REPORT OF SUBSURFACE EXPLORATION

AND

LABORATORY TESTING

HAMILTON LAKE ENHANCEMENT PROJECT

WETLAND DESIGN SITES

HARZA ENGINEERING COMPANY

NOVEMBER 1991

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I. INTRODUCTION

Subsurface soil exploration and laboratory testing of soil samples were conducted in accordance with the Scope of Services in the Hamilton Lake Enhancement Revised Proposal for Phase II Services (Design), dated August 10, 1990. The results of the soil exploration and testing were used to determine criteria for use in the design of six artificial wetlands proposed for construction to enhance the water quality of Hamilton Lake.

The purpose of this report is to present, summarize, and interpret subsurface and laboratory information that has been gathered as a result of drilling and testing of selected soil samples.

II. FIELD WORK

Field work was conducted on July 30 & 31 and August 6 & 7, 1991. Harza's Mr. Carl M. Brown was responsible for making field observations and for logging boreholes and test pits.

Drilling was conducted by Raimonde Drilling Corporation, Inc., Chicago, Illinois, and test pits were excavated by Butler & Butler Construction, Inc., Auburn, Indiana. The subsurface exploration program is summarized below and in Table I.

At site A, which is located on Haughey Ditch (see Exhibit 1), two boreholes were drilled and two test pits were excavated. At site B, located on the Lillian Metz Ditch, upstream of the confluence of Burch Ditch, two test pits were excavated. At site E, located on Black Creek east of Highway 1, two borings were made and one test pit was excavated. At site F two test pits were excavated. At site G, located east of the sand and gravel pit operated by Flegal Sand & Stone Company, three soil borings were made. At site H, located across the county road west of site G, one test pit was excavated.

Table I - Hamilton Lake Enhancement Project
Summary of the Subsurface Exploration Program

Site	Soil Borings	Location	Dates	Test Pits	Location	Dates
A	Two: AB1	Rt. Abut.	8/7	Two: AT1	Rt. side	7/31
	AB2	Lt. Abut.	8/7	AT2	Rt. side	7/31
B	None			Two: BT1	At dam	7/31
				BT2	Rt. side	7/31
E	Two: EB1	Lt. Abut.	8/7	One: ET1	Lt. side	7/31
	EB2	At dam	8/7			
F	None			Two: FT1	Lt. Abut.	8/7
				FT2	Center	8/7
G	Two: GB1	Lt. Abut.	8/6	None		
	GB2	Dam Cntr.	8/6			
	GB3	Rt. Abut.	7/30			
H	None			One: HT1	D/S dam	7/31

All borings were advanced using 4-1/2" I.D. hollow stem augers powered by a CME 55 track mounted drill rig. Samples were obtained at 2-1/2 foot intervals by split spoon sampling according to ASTM D-1286. Representative samples were placed in glass jars and retained by Harza for testing in Harza's soil laboratory.

Insitu shear strength was measured in the field using a pocket penetrometer and a hand torvane shear strength test kit.

III. LABORATORY TESTING

Laboratory testing included Atterberg Limits, gradation analysis, visual classification, and standard Proctor for selected samples. The laboratory testing program is summarized on Table II below.

Table II - Hamilton Lake Laboratory Soil Testing Program

Site	Sample	Atterberg Limits	Gradation	Moisture Content	Standard Proctor
Site A	AB1-S1	xx	xx	xx	
Site A	AB1-S2	xx	xx	xx	
Site A	AB2-S1	xx	xx	xx	
Site B	BT1-S1	xx	xx	xx	
Site B	BT2-S2	xx	xx	xx	
Site B	Creek	xx	xx	xx	
Site E	EB1-S1		xx	xx	
Site E	EB1-S3		xx	xx	
Site E	EB1-S5		xx	xx	
Site E	EB2-S1	xx	xx	xx	
Site E	EB2-S2	xx	xx	xx	
Site E	EB2-S3	xx	xx	xx	
Site E	ET1-S2		xx	xx	xx
Site E	Creek		xx	xx	
Site F	FT1-S1	xx	xx	xx	
Site F	FT1-S2		xx	xx	
Site F	FT2-S1	xx	xx	xx	
Site F	FT2-S2	xx	xx	xx	
Site F	FT2-S3		xx	xx	xx
Site G	GB1-S1		xx	xx	
Site G	GB1-S2		xx	xx	
Site G	GB1-S3	xx	xx	xx	
Site G	GB3-S6		xx	xx	
Site H	HT1-S2	xx	xx	xx	xx
Site H	Creek	xx	xx	xx	
Total		15	25	25	3

IV. SUMMARY OF FIELD AND LABORATORY RESULTS

SITE A. At Site A, soil borings were located on either side of the proposed dam, and two test pits were excavated within the proposed wetland area (see Exhibit 2). The upper 8-10 feet of soil is stiff silty clay with some sand (CL) or stiff clayey silt (ML). Below the silty clay lies gray clay (CL). The gray clay includes a two foot thick soft layer which lies above and below a very thin (2-4 inches thick) coarse sand layer which is located approximately at the depth of the water table. Below the soft layer, the gray clay becomes medium to hard.

Gravelly clay was encountered at a depth of about 18 feet beneath the proposed right abutment, and gravelly clayey sand was found at a depth of 4.5 feet in one of the test pits. The gravelly layers do not appear to be continuous and contain at least 40% fines. Seepage under the embankment dam along gravel layers is unlikely and a seepage cut-off is not necessary.

Excavation of a grass channel spillway or of a deep pool to increase sediment trapping efficiency upstream of the dam will provide suitable embankment fill material. The natural moisture content of the upper 5 feet of soil is below the plastic limit, therefore, preliminary indications are that excavation and compaction of this material will not be a problem during construction.

SITE B. Two test pits were excavated at Site B in the vicinity of the proposed wetland (see Exhibit 3). The soil, to a depth of about 12 feet, varies between silty clay (CL) and clayey silt (ML). Some sand lenses were found, however, they were discontinuous within the test pits.

The moisture content of the upper few feet of soil is below the plastic limit, therefore, no problems should be encountered in working the soil during construction.

SITE E. Two soil borings and one test pit were conducted at Site E. One soil boring was located on the left abutment of the proposed dam and the other was located in the bed of Black Creek upstream of the proposed dam (see Exhibit 4). The test pit was located above the Black Creek flood plain to the left and upstream of the proposed dam.

The left abutment, to a depth of about 10 feet, is silt (ML), silty sand (SM), and gravelly silt (GM). From 10-11 feet, there is a layer of well-graded quartz sand (SW). Below the sand layer the soil is gravelly sand and gravelly sand with some clay clasts to a depth of about 15 feet at which depth the soil is again silt and silty sand. The uncorrected SPT blowcount values (N) are high, ranging from 14 to 34, therefore, the abutment is relatively dense.

The existing creek bed has a layer of gravel about three inches thick which overlies gravelly silty sand (SM) to a depth of about eight feet. From depths of 8-13 feet, the soil is hard gray clay (CL). The foundation soil should have adequate bearing capacity as evidenced by the uncorrected SPT blowcount values.

In the location of the test pit, the topsoil was 1.5 feet thick. Below the topsoil was a layer of gray medium to hard silty clay (CL) extending to a depth of 5 feet followed by a gray clay (CL) to a depth of 6.5 feet. From 6.5 feet to the bottom of the test pit (11 feet deep) was a layer of silty sandy gravel with some cobbles (GP-GM). The water table was at a depth of about 7.5 feet. The gravel was probably deposited along Black Creek before the creek eroded down to its present level. The gravel is similar to existing gravel along the present creek bed and has a high permeability as evidenced by the rate that water entered the test pit. The existence of a continuous gravel layer within the foundation material below the dam indicates that consideration should be given to design of a seepage cutoff beneath the proposed structure.

SITE F. Two test pits were excavated at Site F, one located at the location of the proposed left abutment and the other in the center of the proposed wetland (see Exhibit 5).

At the location of the left abutment, the soil is clayey sand, silty sand and gravelly clayey sand (SC) to a depth of about 5 feet. From 5-7 feet in depth, the soil is poorly graded sand with some silt (SP). From 7-12 feet, the soil is gravelly sand with clay clasts.

In the center of the wetland site the existing topsoil is over three feet thick and is dark brown, organic, silty sand. Below the topsoil is medium gray clay and clayey gravel.

SITE G. Site G is an existing emergent wetland, therefore, to minimize preconstruction impact, no test pits were excavated. The three borings conducted at the site are adequate to define the soil layer types and thicknesses.

There is a layer of soft, black silty organic soil up to 11 feet thick deposited throughout the site from abutment to abutment. The boring on the left abutment, however, was located on a bench midway up the abutment and was above the contact between the black organic soil and the underlying silty sand (see Exhibit 6).

The left abutment and the soil beneath the organic soil is predominately silty sand (SM). However, there is a clayey sand layer from about 10-14 feet in depth at both the left abutment and right abutment, and some gravels with the sand below the clayey sand at the right abutment.

The uncorrected SPT blowcount values ranged from 8 to 13 in the left abutment. The abutment should provide an adequate foundation for the proposed box-culvert spillway. Consideration should be given to removal of the thick organic foundation material or to improving the material's stability by preloading and consolidation. To verify that there is adequate lateral area on the left abutment for construction of the box-culvert spillway, a hand auger boring program is recommended to further define the contact between the soft black topsoil and the silty sand foundation soil.

SITE H. The test pit excavated at Site H revealed that the creek bank at the test pit location consists of silty organic topsoil and sandy silty clay to a depth of about four feet followed by a silty sand layer (SM) at least 10 feet thick.

The test pit was located on the left bank about 200 feet downstream of the existing berm at Site H (see Exhibit 7). If the proposed dam is to be located downstream of the existing berm, the upper sandy silty clay is suitable for embankment fill material while the silty sand is adequate for the spillway foundation.

If the existing berm is utilized as the lower half of the embankment dam, then a hand auger boring program is recommended to further define the foundation soils at the right abutment and the existing fill in the berm.

V. CONCLUSION

The exploration program which was conducted at the proposed wetland sites should be adequate for the design and construction of wetlands in Sites A - F. The field exploration and laboratory testing programs have revealed information regarding the soil layers and construction materials at the wetland sites. The foundation conditions at the sites are well defined and suitable material for fill has been located.

Additional information may be required for Site G and Site H. If necessary, a program of hand auger exploration developed on the basis of design requirements should be sufficient to supplement the existing data.

EXHIBITS

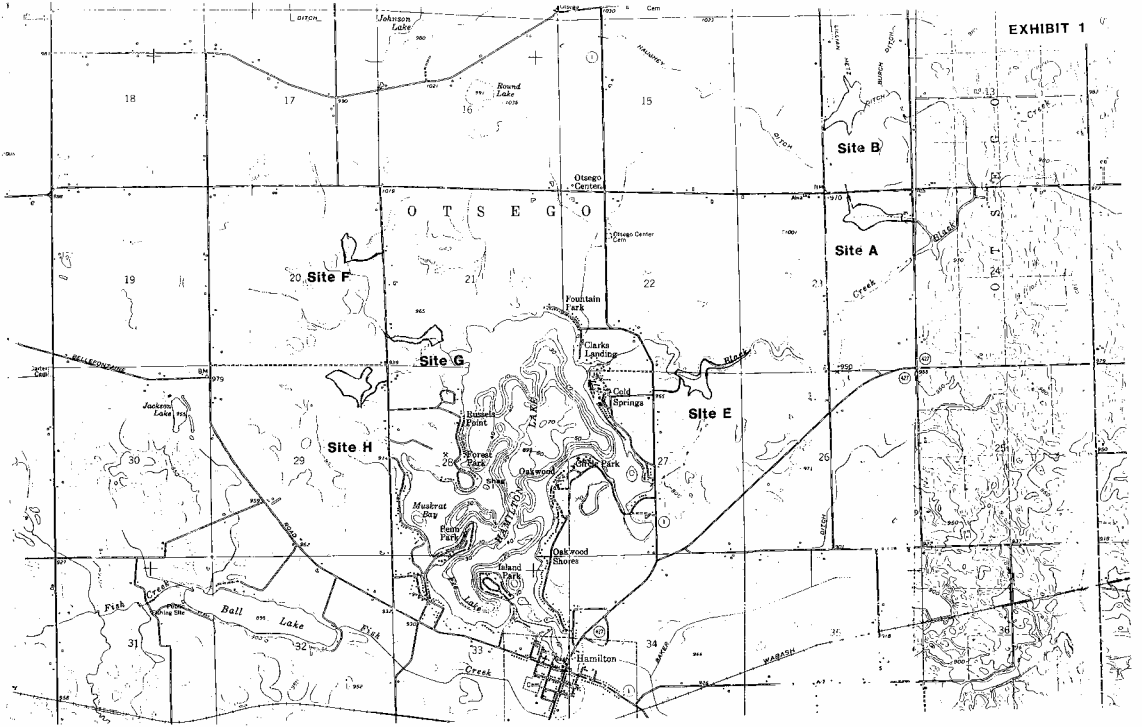


EXHIBIT 1
Site A
Site B
Site E
Site F
Site G
Site H
O T S E G O
Johnson Lake
Round Lake
Otsego Center
Otsego Center Cem
Fountain Park
Clarks Landing
Cold Springs
Russels Point
Forest Park
Oakwood
Girls Park
Muskrat Bay
Penn Park
Island Park
Oakwood Shores
Hamilton
Jackson Lake
Ball Lake
Fish Creek
Black Creek
HAMILTON LAKE
WABASH
BELLEFONTAINE
ROAD
DITCH
Cem

EXHIBIT 2

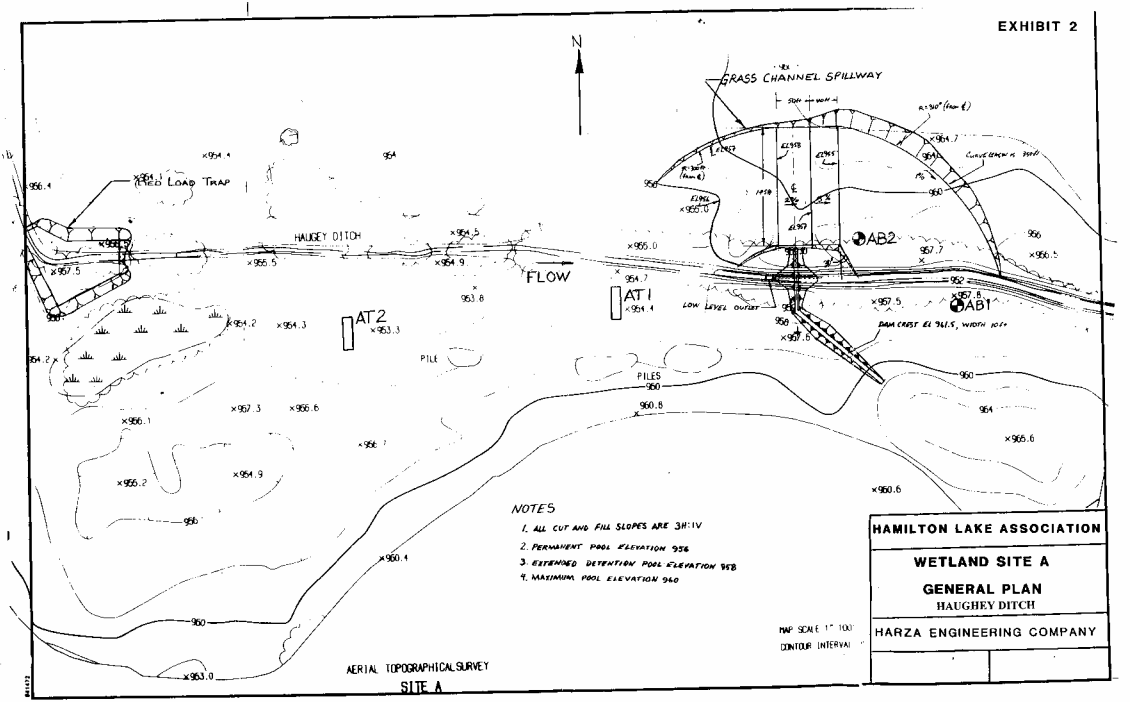
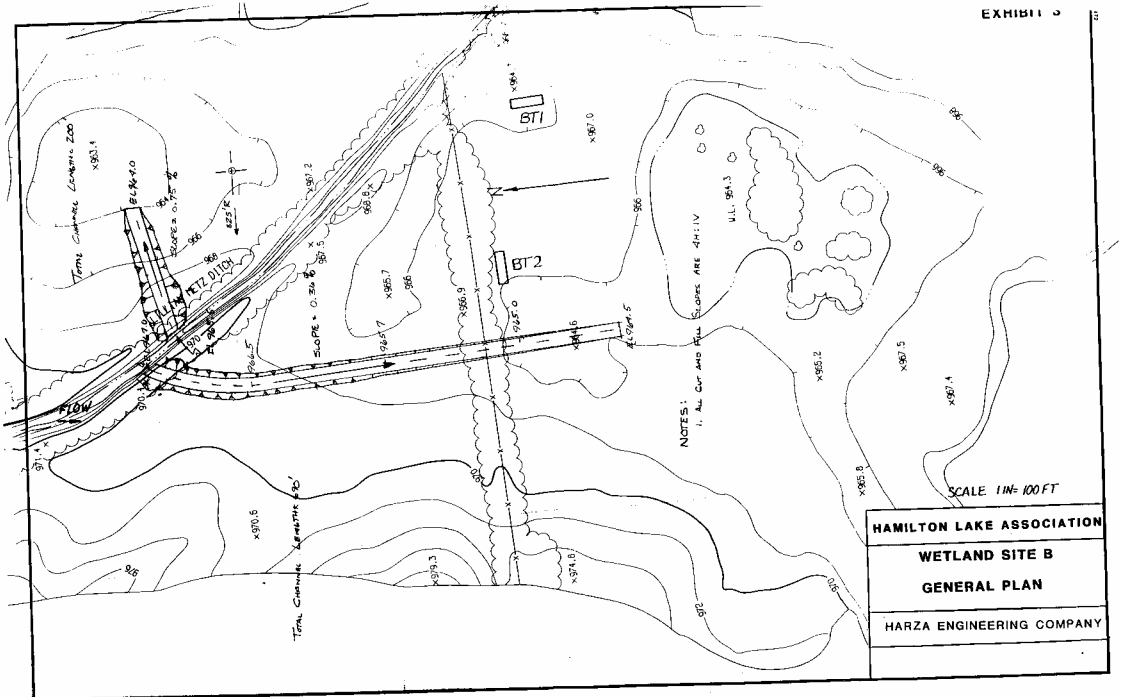
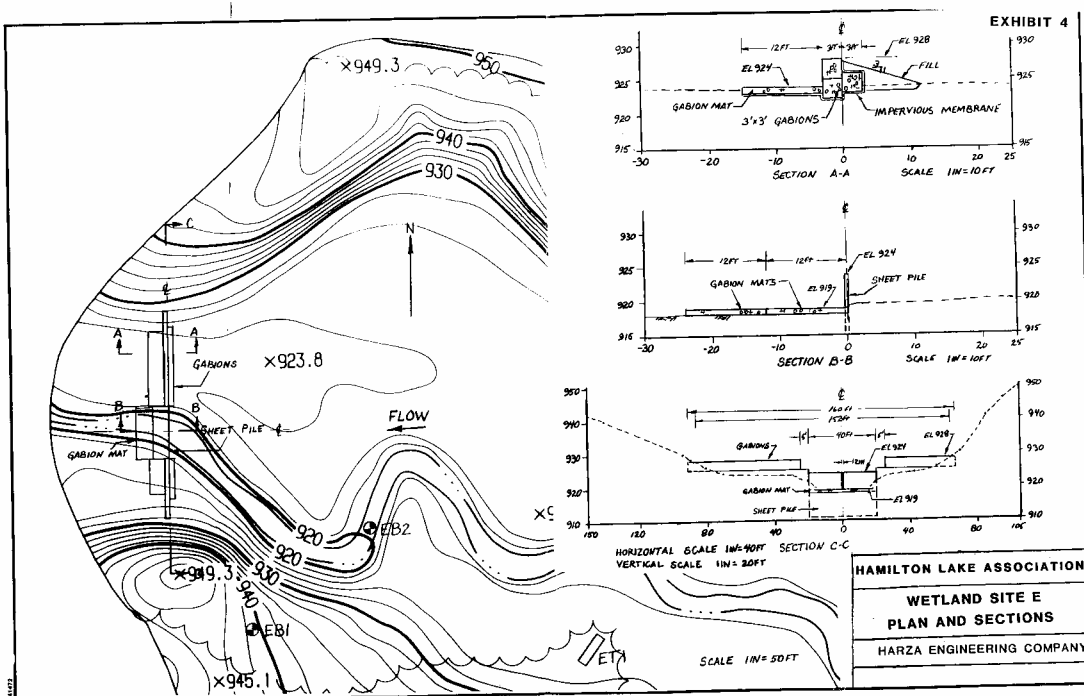

N
GRASS CHANNEL SPILLWAY
BED LOAD TRAP
HAUGEY DITCH
FLOW
AT1
AT2
AB1
AB2
LOW LEVEL OUTLET
DAM CREST EL 961.5, WIDTH 10±
PILE
PILES
NOTES
1. ALL CUT AND FILL SLOPES ARE 3H:1V
2. PERMANENT POOL ELEVATION 956
3. EXTENDED DETENTION POOL ELEVATION 958
4. MAXIMUM POOL ELEVATION 960
MAP SCALE 1" 100'
CONTOUR INTERVAL
AERIAL TOPOGRAPHICAL SURVEY
SITE A
HAMILTON LAKE ASSOCIATION
WETLAND SITE A
GENERAL PLAN
HAUGHEY DITCH
HARZA ENGINEERING COMPANY

EXHIBIT 3



BT1
BT2
FLOW
HETZ DITCH
TOTAL CHANNEL LENGTH = 200'
SLOPE = 0.75 %
SLOPE = 0.36 %
TOTAL CHANNEL LENGTH = 690'
NOTES:
1. ALL CUT AND FILL SLOPES ARE 4H:1V
U.L. 964.3
SCALE 1 IN = 100 FT
HAMILTON LAKE ASSOCIATION
WETLAND SITE B
GENERAL PLAN
HARZA ENGINEERING COMPANY

EXHIBIT 4

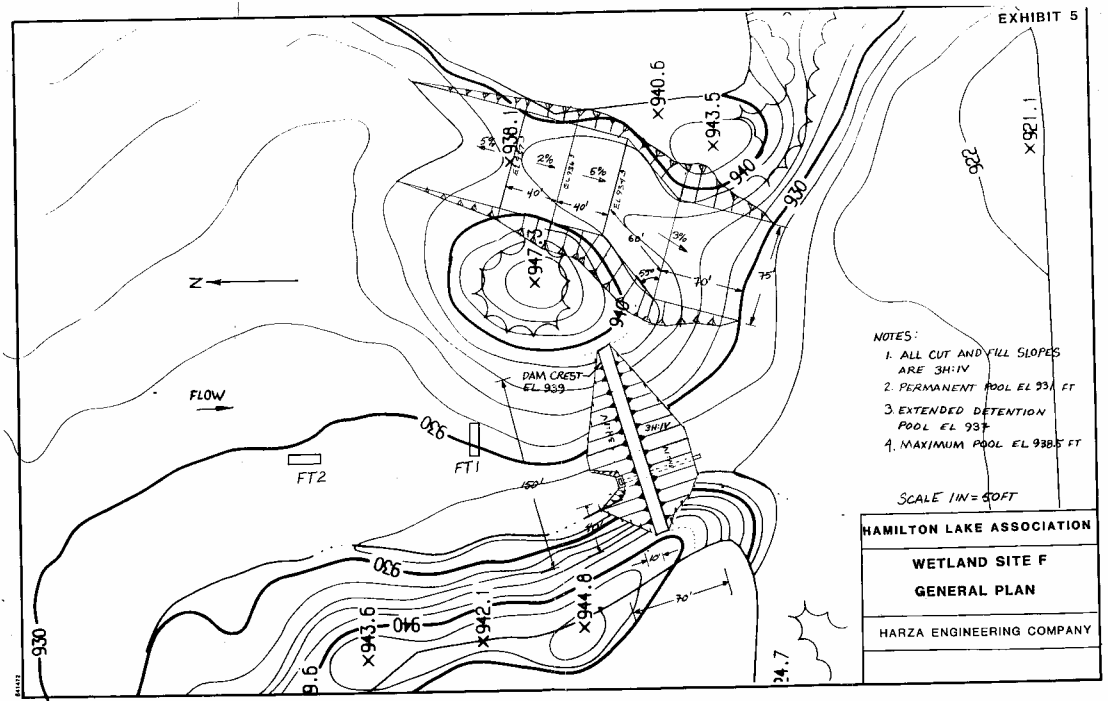


HAMILTON LAKE ASSOCIATION

WETLAND SITE E
PLAN AND SECTIONS

HARZA ENGINEERING COMPANY

EXHIBIT 5



NOTES:

1. ALL CUT AND FILL SLOPES ARE 3H:1V
2. PERMANENT POOL EL 931 FT
3. EXTENDED DETENTION POOL EL 937
4. MAXIMUM POOL EL 938.5 FT

SCALE 1IN = 50FT

HAMILTON LAKE ASSOCIATION

WETLAND SITE F

GENERAL PLAN

HARZA ENGINEERING COMPANY

EXHIBIT 6

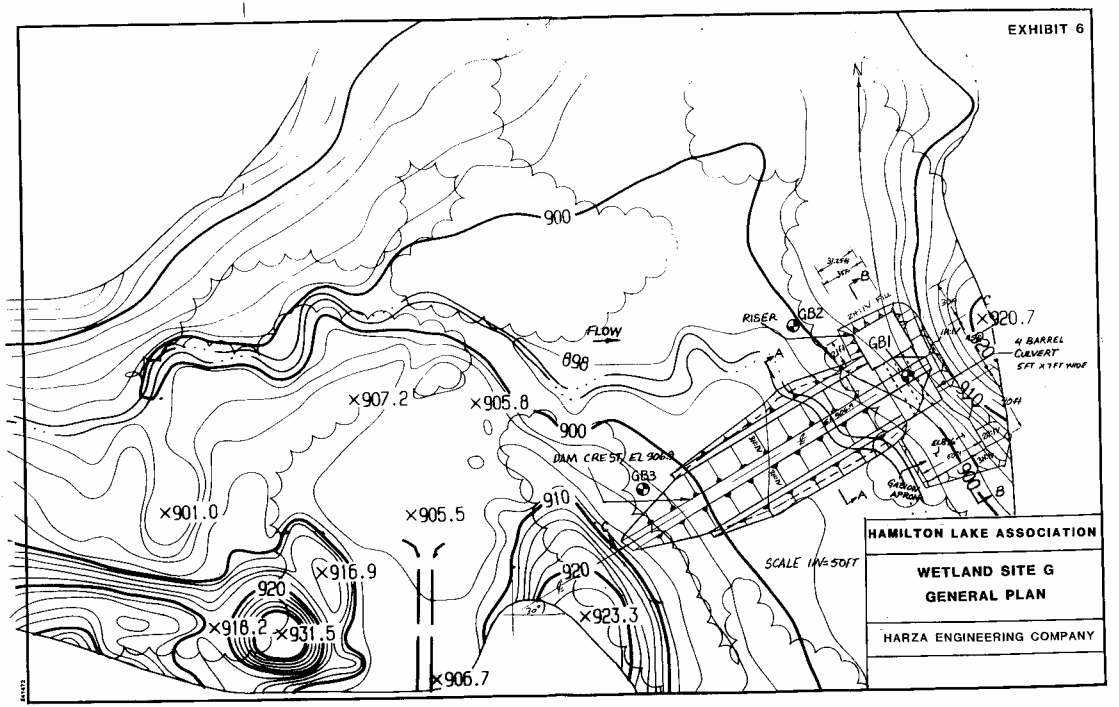
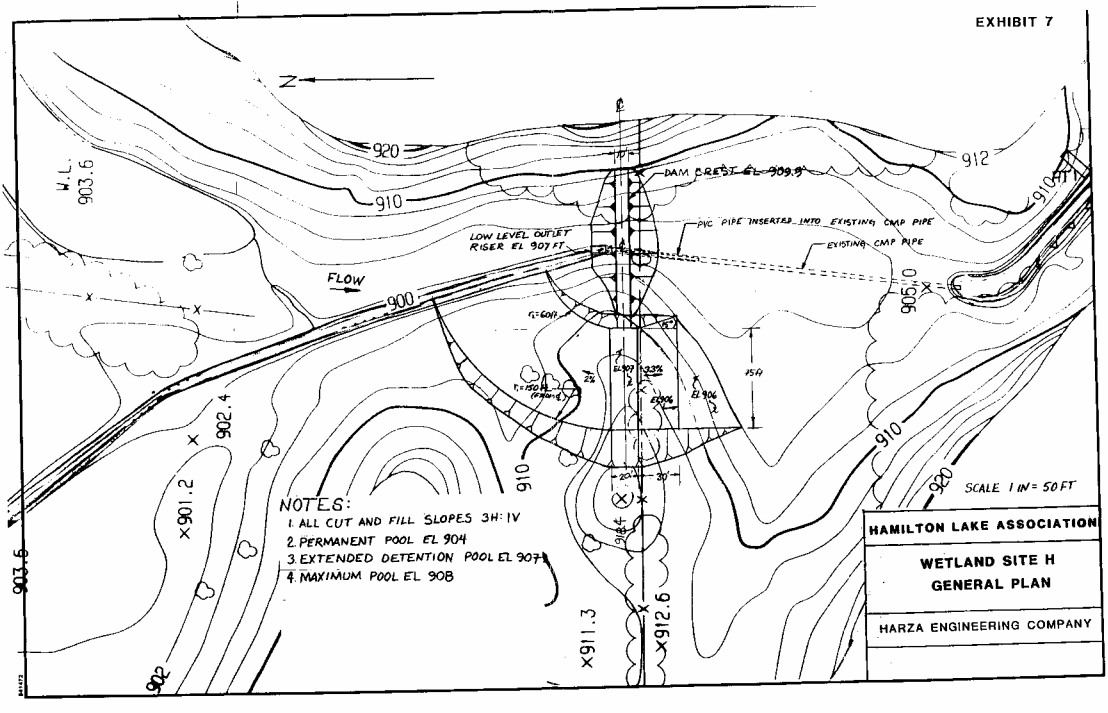

N
900
FLOW
898
×907.2
×905.8
900
DAM CREST EL 906.8
GB3
910
×901.0
×905.5
×916.9
920
×918.2
×931.5
920
×923.3
×906.7
RISER
GB2
GB1
A
B
C
×920.7
4 BARREL
CULVERT
5FT X 7FT WIDE
910
GABION
APRON
SCALE 1IN=50FT
HAMILTON LAKE ASSOCIATION
WETLAND SITE G
GENERAL PLAN
HARZA ENGINEERING COMPANY

EXHIBIT 7


N
W.L. 903.6
920
910
900
912
910
905.0
902.4
901.2
903.6
902
911.3
912.6
DAM CREST EL 909.9'
PVC PIPE INSERTED INTO EXISTING CMP PIPE
EXISTING CMP PIPE
LOW LEVEL OUTLET RISER EL 907 FT
FLOW
EL 907
EL 906
EL 906
15 ft
20'
30'
SCALE 1 IN = 50 FT
NOTES:
1. ALL CUT AND FILL SLOPES 3H:1V
2. PERMANENT POOL EL 904
3. EXTENDED DETENTION POOL EL 907
4. MAXIMUM POOL EL 908
HAMILTON LAKE ASSOCIATION
WETLAND SITE H
GENERAL PLAN
HARZA ENGINEERING COMPANY

APPENDIX A - SOIL BORING LOGS

HARZA ENGINEERING COMPANY

Sheet 1 of 1

SOIL BORING LOG

Project Number 52576

Project Name HAMILTON LAKE

Boring No. AB1

Client HAMILTON LAKE ASSOC

Location RT SIDE OF CREEK

~~Coordinates: N~~ AT SITE OF

E PROPOSED DAM

Contractor RAIMONDE DRILLING

Drilling Method SPT

Hole Size 6" - 4 1/2" ID HOLLOW AUGER

Driller Phil RAIMONDE

Logged by CM BROWN, HARZA

WATER LEVEL	10'		
TIME	4:30		
DATE	8/7		

Sample Hammer: Weight 140 lb

Drop 30 IN

Sampler Dimensions 2 ft Split SPOON

Ground Elevation 957

Total Depth 19 ft

Date Started 7/31/91

Date Completed 7/31/91

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
0									edge of bean field	
1		AB1 S1	SS	5 5 5		12"			tan clayey silt	
2										pocket penetrom
3		S2	SS	7 8 9		18"			dry gray clay, some silt	>4.5 tsf >4.5 tsf >4.5 tsf
4										
5										
6		S3	SS	8 9 10		18"			dry very stiff silty clay	4.25 tsf 4.25 tsf 4.25 tsf
7										
8		S4	SS	4 4 5		0"			no recovery.	
9										
10				3					Soft gray clay	1.0 tsf
11		S5	SS	7 7		18"			black pebble and sand	1.5 tsf 1.5 tsf
12									soft gray clay	
13		S6	SS	5 8 11		18"			stiff gray clay	>4.5 tsf 4 tsf 4.5 tsf
14										
15										
16		S7	SS	4 9 11		12"		CL	med gray clay	
								SC	dk gray fine gravel and med-coarse SAND w/ clay matrix	
17										
18		S8	SS	14 14 14		15"			gray gravelly clay	
19									dk gray clayey, pebbley, SAND	
									EOB — 19 feet	
20										

brown silt content

gray clay content inc

HARZA ENGINEERING COMPANY

SOIL BORING LOG

Project Number 52576
Client HAMILTON LAKE ASSOC.
Contractor RAIMONDE & SONS
Drilling Method SPLIT SPOON
Hole Size
Driller R. RAIMONDE
Logged by CMB

Project Name HAMILTON LAKE

WATER LEVEL	8½'	15'	
TIME	6PM	7PM	
DATE	8/7	8/7	

Sample Hammer: Weight 140 lb
Drop 30 IN
Sampler Dimensions 2 ft split spoon

Boring No. ABR
Location Left ABUTMENT
Coordinates: N
E
Ground Elevation 957 ft
Total Depth 24 ft
Date Started Aug 7, 1991
Date Completed 8/7/91

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
0									edge of beanfield	
1		S1	SS	4 4 6		12"			dk gray clayey silt	
2										
3		S2	SS	3 6 7		15"			red and gray mottled silty clay	Pocket Penet 3.75 tsf
4										
5									soft gray clay	1.75 tsf
6		S3	SS	5 9 9		18"			~~gray coarse sand w/ clay + fine gravel~~	
7									soft gray clay	
8		S4	SS	14 15 16		15			stiff gray clay	4.5 tsf
9									med - soft gray clay ▽	2 tsf
10										
11		S5	SS	12 14 15		18"			soft gray clayey silt soft SANDY silt	<1 tsf
12										
13		S6	SS	14 13 12		18"			gray stiff silty clay	4.25 tsf
14										
15									(water level after drilling)	
16										
17										
18		S7	SS	8 13 22		18"+			gray SANDY silty clay	4.5 tsf
19									gray clay	3.0 tsf 2.5 tsf
20										

HARZA ENGINEERING COMPANY

SOIL BORING LOG

Project Number

Client

Contractor

Drilling Method

Hole Size

Driller

Logged by

Project Name

WATER LEVEL			
TIME			
DATE			

Sample Hammer: Weight

Drop

Sampler Dimensions

Boring No. AB2

Location

Coordinates: N

E

Ground Elevation

Total Depth

Date Started

Date Completed

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
20										
21										
22										
23		SB	SS	10		14"			gray hard silty clay	>4.5tsf
				13						>4.5tsf
24				22						4.0tsf
									EOB 24ft.	

HARZA ENGINEERING COMPANY

Sheet 1 of 2

SOIL BORING LOG

Project Number 52576

Project Name HAMILTON LAKE EXH.

Boring No. EB-1

Client HAMILTON LAKE ASSOC

Location Left ABUTMENT

Contractor RAIMONDE & SONS

Coordinates: N

E

Drilling Method SPLIT SPOON

WATER LEVEL	22'		
TIME	2:00PM		
DATE	8/7		

Ground Elevation 940 ft

Hole Size 4¼IN ID Hollow Auger

Sample Hammer: Weight 140lb

Total Depth 24 ft

Driller P. RAIMONDE

Drop 30IN

Date Started 8/7/91

Logged by CMB

Sampler Dimensions 2IN Split Spoon

Date Completed 8/7/91

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
0									Raspberry red	
									thin layer organic sandy silty soil	
1		S-1	SS	8 15 18	18"	10"	0'	ML	brown dry silt with some-trace gravel	
2										
3				18					may have pushed gravel.	
4		S2	SS	15 12	18"	0"	2.5'			
5									lt brown to white, gravel and silt some SAND gravel is sub ROUNDED	
6		S3	SS	9 7 7	18"	10"	5'	GM		
7										
8		S4	SS	16 13 14	18"	14"	7.5'	ML	yellow dry silt	
9									augered thru gravel	
10									gray/white fine gt SAND	
11		S5	SS	8 8 8	18"	16"	10			
12									lt gray fine gravelly med to coarse SAND subangular to subrounded fine gravel	
13		S6	SS	17 7 7	18"	18"	12½'	SC	brown fine gravelly med to coarse SAND w/ clay clasts AND some clay matrix	
14									cobbles or gravel	
15										augered thru
16										
17									yellow silt	
18		S7	SS	16 13 13	18	15"	17.5'	ML		
19								SM	yellow silty SAND w/ silt lense 2" thick	

HARZA ENGINEERING COMPANY

SOIL BORING LOG

Project Number
Client
Contractor
Drilling Method
Hole Size
Driller
Logged by CMB

Project Name

WATER LEVEL			
TIME			
DATE			

Sample Hammer: Weight
Drop
Sampler Dimensions

Boring No. EB1
Location Left abutment
Coordinates: N
E
Ground Elevation
Total Depth
Date Started
Date Completed

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
20				13					white sandy silt	
21		S8	SS	16	18	12"			white silty SAND	
				18						
22									▽	
23		S9	SS	12	18	12"			white silty fine SAND	
				14						
24				17					EOB 24'	
25										

HARZA ENGINEERING COMPANY

Sheet 1 of 1

SOIL BORING LOG

Project Number 52576
Client HAMILTON LAKE ASSOC
Contractor RAIMONDE DRILLING
Drilling Method SPT
Hole Size 6IN.
Driller P. RAIMONDE
Logged by CMB, HARZA

Project Name HAMILTON LAKE

WATER LEVEL	4 ft		
TIME	3pm		
DATE	8/7/91		

Sample Hammer: Weight 140 lb
Drop 30 IN
Sampler Dimensions 2 in Split spoon

Boring No. EB 2
Location stream bed NE of [illegible]
Coordinates: N
E
Ground Elevation 920 ft
Total Depth 14 ft
Date Started AUG 7, 1991
Date Completed AUG 7, 1991

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
0									3 in gravel in stream bed	
1	1 9 7	EB2 S1	SS	1 9 7	18"	10"		SC	brown sandy clay	
2										
3		S2	SS	10 13 13	18"	12"			yellow sandy clay w/ gravel	
4										
5									saturated sandy clay	
6		S3	SS	10 10 9	18"	12"			black silty fine SAND to fine gravel shale flakes w/ quite sand.	
7										
8		S4	SS	15 11 11	18"	12"			gray hard clay	Pocket pentrometer 4.5 tsf 4.0 tsf >4.5 tsf torvane ~7
9										
10										
11		S5	SS	12 15 19	18"	0"			clay must have remained in hole	
12										Pocket 3.5 tsf 3.5 tsf 4.0 tsf
13			SS	6 8 9	18	18"			half of sample gray clay half brown sandy clay	
14									gray silt EOB – 14 ft	Pocket penetrometer 1 tsf 1 tsf 1 tsf
15										
16										
17										
18										
19										

HARZA ENGINEERING COMPAN

SOIL BORING LOG

Project Number 52576
Client HAMILTON LAKE ASSOC
Contractor
Drilling Method Split Spoon & Hollow Stem AUGER
Hole Size
Driller Phil RAINONDE
Logged by CM BROWN

Project Name HAMILTON LAKE

WATER LEVEL			
TIME			
DATE			

Sample Hammer: Weight 140 lb
Drop 30 IN
Sampler Dimensions 2 IN Split spoon

Boring No. GB-1
Location Left abutment
Coordinates: N (Proposed)
E
Ground Elevation 904
Total Depth 24 ft
Date Started 8/6/91 4:30-6PM
Date Completed 8/6/91

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
0				3					oak trees adjacent to boring, grass + other veg little to no topsoil	
6" 1		GB1 S1	SS	5 7	18"	18"		SM	dry yellow silty, fine SAND	
2										
3 4		GB1 S2	SS	12 6 5	18"	18"		SM	moist yellow silty, fine Sand	
5				3						
6		S3	SS	3 6	18"	18"		SM	gray clayey 5% silty 10% SAND sand is MORE coarse fine tomed.	
7										
8 9		S4	SS	7 4 4	18"	8"		SM	gray silty Sand (fine to coarse SAND)	

.ING COMPANY

SOIL BORING LOG

Project Number
Client
Contractor
Drilling Method
Hole Size
Driller
Logged by CMB

Project Name

WATER LEVEL			
TIME			
DATE			

Sample Hammer: Weight
Drop
Sampler Dimensions

Boring No. GB 1
Location
Coordinates: N
E
Ground Elevation
Total Depth
Date Started
Date Completed

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
10				6					dark gray saturated clayey SAND	
11		55	SS	6	18"	14		SC		
				5						
12										
13		56	SS	14	18"	14			gray saturated clayey SAND	
				6						
14				5					soft brown silty fine sand	
15				10					Gray fine silty SAND pungent odor	
		57	SS	6	18"	16"				
16				7						
17										
18		58	SS	15	18"	15"			gray silty fine to coarse SAND	
				7					= thin black, clayey, silty, fine sand layer =	
19				6					gray silty fine to coarse SAND	
20										

HARZA ENGINEERING COMPANY

SOIL BORING LOG

Project Number
Client
Contractor
Drilling Method
Hole Size
Driller
Logged by

Project Name

WATER LEVEL			
TIME			
DATE			

Sample Hammer: Weight
Drop
Sampler Dimensions

Boring No. GB 1
Location
Coordinates: N
E
Ground Elevation
Total Depth
Date Started
Date Completed

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
20				14						
		5a	SS	6	18"	12"		SM	gray silty, fine to coarse SAND w/ small shale pebbles	
21				5						
22										
				7						
23		5b	SS	6	18"	12"		SW	clean gray fine to coarse SAND	
24				6					EOB 24 ft	

HARZA ENGINEERING COMPANY

Sheet 1 of 2

SOIL BORING LOG

3

Project Number 52571

Client HAMILTON LAKE ASSOC.

Contractor RAIMONDE DRILLING

Drilling Method SPLIT SPOON

Hole Size

Driller PHIL RAIMONDE, SCOTT

Logged by CARL M BROWN

Project Name HAMILTON LAKE

WATER LEVEL			
TIME			
DATE			

Sample Hammer: Weight

Drop

Sampler Dimensions

Boring No. GB-2

Location SITE G, CENTER

Coordinates: N

E

Ground Elevation 899

Total Depth 15.5

Date Started 8/6/91 3-4:30 PM

Date Completed 8/6/91

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
0									4ft grass AND VEGETATION	
6" 1'		GB2 S1	SS	4 1	18	0" only in sampler tip	4½		black organic matter root bound.	
2										
3		GB3 S2	SS	1/18"	18	0"			No sample recovered	
4										
5		S3	SS	1/12 1/6"	18	0" only in SS tip			sample in tip was green/black organic residue w/ some med sand. sample was soft as sour cream.	
6										
7										
8		S4	SS	1/12" 1/6"	18	1"			water washed sample out of Split spoon. sample in tip was dk gray silty, clayey, fine SAND with roots AND organic matter	
9										
10										

HARZA ENGINEERING COMPANY

SOIL BORING LOG

Project Number

Client

Contractor

Drilling Method Split spoon sampler w/ 4½" ID hollow auger

Hole Size

Driller P.R.

Logged by CMB

Project Name

WATER LEVEL			
TIME			
DATE			

Sample Hammer: Weight

Drop

Sampler Dimensions

Boring No. GB-2

Location SITE G, CENTER

Coordinates: N

E

Ground Elevation

Total Depth 15½

Date Started

Date Completed

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
10				1/12"					black organics	
11		55		5/6"	18	8"			grey silty 5% poorly graded very fine-fine sand.	
12										
13		56		3 / 3 / 6	18	16			gray silty, very fine-fine SAND	
14		57		3 / 6 / 10	18	14			gray very fine to med SAND	
15									EOB 15.5 ft	

HARZA ENGINEERING COMPANY

SOIL BORING LOG

Project Number 5257G
Client HAMILTON LAKE
Contractor RAIMONDE
Drilling Method SPLIT SPOON
Hole Size 4 1/4 ID
Driller Phil R. + Sam
Logged by C.M. Pr. Pwn!

Project Name HAMILTON LAKE

WATER LEVEL	6	14	
TIME	3PM	5PM	
DATE	7/30/91	7/30	

Sample Hammer: Weight 140 lb
Drop 30 IN
Sampler Dimensions 2 IN Split Spoon

Boring No. GB-3
Location Rt. 22 ABUTMENT
Coordinates: N
E
Ground Elevation 94 ft
Total Depth 24
Date Started July 30, 1991 2:30pm
Date Completed

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
0				1					DENSE VEGETATION, RASPBERRY AND OTHER 3-4 ft TALL	
½		GB-SS1	SS	1	18	0			NO RECOVERY - very soft black soil	
1				0						
1½										
2										
3		GB-SS2	SS	1 / 1 / 1	18	2"			very soft black soil	
4									well rounded fine sand, silt, tr grey with some clay	
5				1						
6		GB-SS3	SS	1 / 1	18"	14"			soft black organic matter soft spongey red brown + black	WATER
7									(AUGER LIFTED SATURATED GRAY SAND)	
8		GB-SS4	SS	0 / 0 / 2	18	13"			Dk gray clayey organic soil soft black organic matter	
9									SAND - fine to coarse gray SAND well rounded	

HARZA ENGINEERING COMPANY

SOIL BORING LOG

Project Number 5257 G

Client

Contractor

Drilling Method

Hole Size

Driller

Logged by

Project Name

WATER LEVEL			
TIME			
DATE			

Sample Hammer: Weight

Drop

Sampler Dimensions

Boring No. GB-3

Location [illegible]

Coordinates: N

E

Ground Elevation

Total Depth

Date Started

Date Completed

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
10				23					gray clay with organics	
		5	SS	11	18	18"			fine to coarse sandy clay - yellow color	
11		6		8					yellow clayey silty, fine to coarse sand	
									gravelly yellow sand in spots 1"	
12										
				5					sandy clay some organics	
13		6	SS	15	18	18"				
				13					yellow gravelly med-coarse sand	
14										
15				12		18"				
		7	SS	18	18				lt grey-yellow gravelly sand w/ clay matrix	2 samples
16		8		9					yellow/dense clay	
17										
									fine - med gravel sub angular to well rounded	
18		9	SS	18	18	16			gravelly sandy clay	
				11						
19				8					orange med-coarse well rounded sand	

HARZA ENGINEERING COMPANY

SOIL BORING LOG

Project Name HAMILTON LAKE

WATER LEVEL			
TIME			
DATE			

Project Number

Client

Contractor

Drilling Method

Hole Size

Driller PHIL RAIMONDE

Logged by C M BROWN

Sample Hammer: Weight

Drop

Sampler Dimensions

Boring No. GB-3

Location

Coordinates: N

E

Ground Elevation

Total Depth

Date Started

Date Completed

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
20				12					med-coarse rounded sand	
		SS		14						
21				14						
									coarse silt to fine sand very well rounded	
22										
				11					COARSE SAND	
23		SS		9					YELLOW SAND w/ some silt and clay	
24				11					& gray fine-med sand	
									EOB 24 ft	
25										
									AT COMPLETION OF DRILLING WATER LEVEL AT 14 ft	

APPENDIX B - TEST PIT LOGS

HARZA ENGINEERING COMPANY

TEST PIT
~~SOIL BORING~~ LOG

Sheet 1 of 1

Project Number 52576
Client HAMILTON LAKE ASSOC
Contractor BUTLER + BUTLER
Drilling Method BACKHOE
Hole Size
Driller JOE RICHMAN
Logged by CMBROWN

Project Name HamiltonLake

WATER LEVEL	8'		
TIME	10 AM		
DATE	7/31/91		

Sample Hammer: Weight —
Drop —
Sampler Dimensions

Boring No. AT 1
Location BELOW RT ABUTMENT
Coordinates: N
E
Ground Elevation 954.5 ft
Total Depth 11
Date Started 7/31/91
Date Completed 7/31/91

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
0									no vegetation, trees nearby dk gray topsoil	
1										
2									ML-CL	
3	X	AT-4	BS						mottled yellow/gray silty clay.	X SAMPLE
4										
5									gravelly, clayey, silty sand	
6									20% 20% 20% 40%	
7	X								gravel up to 1½ inch - 2 inch	X SAMPLE
8		AT1	BS						▽	
9										
10									gravelly clayed fine-coarse sand	
11									15% 25% 60%	
									EOTest Pit	

HARZA ENGINEERING COMPANY

TEST TRENCH ~~SOIL BORING~~ LOG

Sheet 1 of 1

Project Number 5257 G
Client HAMILTON LAKE ASSOC.
Contractor BUTLER & BUTLER
Drilling Method BACK HOE
Hole Size 7.5 x 10 ft x 14 ft
Driller BOB RICHMAN
Logged by C M BROWN

Project Name HAMILTON LAKE

WATER LEVEL			
TIME			
DATE			

Sample Hammer: Weight —
Drop —
Sampler Dimensions —

~~Boring~~ No. AT 2
Location SITE A, HAMILTON DIT.
Coordinates: N WEST OF RIDGE
E
Ground Elevation 953.3
Total Depth 14 ft
Date Started JULY 31
Date Completed JULY 31

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
0									NO VEGETATION AT TEST PIT SITE, SAME GRASS NEARBY	
1		AT2-S1	BS						DENSE BLACK layey TOPSOIL	X Sample
2										
3									gray clay MED density	
4										
5										
6		AT2-S2	BS							X Sample
7								CL	med gray clay	
8										
9										
10										
11								SC	gray sandy clay	
12										
13		AT2-S3	BS					SP	gray well graded clean fine to med well rounded sand.	X Sample
14										

HARZA ENGINEERING COMPANY

SOIL BORING LOG

Project Number 52576
Client HAMILTON LAKE ASSOC.
Contractor BUTLER & BUTLER
Drilling Method BACKHOE
Hole Size —
Driller BOB RICHMAN
Logged by CMBROWN

Project Name HAMILTON LAKE

WATER LEVEL	6		
TIME	11		
DATE	7/31		

Sample Hammer: Weight —
Drop —
Sampler Dimensions —

Boring No. BT-1
Location RT SIDE OF CREEK
Coordinates: N
E
Ground Elevation 965 Ft
Total Depth 13 ft
Date Started July 31
Date Completed July 31

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
									depression, sparse vegetation	
0									dk gray topsoil	
1										
2	X	51							mottled red/dk gray clay very hard	similar material silty clay entire depth
3										
4	X	50							Hard red/gray clay	
5										
6									RED BROWN clay	
7									silty clay	
8										
9									water seeped into hole at around 6 ft deep	
10										
11										
12	X	57							gray clay	
13									EC TEST PIT	
14										
15										

HARZA ENGINEERING COMPANY

TEST PIT ~~SOIL BORING~~ LOG

Sheet 1 of 1

Project Number 52576
Client HAMILTON LAKE ASSOC
Contractor BUTLER + BUTLER
Drilling Method BACKHOE
Hole Size —
Driller Bob RICHMAN
Logged by CMB

Project Name HAMILTON LAKE

WATER LEVEL			
TIME			
DATE			

Sample Hammer: Weight —
Drop —
Sampler Dimensions —

Boring No. BT-2
Location SITE B - CENTRAL PAR
Coordinates: N along fence
E
Ground Elevation 966
Total Depth 13 ft
Date Started 7/31/91
Date Completed 7/31/91

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
									trees + wild grapes along fence	
0									black topsoil	
1										
2									layer or lense of gravelly (10%) silty clay	
3									SAND LENSE poorly graded med sand	Discontinuous
4										
5									dk gray hard silty clay	
6	X	S1	BS						SAND lense	
7	X	S2	BS						dk gray clayey silt to silty clay	
8										
9										
10										
11										
12										
13									EO Test Pit 13 ft	

HARZA ENGINEERING COMPANY

~~SOIL BORING~~ TEST PIT LOG

Sheet 1 of ___

Project Number 5257 G
Client HAMILTON LAKE ASSOC
Contractor BUTLER + BUTLER
Drilling Method BACKHOE
Hole Size —
Driller Bob Richmar
Logged by CMB

Project Name Hamilton Lake

WATER LEVEL	7½'		
TIME	2 PM		
DATE	7/31		

Sample Hammer: Weight —
Drop —
Sampler Dimensions —

Boring No. ET 1
Location left side of creek
Coordinates: N ___
E ___
Ground Elevation 926
Total Depth 11 ft
Date Started 7/31
Date Completed 7/31/91

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
									tall grass + raspberry at edge of trees	
0									Top Soil, dk gray to black organic silty soil	
1										
2										
3								CL	gray med to hard silty clay	
4	X	ET1 S1	BS							
5										
6								CL	grey clay	
7									silty sandy gravel w/ cobbles	
8	X	ET1 S2	large Bag Sample						material collapsed into test pit during excavation	
9										
10										
11									EOB - 11 ft	
12										
13										
14										
15										
16										

HARZA ENGINEERING COMPANY

TEST PIT ~~SOIL BORING~~ LOG

Sheet 1 of 1

Project Number 52576
Client HAMILTON LAKE ASSOC
Contractor BUTLER + BUTLER
Drilling Method BACKHOE
Hole Size —
Driller BOB RICHMAN
Logged by CMBROWN

Project Name Hamilton Lake

WATER LEVEL	8 ft		
TIME	8 Am		
DATE	8/7/91		

Sample Hammer: Weight —
Drop —
Sampler Dimensions —

Boring No. FT-1
Location SITE F
Coordinates: N —
E —
Ground Elevation 930
Total Depth 12 ft
Date Started 8/7/91
Date Completed 8/7/91

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	Photo 16
0									Woodland vegetation, thorn bushes 4 ft wide	
									dark brown topsoil, gravelly silty sand	
1									dry lt brown silty SAND.	Pocket pen. 3.25 tsf 4.25 tsf 4.5 tsf
2		FT1							red, very stiff gravelly SANDY clay	
3		S1	BS						lense of gravelly sand	Torvane 6. 7. 8. Photo 15
4									dry red brown silty SAND	
5										
6		FT1 S2	BS						grey silty fine SAND	
7										
8								SC	▽ gray clay clasts, yellow gravel and sand.	
9									gravel fine to 2 in dia.	
10										
11										
12									EOT — 12 ft	
13										

HARZA ENGINEERING COMPANY

TEST PIT ~~SOIL BORING~~ LOG

Sheet 1 of 1

Project Number 5257 G
Client HAMILTON LAKE ASSOC.
Contractor BUTLER + BUTLER
Drilling Method BACK HOE
Hole Size —
Driller BOB RICHMAN
Logged by CM BROWN

Project Name HAMILTON LAKE

WATER LEVEL	8		
TIME	9AM		
DATE	8/2/91		

Sample Hammer: Weight —
Drop —
Sampler Dimensions —

Boring No. ET 2
Location CENTER OF SITE 5
Coordinates: N
E
Ground Elevation 930
Total Depth 12 ft
Date Started AUG 7 1991
Date Completed Aug 2, 1991

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
0									4ft high raspberry + other veg.	
1		ET2							dk brown topsoil / organic silty SAND	Torvane 4.3 5.0 3.0 PPenetr 1.5 2.0 2.5
2	X	S1	BS							
3										
4									gray clay, med to hard clay	Torvane PP 3.5 1.5 5.0 1.0 2.0
5	X	ET2 S2	BS							
6	X	S3	Large BAG SAMPLE							
7										Photo 19
8									▽ —	
9										
10										
11									yellow brown gray clayey gravel, w/ silt	
12									EOTEST PIT	

HARZA ENGINEERING COMPANY

TEST PIT ~~SOIL BORING~~ LOG

Sheet 1 of 1

Project Number 52576
Client HAMILTON LAKE ASS
Contractor BUTLER + BUTLER
Drilling Method BACKHOE
Hole Size —
Driller BOB KICHMAN
Logged by C M BROWN

Project Name HAMILTON LAKE

WATER LEVEL	4.3 ft	
TIME	600 AM	
DATE	7/31/91	

Sample Hammer: Weight —
Drop —
Sampler Dimensions —

Boring No. HT-1
Location left side of creek
~~Coordinates:~~ N u/s of Dam
E
Ground Elevation
Total Depth 10 ft
Date Started 7/31/91
Date Completed 7/31/91

Depth (ft/m)	Sample Depth (ft/m)	Sample No.	Sampler Type	Blows per 6 in/15 cm	Length Driven (in/cm)	Length Recovered (in/cm)	Casing Depth (ft/m)	Unified Soil Classification	SOIL DESCRIPTION	NOTES AND FIELD TESTS
									Surface Conditions:	
0									grass	
1								ML	Dark brown Topsoil silty organics	
2										
3								CL	yellow/gray clayey sand Subangular silt to med SAND	
4									▽	
5									yellow brown fine to med SAND	
6	X	HT S2	Large Bag Sample					SP		
7										
8										
9									sand began to colupse into PIT.	
10									EOB - 10 ft	

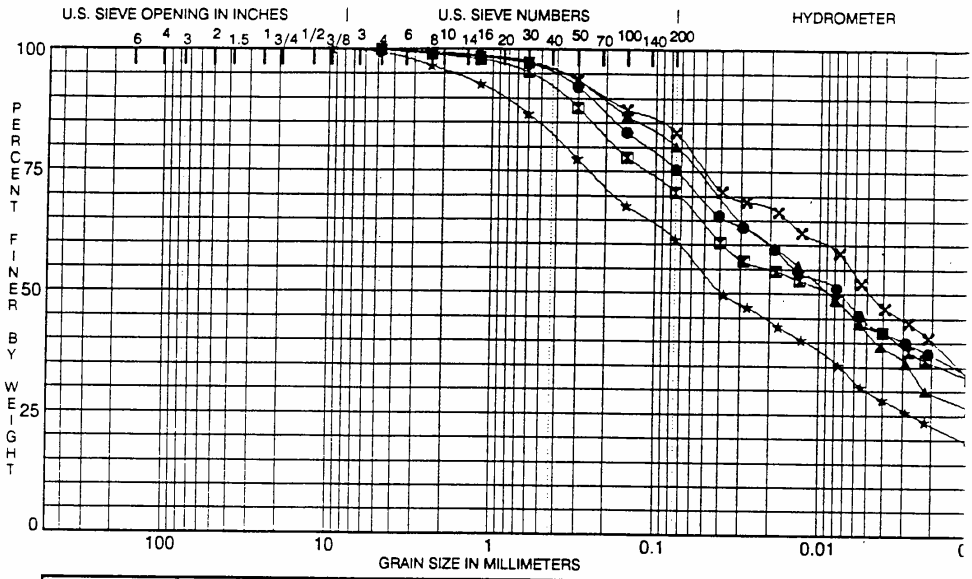
APPENDIX C - GRAIN SIZE CURVES

HARZA

Job No.

Date 9.9.91

Project HAMILTON LAKE ENHANCEMENT -



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	C
●	AB1-S1	0.0	LEAN CLAY with SAND CL	15	35	22	13		
⊠	AB1-S2	0.0	LEAN CLAY with SAND CL	15	38	20	18		
▲	AB2-S1	0.0	SILT with SAND ML	20	41	27	14		
★	B-CREEK	0.0	SANDY LEAN CLAY CL	38	31	22	9		
✕	BT1-S1	0.0	SILT with SAND ML	26	41	33	8		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Cl
●	AB1-S1	0.0	4.75	0.02			0.0	24.7	31.0	44.
⊠	AB1-S2	0.0	4.75	0.04			0.0	29.3	27.3	43.
▲	AB2-S1	0.0	4.75	0.02	0.002		0.0	19.9	37.9	42.
★	B-CREEK	0.0	9.50	0.07	0.005		0.6	38.4	31.0	30.
✕	BT1-S1	0.0	4.75	0.01			0.0	17.0	32.2	50.

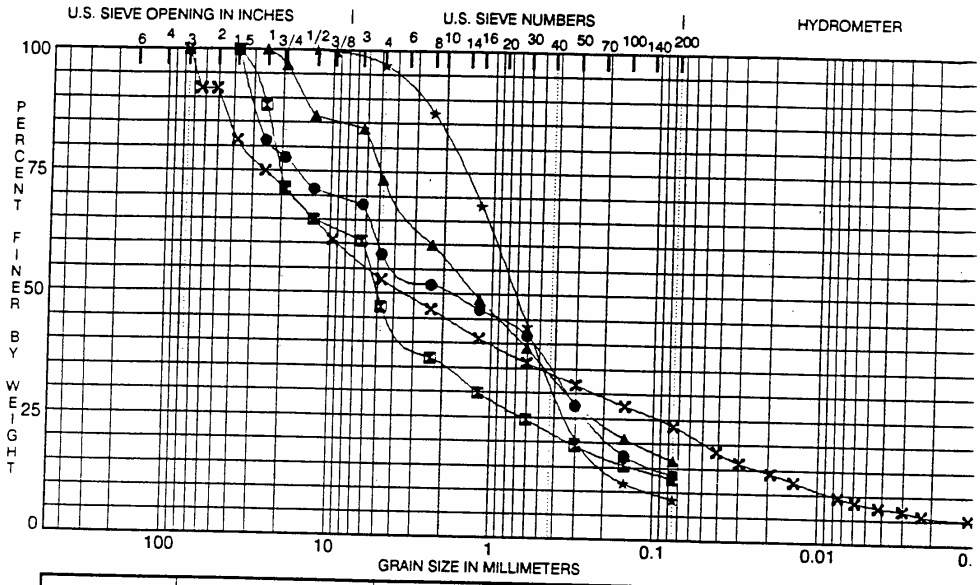
GRADATION CURVES

HARZA

Job No.

Date 9.9.91

Project HAMILTON LAKE ENHANCEMENT -



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	MC%	LL	PL	PI	Cc	C
●	EB2-S1	0.0		20					
⧗	EB2-S2	0.0		8					
▲	EB2-S3	0.0		13					
★	EBI-S5	0.0		4				1.62	9.
✕	ET1-S2	0.0	SILTY GRAVEL with SAND GM	12	17	15	3		

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	EB2-S1	0.0	37.50	5.02	0.339		42.0	44.5	13.5	
⧗	EB2-S2	0.0	37.50	6.21	1.192		52.8	34.5	12.7	
▲	EB2-S3	0.0	25.00	2.36	0.340		26.7	56.9	16.4	
★	EBI-S5	0.0	12.50	0.94	0.399	0.1038	3.0	88.5	8.5	
✕	ET1-S2	0.0	75.00	8.80	0.225	0.0083	47.2	29.2	15.5	8.1

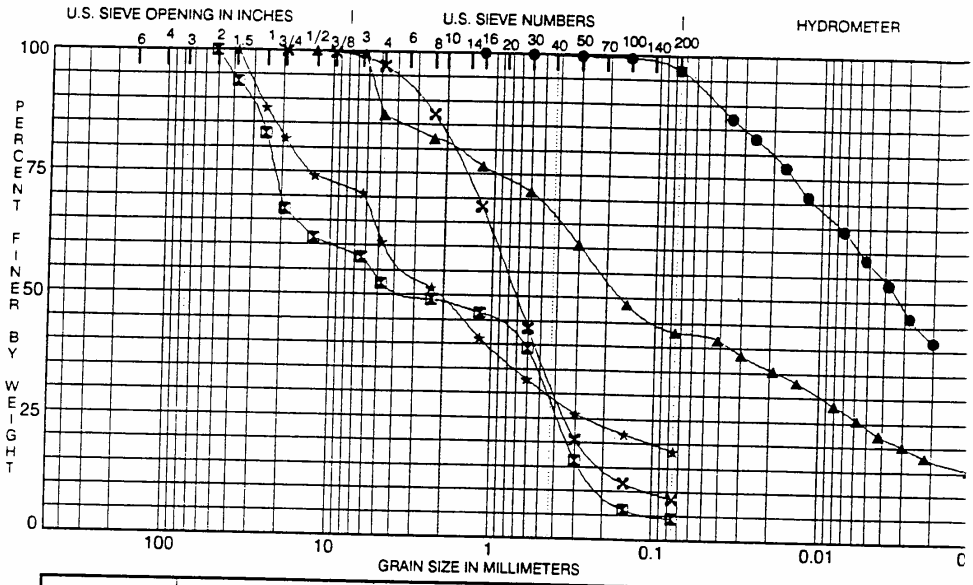
GRADATION CURVES

HARZA

Job No.

Date 9.9.91

Project HAMILTON LAKE ENHANCEMENT -



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	C
●	BT2-S2	0.0	LEAN CLAY CL	28	36	22	14		
⧗	E-CREEK	0.0		11				0.11	5(
▲	EB1-S1	0.0		7					
★	EB1-S3	0.0		4					
✕	EB1-S5	0.0		4				1.62	9.

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Cla
●	BT2-S2	0.0	1.18	0.01	0.001		0.0	3.0	39.4	57.6
⧗	E-CREEK	0.0	50.00	9.76	0.455	0.1952	47.6	47.9	4.5	
▲	EB1-S1	0.0	12.50	0.29	0.010		13.2	43.7	19.0	24.1
★	EB1-S3	0.0	37.50	4.51	0.450		39.3	42.3	18.4	
✕	EB1-S5	0.0	19.00	0.94	0.399	0.1038	3.0	88.5	8.5	

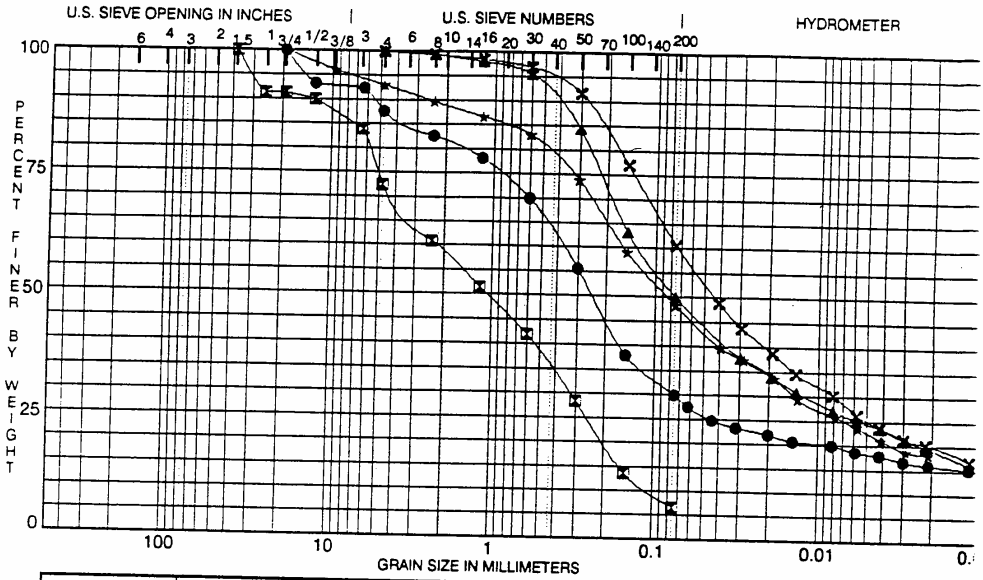
GRADATION CURVES

HARZA

Job No.

Date 9.9.91

Project HAMILTON LAKE ENHANCEMENT -



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	FT1-S1	0.0	CLAYEY SAND SC	13	26	16	10		
⊠	FT1-S2	0.0		13				0.46	21.
▲	FT2-S1	0.0	SANDY SILT ML	20	25	23	2		
★	FT2-S2	0.0	CLAYEY SAND SC	19	28	16	12		
✕	FT2-S3	0.0	SANDY LEAN CLAY CL	15	27	20	7		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	FT1-S1	0.0	19.00	0.37	0.076		12.4	57.7	11.6	18.3
⊠	FT1-S2	0.0	37.50	2.21	0.327	0.1045	27.7	65.6	6.7	
▲	FT2-S1	0.0	4.75	0.13	0.012		0.0	50.0	25.6	24.4
★	FT2-S2	0.0	19.00	0.16	0.014		7.0	44.7	25.8	22.5
✕	FT2-S3	0.0	4.75	0.07	0.008		0.0	39.4	35.5	25.1

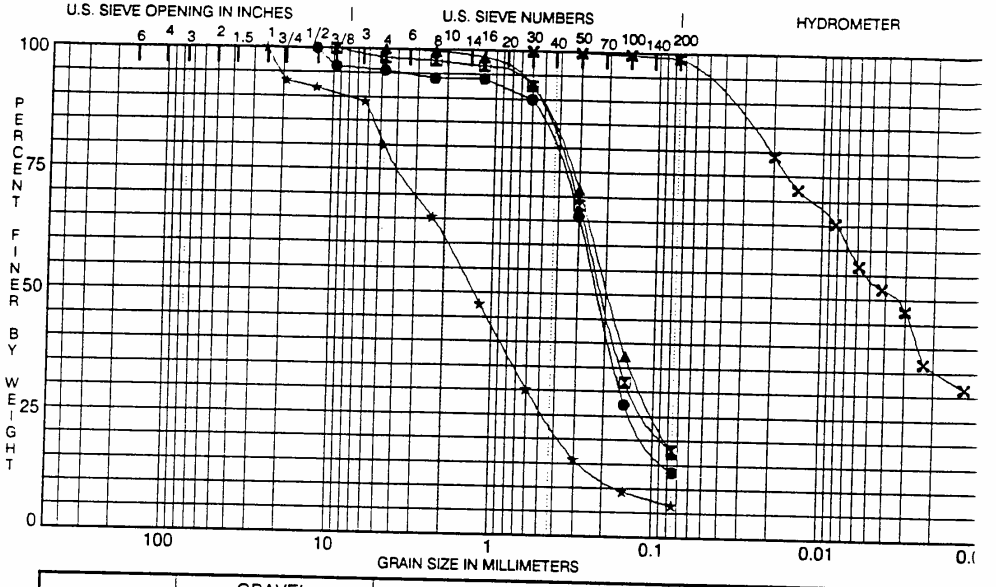
GRADATION CURVES

HARZA

Job No.

Date 9.9.91

Project HAMILTON LAKE ENHANCEMENT -



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	GB1-S1	0.0		3					
■	GB1-S2	0.0		6					
▲	GB1-S3	0.0		22					
★	GB3-S6	0.0		13				1.15	12.
✕	H-CREEK	0.0	ELASTIC SILT MH	115	95	41	54		

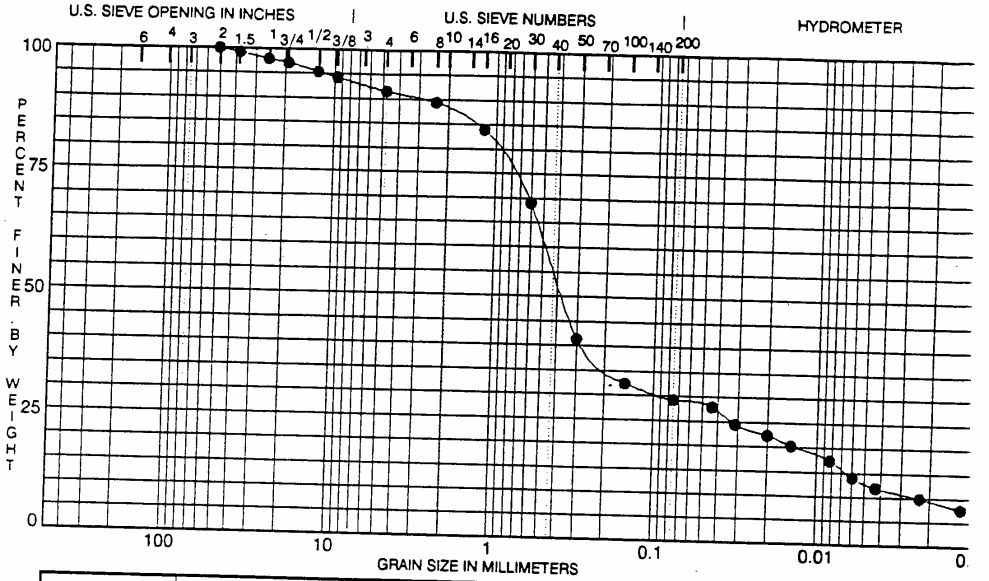
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	GB1-S1	0.0	12.50	0.27	0.158		4.4	82.2	13.4	
■	GB1-S2	0.0	9.50	0.26	0.136		1.7	80.3	18.0	
▲	GB1-S3	0.0	4.75	0.24	0.117		0.0	82.7	17.3	
★	GB3-S6	0.0	25.00	1.92	0.594	0.1601	20.1	73.2	6.7	
✕	H-CREEK	0.0	0.60	0.01			0.0	1.1	44.4	54.5

GRADATION CURVES

HARZA

Job No.
Project HAMILTON LAKE ENHANCEMENT -

Date 9.9.91



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

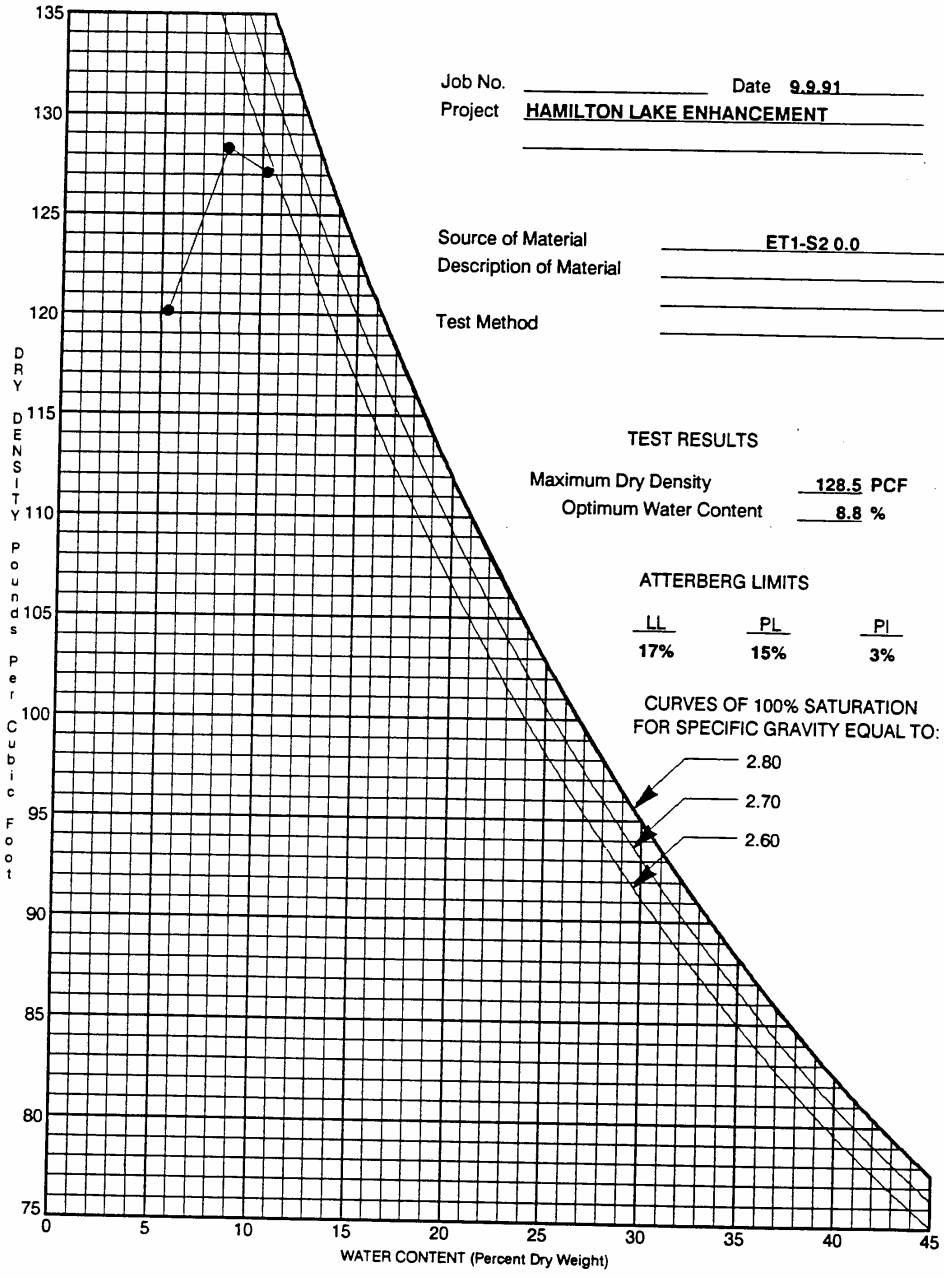
Specimen Identification		Classification	MC%	LL	PL	PI	Cc	C
● HT1-S2	0.0	SILTY SAND SM	23	21	20	1		

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Cla
● HT1-S2	0.0	50.00	0.48	0.089	0.0024	8.5	62.3	16.3	12.9

GRADATION CURVES

APPENDIX D - LABORATORY TEST DATA

HARZA



Job No. _____ Date 9.9.91

Project HAMILTON LAKE ENHANCEMENT

Source of Material ET1-S2 0.0

Description of Material

Test Method

TEST RESULTS

Maximum Dry Density 128.5 PCF

Optimum Water Content 8.8 %

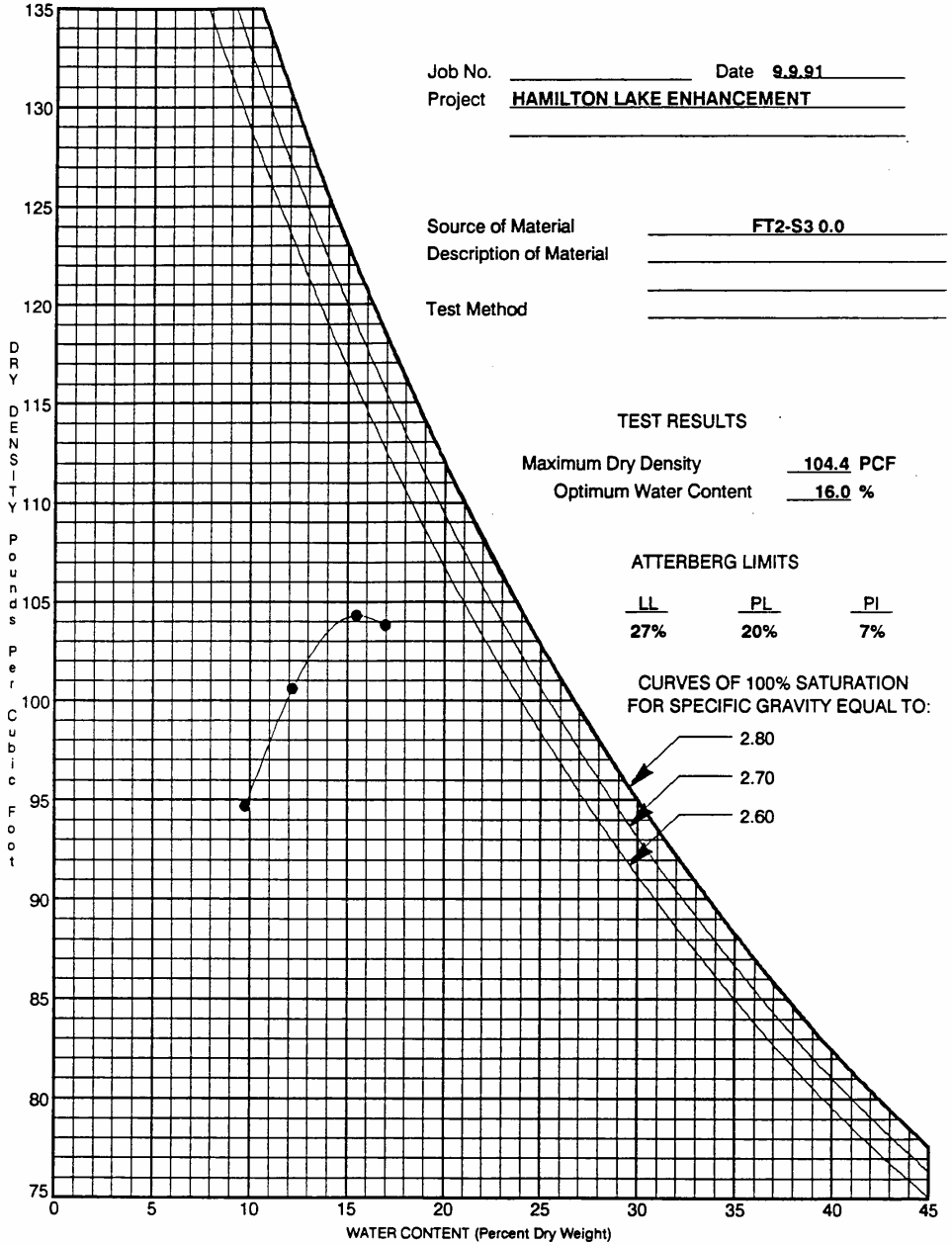
ATTERBERG LIMITS

LL	PL	PI
17%	15%	3%

CURVES OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO:

MOISTURE-DENSITY RELATIONSHIP

HARZA



Job No. _____ Date 9.9.91

Project HAMILTON LAKE ENHANCEMENT

Source of Material FT2-S3 0.0

Description of Material

Test Method

TEST RESULTS

Maximum Dry Density 104.4 PCF

Optimum Water Content 16.0 %

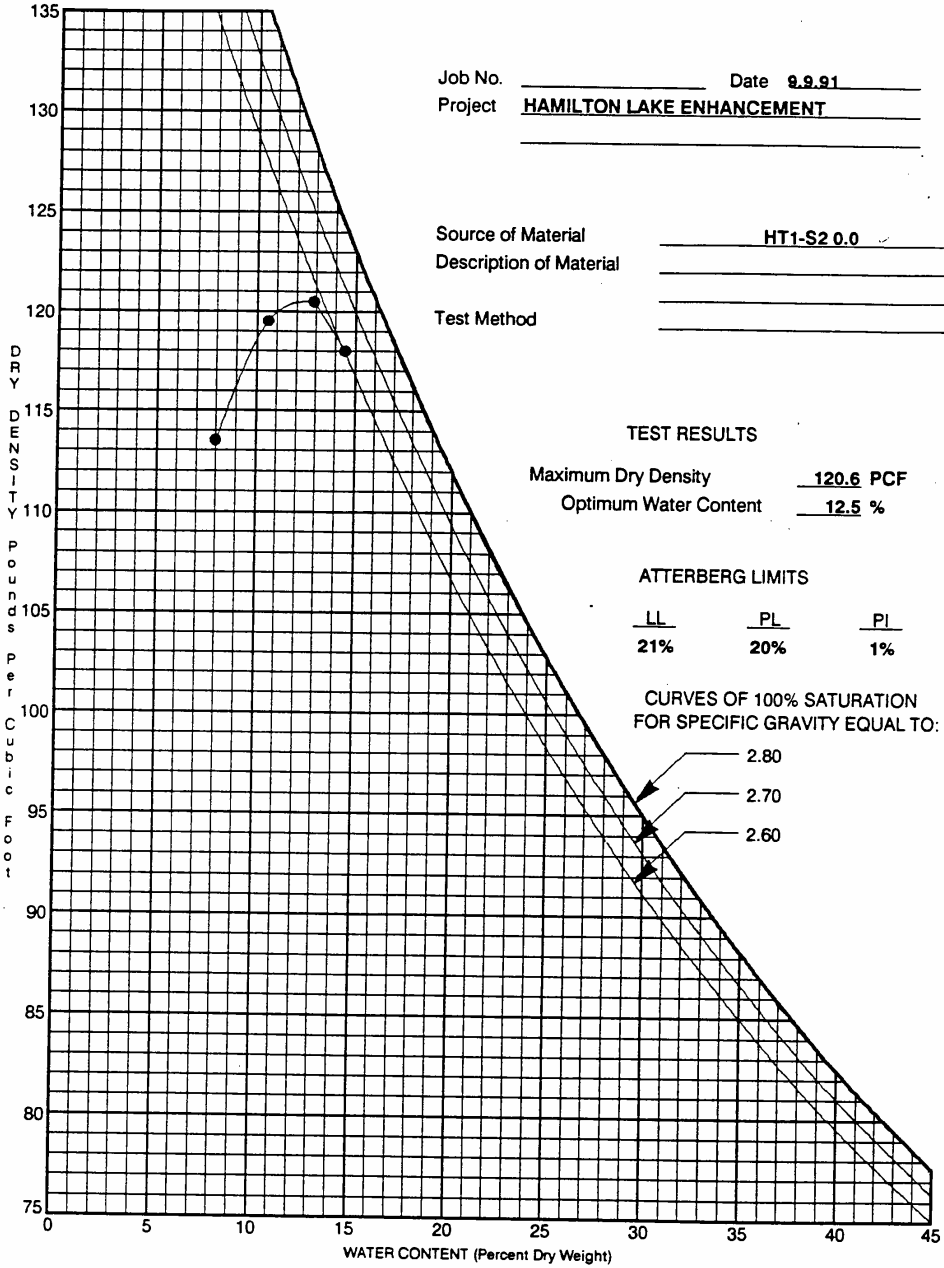
ATTERBERG LIMITS

LL	PL	PI
27%	20%	7%

CURVES OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO:

MOISTURE-DENSITY RELATIONSHIP

HARZA



Job No. _____ Date 9.9.91

Project HAMILTON LAKE ENHANCEMENT

Source of Material HT1-S2 0.0

Description of Material

Test Method

TEST RESULTS

Maximum Dry Density 120.6 PCF

Optimum Water Content 12.5 %

ATTERBERG LIMITS

LL	PL	PI
21%	20%	1%

CURVES OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO:

MOISTURE-DENSITY RELATIONSHIP

PART 10 - DRAWINGS

Sheet 1 - Cover Sheet and Area Map

Sheet 2 - Wetland Structure

SUBMITTED
5-11-00

HAMILTON LAKE ASSOCIATION, INC.

HAMILTON, INDIANA

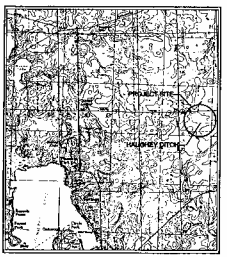
HAMILTON LAKE WETLAND ENHANCEMENT PROJECT

August 1999

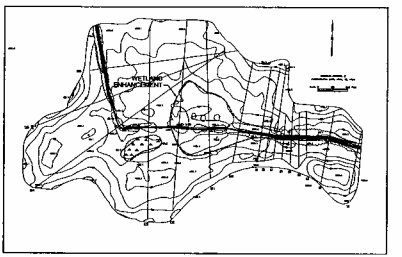
NOTES:

1. THE STEEL SHEET PILE SHALL BE PAIX 22 (USS) ASTM A328 CARBON GRADE OR EQUAL. SEE TYPICAL SECTION ON SHEET 2.
2. THE ALIGNMENT OF THE CONTROL STRUCTURE IS APPROXIMATELY PERPENDICULAR TO THE CENTER LINE OF HAUGHEY DITCH. THE FINAL ALIGNMENT SHALL BE ADJUSTED TO AN ALIGNMENT THAT WILL PROVIDE THE MOST SUITABLE FOUNDATION FOR THE STRUCTURE AND ACCEPTABLE FLOW CONDITION. FINAL ALIGNMENT IS SUBJECT TO THE APPROVAL OF THE HAMILTON LAKE ASSOCIATION.
3. THE MINIMUM EMBEDMENT LENGTH SHALL BE 5 FEET FROM THE TOP OF DRAINE ROK, OR GRAVEL. THE DESIGN ASSUMES EL. 95.
4. THE FINAL ALIGNMENT OF THE STRUCTURE SHALL BE ADJUSTED TO MINIMIZE INTERFERENCE FROM BURIED DEBRIS WHICH MAY IMPEDE DRIVING OF SHEETPILE.
5. THE AERIAL SURVEY PHOTO CONTROL WAS PROVIDED BY A LOCATION ON ROAD 400 E WHERE IT CROSSES OVER BLACK CREEK. THE LOCATION WAS ON THE CENTERLINE OF THE ROAD PERPENDICULAR TO THE NORTH BRIDGE END WALL LOCATED ON THE EAST SIDE OF THE ROAD.

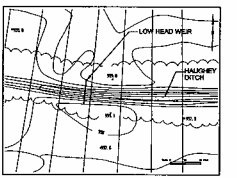
DRAWING INDEX	
SHEET No.	DRAWING TITLE
15087-01	COVER / GENERAL NOTES
15087-02	SEDIMENT CONTROL STRUCTURE



AREA MAP



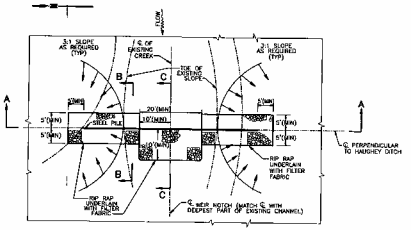
WETLAND ENHANCEMENT AREA MAP



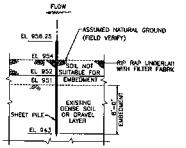
WEIR LOCATION MAP

HARZA ENGINEERING COMPANY
WATER & ENVIRONMENT
SEARS TOWER • 233 South Wacker Drive • Chicago, Illinois 60606-6392 • Tel: (312) 831-3800 • Fax: (312) 831-3976

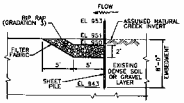
15087-01



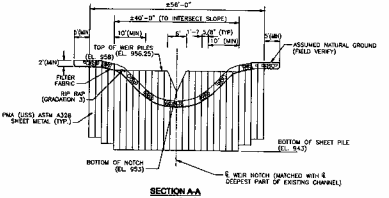
PLAN
SCALE 1"=10'



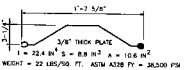
SECTION B-B
SCALE 1"=5'



SECTION C-C
SCALE 1"=5'



SECTION A-A
SCALE 1"=10'



TYP. SECTION OF SHEET PILE
NOT TO SCALE

APPROVED			ENGINEER'S SEAL
DSGN.		REVIEWED	
CHKD.	CIVIL		
DWN.	MECH.		
CHKD.	ELECT.		
SUBM.			

REV. NO.	DWG. MAGNETIC LEVER NO.	DATE	NATURE OF REVISION	BY	CHKD.	APPD.

HAMILTON LAKE ASSOCIATION, INC.
HAMILTON, INDIANA

HAMILTON LAKE WETLAND ENHANCEMENT PROJECT

SEDIMENT TRAP PLAN AND SECTION

HARZA ENGINEERING COMPANY WATER & ENVIRONMENT
CHICAGO, ILLINOIS

DATE AUGUST, 1999

PROJECT NUMBER

DRAWING NO. 15087-02