTB
	5						113		0	SE1	FTB	146			>100	NO BRK	FTB
	AVG						113					147					
Comments: Overlap too small to run peel on outer track.																	
Sample #: DS-26, 88/89	1	114		0	SE1	FTB						142			>100	NO BRK	FTB
	2	114		0	SE1	FTB						144			>100	NO BRK	FTB
Gauge	3	119		0	SE1	FTB						143			>100	NO BRK	FTB
Length: 2.00"	4	119		0	SE1	FTB						146			>100	NO BRK	FTB
	5	114		0	SE1	FTB						147			>100	NO BRK	FTB
	AVG	116										144					
Comments:																	

RMT, Inc.
Destructive Seam Analysis

Date : 22-Sep-00 | Longyear Model LG-200 Tensiometer

Project: Weyerhaeuser | Geomembrane Type: HDPE, 60 mil | QC: H.W.

Project No.: 5108.08 | Seam Type: DHW | QA: JBH

Strain Rate: 2.00 ipm

			PEEL (outer weld)					PEEL (inner weld)					SHEAR					
			Strength		Peel	Break		Strength		Peel	Break		Strength		Elongation		Break	
		Rep	@yld	@brk	%	Code	Class	@yld	@brk	%	Code	Class	@yld	@brk	@yld	@brk	Code	Class.
Sample #:	DS-27, 89/90	1	114		0	SE1	FTB						147			>100	NO BRK	FTB
		2	113		0	SE1	FTB						147			>100	NO BRK	FTB
Gauge		3	117		0	SE1	FTB						147			>100	NO BRK	FTB
Length:	2.00"	4	115		0	SE1	FTB						146			>100	NO BRK	FTB
		5	117		0	SE1	FTB						147			>100	NO BRK	FTB
		AVG	115										147					
Comments:																		
Sample #:	DS-28, 90/91	1	122		0	SE1	FTB						144			>100	NO BRK	FTB
		2	118		0	SE1	FTB						145			>100	NO BRK	FTB
Gauge		3	119		0	SE1	FTB						144			>100	NO BRK	FTB
Length:	2.00"	4	122		0	SE1	FTB						142			>100	NO BRK	FTB
		5	122		0	SE1	FTB						143			>100	NO BRK	FTB
		AVG	121										144					
Comments:																		
Sample #:		1																
		2																
Gauge		3																
Length:		4																
		5																
		AVG																
Comments:																		

RMT, Inc.
Destructive Seam Analysis

Date : 26-Sep-00 — Longyear Model LG-200 Tensiometer

Project: WEYERHAEUSER — Geomembrane Type: HDPE, 60 mil — QC: JRS

Project No.: 5108.08 — Seam Type: DHW — QA: JRS

Strain Rate: 2.00 ipm

		PEEL (outer weld)					PEEL (inner weld)					SHEAR					
		Strength		Peel	Break		Strength		Peel	Break		Strength		Elongation		Break	
	Rep	@yld	@brk	%	Code	Class	@yld	@brk	%	Code	Class	@yld	@brk	@yld	@brk	Code	Class.
Sample #: DS-29, 107/100	1	129		0	SE1	FTB						138			>100	NO BRK	FTB
	2	129		0	SE1	FTB						139			>100	NO BRK	FTB
Gauge	3	130		0	SE1	FTB						140			>100	NO BRK	FTB
Length: 2.00"	4	129		0	SE1	FTB						140			>100	NO BRK	FTB
	5	128		0	SE1	FTB						140			>100	NO BRK	FTB
	AVG	129										139					
Comments:																	
Sample #: DS-30, 91/111	1	121		0	SE1	FTB						142			>100	NO BRK	FTB
	2	121		0	SE1	FTB						143			>100	NO BRK	FTB
Gauge	3	120		0	SE1	FTB						143			>100	NO BRK	FTB
Length: 2.00"	4	122		0	SE1	FTB						143			>100	NO BRK	FTB
	5	123		0	SE1	FTB						144			>100	NO BRK	FTB
	AVG	121										143					
Comments:																	
Sample #: DS-31, 111/112	1						118		0	SE1	FTB	149			>100	NO BRK	FTB
	2						119		0	SE1	FTB	151			>100	NO BRK	FTB
Gauge	3						115		0	SE1	FTB	149			>100	NO BRK	FTB
Length: 2.00"	4						114		0	SE1	FTB	149			>100	NO BRK	FTB
	5						124		0	SE1	FTB	148			>100	NO BRK	FTB
	AVG						118					149					

Comments: Overlap too small to run peel on outer track.

RMT, Inc.
Destructive Seam Analysis

Date : 26-Sep-00 — Longyear Model LG-200 Tensiometer

Project: WEYERHAEUSER — Geomembrane Type: HDPE, 60 mil — QC: JTS

Project No.: 5108.08 — Seam Type: DHW — QA: [illegible]

Strain Rate: 2.00 ipm

			PEEL (outer weld)					PEEL (inner weld)					SHEAR					
			Strength		Peel	Break		Strength		Peel	Break		Strength		Elongation		Break	
		Rep	@yld	@brk	%	Code	Class	@yld	@brk	%	Code	Class	@yld	@brk	@yld	@brk	Code	Class.
Sample #:	DS-32, 112/113	1	124		0	SE1	FTB						150			>100	NO BRK	FTB
		2	114		0	SE1	FTB						149			>100	NO BRK	FTB
Gauge		3	114		0	SE1	FTB						151			>100	NO BRK	FTB
Length:	2.00"	4	118		0	SE1	FTB						151			>100	NO BRK	FTB
		5	116		0	SE1	FTB						150			>100	NO BRK	FTB
		AVG	117										150					
Comments:																		
Sample #:	DS-33, 113/114	1	112		0	SE1	FTB						145			>100	NO BRK	FTB
		2	123		0	SE1	FTB						145			>100	NO BRK	FTB
Gauge		3	140		0	SE1	FTB						145			>100	NO BRK	FTB
Length:	2.00"	4	124		0	SE1	FTB						145			>100	NO BRK	FTB
		5	127		0	SE1	FTB						146			>100	NO BRK	FTB
		AVG	125										145					
Comments:																		
Sample #:	DS-34, 114/115	1	117		0	SE1	FTB						152			>100	NO BRK	FTB
		2	112		0	SE1	FTB						152			>100	NO BRK	FTB
Gauge		3	130		0	SE1	FTB						151			>100	NO BRK	FTB
Length:	2.00"	4	130		0	SE1	FTB						150			>100	NO BRK	FTB
		5	123		0	SE1	FTB						150			>100	NO BRK	FTB
		AVG	122										151					
Comments:																		

RMT, Inc.
Destructive Seam Analysis

Date : 26-Sep-00 — Longyear Model LG-200 Tensiometer

Project: WEYERHAEUSER — Geomembrane Type: HDPE, 60 mil — QC: JRS

Project No.: 5108.08 — Seam Type: DHW — QA: JPH

Strain Rate: 2.00 ipm

			PEEL (outer weld)					PEEL (inner weld)					SHEAR					
			Strength		Peel	Break		Strength		Peel	Break		Strength		Elongation		Break	
		Rep	@yld	@brk	%	Code	Class	@yld	@brk	%	Code	Class	@yld	@brk	@yld	@brk	Code	Class.
Sample #:	DS-35, 115/116	1	122		0	SE1	FTB						150			>100	NO BRK	FTB
		2	125		0	SE1	FTB						149			>100	NO BRK	FTB
Gauge		3	127		0	SE1	FTB						146			>100	NO BRK	FTB
Length:	2.00"	4	127		0	SE1	FTB						144			>100	NO BRK	FTB
		5	127		0	SE1	FTB						142			>100	NO BRK	FTB
		AVG	126										146					
Comments:																		
Sample #:	DS-36, 116/117	1	121		0	SE1	FTB						152			>100	NO BRK	FTB
		2	123		0	SE1	FTB						152			>100	NO BRK	FTB
Gauge		3	122		0	SE1	FTB						151			>100	NO BRK	FTB
Length:	2.00"	4	123		0	SE1	FTB						152			>100	NO BRK	FTB
		5	122		0	SE1	FTB						151			>100	NO BRK	FTB
		AVG	122										152					
Comments:																		
Sample #:	DS-37, 117/118	1	129		0	SE1	FTB						152			>100	NO BRK	FTB
		2	114		0	SE1	FTB						151			>100	NO BRK	FTB
Gauge		3	116		0	SE1	FTB						150			>100	NO BRK	FTB
Length:	2.00"	4	115		0	SE1	FTB						149			>100	NO BRK	FTB
		5	115		0	SE1	FTB						149			>100	NO BRK	FTB
		AVG	118										150					
Comments:																		

RMT, Inc.
Destructive Seam Analysis

Date : 26-Sep-00 — Longyear Model LG-200 Tensiometer

Project: WEYERHAEUSER — Geomembrane Type: HDPE, 60 mil — QC: JRS

Project No.: 5108.08 — Seam Type: DHW — QA:

Strain Rate: 2.00 ipm

			PEEL (outer weld)					PEEL (inner weld)					SHEAR					
			Strength		Peel	Break		Strength		Peel	Break		Strength		Elongation		Break	
		Rep	@yld	@brk	%	Code	Class	@yld	@brk	%	Code	Class	@yld	@brk	@yld	@brk	Code	Class.
Sample #:	DS-38, 118/119	1	114		0	SE1	FTB						145			>100	NO BRK	FTB
		2	121		0	SE1	FTB						144			>100	NO BRK	FTB
Gauge		3	118		0	SE1	FTB						143			>100	NO BRK	FTB
Length:	2.00"	4	116		0	SE1	FTB						144			>100	NO BRK	FTB
		5	117		0	SE1	FTB						144			>100	NO BRK	FTB
		AVG	117										144					
Comments:																		
Sample #:	DS-39, 129/128	1	140		0	SE1	FTB						147			>100	NO BRK	FTB
		2	141		0	SE1	FTB						145			>100	NO BRK	FTB
Gauge		3	140		0	SE1	FTB						142			>100	NO BRK	FTB
Length:	2.00"	4	138		0	SE1	FTB						143			>100	NO BRK	FTB
		5	136		0	SE1	FTB						142			>100	NO BRK	FTB
		AVG	139										144					
Comments:																		
Sample #:		1																
		2																
Gauge		3																
Length:		4																
		5																
		AVG																
Comments:																		

RMT, Inc.
Destructive Seam Analysis

Date : 02-Oct-00 — Longyear Model LG-200 Tensiometer

Project: WEYERHAEUSER — Geomembrane Type: HDPE/T2-HDPE, 60 mil — QC: HJW

Project No.: 5101.08 — Seam Type: EXT — QA: SN

Strain Rate: 2.00 ipm

		PEEL (outer weld)					PEEL (inner weld)					SHEAR					
		Strength		Peel	Break		Strength		Peel	Break		Strength		Elongation	Break		
	Rep	@yld	@brk	%	Code	Class	@yld	@brk	%	Code	Class	@yld	@brk	@yld	@brk	Code	Class.
Sample #: DS-41, 147/119	1	134		0	SE3	FTB						151			>100	NO BRK	FTB
	2	127		0	SE3	FTB						149			>100	NO BRK	FTB
Gauge	3	127		0	SE3	FTB						150			>100	NO BRK	FTB
Length: 2.00"	4	127		0	SE3	FTB						146			>100	NO BRK	FTB
	5	124		0	SE3	FTB						146			>100	NO BRK	FTB
	AVG	128										148					

Comments:

Sample #:	1																
	2																
Gauge	3																
Length:	4																
	5																
	AVG																

Comments:

Sample #:	1																
	2																
Gauge	3																
Length:	4																
	5																
	AVG																

Comments:

RMT, Inc.
Destructive Seam Analysis

Date : 02-Oct-00 — Longyear Model LG-200 Tensiometer

Project: WEYERHAEUSER — Geomembrane Type: HDPE, 60mil — QC: H.W

Project No.: 5101.08 — Seam Type: DHW — QA: MH

Strain Rate: 2.00 ipm		PEEL (outer weld)					PEEL (inner weld)					SHEAR					
		Strength		Peel	Break		Strength		Peel	Break		Strength		Elongation		Break	
	Rep	@yld	@brk	%	Code	Class	@yld	@brk	%	Code	Class	@yld	@brk	@yld	@brk	Code	Class.
Sample #: DS-40, 144/143	1	126		0	SE1	FTB						140			>100	NO BRK	FTB
	2	124		0	SE1	FTB						140			>100	NO BRK	FTB
Gauge	3	128		0	SE1	FTB						138			>100	NO BRK	FTB
Length: 2.00"	4	126		0	SE1	FTB						139			>100	NO BRK	FTB
	5	125		0	SE1	FTB						138			>100	NO BRK	FTB
	AVG	126										139					
Comments:																	
Sample #: DS-42, 137/138	1	138		0	SE1	FTB						144			>100	NO BRK	FTB
	2	132		0	SE1	FTB						143			>100	NO BRK	FTB
Gauge	3	138		0	SE1	FTB						142			>100	NO BRK	FTB
Length: 2.00"	4	135		0	SE1	FTB						142			>100	NO BRK	FTB
	5	129		0	SE1	FTB						142			>100	NO BRK	FTB
	AVG	134										143					
Comments:																	
Sample #:	1																
	2																
Gauge	3																
Length:	4																
	5																
	AVG																
Comments:																	

Appendix T
Geotextile Submittals

EVERGREEN
TECHNOLOGIES, INC.

August 21, 2000

Geo - Synthetics, Inc.
W239 N28 Pewaukee Road
Waukesha, WI 53188

Customer Order # 2109-00, PO # 5765-00, Project: GSI –Ryan LF
TESOrder # 2492, Shipment # 4989, B/L # 4984

Subj: TG032 Nonwoven Geotextile Certificate of Compliance

Dear Sir:

QC certifications for the above project were forwarded to your attention on 8/17/00.

Respectfully,

Rosalyn Forney
Certification Coordinator

ETI

5775-B Glenridge Drive / Lakeside Center, Suite 450 / Atlanta, Georgia 30328-5363
Tel. 800-984-9784 / Fax 404-705-9650

200 Miller Sellers Drive / Evergreen, Alabama 36401
Tel. 334-578-9003 / Fax 334-578-6141

BILL OF LADING–SHORT FORM–NOT NEGOTIABLE

Carrier	Trailer No.	Date	Shipment No.	Bill of Lading No.
LLTR L&L TRUCKING		08/19/2000	4989	4984

RECIEVED, subject to the classifications and lawfully allowed tarrifs in effect on the date of issue of this Bill of Lading.

The property described below in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below which said carrier (the word carrier being understood throughout this contract as any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutally is agreed as to each carrier of all or any said property over all or any portion of said route to destination, and as to each party at any time interested in all or any said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classification in effect on the date hereof, if this is a rail or a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.

Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, set forth in the classification or tariff which governs the transportation of this shipment and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

From:	To:
Shipper (Origin) **EVERGREEN TECHNOLOGIES, INC.** 200 MILLER SELLERS DRIVE EVERGREEN, AL 36401	Cosignee **GEO-SYNTHETICS, INC.** GSI / RYAN, INC. MAIN STREET EXTENSION PLYMOUTH, NC 27962

ETI Order Number: **0002109-00** Customer Purchase Order: **5765-00** Job Number:

TES/TET#: 2492 **TMP#:** **Freight Terms:** PPA

Order Comments TES-2492 / TMP #
PLEASE CALL RANDY FLATT AT 262-524-7979 24 HOURS PRIOR TO DELIVERY.

Bill of Lading Comments

No. Pkgs	Kind of Package, Description of Articles, Special Marks and Exceptions		Weight
2	TG032162150	TG032 13.5X150	900
43	TG032168150	TG032 14x150 233.33y2	20,081
45	**Total Pkgs**	**Total Weight**	20,981 lbs

Cosignee Signature **Delivery Date**

REMIT C.O.D. TO: C.O.D. Amt$ C.O.D Fee: ☐ Prepaid ☐ Collect $

Subject to Section 7 of conditions, if this shipment is to be delivered to the cosignee without recourse on the cosignor, the cosignor shall sign the following statement:

The carrier shall not make delivery of the shipment without payment of freight and all other lawful charges.

(Signature of Cosignor)

Freight charges are PREPAID unless marked collect. **Check box if charges are Collect.** ☐

This is to certify that the above named materials are properly classified, described, packaged, marked and labled, and are in proper condition for transportation, according to the applicable regulations of the Department of Transportation.

EVERGREEN TECHNOLOGIES, INC.
200 MILLER SELLERS DRIVE - EVERGREEN, AL 36401
Permanent post office address of shipper

Shipper, Per

Agent, Per

Evergreen Technologies, Inc.
Packing List

19-Aug-00 11:50:10

Order Number 0002109-00 PO Number: 5765-00

Shipment Number: 4989

Customer GEOSYN

Ship To: GEO-SYNTHETICS, INC.
GSI / RYAN, INC.
MAIN STREET EXTENSION
PLYMOUTH, NC 27962

Line	Roll Number	Lot Number	Product Code	Line	Roll Number	Lot Number	Product Code
1	200101650	04040	TG032168150	40	200101825	04040	TG032168150
2	200101731	04040	TG032168150	41	200101826	04040	TG032168150
3	200101732	04040	TG032168150	42	200101827	04040	TG032168150
4	200101733	04040	TG032168150	43	200101828	04040	TG032168150
5	200101745	04040	TG032168150	44	200101829	04040	TG032168150
6	200101746	04040	TG032168150	45	200101830	04040	TG032168150
7	200101747	04040	TG032168150				
8	200101748	04040	TG032168150				
9	200101749	04040	TG032168150				
10	200101750	04040	TG032168150				
11	200101751	04040	TG032168150				
12	200101752	04040	TG032168150				
13	200101753	04040	TG032168150				
14	200101754	04040	TG032168150				
15	200101755	04040	TG032168150				
16	200101756	04040	TG032168150				
17	200101757	04040	TG032168150				
18	200101758	04040	TG032168150				
19	200101759	04040	TG032168150				
20	200101761	04040	TG032168150				
21	200101762	04040	TG032168150				
22	200101763	04040	TG032168150				
23	200101764	04040	TG032168150				
24	200101766	04040	TG032162150				
25	200101767	04040	TG032162150				
26	200101801	04040	TG032168150				
27	200101802	04040	TG032168150				
28	200101803	04040	TG032168150				
29	200101804	04040	TG032168150				
30	200101805	04040	TG032168150				
31	200101806	04040	TG032168150				
32	200101807	04040	TG032168150				
33	200101808	04040	TG032168150				
34	200101809	04040	TG032168150				
35	200101810	04040	TG032168150				
36	200101811	04040	TG032168150				
37	200101812	04040	TG032168150				
38	200101823	04040	TG032168150				
39	200101824	04040	TG032168150				