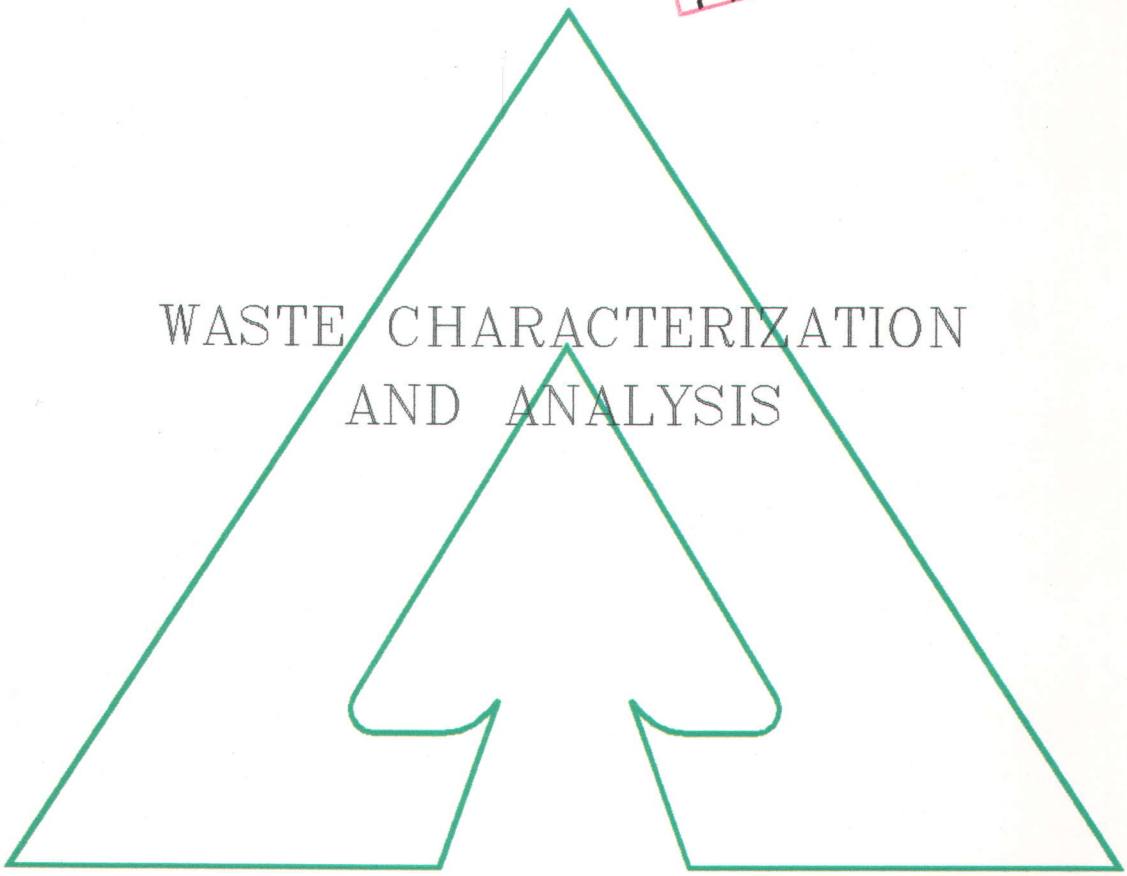

WASTE CHARACTERIZATION AND ANALYSIS

ISSUED: JULY 1990

REVISED: DECEMBER 1990

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WASTE CHARACTERIZATION AND ANALYSIS

Plymouth Mill
Weyerhaeuser Paper Company
Plymouth, N.C.

Issued: July 1990
Revised: December 1990

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TABLE OF CONTENTS

List of Tables

TABLE OF CONTENTS (continued)

Section **Page**

List of Figures

List of Appendices

EXECUTIVE SUMMARY

Background data have been collected for the purpose of designing a new landfill to replace the existing facility in three to five years. Chemical and physical properties of waste samples were evaluated.

Chemical Testing

Various wastes were subjected to acid and water leaching to determine whether hazardous constituents might be released from the landfill to the environment. In the acid leaching tests, nearly all of the wastes tested exceeded one of the United States Environmental Protection Agency (US EPA) primary or secondary drinking water standards. However, none of the variances were greater than the "ten times" action level typically used by the North Carolina Department of Environment, Health and Natural Resources. Only selenium exceeded the primary standard among the water leach samples.

The wastes to be disposed in the landfill are nonhazardous. The level of environmental barrier needed for the new landfill, such as a liner or leachate collection system, can be evaluated on the basis of the data collected.

Physical Testing

Index properties, shear strengths, and consolidation properties were determined for ash and dewatered sludge which are the major wastes that will be disposed of in the landfill. Test results indicate that an ash landfill can be constructed with relatively steep slopes. The addition of dewatered sludge only slightly reduces the strength of the material. Consolidation of the waste due to loading will result in the release of pore water, or leachate. Methods for handling this leachate will be addressed in the landfill design.

Section 1

INTRODUCTION

1.1 Background

The Weyerhaeuser Paper Company (Weyerhaeuser) facility in Plymouth, North Carolina, consists of an integrated kraft process pulp and paper mill and a wood products plant. The solid waste generated by the Plymouth mill is currently disposed of in a state permitted solid waste landfill. Both the manufacturing facility and the existing landfill are shown in Figure 1.

1.2 Purpose

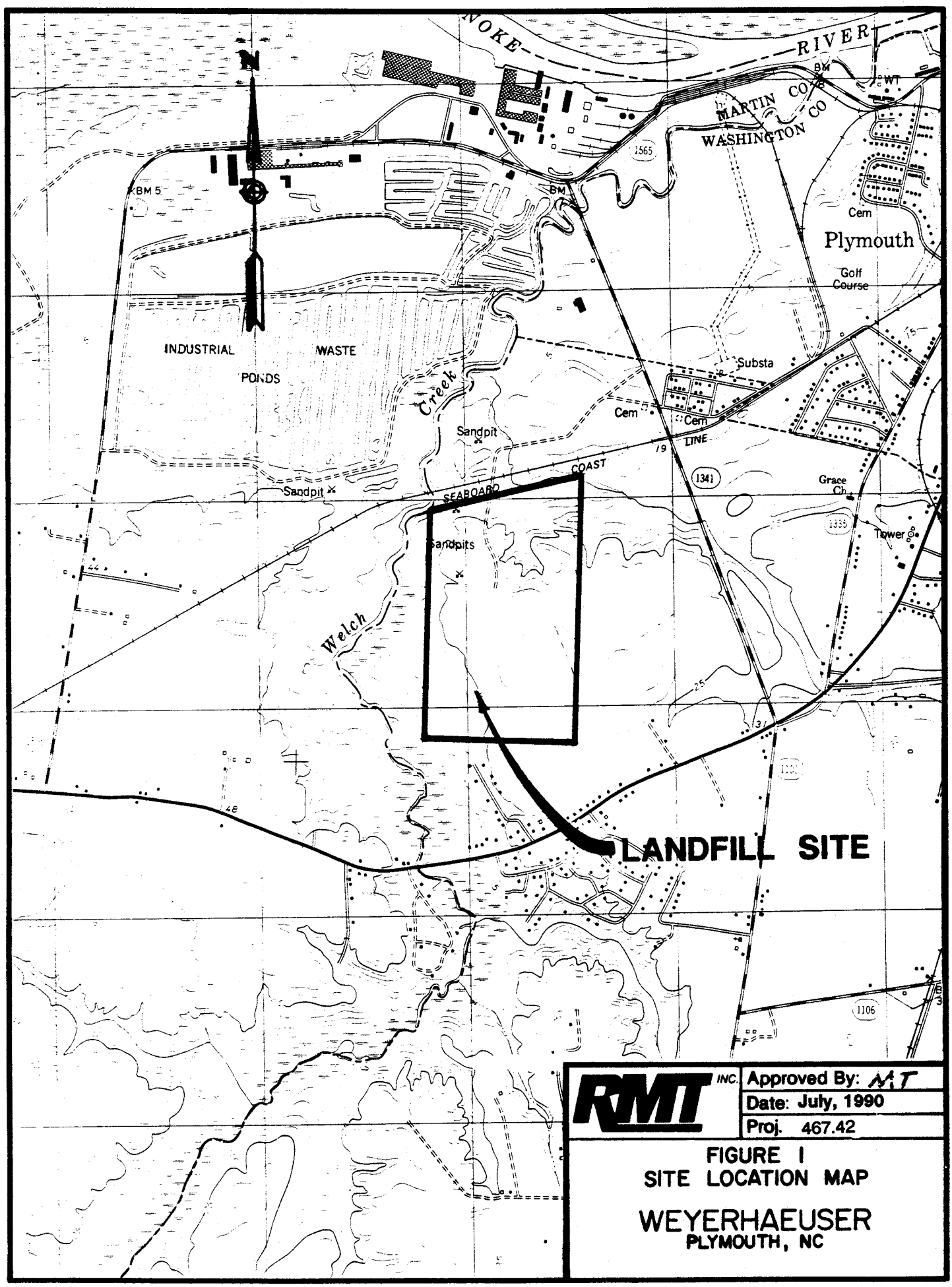
The existing landfill was recently repermitted with a vertical expansion that provides three to five years of capacity. To meet long-term solid waste disposal needs, Weyerhaeuser is in the process of developing and implementing plans for a new landfill. The sampling program described in this report was designed to accomplish the following:

- Document the types and volumes of wastes that are generated at the facility,
- Investigate leaching characteristics of the wastes to facilitate engineering design of the landfill and to help predict leachate characteristics, and
- Obtain information on the physical and engineering properties of wastes to evaluate landfill operation, to determine constructive use of wastes as liner, berm, or cover material, and identify needs for waste segregation or blending.

1.3 Scope

The following Scope of Services was implemented by RMT to meet the objectives of this project.

- Review existing Weyerhaeuser information on raw materials, process flow, materials handling, waste generation, and waste quantities and characteristics.
- Update the Materials Flow Diagram that RMT prepared for inclusion in the Landfill Vertical Expansion permit.
- Develop a sampling and analysis program for physical and chemical characterization of plant wastes.
- Prepare a Waste Characterization and Analysis Report summarizing the results of this work.



RMT INC.	Approved By: MT
	Date: July, 1990
	Proj. 467.42

FIGURE 1
SITE LOCATION MAP

WEYERHAEUSER
PLYMOUTH, NC

TELEDYNE POST N32083

Section 2

FINDINGS AND CONCLUSIONS

The findings and conclusions presented in this section resulted from project investigation activities.

2.1 Chemical Testing

- Individual waste samples consisted of ash and dewatered sludge. Composite waste samples consisted of a paper, rejects, and miscellaneous wood waste composite, a grits, dregs, and lime waste composite, and an overall waste composite. The composites were tested using the Toxicity Characteristic Leaching Procedure (TCLP). None of the samples released constituents above the associated hazardous waste limits. Additionally, only three of the volatile organic compounds and none of the pesticides in the TCLP analysis were detected above laboratory analytical detection limits.

- The Plymouth Mill solid wastes, which were tested, are classified as nonhazardous wastes for the characteristics of TCLP.

- The results of TCLP tests that were conducted on the individual wastes or the composite waste samples may be summarized as follows:

  - Barium was detected slightly above the primary drinking water standard of 1 mg/L in the three samples. The primary drinking water standards are the enforceable maximum contaminant levels (MCLs), which are set by the US EPA using health based criteria.

  - Cadmium was detected above the primary drinking water standard of 0.01 mg/L in two samples. The ash leached 0.056 mg/L of cadmium, and the overall composite leached 0.014 mg/L of cadmium, which is probably from the ash.

  - Arsenic was detected above the primary drinking water standard of 0.05 mg/L in one sample. The overall composite leached 0.086 mg/L of arsenic.

  - Selenium was detected above the primary drinking water standard of 0.01 mg/L in two samples. The ash leached 0.27 mg/L of selenium, and the overall composite leached a proportionate amount.

- The results of analyses for the extended parameter list on TCLP leachate from the ash, the dewatered sludge, and the overall composite can be summarized as follows:

  - The total dissolved solids in the ash, the dewatered sludge and the overall composite were 7300, 5100, and 6100 mg/L respectively. These are above the secondary drinking water standard of 500 mg/L. The secondary drinking water standards are nonenforceable guidelines for the public water supply.

The constituents in the secondary drinking water standards primarily affect the aesthetic qualities of drinking water.

- The ash leached 17 mg/L of manganese, and the overall composite leached a proportionate amount, 6.6 mg/L. These are above the secondary drinking water standard of 0.05 mg/L; however, based on US EPA's acceptable intake for chronic exposure (AIC) for oral intake of manganese through drinking water, the acceptable concentration of manganese is 7.6 mg/L. The AIC limits have been established to assess the health risks of drinking ground water that contain certain constituents.

- ASTM water leachate tests were performed on the ash, the dewatered sludge, and the overall composite. In the overall composite, selenium leached at 0.027 mg/L, which is about twice the primary drinking water standard of 0.01 mg/L. The total dissolved solids in the ash and total composite leachates slightly exceeded the secondary drinking water standard. The pH of these two leachates was also above the secondary drinking water standard.

2.2 Physical Testing

- Testing of the two major waste types, ash, dewatered sludge, and a 1:1 composite of ash and sludge, yielded the following results:

  - The initial moisture content of the ash was 29 percent (71 percent solids).

  - The moisture content of dewatered sludge that was "resaturated" in standing water was 68 to 69 percent (31 to 32 percent solids).

  - The specific gravity of dewatered sludge, ash and sludge/ash composite were determined to be 1.77, 2.13 and 2.04, respectively.

  - The maximum dry unit weights were determined: sludge, 27 to 35 pcf; ash, 37 to 39 pcf; and sludge/ash composite, 36 to 40 pcf.

- Bench scale shear strength test results were as follows:

  - Dewatered sludge at 38, 45 and 50 percent solids exhibited peak internal friction angles ranging from 22 to 32 degrees, and cohesion values ranging from 0 to 371 psf.

  - Ash yielded anomalously low values of both friction angle (15 degrees) and cohesion (66 psf).

  - Two sludge/ash composites (38 percent solids plus ash and 45 percent solids plus ash) exhibited friction angles of 23 and 24 degrees and cohesion values of 45 and 90 psf, respectively.

- Direct shear strength test results were as follows:
  - Sludge samples (38 and 45 percent solids) exhibited friction angles of 31 and 34 degrees, and cohesion values ranging from 54 to 464 psf.
  - Ash produced a friction angle of 35 degrees and 252 psf cohesion.
  - The composite samples produced friction angles of 35 to 36 degrees and 189 to 284 psf cohesion.
- Triaxial shear strength test results were as follows:
  - Dewatered sludge was tested under unconsolidated-undrained (UU) conditions that yield friction angles equal to zero, and had 228 to 953 psf cohesion.
  - Ash, tested under consolidated-undrained (CU) conditions, indicated a friction angle of 22 degrees with 470 psf cohesion.
  - Sludge ash/composite samples (38 and 45 percent solids) indicated an internal angle of friction of 28 to 30 degrees, with cohesion values between 0 and 12 psf.
- Consolidation tests on sludge at 45 percent solids, ash, and a 1:1 composite of each, produced the following results:
  - The compression index for sludge, ash, and sludge/ash composite were 1.00, 1.05 and 0.80, respectively.
  - The recompression index for sludge, ash, and sludge/ash composite were 0.17, 0.10 and 0.09, respectively.
  - The compression ratio for the sludge, ash, and sludge/ash composite were 0.27, 0.25 and 0.21, respectively.
  - The coefficient of the consolidation for the sludge, ash and sludge/ash composite were 1.6, 5.6 and 3.3 square feet per day, respectively.
- The strength of the materials over the range of various solids contents was nearly constant.
- The sludge/ash composite exhibited approximately equivalent strength to the ash.
- The projected waste mixture should be stable at slopes up to 3:1.
- Consolidation of the waste due to the waste load placed above will result in the release of pore water (leachate) that should be collected by a leachate collection system.

2.3 Testing Summary

- Leaching tests indicate that an ash monofill would have relatively low leaching potential, while an ash/sludge landfill would generate more acidic leachate and possess greater leaching potential.

- A mixture of dewatered sludge and ash exhibits nearly the same shear strengths as ash alone.

- Whether ash and sludge are segregated or codisposed, the potential environmental impacts of either waste mix can be managed with standard landfill engineering technology.

Section 3

RECOMMENDATIONS

RMT recommends that ash generated by the incineration of dewatered sludge be tested in the same manner as the materials discussed in this report. In addition, RMT recommends that the results of this study be used to:

- Define the need for environmental barriers, such as liners, for the new landfill.
- Determine if waste can be used in construction or capping of the new landfill.
- Perform stability calculations prior to designing the new landfill.

Section 4

WASTE CLASSIFICATION

4.1 Production Processes

The products of the integrated kraft process include bleached fluff pulp, fine paper, liner board, and corrugated medium. A secondary fiber operation, which recovers fibers from baled waste paper products, supplies pulp for paper board production. A process flow diagram highlighting the waste generation units is presented in Figure 2.

Pulp for papermaking is produced on-site by digesting mixed hardwood and softwood. The kraft process involves cooking wood chips with an alkaline solution called "white liquor" at elevated temperature and pressure in digesters. The digestion extracts some of the wood components, such as lignin, resin, and turpentine, and changes the structure of the cellulose. After digestion, the solution is passed through a series of screens and washers to isolate the fiber stock from the liquid components. The solution that remains after fibers have been removed is known as "weak black liquor."

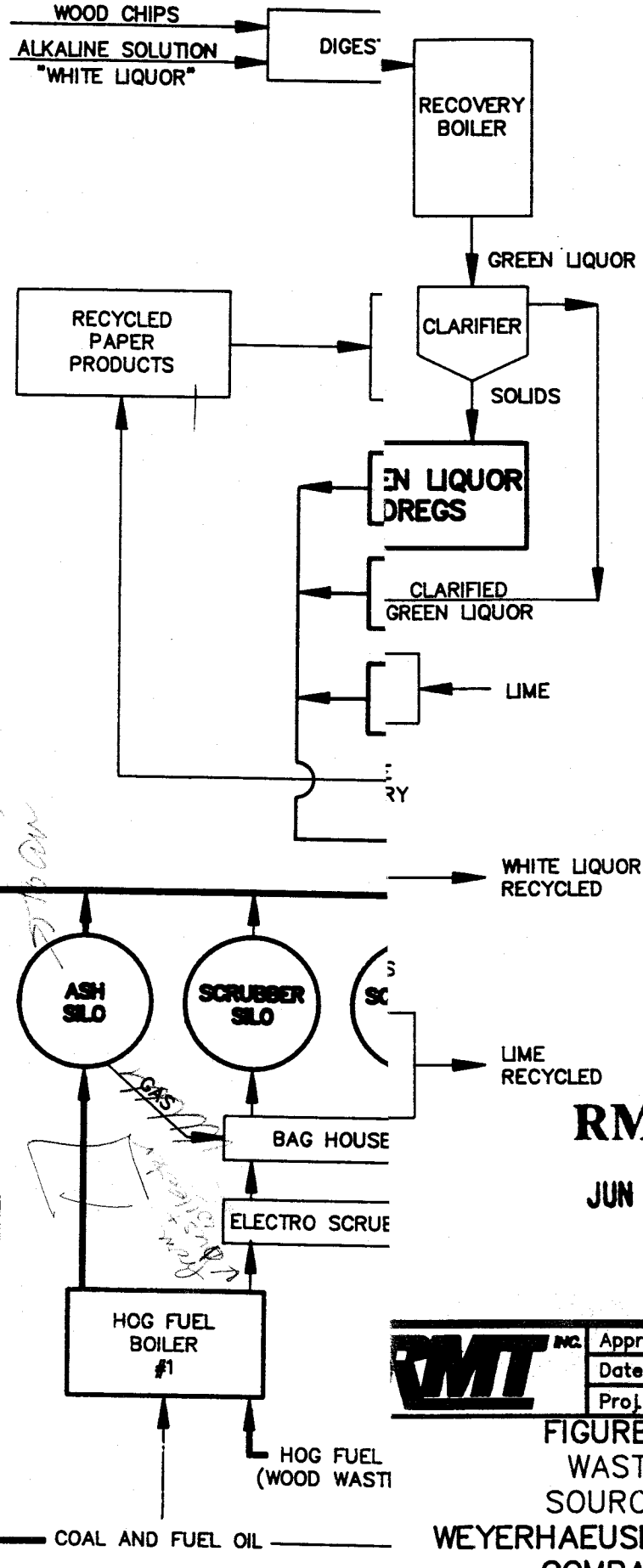
Washed fiber stock is concentrated. A part of it is bleached for the production of fine paper and fluff pulp. The remainder is used for unbleached products and is combined with pulp from the secondary fiber operation, which recycles paper products. Paper is made from bleached and unbleached stock on five paper machines. Most broke and butt-end rolls are recycled, but some are sent to the landfill.

Weak black liquor is concentrated and burned to recover and recycle the chemicals used in the digestion. A series of evaporators is used to concentrate the black liquor. The concentrated black liquor contains sufficient amounts of combustible material for burning in a recovery boiler for steam generation. The non-combustible materials form a molten smelt that falls into dissolving tanks at the bottom of the boiler. The resulting solution, called green liquor, is purified in a clarifier. Solids that settle in the clarifier, or "dregs," are sent to the landfill. The clarified green liquor is reacted with lime in the slaker. "Grits," a dark green insoluble material from the slaking process, are also sent to the landfill for disposal. The resulting solution is the "white liquor" that is used for digestion.

Lime mud (calcium carbonate) is recovered from the slaker in a clarifier. The mud is washed, filtered, and heated in a high temperature kiln to liberate carbon dioxide and to recover lime (CaO). The recovered lime is recycled to the slaking process. Lime mud is occasionally sent to the landfill in unusual circumstances (e.g., when the kiln is out of service).

Currently, primary wastewater treatment sludge is stored in a lagoon. In the future, this sludge will be dewatered by a "screw press". Most of the dewatered sludge will be burned, but some may be sent to the landfill. Bench-scale tests for sludge dewatering equipment were conducted during 1987. Dewatered sludge from these tests was used for waste characterization.

Bark and undersized woodchips are burned, along with coal, in the mill power plant. Fly ash generated at the power plant and some wood waste are sent to the landfill. Other solid wastes, including demolition debris and miscellaneous mill trash, are also disposed of in the landfill.



RMT, INC.

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	Date: MARCH, 1990
	Proj. No.: 467.41

FIGURE 2
WASTE
SOURCES
WEYERHAEUSER PAPER
COMPANY
PLYMOUTH, NC

4.2 Quantification

Major sources of solid waste disposed of in the existing landfill include the following:

Fly Ash - ash entrained in the combustion air from burning coat in the Riley boiler and bark and wood waste in the hog fuel boilers.

Wood Waste - logs, bark, scrap plywood, pallets, etc.

Fiber Waste - paperboard trash, waste pulp, broke, and butt rolls.

Rejects - plastic, metal wire, and general trash from the secondary fiber plant.

Grits - waste from the lime slaker.

Dregs - sediment from the green liquor clarifiers.

Lime and Lime Mud - CaO and $CaCO_3$ that are not successfully reclaimed at the slaker.

Dewatered Sludge - primary wastewater treatment sludge, which is principally wood fiber, dewatered in a screw press.

Other - demolition debris and miscellaneous mill trash.

The actual volume of solid waste generated each day varies. Waste generation data for 1989 provided by Weyerhaeuser were used to formulate the daily average of approximately 700 cubic yards per day currently generated at the plant. This data is summarized in Tables 1 and 3. Based on the dewatering study, the dewatered sludge was assumed to be 180 tons/day at 45 percent solids, with a density of 20 lb/ft^3, which is based on a National Council of the Paper Industry for Air and Stream Improvement, Inc. (NCASI) Report. This represents about 670 additional cubic yards per day.

The actual bulk density of the dewatered sludge used in the analytical program was between 30 and 35 lbs/ft^3 and the solids content was between 55 and 60 percent. This did not significantly change the composition of Composite #3.

4.3 Percentage of Waste Components in Composite Samples

Composite samples (#1, #2, #3) were prepared by mixing waste components in the approximate relative quantities in which they will be disposed at the landfill.

Composite #1: Slaker grits, green liquor dregs, lime, and lime mud (all alkaline).

Composite #2: Broke, butt rolls, waste pulp, rejects, and wood waste.

Composite #3: All waste components.

Tables 2, 3, and 4 show the percentage of each waste component in the composite samples. These tables were prepared from the data presented in Table 1, plus a projected production of 180 tons per day of dewatered sludge.

TABLE 1

WASTES GENERATED IN 1989
WEYERHAEUSER PLYMOUTH MILL, NORTH CAROLINA
Assumed 350 Working Days/Year

WASTE TYPE		TOTAL QUANTITY cubic yards/year	APPROXIMATE DAILY GENERATION cubic yards/day
FLYASH		150,000	410
WOODWASTES		32,460	90
Bark	7,100		
Chips	660		
Sawdust	740		
Log/Branches	460		
Mixed wood	23,500		
MILL TRASH		45,060	125
General Trash	41,000		
Drums	200		
Dirt	945		
Metal Trash	1,760		
Plastics	600		
Concrete	160		
Demolition w/o Brick	35		
Other Waste	360		
SLAKER GRITS		1,460	4
GREEN LIQUOR DREGS		8,285	23
LIME/LIME MUD		5,000	14
Lime/Lime Mud	4,800		
Lime Mud	150		
Lime	50		

TABLE 1 (continued)

WASTES GENERATED IN 1989
WEYERHAEUSER FACILITY, PLYMOUTH NORTH CAROLINA
Assumed 350 Working Days/Year

WASTE TYPE		TOTAL QUANTITY cubic yards/year	APPROXIMATE DAILY GENERATION cubic yards/day
PULP AND PAPER WASTE		12,910	35
Paper and paper board	10,500		
Pulp/rejects	1,990		
Paper	410		
Paper board	10		

TABLE 2

WASTE COMPONENTS OF COMPOSITE SAMPLE #1

Waste Component	Cubic Yards/Day	Percentage
Slaker grits	4	10
Green liquor dregs	23	56
Lime/lime mud	14	34
	41	100

TABLE 3

PAPER WASTE COMPONENT OF COMPOSITE SAMPLE #2

Waste Component	Cubic Yards/Day	Percentage
Paper and paper board	10,500	81
Rejects	1,990	15
Paper	410	3
Paper board	10	1
	12,910	100

TABLE 4

WASTE COMPONENTS OF COMPOSITE SAMPLE #3

Waste Components	Cubic Yards/Day	Percentage
Fly ash	410	32
Wood wastes	90	7
Pulp and paper	35	3
Slaker grits	4	3
Green liquor dregs	23	2
Lime/lime mud	14	1
Dewatered sludge	670	52
	1,250	100

Section 5

SAMPLING AND ANALYSIS PROCEDURES

5.1 General Description

Discrete samples of the various materials that are to be landfilled were collected by RMT from areas of the mill that were accessible on April 5, 1990. To minimize mixing the wastes for chemical testing, the samples were collected as near the generation point as possible. These material samples were composited on a volume basis to represent the proportionate contribution of each area to the overall landfill mass.

A Weyerhaeuser representative assisted RMT in collecting samples. However, considering the variability of types of materials and the availability of these materials at the time, the composites may vary from the actual material that will be placed in the landfill.

Sample composition was accurately documented. This information, as well as chain-of-custody documentation, is available for review at RMT offices in Greenville, South Carolina. Samples for chemical analyses were packed in ice and shipped by overnight courier to RMT Laboratories in Madison, Wisconsin.

5.2 Sample Descriptions and Sampling Methods

Five samples were collected for chemical analysis: ash, dewatered sludge, Composite #1, Composite #2, and Composite #3. These samples are described as follows:

Fly ash: The fly ash sample was collected by Weyerhaeuser personnel from the five ash silos. RMT received the samples at the plant on April 5, 1990, in 10 amber glass jars (two from each silo) and five 5-gallon buckets. Bottom ash (heavies) was not part of the sample.

Dewatered Sludge : The dewatered sludge sample was provided by Weyerhaeuser from material generated during screw press tests that occurred at the facility. Pure sludge samples for chemical analyses were prepared by combining frozen material contained in Ziploc bags into one sample. Two 5-gallon buckets of dewatered sludge were also collected from a 55 gallon drum. More than a foot of rainwater was standing on top of the sludge in the drum. This material was used to prepare Composite #3, and for physical testing.

Composite #1: Composite #1 was prepared by mixing slaker grits, green liquor dregs, lime, and lime mud in a stainless steel bowl in a 1:4:1:1 volume (1:4:2:2 by weight) proportional ratio. Stainless steel scoops were used to take the samples.

The samples of both grits and dregs had been in the waste canisters, from which they were taken, for approximately two days. The recovery boiler went down on April 4, 1990, and was not operating at the time of sampling on April 5th. Neither grits nor dregs are produced when the boiler is down. The grits sample was removed from under water that was standing in the canister. Plant personnel indicated that dregs would not have been thoroughly washed due to the process interruption. This resulted in an elevated pH and sodium content.

Lime was sampled from a dumpster. Lime mud was collected adjacent to a sump beside a large silo. These samples should not be affected by the recovery boiler shutdown.

Composite #2: Composite #2 contained wood waste, paper waste, and rejects from the secondary fiber plant in a 9:4:1 volume (14:1:1 weight) ratio. Wood waste was collected from the wood yard and from the hog fuel pile in the power recovery area. Paper waste was collected from dumpsters behind the mill. Secondary fiber rejects, consisting of waste bleached pulp and plastic from the "ragtail," were sampled at the secondary fiber plant.

In the wood yard, three quart jars of wood and bark were collected randomly from a large pile that had been pushed up by a front-end loader. This material was sampled by hand using latex gloves and stainless steel scoops, and placed in a stainless steel bucket. While this pile could have been "contaminated" with oil from the loader and asphalt from the wood yard, neither of these materials were observed in the sample. Four hand-packed quart jars of wood waste from the hog fuel pile, plus one stainless steel scoop of metal and plastic trash, were added to the composite sample.

The paper component of Composite #2 was collected from two trash dumpsters. The samples were collected by hand with latex gloves. One quart jar of broke, paperboard, butt roll, and core material from the first dumpster was added to the bucket. Two quart jars of fine paper broke and linerboard were collected from the second dumpster and added to the bucket.

Composite #3: Composite #3 was prepared with fly ash, dewatered sludge, Composite #1, and Composite #2 in a 4:3:1.5:1 weight ratio, respectively. A triple beam balance was used to weigh components of this composite.

In addition to the five samples mentioned above, five 5-gallon buckets of fly ash and two 5-gallon buckets of dewatered sludge were sent to RMT Laboratories for physical property testing.

5.3 Sample Analyses

Chemical testing was conducted on the samples to determine leaching characteristics of the wastes. Physical testing determined compaction characteristics of dewatered sludge, ash, and sludge/ash composites, and the relationship between sludge moisture, density, and shear strength.

Chemical Testing

Samples were analyzed as described below:

Test	Fly Ash	Sludge	Composites #1	#2	#3
TCLP	X	X	X	X	X
20 parameters on TCLP acid leachate	X	X			X
8 drinking water metals on ASTM water leachate	X	X			X
20 parameters on ASTM water leachate	X	X			X
Compositional testing		X			

NOTES:
- The 20 parameters are Na, K, Ca, Mg, Ni, Cu, Zn, Fe, Mn, P, nitrate, chloride, sulfate, ammonia, fluoride, phenols, alkalinity, pH, TOC, TDS
- Compositional testing includes TOC, TKN, P, and ash content only
- Composite #1: slaker grits, green liquor dregs, lime, and lime mud
- Composite #2: broke, butt rolls, cores, linerboard, and secondary fiber rejects
- Composite #3: each major waste in the approximate relative quantities that will occur in the landfill
- Testing procedures: TCLP - 40 CFR 268 Appendix I
  Water leach - ASTM D-3987-85

Physical Testing

The samples listed below were tested for the following physical properties:

Test	Dewatered Sludge #1	#2	Ash	Composites #1	#2
Direct shear	X	X	X	X	X
3-point triaxial shear			X		X
1-point triaxial shear	X		X		X
Bucket shear	X	X	X	X	X
Consolidation	X	X			
Permeability	X	X	X		
Specific gravity	X	X	X	X	X

NOTES:
- Two samples of dewatered sludge were prepared at different densities and moisture contents based on the results of the two initial tests.
- One sample of ash was tested to evaluate ash monofill conditions.
- Two composites of ash and sludge were made to approximate actual landfill conditions.

Section 6

ANALYTICAL RESULTS

6.1 Chemical Analytical Results

The results of the TCLP tests are shown in Tables 5 and 6. The results of ASTM water leaching tests are shown in Table 7. Appendix A contains analytical chemical data. Samples are classified as nonhazardous on the basis of TCLP. Traces of some inorganics were found in both the acid and water leachates, but virtually no volatiles were detected in the TCLP leachates.

Dewatered sludge and ash account for 75-80 percent of the waste to be landfilled at Plymouth. The overall composite showed very low leaching potential in the acid and water leach tests.

- arsenic, 0.086 mg/L (drinking water standard, 0.05 mg/L);
- barium, 1.5 mg/L (drinking water standard, 1.0 mg/L);
- cadmium, 0.014 mg/L (drinking water standard, 0.01 mg/L); and
- selenium, 0.088 mg/L (drinking water standard, 0.01 mg/L);

The primary drinking water standards are the enforceable maximum contaminant levels (MCLs), which are set by the US EPA using health based criteria.

In 1988, discussions between RMT and the North Carolina Department of Environmental Management indicated that a level of 10 times the primary drinking water standard in an acid leach test suggests that the parameter should be examined more closely. In the Plymouth samples, no constituent exceeded 10 times the primary drinking water standard. Selenium was the highest at 8.8 times the standard. Cadmium, arsenic, and barium were approximately 1.5 times the standard in the overall composite. Selenium exceeded the primary drinking water standard by more than 10 times in the ash sample. Because ash makes up approximately 40 percent of the solid waste that is sent to the landfill, the leaching of metals should be further monitored.

Barium and arsenic are common in leachates from papermill wastes. Barium is found in wood ash, lime residue, and wood wastes. The most common sources of arsenic are pulp waste and ash; however, the Plymouth results do not suggest a specific source of arsenic and barium in the overall composite. The barium and arsenic concentrations in the TCLP leachate at Plymouth are typical of papermill wastes.

The major source of the cadmium and selenium appears to be the ash. Cadmium and selenium do not typically leach from wood ash at these levels; therefore, they probably come from the coal that is burned in the Riley Boiler.

TABLE 5

TCLP ANALYSIS
(mg/L)

Parameter	Flyash	Dewatered Sludge	Composites #1	Composites #2	Composites #3	TCLP Limit	Drinking Water
Primary Drinking Water Parameters							
Arsenic	0.02	<0.003	<0.003	0.005	0.086	5.0	0.05
Barium	0.24	0.31	1.2	1.2	1.5	100	1.0
Cadmium	0.056	<0.005	<0.005	<0.005	0.014	1.0	0.01
Chromium	0.03	<0.01	<0.01	<0.01	0.02	5.0	0.05
Fluoride	4.1	<0.50			<0.50		4.0
Lead	<0.1	<0.1	<0.1	<0.1	<0.1	5.0	0.05
Mercury	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	0.2	0.002
Nitrate	0.5	0.56			0.56		10.0
Selenium	0.27	<0.003	<0.003	<0.003	0.066	1.0	0.01
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	5.0	0.05
Secondary Drinking Water Parameters							
Chloride	69	11			32		250
Copper	0.05	<0.02			<0.02		1.0
Iron	<0.1	0.9			0.1		0.3
Manganese	15	0.92			8.6		0.05
Sulfate	810	<20			160		250
Zinc	3.2	2.0			3.3		5.0
Total Solids as Dissolved	7,300	5,100			6,100		500
Additional Parameters							
Alkalinity (as CaCO3)	3,000	2,600			2,900		
Ammonia	0.26	1.00			0.41		
Calcium	1,300	26			1,200		
Magnesium	98	2.5			48		
Nickel	0.3	0.08			0.17		
Phosphorus, Total	<2.0	0.20			2.00		
Potassium	250	1.2			70		
Sodium	34	1,200			96		
Phenol	0.17	0.23			<0.062		
Solution Parameters							
pH (5 min)	12.2	6.0	12.6	6.8	10.8		
pH (after heating)	9.2	1.7	11.8	1.8	7.6		
pH (final)	4.9	4.9	6.8	5.2	5.2		
Extract Solution	2	1	2	1	2		
Extraction pH	2.9	5	2.9	4.9	2.9		

NOTE: Shaded analyses exceed drinking water standards

TABLE 6

VOLATILE ORGANICS ANALYSIS
(mg/L)

CAS #	TCLP EXTRACT Parameter	MDL	Flyash	Dewatered Sludge	Composites #1	#2	#3
75-01-4	Vinyl chloride	10	U	U	U	U	U
75-09-2	Methylene chloride	5	U	7	U	4 J	2 J
107-13-1	Acrylonitrile	200	U	U	U	U	U
75-15-0	Carbon disulfide	5	U	U	12	U	U
75-35-4	1,1-Dichloroethene	5	U	U	U	U	U
67-66-3	Chloroform	5	U	U	U	U	U
107-02-2	1,2-Dichloroethane	5	U	U	U	U	U
78-93-3	2-Butanone	10	U	U	U	11	U
71-55-6	1,1,1-Trichloroethane	5	U	U	U	U	U
78-83-1	Isobutanol	2000	U	U	U	U	U
56-23-5	Carbon tetrachloride	5	U	U	U	U	U
79-01-6	Trichloroethene	5	U	U	U	U	U
79-00-5	1,1,2-Trichloroethane	5	U	U	U	U	U
71-43-2	Benzene	5	U	U	U	U	U
127-18-4	Tetrachloroethene	5	U	U	U	U	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U	U	U	U	U
630-20-6	1,1,1,2-Tetrachloroethane	10	U	U	U	U	U
108-88-3	Toluene	5	U	U	1 J	U	U
108-90-7	Chlorobenzene	5	U	U	U	U	U

MDL = Method Detection Limit *U = Undetected* *J = Below MDL*

CAS #	WATER Parameter	MDL	Flyash	Dewatered Sludge	Composites #1	#2	#3
106-46-7	1,4-Dichlorobenzene	10	U	U	U	U	U
95-48-7	2-Methylphenol	10	U	U	5 J	7 J	U
108-39-4	3-Methylphenol	10	U	U	U	U	U
106-44-5	4-Methylphenol	10	U	U	U	3 J	U
67-72-1	Hexachloroethane	10	U	U	U	U	U
118-74-1	Hexachlorobenzene	10	U	U	U	U	U
98-59-1	Nitrobenzene	10	U	U	U	U	U
87-68-3	Hexachlorobutadiene	10	U	U	U	U	U
88-06-2	2,4,6-Trichlorophenol	10	U	U	U	U	U
95-95-4	2,4,5-Trichlorophenol	50	U	U	U	U	U
87-86-5	Pentachlorophenol	50	U	U	U	U	U
108-95-2	Phenol	10	U	U	U	U	U
95-50-1	1,2-Dichlorobenzene	10	U	U	U	U	U
935-95-5	2,3,4,6-Tetrachlorophenol	50	U	U	U	U	U
110-86-1	Pyridine	10	U	U	U	U	U
121-14-2	2,4-Dinitrotoluene	10	U	U	U	U	U

MDL = Method Detection Limit *U = Undetected* *J = Below MDL*

TABLE 7

ASTM ANALYSIS
(mg/L)

Parameter	Flyash	Dewatered Sludge	Composite #3	Drinking Water
Primary Drinking Water Parameters				
Arsenic	<0.003	<0.003	0.028	0.05
Barium	0.35	<0.005	0.1	1.0
Cadmium	<0.03	<0.03	<0.03	0.01
Chromium	0.03	<0.001	<0.001	0.05
Fluoride	0.67	<0.5	<0.5	4.0
Lead	<0.003	<0.003	<0.003	0.05
Mercury	<0.0002	<0.0002	<0.0002	0.002
Nitrate, Nitrogen	5.6	5.6	1.9	10.0
Selenium	<0.003	<0.003	0.022	0.01
Silver	<0.001	<0.001	<0.001	0.05
Secondary Drinking Water Parameters				
Chloride	66	8	44	250
Copper	<0.02	<0.02	0.07	1.0
Iron	<0.1	0.4	0.2	0.3
Manganese	0.006	0.16	0.027	0.05
Sulfate	340	<10	140	250
Zinc	0.02	0.30	0.02	5.0
Total Solids as Dissolved	1,500	190	680	500
Additional Parameters				
Alkalinity (as CaCO3)	530	<20	180	
Ammonia, Nitrogen	0.32	0.68	0.38	
Calcium	244	4	35	
Magnesium	<0.5	<0.5	0.3	
Nickel	<0.02	<0.02	<0.02	
Phosphorus, Total	<0.2	<0.2	0.37	
Potassium	0.23	0.70	51	
Sodium	25	11	81	
Phenol	<0.012	0.013	0.011	
Total Organic Carbon	0.58	65	71	
Solution Parameters				
pH (initial)	11.9	6.5	10.4	
pH (final)	12.1	5.8	10.8	

Compositional Analysis – Dewatered Sludge		
Percent Ash	35%	
Kjeldahl Nitrogen, Total	3,100	mg/kg dry wt
Phosphorus,Total	140	mg/kg dry wt
Solids, Total	57%	
Total Organic Carbon	>16,000	mg/kg dry wt

NOTE: Shaded analyses exceed drinking water standards

In the ASTM water leachate for the overall composite, the selenium concentration was 0.022 mg/L, which is slightly more than the primary drinking water standard of 0.01 mg/L. The selenium concentration in the ash leachate was below the analytical detection limit. The reason might be the higher pH of the ash leachate. No other parameters exceeded the primary drinking water standards.

The concentrations of most constituents on the extended parameter list that were detected in the overall composite are typical for papermill wastes. Phosphorous and sulfate were a little higher than is typically observed, but they were not at levels of concern. Two constituents exceeded the secondary drinking water standards. The secondary drinking water standards are nonenforceable guidelines for the public water supply. The constituents in the secondary drinking water standards primarily affect the color and clarity of drinking water.

The constituents that exceeded the secondary drinking water standards in the TCLP leachate of the overall composite are as follows:

- total dissolved solids, 6100 mg/L (secondary drinking water standard, 500 mg/L);
- manganese, 6.6 mg/L (secondary drinking water standard, 0.05 mg/L. Based on US EPA's acceptable intake for chronic exposure (AIC) for oral intake of manganese through drinking water, the acceptable concentration of manganese is 7.6 mg/L. The AIC limits have been established to assess the health risks of drinking ground water containing certain constituents.)

The principal source of manganese appears to be the ash. The TCLP leachate from the ash also exceeded the secondary drinking water standards for sulfate. Iron in the TCLP leachate from the dewatered sludge was slightly higher than the secondary drinking water standard.

In the water leaching tests, much lower leaching potential was demonstrated for most of the constituents. Only the pH and total dissolved solids exceeded the secondary drinking water standards. High pH in the ash, and probably in the lime waste, and high dissolved solids in the ash appear to be the principal sources.

6.2 Implications of Leach Test Data for Landfill Design

Based on test results, the mill solid wastes appear to be suitable for disposal in a nonhazardous solid waste landfill.

In the overall composite, none of the primary drinking water parameters exceeded the standard by more than 10 times in the TCLP leachate; however, selenium in the ash leachate measured more than 10 times the drinking water standard. Also, selenium in the ASTM water leachate of the overall composite slightly exceeded the drinking water standard.

The leaching environment in a landfill where inorganic (such as ash) and organic (such as primary sludge) wastes are codisposed is typically acidic. The pH will probably not be as low as in the TCLP test, but the leaching time is generally longer and the solid-to-liquid ratio is lower. Therefore, the TCLP in most cases predicts the constituents that may leach from the waste, but not necessarily the

concentrations of the constituent in the leachate. Often, the concentration is higher in the landfill leachate than in the TCLP leachate.

If the proposed disposal facility is an inorganic monofill, it can be expected that neutral or slightly basic leaching conditions will prevail. These leaching conditions will likely reduce the leaching potential of the waste so that the water leach tests are more indicative of the landfill leachate. Thus, based on test results, the mill's solid wastes, which were identified, appear to be suitable for disposal in the proposed solid waste disposal facility.

6.3 Physical Test Results

To evaluate the physical characteristics of the wastes generated at the Plymouth Mill, RMT conducted a physical testing program on the two major waste types. Table 4 contains solid waste types and approximate generation rates at the mill.

Physical properties of the wastes critical for landfill design and operation are strength, consolidation, and pore water release. The screw press sludge used for physical testing was obtained from a simulated screw press operation. The operation was performed using waste from the mill and the additives that will be used at the proposed site during the dewatering process. The ash tested was fly ash from the existing mill operation. The physical tests performed were standard tests for soils or adaptations of standard tests to make them more applicable to the wastes being tested. Table 8 summarizes the physical testing results of the sludge, ash, and sludge/ash composite wastes. Laboratory calculations and data sheets are contained in Appendix B.

6.3.1 Index Tests

Index tests are used to indicate which physical characteristics can be considered typical of a given material. They are also used to help estimate how material will react under given circumstances (i.e., during construction). The laboratory data sheets for index tests are contained in Appendix B, and a discussion of the results is presented below.

Moisture Content - The initial moisture content of the composite ash samples was 29 percent of the total weight and 40 percent of the solids weight. Initial moisture content of the screw press sludge was not obtained. The sludge was stored in a 55-gallon drum for several months prior to testing. Upon obtaining the sludge samples, approximately 12 inches of free-standing rainwater were decanted from the drum of sludge. The moisture content of the sludge in this state varied from 68 to 69 percent of the total weight, and 212 to 225 percent of the solids weight.

Solids Content - The initial solids content of the ash samples was 71 percent. The solids content of the screw press sludge after drum storage was between 31 and 32 percent.

Specific Gravity - The specific gravities of the sludge, ash, and sludge/ash composite samples were determined to be 1.77, 2.13, and 2.04, respectively.

Dry Density Relationships - In order to test the waste samples at or near field conditions, the samples were remolded to an estimated "field" density. The variability of the possible densities that would be achieved when placing the waste into the landfill was estimated by generating moisture-density relationships. Three methods, each with different compaction levels of effort,

TABLE 8

SUMMARY OF PHYSICAL TEST RESULTS

Parameter	Sludge			Ash	Sludge/Ash Composite	
Index Tests:						
Initial Moisture Content ^1 (percent)	68-69			29	NA	
	(212-225)			(40)		
Initial Solids Content (percent)	31-32			71	NA	
Specific Gravity	1.77			2.13	2.04	
Percent Solids ^2	38%	45%	50%	71%	38%	45%
Maximum Dry Density Relationships (pcf)						
Standard Proctor Method, ASTM D-968	27	32	35	39	39	40
5-15 Method ^3	27	32	32	39	37	38
5-10 Method ^4	27	31	31	37	36	37
Strength Tests:						
Bench-scale Method						
Internal Angle of Friction, (degrees)	26	22-27	32	15	23	24
Cohesion, (psf)	20	371-28	0	66	45	95
Direct Shear						
Internal Angle of Friction, (degrees)	34	31-32	---	35	35	36
Cohesion, (psf)	54	464-158	---	252	284	189
Triaxial Shear ^5						
Internal Angle of Friction, (degrees)	0	0	---	22	28	30
Cohesion, (psf)	228	953	---	470	0	12
Consolidation Tests:						
Initial void ratio, e (unitless)	2.70			3.20	2.76	
Compression Index, Cc (unitless)	1.00			1.05	0.80	
Recompression Index, Cr (unitless)	0.17			0.10	0.09	
Compression Ratio, CR (unitless)	0.27			0.25	0.21	
Coeff. of consolidation @ 1 tsf, Cv (sq ft/day)	1.6			5.6	3.3	
Permeability (cm/sec)						
	3.6E-06			7.3E-04	3.5E-04	

Notes:

1. Moisture content has been calculated by two definitions as follows: : - % Moisture= Weight of Liquid/Total Weight
   -(% Moisture= Weight of Liquid/Weight of Solids)
2. Two composite samples mixed at a 1:1 by weight mix ratio were tested. The ash component was mixed at 71% solids content for both samples. The sludge was mixed at 38% solids content for one mix and 45% solids content for the other mix.
3. Standard Proctor Method (ASTM D-968) modified to a 15 blows/lift versus 25 blows/lift compaction effort.
4. Standard Proctor Method (ASTM D-968) modified to a 10 blows/lift versus 25 blows/lift compaction effort.
5. Sludge was tested under unconsolidated-Undrained (UU) conditions. Ash & sludge/ash composite samples were tested under consolidated-undrained (CU) conditions.

were used to develop the moisture-density relationships at 38 percent, 45 percent, and 50 percent solids content for the sludge samples; at 71 percent solids content for the ash samples; and at 38 percent and 45 percent solids content for the sludge/ash composite samples. The Standard Proctor Method for Moisture-Density Relationships of Soils and Soil-Aggregate Mixtures using a 5.5-pound rammer and 12-inch drop, as per the American Society for Testing and Materials (ASTM) designation D-698, was used as the maximum compaction effort. Lower compaction efforts were performed by reducing the 25 blows per lift procedure dictated in ASTM D-698 (Standard Proctor Method) to 15 blows per lift and 10 blows per lift.

The maximum dry unit weight of the sludge samples ranged from 27 to 35 pounds per cubic foot (pcf). The maximum dry unit weights of the ash samples ranged from 37 to 39 pcf, and the maximum dry unit weights of the sludge/ash composite samples ranged from 36 to 40 pcf.

6.3.2 Shear Strength Testing

The shear strength of the waste was determined by three strength testing methods. The first method was a bench-scale method which simulates the traditional field vane test. The second and third methods used were traditional soil testing methods. They include the direct shear test and the triaxial (unconsolidated - undrained and consolidated - undrained) shear test.

Bench-scale Method - The bench-scale method was used in conjunction with standard soil testing methods to simulate field conditions as much as possible in the laboratory. A large waste sample was used with this method which allows different fabric orientation of the waste to be tested (i.e., clods, clumps, etc.). The bench-scale method determines the shear strength of the waste by relating the torque required to turn a vane embedded in the waste to the applied vertical pressure on the sample. Based on the configuration of the vane and the applied torque, the shear stress on the failure surface was calculated. The concept of the embedded vane shear is similar to the field vane test which is an accepted method for field investigation of soils. Strength results are reported as an internal angle of friction and a cohesion.

Samples of sludge were moisture-conditioned to a solids content of 38 percent, 45 percent, and 50 percent. Each was tested to compare strength characteristics at varying solids contents. The solid contents were selected based on the 45 percent solids specification for the sludge screw press to be used during the dewatering process.

The first series of samples at 38 percent and 45 percent solids content were placed loosely into the bench-scale device without any initial compaction effort, and the second series of samples at 45 percent and 50 percent solids content were tamped into place. The peak internal angle of friction for both series ranged from 22 to 32 degrees with a cohesion value of 0 to 371 psf.

Next, samples of ash at 71 percent solids content were tested. The ash was tamped into place initially. The internal angle of friction was determined to be approximately 15 degrees with a cohesion value of 66 psf. RMT experience with similar materials indicates that these results are low. Users of this information should refer to the direct shear and triaxial shear testing results that follow.

Finally, tests were conducted on two composite samples of sludge and ash mixed at a 1:1 ratio by weight: the first sample was composed of sludge moisture-conditioned to 38 percent solids content and ash at 71 percent solids, and the second sludge at 45 percent solids content and ash at 71 percent solids. The peak internal angle of friction for the samples were 23 and 24 degrees, with a cohesion value of 45 and 95 pcf, respectively.

Direct Shear Method (ASTM D3080) - The test equipment for the direct shear method consists of a metal shear box in which the sample is placed. The samples are about 4 inches square and about 1 inch high. The box is split horizontally into two halves. The samples of sludge, ash, and sludge/ash composite were prepared and tested in a similar manner to the bench-scale method. To approximate worst-case and optimum sludge moisture conditions, samples of sludge moisture-conditioned to 38 percent solids and 45 percent solids were tested. A sample at 50 percent solids was neither prepared nor tested.

The sludge samples produced internal angles of friction ranging from 31 to 34 degrees with a cohesion value of 54 to 464 psf. The ash sample produced an angle of internal friction of 35 degrees and 252 psf cohesion. The sludge/ash composite samples produced internal angles of friction of 35 to 36 degrees and 189 to 284 psf cohesion.

Triaxial Shear Method (ASTM D2850) - The triaxial shear method tests a sample that is approximately 3 inches in diameter and 6 inches in height. The sample is encased by a thin rubber membrane and placed in a plastic cylindrical chamber that is filled with water. The sample is subjected to a confining pressure by compression of the fluid in the chamber. Shear failure in the sample is caused by axial stress applied through a vertical ram.

As discussed for the direct shear method of testing, the samples of sludge, ash, and sludge/ash composite were prepared and tested in a similar manner to the bench-scale method. A sludge sample moisture-conditioned to 50 percent solids content was neither prepared nor tested.

The sludge samples were tested under unconsolidated-undrained (UU) conditions. This type of test yields an internal angle of friction equal to zero degrees and some cohesion value. The test result for the sludge samples indicated cohesion values of between 228 to 953 psf.

The ash sample and the sludge/ash composite were tested under consolidated-undrained (CU) conditions. The results of the ash testing indicated an internal angle of friction of 22 degrees with 470 psf cohesion. The sludge/ash composite samples indicated an internal angle of friction of 28 to 30 degrees with cohesion values between 0 and 12 psf.

6.3.3 Consolidation Tests (ASTM D2435)

Consolidation properties were measured by monitoring the deformation of the waste over time after applying a series of known load increments to the waste. Conventional consolidometers were used to perform the tests.

Three consolidation tests were performed. The sludge and ash samples were each tested at solid contents of 45 and 71 percent, respectively. The sludge/ash composite sample was comprised of a 1:1 mix of the 45 percent solids content sludge and 71 percent solids content ash by weight.

The compression index (C_c) and the recompression index (C_r) determined from consolidation testing are used to estimate the field settlement due to consolidation. These indices are directly proportional to settlement. As the index values increase, settlement calculations indicate a greater settlement potential. The "C_c" values for the sludge, ash, and composite samples were calculated to be 1.00, 1.05, and 0.80, respectively. The "C_r" values for the sludge, ash, and composite samples were calculated to be 0.17, 0.10, and 0.09, respectively. Typical compression index values for clay soils range from 0.1 to 0.4. Typical recompression index values are 10 to 20 percent of the compression index values.

The compression ratio (CR) is the ratio of the compression index (C_c) to the sum of one plus the initial void ratio (e_o). The compression ratio is also directly proportional to settlement. The "CR" values for the sludge, ash, and sludge/ash composite samples were calculated to be 0.27, 0.25, and 0.21, respectively.

The coefficient of consolidation (C_v) was calculated for each consolidation test. The "C_v" value was determined for each load during each test. The one ton per square foot load C_v values for the sludge, ash, and sludge/ash composite samples were calculated to be 1.6, 5.6, and 3.3 square feet per day, respectively.

6.4 Implications of Physical Test Data for Landfill Design

Overall, test results indicated that the strength of the materials over the range of various solids contents was reasonably close. The samples with higher moisture contents exhibit slightly lower strength characteristics. The ash samples contained slightly higher strength values than sludge. The sludge/ash composite samples showed approximately equivalent strength to the ash samples. This is explained by the fact that ash composes the majority of the mix by volume.

The friction angle of 28 degrees and cohesion of zero psf is the most conservative strength parameter for the sludge/ash composite based on 38 to 45 percent sludge solids contents, and 71 percent ash solids contents mixed at a 1:1 ratio by weight. Therefore, these values are recommended for use in future stability calculations, provided the waste stream does not change significantly.

The waste should be stable at slopes of up to 3:1. Because of the low shear strength of the waste when not confined, vehicle traffic on top of the waste may be limited to low contact pressure tracked vehicles. Roads constructed on the waste will require sufficient base course thickness or special reinforcement to distribute loads. Fly ash, bottom ash, other non-sludge waste, or geotextiles may be required to help provide road stability.

The sludge samples were more compressible than the sludge/ash composite sample, due to the removal of the ash waste which is less compressible than the sludge. The sludge/ash composite sample appears to be the least compressible, probably due to the smaller ash particles filling some of the void spaces in the sludge sample producing a more well-graded mix. Consolidation of the waste due to the waste load placed above will result in the release of pore water which should be collected by a leachate collection system over time.

APPENDIX A

CHEMICAL ANALYTICAL RESULTS

NOTE: This Appendix is arranged by sample in the following order:

1. Fly Ash
2. Dewatered Sludge
3. Composite Nos. 1, 2 and 3

RMT INC
LABORATORIES

CLIENT: Weyerhaeuser
PROJECT #: 467.41
DATE: 05/10/90

Project Narrative

RE: The application of Wet Chemistry on TCLP leachate.

TCLP data, when compared with the ASTM data on common samples, exhibits a wide variation. This may be attributed to several factors:

1. TCLP leachate will have a higher ionic strength which is contributed by the acetic acid. This can cause matrix interferences with color developed chemistry and the ion specific electrode method.

2. Samples extracted with solution #1 are buffered with NaOH, therefore contributing to the Na background found in the TCLP extract.

3. TCLP extract is filtered through a 0.7 micron filter as opposed to a 0.45 micron filter on the ASTM extract. This would attribute the higher solids content of the TCLP leachate.

Reviewed By: Eric L Thomas
Eric L. Thomas
Supervisor
Inorganic Chemistry

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49119
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 06/06/90
COLLECTION DATE: 04/05/90
STATION ID: FLYASH
SAMPLE COLLECTOR: MB

TOXICITY CHARACTERISTIC LEACHING PROCEDURE

PARAMETER	RESULT	UNITS
Alkalinity	3000	mg/l as CaCO3
Ammonia	0.26	mg/l
Chloride	69	mg/l
Fluoride	4.1	mg/l
Nitrate	0.50	mg/l
Phenol	0.17	mg/l
Phosphorus, Total	<2.0*	mg/l
Sulfate	810	mg/l
Total Solids as Dissolved	7300	mg/l
Arsenic	0.020	mg/l
Barium	0.24	mg/l
Cadmium	0.056	mg/l
Calcium	1300	mg/l
Chromium	0.03	mg/l
Copper	0.05	mg/l
Iron	<0.1	mg/l
Lead	<0.1	mg/l
Magnesium	98	mg/l
Manganese	15	mg/l
Mercury	<0.0002	mg/l
Nickel	0.30	mg/l
Potassium	250	mg/l
Selenium	0.27	mg/l
Silver	<0.01	mg/l
Sodium	34	mg/l
Zinc	3.2	mg/l
Sample Wt.	100.0	grams
pH (5 min)	12.2	pH units
pH (after heating)	9.2	pH units
Extraction Solution	2	
Final pH	4.9	pH units

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49119
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 06/06/90
COLLECTION DATE: 04/05/90
STATION ID: FLYASH
SAMPLE COLLECTOR: MB

TOXICITY CHARACTERISTIC LEACHING PROCEDURE

PARAMETER	RESULT	UNITS
Extraction pH	2.9	pH units

Additional analysis is listed under lab #49134
* High detect limit based on matrix interference.

H. Mitchell Rubenstein, Ph.D., Technical Director

RMT INC.
LABORATORIES

VOLATILE ORGANICS ANALYSIS DATA SHEET
TCLP EXTRACT
Report Date: 05/15/90

RMT SAMPLE NO.
49119

Client Name: WEYERHAEUSER . Project #467.41

Matrix: (soil/water) TCLP EXTRACT
Sample wt/vol: 5 (g/mL) ML
Level: (low/med) LOW
Extraction Date: 04/19-20/90
Column: (pack/cap) PACK

Field Sample ID: FLYASH
Lab File ID: >ABB02
Sampling Date: 04/05/90
Analysis Date: 04/28/90
Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS:UG/L Conc.	*MDL	Code
75-01-4	Vinyl Chloride		10.	U
75-09-2	Methylene Chloride		5.	UX
107-13-1	Acrylonitrile		200.	UX
75-15-0	Carbon Disulfide		5.	UX
75-35-4	1,1-Dichloroethene		5.	U
67-66-3	Chloroform		5.	U
107-02-2	1,2-Dichloroethane		5.	U
78-93-3	2-Butanone		10.	U
71-55-6	1,1,1-Trichloroethane		5.	UX
78-83-1	Isobutanol		2000.	UX
56-23-5	Carbon Tetrachloride		5.	U
79-01-6	Trichloroethene		5.	U
79-00-5	1,1,2-Trichloroethane		5.	UX
71-43-2	Benzene		5.	U
127-18-4	Tetrachloroethene		5.	U
79-34-5	1,1,2,2-Tetrachloroethane		5.	UX
630-20-6	1,1,1,2-Tetrachloroethane		10.	UX
108-88-3	Toluene		5.	UX
108-90-7	Chlorobenzene		5.	U

FORM I VOA

ALAN DOUGHTY, PH.D., LABORATORY DIRECTOR

RMT INC.
LABORATORIES

THE FOLLOWING ARE CODES THAT ARE USED ON THE DATA SHEET:

U = Undetected

B = Present in Blank

J = Estimated Concentration

M = Matrix Spike Compound

E = Exceeds Calibration Limit

D = Value is from a Diluted Run

*MDL = Method Detection Limit -corrected for moisture fraction when sample is a soil

Z = Present in the ZHE extract blank for that day.

X = Recently removed from the list of regulated TCLP volatile constituents. A screen was performed for these compounds.

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49119
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 05/07/90
COLLECTION DATE: 04/05/90
STATION ID: FLYASH
SAMPLE COLLECTOR: MB

PESTICIDE ANALYSIS REPORT

PARAMETER	RESULT	UNITS
2,4-D	<2000	ug/l
2,4,5-TP	<200	ug/l

Alan Doughty, Ph.D., Laboratory Director

744 Heartland Trail, P.O. Box 8923, Madison, WI 53708-8923, Ph:(608)831-4444

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49119
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 05/07/90
COLLECTION DATE: 04/05/90
STATION ID: FLYASH
SAMPLE COLLECTOR: MB

PESTICIDE ANALYSIS REPORT

PARAMETER	RESULT	UNITS
LINDANE	<80	ug/l
HEPTACHLOR	<1.6	ug/l
HEPTACHLOR EPOXIDE	<1.6	ug/l
CHLORDANE	<6.0	ug/l
ENDRIN	<4.0	ug/l
METHOXYCHLOR	<2000	ug/l
TOXAPHENE	<100	ug/l

Alan Doughty, Ph.D., Laboratory Director

744 Heartland Trail, P.O. Box 8923, Madison, WI 53708-8923, Ph:(608)831-444

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49134
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 05/07/90
COLLECTION DATE: 04/05/90
STATION ID: FLYASH
SAMPLE COLLECTOR: MB

ASTM ANALYSIS REPORT

PARAMETER	RESULT	UNITS
Alkalinity	530	mg/l
Ammonia, Nitrogen	0.32	mg/l
Chloride	66	mg/l
Fluoride	0.67	mg/l
Nitrate, Nitrogen	5.6	mg/l
Phenols	<0.012	mg/l
Phosphorus, Total	<0.20	mg/l
Sulfate	340	mg/l
Total Organic Carbon	0.58	mg/l
Total Solids	1500	mg/l
Calcium	244000	ug/l
Copper	<20	ug/l
Iron	<100	ug/l
Magnesium	<500	ug/l
Manganese	6	ug/l
Nickel	<20	ug/l
Potassium	230	ug/l
Sodium	25000	ug/l
Zinc	20	ug/l
Total Weight	100.0	gm
Initial pH	11.9	pH units
Final pH	12.1	pH units

Additional analysis is listed under lab #49119

Alan Doughty, Ph.D., Laboratory Director

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 51756
PROJECT #: 00467.41
WORK ORDER #: 900613-0046741

REPORT DATE: 06/22/90
COLLECTION DATE: 04/05/90
STATION ID: FLYASH
SAMPLE COLLECTOR: MB

ASTM ANALYSIS REPORT

PARAMETER	RESULT	UNITS
Arsenic	<3	ug/l
Barium	350	ug/l
Cadmium	<0.3	ug/l
Chromium	30	ug/l
Lead	<3	ug/l
Mercury	<0.2	ug/l
Selenium	<3	ug/l
Silver	<10	ug/l

Previous analysis is listed under lab #49134

Alan Doughty, Ph.D., Laboratory Director

RMT INC.
LABORATORIES

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
Report Date: 05/16/90

RMT SAMPLE NO.
49119

Client Name: WEYERHAEUSER Project # 467.41

Matrix: (soil/water) WATER Field Sample ID: FLYASH
Sample wt/vol: 1000 (g/mL) ML Lab File ID: >MFH26::D5
Level: (low/med) LOW Sampling Date: 04/05/90
GPC Cleanup: (Y/N) NO Date Extracted: 04/23/90.
Moisture: --. % Analysis Date: 5/04/90
Column: (pack/cap) CAP Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS:UG/L Conc.	*MDL	Code
106-46-7	1,4-Dichlorobenzene		10.	U
95-48-7	2-Methylphenol		10.	U
108-39-4	3-Methylphenol		10.	S
106-44-5	4-Methylphenol		10.	U
67-72-1	Hexachloroethane		10.	U
118-74-1	Hexachlorobenzene		10.	U
98-59-1	Nitrobenzene		10.	U
87-68-3	Hexachlorobutadiene		10.	U
88-06-2	2,4,6-Trichlorophenol		10.	U
95-95-4	2,4,5-Trichlorophenol		50.	U
87-86-5	Pentachlorophenol		50.	U
108-95-2	Phenol		10.	U
95-50-1	1,2,-Dichlorobenzene		10.	U
935-95-5	2,3,4,6-Tetrachlorophenol		50.	U
110-86-1	Pyridine		10.	U
121-14-2	2,4-Dinitrotoluene		10.	U

ALAN DOUGHTY, PH.D., LABORATORY DIRECTOR

RMT INC.
LABORATORIES

THE FOLLOWING ARE CODES THAT ARE USED ON THE DATA SHEET:

U = Undetected

B = Present in Blank

J = Estimated Concentration

M = Matrix Spike Compound

E = Exceeds Calibration Limit

D = Value is from a Diluted Run

S =Cannot be separated from 2-Methylphenol

*MDL = Method Detection Limit -corrected for moisture fraction when sample is a soil.

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49121
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 06/06/90
COLLECTION DATE: 04/05/90
STATION ID: DWT SLG
SAMPLE COLLECTOR: MB

TOXICITY CHARACTERISTIC LEACHING PROCEDURE

PARAMETER	RESULT	UNITS
Alkalinity	2600	mg/1 as CaCO3
Ammonia	1.0	mg/1
Chloride	11	mg/1
Fluoride	<0.50	mg/1
Nitrate	0.56	mg/1
Phenol	0.23	mg/1
Phosphorus, Total	0.20	mg/1
Sulfate	<20	mg/1
Total Solids as Dissolved	5100	mg/1
Arsenic	<0.003	mg/1
Barium	0.31	mg/1
Cadmium	<0.005	mg/1
Calcium	26	mg/1
Chromium	<0.01	mg/1
Copper	<0.02	mg/1
Iron	0.9	mg/1
Lead	<0.1	mg/1
Magnesium	2.5	mg/1
Manganese	0.92	mg/1
Mercury	<0.0002	mg/1
Nickel	0.08	mg/1
Potassium	1.2	mg/1
Selenium	<0.003	mg/1
Silver	<0.01	mg/1
Sodium	1200	mg/1
Zinc	2.0	mg/1
Sample Wt.	100.0	grams
pH (5 min)	6.0	pH units
pH (after heating)	1.7	pH units
Extraction Solution	1	
Final pH	4.9	pH units

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49121
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 06/06/90
COLLECTION DATE: 04/05/90
STATION ID: DWT SLG
SAMPLE COLLECTOR: MB

TOXICITY CHARACTERISTIC LEACHING PROCEDURE

PARAMETER	RESULT	UNITS
Extraction pH	5.0	pH units

Additional analysis is listed under lab #49136

H. Mitchell Rubenstein, Ph.D., Technical Director

RMT INC.
LABORATORIES

VOLATILE ORGANICS ANALYSIS DATA SHEET
TCLP EXTRACT
Report Date: 05/15/90

RMT SAMPLE NO.
49121

Client Name: WEYERHAEUSER . Project #467.41

Matrix: (soil/water) TCLP EXTRACT
Sample wt/vol: 5 (g/mL) ML
Level: (low/med) LOW
Extraction Date: 04/19-20/90
Column: (pack/cap) PACK

Field Sample ID: DWT SLG
Lab File ID: >ABB04
Sampling Date: 04/05/90
Analysis Date: 04/28/90
Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS:UG/L Conc.	*MDL	Code
75-01-4	Vinyl Chloride		10.	U
75-09-2	Methylene Chloride	7.	5.	X
107-13-1	Acrylonitrile		200.	UX
75-15-0	Carbon Disulfide		5.	UX
75-35-4	1,1-Dichloroethene		5.	U
67-66-3	Chloroform		5.	U
107-02-2	1,2-Dichloroethane		5.	U
78-93-3	2-Butanone		10.	U
71-55-6	1,1,1-Trichloroethane		5.	UX
78-83-1	Isobutanol		2000.	UX
56-23-5	Carbon Tetrachloride		5.	U
79-01-6	Trichloroethene		5.	U
79-00-5	1,1,2-Trichloroethane		5.	UX
71-43-2	Benzene		5.	U
127-18-4	Tetrachloroethene		5.	U
79-34-5	1,1,2,2-Tetrachloroethane		5.	UX
630-20-6	1,1,1,2-Tetrachloroethane		10.	UX
108-88-3	Toluene		5.	UX
108-90-7	Chlorobenzene		5.	U

FORM I VOA

ALAN DOUGHTY, PH.D., LABORATORY DIRECTOR

RMT INC.
LABORATORIES

THE FOLLOWING ARE CODES THAT ARE USED ON THE DATA SHEET:

U = Undetected

B = Present in Blank

J = Estimated Concentration

M = Matrix Spike Compound

E = Exceeds Calibration Limit

D = Value is from a Diluted Run

*MDL = Method Detection Limit -corrected for moisture fraction when sample is a soil

Z = Present in the ZHE extract blank for that day.

X = Recently removed from the list of regulated TCLP volatile constituents. A screen was performed for these compounds.

RMT INC
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49121
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 05/07/90
COLLECTION DATE: 04/05/90
STATION ID: DWT SLG
SAMPLE COLLECTOR: MB

PESTICIDE ANALYSIS REPORT

PARAMETER	RESULT	UNITS
2,4-D	<2000	ug/l
2,4,5-TP	<200	ug/l

Alan Doughty, Ph.D., Laboratory Director

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RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49121
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 05/07/90
COLLECTION DATE: 04/05/90
STATION ID: DWT SLG
SAMPLE COLLECTOR: MB

PESTICIDE ANALYSIS REPORT

PARAMETER	RESULT	UNITS
LINDANE	<80	ug/l
HEPTACHLOR	<1.6	ug/l
HEPTACHLOR EPOXIDE	<1.6	ug/l
CHLORDANE	<6.0	ug/l
ENDRIN	<4.0	ug/l
METHOXYCHLOR	<2000	ug/l
TOXAPHENE	<100	ug/l

Alan Doughty, Ph.D., Laboratory Director

744 Heartland Trail, P.O. Box 8923, Madison, WI 53708-8923, Ph:(608)831-4444

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49136
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 05/07/90
COLLECTION DATE: 04/05/90
STATION ID: DWT SLG
SAMPLE COLLECTOR: MB

ASTM ANALYSIS REPORT

PARAMETER	RESULT	UNITS
Alkalinity	<20	mg/l
Ammonia, Nitrogen	0.68	mg/l
Chloride	8.1	mg/l
Fluoride	<0.50	mg/l
Nitrate, Nitrogen	5.6	mg/l
Phenols	0.013	mg/l
Phosphorus, Total	<0.20	mg/l
Sulfate	<10	mg/l
Total Organic Carbon	65	mg/l
Total Solids	190	mg/l
Calcium	3900	ug/l
Copper	<20	ug/l
Iron	400	ug/l
Magnesium	<500	ug/l
Manganese	160	ug/l
Nickel	<20	ug/l
Potassium	700	ug/l
Sodium	11000	ug/l
Zinc	300	ug/l
Total Weight	100.0	gm
Initial pH	6.5	pH units
Final pH	5.8	pH units

Add'l analysis is listed under lab #49121 * Concentration exceeds upper limit of instrument quantitation.

Alan Doughty, Ph.D., Laboratory Director

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 51758
PROJECT #: 00467.41
WORK ORDER #: 900613-0046741

REPORT DATE: 06/22/90
COLLECTION DATE: 04/05/90
STATION ID: DWT SLG
SAMPLE COLLECTOR: MB

ASTM ANALYSIS REPORT

PARAMETER	RESULT	UNITS
Arsenic	<3	ug/l
Barium	<50	ug/l
Cadmium	<0.3	ug/l
Chromium	<10	ug/l
Lead	<3	ug/l
Mercury	<0.2	ug/l
Selenium	<3	ug/l
Silver	<10	ug/l

Previous analysis is listed under lab #49136

Alan Doughty, Ph.D., Laboratory Director

RMT INC.
LABORATORIES

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
Report Date: 05/16/90

RMT SAMPLE NO.
49121

Client Name: WEYERHAEUSER Project # 467.41

Matrix: (soil/water) WATER
Sample wt/vol: 1000 (g/mL) ML
Level: (low/med) LOW
GPC Cleanup: (Y/N) NO
Moisture: --. %
Column: (pack/cap) CAP

Field Sample ID: DWT SLG
Lab File ID: >MFH04::D5
Sampling Date: 04/05/90
Date Extracted: 04/23/90.
Analysis Date: 4/23/90
Dilution Factor: 1.00000

CONCENTRATION UNITS:UG/L

CAS NO.	COMPOUND	Conc.	*MDL	Code
106-46-7	1,4-Dichlorobenzene		10.	U
95-48-7	2-Methylphenol		10.	U
108-39-4	3-Methylphenol		10.	S
106-44-5	4-Methylphenol		10.	U
67-72-1	Hexachloroethane		10.	U
118-74-1	Hexachlorobenzene		10.	U
98-59-1	Nitrobenzene		10.	U
87-68-3	Hexachlorobutadiene		10.	U
88-06-2	2,4,6-Trichlorophenol		10.	U
95-95-4	2,4,5-Trichlorophenol		50.	U
87-86-5	Pentachlorophenol		50.	U
110-86-1	Pyridine		10.	U
108-95-2	Phenol		10.	U
95-50-1	1,2-Dichlorobenzene		10.	U
935-95-5	2,3,4,6-Tetrachlorophenol		50.	U
121-14-2	2,4-Dinitrotoluene		10.	U

ALAN DOUGHTY, PH.D., LABORATORY DIRECTOR

RMT INC.
LABORATORIES

THE FOLLOWING ARE CODES THAT ARE USED ON THE DATA SHEET:

U = Undetected

B = Present in Blank

J = Estimated Concentration

M = Matrix Spike Compound

E = Exceeds Calibration Limit

D = Value is from a Diluted Run

S =Cannot be separated from 2-Methylphenol

*MDL = Method Detection Limit -corrected for moisture fraction when sample is a soil.

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49136
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 05/07/90
COLLECTION DATE: 04/05/90
STATION ID: DWT SLG
SAMPLE COLLECTOR: MB

COMPOSITIONAL ANALYSIS REPORT

PARAMETER	RESULT	UNITS
% Ash	35	%
Kjeldahl Nitrogen, Total	3100	mg/kg dry wt.
Phosphorus, Total	140	mg/kg dry wt.
Solids, Total	57	%
Total Organic Carbon	>16000*	mg/kg dry wt.

Add'l analysis is listed under lab #49121 * Concentration exceeds upper limit of instrument quantitation.

Alan Doughty, Ph.D., Laboratory Director

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49122
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 05/07/90
COLLECTION DATE: 04/05/90
STATION ID: COMP 1
SAMPLE COLLECTOR: MB

TOXICITY CHARACTERISTIC LEACHING PROCEDURE

PARAMETER	RESULT	UNITS
Arsenic	<0.003	mg/1
Barium	1.2	mg/1
Cadmium	<0.005	mg/1
Chromium	<0.01	mg/1
Lead	<0.1	mg/1
Mercury	0.0002	mg/1
Selenium	<0.003	mg/1
Silver	<0.01	mg/1
Sample Wt.	100.0	grams
pH (5 min)	12.6	pH units
pH (after heating)	11.8	pH units
Extract Sol 'N	2	
Final pH	6.8	pH units
Extraction pH	2.9	pH units

Alan Doughty, Ph.D., Laboratory Director

RMT INC.
LABORATORIES

VOLATILE ORGANICS ANALYSIS DATA SHEET
TCLP EXTRACT
Report Date: 05/15/90

RMT SAMPLE NO.
49122

Client Name: WEYERHAEUSER Project #467.41

Matrix: (soil/water) TCLP EXTRACT
Sample wt/vol: 5 (g/mL) ML
Level: (low/med) LOW
Extraction Date: 04/19-20/90
Column: (pack/cap) PACK

Field Sample ID: COMP 1
Lab File ID: >ABB05
Sampling Date: 04/05/90
Analysis Date: 04/28/90
Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS:UG/L Conc.	*MDL	Code
75-01-4	Vinyl Chloride		10.	U
75-09-2	Methylene Chloride		5.	UX
107-13-1	Acrylonitrile		200.	UX
75-15-0	Carbon Disulfide	12.	5.	X
75-35-4	1,1-Dichloroethene		5.	U
67-66-3	Chloroform		5.	U
107-02-2	1,2-Dichloroethane		5.	U
78-93-3	2-Butanone		10.	U
71-55-6	1,1,1-Trichloroethane		5.	UX
78-83-1	Isobutanol		2000.	UX
56-23-5	Carbon Tetrachloride		5.	U
79-01-6	Trichloroethene		5.	U
79-00-5	1,1,2-Trichloroethane		5.	UX
71-43-2	Benzene		5.	U
127-18-4	Tetrachloroethene		5.	U
79-34-5	1,1,2,2-Tetrachloroethane		5.	UX
630-20-6	1,1,1,2-Tetrachloroethane		10.	UX
108-88-3	Toluene	1.	5.	XJ
108-90-7	Chlorobenzene		5.	U

FORM I VOA

ALAN DOUGHTY, PH.D., LABORATORY DIRECTOR

RMT INC.
LABORATORIES

THE FOLLOWING ARE CODES THAT ARE USED ON THE DATA SHEET:

U = Undetected

B = Present in Blank

J = Estimated Concentration

M = Matrix Spike Compound

E = Exceeds Calibration Limit

D = Value is from a Diluted Run

*MDL = Method Detection Limit -corrected for moisture fraction when sample is a soil

Z = Present in the ZHE extract blank for that day.

X = Recently removed from the list of regulated TCLP volatile constituents. A screen was performed for these compounds.

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49122
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 05/07/90
COLLECTION DATE: 04/05/90
STATION ID: COMP 1
SAMPLE COLLECTOR: MB

PESTICIDE ANALYSIS REPORT

PARAMETER	RESULT	UNITS
2,4-D	<2000	ug/l
2,4,5-TP	<200	ug/l

Alan Doughty, Ph.D., Laboratory Director

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RMT INC
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49122
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 05/07/90
COLLECTION DATE: 04/05/90
STATION ID: COMP 1
SAMPLE COLLECTOR: MB

PESTICIDE ANALYSIS REPORT

PARAMETER	RESULT	UNITS
LINDANE	<80	ug/l
HEPTACHLOR	<1.6	ug/l
HEPTACHLOR EPOXIDE	<1.6	ug/l
CHLORDANE	<6.0	ug/l
ENDRIN	<4.0	ug/l
METHOXYCHLOR	<2000	ug/l
TOXAPHENE	<100	ug/l

Alan Doughty, Ph.D., Laboratory Director

744 Heartland Trail, P.O. Box 8923, Madison, WI 53708-8923, Ph:(608)831-444

RMT INC.
LABORATORIES

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
Report Date: 05/16/90

RMT SAMPLE NO.
49122

Client Name: WEYERHAEUSER Project # 467.41

Matrix: (soil/water) WATER
Sample wt/vol: 1000 (g/mL) ML
Level: (low/med) LOW
GPC Cleanup: (Y/N) NO
Moisture: --. %
Column: (pack/cap) CAP

Field Sample ID: COMP 1
Lab File ID: >MFH03::D5
Sampling Date: 04/05/90
Date Extracted: 04/23/90.
Analysis Date: 4/23/90
Dilution Factor: 1.00000

CONCENTRATION UNITS:UG/L

CAS NO.	COMPOUND	Conc.	*MDL	Code
106-46-7	1,4-Dichlorobenzene		10.	U
95-48-7	2-Methylphenol	5.	10.	J
108-39-4	3-Methylphenol		10.	S
106-44-5	4-Methylphenol		10.	U
67-72-1	Hexachloroethane		10.	U
118-74-1	Hexachlorobenzene		10.	U
98-59-1	Nitrobenzene		10.	U
87-68-3	Hexachlorobutadiene		10.	U
88-06-2	2,4,6-Trichlorophenol		10.	U
95-95-4	2,4,5-Trichlorophenol		50.	U
87-86-5	Pentachlorophenol		50.	U
110-86-1	Pyridine		10.	U
108-95-2	Phenol		10.	U
95-50-1	1,2-Dichlorobenzene		10.	U
935-95-5	2,3,4,6-Tetrachlorophenol		50.	U
121-14-2	2,4-Dinitrotoluene		10.	U

ALAN DOUGHTY, PH.D., LABORATORY DIRECTOR

RMT INC.
LABORATORIES

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U = Undetected

B = Present in Blank

J = Estimated Concentration

M = Matrix Spike Compound

E = Exceeds Calibration Limit

D = Value is from a Diluted Run

S =Cannot be separated from 2-Methylphenol

*MDL = Method Detection Limit -corrected for moisture fraction when sample is a soil.

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49123
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 05/07/90
COLLECTION DATE: 04/05/90
STATION ID: COMP 2
SAMPLE COLLECTOR: MB

TOXICITY CHARACTERISTIC LEACHING PROCEDURE

PARAMETER	RESULT	UNITS
Arsenic	0.005	mg/1
Barium	1.2	mg/1
Cadmium	<0.005	mg/1
Chromium	<0.01	mg/1
Lead	<0.1	mg/1
Mercury	<0.0002	mg/1
Selenium	<0.003	mg/1
Silver	<0.01	mg/1
Sample Wt.	100.0	grams
pH (5 min)	6.8	pH units
pH (after heating)	1.8	pH units
Extract Sol 'N	1	
Final pH	5.2	pH units
Extraction pH	4.9	pH units

Alan Doughty, Ph.D., Laboratory Director

RMT INC.
LABORATORIES

VOLATILE ORGANICS ANALYSIS DATA SHEET
TCLP EXTRACT
Report Date: 05/15/90

RMT SAMPLE NO.
49123

Client Name: WEYERHAEUSER . Project #467.41

Matrix: (soil/water) TCLP EXTRACT
Sample wt/vol: 5 (g/mL) ML
Level: (low/med) LOW
Extraction Date: 04/19-20/90
Column: (pack/cap) PACK

Field Sample ID: COMP 2
Lab File ID: >ABB06
Sampling Date: 04/05/90
Analysis Date: 04/28/90
Dilution Factor: 1.00000

CONCENTRATION UNITS:UG/L

CAS NO.	COMPOUND	Conc.	*MDL	Code
75-01-4	Vinyl Chloride		10.	U
75-09-2	Methylene Chloride	4.	5.	XJ
107-13-1	Acrylonitrile		200.	UX
75-15-0	Carbon Disulfide		5.	UX
75-35-4	1,1-Dichloroethene		5.	U
67-66-3	Chloroform		5.	U
107-02-2	1,2-Dichloroethane		5.	U
78-93-3	2-Butanone	11.	10.	
71-55-6	1,1,1-Trichloroethane		5.	UX
78-83-1	Isobutanol		2000.	UX
56-23-5	Carbon Tetrachloride		5.	U
79-01-6	Trichloroethene		5.	U
79-00-5	1,1,2-Trichloroethane		5.	UX
71-43-2	Benzene		5.	U
127-18-4	Tetrachloroethene		5.	U
79-34-5	1,1,2,2-Tetrachloroethane		5.	UX
630-20-6	1,1,1,2-Tetrachloroethane		10.	UX
108-88-3	Toluene		5.	UX
108-90-7	Chlorobenzene		5.	U

FORM I VOA

ALAN DOUGHTY, PH.D., LABORATORY DIRECTOR

RMT INC.
LABORATORIES

THE FOLLOWING ARE CODES THAT ARE USED ON THE DATA SHEET:

U = Undetected

B = Present in Blank

J = Estimated Concentration

M = Matrix Spike Compound

E = Exceeds Calibration Limit

D = Value is from a Diluted Run

*MDL = Method Detection Limit -corrected for moisture fraction when sample is a soil

Z = Present in the ZHE extract blank for that day.

X = Recently removed from the list of regulated TCLP volatile constituents. A screen was performed for these compounds.

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49123
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 05/07/90
COLLECTION DATE: 04/05/90
STATION ID: COMP 2
SAMPLE COLLECTOR: MB

PESTICIDE ANALYSIS REPORT

PARAMETER	RESULT	UNITS
2,4-D	<2000	ug/l
2,4,5-TP	<200	ug/l

Alan Doughty, Ph.D., Laboratory Director

744 Heartland Trail, P.O. Box 8923, Madison, WI 53708-8923, Ph:(608)831-444

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49123
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 05/07/90
COLLECTION DATE: 04/05/90
STATION ID: COMP 2
SAMPLE COLLECTOR: MB

PESTICIDE ANALYSIS REPORT

PARAMETER	RESULT	UNITS
LINDANE	<80	ug/l
HEPTACHLOR	<1.6	ug/l
HEPTACHLOR EPOXIDE	<1.6	ug/l
CHLORDANE	<6.0	ug/l
ENDRIN	<4.0	ug/l
METHOXYCHLOR	<2000	ug/l
TOXAPHENE	<100	ug/l

Alan Doughty, Ph.D., Laboratory Director

744 Heartland Trail, P.O. Box 8923, Madison, WI 53708-8923, Ph:(608)831-444

RMT INC.
LABORATORIES

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
Report Date: 05/16/90

RMT SAMPLE NO.
49123

Client Name: WEYERHAEUSER Project # 467.41

Matrix: (soil/water) WATER
Sample wt/vol: 1000 (g/mL) ML
Level: (low/med) LOW
GPC Cleanup: (Y/N) NO
Moisture: --. %
Column: (pack/cap) CAP

Field Sample ID: COMP 2
Lab File ID: >MFH24::D5
Sampling Date: 04/05/90
Date Extracted: 04/23/90.
Analysis Date: 5/04/90
Dilution Factor: 1.00000

CONCENTRATION UNITS:UG/L

CAS NO.	COMPOUND	Conc.	*MDL	Code
106-46-7	1,4-Dichlorobenzene		10.	U
95-48-7	2-Methylphenol	7.	10.	J
108-39-4	3-Methylphenol		10.	S
106-44-5	4-Methylphenol	3.	10.	J
67-72-1	Hexachloroethane		10.	U
118-74-1	Hexachlorobenzene		10.	U
98-59-1	Nitrobenzene		10.	U
87-68-3	Hexachlorobutadiene		10.	U
88-06-2	2,4,6-Trichlorophenol		10.	U
95-95-4	2,4,5-Trichlorophenol		50.	U
87-86-5	Pentachlorophenol		50.	U
110-86-1	Pyridine		10.	U
108-95-2	Phenol		10.	U
95-50-1	1,2-Dichlorobenzene		10.	U
935-95-5	2,3,4,6-Tetrachlorophenol		50.	U
121-14-2	2,4-Dinitrotoluene		10.	U

ALAN DOUGHTY, PH.D., LABORATORY DIRECTOR

RMT INC.
LABORATORIES

THE FOLLOWING ARE CODES THAT ARE USED ON THE DATA SHEET:

U = Undetected

B = Present in Blank

J = Estimated Concentration

M = Matrix Spike Compound

E = Exceeds Calibration Limit

D = Value is from a Diluted Run

S =Cannot be separated from 2-Methylphenol

*MDL = Method Detection Limit -corrected for moisture fraction when sample is a soil.

RMT INC
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49120
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 06/06/90
COLLECTION DATE: 04/05/90
STATION ID: COMP 3
SAMPLE COLLECTOR: MB

TOXICITY CHARACTERISTIC LEACHING PROCEDURE

PARAMETER	RESULT	UNITS
Alkalinity	2900	mg/l as CaCO3
Ammonia	0.41	mg/l
Chloride	32	mg/l
Fluoride	<0.50	mg/l
Nitrate	0.56	mg/l
Phenol	<0.062	mg/l
Phosphorus, Total	2.0*	mg/l
Sulfate	160	mg/l
Total Solids as Dissolved	6100	mg/l
Arsenic	0.086	mg/l
Barium	1.5	mg/l
Cadmium	0.014	mg/l
Calcium	1200	mg/l
Chromium	0.02	mg/l
Copper	<0.02	mg/l
Iron	0.1	mg/l
Lead	<0.1	mg/l
Magnesium	48	mg/l
Manganese	6.6	mg/l
Mercury	<0.0002	mg/l
Nickel	0.17	mg/l
Potassium	70	mg/l
Selenium	0.088	mg/l
Silver	<0.01	mg/l
Sodium	96	mg/l
Zinc	3.3	mg/l
Sample Wt.	100.0	grams
pH (5 min)	10.8	pH units
pH (after heating)	7.6	pH units
Extraction Solution	2	
Final pH	5.2	pH units

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49120
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 06/06/90
COLLECTION DATE: 04/05/90
STATION ID: COMP 3
SAMPLE COLLECTOR: MB

TOXICITY CHARACTERISTIC LEACHING PROCEDURE

PARAMETER	RESULT	UNITS
Extraction pH	2.9	pH units

Additional analysis is listed under lab #49135
* High detect limit based on matrix interference.

H. Mitchell Rubenstein, Ph.D., Technical Director

RMT INC.
LABORATORIES

VOLATILE ORGANICS ANALYSIS DATA SHEET
TCLP EXTRACT
Report Date: 05/15/90

RMT SAMPLE NO.
49120

Client Name: WEYERHAEUSER . Project #467.41

Matrix: (soil/water) TCLP EXTRACT
Sample wt/vol: 5 (g/mL) ML
Level: (low/med) LOW
Extraction Date: 04/19-20/90
Column: (pack/cap) PACK

Field Sample ID: COMP 3
Lab File ID: >ABB03
Sampling Date: 04/05/90
Analysis Date: 04/28/90
Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS:UG/L Conc.	*MDL	Code
75-01-4	Vinyl Chloride		10.	U
75-09-2	Methylene Chloride	2.	5.	XJ
107-13-1	Acrylonitrile		200.	UX
75-15-0	Carbon Disulfide		5.	UX
75-35-4	1,1-Dichloroethene		5.	U
67-66-3	Chloroform		5.	U
107-02-2	1,2-Dichloroethane		5.	U
78-93-3	2-Butanone		10.	U
71-55-6	1,1,1-Trichloroethane		5.	UX
78-83-1	Isobutanol		2000.	UX
56-23-5	Carbon Tetrachloride		5.	U
79-01-6	Trichloroethene		5.	U
79-00-5	1,1,2-Trichloroethane		5.	UX
71-43-2	Benzene		5.	U
127-18-4	Tetrachloroethene		5.	U
79-34-5	1,1,2,2-Tetrachloroethane		5.	UX
630-20-6	1,1,1,2-Tetrachloroethane		10.	UX
108-88-3	Toluene		5.	UX
108-90-7	Chlorobenzene		5.	U

FORM I VOA

ALAN DOUGHTY, PH.D., LABORATORY DIRECTOR

RMT INC.
LABORATORIES

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U = Undetected

B = Present in Blank

J = Estimated Concentration

M = Matrix Spike Compound

E = Exceeds Calibration Limit

D = Value is from a Diluted Run

*MDL = Method Detection Limit -corrected for moisture fraction when sample is a soil

Z = Present in the ZHE extract blank for that day.

X = Recently removed from the list of regulated TCLP volatile constituents. A screen was performed for these compounds.

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49120
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 05/07/90
COLLECTION DATE: 04/05/90
STATION ID: COMP 3
SAMPLE COLLECTOR: MB

PESTICIDE ANALYSIS REPORT

PARAMETER	RESULT	UNITS
2,4-D	<2000	ug/l
2,4,5-TP	<200	ug/l

Alan Doughty, Ph.D., Laboratory Director

744 Heartland Trail, P.O. Box 8923, Madison, WI 53708-8923, Ph:(608)831-444

RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49120
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 05/07/90
COLLECTION DATE: 04/05/90
STATION ID: COMP 3
SAMPLE COLLECTOR: MB

PESTICIDE ANALYSIS REPORT

PARAMETER	RESULT	UNITS
LINDANE	<80	ug/l
HEPTACHLOR	<1.6	ug/l
HEPTACHLOR EPOXIDE	<1.6	ug/l
CHLORDANE	<6.0	ug/l
ENDRIN	<4.0	ug/l
METHOXYCHLOR	<2000	ug/l
TOXAPHENE	<100	ug/l

Alan Doughty, Ph.D., Laboratory Director

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RMT INC.
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 49135
PROJECT #: 00467.41
WORK ORDER #: 900406-0046741

REPORT DATE: 05/07/90
COLLECTION DATE: 04/05/90
STATION ID: COMP 3
SAMPLE COLLECTOR: MB

ASTM ANALYSIS REPORT

PARAMETER	RESULT	UNITS
Alkalinity	180	mg/l
Ammonia, Nitrogen	0.38	mg/l
Chloride	44	mg/l
Fluoride	<0.50	mg/l
Nitrate, Nitrogen	1.9	mg/l
Phenols	0.011	mg/l
Phosphorus, Total	0.37	mg/l
Sulfate	140	mg/l
Total Organic Carbon	71	mg/l
Total Solids	680	mg/l
Calcium	35000	ug/l
Copper	70	ug/l
Iron	200	ug/l
Magnesium	300	ug/l
Manganese	27	ug/l
Nickel	<20	ug/l
Potassium	51000	ug/l
Sodium	81000	ug/l
Zinc	20	ug/l
Total Weight	100.0	gm
Initial pH	10.4	pH units
Final pH	10.8	pH units

Additional analysis is listed under lab #49120

Alan Doughty, Ph.D., Laboratory Director

RMT INC
LABORATORIES

CLIENT: WEYERHAEUSER
SAMPLE #: 51757
PROJECT #: 00467.41
WORK ORDER #: 900613-0046741

REPORT DATE: 06/22/90
COLLECTION DATE: 04/05/90
STATION ID: COMP 3
SAMPLE COLLECTOR: MB

ASTM ANALYSIS REPORT

PARAMETER	RESULT	UNITS
Arsenic	28	ug/l
Barium	100	ug/l
Cadmium	<0.3	ug/l
Chromium	<10	ug/l
Lead	<3	ug/l
Mercury	<0.2	ug/l
Selenium	22	ug/l
Silver	<10	ug/l

Previous analysis is listed under lab #49135

Alan Doughty, Ph.D., Laboratory Director

744 Heartland Trail, P.O. Box 8923, Madison, WI 53708-8923, Ph:(608)831-44

RMT INC.
LABORATORIES

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
Report Date: 05/16/90

RMT SAMPLE NO.
49120

Client Name: WEYERHAEUSER Project # 467.41

Matrix: (soil/water) WATER Field Sample ID: COMP 3
Sample wt/vol: 1000 (g/mL) ML Lab File ID: >MFH05::D5
Level: (low/med) LOW Sampling Date: 04/05/90
GPC Cleanup: (Y/N) NO Date Extracted: 04/23/90.
Moisture: --. % Analysis Date: 4/23/90
Column: (pack/cap) CAP Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS:UG/L Conc.	*MDL	Code
106-46-7	1,4-Dichlorobenzene		10.	U
95-48-7	2-Methylphenol		10.	U
108-39-4	3-Methylphenol		10.	S
106-44-5	4-Methylphenol		10.	U
67-72-1	Hexachloroethane		10.	U
118-74-1	Hexachlorobenzene		10.	U
98-59-1	Nitrobenzene		10.	U
87-68-3	Hexachlorobutadiene		10.	U
88-06-2	2,4,6-Trichlorophenol		10.	U
95-95-4	2,4,5-Trichlorophenol		50.	U
87-86-5	Pentachlorophenol		50.	U
110-86-1	Pyridine		10.	U
108-95-2	Phenol		10.	U
95-50-1	1,2-Dichlorobenzene		10.	U
935-95-5	2,3,4,6-Tetrachlorophenol		50.	U
121-14-2	2,4-Dinitrotoluene		10.	U

ALAN DOUGHTY, PH.D., LABORATORY DIRECTOR

RMT INC.
LABORATORIES

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U = Undetected

B = Present in Blank

J = Estimated Concentration

M = Matrix Spike Compound

E = Exceeds Calibration Limit

D = Value is from a Diluted Run

S =Cannot be separated from 2-Methylphenol

*MDL = Method Detection Limit -corrected for moisture fraction when sample is a soil.

APPENDIX B

PHYSICAL TESTING RESULTS

RMT Soils Laboratory - As Received Moisture Content Determination

PROJECT: WEYERHAEUSER

JOB #: 467.41

Tech: JPH 05/10/90 QC JPH 5/11/90
Input: GAP 05/11/90 QA [illegible] 5/11/90

BORING	SAMPLE	DEPTH	TARE	WET WT	DRY WT	% MOISTURE
DEWATERED SLUDGE			107.83	777.80	313.98	225.0
DEWATERED SLUDGE			107.35	691.00	294.72	211.5
ASH			274.75	532.39	458.67	40.1

✓ HJW
6-6-90

RMT Soils Laboratory - Specific Gravity Determination

PROJECT: WEYERHAEUSER — QC HJW 6-6-90

Tech: GTF 6-5-90 — QA JPL 6-20-90

JOB #: 467.42 — Input: GTF 06/06/90

FLASK VOL @20 C	250
AIR REMOVAL	VACUUM
BORING #	PAPERMILL
SAMPLE #	SLUDGE
DEPTH	
WT FLASK+H20	353.5
WT DRY SOIL	18.36
WT FLASK+SOIL+H20	361.49
TEMP C	22.5
SPECIFIC GRAVITY	1.77

RMT Soils Laboratory - Specific Gravity Determination

PROJECT: WEYERHAEUSER

JOB #: 467.41

Tech: GTF 6-20-90

Input: GTF 06/20/90

QC [signature] 6-20-90

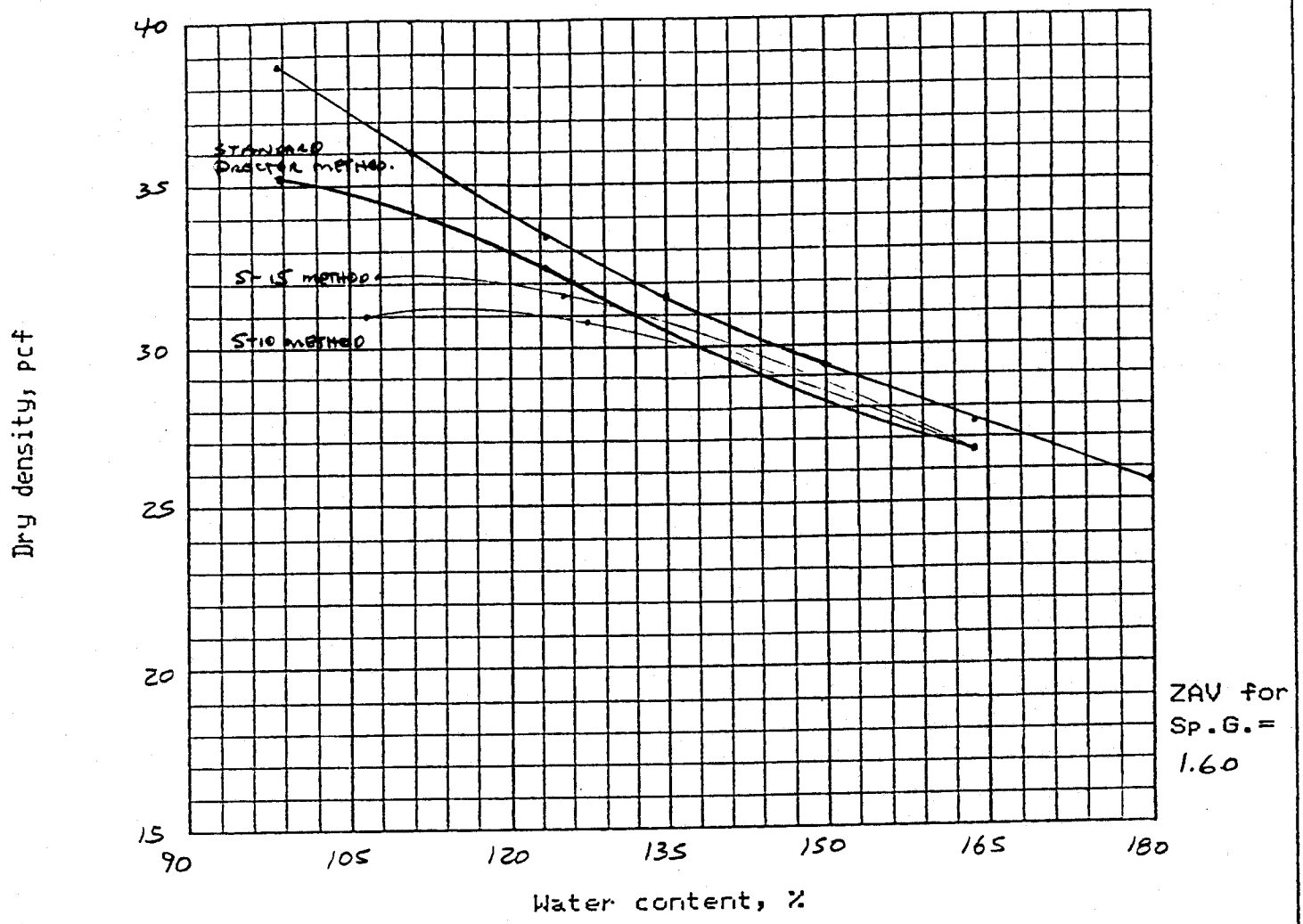
QA [signature] 6-20-90

FLASK VOL @20 C 250

AIR REMOVAL VACUUM

BORING #	ASH COMP	ASH & SLUDGE @ 45% SOLIDS
SAMPLE #		
DEPTH		
WT FLASK+H20	351.74	353.45
WT DRY SOIL	27.87	27.21
WT FLASK+SOIL+H20	366.54	367.35
TEMP C	22.5	22.5
SPECIFIC GRAVITY	2.13	2.04

COMPACTION TEST REPORT



Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = Maximum dry density =	Sludge

Project No.: 467.42
Project: Weyerhaeuser
Location:

Date:

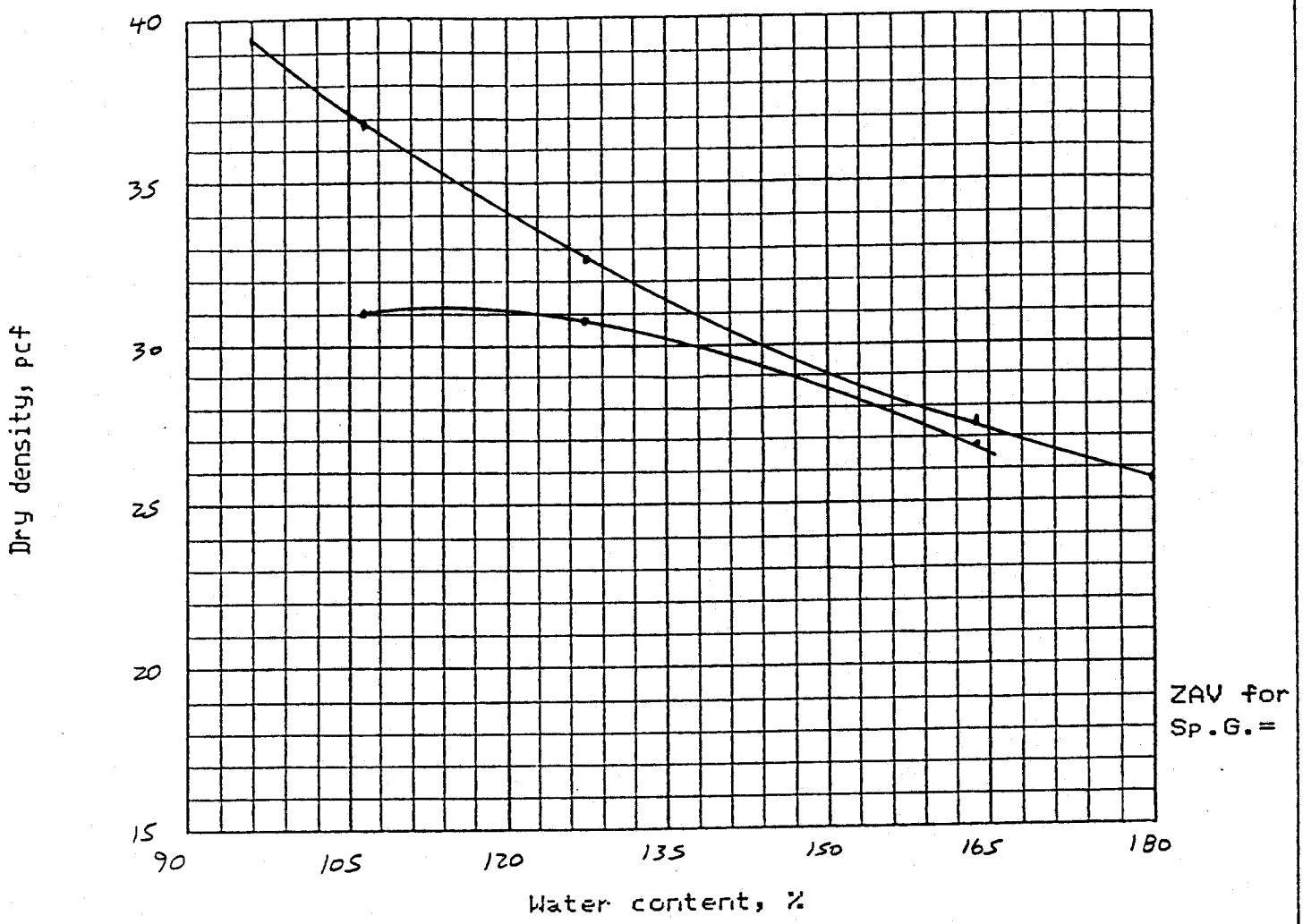
COMPACTION TEST REPORT

Remarks:

Standard Proctor Effort

Fig. No. _____

COMPACTION TEST REPORT



Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = Maximum dry density =	Sludge

Project No.: 467.41
Project: Weyerhaeuser
Location:

Date:

COMPACTION TEST REPORT

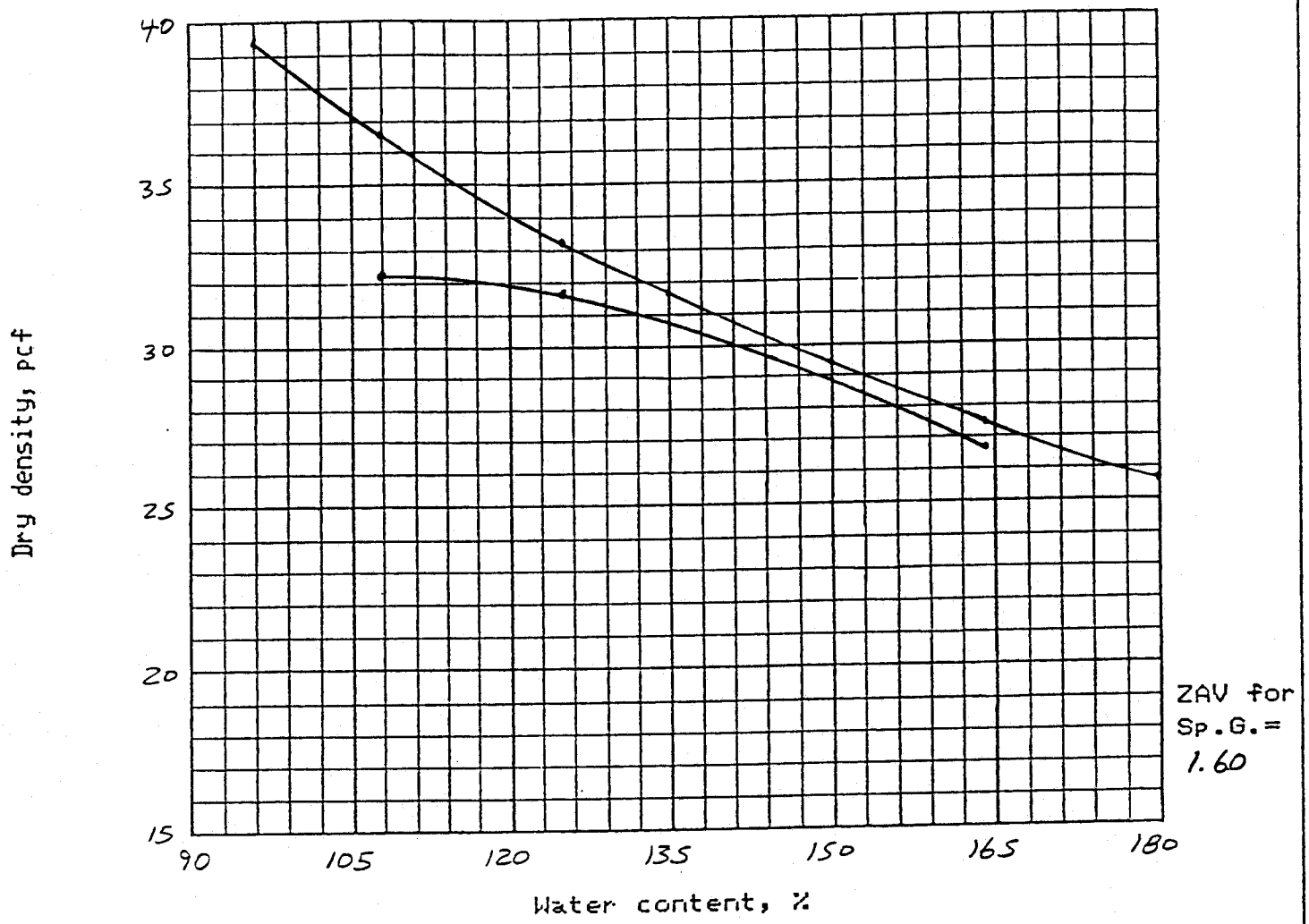
Remarks:

5-10 Method

5.5 # Hammer
3 Lifts
1 ft. Drop
10 Blows per Lift

Fig. No. _____

COMPACTION TEST REPORT



Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
			218 %					

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = Maximum dry density =	Sludge

Project No.: 467.41
Project: Weyerhaeuser
Location:

Date:

COMPACTION TEST REPORT

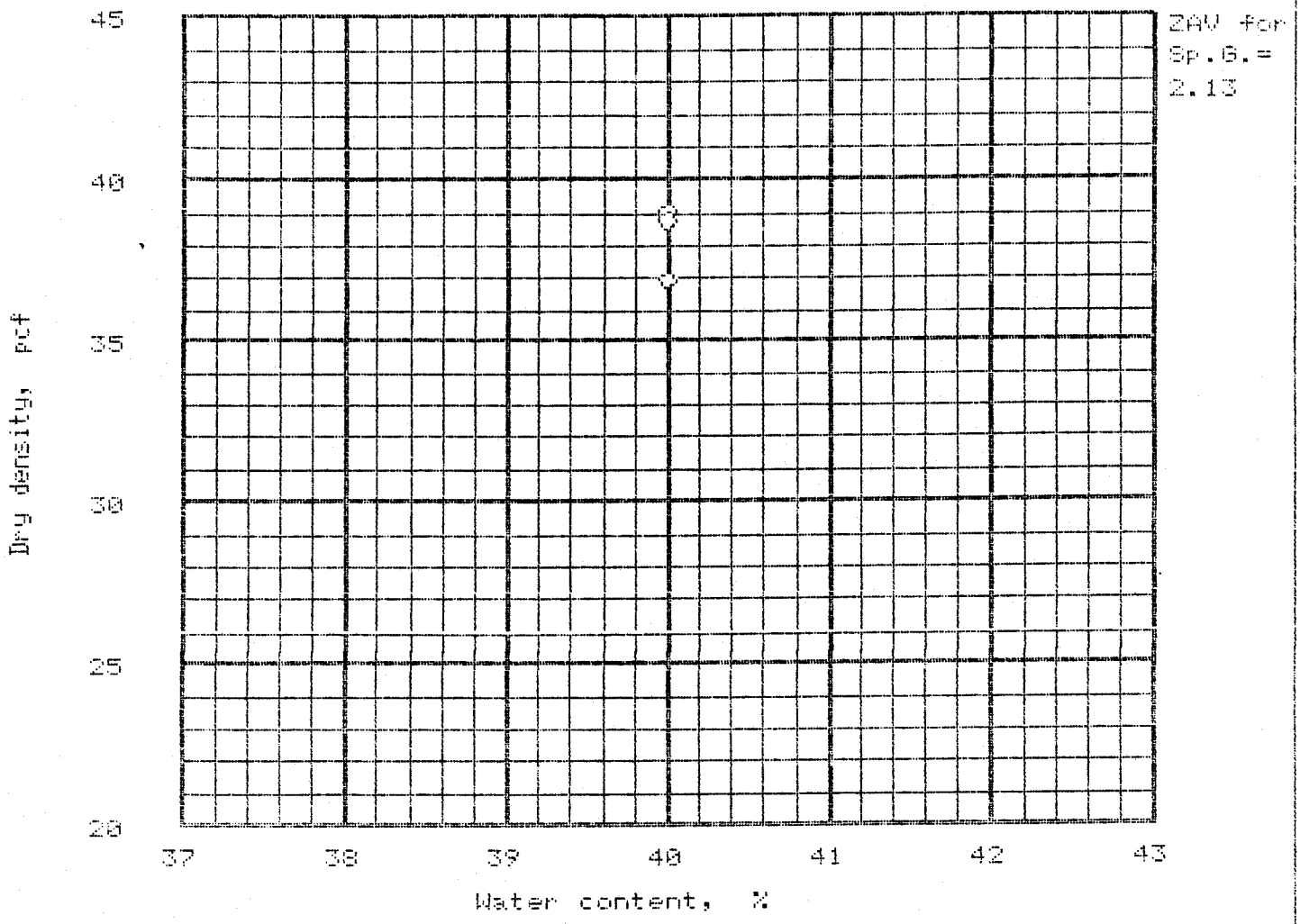
Remarks:

5-15 Method

Fig. No. _____

6-26-90 J.A.L.

PROCTOR TEST REPORT



"Standard" Proctor, ASTM D 698, Method A

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
			40 %	2.13				

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = Maximum dry density =	ASH

Project No.: 467.41
Project: WEYERHAEUSER
Location:

Date: 6-26-1990

Remarks:
SAMPLE COMPACTED USING STANDARD PROCTPOR EFFORT ,5-15 & 5-10 EFFORT

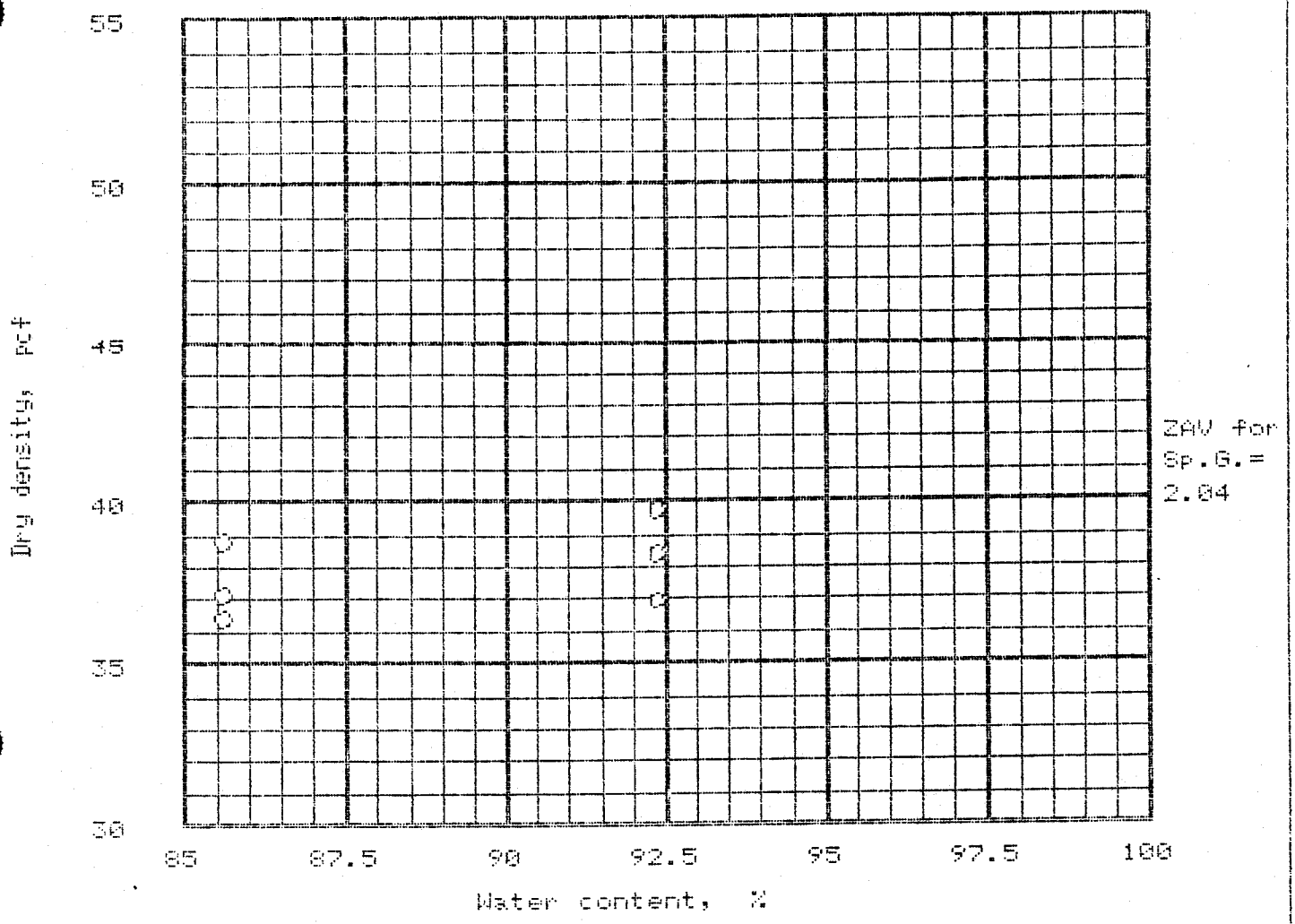
PROCTOR TEST REPORT

RMT Inc.

Figure No._____

6-26-90 V 81 6,10

PROCTOR TEST REPORT



"Standard" Proctor, ASTM D 698, Method A

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
				2.04				

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = % Maximum dry density = pcf	SLUDGE @ 38% & 45% SOLIDS & ASH COMPOSITES
Project No.: 487.41 Project: WEYERHAEUSER Location: Date: 6-26-1990	Remarks: SAMPLES COMPACTED USING STANDARD PROCTOR EFFORT, 5-15 & 5-10 EFFORT
PROCTOR TEST REPORT RMT Inc.	Figure No._____

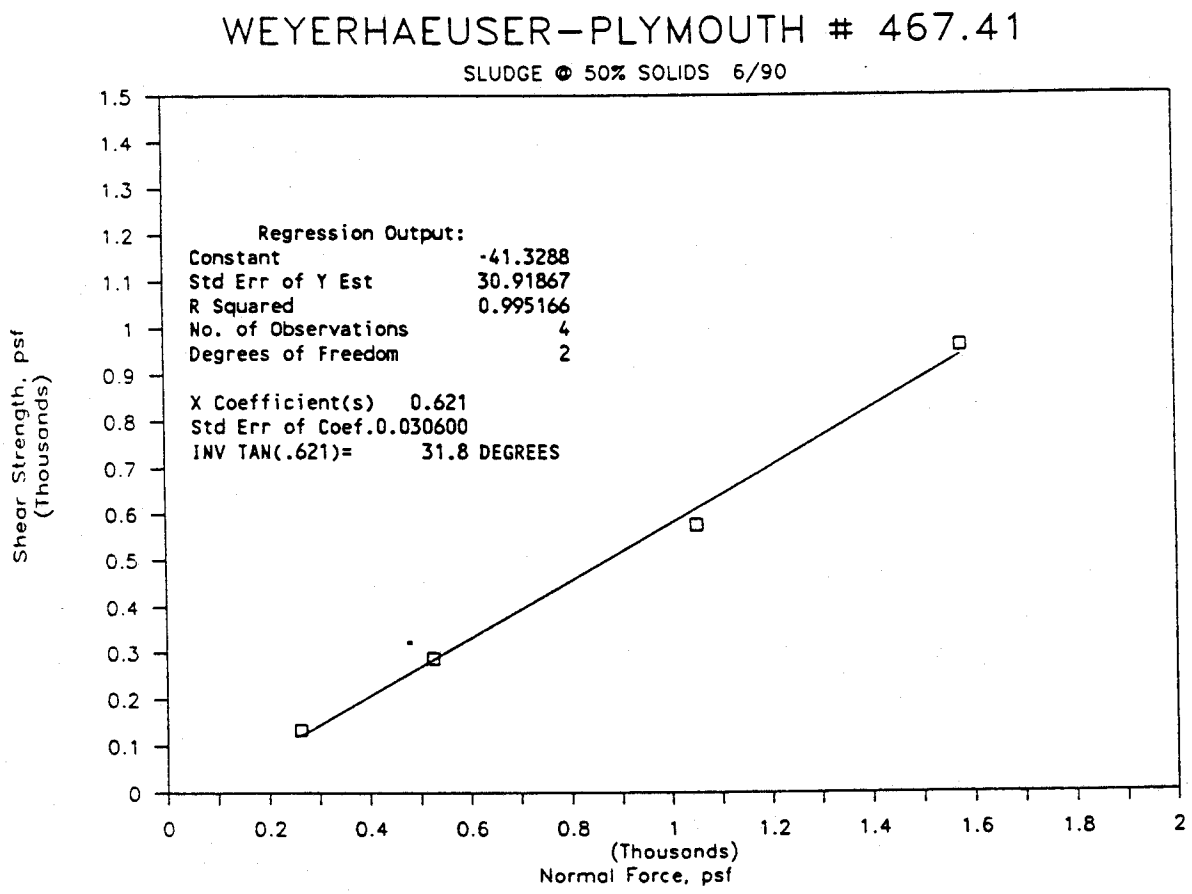
RMT, Inc.
SHEAR STRENGTH DETERMINATION
BUCKET SHEAR DEVICE

QA: DRG 6/22/90
QC: GTF 6.22.90
Tech: JPH

Project: WEYERHAEUSER-PLYMOUTH # 467.41 Filename: WEYSHR01.WKS
Proj. #: 467.41 Date :06/21/90
Sample: SLUDGE @ 50% SOLIDS 6/90

Initial Height: 9.63 in. Moisture Content: 100.0 % (initial)
Weight of Waste: 23.61 lbs 100.0 % (final)
Volume: 0.60 cu ft Shear Plate Dia.: 5.0 inches

Normal Load		Shear Strength		Consolidation	Strain	Unit Weight*		Comments
Reading (mv)	Sample (psf)	Torque (ft#)	Sample (psf)	Total (inches)	(%)	WET (pcf)	DRY (pcf)	
0	0	--	--	0	100	39.5	19.8	
15	263	14	134	1.4	85	46.3	23.2	
30	526	30	288	2.1	79	50.2	25.1	
60	1052	60	576	2.6	73	54.1	27.1	
90	1579	100	960	3.1	68	58.4	29.2	*No pore water release noted.
Residual		40	384					



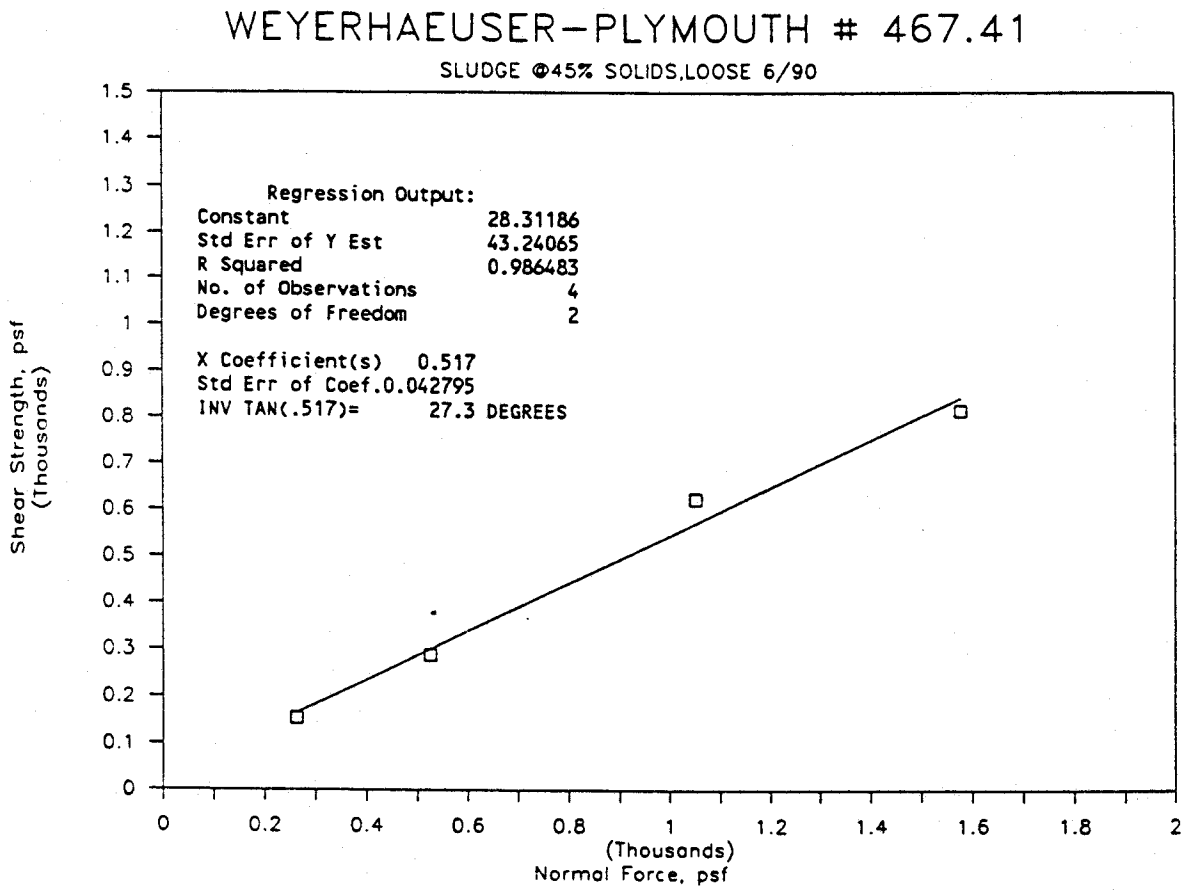
RMT, Inc.
SHEAR STRENGTH DETERMINATION
BUCKET SHEAR DEVICE

QA: DRG 6/22/90
QC: GTF 6.22.90
Tech: JPH

Project: WEYERHAEUSER-PLYMOUTH # 467.41 Filename: WEYSHR02.WKS
Proj. #: 467.41 Date :06/22/90
Sample: SLUDGE @45% SOLIDS,LOOSE 6/90

Initial Height: 9.00 in. Moisture Content: 122.0 % (initial)
Weight of Waste: 26.45 lbs 122.0 % (final)
Volume: 0.56 cu ft Shear Plate Dia.: 5.0 inches

Normal Load		Shear Strength		Consol-idation	Strain	Unit Weight*		Comments
Reading (mv)	Sample (psf)	Torque (ft#)	Sample (psf)	Total (inches)	(%)	WET (pcf)	DRY (pcf)	
0	0	--	--	0	100	47.3	21.3	
15	263	16	154	1.2	86	54.8	24.7	
30	526	30	288	1.9	79	59.9	27.0	
60	1052	65	624	2.6	72	66.1	29.8	
90	1579	85	816	2.8	69	69.0	31.1	*No pore water release noted.
Residual		40	384					



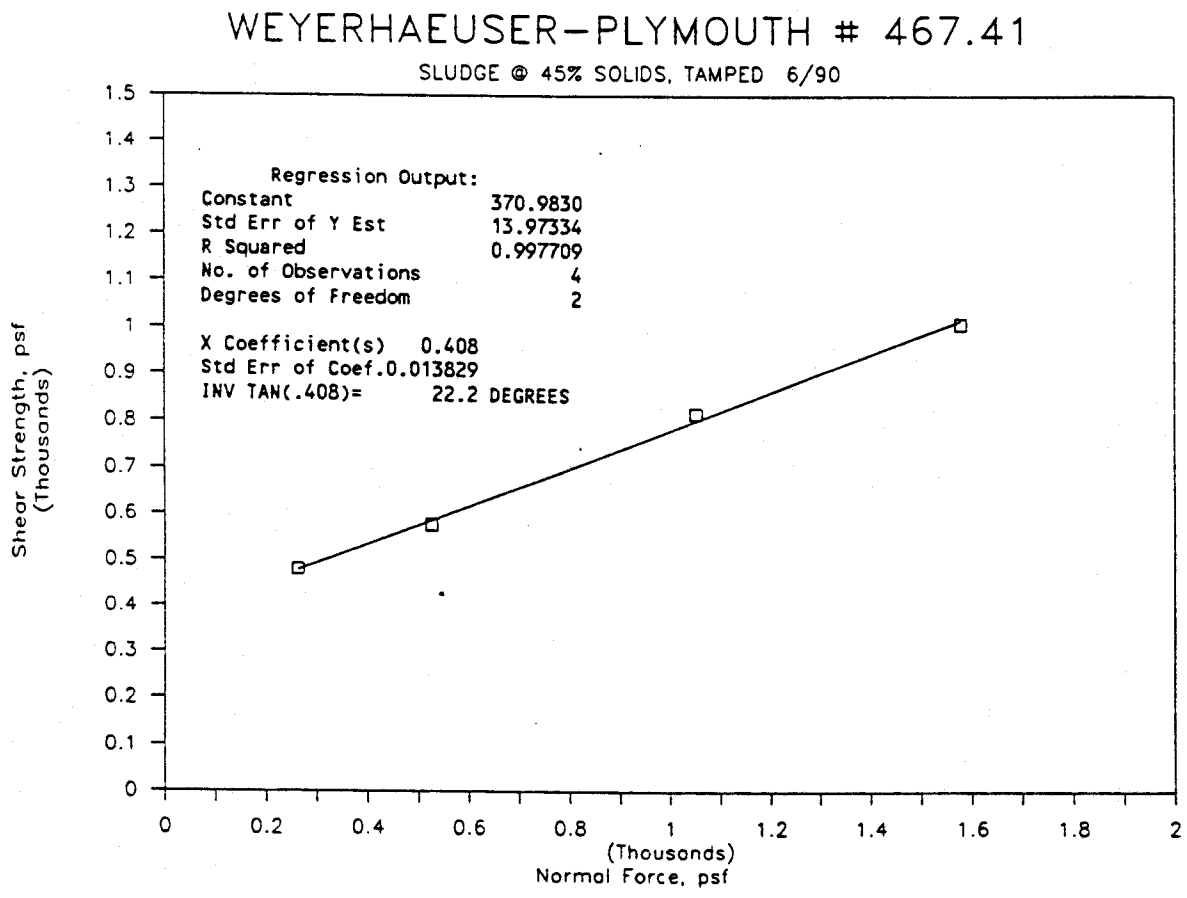
RMT, Inc.
SHEAR STRENGTH DETERMINATION
BUCKET SHEAR DEVICE

QA: DRG 6/22/90
QC: GFF 6-22-90
Tech: JPH

Project: WEYERHAEUSER-PLYMOUTH # 467.41 Filename: WEYSHR03.WKS
Proj. #: 467.41 Date :06/22/90
Sample: SLUDGE @ 45% SOLIDS, TAMPED 6/90

Initial Height: 5.88 in. Moisture Content: 122.0 % (initial)
Weight of Waste: 22.10 lbs 81.3 % (final)
Volume: 0.37 cu ft Shear Plate Dia.: 5.0 inches

Normal Load		Shear Strength		Consolidation	Strain	Unit Weight*		Comments
Reading (mv)	Sample (psf)	Torque (ft#)	Sample (psf)	Total (inches)	(%)	WET (pcf)	DRY (pcf)	
0	0	--	--	0	100	60.5	27.3	*No pore water release noted.
15	263	50	480	0.1	98	61.8	27.8	*No pore water release noted.
30	526	60	576	0.3	95	63.6	28.6	*No pore water release noted.
60	1052	85	816	0.5	91	66.3	29.9	*No pore water release noted.
90	1579	105	1008	0.7	88	68.8	38.0	*Pore water release noted.
	Residual	50	480					



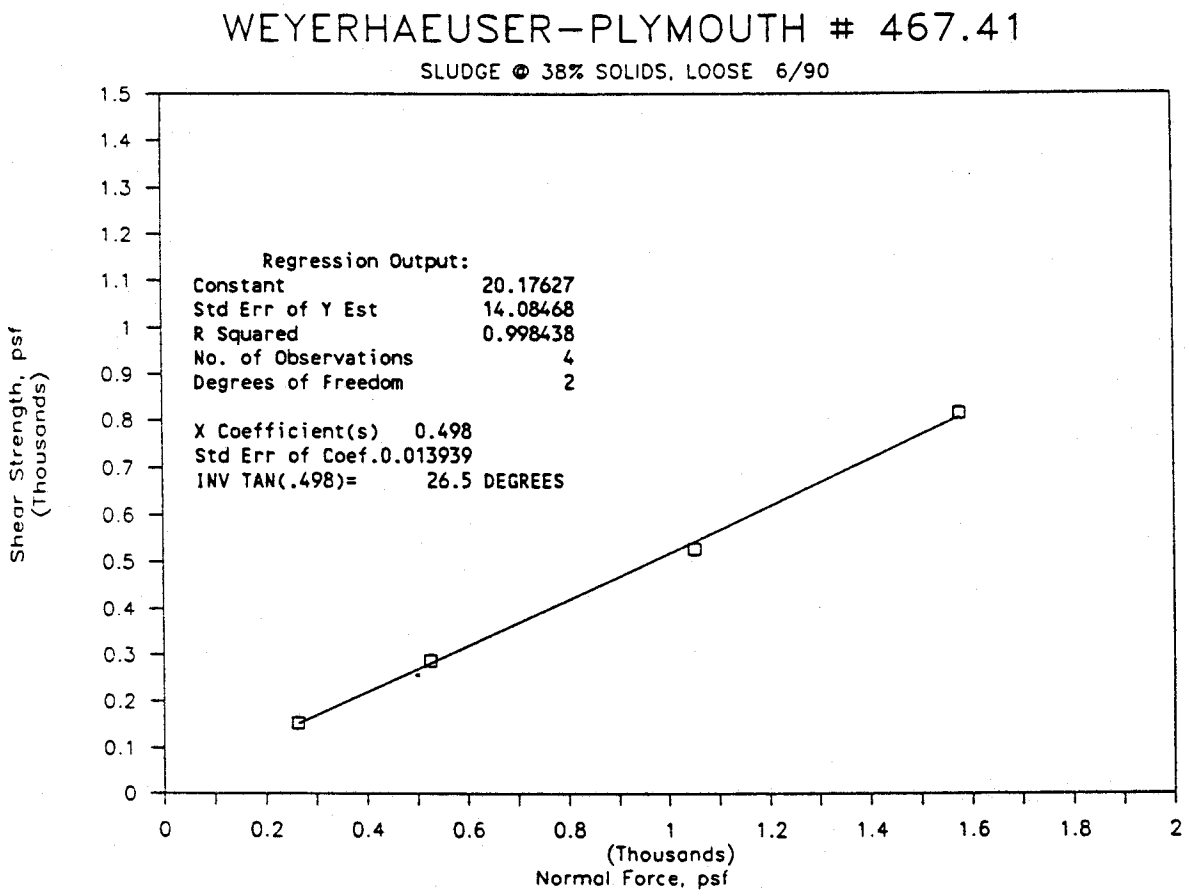
RMT, Inc.
SHEAR STRENGTH DETERMINATION
BUCKET SHEAR DEVICE

QA: DSG 6/22/90
QC: GTF 6-22-90
Tech: JPH

Project: WEYERHAEUSER-PLYMOUTH # 467.41 Filename: WEYSHR04.WKS
Proj. #: 467.41 Date :06/21/90
Sample: SLUDGE @ 38% SOLIDS, LOOSE 6/90

Initial Height: 8.75 in. Moisture Content: 163.0 % (initial)
Weight of Waste: 31.90 lbs 102.1 % (final)
Volume: 0.54 cu ft Shear Plate Dia.: 5.0 inches

Normal Load		Shear Strength		Consol-idation	Strain	Unit Weight*		Comments
Reading (mv)	Sample (psf)	Torque (ft#)	Sample (psf)	Total (inches)	(%)	WET (pcf)	DRY (pcf)	
0	0	--	--	0	100	58.7	22.3	
15	263	16	154	1.5	82	71.3	?	* Pore water release noted.
30	526	30	288	2.0	77	76.2	?	
60	1052	55	528	2.6	71	83.0	?	
90	1579	85	816	2.9	67	88.0	43.5	
	Residual	55	528					



RMT, Inc.
SHEAR STRENGTH DETERMINATION
BUCKET SHEAR DEVICE

QA: DRG 6/22/90
QC: GTF 6-22-90
Tech: JPH

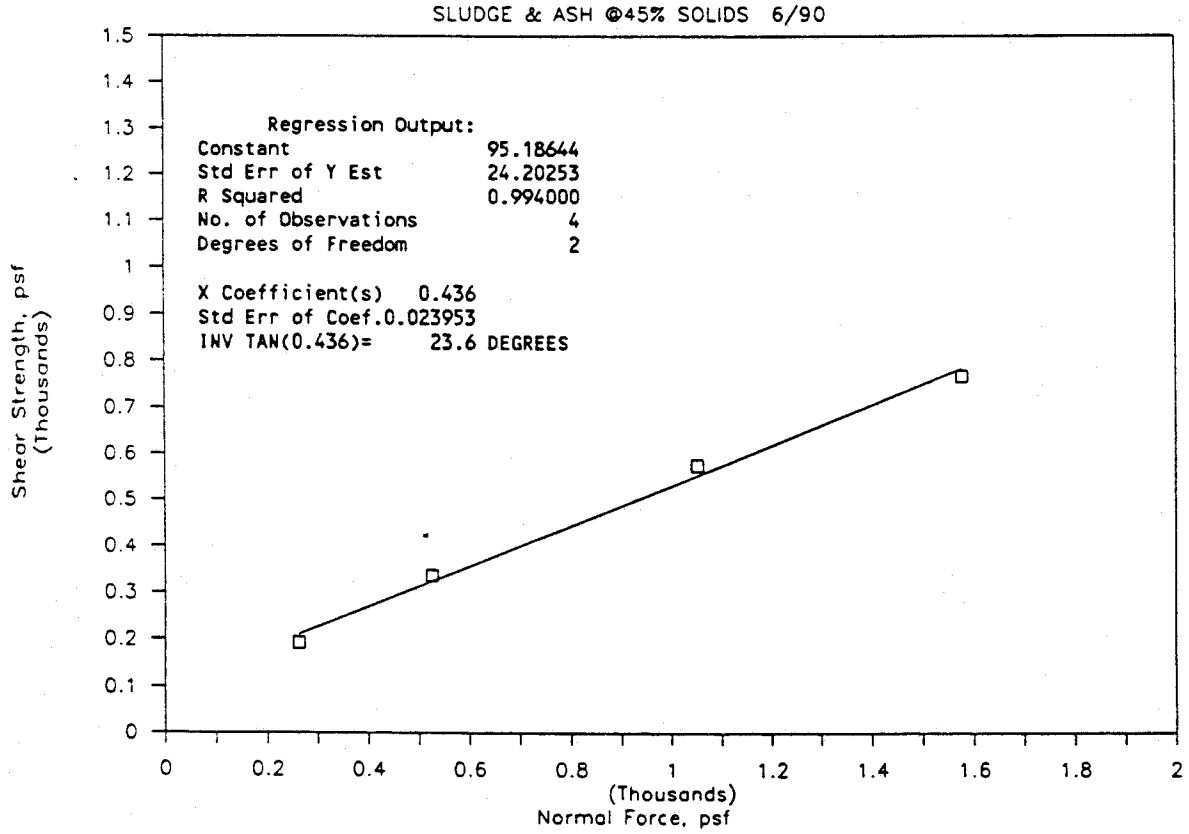
Project: WEYERHAEUSER-PLYMOUTH # 467.41 Filename: WEYSHR05.WKS
Proj. #: 467.41 Date :06/21/90
Sample: SLUDGE & ASH @45% SOLIDS 6/90

Initial Height: 7.50 in. Moisture Content: 85.8 % (initial)
Weight of Waste: 19.59 lbs 85.4 % (final)
Volume: 0.47 cu ft Shear Plate Dia.: 5.0 inches

Normal Load		Shear Strength		Consol-idation	Strain	Unit Weight*		Comments
Reading (mv)	Sample (psf)	Torque (ft#)	Sample (psf)	Total (inches)	(%)	WET (pcf)	DRY (pcf)	
0	0	--	--	0	100	42.1	22.6	
15	263	20	192	0.6	93	45.4	24.4	
30	526	35	336	0.9	88	47.8	25.7	
60	1052	60	576	1.3	83	50.5	27.2	
90	1579	80	768	1.5	80	52.4	28.2	*No pore water release noted.
	Residual	62	595					

WEYERHAEUSER—PLYMOUTH # 467.41

SLUDGE & ASH @45% SOLIDS 6/90



RMT, Inc.
SHEAR STRENGTH DETERMINATION
BUCKET SHEAR DEVICE

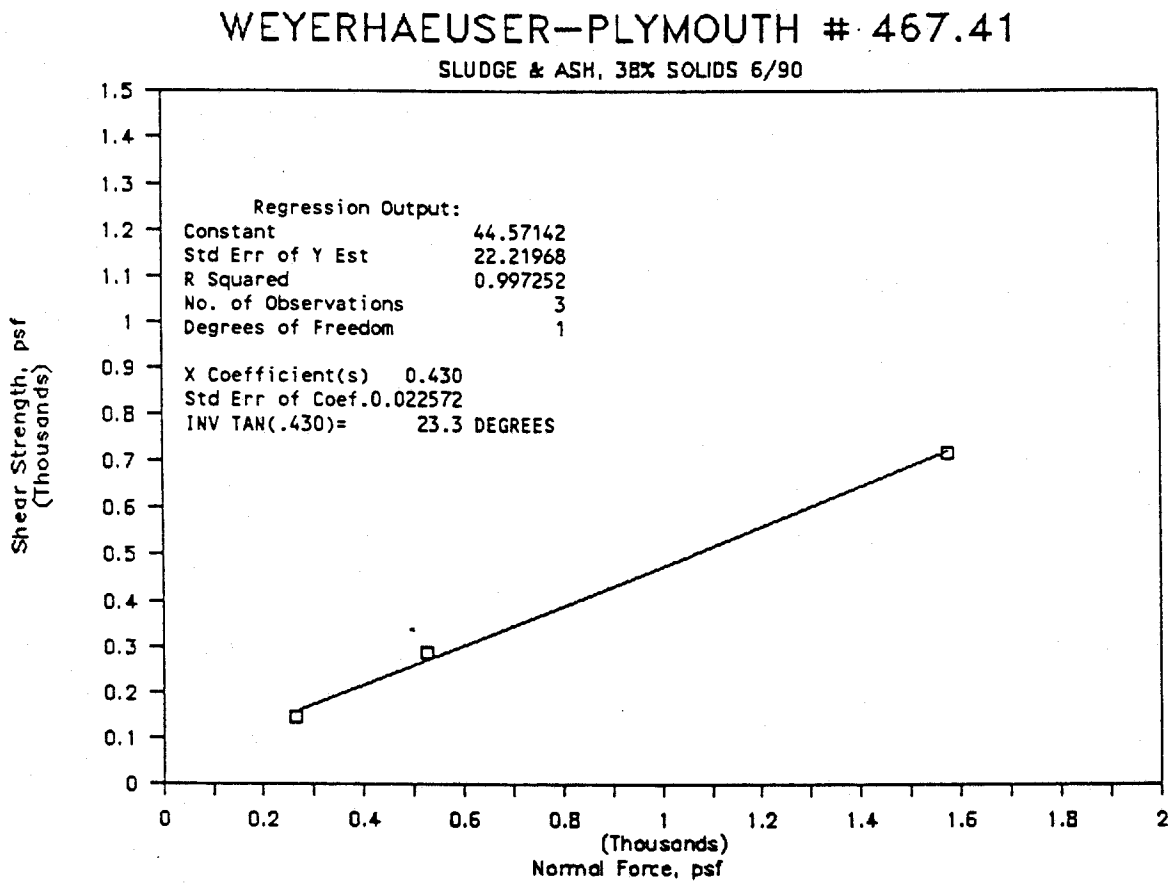
QA: 6-22-90
QC: GTF 6-22-90

Tech: G.FRIES

Project: WEYERHAEUSER-PLYMOUTH # 467.41 Filename: WEYSHR06.WKS
Proj. #: 467.41 Date :06/22/90
Sample: SLUDGE & ASH, 38% SOLIDS 6/90

Initial Height: 8.50 in. Moisture Content: 93.6 % (initial)
Weight of Waste: 23.30 lbs 91.1 % (final)
Volume: 0.53 cu ft Shear Plate Dia.: 5.0 inches

Normal Load		Shear Strength		Consol-idation	Strain	Unit Weight*		Comments
Reading (mv)	Sample (psf)	Torque (ft#)	Sample (psf)	Total (inches)	(%)	WET (pcf)	DRY (pcf)	
0	0	--	--	0	100	44.1	22.8	
15	263	15	144	0.6	94	47.2	24.4	
30	526	30	288	1.0	88	49.9	25.8	
90	1579	75	720	1.8	79	55.8	28.8	
								*No pore water release noted.
	Residual	46	442					



RMT, Inc.
SHEAR STRENGTH DETERMINATION
BUCKET SHEAR DEVICE

QA: JRG 6/22/90
QC: GTF 6-22-90

Tech: G.FRIES

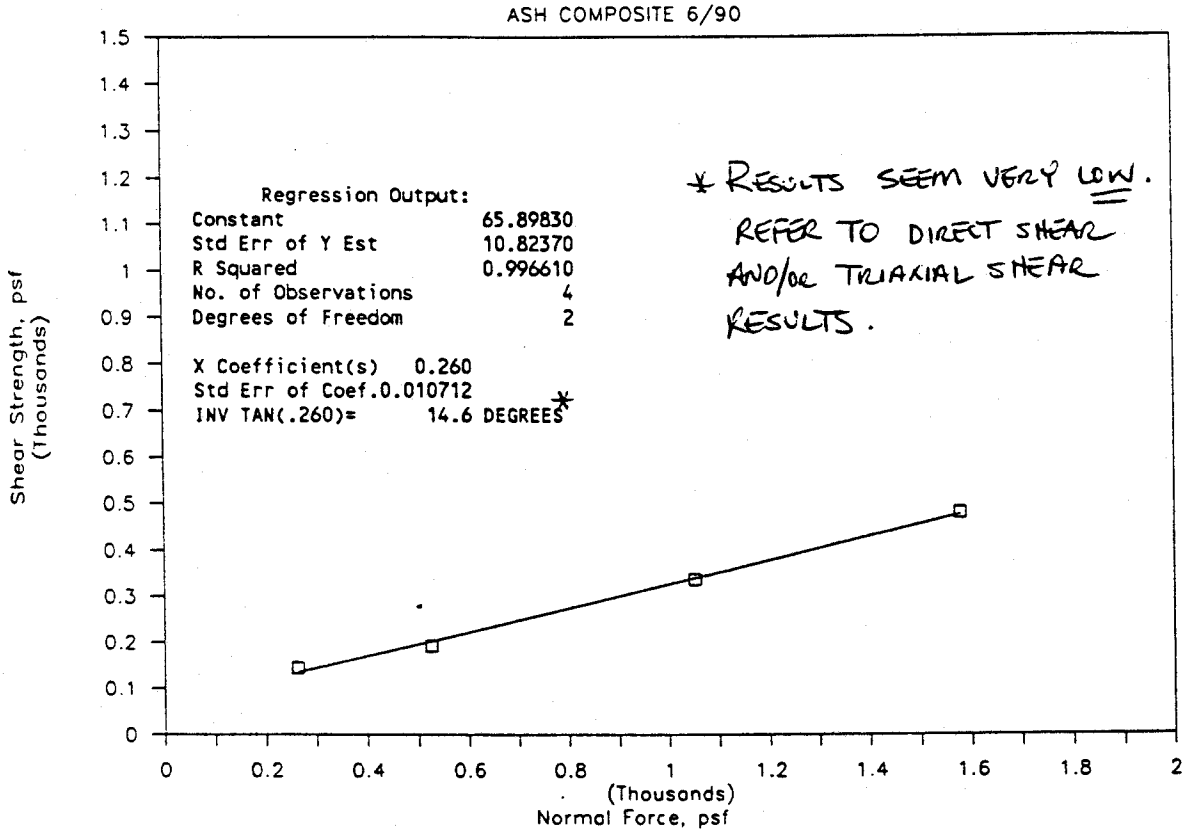
Project: WEYERHAEUSER-PLYMOUTH # 467.41 Filename: WEYSHR07.WKS
Proj. #: 467.41 Date :06/21/90
Sample: ASH COMPOSITE 6/90

Initial Height: 11.38 in. Moisture Content: 40.0 % (initial)
Weight of Waste: 26.43 lbs 40.0 % (final)
Volume: 0.71 cu ft Shear Plate Dia.: 5.0 inches

Normal Load		Shear Strength		Consolidation	Strain	Unit Weight*		Comments
Reading (mv)	Sample (psf)	Torque (ft#)	Sample (psf)	Total (inches)	(%)	WET (pcf)	DRY (pcf)	
0	0	--	--	0	100	37.4	26.7	
15	263	15	144	0.3	97	38.5	27.5	
30	526	20	192	0.6	95	39.5	28.2	
60	1052	35	336	0.9	92	40.5	28.9	
90	1579	50	480	1.1	91	41.2	29.4	*No pore water release noted.
	Residual	10	96					

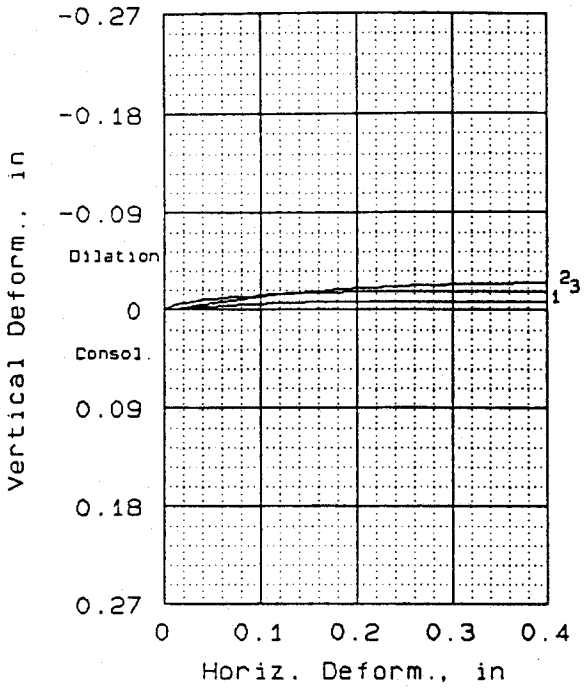
WEYERHAEUSER-PLYMOUTH # 467.41

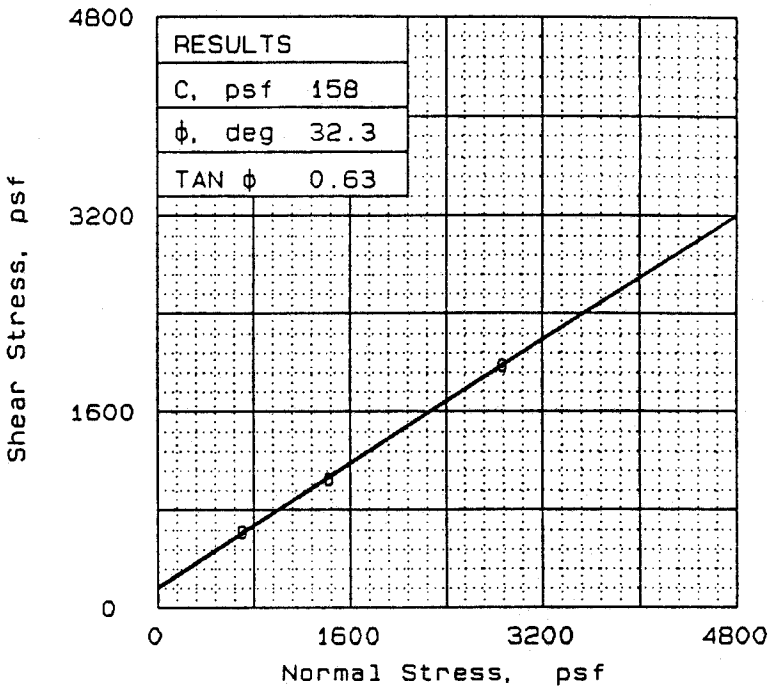
ASH COMPOSITE 6/90

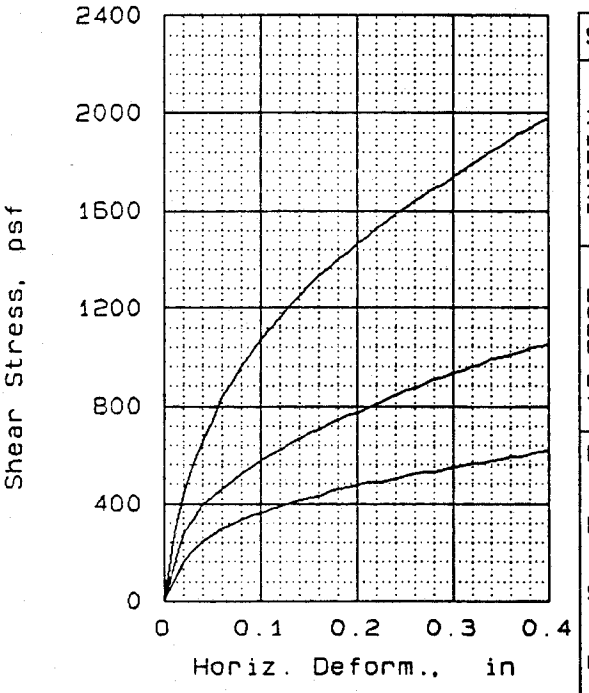


* RESULTS SEEM VERY LOW. REFER TO DIRECT SHEAR AND/OR TRIAXIAL SHEAR RESULTS.

JPL 6-26-90







SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	122.0	122.0	122.0
	DRY DENSITY, pcf	29.2	28.9	28.6
	SATURATION, %	74.0	73.0	72.2
	VOID RATIO	3.365	3.408	3.450
	SIDE LENGTH, in	4.00	4.00	4.00
	HEIGHT, in	1.03	1.04	1.05
AT TEST	WATER CONTENT, %	189.9	180.2	169.4
	DRY DENSITY, pcf	34.2	34.3	40.7
	SATURATION, %	142.1	135.5	162.0
	VOID RATIO	2.727	2.714	2.132
	SIDE LENGTH, in	4.51	4.51	4.51
	HEIGHT, in	0.88	0.88	0.74
NORMAL STRESS, psf		720	1440	2880
MAX. SHEAR, psf		621	1053	1980
STRAIN RATE, %/min.		0.100	0.100	0.100
ULT. SHEAR, psf				

SAMPLE DATA

SAMPLE TYPE:

DESCRIPTION: SLUDGE AT 45%

LL= PL= PI=

SPECIFIC GRAVITY= 2.04

REMARKS:

FIG. NO.

CLIENT: WEYERHAEUSER

PROJECT: WEYERHAEUSER

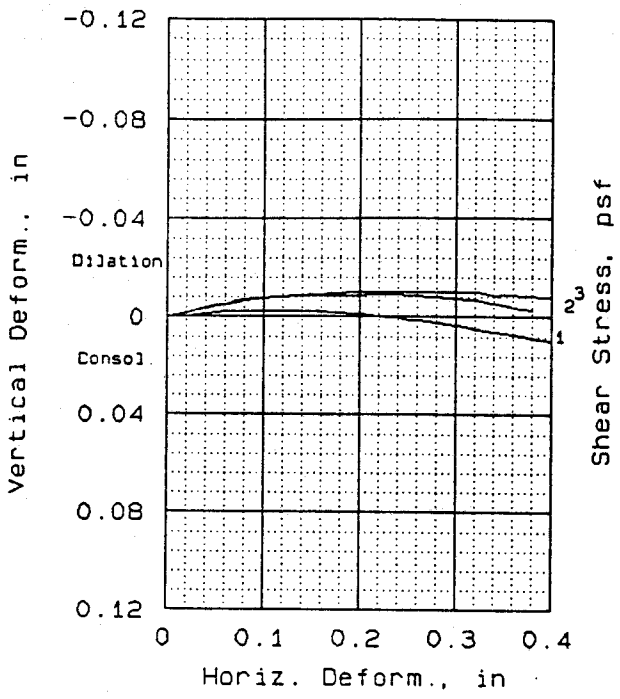
SAMPLE LOCATION: SLUDGE AT 45% SOLIDS

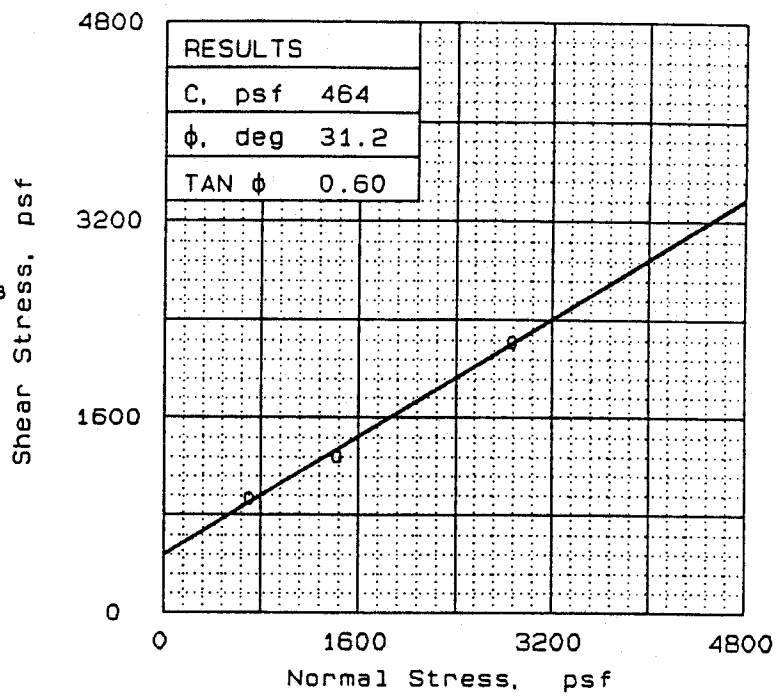
PROJ. NO.: 467.42 DATE: 6-21-90

DIRECT SHEAR TEST

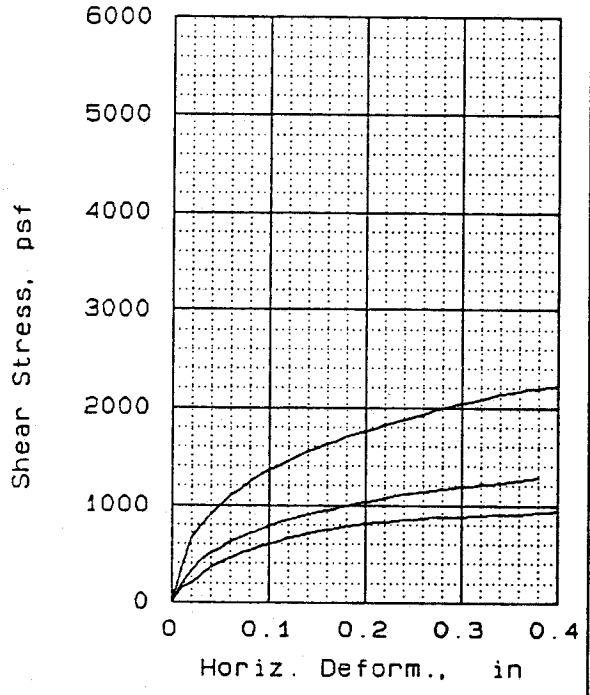
RMT, INC.

✓ JDL 6-26-90





RESULTS	
C, psf	464
ϕ, deg	31.2
TAN ϕ	0.60



	SAMPLE NO.	1	2	3
INITIAL	WATER CONTENT, %	122.2	122.0	122.0
	DRY DENSITY, pcf	25.7	27.6	28.0
	SATURATION, %	65.4	72.0	73.3
	VOID RATIO	3.307	2.998	2.946
	SIDE LENGTH, in	4.00	4.00	4.00
	HEIGHT, in	0.90	0.92	0.90
AT TEST	WATER CONTENT, %	138.5	147.2	165.7
	DRY DENSITY, pcf	33.2	32.5	38.3
	SATURATION, %	105.5	108.4	155.6
	VOID RATIO	2.323	2.402	1.885
	SIDE LENGTH, in	4.51	4.51	4.51
	HEIGHT, in	0.70	0.78	0.66
NORMAL STRESS, psf		720	1440	2880
MAX. SHEAR, psf		936	1278	2223
STRAIN RATE, %/min.		0.100	0.100	0.100
ULT. SHEAR, psf		936	1278	2223

SAMPLE DATA

SAMPLE TYPE:

DESCRIPTION: SLUDGE @45% SOLIDS
. TAMPED

LL= PL= PI=

SPECIFIC GRAVITY= 1.77

REMARKS:

FIG. NO.

CLIENT:

PROJECT: WEYERHAEUSER

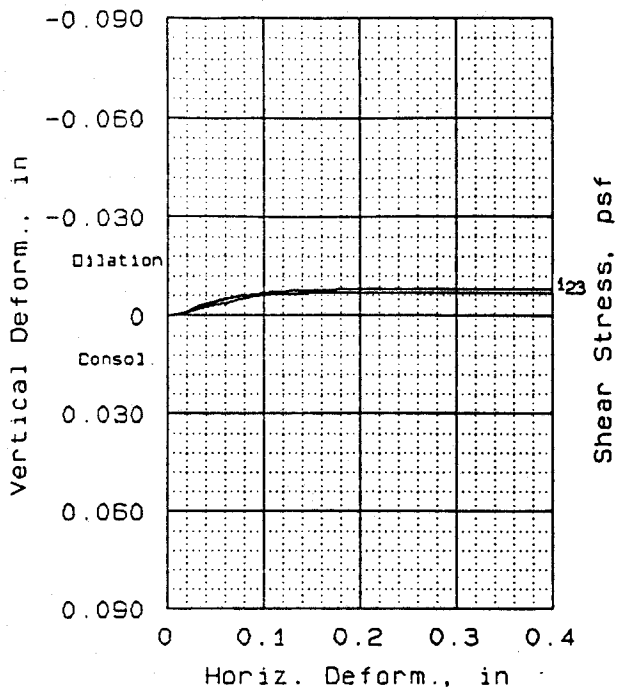
SAMPLE LOCATION:

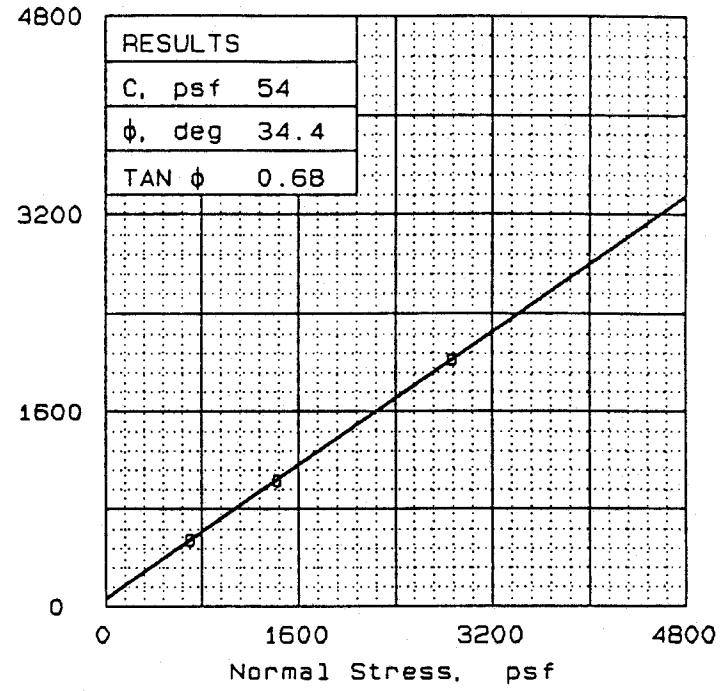
PROJ. NO.: 467.41 DATE: 6-13-90

DIRECT SHEAR TEST

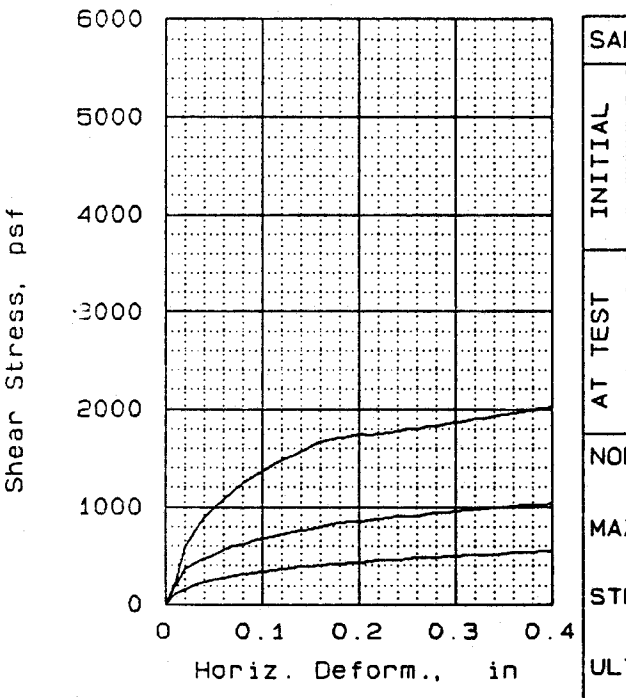
RMT, INC.

✓ JPH 6-26-90





RESULTS	
C, psf	54
ϕ, deg	34.4
TAN ϕ	0.68



SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	163.2	163.2	163.2
	DRY DENSITY, pcf	23.8	23.8	24.3
	SATURATION, %	76.4	76.5	78.5
	VOID RATIO	4.375	4.375	4.262
	SIDE LENGTH, in	4.00	4.00	4.00
	HEIGHT, in	0.95	0.95	0.93
AT TEST	WATER CONTENT, %	204.7	199.8	181.1
	DRY DENSITY, pcf	29.5	32.6	38.3
	SATURATION, %	125.6	139.9	158.7
	VOID RATIO	3.341	2.928	2.339
	SIDE LENGTH, in	4.51	4.51	4.51
	HEIGHT, in	0.77	0.69	0.59
NORMAL STRESS, psf		720	1440	2880
MAX. SHEAR, psf		549	1035	2025
STRAIN RATE, %/min.		0.100	0.100	0.100
ULT. SHEAR, psf				

SAMPLE DATA

SAMPLE TYPE:

DESCRIPTION:

LL= PL= PI=

SPECIFIC GRAVITY= 2.05

REMARKS:

FIG. NO.

CLIENT: WEYERHAEUSER

PROJECT:

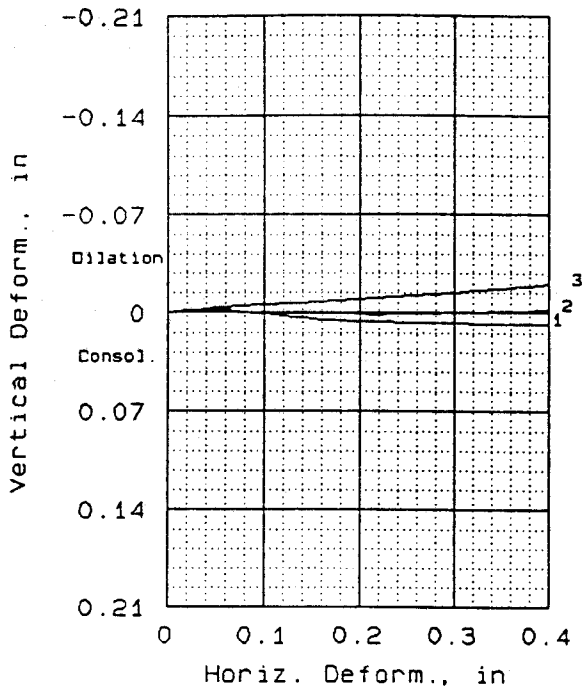
SAMPLE LOCATION: SLUDGE AT 38%

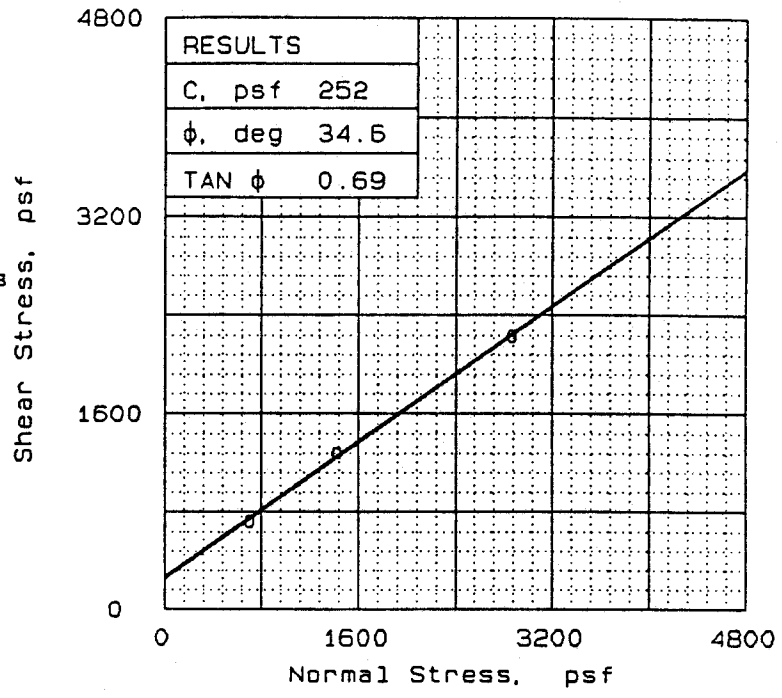
PROJ. NO.: 467.41 DATE: 6-21-90

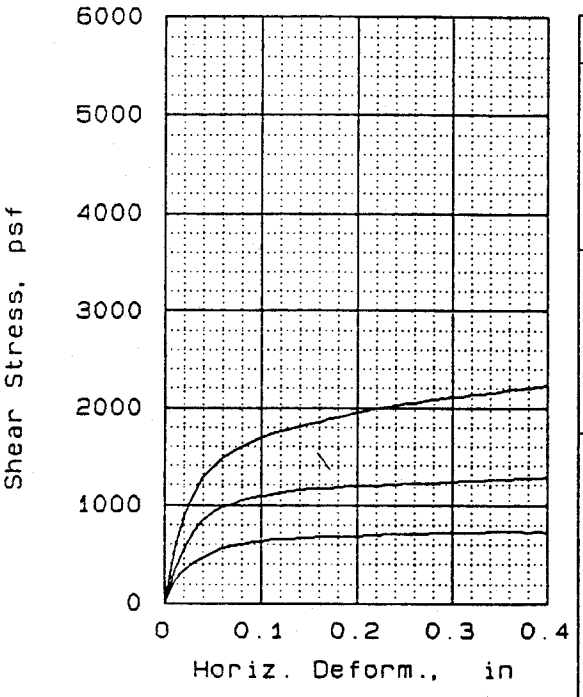
DIRECT SHEAR TEST

RMT, INC.

/ JDH 6-26-90







SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	40.0	40.0	40.0
	DRY DENSITY, pcf	33.4	34.0	34.7
	SATURATION, %	28.6	29.4	30.2
	VOID RATIO	2.967	2.889	2.811
	SIDE LENGTH, in	4.00	4.00	4.00
	HEIGHT, in	1.02	1.00	0.98
AT TEST	WATER CONTENT, %	129.5	128.7	124.0
	DRY DENSITY, pcf	34.8	34.2	34.7
	SATURATION, %	97.7	95.2	93.5
	VOID RATIO	2.808	2.866	2.811
	SIDE LENGTH, in	4.51	4.51	4.51
	HEIGHT, in	0.98	0.99	0.98
NORMAL STRESS, psf		720	1440	2880
MAX. SHEAR, psf		729	1278	2232
STRAIN RATE, %/min.		0.100	0.100	0.100
ULT. SHEAR, psf				

SAMPLE DATA

SAMPLE TYPE: DIRECT SHEAR

DESCRIPTION: ASH

LL= PL= PI=

SPECIFIC GRAVITY= 2.12

REMARKS:

FIG. NO.

CLIENT: WEYERHAEUSER

PROJECT: WEYERHAEUSER

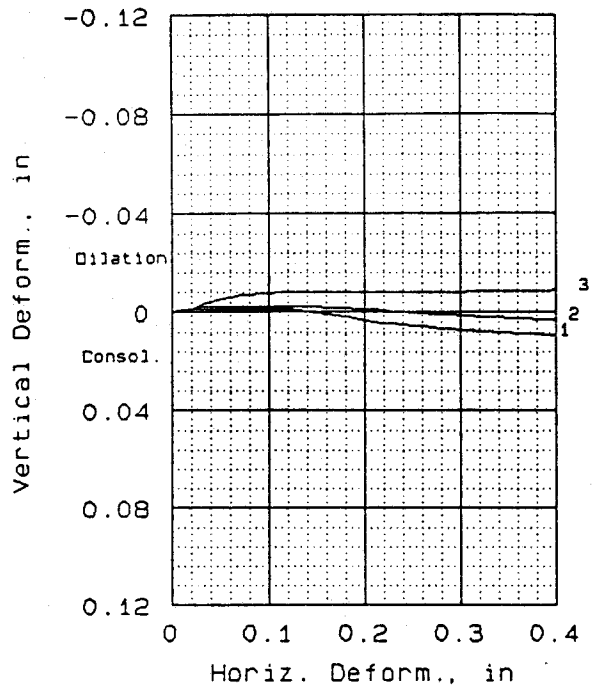
SAMPLE LOCATION:

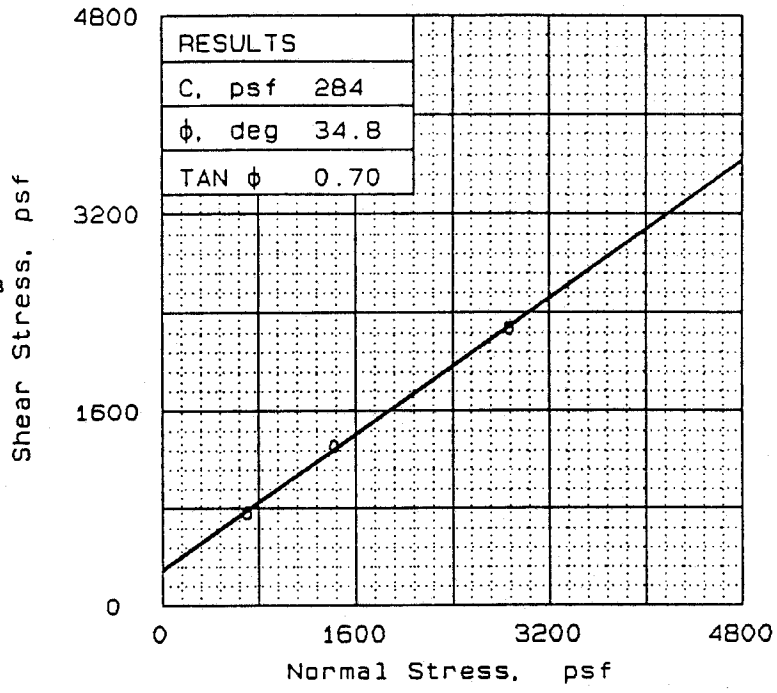
PROJ. NO.: 467.41 DATE: 6-21-90

DIRECT SHEAR TEST

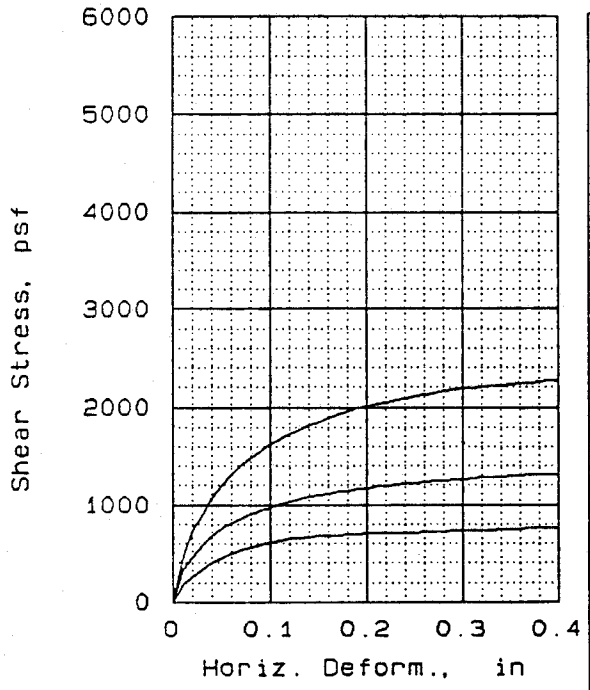
RMT, INC.

✓ JPK 6-26-90





RESULTS	
C, psf	284
ϕ, deg	34.8
TAN ϕ	0.70



SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	92.4	92.4	92.4
	DRY DENSITY, pcf	35.1	36.2	36.2
	SATURATION, %	71.7	74.9	74.9
	VOID RATIO	2.630	2.518	2.518
	SIDE LENGTH, in	4.00	4.00	4.00
	HEIGHT, in	0.97	0.94	0.94
AT TEST	WATER CONTENT, %	121.5	121.8	118.8
	DRY DENSITY, pcf	36.3	38.2	39.5
	SATURATION, %	98.6	106.4	109.0
	VOID RATIO	2.513	2.335	2.224
	SIDE LENGTH, in	4.51	4.51	4.51
	HEIGHT, in	0.94	0.89	0.86
NORMAL STRESS, psf		720	1440	2880
MAX. SHEAR, psf		765	1314	2277
STRAIN RATE, %/min.		0.100	0.100	0.100
ULT. SHEAR, psf				

SAMPLE DATA

SAMPLE TYPE:

DESCRIPTION: SLUDGE @38% SOLIDS
. & ASH COMPOSITE

LL= PL= PI=

SPECIFIC GRAVITY= 2.04

REMARKS:

FIG. NO.

CLIENT:

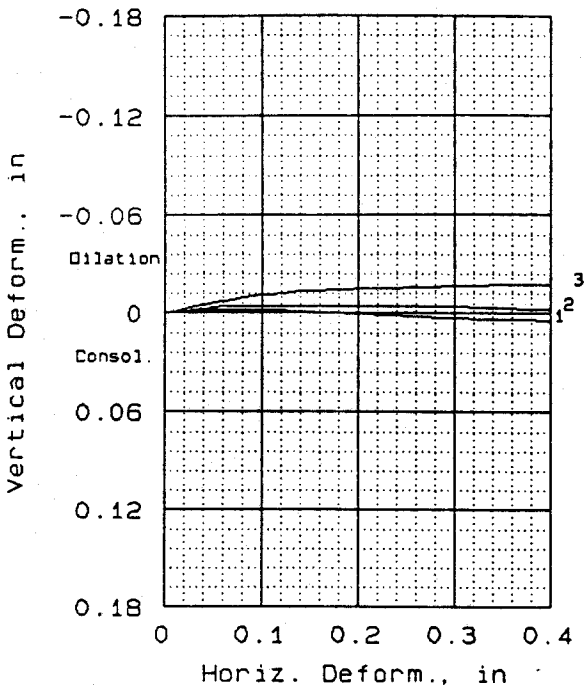
PROJECT: WEYERHAEUSER

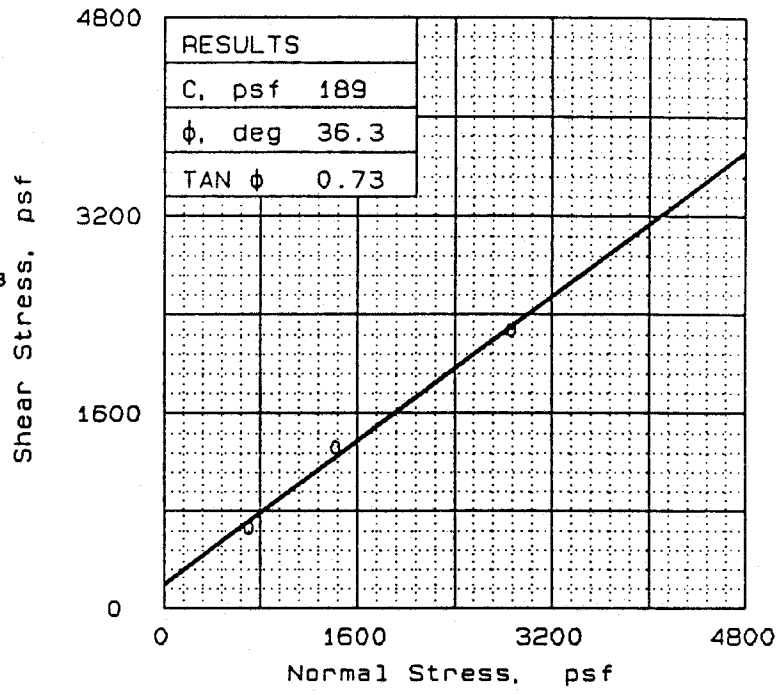
SAMPLE LOCATION:

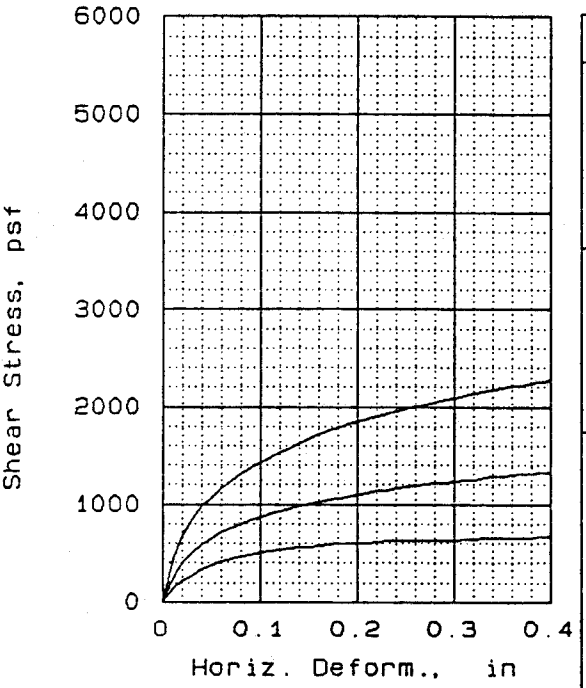
PROJ. NO.: 467.41 DATE: 6-25-90

DIRECT SHEAR TEST

RMT, INC.







SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	85.6	85.6	85.6
	DRY DENSITY, pcf	34.0	34.0	34.0
	SATURATION, %	63.7	63.7	63.7
	VOID RATIO	2.742	2.742	2.742
	SIDE LENGTH, in	4.00	4.00	4.00
	HEIGHT, in	1.00	1.00	1.00
AT TEST	WATER CONTENT, %	128.6	122.0	121.0
	DRY DENSITY, pcf	35.9	35.9	37.3
	SATURATION, %	102.9	97.6	102.2
	VOID RATIO	2.550	2.549	2.415
	SIDE LENGTH, in	4.51	4.51	4.51
	HEIGHT, in	0.95	0.95	0.91
NORMAL STRESS, psf		720	1440	2880
MAX. SHEAR, psf		666	1323	2277
STRAIN RATE, %/min.		0.100	0.100	0.100
ULT. SHEAR, psf				

SAMPLE DATA

SAMPLE TYPE:

DESCRIPTION: SLUDGE @45% SOLIDS & ASH, COMPOSITE

LL= PL= PI=

SPECIFIC GRAVITY= 2.04

REMARKS:

FIG. NO.

CLIENT: WEYERHAEUSER

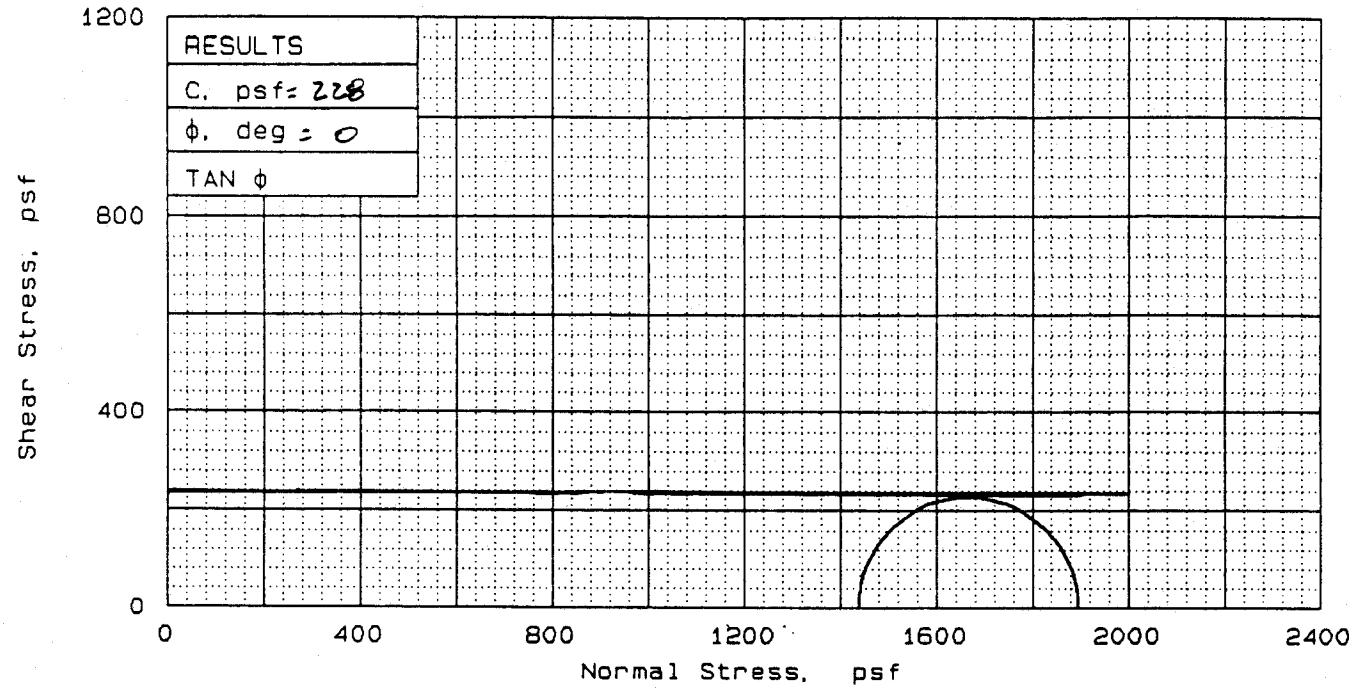
PROJECT: WEYERHAEUSER

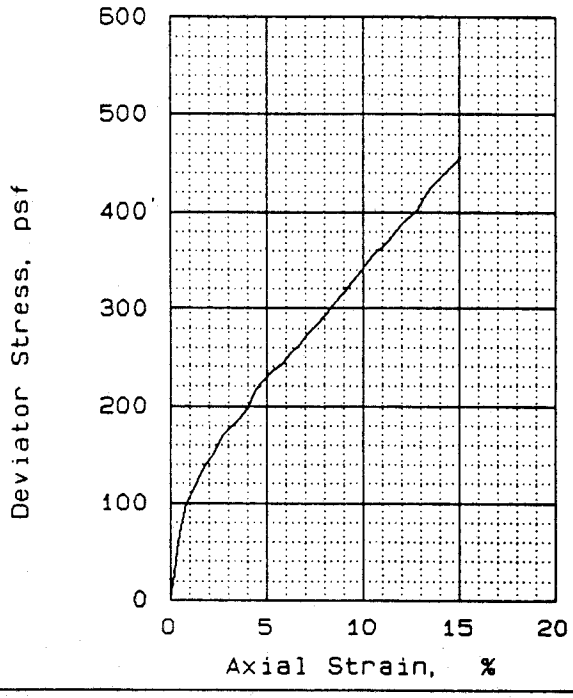
SAMPLE LOCATION:

PROJ. NO.: 467.41 DATE: 6-22-90

DIRECT SHEAR TEST

RMT, INC.





SAMPLE NO.		1
INITIAL	WATER CONTENT, %	163.0
	DRY DENSITY, pcf	27.4
	SATURATION, %	95.0
	VOID RATIO	3.038
	DIAMETER, in	2.87
	HEIGHT, in	6.58
AT TEST	WATER CONTENT, %	174.4
	DRY DENSITY, pcf	27.4
	SATURATION, %	101.6
	VOID RATIO	3.038
	DIAMETER, in	2.87
	HEIGHT, in	6.58
BACK PRESSURE, psf		0
CELL PRESSURE, psf		1440
FAILURE STRESS, psf		456
PORE PRESSURE, psf		
STRAIN RATE, %/min.		1.000
ULTIMATE STRESS, psf		
PORE PRESSURE, psf		
σ_1 FAILURE, psf		1896
σ_3 FAILURE, psf		1440

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE:
DESCRIPTION: SLUDGE @38% SOLIDS
TAMPED
LL= PL= PI=
SPECIFIC GRAVITY= 1.77
REMARKS:

FIG. NO.

CLIENT:

PROJECT: WEYERHAEUSER

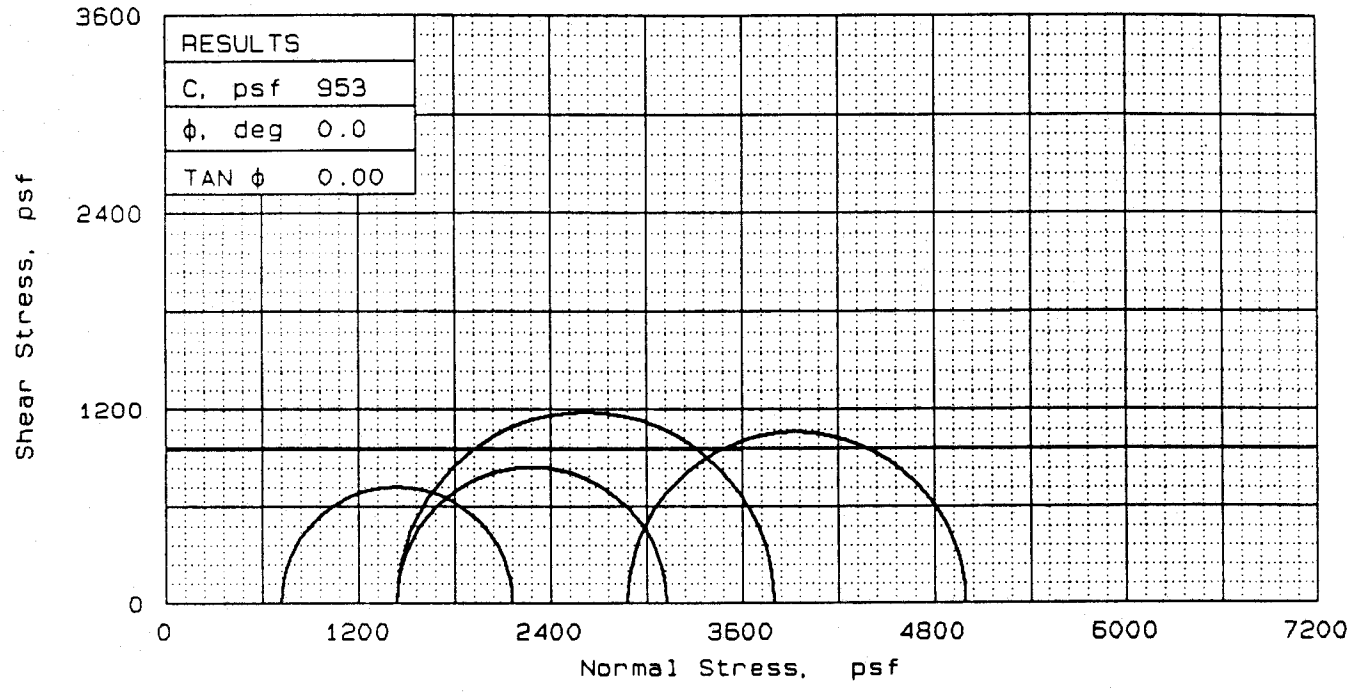
SAMPLE LOCATION:

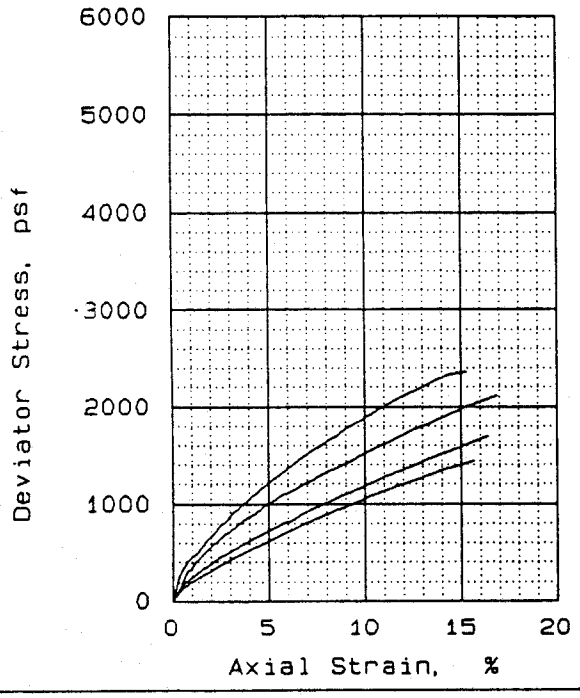
PROJ. NO.: 467.41 DATE: 6-6-90

TRIAXIAL COMPRESSION TEST

RMT, INC.

✓ JDH 6-27-10





SAMPLE NO.		1	2	3	4
INITIAL	WATER CONTENT, %	122.0	122.0	122.0	122.2
	DRY DENSITY, pcf	32.4	32.6	31.9	28.3
	SATURATION, %	89.6	90.2	87.7	74.4
	VOID RATIO	2.411	2.394	2.462	2.908
	DIAMETER, in	2.87	2.87	2.87	2.87
	HEIGHT, in	6.65	6.65	6.75	6.50
AT TEST	WATER CONTENT, %	129.8	131.5	128.4	120.8
	DRY DENSITY, pcf	32.4	32.6	31.9	28.3
	SATURATION, %	95.3	97.2	92.3	73.5
	VOID RATIO	2.411	2.394	2.462	2.908
	DIAMETER, in	2.87	2.87	2.87	2.87
	HEIGHT, in	6.65	6.65	6.75	6.50
BACK PRESSURE, psf		0	0	0	0
CELL PRESSURE, psf		720	1440	2880	1440
FAILURE STRESS, psf		1442	1688	2116	2362
PORE PRESSURE, psf					
STRAIN RATE, %/min.		1.000	1.000	1.000	1.000
ULTIMATE STRESS, psf					
PORE PRESSURE, psf					
σ_1 FAILURE, psf		2162	3128	4996	3802
σ_3 FAILURE, psf		720	1440	2880	1440

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE:
DESCRIPTION: SLUDGE @45% SOLIDS
TAMPED
LL= PL= PI=
SPECIFIC GRAVITY= 1.77
REMARKS:

FIG. NO.

CLIENT:

PROJECT: WEYERHAEUSER

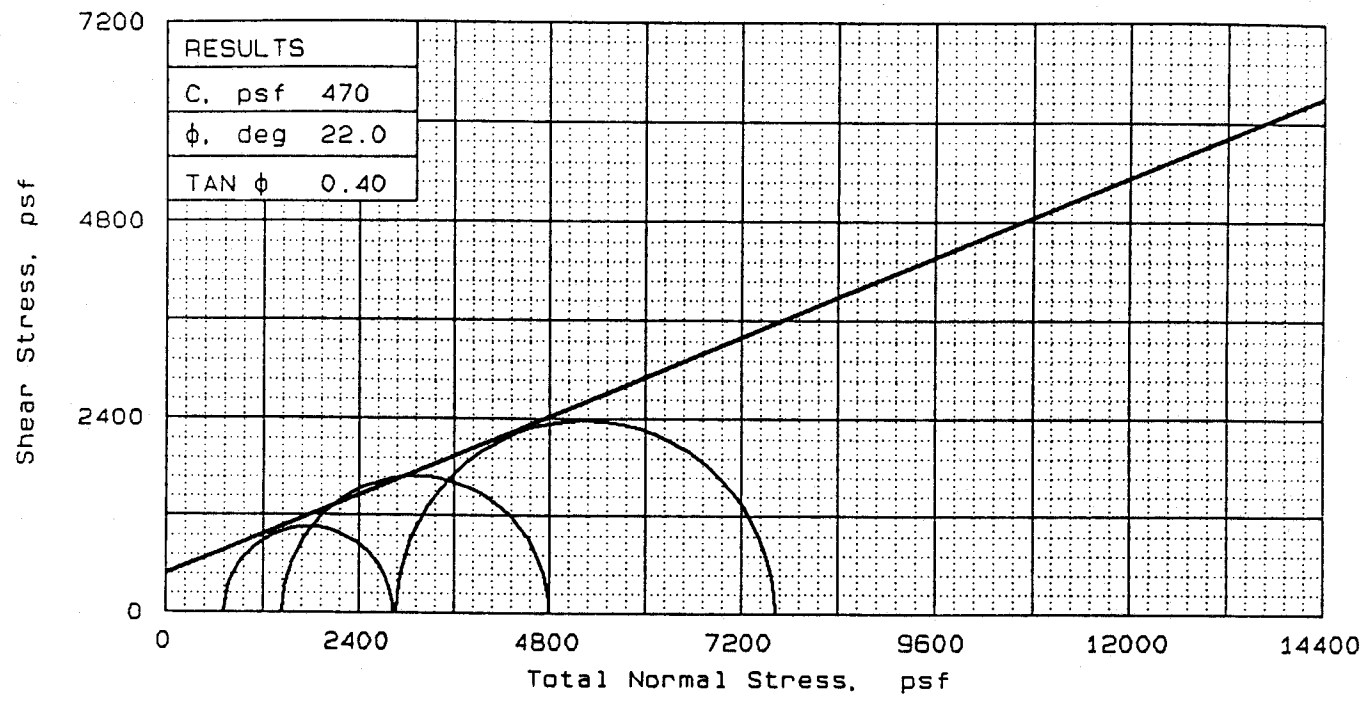
SAMPLE LOCATION:

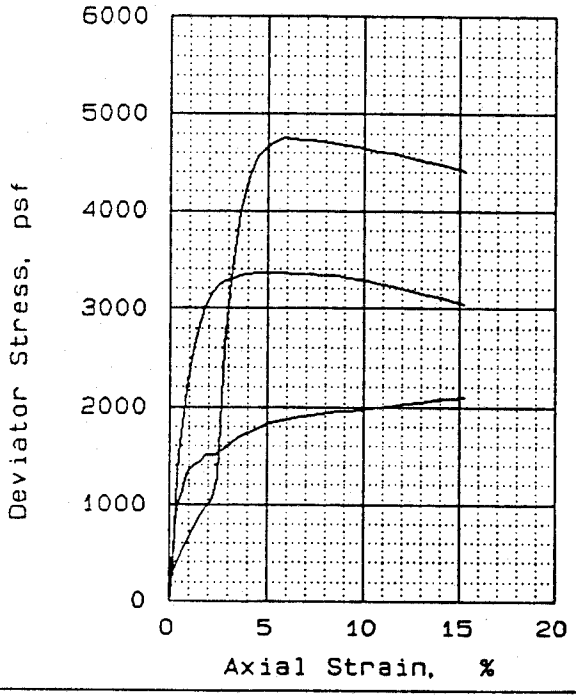
PROJ. NO.: 467.41 DATE: 6-8-90

TRIAXIAL COMPRESSION TEST

RMT, INC.

✓ JPK 6-26-90 6-26-90





SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	53.0	64.3	55.1
	DRY DENSITY, pcf	34.4	33.1	33.3
	SATURATION, %	39.4	45.4	39.2
	VOID RATIO	2.865	3.019	2.993
	DIAMETER, in	2.87	2.87	2.87
	HEIGHT, in	6.50	6.50	6.50
AT TEST	WATER CONTENT, %	45.3	63.0	50.5
	DRY DENSITY, pcf	67.7	56.8	64.0
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.964	1.342	1.076
	DIAMETER, in	2.05	2.19	2.07
	HEIGHT, in	6.49	6.49	6.47
BACK PRESSURE, psf		11520	10080	10080
CELL PRESSURE, psf		12240	11520	12960
FAILURE STRESS, psf		2106	3365	4752
PORE PRESSURE, psf		11635	10814	11938
STRAIN RATE, %/min.		1.000	1.000	1.000
ULTIMATE STRESS, psf				
PORE PRESSURE, psf				
$\bar{\sigma}_1$ FAILURE, psf		2711	4070	5774
$\bar{\sigma}_3$ FAILURE, psf		605	706	1022

TYPE OF TEST:
CU with pore pressures
SAMPLE TYPE:
DESCRIPTION: ASH

LL= PL= PI=
SPECIFIC GRAVITY= 2.13
REMARKS:

FIG. NO.

CLIENT: WEYERHAEUSER

PROJECT: WEYERHAEUSER

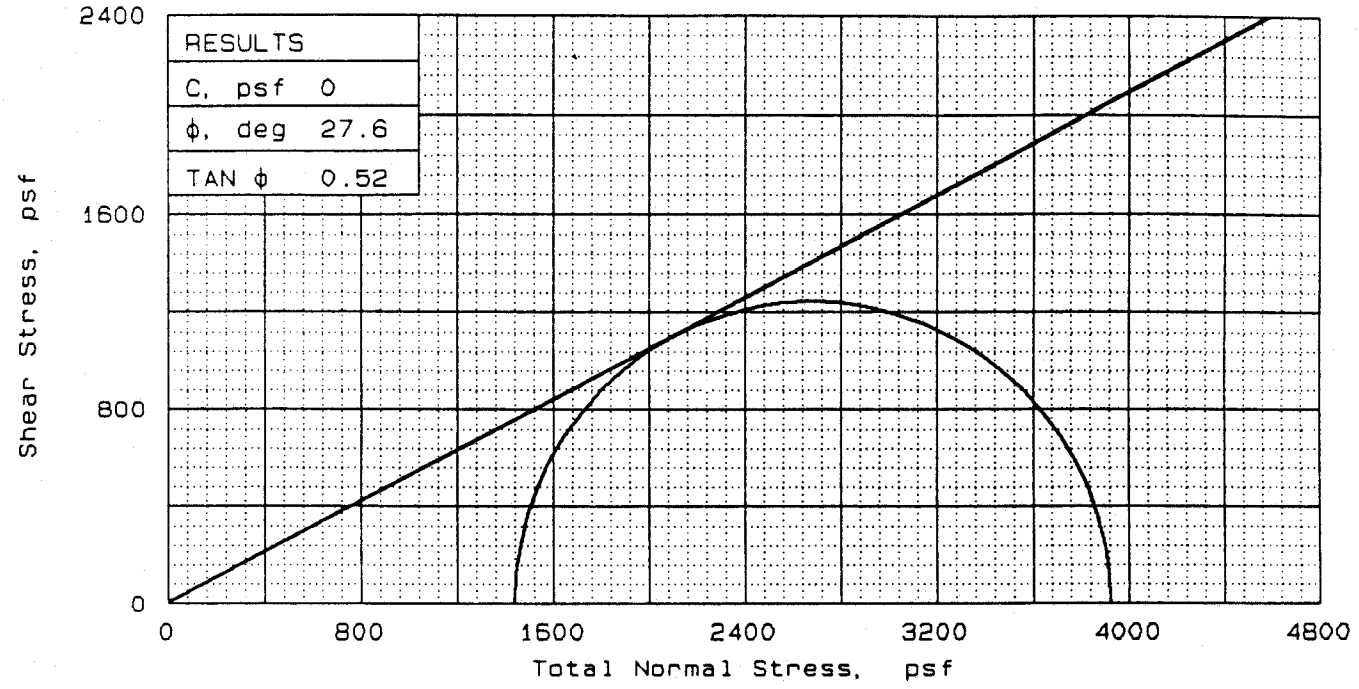
SAMPLE LOCATION:

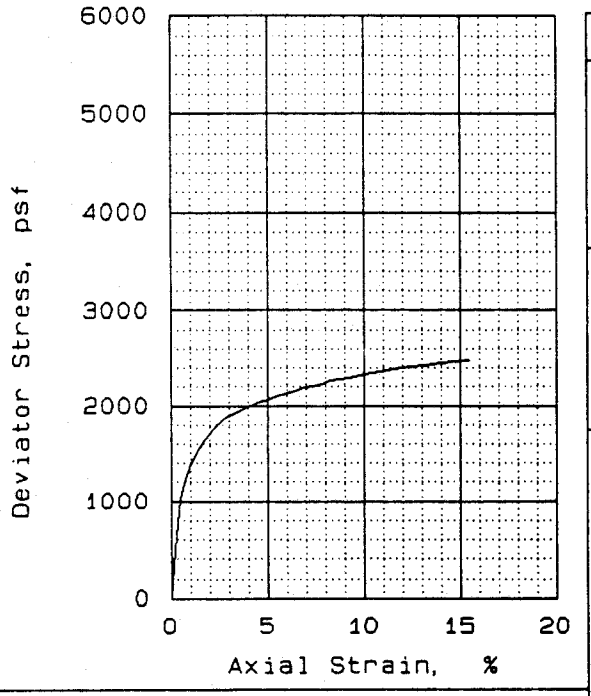
PROJ. NO.: 467.41 DATE: 06/26/90

TRIAXIAL COMPRESSION TEST

RMT, INC.

JJH 6-27-90





SAMPLE NO.		1
INITIAL	WATER CONTENT, %	88.9
	DRY DENSITY, pcf	34.6
	SATURATION, %	67.5
	VOID RATIO	2.686
	DIAMETER, in	2.87
	HEIGHT, in	6.50
AT TEST	WATER CONTENT, %	76.9
	DRY DENSITY, pcf	49.6
	SATURATION, %	100.0
	VOID RATIO	1.569
	DIAMETER, in	2.41
	HEIGHT, in	6.40
BACK PRESSURE, psf		8640
CELL PRESSURE, psf		10080
FAILURE STRESS, psf		2484
PORE PRESSURE, psf		9677
STRAIN RATE, %/min.		1.000
ULTIMATE STRESS, psf		
PORE PRESSURE, psf		
$\bar{\sigma}_1$ FAILURE, psf		2888
$\bar{\sigma}_3$ FAILURE, psf		403

TYPE OF TEST:
CU with pore pressures
SAMPLE TYPE:
DESCRIPTION: SLUDGE 38% SOLIDS & ASH
LL= PL= PI=
SPECIFIC GRAVITY= 2.04
REMARKS:

FIG. NO.

CLIENT: WEYERHAEUSER

PROJECT: WEYERHAEUSER

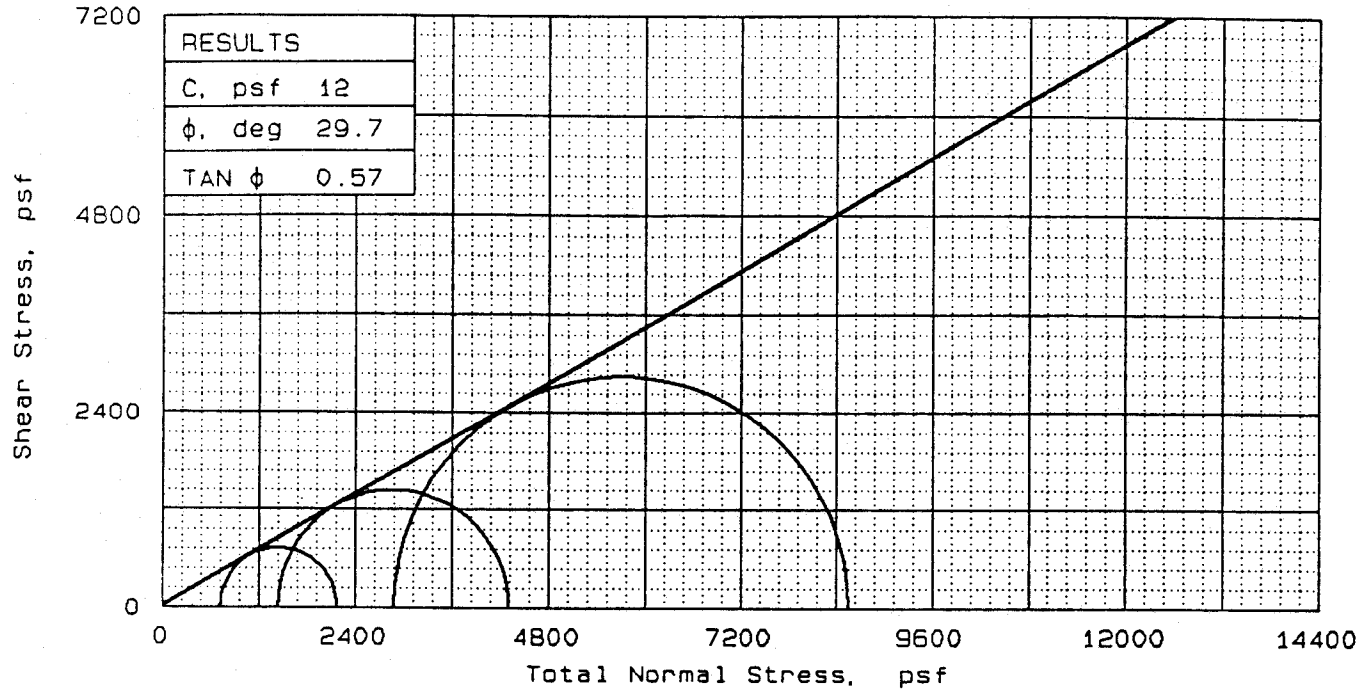
SAMPLE LOCATION:

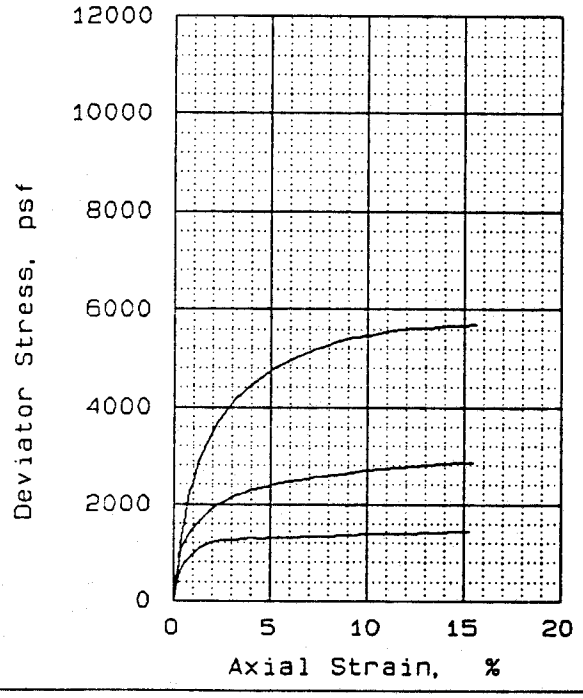
PROJ. NO.: 467.41 DATE: 6-26-90

TRIAXIAL COMPRESSION TEST

RMT, INC.

✓ JPH 6-26-90 6-26-90





SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	82.4	84.7	83.1
	DRY DENSITY, pcf	34.5	34.2	35.6
	SATURATION, %	62.4	63.3	65.8
	VOID RATIO	2.694	2.728	2.576
	DIAMETER, in	2.87	2.87	2.87
	HEIGHT, in	6.50	6.50	6.50
AT TEST	WATER CONTENT, %	77.5	83.9	73.6
	DRY DENSITY, pcf	49.3	47.0	50.9
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	1.581	1.712	1.502
	DIAMETER, in	2.41	2.45	2.43
	HEIGHT, in	6.42	6.47	6.36
BACK PRESSURE, psf		10080	10080	10080
CELL PRESSURE, psf		11520	10800	12960
FAILURE STRESS, psf		2869	1450	5685
PORE PRESSURE, psf		11218	10526	12125
STRAIN RATE, %/min.		1.000	1.000	1.000
ULTIMATE STRESS, psf				
PORE PRESSURE, psf				
$\bar{\sigma}_1$ FAILURE, psf		3172	1724	6521
$\bar{\sigma}_3$ FAILURE, psf		302	274	835

TYPE OF TEST:
CU with pore pressures
SAMPLE TYPE:
DESCRIPTION: SLUDGE @45% SOLIDS & ASH COMPOSITE
LL= PL= PI=
SPECIFIC GRAVITY= 2.04
REMARKS:

FIG. NO.

CLIENT: WEYERHAEUSER

PROJECT: WEYERHAEUSER

SAMPLE LOCATION:

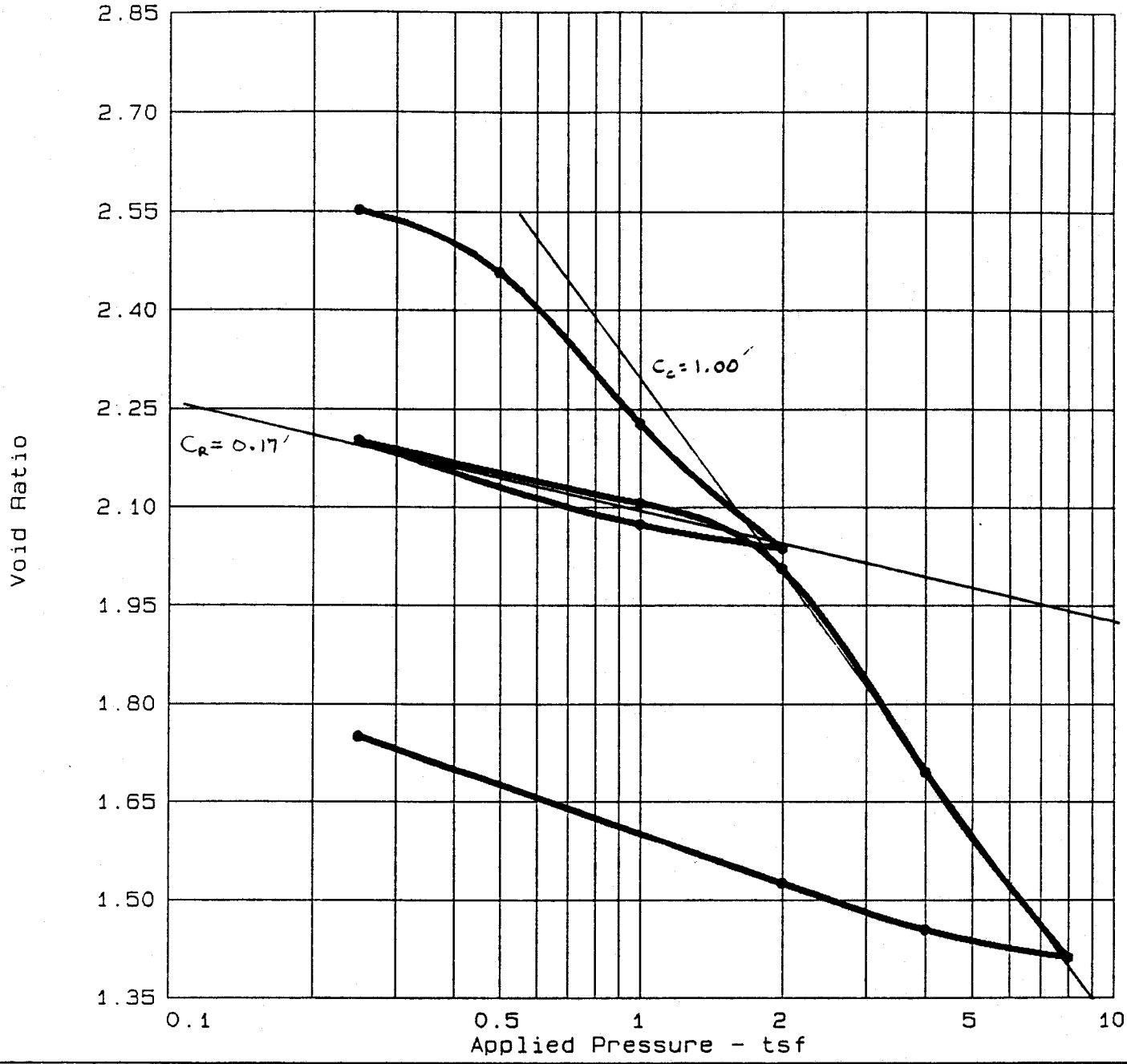
PROJ. NO.: 467.41 DATE: 6-22-90

TRIAXIAL COMPRESSION TEST

RMT, INC.

✓ JPH 6-20-90

CONSOLIDATION TEST REPORT



Swell press.	Nat. Sat.	Nat. Moist.	Dry Density	LL	PI	Sp.Gr.	Initial void ratio
	85.5 %	130.3	29.9			1.77	2.6972

TEST RESULTS

$CR = \frac{C_c}{1+e_o} = \frac{1.0}{1+2.7} = 0.27$

MATERIAL DESCRIPTION

SLUDGE @45% SOLIDS, TAMPED

Project No.: 467.41
Project: WEYERHAEUSER
Location: SLUDGE @45% SOLIDS, TAMPED

Date: 6-13-90

Remarks:

CONSOLIDATION TEST REPORT

RMT, INC.

Fig. No. _____

✓ JPH 6-20-90

15:43, 6-20-1990 CONSOLIDATION TEST PROJECT DATA Test No. 18

Project Number: 467.41
Project: WEYERHAEUSER
Date: 6-13-90
Location 1: SLUDGE @45% SOLIDS, TAMPED
2:
Remarks 1:
2:
3:
4:
5:
Material 1: SLUDGE @45% SOLIDS,
description 2: TAMPED
Classification:
Liquid limit:
Plasticity index:
Figure Number:

CONSOLIDATION TEST SPECIMEN DATA

TOTAL SAMPLE		BEFORE TEST		AFTER TEST	
Wet w+t	= 88.67 g.	Oedometer No.	= 1	Wet w+t	= 300.57 g.
Dry w+t	= 38.51 g	Machine No.	= N/A	Dry w+t	= 261.38 g.
Tare wt.	= 0.00 g.	Spec. Gravity	= 1.77	Tare wt.	= 222.87 g.
Height	= 1.00 in.	Height	= 1.00 in.		
Diameter	= 2.50 in.	Diameter	= 2.50 in.		
Weight	= 88.67 g.				
Moisture	= % 130.3 %	Ht. Solids	= 0.27 in.	Moisture	= 101. %
Wet Den.	= 68.8 pcf	Dry wt.	= 38.51 g.	Dry wt.	= 38.51 g. *
Dry Den.	= 29.9 pcf	Void ratio	= 2.6972	Void ratio	= 1.7496
		Saturation	= 85.5 %	Saturation	= 103. %

* Final dry weight used in calculations

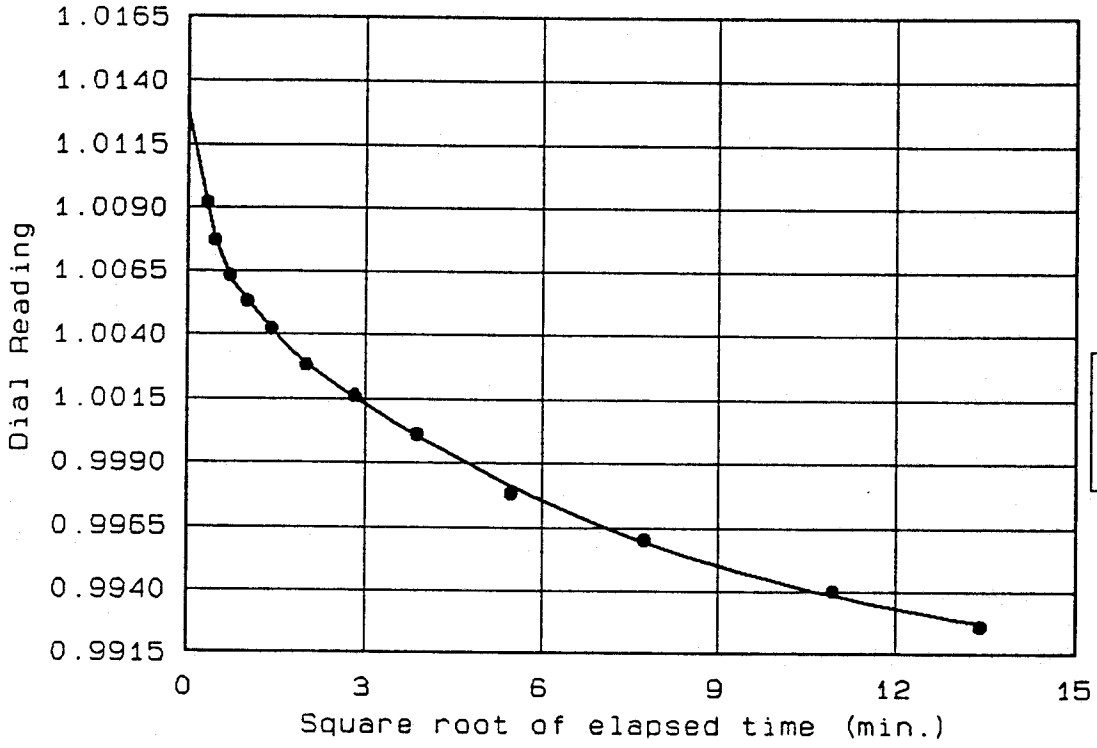
CONSOLIDATION TEST READINGS SUMMARY

LOAD (tsf)	DIAL (in.)	DEFLECTION (in.)	CORRECTED DIAL (in.)	VOID RATIO	% SWELL/CONSOL.
Initial	1.03200			2.6972	
0.25	0.99260	0.0000	0.99260	2.5515	3.9 Consol.
0.50	0.96710	0.0000	0.96710	2.4572	6.5 Consol.
1.00	0.90480	0.0000	0.90480	2.2269	12.7 Consol.
2.00	0.85340	0.0000	0.85340	2.0369	17.9 Consol.
1.00	0.86320	0.0000	0.86320	2.0731	16.9 Consol.
0.25	0.89790	0.0000	0.89790	2.2014	13.4 Consol.
1.00	0.87200	0.0000	0.87200	2.1056	16.0 Consol.
2.00	0.84500	0.0000	0.84500	2.0058	18.7 Consol.
4.00	0.76090	0.0000	0.76090	1.6949	27.1 Consol.

Dial Reading vs. Time

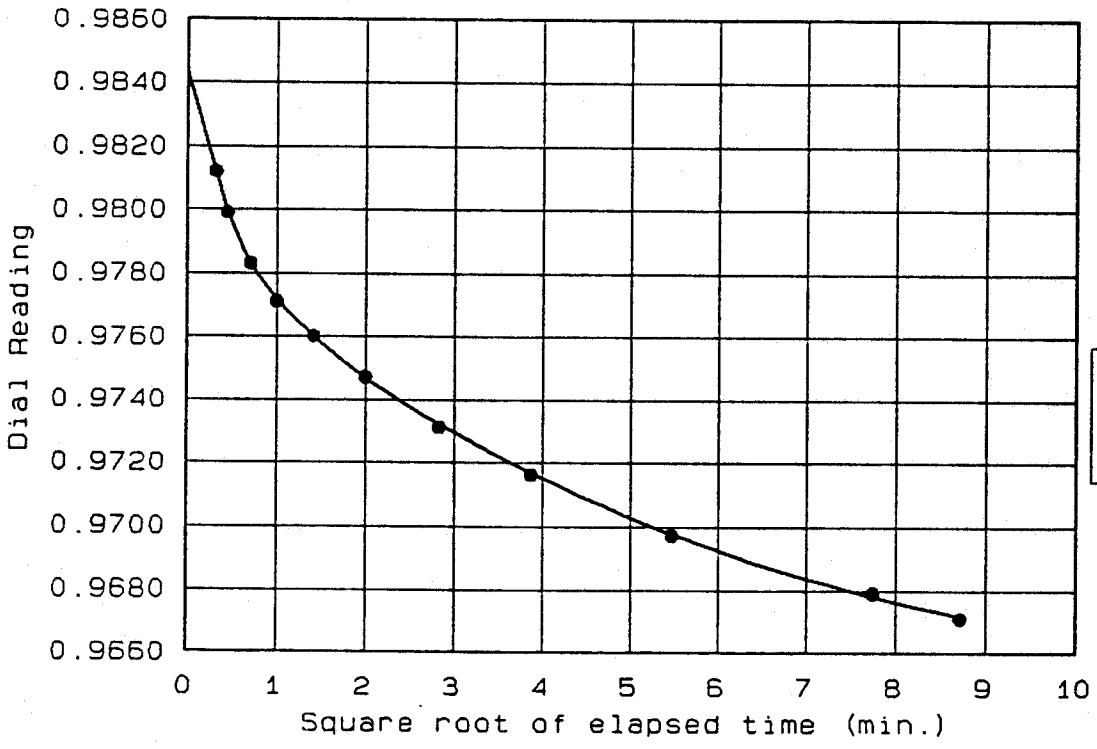
Project No.: 467.41
Project: WEYERHAEUSER
Location: SLUDGE @45% SOLIDS, TAMPED

Date: 6-13-90



Load No.= 1
Load= 0.25 tsf
D_0 = 1.0128
D_{90} = 1.0069
D_{100}= 1.0062
T_{90}= 0.36 min.

C_v @ T_{90} = 5.7 ft^2/day



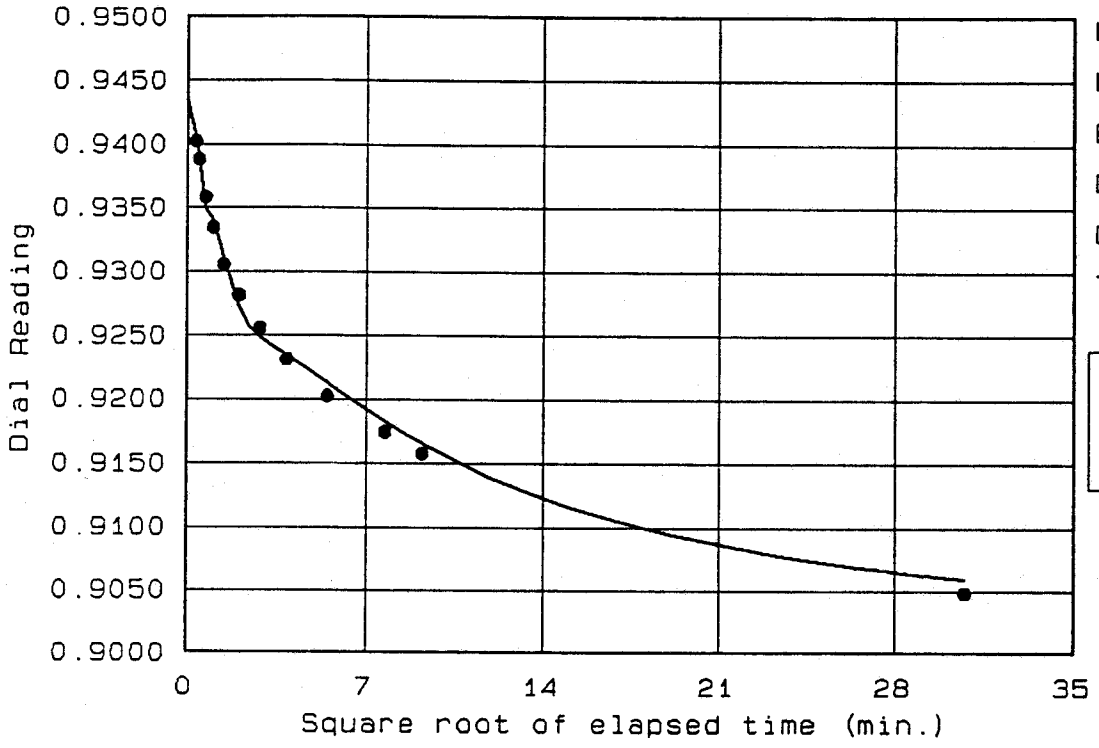
Load No.= 2
Load= 0.50 tsf
D_0 = 0.9843
D_{90} = 0.9783
D_{100}= 0.9777
T_{90}= 0.48 min.

C_v @ T_{90} = 3.9 ft^2/day

Dial Reading vs. Time

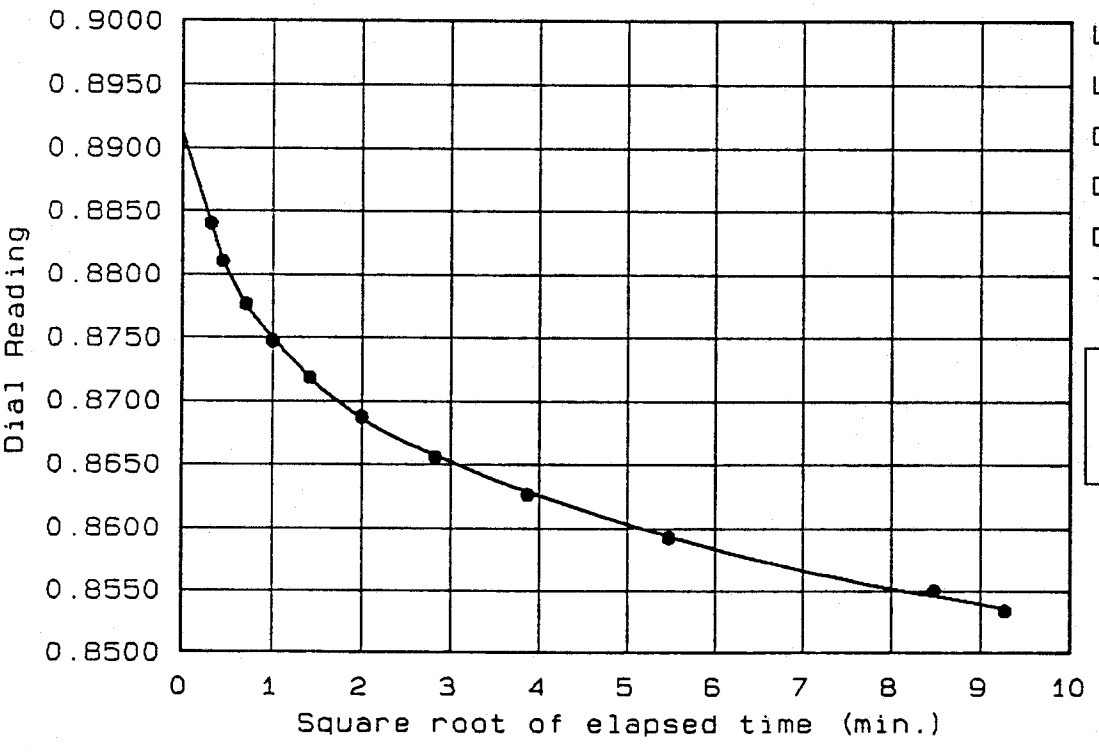
Project No.: 467.41
Project: WEYERHAEUSER
Location: SLUDGE @45% SOLIDS, TAMPED

Date: 6-13-90



Load No.= 3
Load= 1.00 tsf
D_0 = 0.9436
D_{90} = 0.9338
D_{100}= 0.9327
T_{90}= 1.11 min.

C_v @ T_{90} =
1.6 ft^2/day



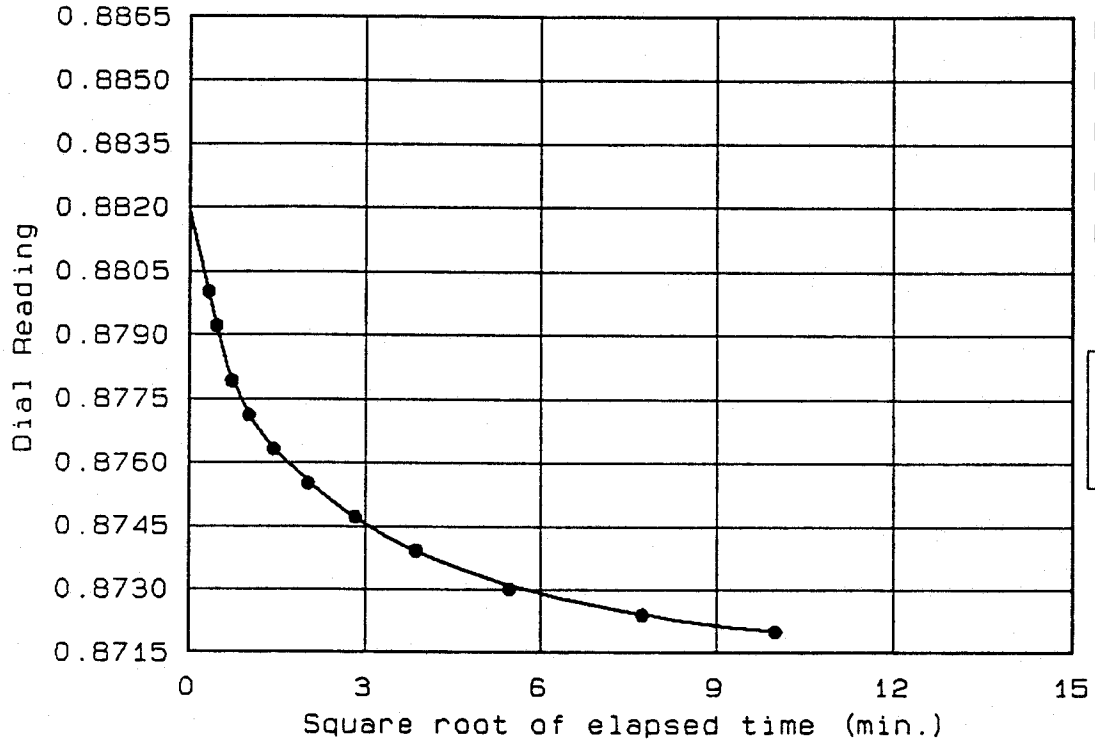
Load No.= 4
Load= 2.00 tsf
D_0 = 0.8912
D_{90} = 0.8779
D_{100}= 0.8765
T_{90}= 0.45 min.

C_v @ T_{90} =
3.4 ft^2/day

Dial Reading vs. Time

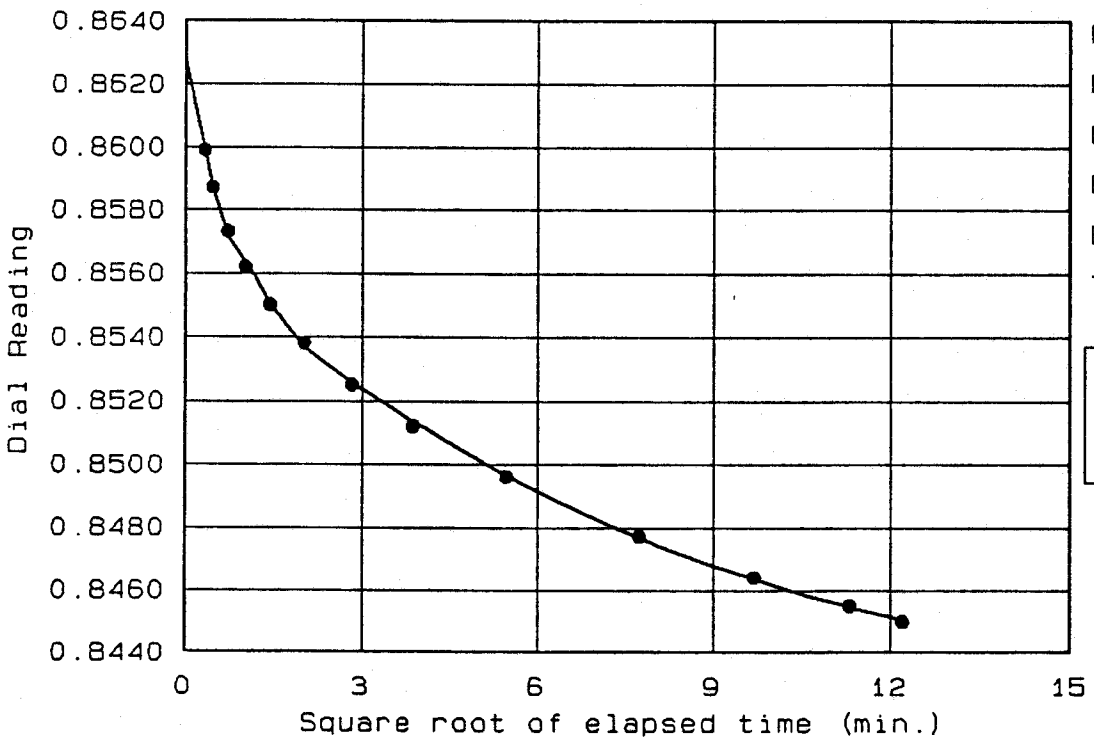
Project No.: 467.41
Project: WEYERHAEUSER
Location: SLUDGE @45% SOLIDS, TAMPED

Date: 6-13-90



Load No.= 7
Load= 1.00 tsf
D_0 = 0.8819
D_{90} = 0.8776
D_{100}= 0.8771
T_{90}= 0.67 min.

C_v @ T_{90} =
2.3 ft^2/day



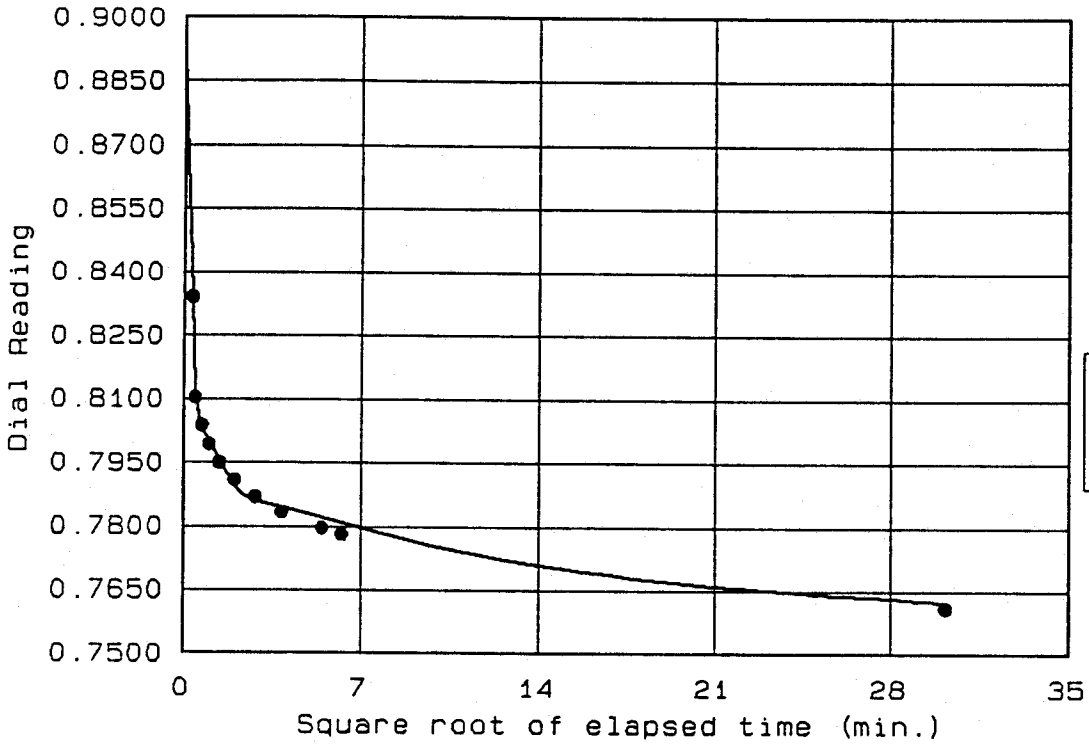
Load No.= 8
Load= 2.00 tsf
D_0 = 0.8628
D_{90} = 0.8572
D_{100}= 0.8566
T_{90}= 0.49 min.

C_v @ T_{90} =
2.9 ft^2/day

Dial Reading vs. Time

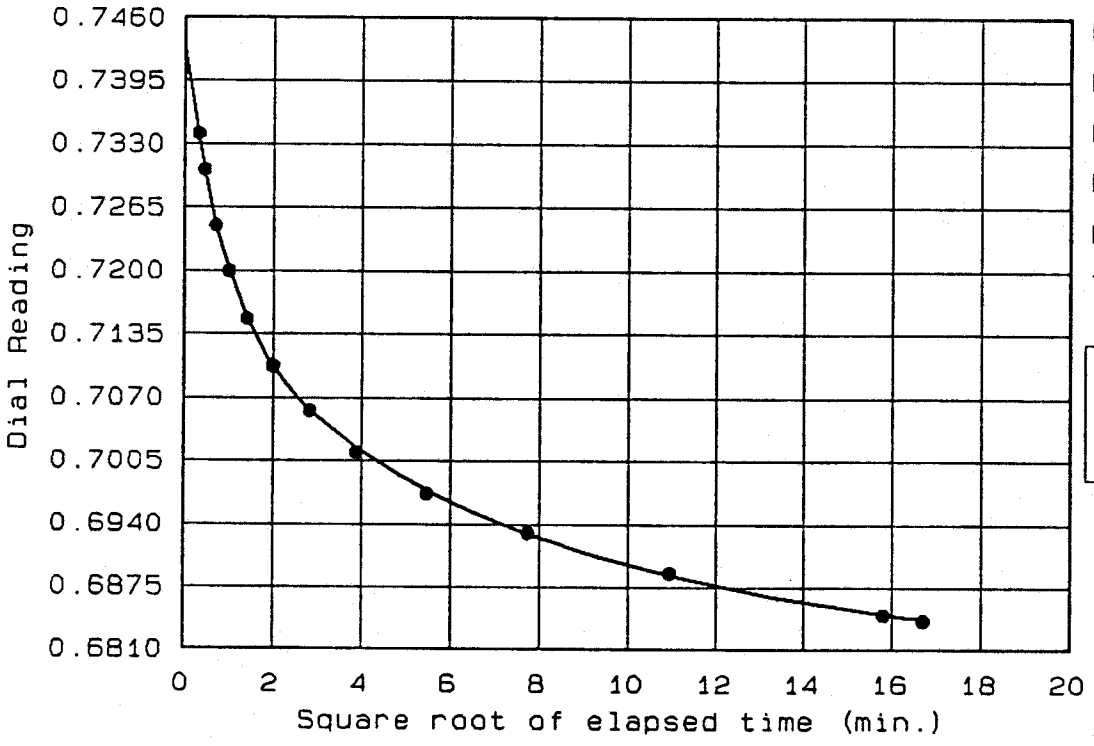
Project No.: 467.41
Project: WEYERHAEUSER
Location: SLUDGE @45% SOLIDS, TAMPED

Date: 6-13-90



Load No.= 9
Load= 4.00 tsf
D_0 = 0.8915
D_{90} = 0.8091
D_{100}= 0.7999
T_{90}= 0.27 min.

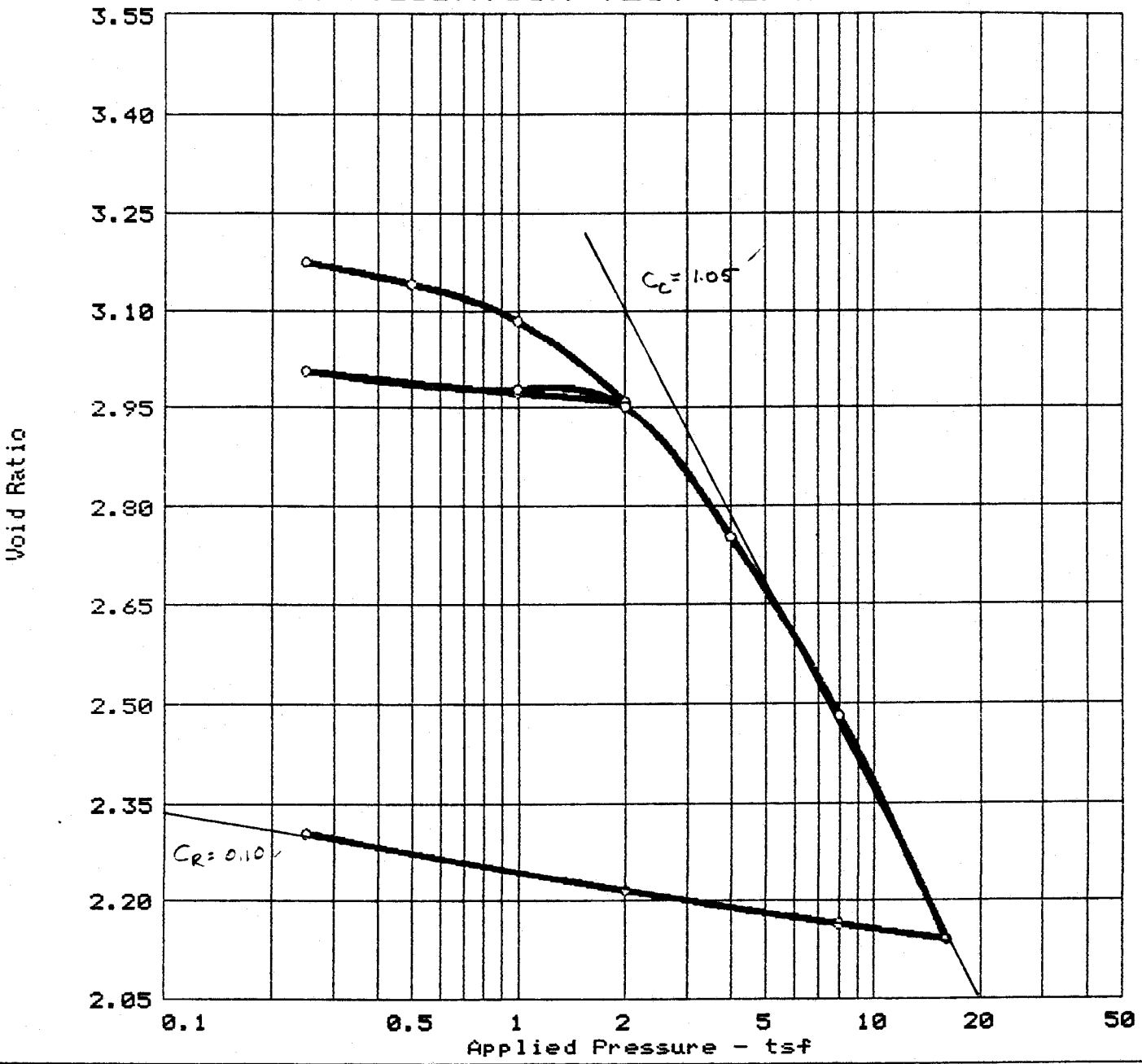
C_v @ T_{90} = 4.7 ft^2/day



Load No.= 10
Load= 8.00 tsf
D_0 = 0.7429
D_{90} = 0.7223
D_{100}= 0.7200
T_{90}= 0.70 min.

C_v @ T_{90} = 1.4 ft^2/day

CONSOLIDATION TEST REPORT



Swell press.	Nat. Sat.	Nat. Moist.	Dry Density	LL	PI	Sp.Gr.	Initial void ratio
	28.2 %	42.5	31.6			2.13	3.2025

TEST RESULTS	MATERIAL DESCRIPTION
$CR = \frac{C_c}{1+e_0} = \frac{1.05}{1+3.2} = 0.25$	ASH
Project No.: 467.41 Project: WEYERHAEUSER Location: Date:	Remarks:
CONSOLIDATION TEST REPORT RMT, INC.	Fig. No._____

/ [handwritten initials] 6-26-90

:36. 6-21-1990 CONSOLIDATION TEST PROJECT DATA Test No. 8

Project Number: 467.41
Project: WEYERHAEUSER
Date:
Location 1:
2:
Remarks 1:
2:
3:
4:
5:
Material 1: ASH COMPOSITE
description 2:
Classification:
Liquid limit:
Plasticity index:
Figure Number:

CONSOLIDATION TEST SPECIMEN DATA

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
t w+t = 58.08 g.	Oedometer No. = 2	Wet w+t = 334.20 g.
y w+t = 40.77 g	Machine No. = N/A	Dry w+t = 292.27 g.
t. = 0.00 g.	Spec. Gravity = 2.13	Tare wt. = 251.50 g.
= 1.00 in.	Height = 1.00 in.	
ameter = 2.50 in.	Diameter = 2.50 in.	
ight = 58.08 g.		
isture = 42.5 %	Ht. Solids = 0.24 in.	Moisture = 102. %
t Den. = 45.1 pcf	Dry wt. = 40.77 g.	Dry wt. = 40.77 g. *
y Den. = 31.6 pcf	Void ratio = 3.2025	Void ratio = 2.3036
	Saturation = 28.2 %	Saturation = 95.1 %

* Final dry weight used in calculations

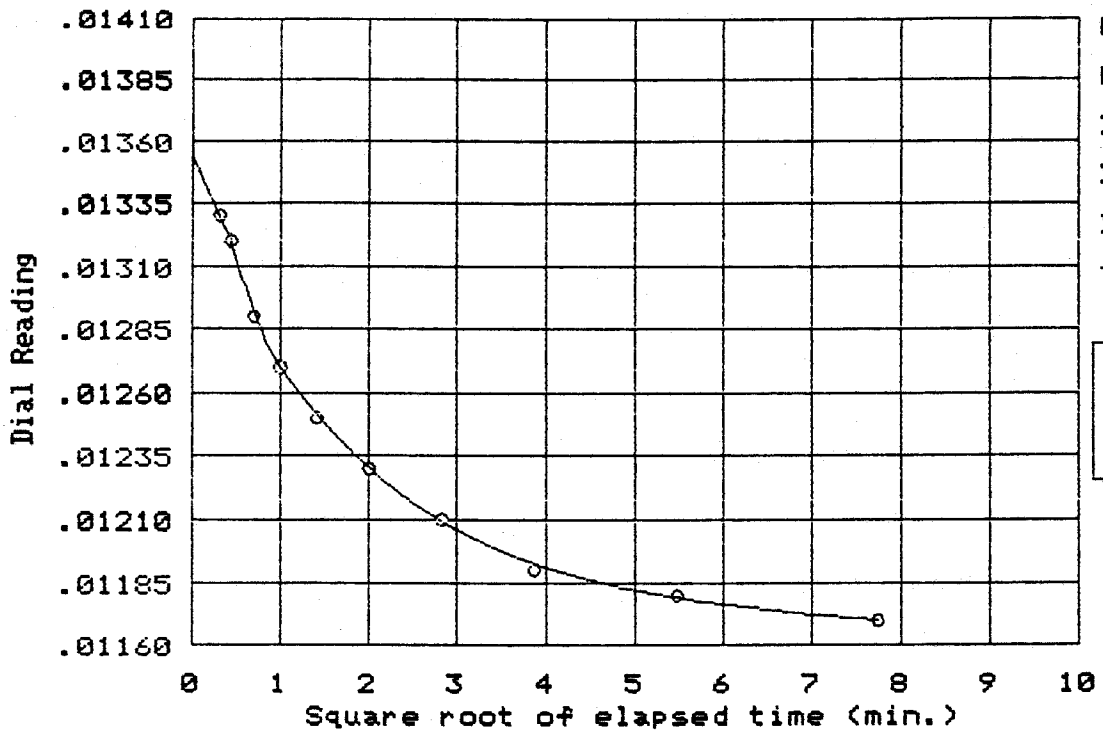
CONSOLIDATION TEST READINGS SUMMARY

LOAD (tsf)	DIAL (in.)	DEFLECTION (in.)	CORRECTED DIAL (in.)	VOID RATIO	% SWELL/CONSOL.
nitial	1.01810			3.2025	
0.25	1.01170	0.0000	1.01170	3.1756	0.6 Consol.
0.50	1.00350	0.0000	1.00350	3.1412	1.5 Consol.
1.00	0.99000	0.0000	0.99000	3.0844	2.8 Consol.
2.00	0.95990	0.0000	0.95990	2.9579	5.8 Consol.
1.00	0.96300	0.0000	0.96300	2.9710	5.5 Consol.
0.25	0.97110	0.0000	0.97110	3.0050	4.7 Consol.
1.00	0.96450	0.0000	0.96450	2.9773	5.4 Consol.
2.00	0.95800	0.0000	0.95800	2.9499	6.0 Consol.
.00	0.91110	0.0000	0.91110	2.7529	10.7 Consol.
.00	0.84670	0.0000	0.84670	2.4822	17.1 Consol.
16.00	0.76520	0.0000	0.76520	2.1397	25.3 Consol.
8.00	0.77090	0.0000	0.77090	2.1637	24.7 Consol.
2.00	0.78300	0.0000	0.78300	2.2145	23.5 Consol.
0.25	0.80420	0.0000	0.80420	2.3036	21.4 Consol.

Dial Reading vs. Time

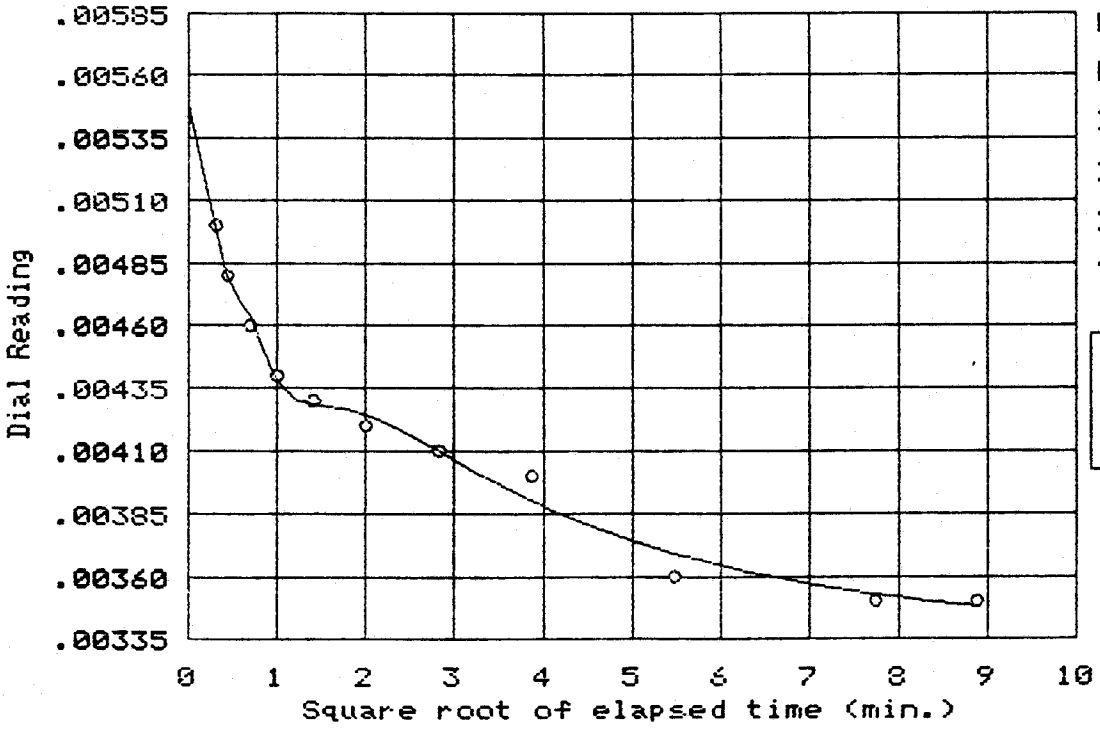
Project No.: 467.41
Project: WEYERHAEUSER
Location:

Date:



Load No.= 1
Load= 0.25 tsf
D_0 = 1.0135
D_{90} = 1.0124
D_{100}= 1.0123
T_{90}= 2.74 min.

C_v @ T_{90} = 0.08 $in.^2/min.$



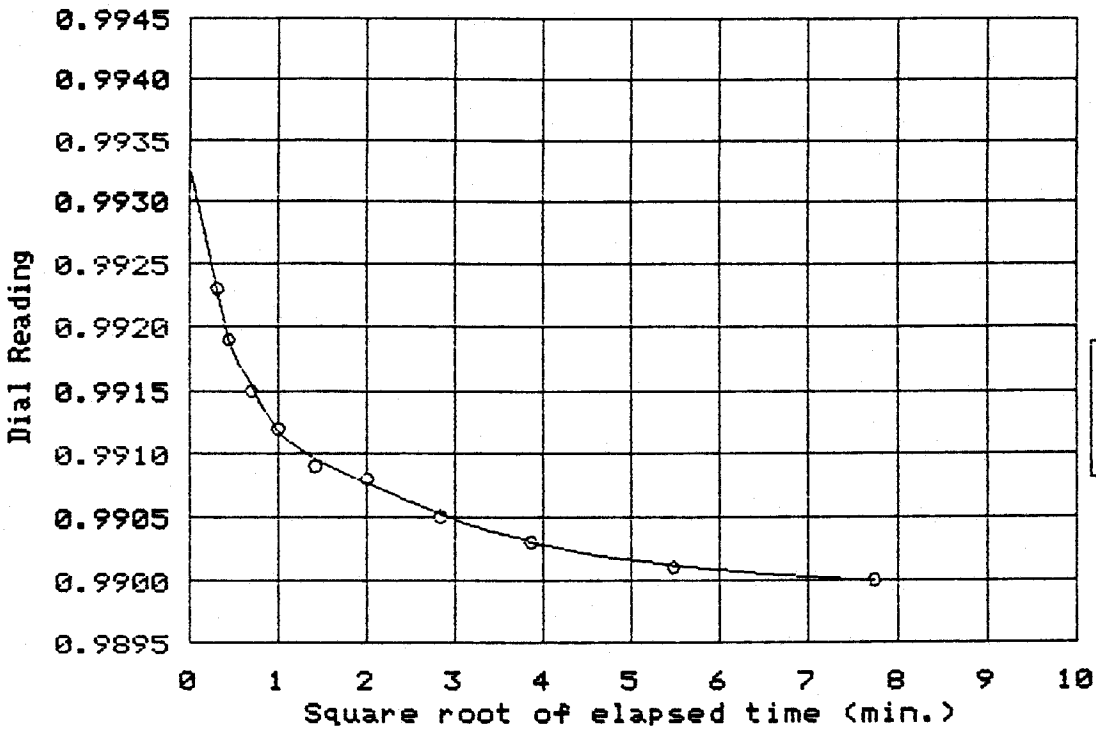
Load No.= 2
Load= 0.50 tsf
D_0 = 1.0055
D_{90} = 1.0047
D_{100}= 1.0046
T_{90}= 0.36 min.

C_v @ T_{90} = 0.57 $in.^2/min.$

Dial Reading vs. Time

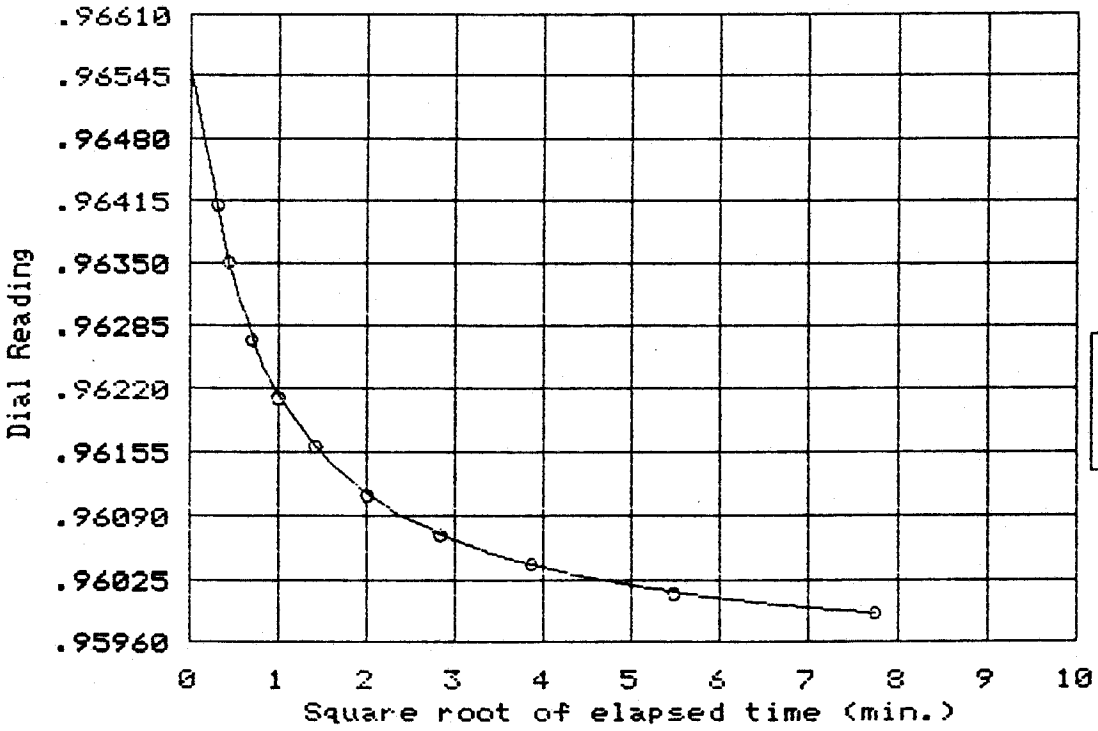
Project No.: 467.41
Project: WEYERHAEUSER
Location:

Date:



Load No.= 3
Load= 1.00 tsf
D_0 = 0.9933
D_{90} = 0.9917
D_{100}= 0.9915
T_{90}= 0.37 min.

C_v @ T_{90} =
0.56 $in.^2/min.$



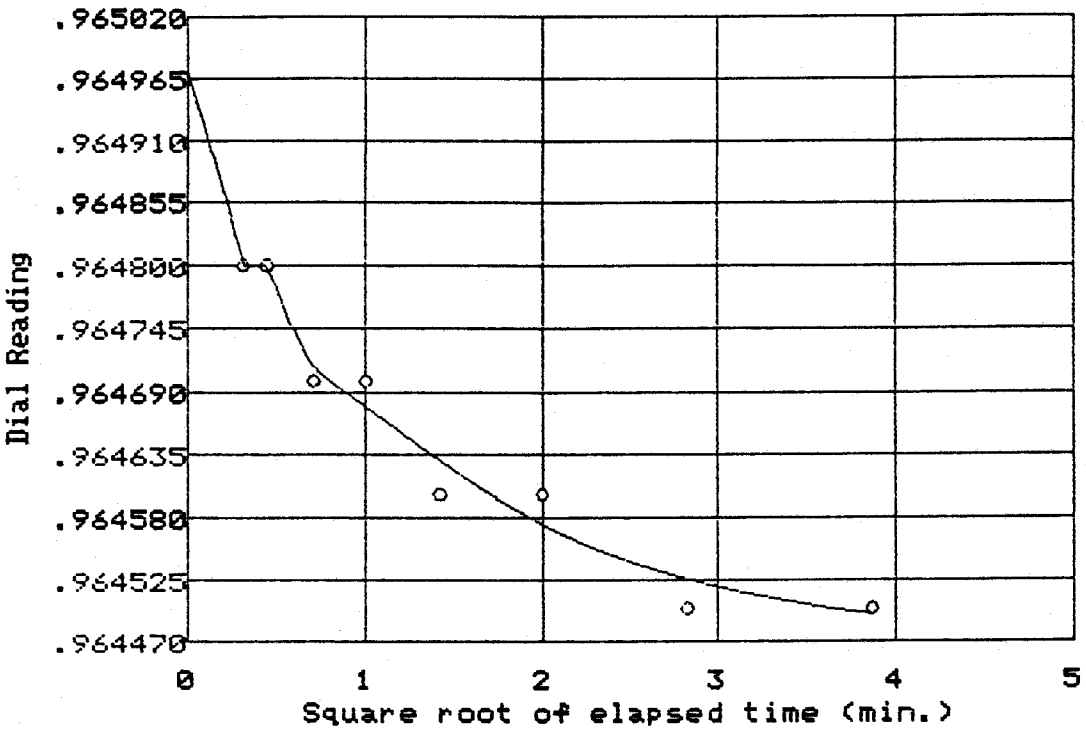
Load No.= 4
Load= 2.00 tsf
D_0 = 0.9655
D_{90} = 0.9627
D_{100}= 0.9624
T_{90}= 0.51 min.

C_v @ T_{90} =
0.38 $in.^2/min.$

Dial Reading vs. Time

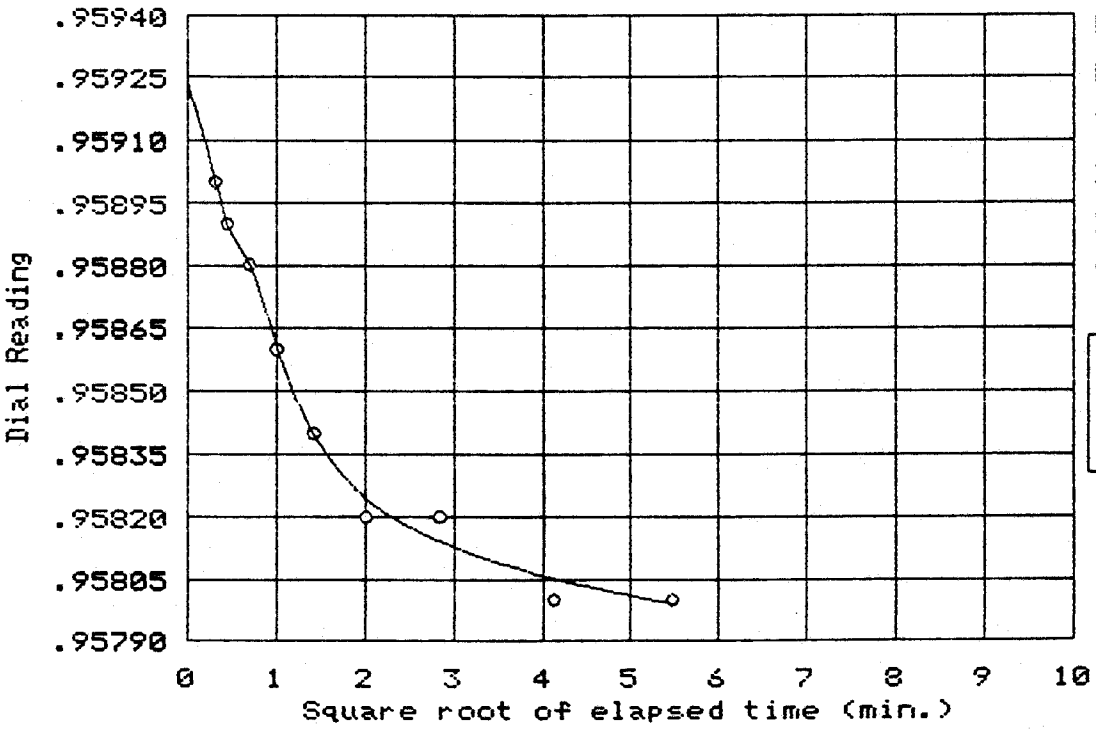
Project No.: 467.41
Project: WEYERHAEUSER
Location:

Date:



Load No.= 7
Load= 1.00 tsf
D_0 = 0.9650
D_{90} = 0.9647
D_{100}= 0.9647
T_{90}= 0.67 min.

C_v @ T_{90} =
0.29 $in.^2/min.$



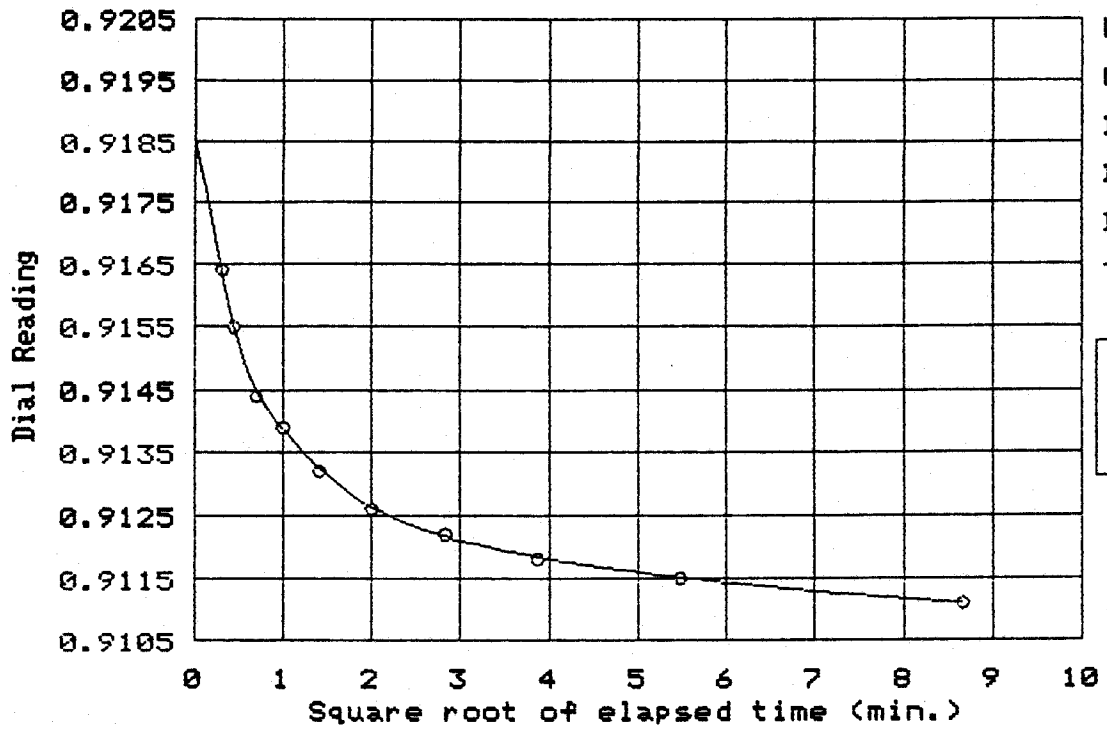
Load No.= 8
Load= 2.00 tsf
D_0 = 0.9592
D_{90} = 0.9588
D_{100}= 0.9588
T_{90}= 0.36 min.

C_v @ T_{90} =
0.52 $in.^2/min.$

Dial Reading vs. Time

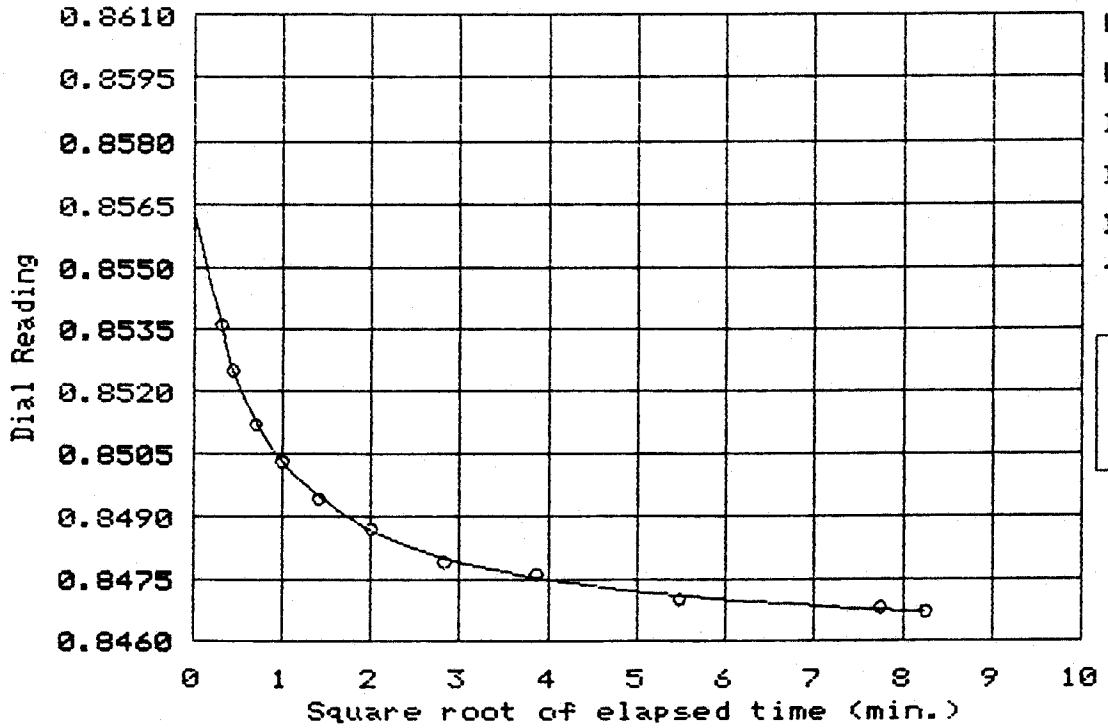
Project No.: 467.41
Project: WEYERHAEUSER
Location:

Date:



Load No.= 9
Load= 4.00 tsf
D_0 = 0.9186
D_{90} = 0.9146
D_{100}= 0.9141
T_{90}= 0.45 min.

C_v @ T_{90} =
0.40 in.^{2}/min.



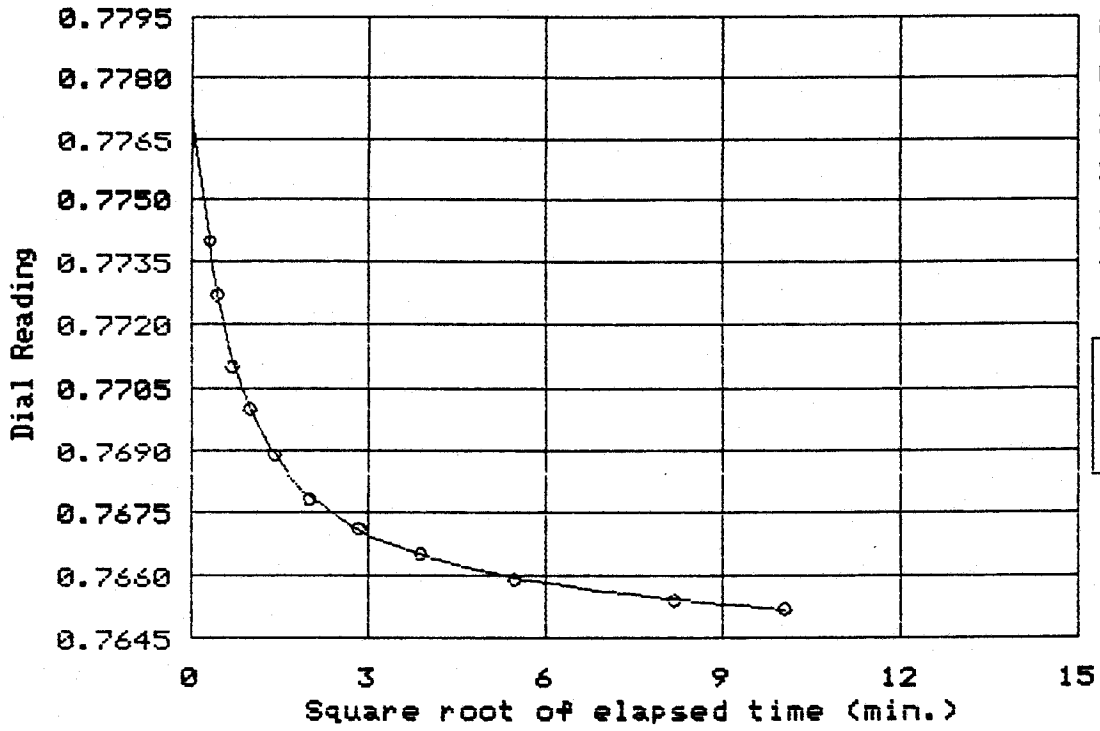
Load No.= 10
Load= 8.00 tsf
D_0 = 0.8563
D_{90} = 0.8515
D_{100}= 0.8509
T_{90}= 0.43 min.

C_v @ T_{90} =
0.36 in.^{2}/min.

Dial Reading vs. Time

Project No.: 467.41
Project: WEYERHAEUSER
Location:

Date:



Load No.= 11

Load= 16.00 tsf

D_0 = 0.7771

D_{90} = 0.7711

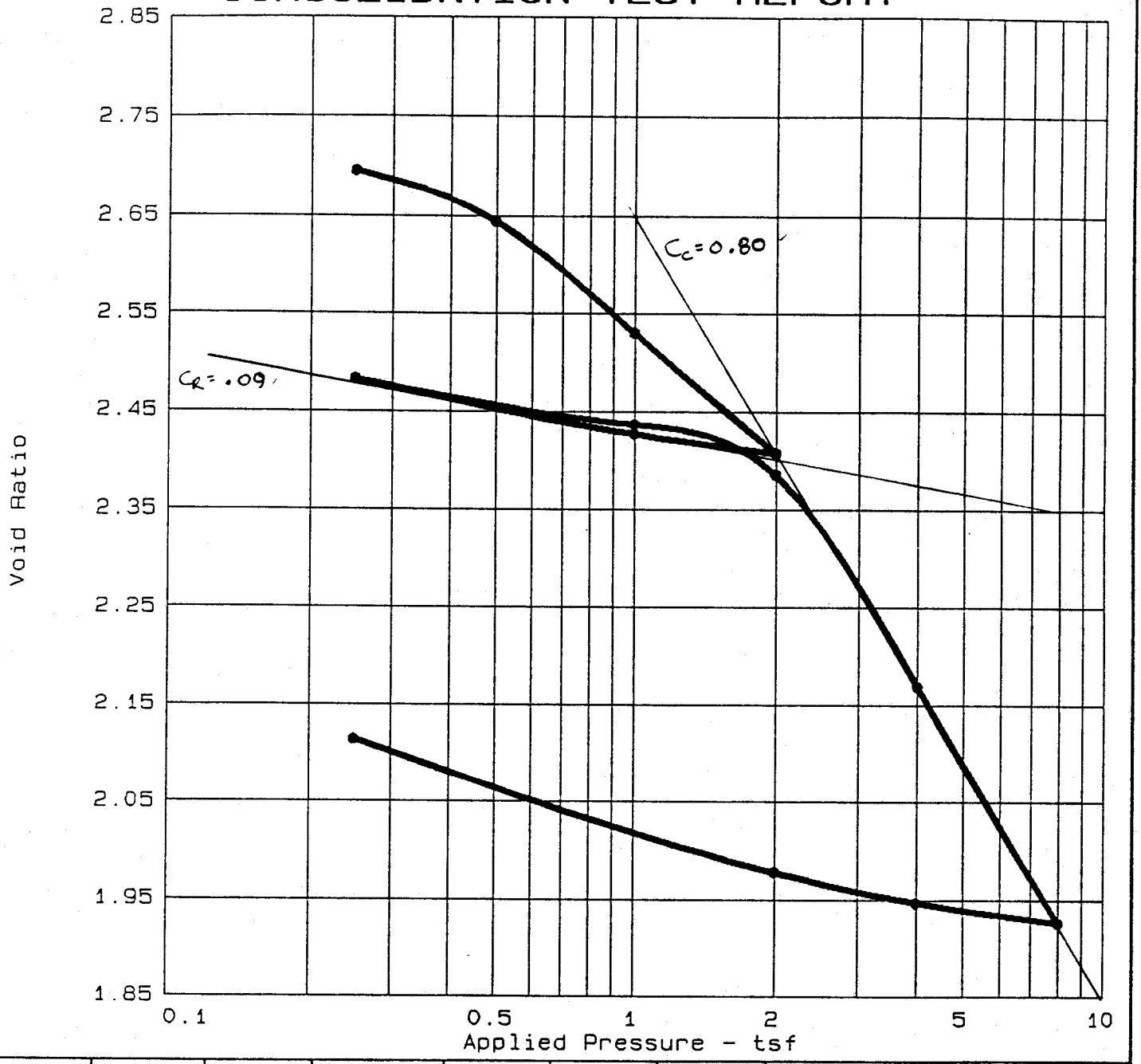
D_{100}= 0.7704

T_{90}= 0.49 min.

C_v @ T_{90} =

0.27 $in.^2/min.$

CONSOLIDATION TEST REPORT



Swell press.	Nat. Sat.	Nat. Moist.	Dry Density	LL	PI	Sp.Gr.	Initial void ratio
	53.8 %	72.7	33.9			2.04	2.7577

TEST RESULTS

$CR = \frac{C_c}{1+e_o} = \frac{0.80}{1+2.74} = 0.21$

MATERIAL DESCRIPTION

COMPOSITE- 50% SLUDGE @ 45% SOLIDS+50%ASH COMP

Project No.: 467.41
Project: WEYERHAEUSER
Location: COMPOSITE OF SLUDGE @ 45% SOLIDS & ASH

Date: 6-13-90

Remarks:

CONSOLIDATION TEST REPORT

RMT, INC.

Fig. No. _____

/ JPH 6-26-90

07:54, 6-21-1990 CONSOLIDATION TEST PROJECT DATA Test No. 19

Project Number: 467.41
Project: WEYERHAEUSER
Date: 6-13-90
Location 1: COMPOSITE OF SLUDGE @ 45% SOLIDS & ASH
2:
Remarks 1:
2:
3:
4:
5:
Material 1: COMPOSITE- 50% SLUDGE @
description 2: 45% SOLIDS+50%ASH COMP
Classification:
Liquid limit:
Plasticity index:
Figure Number:

CONSOLIDATION TEST SPECIMEN DATA

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
Wet w+t = 75.42 g.	Oedometer No. = 2	Wet w+t = 308.93 g.
Dry w+t = 43.67 g	Machine No. = N/A	Dry w+t = 264.14 g.
Tare wt. = 0.00 g.	Spec. Gravity = 2.04	Tare wt. = 220.47 g.
Height = 1.00 in.	Height = 1.00 in.	
Diameter = 2.50 in.	Diameter = 2.50 in.	
Weight = 75.42 g.		
Moisture = 72.7 %	Ht. Solids = 0.27 in.	Moisture = 102. %
Wet Den. = 58.5 pcf	Dry wt. = 43.67 g.	Dry wt. = 43.67 g. *
Dry Den. = 33.9 pcf	Void ratio = 2.7577	Void ratio = 2.1132
	Saturation = 53.8 %	Saturation = 99.0 %

* Final dry weight used in calculations

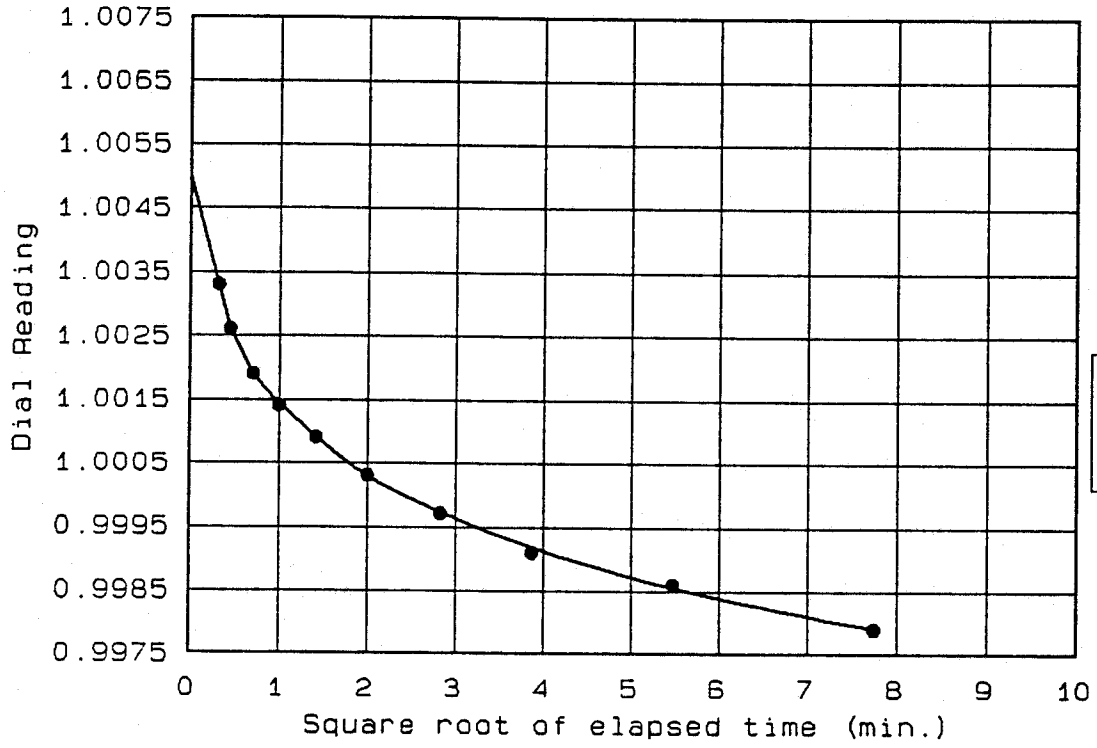
CONSOLIDATION TEST READINGS SUMMARY

LOAD (tsf)	DIAL (in.)	DEFLECTION (in.)	CORRECTED DIAL (in.)	VOID RATIO	% SWELL/CONSOL.
Initial	1.01470			2.7577	
0.25	0.99790	0.0000	0.99790	2.6945	1.7 Consol.
0.50	0.98450	0.0000	0.98450	2.6442	3.0 Consol.
1.00	0.95400	0.0000	0.95400	2.5296	6.1 Consol.
2.00	0.92140	0.0000	0.92140	2.4071	9.3 Consol.
1.00	0.92650	0.0000	0.92650	2.4262	8.8 Consol.
0.25	0.94150	0.0000	0.94150	2.4826	7.3 Consol.
1.00	0.92910	0.0000	0.92910	2.4360	8.6 Consol.
2.00	0.91560	0.0000	0.91560	2.3853	9.9 Consol.
4.00	0.85790	0.0000	0.85790	2.1685	15.7 Consol.

Dial Reading vs. Time

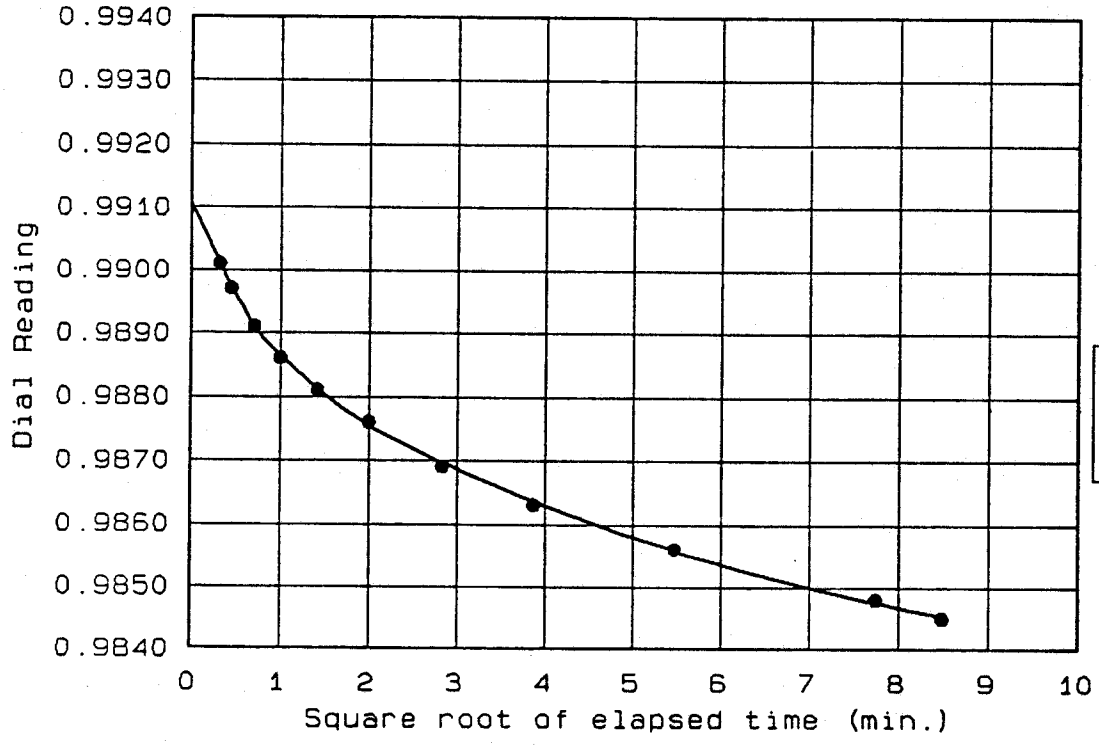
Project No.: 467.41
Project: WEYERHAEUSER
Location: COMPOSITE OF SLUDGE @ 45% SOLIDS & ASH

Date: 6-13-90



Load No.= 1
Load= 0.25 tsf
D_0 = 1.0050
D_{90} = 1.0021
D_{100}= 1.0018
T_{90}= 0.38 min.

C_v @ T_{90} =
5.5 ft^2/day



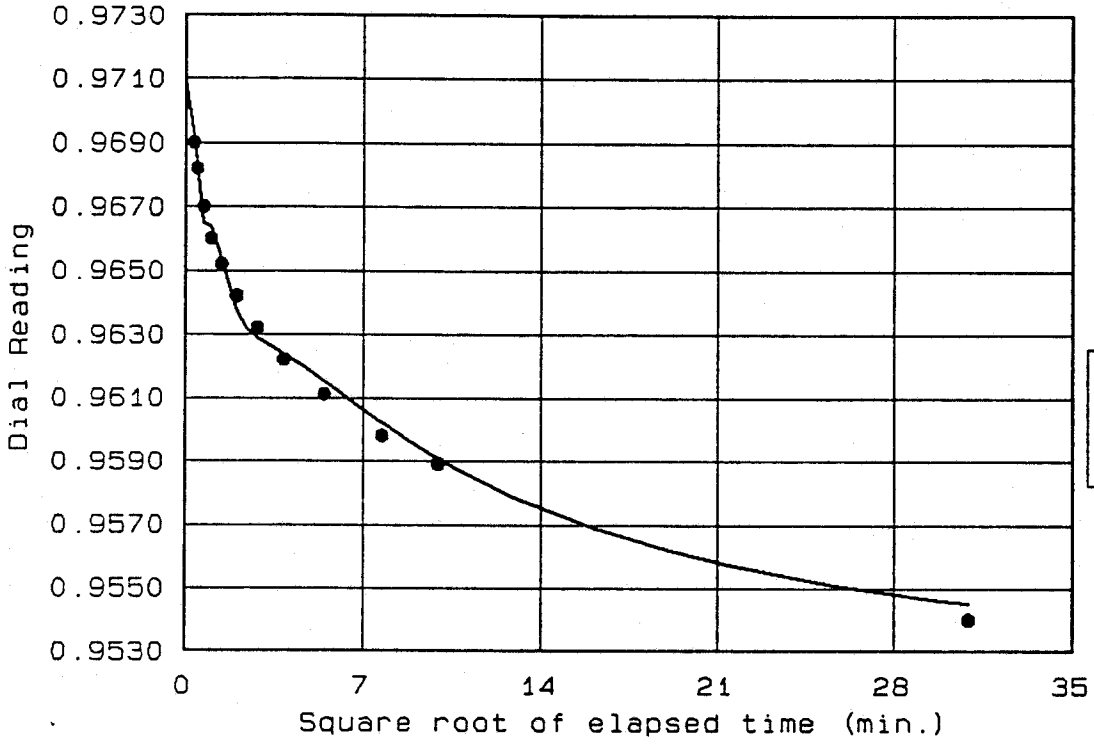
Load No.= 2
Load= 0.50 tsf
D_0 = 0.9911
D_{90} = 0.9889
D_{100}= 0.9886
T_{90}= 0.67 min.

C_v @ T_{90} =
3.0 ft^2/day

Dial Reading vs. Time

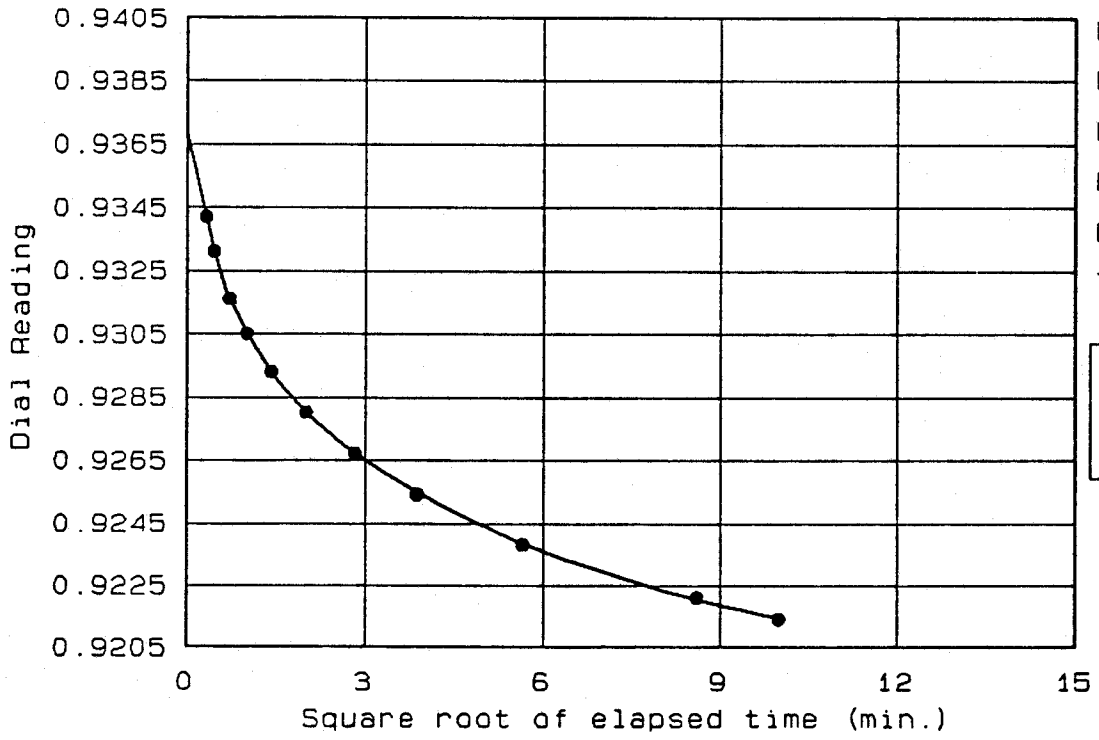
Project No.: 467.41
Project: WEYERHAEUSER
Location: COMPOSITE OF SLUDGE @ 45% SOLIDS & ASH

Date: 6-13-90



Load No.= 3
Load= 1.00 tsf
D_0 = 0.9709
D_{90} = 0.9663
D_{100}= 0.9658
T_{90}= 0.58 min.

C_v @ T_{90} =
3.3 ft^2/day



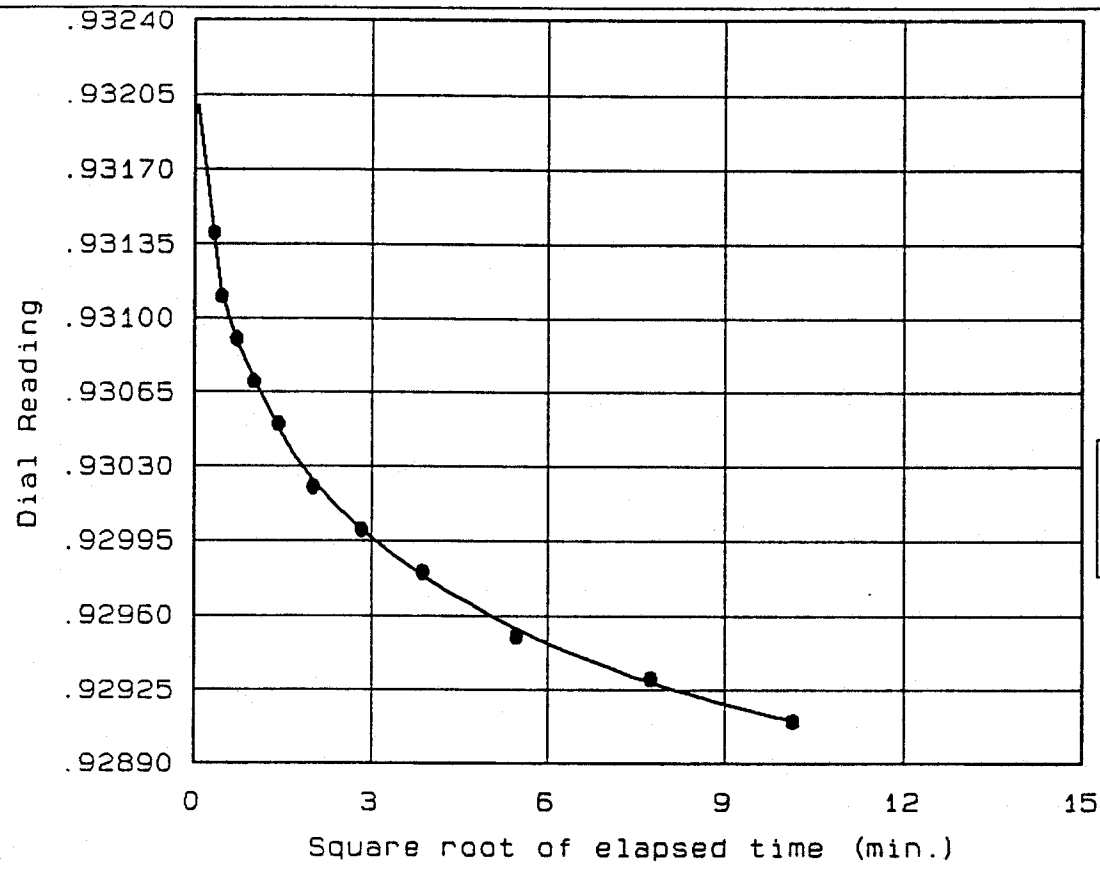
Load No.= 4
Load= 2.00 tsf
D_0 = 0.9369
D_{90} = 0.9314
D_{100}= 0.9308
T_{90}= 0.55 min.

C_v @ T_{90} =
3.3 ft^2/day

Dial Reading vs. Time

Project No.: 467.41
Project: WEYERHAEUSER
Location: COMPOSITE OF SLUDGE @ 45% SOLIDS & ASH

Date: 6-13-90



Load No.= 7

Load= 1.00 tsf

D_0 = 0.9321

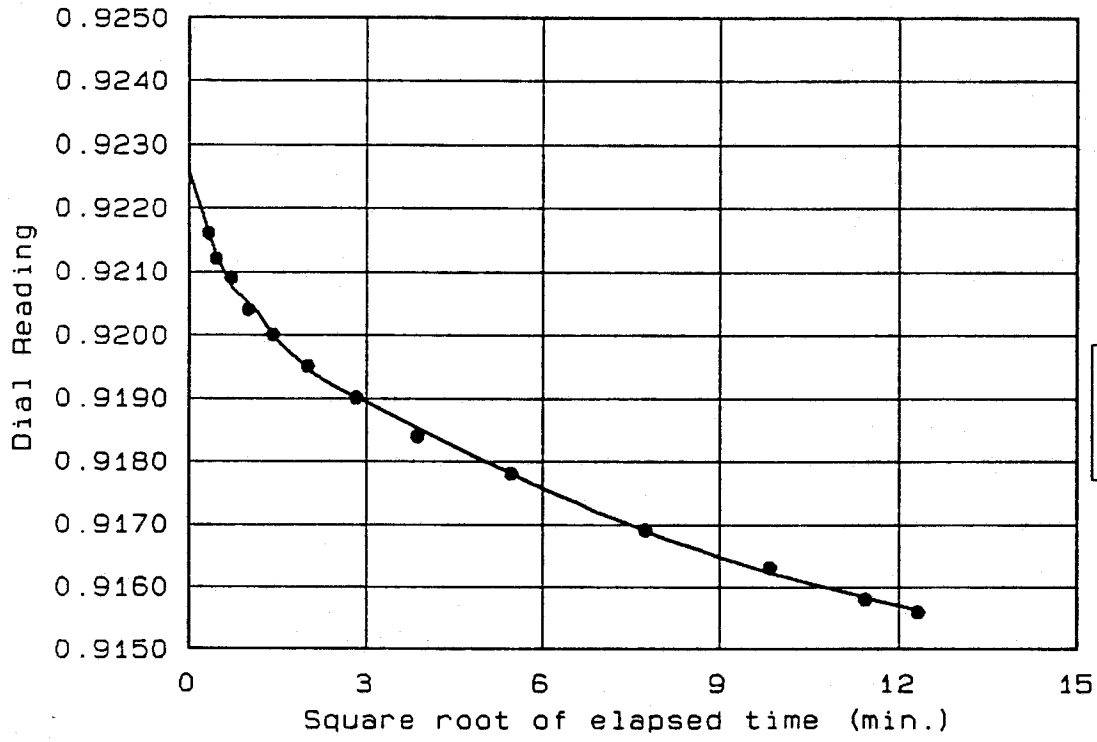
D_{90} = 0.9310

D_{100}= 0.9309

T_{90}= 0.31 min.

C_v @ T_{90} =

5.8 ft^2/day



Load No.= 8

Load= 2.00 tsf

D_0 = 0.9226

D_{90} = 0.9213

D_{100}= 0.9211

T_{90}= 0.16 min.

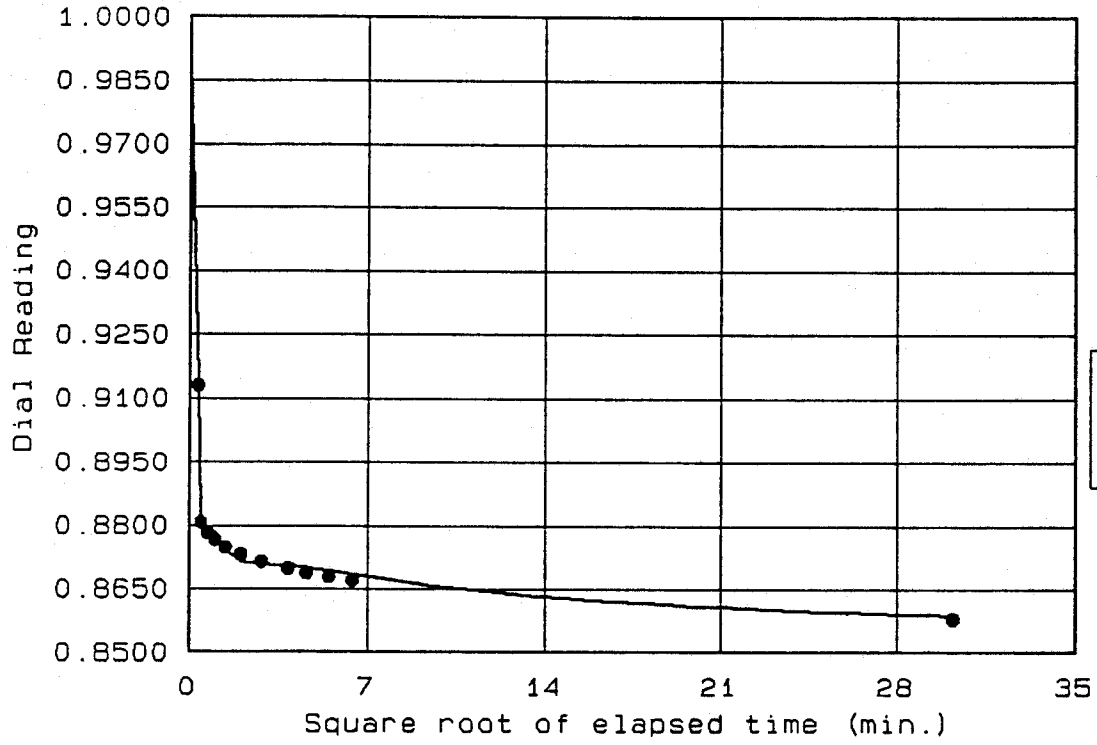
C_v @ T_{90} =

11.0 ft^2/day

Dial Reading vs. Time

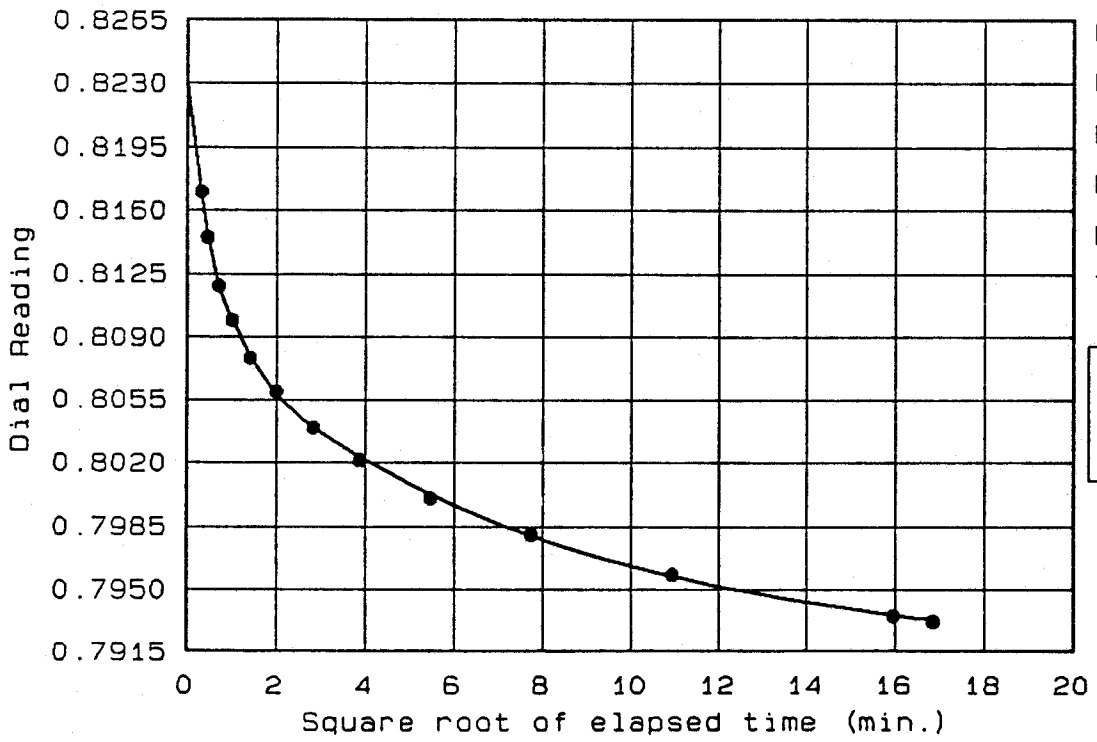
Project No.: 467.41
Project: WEYERHAEUSER
Location: COMPOSITE OF SLUDGE @ 45% SOLIDS & ASH

Date: 6-13-90



Load No.= 9
Load= 4.00 tsf
D_0 = 0.9909
D_{90} = 0.8745
D_{100}= 0.8616
T_{90}= 1.90 min.

C_v @ T_{90} = 0.8 ft^2/day



Load No.= 10
Load= 8.00 tsf
D_0 = 0.8230
D_{90} = 0.8123
D_{100}= 0.8111
T_{90}= 0.42 min.

C_v @ T_{90} = 3.3 ft^2/day

JPH 6-20-90

RMT, Inc.
Falling Head Permeability Test

Job: WEYERHAEUSER
Job #: 467.42
Sample: SLUDGE @ 45% SOLIDS
:
Visual Descript:

Date: 18-Jun-90
Tech: HJW
File: WER11
Cell #: 14S

INPUT VALUES

	INIT.	FINAL
Sample Dia. (in)	2.50	2.43
Sample Ht. (in)	2.34	2.24
Tare & Wet (g)	217.8	286.1
Tare & Dry (g)	98.1	174.8
Tare (g)	0.0	76.7
Sample Wt. (g)	212.5	209.3

Permeant:	TAP WATER
Permeant Specific Gravity:	1.00
Sample Specific Gravity:	1.77
Confining Pressure (psi):	100.0
Burette Diameter (in):	0.250
Burette Zero (cm):	100.0

CALCULATED VALUES

MOISTURE (%)	122.0	113.5
WET DENS. (pcf)	70.5	76.8
DRY DENS. (pcf)	31.7	36.0
SATURATION (%)	87.1	97.0

MAXIMUM GRADIENT:	17.5
AVERAGE GRADIENT:	12.8
MAX. EFFECT. STRESS (psi):	6.2
MIN. EFFECT. STRESS (psi):	4.7
AVE. EFFECT. STRESS (psi):	5.4

Date YY	MM	DD	Time HH	MM	Temp *	Press.(psi) BOT	TOP	Readings (cm) CHAM	BOT	TOP	Flow Dif. %	Kv cm/sec	Ave. 0,1
90	6	7	7	39	0	95	95	17.00	3.40	101.70			
90	6	7	8	18	20	95	95	17.10	21.80	83.40	0.3	6.0E-06	
90	6	7	8	30	20	95	95	17.10	25.90	79.40	1.2	5.9E-06	
90	6	7	8	48	20	95	95	17.10	31.20	74.30	1.9	6.0E-06	
90	6	8	7	58	0	95	95	18.70	3.25	101.90			
90	6	8	8	18	20	95	95	18.90	13.30	90.90	-4.5	6.0E-06	
90	6	8	8	32	20	95	95	18.90	19.60	85.00	3.3	6.1E-06	
90	6	8	8	48	20	95	95	18.90	25.15	79.55	0.9	5.8E-06	
90	6	11	8	56	0	95	95	21.20	2.55	101.90			
90	6	11	9	12	20	95	95	21.20	7.55	96.80	-1.0	3.4E-06	1
90	6	11	9	27	20	95	95	21.05	11.90	92.40	-0.6	3.5E-06	1
90	6	11	9	49	20	95	95	21.00	17.70	86.60	-0.0	3.5E-06	1
90	6	11	10	3	20	95	95	21.00	21.10	83.20	0.0	3.7E-06	1
90	6	11	10	17	20	95	95	20.90	24.10	80.25	0.8	3.6E-06	1
90	6	11	10	30	20	95	95	20.90	26.65	77.65	-1.0	3.7E-06	1

Average Kv for those rows with a 1 in the Ave. column 3.6E-06 cm/sec
1.4E-06 in/sec

Termination determined by stable Kv and low flow differential
* A zero in this column starts a series of measurements

v HJW
6-26-91

RMT, Inc.
Falling Head Permeability Test

Job:	WEYERHAEUSER	Date:	26-Jun-90
Job #:	467.41	Tech:	GAP
Sample:	ASH	File:	WEYREM11
:		Cell #:	15S
Visual Descript:			

INPUT VALUES

	INIT.	FINAL			
Sample Dia. (in)	2.86	2.82	Permeant:	TAP WATER	
Sample Ht. (in)	2.29	2.25	Permeant Specific Gravity:	1.00	
Tare & Wet (g)	185.8	373.5	Sample Specific Gravity:	2.13	EST.
Tare & Dry (g)	132.7	206.4	Confining Pressure (psi):	100.0	
Tare (g)	0.0	79.6	Burette Diameter (in):	0.250	
Sample Wt. (g)	185.8	293.9	Burette Zero (cm):	100.0	

CALCULATED VALUES

MOISTURE (%)	40.0	131.8	MAXIMUM GRADIENT:	17.0
WET DENS. (pcf)	48.1	79.7	AVERAGE GRADIENT:	12.7
DRY DENS. (pcf)	34.4	34.4	MAX. EFFECT. STRESS (psi):	6.4
SATURATION (%)	29.7	97.9	MIN. EFFECT. STRESS (psi):	5.0
			AVE. EFFECT. STRESS (psi):	5.6

Date			Time		Temp	Press.(psi)		Readings (cm)			Flow Dif.	Kv	Ave.
YY	MM	DD	HH	MM	*	BOT	TOP	CHAM	BOT	TOP	%	cm/sec	0,1
90	6	21	1	0	0	95	95	3.70	1.95	99.90			
90	6	21	1	0.038	21	95	95	3.70	5.00	96.85	-0.0	6.3E-04	
90	6	21	1	0.167	21	95	95	3.70	15.00	86.85	0.0	7.2E-04	
90	6	21	1	0.24	21	95	95	3.70	20.00	81.85	0.0	7.7E-04	
90	6	21	1	0.329	21	95	95	3.70	25.00	76.85	0.0	7.4E-04	
90	6	21	1	0.434	21	95	95	3.70	30.00	71.85	0.0	7.6E-04	
90	6	21	1	0	0	95	95	3.70	2.25	99.35			
90	6	21	1	0.03	21	95	95	3.85	5.00	96.60	0.0	7.3E-04	
90	6	21	1	0.158	21	95	95	3.85	15.00	86.60	0.0	7.2E-04	
90	6	21	1	0.321	21	95	95	3.85	25.00	76.60	0.0	7.5E-04	
90	6	21	1	0	0	95	95	3.85	1.45	99.45			
90	6	21	1	0.042	21	95	95	3.90	5.00	95.90	0.0	6.7E-04	
90	6	21	1	0.17	21	95	95	3.90	15.00	85.90	0.0	7.3E-04	
90	6	21	1	0.333	21	95	95	3.90	25.00	75.90	0.0	7.6E-04	
90	6	21	1	0	0	95	95	3.90	2.50	99.75			
90	6	21	1	0.091	21	95	95	3.90	10.00	92.25	0.0	6.9E-04	1
90	6	21	1	0.157	21	95	95	3.90	15.00	87.25	0.0	7.4E-04	1
90	6	21	1	0.232	21	95	95	3.90	20.00	82.25	0.0	7.4E-04	1
90	6	21	1	0.32	21	95	95	3.90	25.00	77.25	0.0	7.4E-04	1

Average Kv for those rows with a 1 in the Ave. column 7.3E-04 cm/sec
2.9E-04 in/sec

Termination determined by stable Kv and low flow differential
* A zero in this column starts a series of measurements