

OlyWest EIA

Environment Act Proposal Form and Supporting Documentation for Licensing of the OlyWest Pork Processing Facility Volume II

Prepared for:
OlyWest MB Limited Partnership

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August, 2006

Project No. 91511



Appendix A
Geotechnical Report

91510.

DYREGROV CONSULTANTS
CONSULTING GEOTECHNICAL ENGINEERS

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GEOTECHNICAL REPORT
PROPOSED OLYWEST PLANT
WINNIPEG, MANITOBA

Prepared for
EARTH - TECH CANADA
on behalf of
OLYMEL S.E.C./L.P.

May, 2006

Project No. 252769

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1.0 INTRODUCTION

This report summarizes the results of a geotechnical investigation undertaken by Dyregrov Consultants for the proposed Olywest Plant in the east St. Boniface area of Winnipeg, Manitoba. The study was done at the request of Earth-Tech Canada on behalf of Olymel S.E.C./L.P. of St. Hyacinthe, Quebec. Earth-Tech Canada are the project engineers for the design of the hog processing facility.

2.0 THE SITE

The location of the triangular shaped property, which will contain the facility, is on the east side of the Mazonod Road right-of-way, north of the St. Boniface Road right-of-way and south of the Winnipeg Aqueduct and Railway as illustrated on Figure 1. Neither the Mazonod Road nor the St. Boniface Road are developed at the present time. The site is relatively flat with scattered bush areas, however, most of the area has been cultivated in the past. At the time of this investigation, at the end of the snow melt, there were a number of areas of ponded water.

3.0 PROPOSED DEVELOPMENT

It is our understanding that the proposed development will entail the construction of a 350,000 sq.ft. single storey building but will have several two storey areas. The facility will include an area for receiving hogs, an extensive area for their processing and packaging, a large heavy freezer and shipping area, as well as support areas. A separate truck wash facility will be provided. It is anticipated that foundation loads will be light which would be amenable for the use of cast-in-place concrete friction piles except for the heavy freezer area where large capacity, driven, end bearing, prestressed, precast concrete piles would likely be appropriate. Due to the presence of the lacustrine clays, which are present and known to undergo swelling type movements which would

be reflected in floor slab movements, it is highly desirable that structurally supported floor slabs be used throughout. Extensive areas of parking and on-site roads will be required as well as general site grading.

4.0 DESCRIPTION OF FIELD INVESTIGATION

The geotechnical investigation included the drilling and sampling of 12 deep test holes at specific locations around the building site and 17 shallow test holes around the proposed pavement areas. Disturbed off-auger samples were recovered at frequent depth intervals in all of the test holes and undisturbed samples were recovered in 3 inch diameter thin wall steel Shelby tube samplers at random intervals in the deep test holes. The test holes were drilled by a Soil Mec piling rig which is owned and operated by Subterranean (Manitoba) Ltd., between April 3 to 5, 2006. Bush and/or ponded water areas prevented access to Test Holes 101, 111 and 117. The test holes were 24 inches in diameter and were backfilled with the auger cuttings on completion of each of the test holes. The deep test holes were carried to auger refusal depths in the underlying glacial till and the shallow test holes were stopped at 10 feet.

During the drilling, the soil profile was examined and classified on a continuous basis and samples were taken as earlier described. The samples were sealed to prevent moisture loss and then delivered to our laboratory for reclassification and testing.

Observations were made during the drilling concerning groundwater, seepage and caving conditions within the borings and the effect that these factors may have on the design and construction of geotechnically related features.

Earth-Tech Canada laid out the locations of the test holes and obtained the ground elevations at the locations. The locations of the test holes are indicated on Figure 2.

The logs of the test holes are appended as Figures 3 to 32 inclusive.

5.0 LABORATORY TESTING PROGRAM

In general, the laboratory testing program included sample reclassification, determination of soil moisture contents, assessment of undrained shear strengths of undisturbed samples, soil densities and plasticity characteristics. The pertinent numerical data obtained from the laboratory testing are included on the test hole logs.

6.0 SOIL PROFILE

The soil profile consists of, in descending order, an organic topsoil, underlain by a thick deposit of the Lake Agassiz lacustrine silty clay which in turn is underlain by a glacial silt till deposit. Near the upper part of the clay deposit, a tan silt was encountered in a number of the test holes.

The dominant soil deposit is the Lake Agassiz lacustrine silty clay which extends to depths from 39.0 to 52.5 feet below the existing ground surface between elevations of 716.1 and 724.3 feet. It is brown in colour and transitions to grey near a depth of 25.0 to 30.0 feet. The silty clay is highly plastic and has moisture contents generally in the range of 45.0 to 55.0 percent. It is considerably drier above a depth of about 8.0 feet. The Liquid Limits of four samples which were tested ranged from 80.0 to 100.2 percent and the Plastic Limits ranged between 27.0 and 31.3 percent. The Plasticity Index ranging from 52.4 to 71.8 percent. Corresponding grain size distributions are included as Figures 35 to 38 and indicate clay contents from 54 to 78 percent. The undrained shear strengths tend to decrease with depth as illustrated on the strength profiles on Figure 33. The undrained shear strengths were obtained from unconfined compression tests and supplemented by Torvane and penetrometer tests. The average unit weight of the clay was approximately 109 pcf.

The silt was encountered within the upper 7.0 feet of 13 of the 29 test holes which were drilled. The thickness varied from 0.3 to 4.5 feet. The silt is light brown (tan) in color. At the time of the test drilling, it was relatively dry with no significant seepage noted. However, the silt can become very wet.

The glacial till is a light brown to grey heterogeneous mixture of clay, sand, gravel, cobble and boulder-size materials in a predominately silt matrix. A layer of sand was noted in several of the test holes above and within the glacial till. The glacial till extended to the depth of the test holes where auger refusal was encountered. The contact elevation of the clay-till interface ranged between 716.1 and 724.3 feet (depths of 39.0 and 52.5 feet). The moisture contents of the glacial till are indicative of its relative density and suggest that it is very soft in its upper portion to dense to very dense at depths (moisture contents in excess of and lower than about 9.0 percent respectively).

7.0 GROUNDWATER CONDITIONS

Seepage and caving conditions were noted in only some of the deep test holes when the glacial till was being drilled. It was only in Test Holes 123 and 128 that measurable accumulations were identified immediately after drilling. Test Hole 124 had one foot of water at the bottom of the boring in about 10 minutes and in Test Hole 128, the water rose to 24 feet below the ground surface.

8.0 DISCUSSION AND RECOMMENDATIONS

8.1 General

It is our understanding that the project will entail the construction of a large single storey structure with several two storey areas for the processing of hogs. No basement will be provided but a small 25 to 30 foot deep chamber will be constructed. The building will have an area for receiving, a variety of processing areas, packaging facilities, a large freezer and shipping areas as

well as extensive areas for support services. A weigh scale will be provided near the entrance to the site and a truck wash which will be remote from the main building.

The site will have to be regraded for drainage purposes and the development of roads and parking facilities. Underground services will also be provided.

8.2 Site Considerations

The site development should include the removal of the organic topsoil covering prior to any fill placement for the site regrading. The topsoil could be stockpiled for subsequent reuse. The underlying clay is satisfactory for regrading purposes, however, its moisture content will likely have to be adjusted to optimum conditions. The subgrade on which any fill is to be placed should be compacted to a uniform density of at least 98 percent of Standard Proctor density at optimum moisture content. As noted earlier, tan silt was encountered in a number of the test holes and will likely be encountered in the site development construction. The silt is not suitable as a subgrade material for pavement construction but could be used as general fill such as in landscape areas. Caution should be taken to avoid placing the silt in future development areas.

The site grading considerations are not completed but it is anticipated that the grades at the main building site will be in the order of 2 feet above existing grade.

It is strongly recommended that a working platform of compacted granular materials be placed over the building area, site access roads and any laydown areas, preferably before freezing conditions make it difficult. This will ensure that good access and working areas will be available during construction. It is recommended that the working platform for the building area be extended at least 10 feet or further outside of the building footprint. The working surface could consist of 12 inches of pit run gravel capped with at least 8 inches of crushed granular base course. Alternatives

could be with 4 inch down crushed limestone or crushed concrete. Sand or coarser materials should not be used. The presence of these materials would be a significant hindrance to the foundation installation.

8.3 Foundations

8.3.1 General

On the basis of our understanding of the project, it is our opinion that the preferred foundation for the support of the structure is cast-in-place concrete friction piles and for the heavier loads, driven, end bearing, prestressed, precast concrete piles. Other types of piles are not recommended.

8.3.2 Cast-in-Place Concrete Friction Piles

The cast-in-place concrete friction piles may be sized on the basis of an allowable shaft adhesion of 350 psf of circumferential pile area. The shaft support for the upper 8 feet of shaft should be discounted due to potential soil shrinkage away from the pile. A minimum shaft diameter of 16 inches is recommended. The piles should not extend into the underlying glacial till. If longer piles are required, the shaft sizes should be increased.

Piles potentially subject to natural freezing conditions and potential uplift should contain full length reinforcement and should be a minimum of 25 feet in length regardless of the design loads.

Temporary casing should be used on an as-required basis to prevent seepage and caving conditions into the pile borings, particularly from the silt deposit. It should be noted that the casing was not required during the drilling of the test holes.

8.3.3 Driven Precast Prestressed Concrete Piles

For heavier loads, driven precast prestressed concrete piles are the preferred alternative.

These piles, if driven to practical refusal in the underlying glacial till, can be assigned conventional capacities of 50, 70 and 90 tons respectively for 12, 14 and 16 inch hexagonal sizes. The piles must be driven with a diesel hammer with a rated energy of not less than 30,000 ft. lbs. per blow. Such hammers are the Link Belt 520 and the Delmag D22. Practical refusal can be defined as the final penetration resistance of 5, 8 and 12 blows per inch for the 12, 14 and 16 inch sizes respectively. At least three consecutive sets of the refusal criteria should be obtained for each pile at refusal.

Good construction practice requires that preboring be done at the driven pile locations usually to diameters that are 2 inches larger than the pile size and to depths of 10 to 20 feet. The preboring is effective in reducing ground vibrations, pile heave and contributes positively to pile verticality.

All piles in groups should be restruck to counter the effects of pile heave. Pile spacing should not be closer than 2.5 pile diameters centre to centre. These precast piles, when driven to practical refusal, will derive virtually all of their support from end bearing and no reduction in individual pile capacity within groups is necessary for reasons related to group action.

Due to the variable condition of the glacial till, pile penetration is expected to be quite variable. Difficult driving conditions may be encountered at some pile locations. Full time inspection of this pile installation should be provided.

The pile concrete should be specified to be at least 7 days old prior to driving.

8.3.4 Other Foundation Types

Other types of deep foundations which have been used in the Winnipeg area include cast-in-place concrete spread bored piles, cast-in-place concrete caissons end bearing on the glacial till, cast-in-place concrete caissons socketed into the underlying limestone bedrock and driven timber

piles. For a variety of reasons, principally economics and load/capacity capabilities, these types of piles are not considered appropriate, at least on the basis of our understanding of the project. Shallow footings are not appropriate for this type of facility in the local geotechnical environment.

8.4 Floor Slabs

It is understood that structurally supported floor slabs placed on the deep foundation system will be used throughout this development. A minimum void of at least 8 inches should be provided between the underside of the floor slab and the subgrade soil. A similar void should be provided beneath grade beams and pile caps.

8.5 Excavations and Below-Grade Walls

At the present time, the only deep excavation which is proposed is a CO₂ chamber. It is anticipated that it will be about 25 to 30 feet deep and will have a footprint of about 20 by 20 feet. This type of excavation will have to be shored, rather than open cut. The design of the shoring can be undertaken on the basis of the attached earth pressure diagram, attached as Figure 34.

The below-grade walls should be designed to resist lateral earth pressures based on an earth pressure coefficient of 0.5 and a soil unit weight of 109 pcf. A filter protected weeping tile system must be placed at the base of the wall and any collected seepage waters directed to a positive drainage disposal system. If the weeping tile system is not installed, full hydrostatic pressure must be added to the earth pressure. The backfill adjacent to the walls should be with free draining granular materials.

The design of any retaining walls can be undertaken on the foregoing basis. Weep holes should be provided as well as the free draining granular materials adjacent to the wall.

8.6 Roads and Pavements

Conventional pavement designs which can be considered for this site for heavy duty sections include the following:

- * 8 inches of reinforced concrete on 3 inches of crushed granular base course;
- * 3 inches of asphaltic concrete on 15 inches of crushed granular base course;
- * 20 inches of crushed granular base course.

These sections would be appropriate where truck traffic and large volumes of traffic are proposed.

For light duty areas such as parking lots, the pavements sections could include:

- * 2 inches of asphaltic concrete on 8 inches of crushed granular base course;
- * 12 inches of crushed granular base course.

Other equivalent alternatives may be considered.

The material selections and construction requirements should be to the standards of road construction as set out in the City of Winnipeg Standard Specifications.

The foregoing pavement sections should be placed on a suitably prepared subgrade. The native subgrade soil and fill materials should be compacted to a uniform density of at least 98 percent of Standard Proctor density at optimum water content. Any "soft spots" which might be found by "proof rolling" should be removed and replaced with acceptable materials and should be compacted to the same standard.

We would recommend that, as much as practical, the underground services should not be located beneath pavement areas to avoid settlement problems with trench backfill. Where this is not possible, the backfill should be with the excavated materials compacted to the densities of the adjacent native soils. Bedding of the services should be to current standards.

8.7 Other

All concrete in contact with the soil should be manufactured with sulphate resistant cement and should be of high quality.

Slope gradients in landscaped area should be at least 2 percent and in pavement areas, at least 1 percent.



Respectfully submitted,

DYREGROV CONSULTANTS

per: 

A.O. Dyregrov, P.Eng.

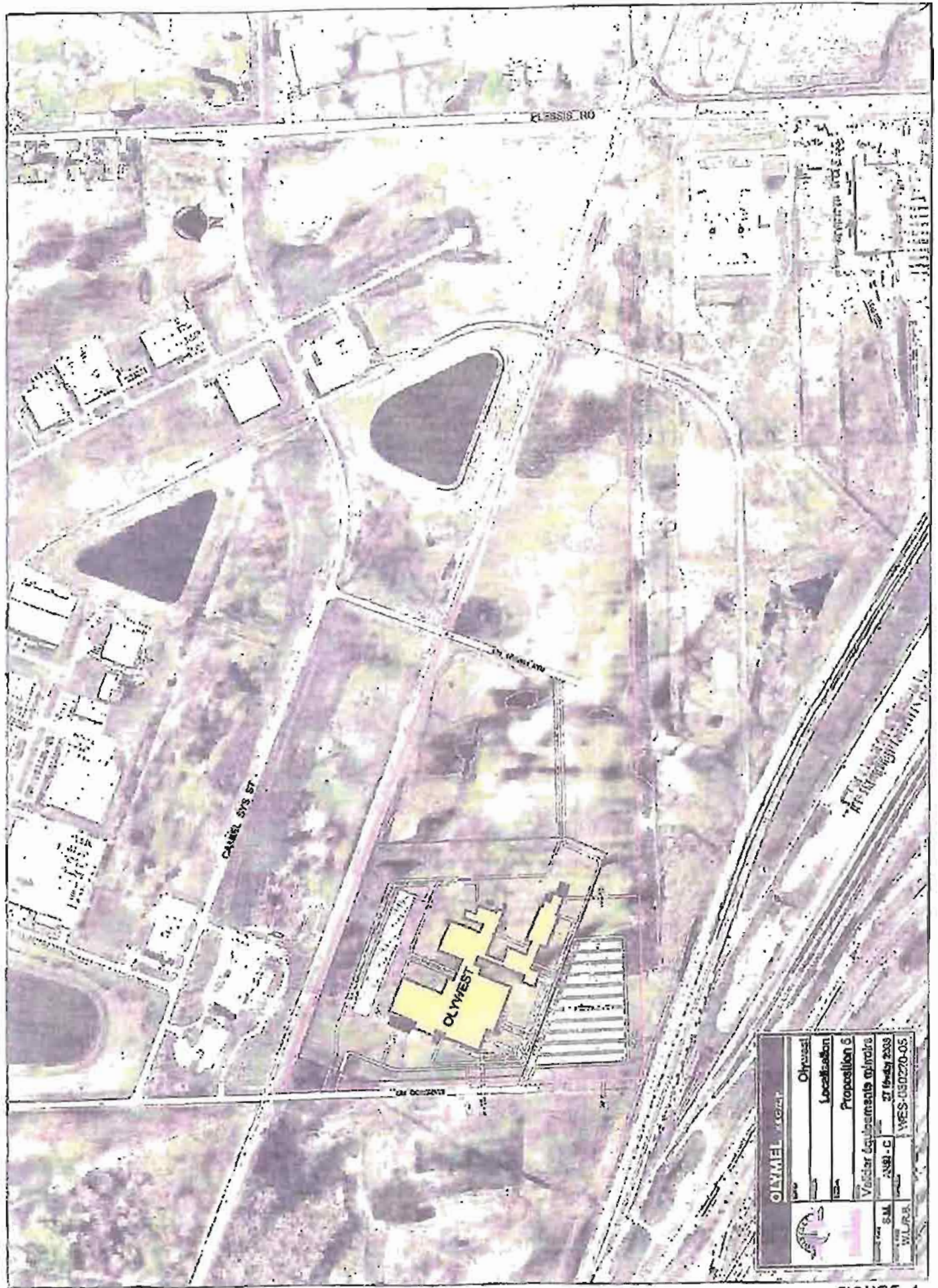
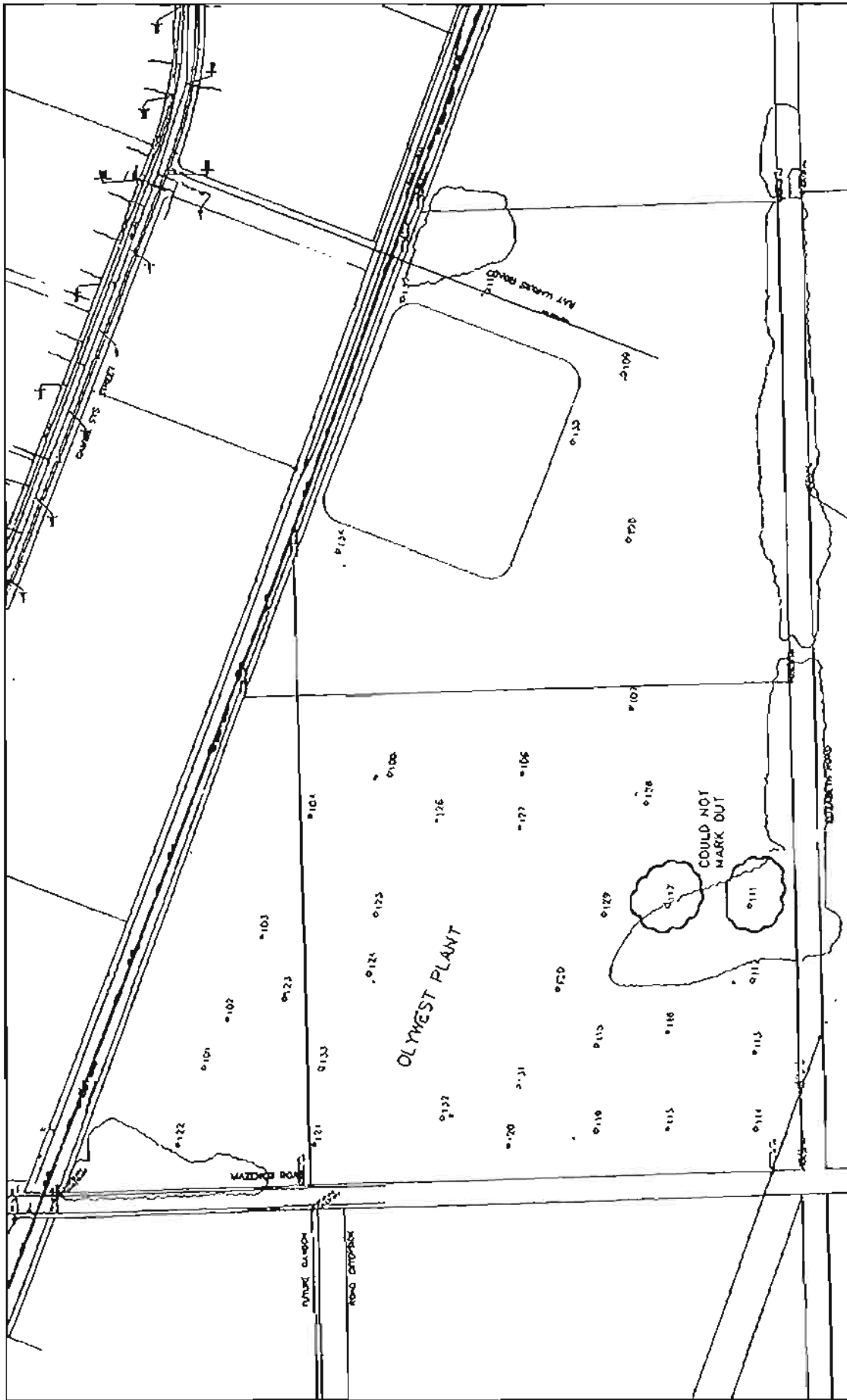


FIGURE 1



		Project: NIS 03/28/06 Subject: RY-02 Date: 06/03/28	
OLYMEST PLANT TEST HOLE LOCATIONS MARK OUT		1 06/03/28 TEST HOLE MARK OUT 1 06/03/28 TEST HOLE MARK OUT	

FIGURE 2

C:\Documents and Settings\jllie\Local Settings\Temporary Internet Files\O:\K:\148\RY-02.dwg 06-03-06 02:35pm 07/01/11-02 -jllie.dwg

DYREGROV		CONSULTANTS		Logged/Dwn.: TH	Test Hole No.	Project No.
PROJECT:		OLYWEST PORK PROCESSING PLANT		Checked: AOD	102	252709
CLIENT:		EARTH TEST		DATE OF INVEST.		APRIL 3, 2006
				DRILL		SUBTERRANEAN, 24 INCH AUGER
SAMPLE NO.	DEPTH (FT)	ELEV (FT)	S Y M	SDIL DESCRIPTION	MOISTURE CONTENT (%)	
	0.00	761.57		0.00-0.70 GRASS OVER TOPSOIL	0	0
	1.50	760.97		0.70-10.00 CLAY	10	10
	3.00	756.57		DARK BROWN TO BROWN, SILTY, STIFF	20	20
	4.50	767.07		HIGH PLASTIC.	30	30
	6.00	755.57			40	40
	7.50	754.07			50	50
	9.00	762.62			60	60
	10.50	751.07		END OF TEST HOLE AT 10.0 FEET IN BROWN STIFF CLAY	70	70

FIGURE 3

DYREGROV CONSULTANTS		Logged/Dwn.: TH Checked: AOD		Test Hole No. 103	Project No. 252769
PROJECT: OLYWEST PORK PROCESSING PLANT				DATE OF INVEST. APRIL 3, 2006	
CLIENT: EARTH TECH				DRILL: SUBTERRANEAN, 24 INCH AUGER	
SAMPLE NO	DEPTH (FT)	ELEV (FT)	S Y M	SOIL DESCRIPTION	MOISTURE CONTENT (%)
	0.00	781.84		0.00-0.00 TOPSOIL	
	1.00	780.34		0.00-1.00 CLAY BROWN, BRNF, SATY, HIGH PLASTIC	
	3.00	758.84			
	4.50	757.34		1.00-4.70 SILT - TAN, DAMP 0.70-10.00 CLAY BROWN, STUFF, SATY, HIGH PLASTIC	
	6.00	755.84			
	7.50	754.34			
	9.00	767.84		TRACE SULPHATE LENSING	
	10.50	751.34			
END OF TEST HOLE AT 10.00 IN BROWN CLAY					

The graph plots Moisture Content (%) on the x-axis (0 to 100) against depth in feet on the y-axis (0 to 60). A single data point is plotted at a depth of approximately 4.5 feet and a moisture content of approximately 45%. The point is connected to the y-axis by a vertical line and to the x-axis by a horizontal line.

FIGURE 1

DYREGROV		CONSULTANTS		Logged/Dwn.: TH	Test Hole No.	Project No.
PROJECT:		OLYWEST PORK PROCESSING PLANT		Checked: AOD	104	252769
CLIENT:		EARTH TEST		DATE OF INVEST. APRIL 3, 2006		DRILL: SUBTERRANEAN, 24 INCH AUGER
SAMPLE NO.	DEPTH (FT)	ELEV (FT)	S Y U	SOIL DESCRIPTION	MOISTURE CONTENT (%)	
	0.00	781.65		0.00-0.80 TOPSOIL	0	0
	1.20	780.15		0.80-1.00 CLAY	10	40
	3.00	758.65		BROWN, STIFF, SILTY, HIGH PLASTIC	10	40
	4.50	757.15		4.00-4.60 SILT	10	40
	6.00	765.65		TAXI CLAMP (+)	10	40
	7.50	754.15		0.50-10.00 CLAY	10	40
	9.00	762.65		BROWN, STIFF, SILTY, HIGH PLASTIC	10	40
	10.50	751.15		END OF TEST HOLE AT 10.6 FEET IN BROWN CLAY	10	40
	12.00	740.65			10	40

FIGURE 5

DYREGROV		CONSULTANTS		Logged/Own.: TH	Test Hole No.	Project No.
PROJECT:		OLYWEST PORK PROCESSING PLANT		Checked: AOD	105	252769
CLIENT:		EARTH TECH		DATE OF INVEST		APRIL 5, 2006
				DRILL:		SUBTERRANEAN, 24 INCH AUGER
SAMPLE NO.	DEPTH (FT)	ELEV (FT)	S Y M	SOIL DESCRIPTION	MOISTURE CONTENT (%)	
	0.00	761.81		NOTE TEST HOLE MOVED 28 FEET N.E FROM MARKED LOCATION	0	100
	1.50	760.21		0.00-0.80 TOPSOIL		
	3.00	758.84		0.80-1.00 CLAY, BROWN, SILTY, STIFF		
	4.50	767.34		1.00-3.80 SILT FAY, WET		
	6.00	755.84		3.80-10.00 CLAY BROWN, SILTY, STIFF, HIGH PLASTIC		
	7.50	754.34				
	9.00	752.84				
	10.50	751.34		END OF TEST HOLE AT 10.0 FEET IN BROWN STIFF CLAY		
	12.00	749.84				

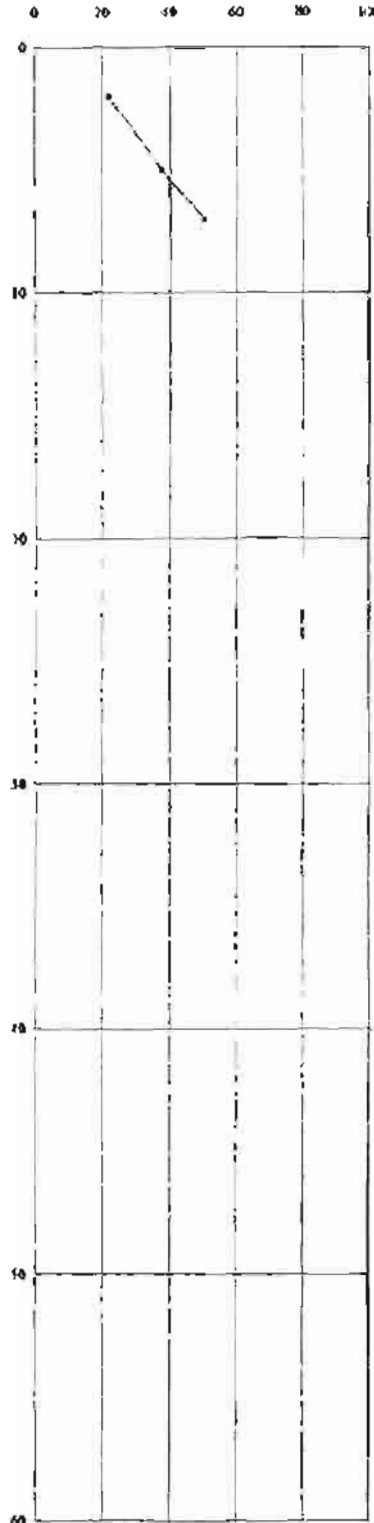
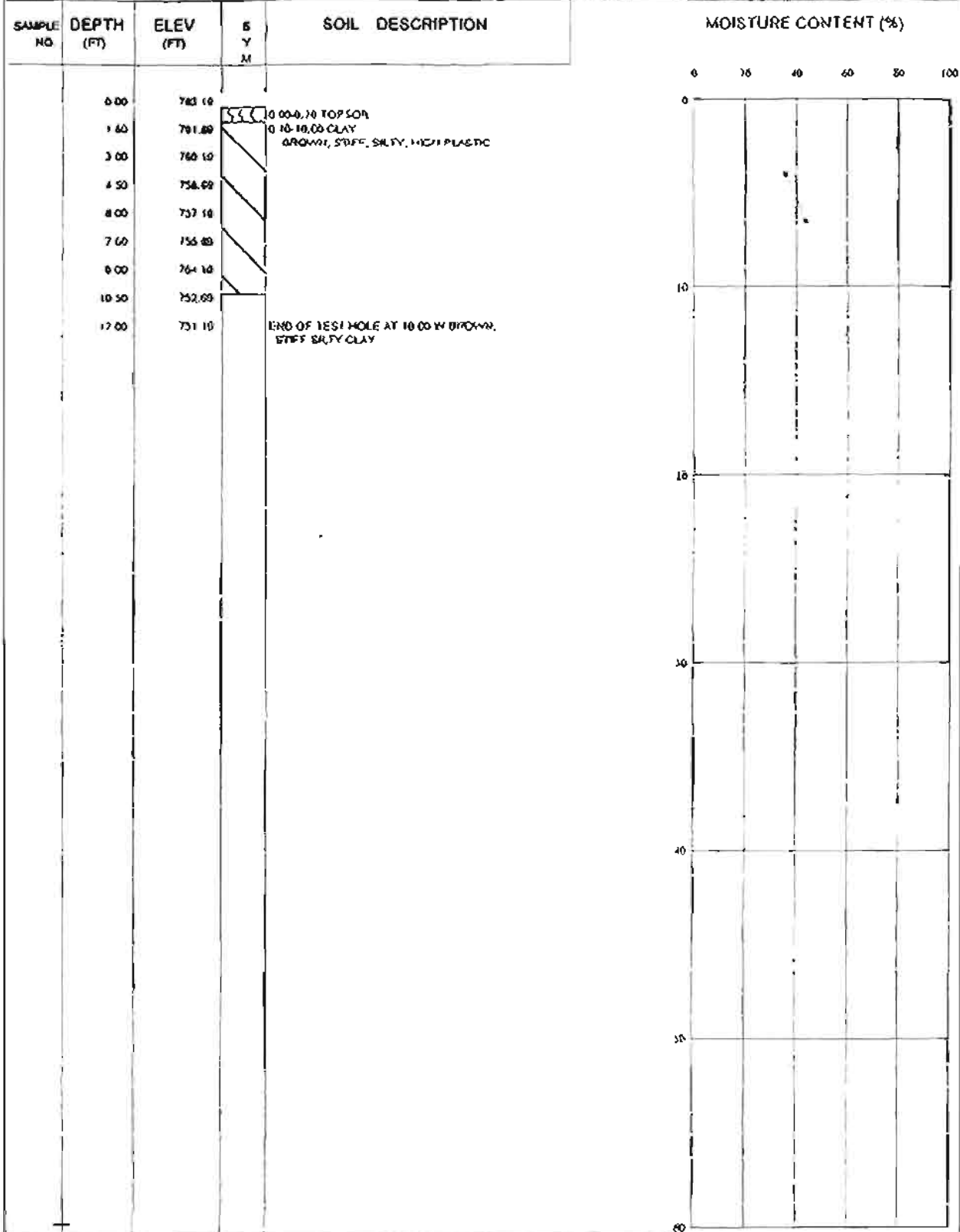


FIGURE 8

DYREGROV		CONSULTANTS		Logged/Dwn.: TH	Test Hole No.	Project No.
PROJECT: OLYWEST PORK PROCESSING PLANT		EARTH TECT		Checked: AOD	106	252769
CLIENT:				DATE OF INVEST. APRIL 5, 2006		DRILL: SUBTERRANEAN, 24 INCH AUGER
SAMPLE NO.	DEPTH (FT)	ELEV (FT)	S Y M	SOIL DESCRIPTION	MOISTURE CONTENT (%)	
	0.00	772.57		0.00-0.20 TOPSOIL	0 10 20 30 40 50 60 70 80 90 100	
	1.50	761.07		0.20-10.00 CLAY	<p>The graph plots moisture content (%) on the x-axis (0 to 100) against depth (ft) on the y-axis (0 to 50). A single data point is plotted at a depth of 1.50 ft with a moisture content of approximately 45%. The rest of the graph area is empty.</p>	
	3.00	768.67		BROWN, STIFF, SILTY, HIGH PLASTIC		
	3.50	758.07				
	4.00	758.57				
	7.50	765.07				
	9.00	762.67				
	10.50	757.07				
	12.00	760.57		END OF TEST HOLE AT 10.00 FT BROWN STIFF CLAY		

FIGURE 7

PROJECT: OLYWEST PORK PROCESSING PLANT	DATE OF INVEST. APRIL 5, 2008
CLIENT: EARTH TECH	DRILL: SUBTERRANEAN, 24 INCH AUGER



DYREGROV		CONSULTANTS		Logged/Dwn.: TH	Test Hole No.	Project No.
PROJECT:		OLYWEST PORK PROCESSING PLANT			100	252769
CLIENT:		EARTH TEST			DATE OF INVEST.	APRIL 5, 2006
					DRILL :	SUBTERRANEAN, 24 INCH AUGER
SAMPLE NO.	DEPTH (FT)	ELEV (FT)	g Y M	SOIL DESCRIPTION	MOISTURE CONTENT (%)	
	0.00	783.82		NOTE: MOVED TEST HOLE 25 FEET EAST FROM MARKED LOCATION	0 20 40 60 80 100	
	1.00	782.17	556	0.00-0.80 TOPSOIL		
	3.00	780.82		0.80-10.00 CLAY		
	4.50	759.12		BROWN, SILTY, STIFF, HIGH PLASTIC		
	6.00	757.62				
	7.50	756.12				
	9.00	754.82				
	10.50	753.12		END OF TEST HOLE AT 10.0 FEET IN STIFF BROWN CLAY		

DYREGROV		CONSULTANTS		Logged/Dwn.: TH	Test Hole No.	Project No.
PROJECT: OLYWEST PORK PROCESSING PLANT		EARTH TECH		Checked: AOD	109	252769
CLIENT:				DATE OF INVEST. APRIL 5, 2006		DRILL: SUBTERRANEAN, 24 INCH AUGER
SAMPLE NO.	DEPTH (FT)	ELEV (FT)	S Y M	SOIL DESCRIPTION	MOISTURE CONTENT (%)	
				NOTE MOVED TEST HOLE 26 FEET WEST FROM MARKED LOCATION	0	10 20 30 40 50 60 70 80 90 100
	0.00	767.27		0.00-0.40 TOPSOIL		
	1.50	760.87		0.80-10.00 CLAY		
	3.00	754.37		BROWN, STIFF, SILTY, HIGH PLASTIC		
	4.50	767.87				
	6.00	760.37				
	7.50	754.87				
	9.00	762.37				
	10.50	761.87				
	12.00	756.37		END OF TEST HOLE AT 10.0 FEET IN BROWN SILTY CLAY		
	17.00	750.37				

DYREBROV CONSULTANTS		Logged/Dwn.: TH Checked: AOD		Test Hole No. 110	Project No. 252769							
PROJECT: OLYWEST PORK PROCESSING PLANT				DATE OF INVEST. APRIL 6, 2008								
CLIENT: EARTH TEST				DRILL: SUBTERRANEAN, 24 INCH AUGER								
SAMPLE NO	DEPTH (FT)	ELEV (FT)	SYM	SOIL DESCRIPTION	MOISTURE CONTENT (%)							
					0	10	20	30	40	50		
	0.00	787.61		NOTE: MOVED TEST HOLE 15.0 FEET NORTH FROM MARKED LOCATION								
	1.50	780.31		0.00-1.00 TOPSOIL								
	3.00	777.81		1.00-10.00 CLAY								
	4.50	757.51		BROWN, STIFF, SILTY HIGH PLASTIC								
	6.00	766.81										
	7.50	754.51										
	9.00	763.01										
	10.50	751.51										
	12.00	750.01		END OF TEST HOLE AT 10.5 IN BROWN, STIFF, SILTY, CLAY								

BYREGROV		CONSULTANTS		Logged/Down: TH	Test Hole No.	Project No.	
				Checked: AOD.	112	252769	
PROJECT:		OLYWEST PORK PROCESSING PLANT			DATE OF INVEST. APRIL 5, 2006		
CLIENT:		EARTH TEST			DRILL: SUBTERRANEAN, 24 INCH AUGER		
SAMPLE NO.	DEPTH (FT)	ELEV (FT)	S Y M	SOIL DESCRIPTION	MOISTURE CONTENT (%)		
	0.00	700.35		0.00-0.20 TOPSOIL			
	1.50	701.85		0.20-2.50 CLAY BROWN, SILTY, SILTY			
	3.00	700.35		2.50-3.50 SAT GREY/TAN, SOME SAND, SOME CLAY, DAMP			
	4.00	700.25					
	6.00	757.35		5.50-10.00 CLAY BROWN, SILTY, HIGH PLASTIC			
	7.50	753.85					
	9.00	764.35					
	10.50	757.85					
				END OF TEST HOLE AT 10.0 FEET IN BROWN CLAY			

DYREGROV		CONSULTANTS		Logged/Down.: TH Checked: AOD		Test Hole No. 113		Project No. 252769					
PROJECT: CLIENT:				OLYWEST PORK PROCESSING PLANT EARTH TEST		DATE OF INVEST. DRILL :		APRIL 5, 2006 SUBTERRANEAN, 24 INCH AUGER					
SAMPLE NO	DEPTH (FT)	ELEV (FT)	S Y U	SOIL DESCRIPTION		MOISTURE CONTENT (%)							
	0.00	187.16		0.00-1.00 TOP SOIL 0.10-1.00 CLAY BROWN, SALTY, STIFF, HIGH PLASTIC									
	1.50	181.70											
	3.00	158.76											
	4.50	156.70											
	6.00	154.70											
	7.50	165.20		END OF TEST HOLE AT 10.0 FEET IN BROWN CLAY									
	9.00	163.36											
	10.50	152.26											

DYREGROV		CONSULTANTS		Logged/Dwn.: TH	Test Hole No.	Project No.
PROJECT:		OLYWEST PORK PROCESSING PLANT		Checked: AOD	114	252769
CLIENT:		EARTH TEST		DATE OF INVEST. APRIL 5, 2006		DRILL: SUBTERRANEAN, 24 INCH AUGER
SAMPLE NO.	DEPTH (FT)	ELEV (FT)	S Y M	SOIL DESCRIPTION	MOISTURE CONTENT (%)	
	0.00	782.04			0	100
	1.50	780.54		0.00-1.00 TOPSOIL		
	3.00	759.04		1.00-10.00 CLAY		
	4.50	757.54		BROWN, STIFF, SILTY, > 10% PLASTIC		
	6.00	756.04				
	7.50	754.54				
	9.00	763.04				
	10.60	751.54				
	12.00	750.04		END OF TEST HOLE AT 10.6 FEET IN BROWN CLAY		

FIGURE 14

DYREGROV		CONSULTANTS		Logged/Own.: TH	Test Hole No.	Project No.				
PROJECT:		OLYWEST PORK PROCESSING PLANT		Checked: AOD	115	2S2769				
CLIENT:		EARTH TEST		DATE OF INVEST. APRIL 5, 2006		DRILL: SUBTERRANEAN, 24 INCH AUGER				
SAMPLE NO.	DEPTH (FT)	ELEV (FT)	S Y M	SOIL DESCRIPTION	MOISTURE CONTENT (%)					
					0	20	40	60	80	100
	0.00	762.57		0.00-0.60 TOPSOIL						
	1.60	761.07		0.60-10.00 CLAY						
	3.00	760.67		BROWN, STIFF, SILTY, HIGH PLASTIC						
	4.50	760.07								
	6.00	759.57								
	7.50	759.07								
	9.00	758.57								
	10.60	752.07								
	12.00	750.57		END OF TEST HOLE AT 10.00 IN BROWN CLAY						

FIGURE 15

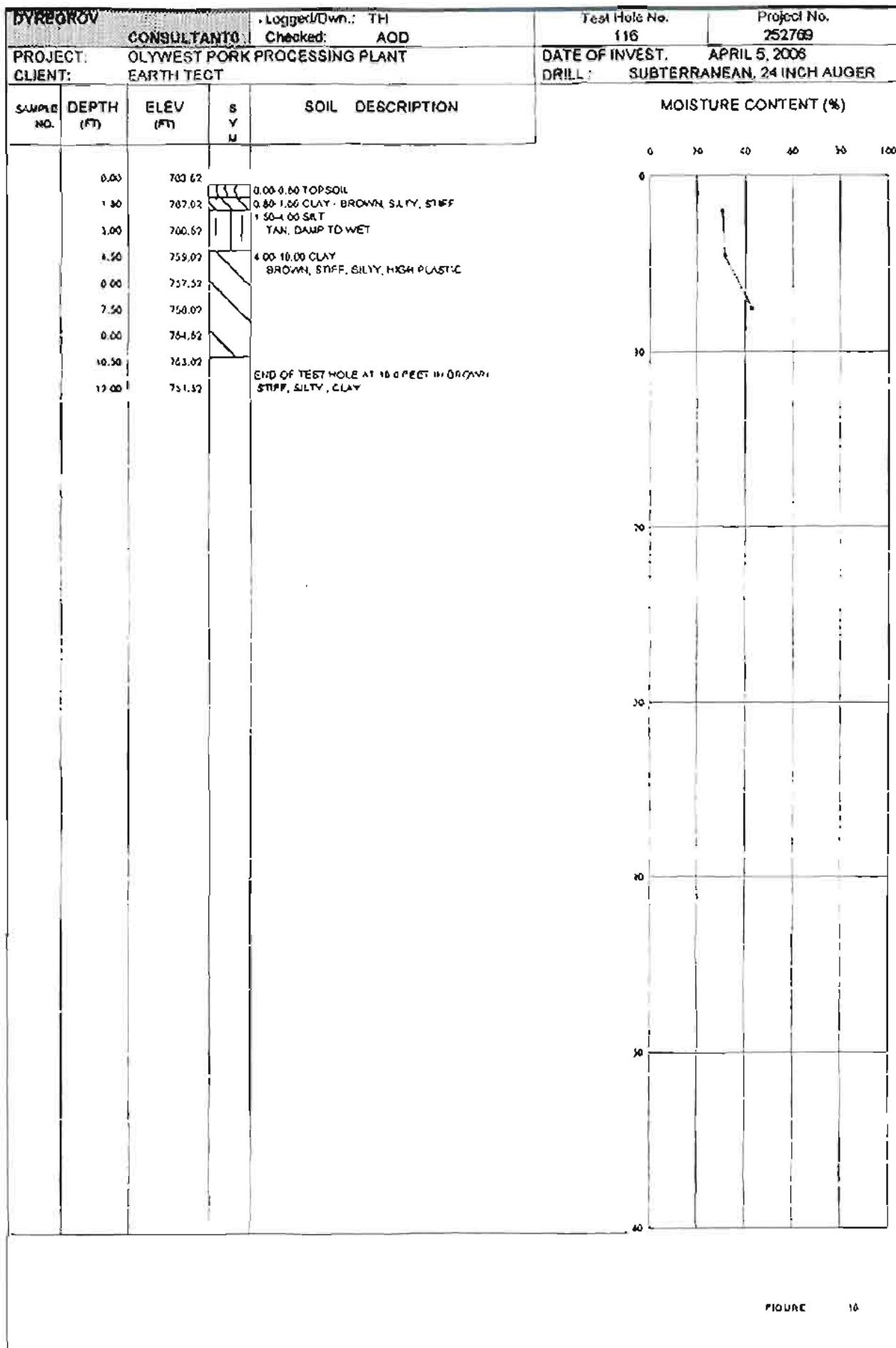


FIGURE 10

BYREGROV		CONSULTANTS		Logged/Drawn: TH	Test Hole No.	Project No.				
PROJECT:		OLYWEST PORK PROCESSING PLANT		Checked: AOD	118	252769				
CLIENT:		EARTH TEST		DATE OF INVEST. APRIL 5, 2006		DRILL: SUBTERRANEAN, 24 INCH AUGER				
SAMPLE NO.	DEPTH (FT)	ELEV (FT)	SYMBOL	SOIL DESCRIPTION	MOISTURE CONTENT (%)					
					0	20	40	60	80	100
	0.00	783.45		0.00-0.50 TOPSOIL						
	1.50	781.05		0.50-2.00 CLAY BROWN STIFF, SILTY, HIGH PLASTIC						
	3.00	780.45		2.00-7.00 SILT YAW, WET						
	4.50	780.95								
	8.00	757.43								
	7.50	753.05		7.00-10.00 CLAY BROWN, SILTY, STIFF HIGH PLASTIC						
	9.00	744.16								
	10.50	752.05								
	17.00	751.45		END OF TEST HOLE AT 10.0 FEET IN BROWN CLAY						

DYREGROV		CONSULTANTS		Logged/Dwn.: TH	Test Hole No.	Project No.					
PROJECT:		OLYWEST PORK PROCESSING PLANT		Checked: AOD	119	252709					
CLIENT:		EARTH TEST		DATE OF INVEST. APRIL 5, 2006		DRILL: SUBTERRANEAN, 24 INCH AUGER					
SAMPLE NO.	DEPTH (FT)	ELEV (FT)	B Y M	SOIL DESCRIPTION	MOISTURE CONTENT (%)						
					0	20	40	60	80	100	
	0.00	763.00		0.00-0.10 TOPSOIL							
	1.50	762.10		0.10-10.00 CLAY							
	3.00	760.00		BROWN, STIFF, SILTY, HIGH PLASTIC							
	4.50	758.10									
	6.00	757.00									
	7.50	766.10									
	9.00	764.60		FROM 7.5 TO 10.0 SOME SILT LENSING AND TRACE OF SULPHATES							
	10.00	753.10		END OF TEST HOLE AT 10.00 IN BROWN CLAY							

FIGURE 10

DYREGROV		CONSULTANTS		Logged/Dwn.: TH	Test Hole No.	Project No.
PROJECT:		OLYWEST PORK PROCESSING PLANT		Checked: AOD	120	252769
CLIENT:		EARTH TEST		DATE OF INVEST. APRIL 5, 2008		DRILL: SUBTERRANEAN, 24 INCH AUGER
SAMPLE NO.	DEPTH (FT)	ELEV (FT)	S Y M	SOIL DESCRIPTION	MOISTURE CONTENT (%)	
	0.00	763.48		0.00-0.60 TOPSOIL	0	100
	1.50	761.08		0.60-2.60 CLAY BROWN, STIFF, SILTY HIGH PLASTIC	0	100
	2.00	760.48		2.20-4.60 SILT TAN, WET	0	100
	1.50	756.98		4.60-10.00 CLAY BROWN, STIFF, SILTY HIGH PLASTIC	0	100
	4.00	757.48			0	100
	7.50	756.98			0	100
	9.00	764.48			0	100
	10.50	762.98		END OF TEST HOLE AT 10.0 IN BROWN SILTY CLAY	0	100

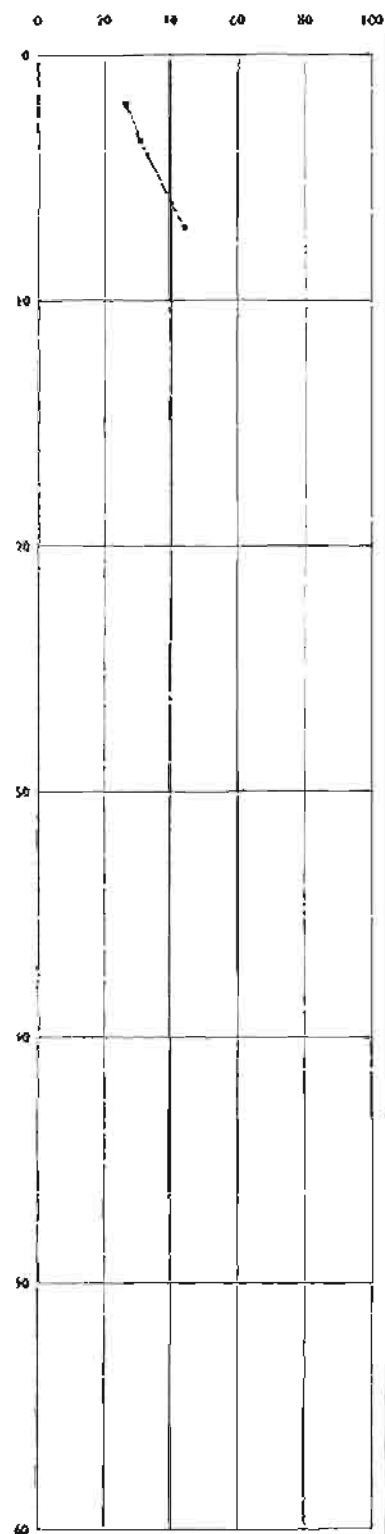


FIGURE 19

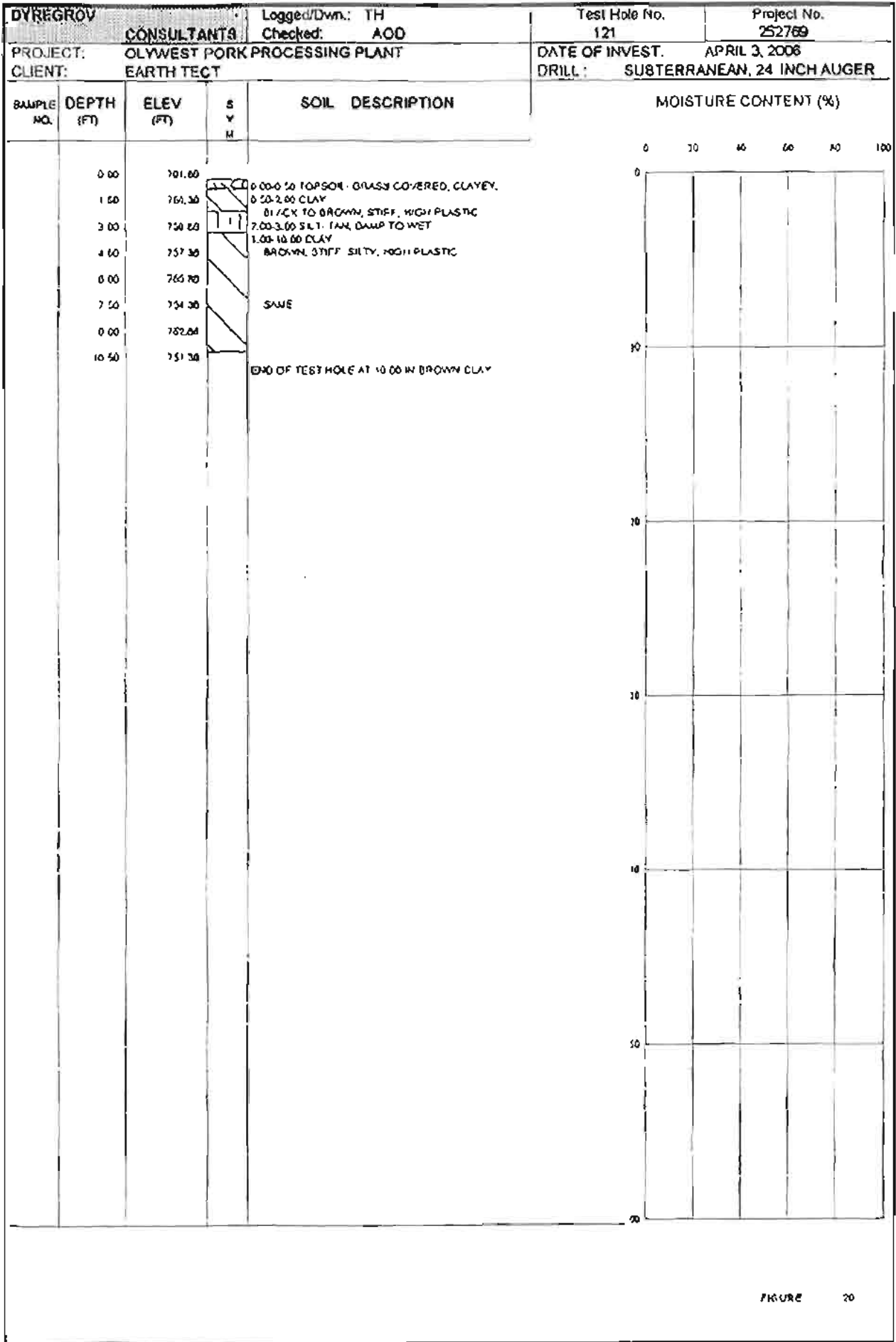


FIGURE 20

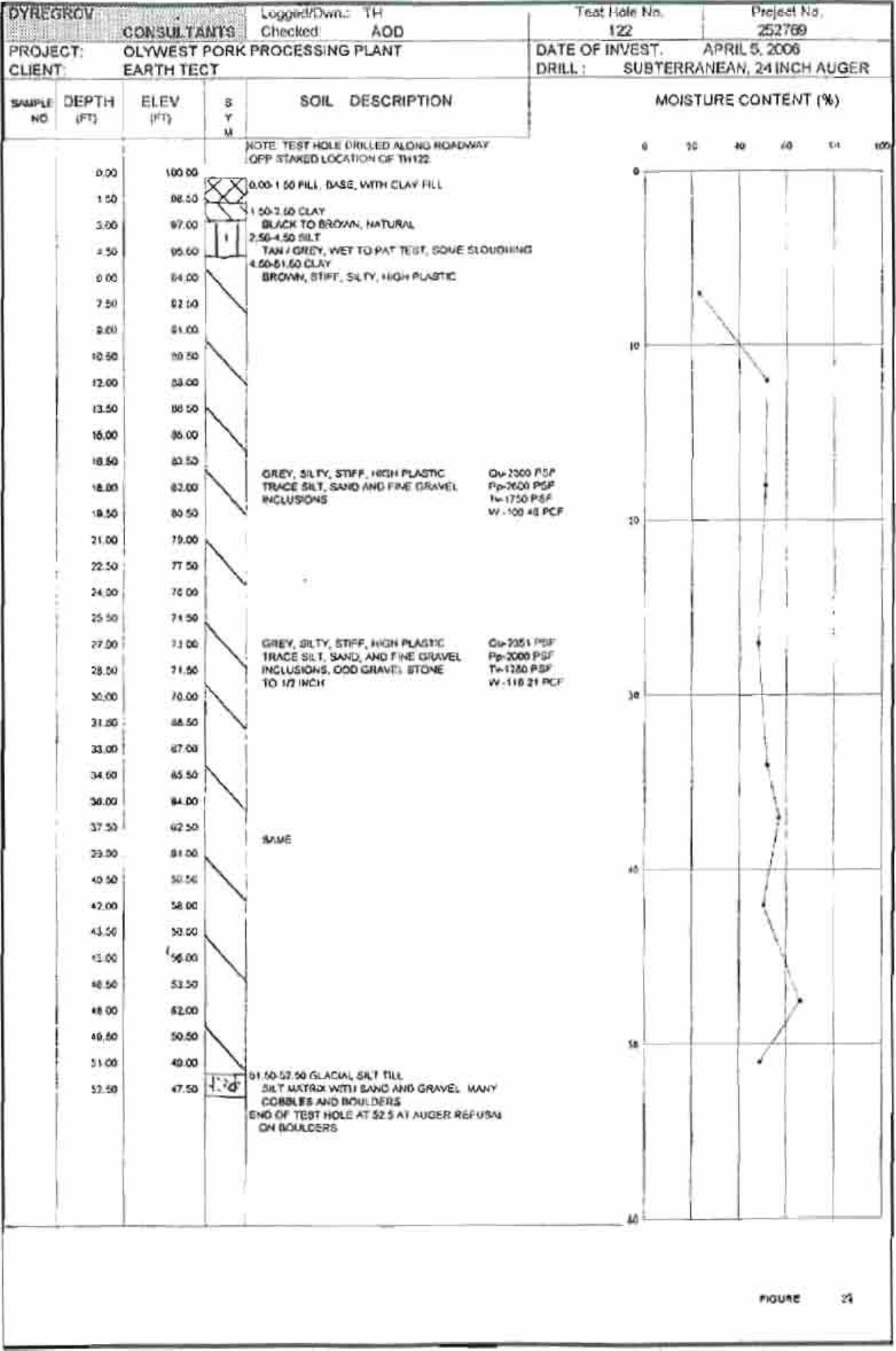


FIGURE 24

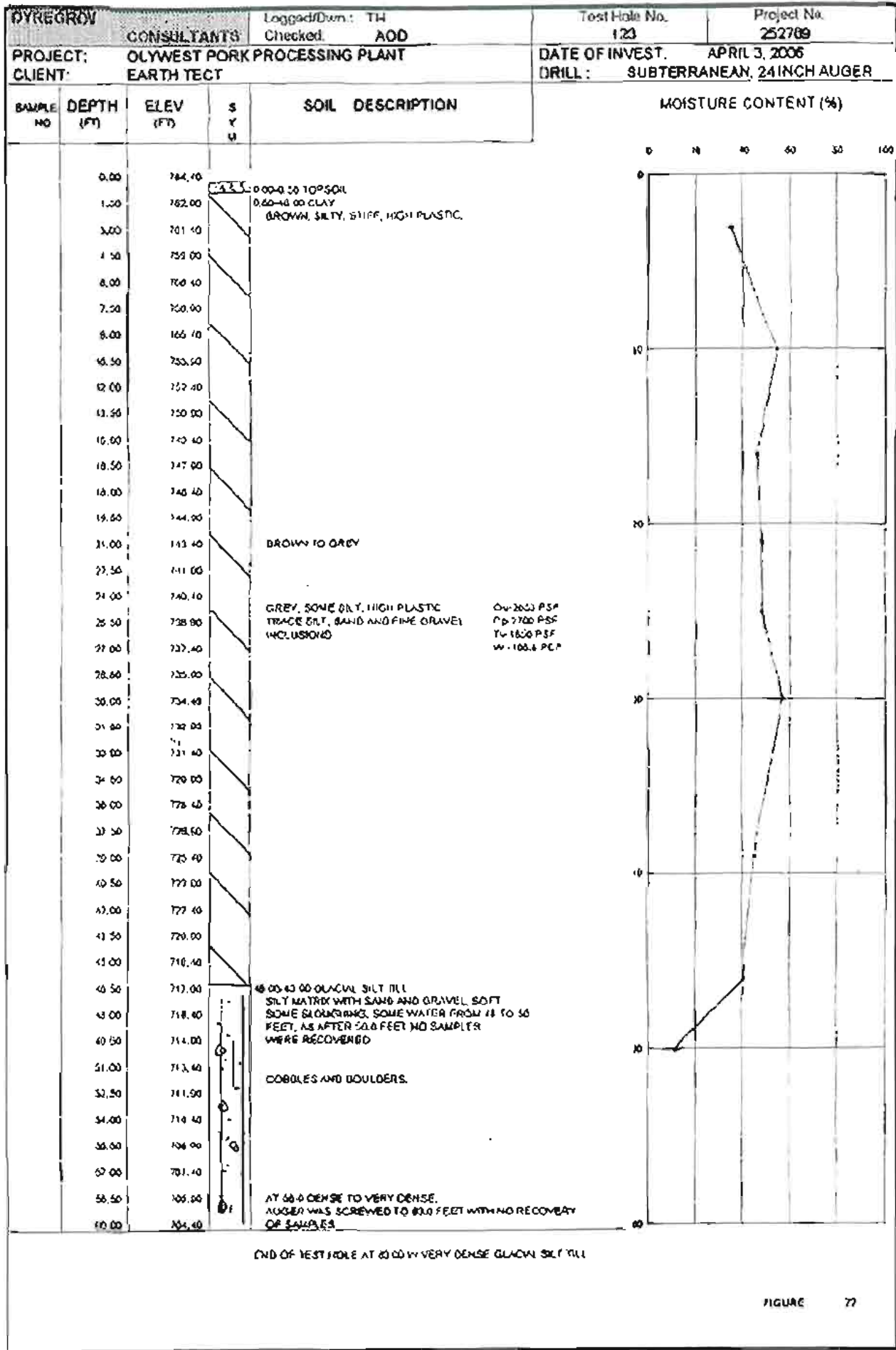


FIGURE 77

BYREGROV		CONSULTANTS		Logged/Down: TH Checked: AOD		Test Hole No. 124		Project No. 252769		
PROJECT:		OLYWEST PORK PROCESSING PLANT				DATE OF INVEST.		APRIL 5, 2006		
CLIENT:		EARTH TECT				DRILL:		SUBTERRANEAN, 24 INCH AUGER		
SAMPLE NO.	DEPTH (FT)	ELEV (FT)	S Y M	SOIL DESCRIPTION	MOISTURE CONTENT (%)					
					0	20	40	60	80	100
	0.00	781.04		0.00-0.80 TOPSOIL						
	1.50	780.18		0.80-11.00 CLAY						
	3.00	758.08		BROWN, SILTY, STIFF, HIGH PLASTIC						
	4.50	757.18								
	6.00	756.08								
	7.50	754.18								
	9.00	762.84		SAME						
	10.50	751.18								
	12.00	749.00								
	13.50	748.18								
	15.00	740.08								
	16.50	745.18								
	18.00	743.08		BROWN, SILTY, STIFF, LAMINATED SILT AND CLAY, TRACE SILT, SAND, AND FINE GRAVEL INCLUSIONS	QU-2076 PSF PO-7800 PSF TW-2100 PSF W-100 TO PCF					
	19.50	742.18		HIGH PLASTIC						
	21.00	740.08								
	22.50	730.18								
	24.00	737.08								
	25.50	738.18								
	27.00	734.08								
	28.50	733.18								
	30.00	731.08								
	31.50	730.18		GREY, FIRM, SILTY, HIGH PLASTIC TRACE SILT, SAND AND FINE GRAVEL INCLUSIONS	QU-1837 PSF PO-1020 PSF TW-1100 PSF W-100 TO PCF					
	33.00	728.88								
	34.50	727.18								
	36.00	725.05								
	37.50	724.18								
	39.00	722.88								
	40.50	721.18								
	42.00	719.88								
	43.50	718.18								
	45.00	718.88		44.00-46.00 GLACIAL SILT TILL						
				END OF TEST HOLE AT 45.0 FEET ON LARGE Boulders NOTE: WATER ON TIP OF AUGER, WATER ROSE SLOWLY, AT ONE FOOT IN TEST HOLE AFTER 10 MINUTES THE TEST HOLE WAS PULVED OFF LINE AT 44.0 FEET						

DYREGROV		CONSULTANTS		Logged/Dwnr.: TH	Test Hole No.	Project No.
PROJECT: OLYWEST PORK PROCESSING PLANT		EARTH TEST		Checked: AOD	125	252769
CLIENT:				DATE OF INVEST. APRIL 3, 2006		
				DRILL: SUBTERRANEAN, 24 INCH AUGER		
SAMPLE NO	DEPTH (FT)	ELEV (FT)	S Y M	SOIL DESCRIPTION	MOISTURE CONTENT (%)	
	0.00	702.07		0 00-0 70 TOPSOIL	0	9
	1.50	780.67		0 70-18.00 CLAY		
	3.00	769.07		BROWN, STIFF, SILTY, HIGH PLASTIC		
	4.50	757.57				
	6.00	750.07				
	7.50	754.67		AT 6.6 TO 7.25 DAY SALT LAYER		
	9.00	763.07				
	10.50	751.57				
	12.00	750.07		BROWN, STIFF, SILTY, HIGH PLASTIC		
	13.50	748.57				
	15.00	747.07				
	16.50	745.57				
	18.00	744.07				
	19.50	742.57				
	21.00	741.07				
	22.50	739.57				
	24.00	738.07		GREY, SILTY, STIFF, TRACE SILT, SAND AND FINE GRAVEL, HIGH PLASTIC	PO 7200 PSF	
	25.50	736.57			PA 1350 PSF	
	27.00	735.07				
	28.50	733.57				
	30.00	732.07				
	31.50	730.57				
	33.00	729.07				
	34.50	727.57				
	36.00	726.07		GREY, MEDIUM, SILTY, HIGH PLASTIC TRACE SILT SAND AND FINE GRAVEL INCLUSIONS	Q> 1064 PSF	
	37.50	724.57			P< 1500 PSF	
	39.00	723.07			N-700 PSF	
	40.50	721.57			W-100.10 PCF	
	42.00	720.07				
	43.50	718.57				
	45.00	717.07				
	46.50	715.57				
	48.00	714.07		48.00-50.00 GLACIAL SALT TILL SILT MATRIX WITH SAND AND GRAVEL SOME COBBLES AND BOULDERS MEDIUM TO SOFT, WET TO PAT TEST AT 48.0 FEET NOTE DENSE		
	49.50	712.57				
	51.00	711.07				
	52.50	709.57				
	54.00	708.07		AT 54.0 FEET DENSE TO VERY DENSE, BOULDERS		
	55.50	706.57				
	57.00	705.07		END OF TEST HOLE AT 56.00 AT AUGER REFUSAL		
				NOTE: TEST HOLE DRY UPON COMPLETION OF DRILLING		

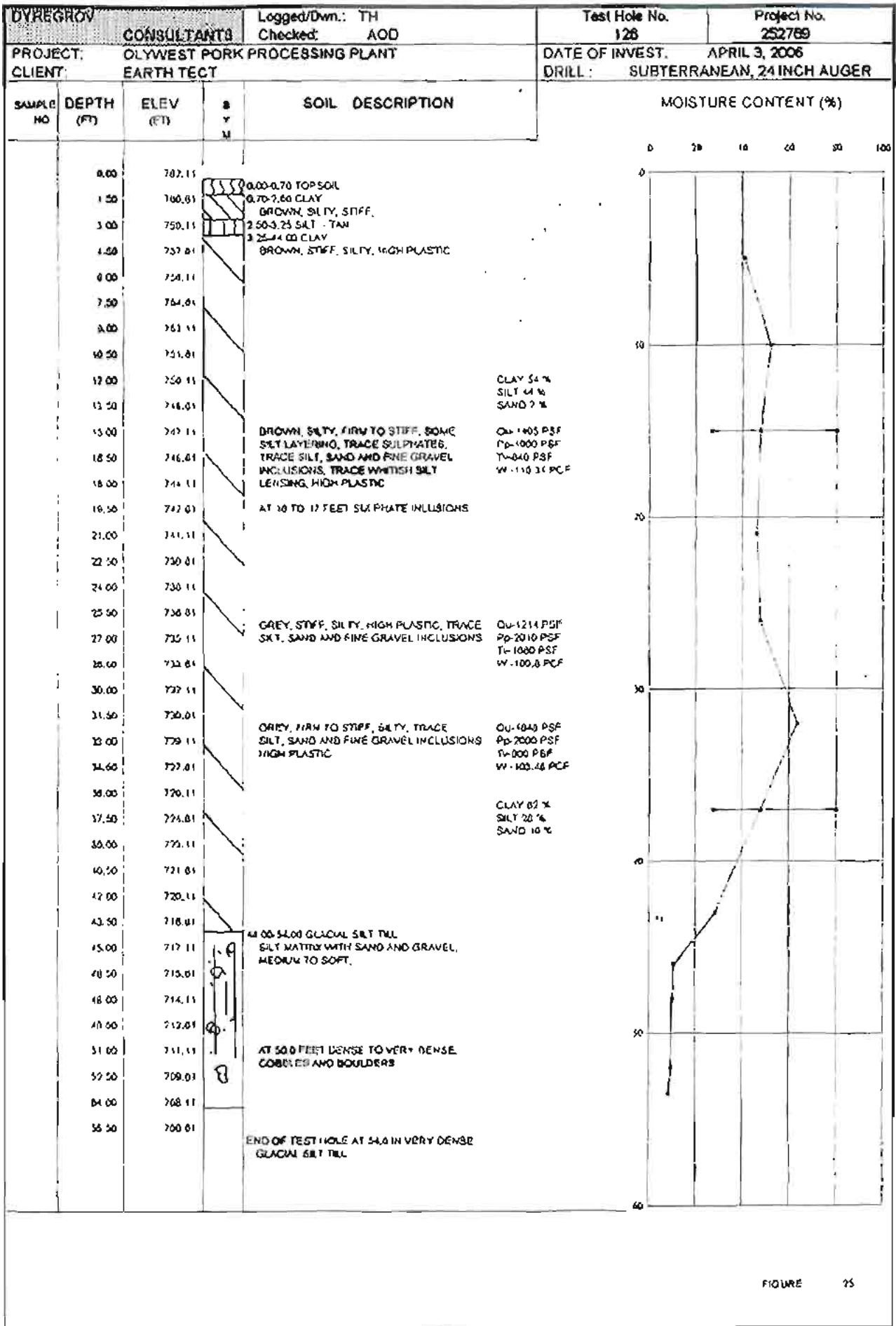


FIGURE 25

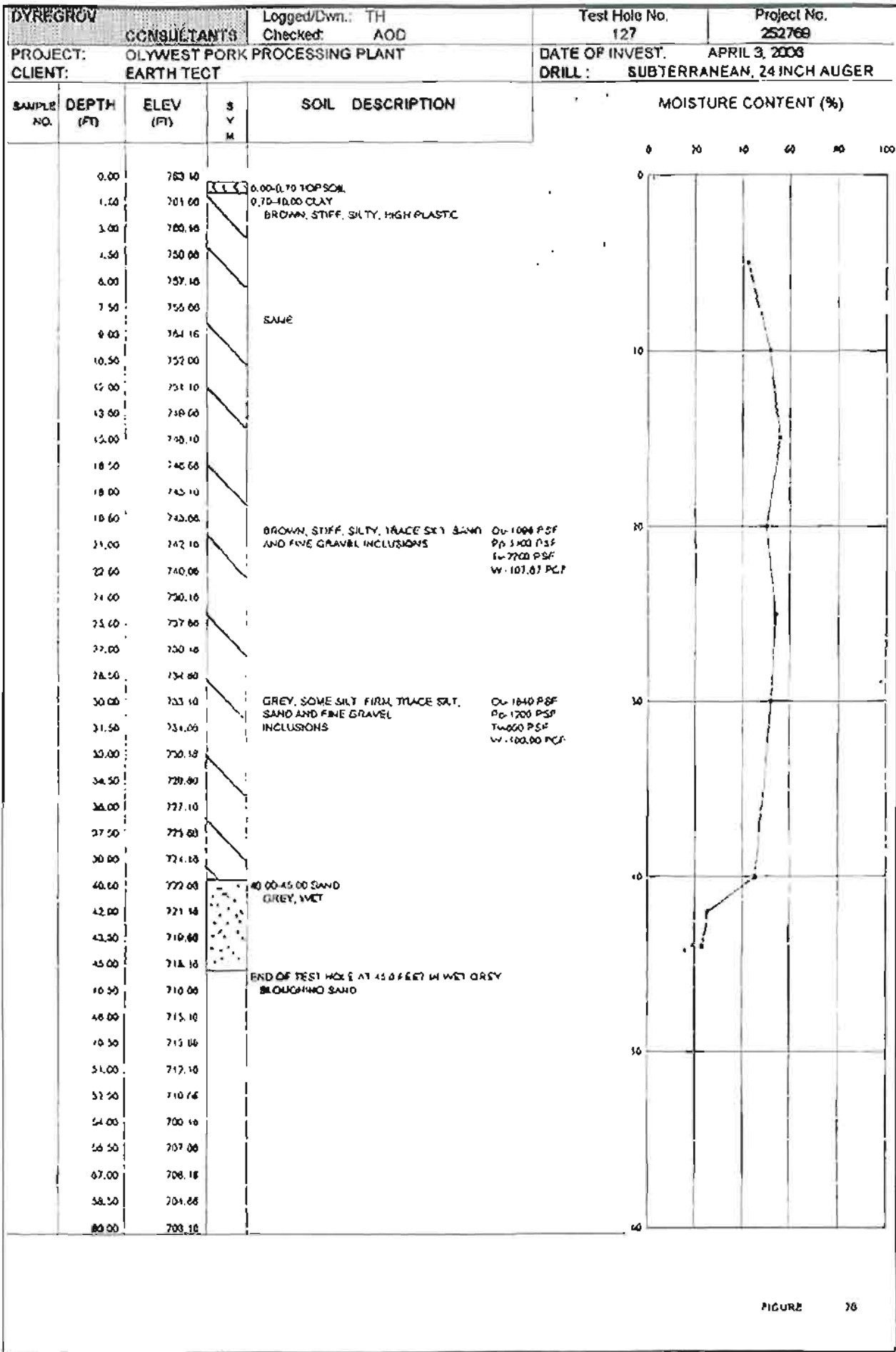


FIGURE 76

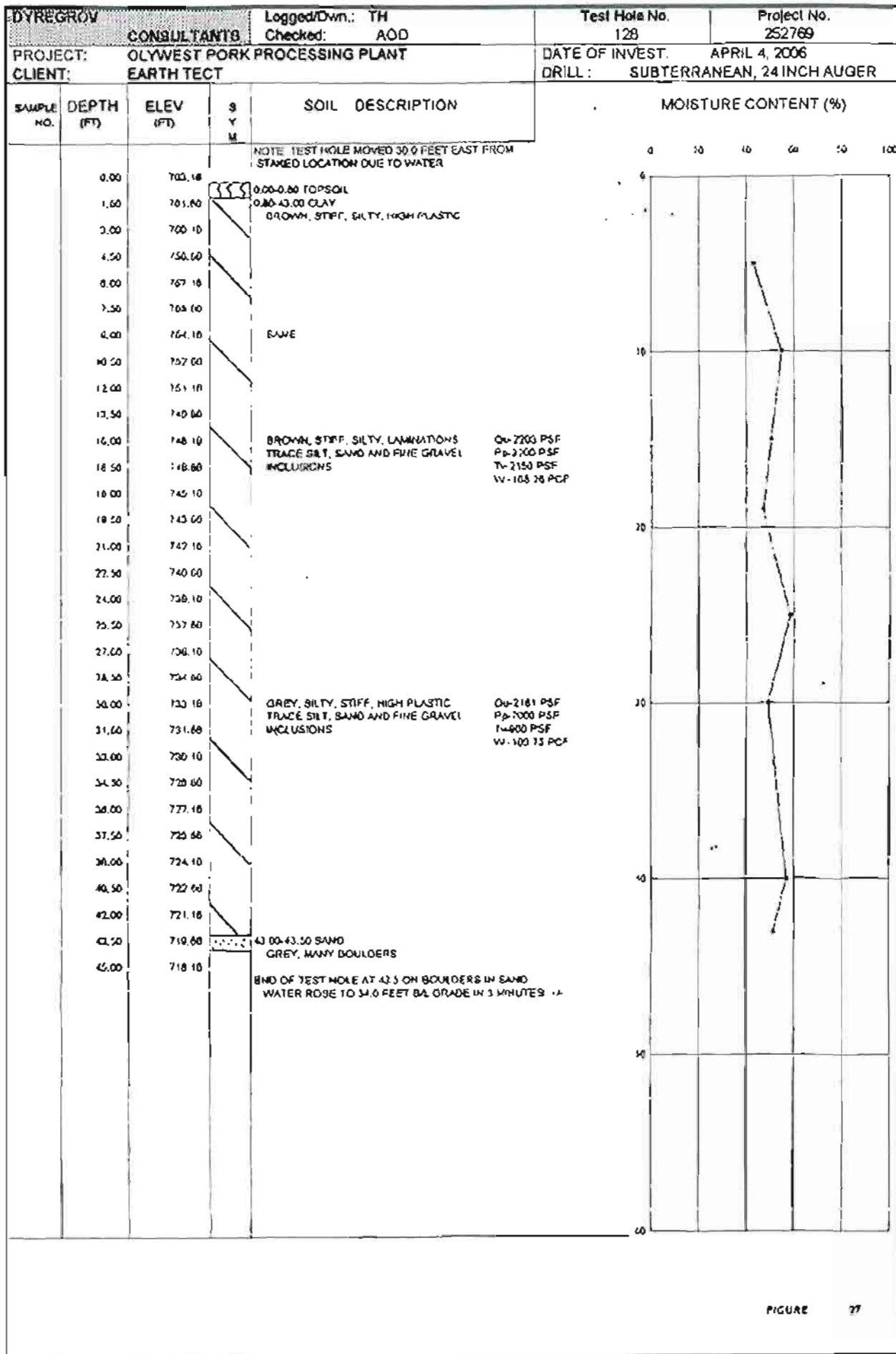


FIGURE 77

BYREGROV		CONSULTANTS		Logged/Down: TH	Test Hole No.	Project No.
PROJECT: OLYWEST PORK PROCESSING PLANT		EARTH TEST		Checked: AOD	129	252769
CLIENT: OLYWEST PORK PROCESSING PLANT				DATE OF INVEST. APRIL 4, 2008		
				DRILL: SUBTERRANEAN, 24 INCH AUGER		
SAMPLE NO.	DEPTH (FT)	ELEV (FT)	S Y M	SOIL DESCRIPTION	MOISTURE CONTENT (%)	
				NOTE: TEST HOLE MOVED 35 FEET EAST FROM STAKED LOCATION DUE TO WATER		
	0.00	783.10		0.00-0.60 TOPSOIL	0	
	1.00	781.00		0.60-1.00 CLAY		
	3.00	780.10		BROWN, SILTY, STIFF, HIGH PLASTIC		
	4.50	780.00		0.50-2.50 SILT - TAN		
	6.00	787.10		0.50-12.00 CLAY		
	7.50	785.00		BROWN, SILTY, STIFF, HIGH PLASTIC		
	9.00	784.10				
	10.50	782.00				
	12.00	781.10		BROWN, SILTY, STIFF, UNDRYED SILT AND CLAY, TRACE SILT, SAND AND FINE GRAVEL		
	12.50	780.00				
	15.00	786.10				
	16.50	786.00				
	18.00	785.10				
	19.50	782.00				
	21.00	782.10				
	22.50	780.00				
	24.00	780.10				
	26.50	787.00				
	27.00	786.10				
	28.50	784.00				
	30.00	783.10				
	31.50	781.00		GREY FIRM, SILTY, HIGH PLASTIC, TRACE SILT, SAND, FINE GRAVEL INCLUSIONS		
	33.00	780.10				
	34.50	778.00				
	36.00	777.10				
	37.50	775.00				
	39.00	774.10				
	40.50	772.00				
	42.00	771.10		42.00-47.00 GLACIAL SILT TILL		
	43.50	770.00		LAYER OF GREY SAND FROM 42.0 TO 43.0 AT 43.5 SILT TILL AND BOULDERS		
	45.00	770.10		DIFFICULT TO DRILL, MANY BOULDERS		
	46.50	770.00				
	48.00	775.10		END OF TEST HOLE AT 48.0 FEET ON BOULDERS		

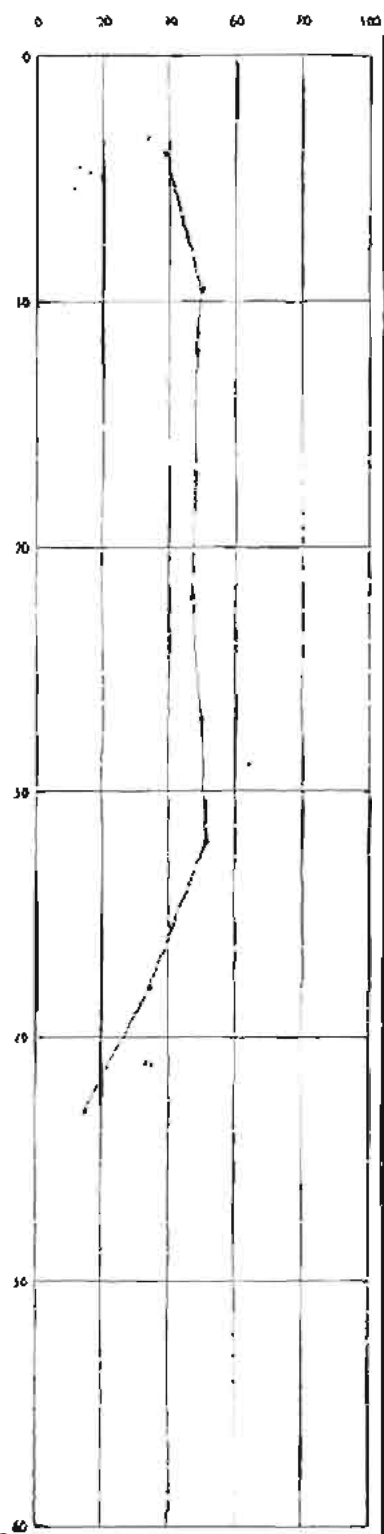


FIGURE 28

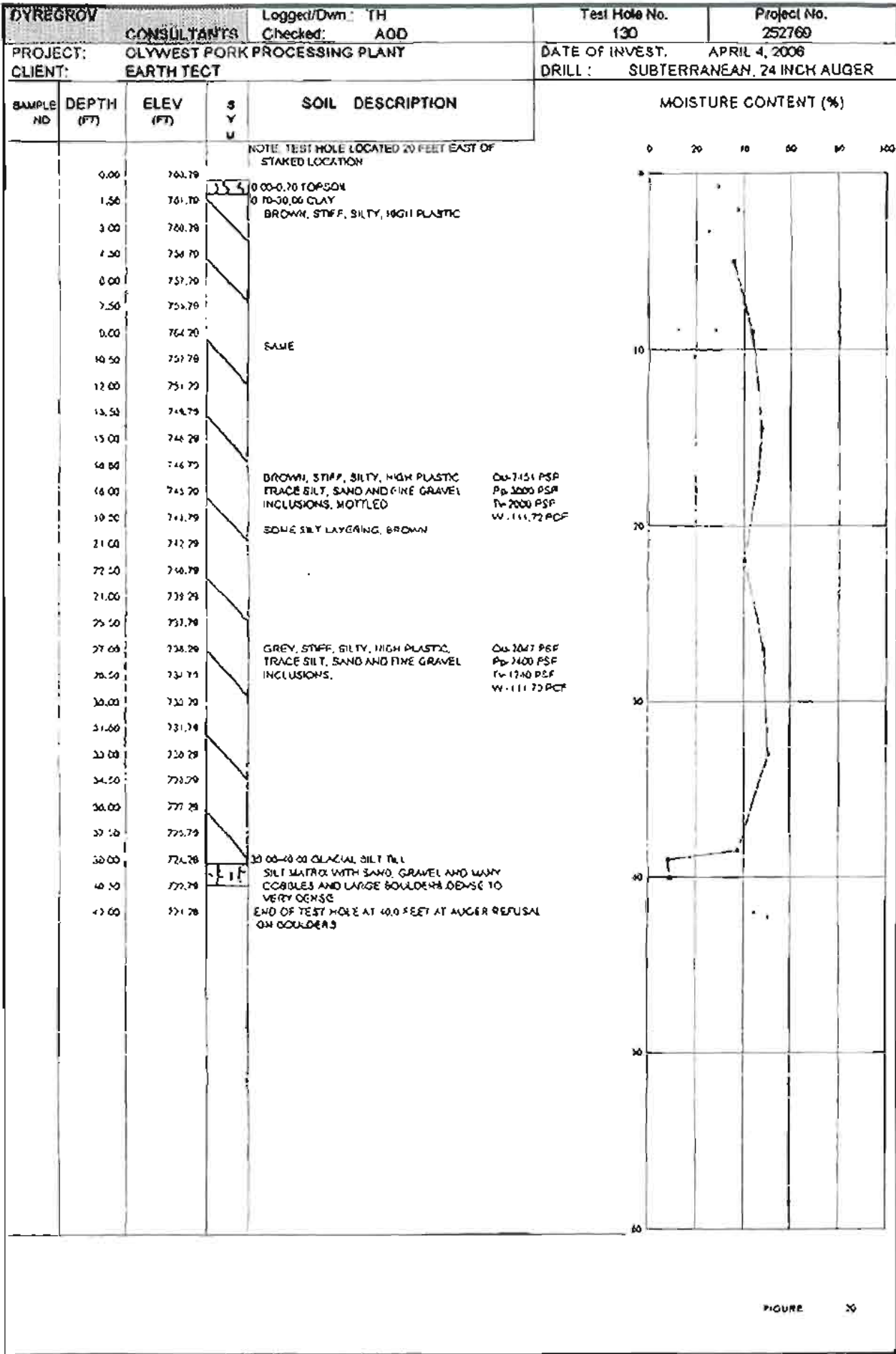


FIGURE 20

DYREGROV		CONSULTANTS		Logged/Down.: TH	Test Hole No.	Project No.
PROJECT:		OLYWEST PORK PROCESSING PLANT		Checked: AOD	131	252769
CLIENT:		EARTH TEST		DATE OF INVEST.	APRIL 4, 2006	
				DRILL:	SUBTERRANEAN, 24 INCH AUGER	
SAMPLE NO	DEPTH (FT)	ELEV (FT)	S Y H	SOIL DESCRIPTION	MOISTURE CONTENT (%)	
	0.00	703.88		0.00-0.70 TOPSOIL	0	
	1.50	702.18		0.70-1.00 CLAY		
	3.00	700.88		BROWN, SILTY, STIFF,		
	4.50	700.18		4.00-6.50 SILT		
	6.00	757.68		TAN, DAMP,		
	7.50	756.18		0.60-13.00 CLAY		
	9.00	764.68		BROWN, SILTY, STIFF, HIGH PLASTIC		
	10.50	763.18				
	12.00	751.68				
	13.50	750.18		TRACE SMALL SILT BAND AND FINE GRAVEL		
	15.00	748.68		INCLUSIONS, SOME SILT LAYERING		
	16.50	747.18				
	18.00	745.68				
	19.50	744.18				
	21.00	742.68		BROWN, SILTY, STIFF, HIGH PLASTIC, TRACE SILT, SAND AND FINE GRAVEL INCLUSIONS	10	
	22.50	741.18				
	24.00	738.68				
	25.50	736.18				
	27.00	736.68				
	28.50	735.18				
	30.00	733.68		GREY, SILTY, FIRM, HIGH PLASTIC	10	
	31.50	732.18		TRACE SILT, SAND AND FINE GRAVEL INCLUSIONS		
	33.00	730.68				
	34.60	729.18				
	36.00	727.68				
	37.50	726.18				
	39.00	724.68				
	40.50	723.18				
	42.00	721.68				
	43.60	720.18		43.00-55.50 GLACIAL SILT TILL		
	45.00	718.68		SILT MATRIX WITH SILT, SAND AND GRAVEL		
	46.50	717.18		SOME COBBLES AND BOULDERS		
	48.00	715.68		MORE SANDY, WET TO PAT TEST		
	49.50	714.18				
	51.00	712.68		DENSE TO VERY DENSE, MANY COBBLES		
	52.50	711.18		AND BOULDERS		
	54.00	709.68				
	55.50	708.18				
	67.00	708.68		END OF TEST HOLE AT 66.60 FEET !!! BOULDERS		
				NOTE: WATER ON TIP OF AUGER		



FIGURE 30

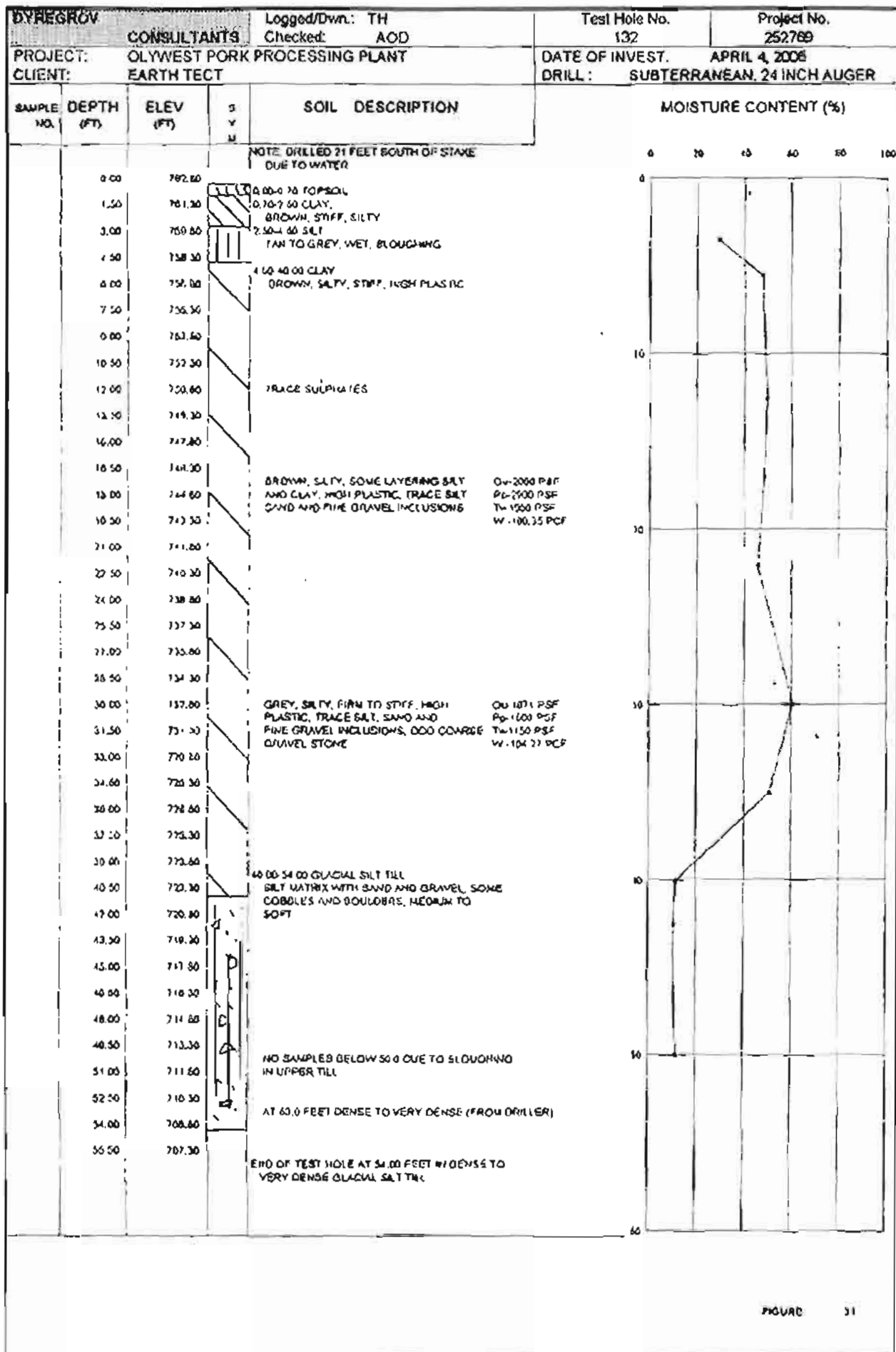


FIGURE 31

BY REG/ICV		Consultants		Logged/Ann. 114 Checked AOD		Test Hole No. 133		Project No. 252709		
PROJECT		OLYWEST PORK PROCESSING PLANT				DATE OF INVEST. APRIL 3, 2000				
CLIENT		EARTH TECH				DRILL: SUBTERRANEAN, 24 INCH AUGER				
SAMPLE NO.	DEPTH (FT)	ELEV (FT)	SOIL DESCRIPTION		MOISTURE CONTENT (%)					
					0	10	20	30	40	50
	0.00	780.80	SAND TO TOPSOIL - GRASS OVER CLAYEY SILT CLAY BREGARD							
	0.25	781.30	SANDY SILT, FINE SAND							
	1.00	782.80	SANDY SILT CLAY DARK BROWN TO BROWN SILTY, STIFF HIGH PLASTIC		CLAY 66 % SILT 1 % SAND 1 %					
	4.00	786.30								
	6.00	784.30								
	7.00	783.30								
	8.00	782.30	SAND, HIGH PLASTIC							
	10.00	779.30								
	12.00	777.30								
	14.00	775.30								
	16.00	773.30								
	18.00	771.30								
	20.00	769.30								
	22.00	767.30	BROWN SILTY, STIFF, HIGH PLASTIC, TRACE SILT, SAND AND FINE GRAVEL INCLUSIONS		Qc-2068 PPF Pc-2400 PPF Lc-1750 PPF Wc-115.3 PCF					
	26.00	763.30								
	31.00	758.30								
	34.00	755.30	SAND, STIFF							
	36.00	753.30								
	38.00	751.30								
	40.00	749.30	GREY BONE SILT WITHIN TO STIFF HIGH PLASTIC, TRACE SILT, SAND AND FINE GRAVEL (ODD STONE TO 1/8" MAX DIA)		Qc-2104 PPF Pc-1800 PPF Lc-1400 PPF Wc-118.14 PCF					
	42.00	747.30	LARGE SILT INCLUSIONS		CLAY 34 % SILT 12 % SAND 1 %					
	43.00	746.30								
	44.00	745.30	45 TO 50 LB CLONAL SILT TRL SILT WITHIN WITH SOME SAND AND GRAVEL, COLLERS AND BOULDERS, SOME LARGER COLLERS LARGE BOULDER AT 47.5 FEET AT 50.5 FEET TRL APPEARED MORE DENSE							
	48.00	741.30								
	51.00	738.30								
	53.00	736.30	BLUISHING BELOW 11.5 FEET, (UNABLE TO GET SAMPLE)							
	54.00	735.30								
	55.00	734.30								
	57.00	732.30	END OF TEST HOLE AT MAXIMUM CLONAL SILT TRL							
			NOTE: AFTER 3 HOURS FROM COMPLETION OF DRILLING WATER WAS AT 44 FEET & TOP OF TEST HOLE WAS 52 FEET THE TEST HOLE BLUISHING							

OLYWEST PLANT SHEAR STRENGTH (PSF)

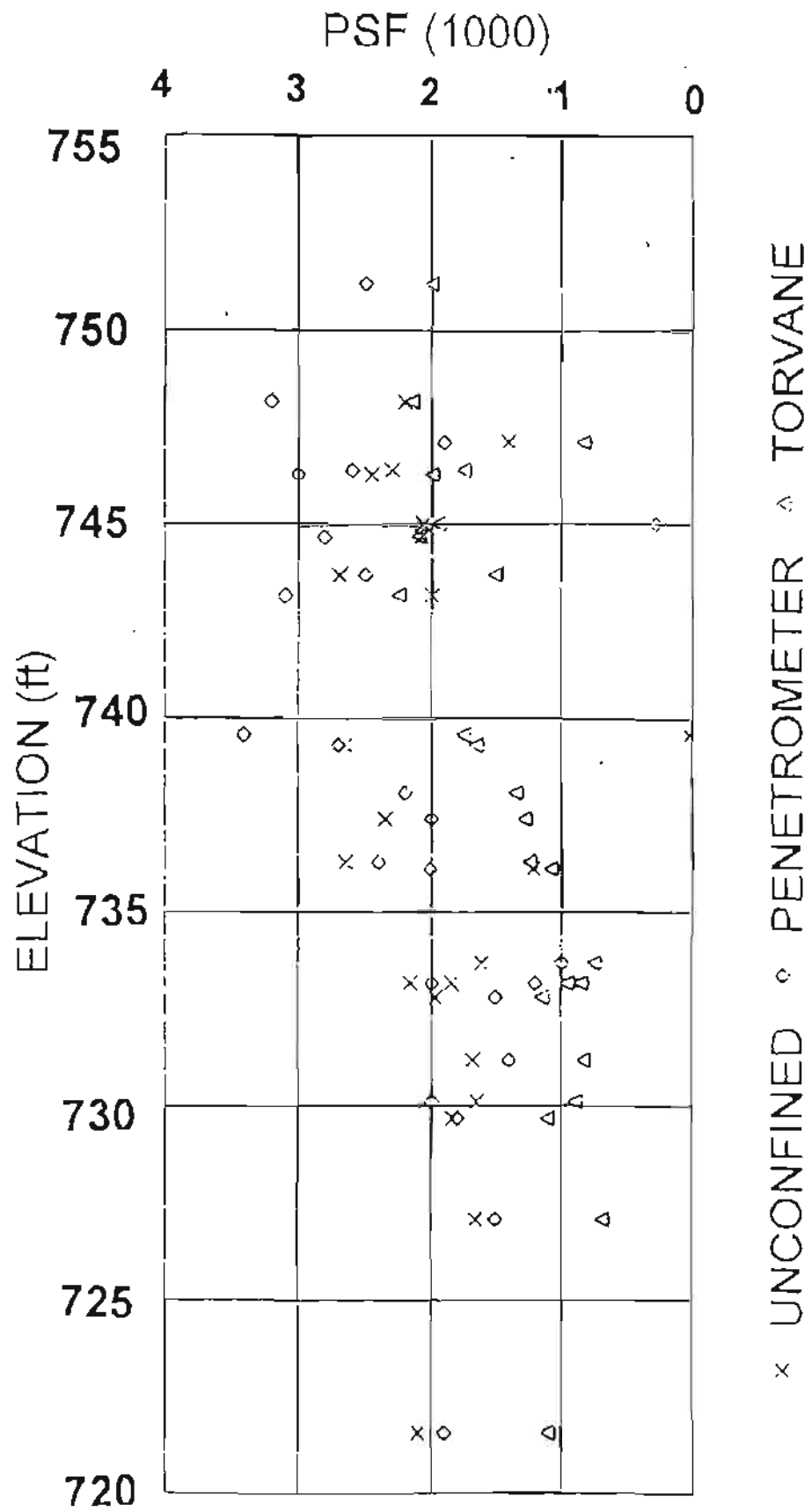
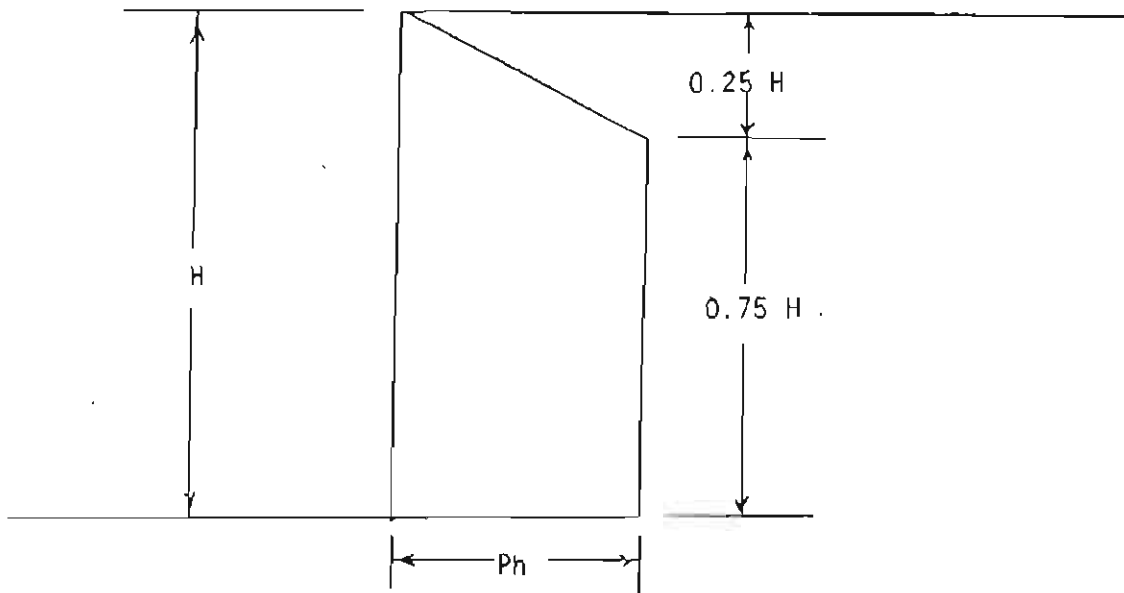


FIGURE 33



$$Ph = 0.4 H$$

Where: Ph = Lateral earth pressure on shoring (psf)

= Soil unit weight (110 pcf)

H = Wall height (ft)

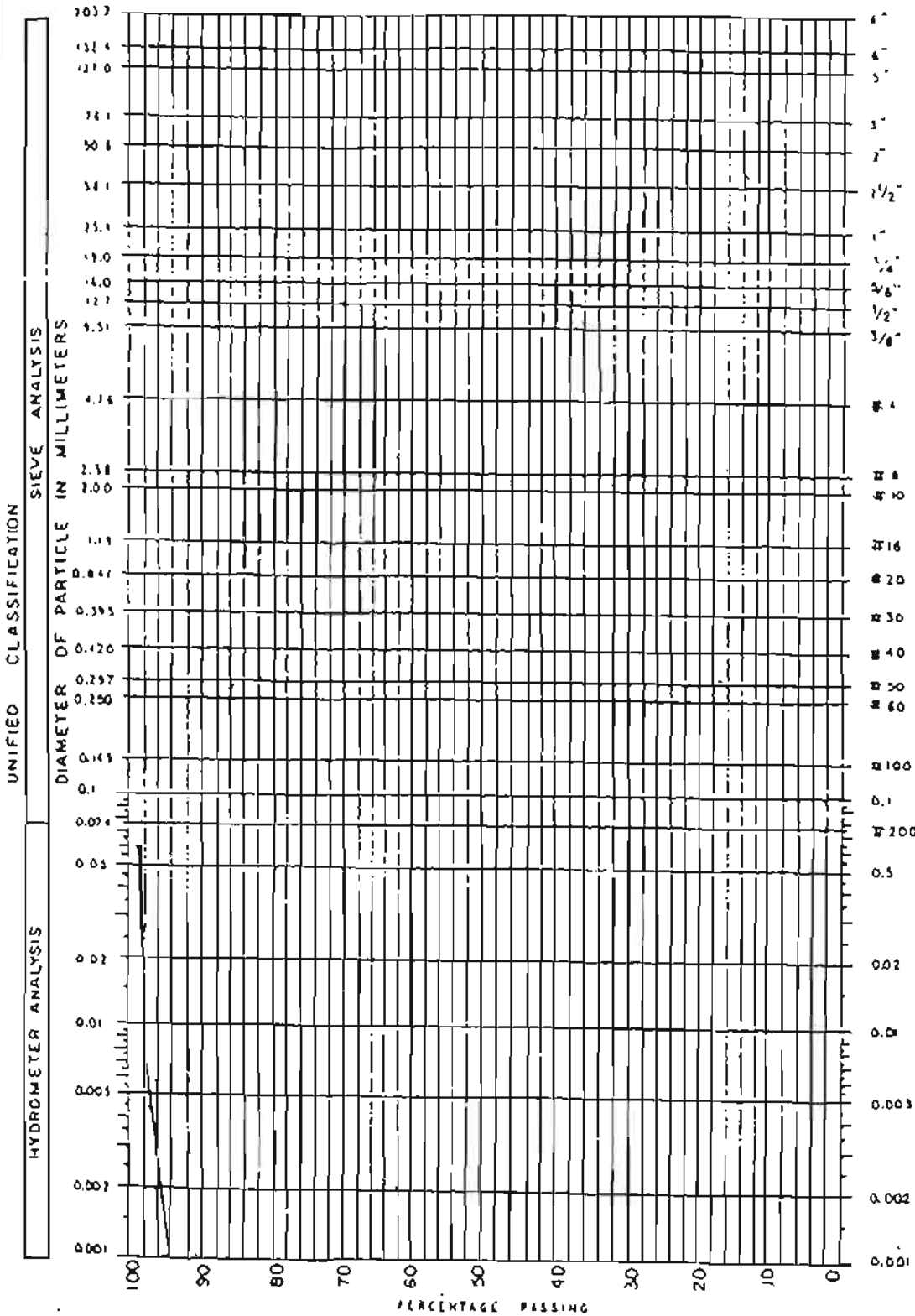
Note: Add surface load surcharge where applicable

DYREGROV CONSULTANTS
CONSULTING GEOTECHNICAL ENGINEERS

OLYMEL SHORING
DESIGN CHART

SCALE	NTS	DATE	26/4/06	MADE	TJH	CHKD	AOD	JOB	262769	FIGURE	34
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GRADATION ANALYSIS



UNIFIED CLASSIFICATION

SIEVE ANALYSIS

DIAMETER OF PARTICLE IN MILLIMETERS

HYDROMETER ANALYSIS

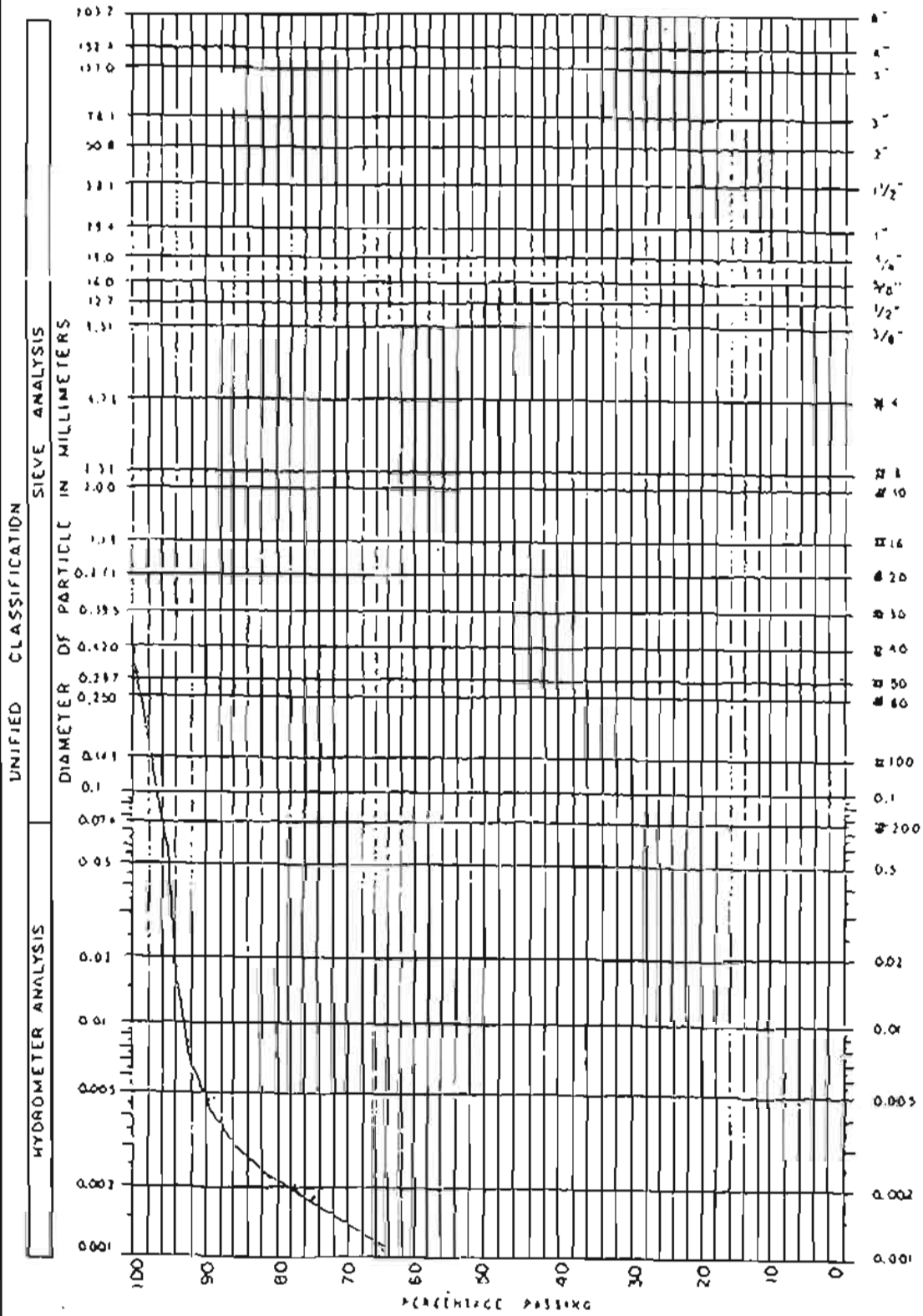
CLAY		SILT		SAND		GRAVEL		COBBLES
		FINE	MEDIUM	COARSE	FINE	COARSE		
SAMPLE DESCRIPTION <u>95% CLAY, 4% SILT, 1% SAND</u>								
C _u = $\frac{D_{60}}{D_{10}}$								
C _c = $\frac{D_{30}^2}{(D_{60})(D_{10})}$								
LL <u>99%</u> PL <u>31.3%</u> PI <u>67.7</u>								

DYREGROV CONSULTANTS
CONSULTING GEOTECHNICAL ENGINEERS

JOB NO.: 252769 DATE: Apr 27/69
 PROJECT: OL. WEST
 SITE: _____
 LOCATION: _____
 HOLE NO.: 133 SAMPLE NO.: _____
 DEPTH: 3' TECHNICIAN: TH

FIGURE 37

GRADATION ANALYSIS



CLAY	SILT			SAND		GRAVEL		COBBLES
	FINE	MEDIUM	COARSE	FINE	COARSE	FINE	COARSE	

SAMPLE DESCRIPTION 78% CLAY, 18% SILT, 4% SAND $C_u = \frac{D_{60}}{D_{10}}$
LL 100.2% PL 28.4 P.I. 71.8 $C_c = \frac{(D_{40})^2}{(D_{60} \cdot D_{10})}$

DYREGROV CONSULTANTS
CONSULTING GEOTECHNICAL ENGINEERS

JOB NO.:	252769	DATE:	APR 27/06
PROJECT:	DIYWEST		
SITE:			
LOCATION:			
HOLE NO.:	133	SAMPLE NO.:	
DEPTH:	40'	TECHNICIAN:	JF

FIGURE 38