Ex. 1101 1/7

13305

PRELIMINARY SOIL INVESTIGATION

LOTS 3, 4 AND 5

7600 BLOCK WEST MERCER WAY

MERCER ISLAND, WASHINGTON

E-309

MAY 2 1985

Earth Consultants Inc.

Geotechnical Engineering and Geology

EX. 1101 2/17 X-134

(1136)

Earth Consultants Inc.
Geotechnical Engineers, Geologists & Environmental Scientists

Ref: 91-1192

August 3, 1983 E-309-6

Mr. George Lewis
25840 - 135th Place S.E.
Kent, Washington 98031

Subject: Geotechnical Investigation Report
Lewis Short Plat
Lots A, B, and C
Mercer Island, Washington

Dear Mr. Lewis:

We are pleased to submit herewith the geotechnical engineering study report for Lots A, B, and C of the Lewis Short Plat. The property is located at 7685 West Mercer Way, on Mercer Island. The general location of the site is shown on Plate 1, Vicinity Map. This report presents the results of our field investigation, laboratory tests, and engineering analysis. The purpose and scope of our study was outlined in our proposal dated June 13, 1983.

Our study indicates that in the proposed building area, the ground surface is generally underlain by medium dense to dense sands and glacial tills at a relatively shallow depth. The proposed buildings may be supported on conventional spread footings bearing on these native soils. The following sections of this report describes our study and contains recommendations regarding foundation design criteria, earthwork considerations, and site drainage.

This report has been prepared for specific application to this project in accordance with generally accepted geotechnical engineering practices for the exclusive use of Mr. George Lewis and his representatives. No other warranty, expressed or implied, is made.

PROJECT DESCRIPTION

At the time our study was performed, the site and proposed building locations were as shown schematically on the Test Pit Location Plan, Plate 2.

Ex. 1101
3/17

Based on our discussions with you, we understand that it is planned to construct single-family residences on Lots A, B, and C. The buildings will be founded on the native subsoils. The site will be re-graded to create a bench for the house construction and the spoils will be placed downslope from any construction.

If any of the above design criteria change, we should be consulted to review the recommendations contained in this report. In any case, it is recommended that Earth Consultants, Inc. be provided the opportunity for a general review of final design.

SITE CONDITIONS

Surface

Lots A, B, and C of the Lewis Short Plat are located on a moderate to steeply sloping hillside. Some clearing and re-grading had been accomplished prior to this investigation. Where the site is undisturbed, there is a moderate to dense growth of brush. There are numerous trees on the site, although many of them are dead. At the bottom of the slope near the lake the ground surface flattens abruptly. On this lower flat surface there is a peaty soft area about thirty feet in diameter. There appears to be slope drainage to this area.

Subsurface

The site was explored by excavating five test pits at the locations shown on Plate 2. In addition, we examined one previously dug test pit and an exposed bluff. Please refer to the test pit logs, Plates 4 through 7, for a detailed description of the conditions encountered at each location explored. A description of the field exploration methods and laboratory testing program is included in this report following the Discussion and Recommendations section. The following is a generalized description of the subsurface conditions encountered.

The near surface soils on the site are primarily loose sandy silts to medium dense gravelly sands. Below two to four feet the soils became dense to very dense. We encountered dense gray gravelly glacial till soils below the surface soils in Test Pits TP-2 and TP-5. Test Pit TP-4 was completely in glacial till. Laboratory tests on representative samples consisted of sieves, moistures, and Atterberg limits. The results of the laboratory tests are given on the test pit logs.

No groundwater was observed while excavating. However, some seepage may be expected into excavations near the lake or in the more permeable soil layers overlying the till, especially during wet weather.

EX. 1101
4/17

Mr. George Lewis
August 3, 1983

E-309-6
Page 3

DISCUSSION AND RECOMMENDATIONS

Foundations

The proposed structure may be supported on conventional continuous and spread footings bearing on the native dense sandy subsoils or glacial till. Exterior footings should be bottomed at a minimum depth of twelve (12) inches below the lowest adjacent outside finish grade where the footings are placed on a "bench area". The footing depth where the footings are closer than ten feet to a steep downward slope should be evaluated considering the site topography. Interior footings may be at a depth of twelve (12) inches below the top of the slab. Footings may be designed for an allowable soil bearing capacity of twenty-five hundred (2500) pounds per square foot (psf). Footings bearing on structural fill should be designed for a bearing pressure of two thousand (2000) psf. Continuous and individual spread footings should have minimum widths of twelve (12) and eighteen (18) inches, respectively. A one-third increase in the above bearing pressures may be used when considering short term wind or seismic loads.

For the above design criteria, it is anticipated that total settlements of footings founded on the native soils will be less than one-half inch, with differential settlements of less than one-quarter inch. Almost all settlements should occur during construction.

Lateral loads due to wind forces or seismic forces may be resisted by friction between the foundations and the supporting compacted fill subgrade or by passive earth pressure on the foundations. For the latter, the foundations must be poured "neat" against the existing soil or backfilled with a compact fill meeting the requirements of structural fill. A coefficient of friction of 0.35 may be used between the structural foundation concrete and the supporting subgrade. The passive resistance of undisturbed natural soils and well compacted fill may be taken as equal to the pressure of a fluid having a density of three hundred (300) pounds per cubic foot (pcf).

We recommend that drains be placed around all perimeter footings. The drains should be constructed with a four inch diameter perforated pipe bedded and covered with free draining gravel. The drains should have a positive gradient towards suitable discharge facilities. The footing drainage system should not be tied into the roof drainage system until the drains are tightlined well away from the building. The footing excavation shall be backfilled with granular soil except for the top foot which should be backfilled with a relatively impermeable soil such as silt, clay or topsoil. Alternately, the surface can be sealed with asphalt or concrete pavements.

FILE COPY 4

EX. 1101
5/17

Slab-on-Grade Floors

Slab-on-grade floors may be supported on the compacted native soil subgrade or on structural fill. Any disturbed native soils must either be recompacted or replaced with structural fill. The slab should be provided with a minimum of four inches of free draining sand or gravel. In areas where moisture is undesirable, a vapor barrier such as a 6 mil plastic membrane should be placed beneath the slab. Two inches of sand may be placed over the membrane for protection during construction and to aid in curing of the concrete.

Retaining and Basement Walls

Retaining walls should be designed to resist lateral earth pressures imposed by the soils retained by these structures. Walls that are designed to yield an amount equal to 0.002 times the wall height, or more, can be designed to resist the lateral earth pressure imposed by an equivalent fluid with a unit weight of thirty (30) pcf. If walls are to be restrained at the top from free movement a uniform force of one hundred (100) psf should be added to the equivalent fluid pressure force. These values do not contain a safety factor. An appropriate safety factor should be used in the structural design of the wall system. The base of all walls should bear on undisturbed non-organic, dense, natural soils.

The wall pressures apply only for a maximum wall height of ten feet. It is assumed that no hydrostatic pressures act behind the wall and that no surcharge slopes or loads will be placed above the walls. If surcharges are to be applied they should be added to the above lateral pressures.

Retaining walls should be backfilled with compacted free-draining soils with no organics. The soil should contain no more than 5 percent silt or clay and no particles greater than four inches in diameter. The percentage of particles passing the No. 4 sieve should be between 25 and 70 percent. All walls should be provided with footing drains or weepholes. The footing drains should be surrounded by at least six inches of one inch minus washed rock, and provided with a positive gradient towards suitable discharge facilities. Weepholes should be placed as low as possible to maintain drainage behind the walls. When footing drains are not provided, all backfill within eighteen (18) inches of the weephole should consist of one inch minus washed rock.

FILE COPY

Excavations and Slopes

The existing, natural site slopes appear to be generally stable, although some minor sloughing is occuring on the more steep slopes. The glacial till soil is very dense and cemented, giving it cohesive-type properties in the natural state. We recommend that in the area of the houses, all slopes be cut back to at least 1.25:1 (Horizontal:Vertical) where dense soils are present. In less dense soil, the cut slopes should be at least 1.5:1.

In no case should the excavation slopes be greater than the limits specified in local, state and national government safety regulations. Temporary cuts greater than ten (10) feet in height should have an inclination no steeper than 1:1. As an alternate to open cuts, temporary shoring can be used in conjunction with vertical cuts. Detailed criteria for shoring systems can be developed later, if needed.

All permanent fill slopes should be inclined no steeper than 1.5:1. The above recommendations are applicable to slopes with a maximum height of fifteen (15) feet. We recommend that all excavated slopes be examined by Earth Consultants, Inc. to verify that conditions are as anticipated. In addition, supplementary recommendations can be developed if needed, to improve stability, including flattening of slopes or installation of surface or subsurface drains. Water should not be allowed to flow uncontrolled over the top of any slopes.

All permanently exposed slopes should be seeded with an appropriate species of vegetation to reduce erosion and improve stability of the surficial layer of soil.

Site Drainage

No groundwater was observed in our test pits. However, it has been our experience that seepage levels change significantly due to changes in rainfall amounts, surface drainage or other factors. If seepage is encountered in the building excavation, the water should be drained away from the site by use of drainage ditches, French drains, or by pumping from sumps interconnected by shallow connector trenches at the bottom of the excavation.

We suggest that appropriate locations of subsurface drains, if needed, be established during grading operations by a representative of Earth Consultants, Inc., at which time the seepage areas, if present, may be more clearly defined.

Ex. 1101 7/17

The excavation and site should be graded so that surface water is directed off the site and away from the tops of slopes. Water should not be allowed to stand in any area where buildings, slabs, or pavements are to be constructed. Loose surfaces should be sealed at night by compacting the surface soils to reduce the infiltration of rain into the soils. Final site grades should allow for drainage away from the building foundations. We suggest that the ground be sloped 3 percent for a distance of at least ten feet away from the buildings except in areas that are to be paved.

Site Preparation and General Earthwork

The building and pavement areas should be stripped and cleared of all trees, existing utilities, surface vegetation, organic matter and any other deleterious material. It is anticipated that a stripping depth of twelve (12) to twenty-four (24) inches will be required. Stripped materials should be removed from the site or stockpiled for later use in landscaping, if desired. The stripped materials should not be mixed with any materials to be used as structural fill. Structural fill is defined as any fill placed under buildings, roadways, slabs, pavements, or any other load bearing areas.

Structural fill under floor slabs should be placed in horizontal lifts and compacted to a minimum 95 percent of the maximum dry density in accordance with ASTM Test Designation D-1557-70 (Modified Proctor). The fill materials should be placed at or near the optimum moisture content. Fill under pavements and walks should also be placed in horizontal lifts and compacted to 90 percent of maximum density except for the top twelve (12) inches which should be compacted to 95 percent of maximum density.

On-site soils can generally be used as structural fill. An approved granular imported fill may be required however, if grading operations are performed during wet weather. Ideally, imported fill to be placed in wet weather should consist of a granular material with a maximum size of three inches and no more than 5 percent fines passing the No. 200 sieve.

Additional Services

It is recommended that Earth Consultants, Inc. be provided the opportunity for a general review of the final design and specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design and construction.

EX. 1101
8/17

The analyses and recommendations submitted in this report are based upon the data obtained from the test pits. Soil and groundwater conditions between test pits may vary from those encountered by the test pits. The nature and extent of variations between test pits may not become evident until construction. If variations then appear evident, Earth Consultants, Inc. should be allowed to reevaluate the recommendations of this report prior to proceeding with the construction.

It is also recommended that Earth Consultants, Inc. be retained to provide geotechnical services during construction. This is to observe compliance with the design concepts, specifications or recommendations and to allow design changes in the event subsurface conditions differ from those anticipated prior to the start of construction.

FIELD EXPLORATION AND LABORATORY TESTING

Our field exploration was performed on July 18, 1983. The subsurface conditions were explored by excavating five test pits to a maximum depth of eleven (11) feet below the existing surface. Also, a previously dug pit and an excavated bluff were inspected. The location of these areas are shown on Plate 1.

The locations of the test pits were approximately determined by pacing and visual estimation. Elevations of test pits were approximately determined by interpolation between contours on a site plan provided to us by Mr. Lewis. The locations and elevations of the test pits should be considered accurate only to the degree implied by the method used.

The field exploration was continuously monitored by a field engineer from our firm who classified the soils encountered, maintained a log of each test pit, obtained representative bulk soil samples and observed pertinent site features. Soils were classified visually in the field according to the Unified Soil Classification System which is presented on Plate 3, Legend. The consistency of the soil was estimated based on the effort required to excavate the soil, the stability of the trench walls and other factors. Logs of the individual test pits are presented on Plates 4 through 6 Test Pit Logs. The log of the excavation bluff is presented on Plate 7. The final logs represent our interpretations of the field logs and the results of the laboratory examination and test of field samples. The stratification lines on the logs represent the approximate boundary between soil types. In actuality, the transition may be gradual.

Representative soil samples were placed in closed containers and returned to our laboratory for further examination and testing. Visual classifications were supplemented by index tests such as grain size analysis and Atterberg limits on representative samples. Results of moisture determinations, together with classifications, are shown on the test pit logs included in this report. The results of three sieve analyses are illustrated on Plate 8, Grain Size Analyses.

The following plates are attached and complete this report:

Plate 1	Vicinity Map
Plate 2	Test Pit Location Plan
Plate 3	Legend
Plates 4 through 7	Test Pit Logs
Plate 8	Grain Size Analysis

We trust this information is sufficient for your present needs. If you have any questions, please do not hesitate to contact us. We look forward to working with you during the construction phase of this project.

JAMES R. FINLEY JR. STATE OF WASHINGTON 19660 REGISTERED PROFESSIONAL ENGINEER

Respectfully submitted,

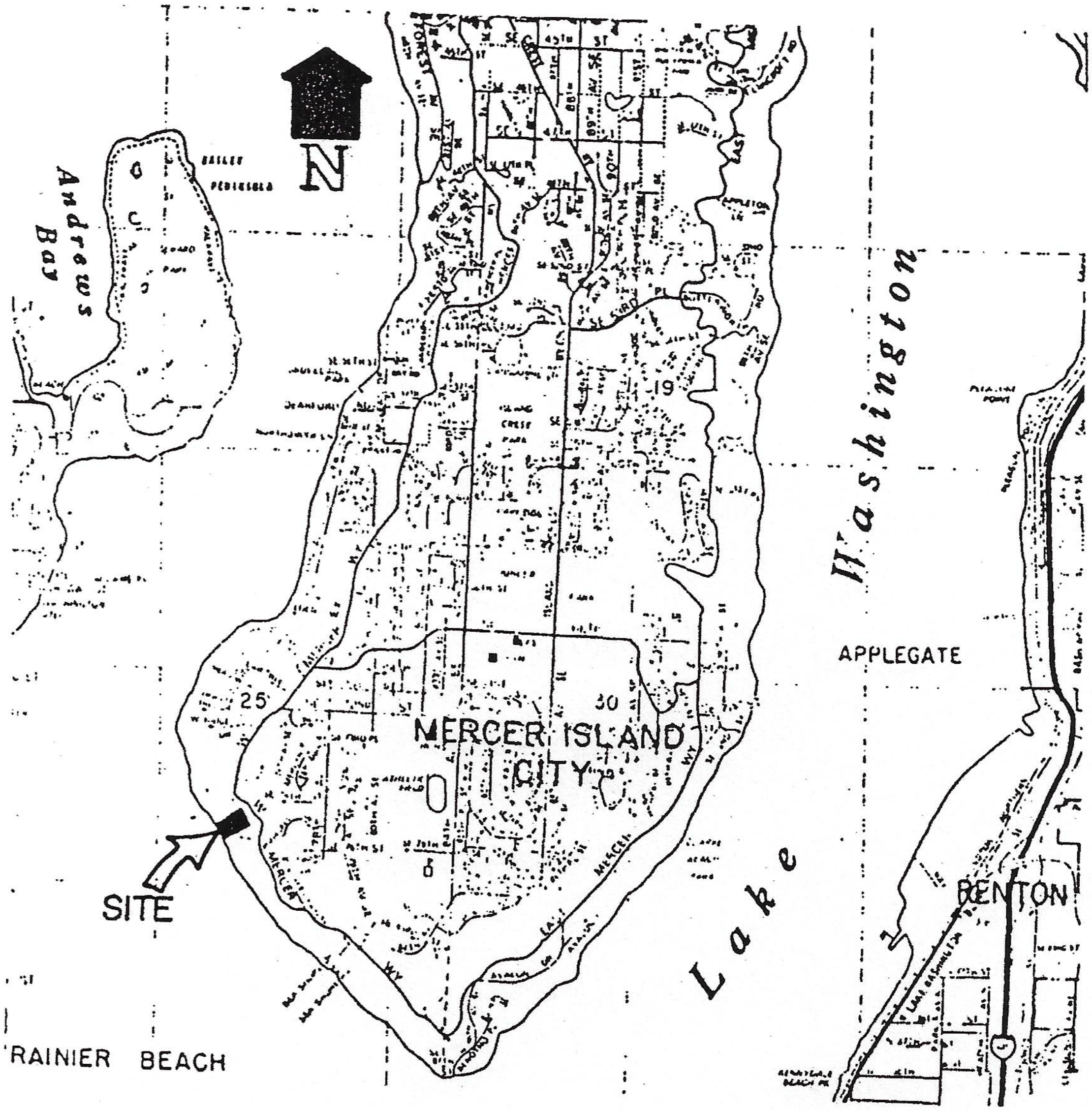
EARTH CONSULTANTS, INC.

James R Finley Jr.

James R. Finley, Jr., P. E.
Chief Engineer

MD/JRF/jg/ca

Ex. 1101
10/17

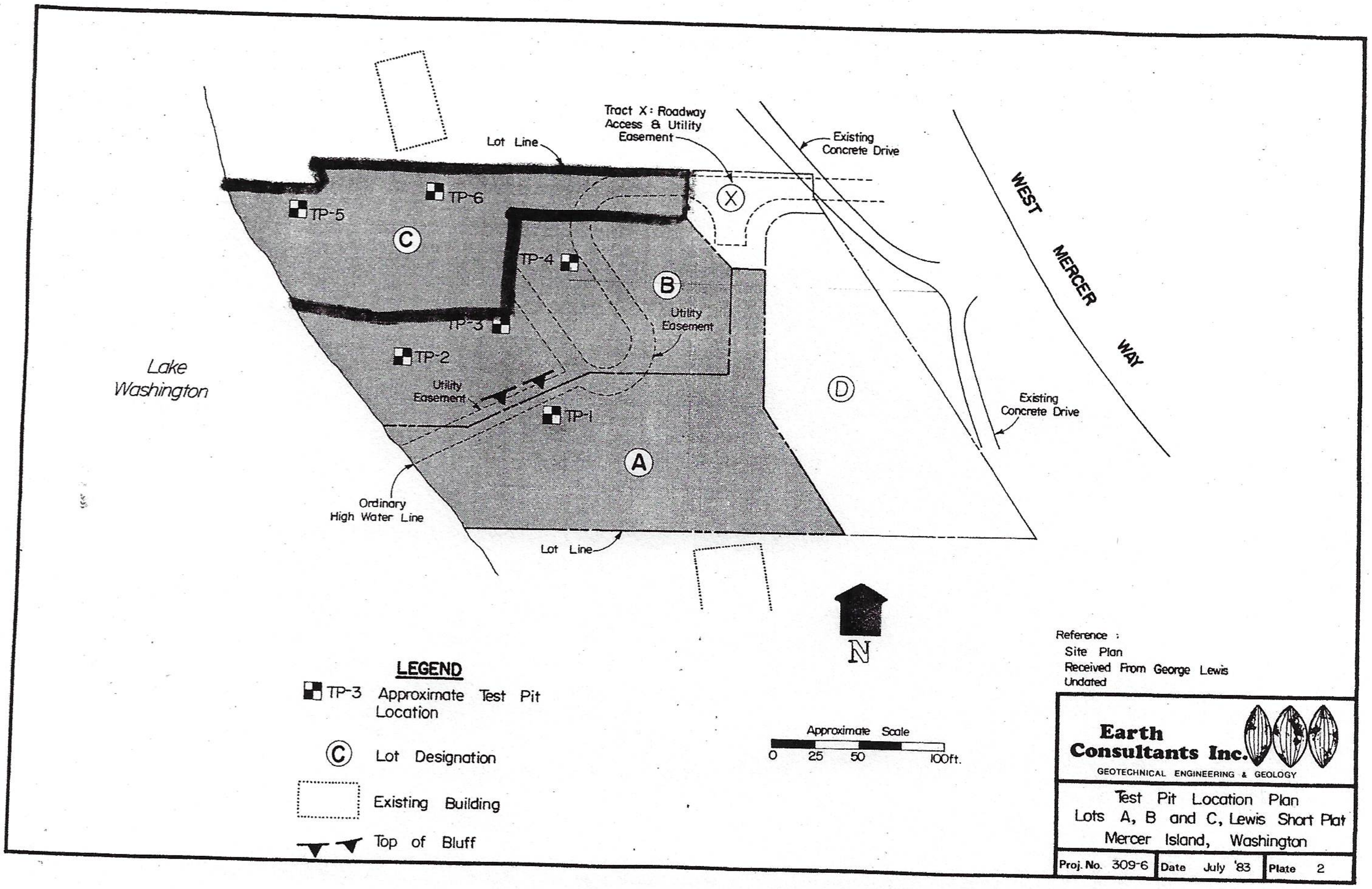


Earth Consultants Inc.
GEOTECHNICAL ENGINEERING & GEOLOGY

Vicinity Map
Lots A, B and C, Lewis Short Plat
Mercer Island, Washington

Proj. No. 309-6	Date July '83	Plate

Ex. 1102
11/17



DEFT000581

EX. 1102
12/17

MAJOR DIVISIONS			LETTER SYMBOL		TYPICAL DESCRIPTION
Coarse Grained Soils	Gravel And Gravelly Soils	Clean Gravels (little or no fines)	GW	gw	Well-Graded Gravels, Gravel-Sand Mixtures, Little Or No Fines
			GP	gp	Poorly-Graded Gravels, Gravel-Sand Mixtures, Little Or No Fines
	More Than 50% Coarse Fraction Retained On No. 4 Sieve	Gravels With Fines (appreciable amount of fines)	GM	gm	Silty Gravels, Gravel-Sand-Silt Mixtures
			GC	gc	Clayey Gravels, Gravel-Sand-Clay Mixtures
More Than 50% Material Larger Than No 200 Sieve Size	Sand And Sandy Soils	Clean Sand (little or no fines)	SW	sw	Well-Graded Sands, Gravelly Sands, Little Or No Fines
			SP	sp	Poorly-Graded Sands, Gravelly Sands, Little Or No Fines
	More Than 50% Coarse Fraction Passing No. 4 Sieve	Sands With Fines (appreciable amount of fines)	SM	sm	Silty Sands, Sand-Silt Mixtures
			SC	sc	Clayey Sands, Sand-Clay Mixtures
Fine Grained Soils	Silts And Clays	Liquid Limit Less Than 50	ML	ml	Inorganic Silts & Very Fine Sands, Rock Flour, Silty-Clayey Fine Sands; Clayey Silts w/ Slight Plasticity
			CL	cl	Inorganic Clays Of Low To Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean
			OL	ol	Organic Silts And Organic Silty Clays Of Low Plasticity
More Than 50% Material Smaller Than No. 200 Sieve Size	Silts And Clays	Liquid Limit Greater Than 50	MH	mh	Inorganic Silts, Micaceous Or Diatomaceous Fine Sand Or Silty Soils
			CH	ch	Inorganic Clays Of High Plasticity, Fat Clays
			OH	oh	Organic Clays Of Medium To High Plasticity, Organic Silts
Highly Organic Soils			PT	pt	Peat, Humus, Swamp Soils With High Organic Contents

Topsoil	Humus And Duff Layer
Fill	Highly Variable Constituents

The Discussion In The Text Of This Report Is Necessary For A Proper Understanding Of The Nature Of The Material Presented In The Attached Logs

Notes:
Dual symbols are used to indicate borderline soil classification. Upper case letter symbols designate sample classifications based upon laboratory testing; lower case letter symbols designate classifications not verified by laboratory testing.

- I 2" O.D. SPLIT SPOON SAMPLER
- II 2.4" I.D. RING SAMPLER OR SHELBY TUBE SAMPLER
- P SAMPLER PUSHED
- * SAMPLE NOT RECOVERED
- ∇ WATER LEVEL (DATE)
- WATER OBSERVATION WELL

- C TORVANE READING, tsf
- qu PENETROMETER READING, tsf
- W MOISTURE, percent of dry weight
- pcf DRY DENSITY, pounds per cubic ft.
- LL LIQUID LIMIT, percent
- PI PLASTIC INDEX

Earth Consultants Inc.
GEOTECHNICAL ENGINEERING & GEOLOGY

LEGEND

Proj. No. 309-6 | Date July '83 | Plate 3

DEFT000594

12

EX. 1102

ONLY BORE IN LOT A

13/17

TEST PIT NO. 1

Logged By MD
Date 7/18/83

Elev. 64±

Depth (ft.)	USCS	Soil Description	W (%)	
0–2	sw	Brown gravelly sand, damp to moist, loose, with roots		
2–8	ML	Gray SILT with sand to sandy SILT, moist, medium dense to dense	25 16	
8–15		Test Pit terminateted at 8'. No groundwater observed		

TEST PIT NO. 2

Logged By MD
Date 7/18/83

Elev. 30±

Depth (ft.)	USCS	Soil Description	W (%)	
0–2	sw	Brown gravelly sand, moist, loose with roots		
2–10	sm	Gray gravelly silty sand, moist, dense to very dense below 4' (TILL)	17	
10–15		Test Pit terminated at 10'. No groundwater observed.		

Earth Consultants Inc.
GEOTECHNICAL ENGINEERING & GEOLOGY

TEST PIT LOGS
LOTS A, B & C, LEWIS SHORT PLAT
MERCER ISLAND, WASHINGTON

Proj. No. 309-6 | Date July '83 | Plate

DEF000595

TEST PIT NO. 3

Logged By MD

Date 7/18/83

Elev. 70±

Depth (ft.)	USCS	Soil Description	W (%)	
0	SM	Brown gravelly silty sand, moist with roots to 2'	9	
5	ML	Gray sandy SILT with trace of gravel, moist, moderately dense, stratified	20	
10				
		Test Pit terminated at 11'. No groundwater observed.		
15				

TEST PIT NO. 4

Logged By MD

Date 7/18/83

Elev. 86±

Depth (ft.)	USCS	Soil Description	W (%)	
0	SM	Gray gravelly silty SAND, damp to moist, dense (TILL)		
5				
		Test Pit terminated at 7'. No groundwater observed.		
10				
15				

Earth Consultants Inc.
GEOTECHNICAL ENGINEERING & GEOLOGY

TEST PIT LOGS

LOTS A, B & C, LEWIS SHORT PLAT

MERCER ISLAND, WASHINGTON

Proj. No. 309-6	Date July '83	Plate 5

Ex. 1102
15/17

TEST PIT NO. 5

Logged By MD
Date 7/18/83

Elev. 30±

USCS	Soil Description	W (%)	
SP SM	Light brown gravelly SAND with silt, damp to moist, loose to medium dense, roots in top 2 feet	6	
sp	Gray clean gravelly SAND, moist, dense (TILL)	11	
	Test Pit terminated at 11'. No Groundwater encountered.		

Logged By MD
Date 7/18/83

TEST PIT NO. 6

Elev. 68±

USCS	Soil Description	W (%)	
SP SM	Brown gravelly SAND with silt, damp to moist, moderately dense, roots in top 1 foot	6	
SM	Gray silty SAND with gravel, damp to moist, dense	15	
	Test Pit terminated at 10'. No groundwater encountered.		

Earth Consultants Inc.
GEOTECHNICAL ENGINEERING & GEOLOGY

TEST PIT LOGS
LOTS A, B & C, LEWIS SHORT PLAT
MERCER ISLAND, WASHINGTON

Proj. No. 309-6 | Date July '83 | Plate 6

DEFT000597

BLUFF EXPOSURE

EX. 1102
16/17

Logged By MD
Date 7/18/83

Elev. 80±

Depth (ft.)	USCS	Soil Description	W (%)	
0	SW	Brown gravelly SAND, moist, loose, with roots		
5	sm	Dark brown gravelly silty SAND, moist, medium dense		
	ML	Brown SILT with fine sand to sandy SILT, moist hard	24	q_u > 4.5 tsf LL=26, PI=4
10	sm sp	Gray SAND with silt, moist dense, stratified		
15				
		Height of bluff exposed = 16'. No grounwater seepage noted.		
20				

Earth Consultants Inc.
GEOTECHNICAL ENGINEERING & GEOLOGY

LOTS A, B & C, LEWIS SHORT PLAT
MERCER ISLAND, WASHINGTON

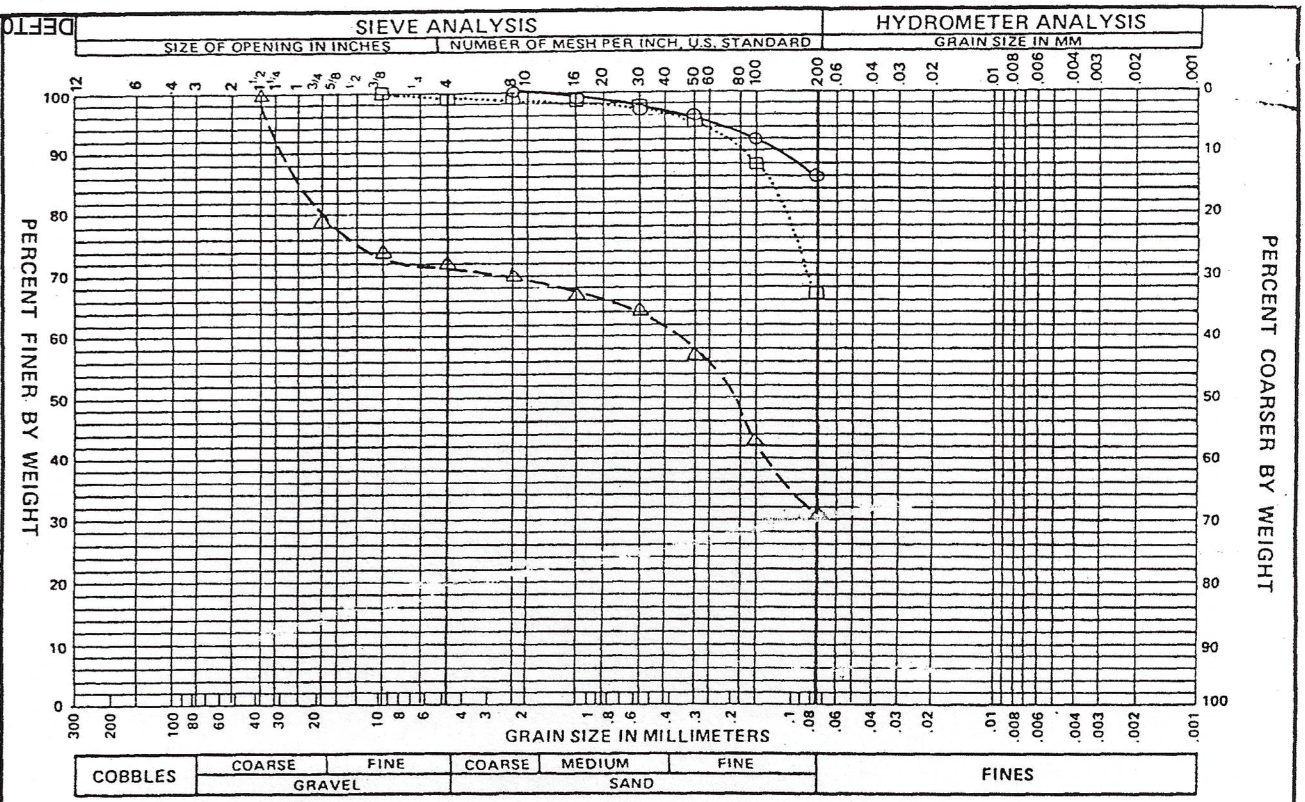
Proj. No. 309-6	Date July '83	Plate 7

DEFT000598

Ex. 1102
17/17

DEFT000599

Earth Consultants Inc.
GEOTECHNICAL ENGINEERING & GEOLOGY



KEY	Boring or Test Pit No.	DEPTH (ft.)	USCS	DESCRIPTION	Moisture Content (%)	LL	PL
○ ———	TP-1	5	ML	sandy SILT	25		
△ – – –	TP-3	2	SM	Gravelly SILTY sand	9		
□ ········	TP-3	7	ML	Sandy silt	20		

GRAIN SIZE ANALYSES
LOTS A, B & C, LEWIS SHORT PLAT
MERCER ISLAND, WASHINGTON

Proj. No. 309-6 | Date July '83 | Plate 8