HARTCROWSER

Earth and Environmental Technologies

DRAFT

# Geotechnical Engineering Design Study
# Southwest Harbor Project
# Port of Seattle, Washington

Prepared for
KPFF Consulting Engineers

September 17, 1993
J-3528

# Key to Exploration Logs

## Sample Descriptions

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:
Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

### Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance. Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

| SAND or GRAVEL Density | Standard Penetration Resistance in Blows/Foot | SILT or CLAY Consistency | Standard Penetration Resistance in Blows/Foot | Approximate Shear Strength in TSF |
|---|---|---|---|---|
| Very loose | 0 - 4 | Very soft | 0 - 2 | <0.125 |
| Loose | 4 - 10 | Soft | 2 - 4 | 0.125 - 0.25 |
| Medium dense | 10 - 30 | Medium stiff | 4 - 8 | 0.25 - 0.5 |
| Dense | 30 - 50 | Stiff | 8 - 15 | 0.5 - 1.0 |
| Very dense | >50 | Very stiff | 15 - 30 | 1.0 - 2.0 |
| | | Hard | >30 | >2.0 |

### Moisture

| | |
|---|---|
| Dry | Little perceptible moisture |
| Damp | Some perceptible moisture, probably below optimum |
| Moist | Probably near optimum moisture content |
| Wet | Much perceptible moisture, probably above optimum |

### Minor Constituents

| | Estimated Percentage |
|---|---|
| Not identified in description | 0 - 5 |
| Slightly (clayey, silty, etc.) | 5 - 12 |
| Clayey, silty, sandy, gravelly | 12 - 30 |
| Very (clayey, silty, etc.) | 30 - 50 |

## Legends

### Sampling

BORING SAMPLES

- ⊠ Split Spoon
- ⧅ Shelby Tube
- ▥ Cuttings
- ◫ Core Run
- * No Sample Recovery
- P Tube Pushed, Not Driven

TEST PIT SAMPLES

- ⊠ Grab (Jar)
- ⧄ Bag
- ⧅ Shelby Tube

### Ground Water Observations

- Surface Seal
- ▽ Ground Water Level on Date (ATD) At Time of Drilling
- Observation Well Tip or Slotted Section
- Ground Water Seepage (Test Pits)

### Test Symbols

| | |
|---|---|
| GS | Grain Size Classification |
| CN | Consolidation |
| TUU | Triaxial Unconsolidated Undrained |
| TCU | Triaxial Consolidated Undrained |
| TCD | Triaxial Consolidated Drained |
| QU | Unconfined Compression |
| DS | Direct Shear |
| K | Permeability |
| PP | Pocket Penetrometer<br>Approximate Compressive Strength in TSF |
| TV | Torvane<br>Approximate Shear Strength in TSF |
| CBR | California Bearing Ratio |
| MD | Moisture Density Relationship |
| AL | Atterberg Limits |

Water Content in Percent
- Liquid Limit
- Natural
- Plastic Limit

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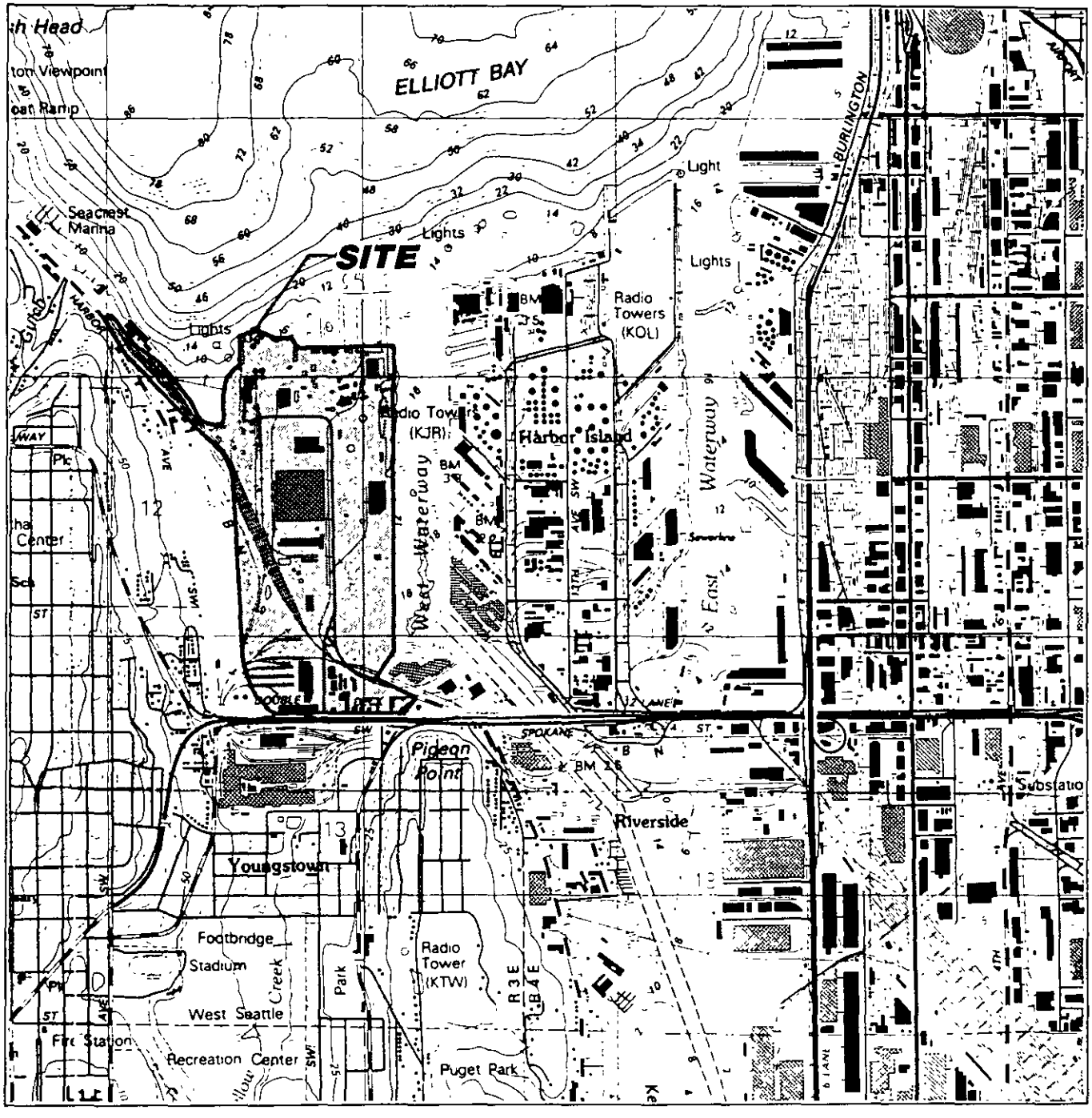
Figure A-1

# Vicinity Map




Note: Base map prepared from USGS 7.5 minute quadrangle entitled "Seattle South, Washington", dated 1983

0 2000 4000

Scale in Feet

N

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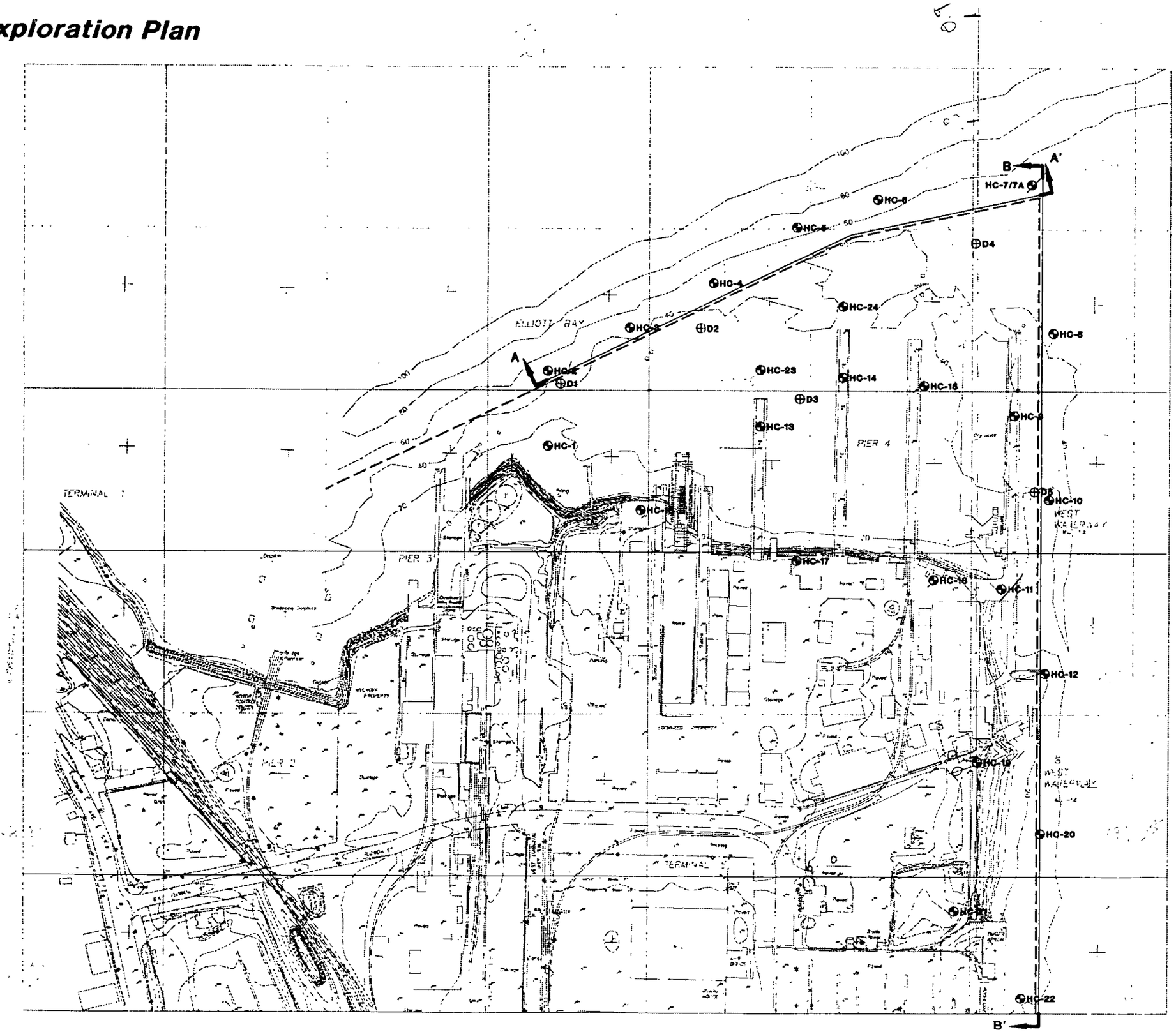
Figure 1

# Exploration Plan




HC-1 Boring Location and Number (Hart·Crowser, Current Study)

D1 Boring Location and Number (Hong West Consulting Engineers, 1989)

A A' Cross Section Location and Designation

Outer Harbor Line

N

Note: Base map prepared from drawing provided by Port of Seattle entitled "Terminal 5 and Seattle Steel", dated August 17, 1986.

0 300 600

Scale in Feet

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Figure 2

# Generalized Subsurface Cross Section A–A'

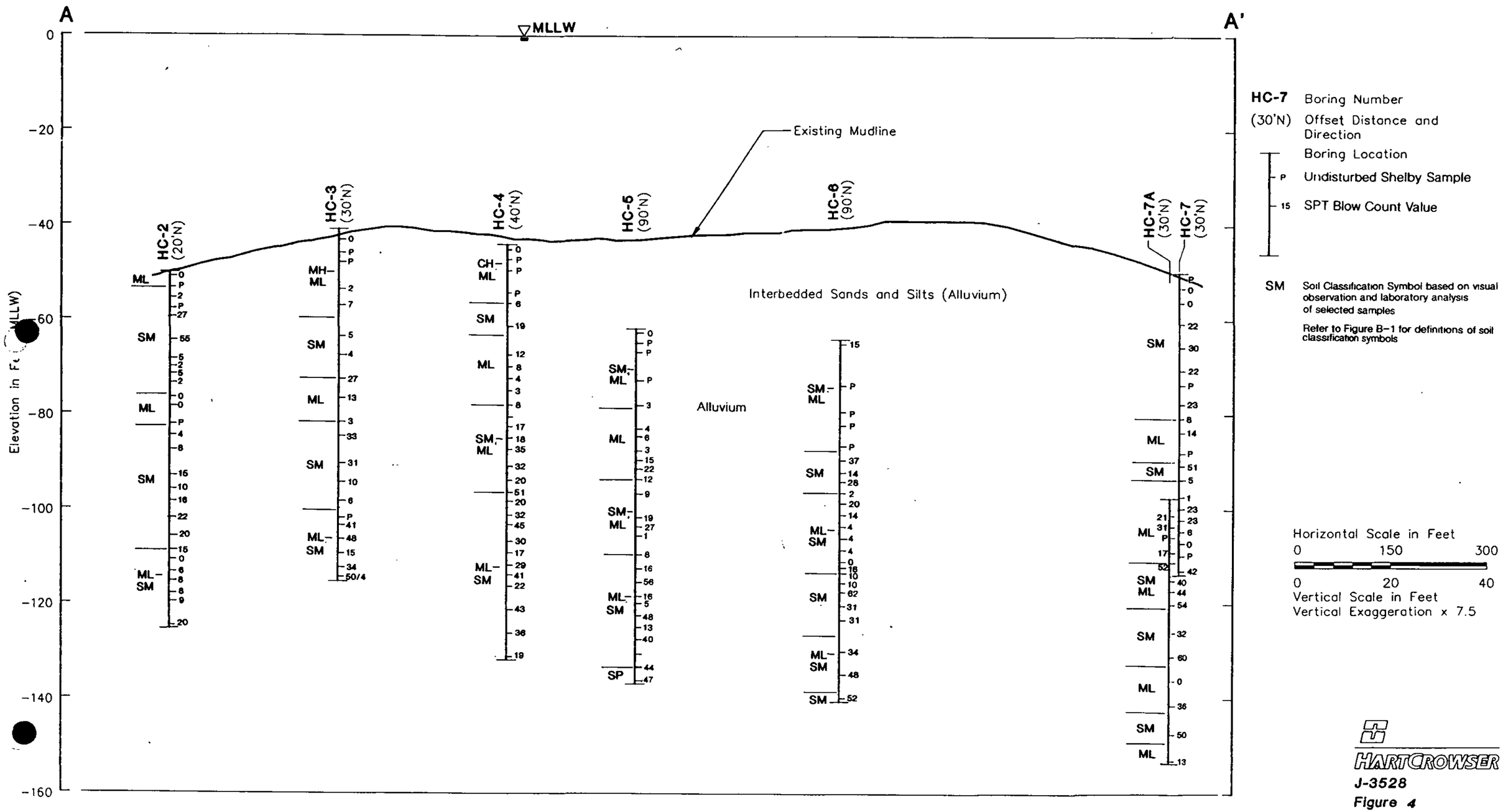


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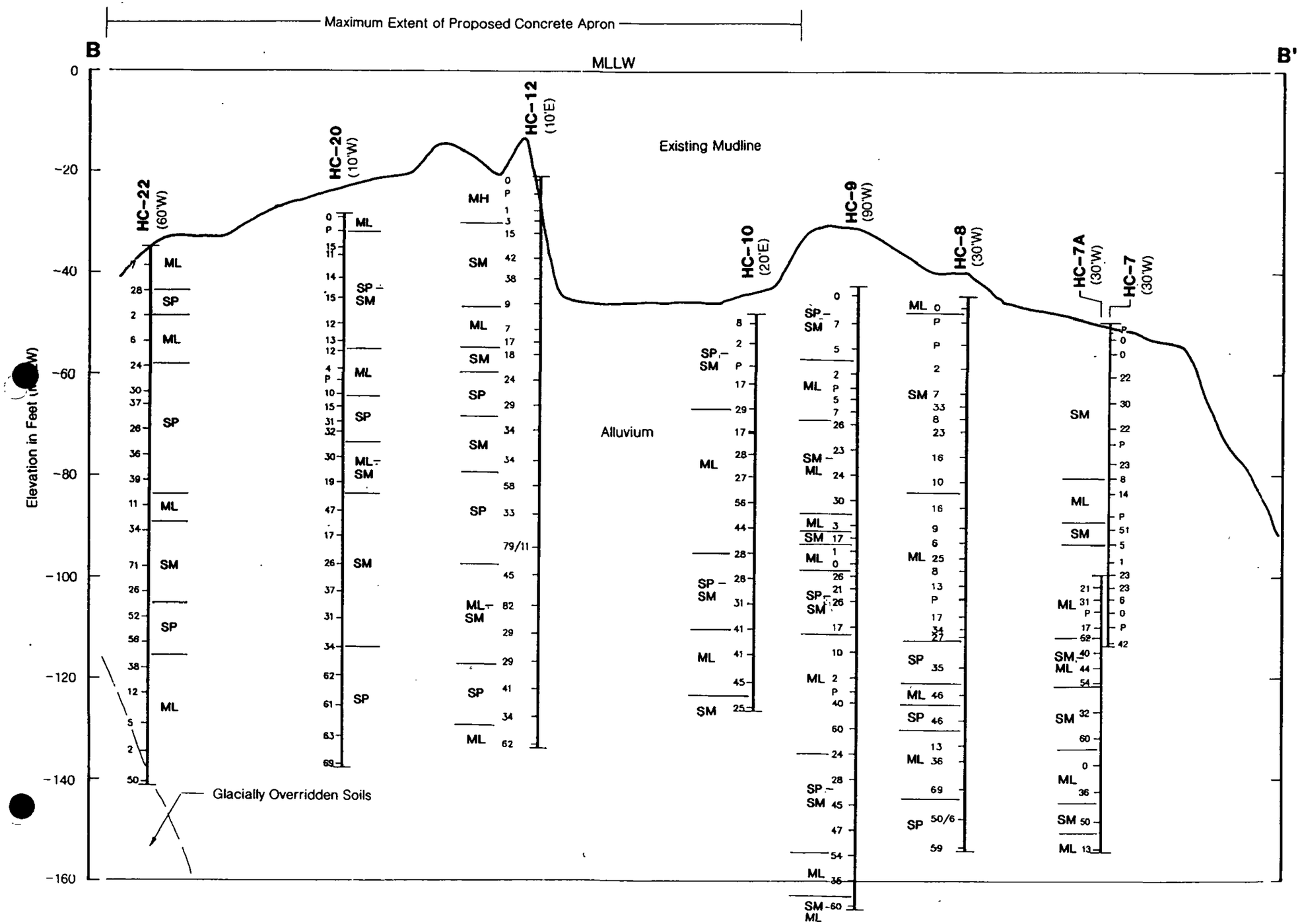
Figure 4

# Generalized Subsurface Cross Section B–B'




**HC–22** Boring Number
**(60'W)** Offset Distance and Direction
Boring Location
22 SPT Blow Count Value
P Undisturbed Shelby Sample

**SM** Soil Classification Symbol based on visual observation and laboratory analysis of selected samples.

Refer to Figure B–1 for definitions of soil classification symbols.

Horizontal Scale in Feet
0 250 500
0 20 40
Vertical Scale in Feet
Vertical Exaggeration x 12.5

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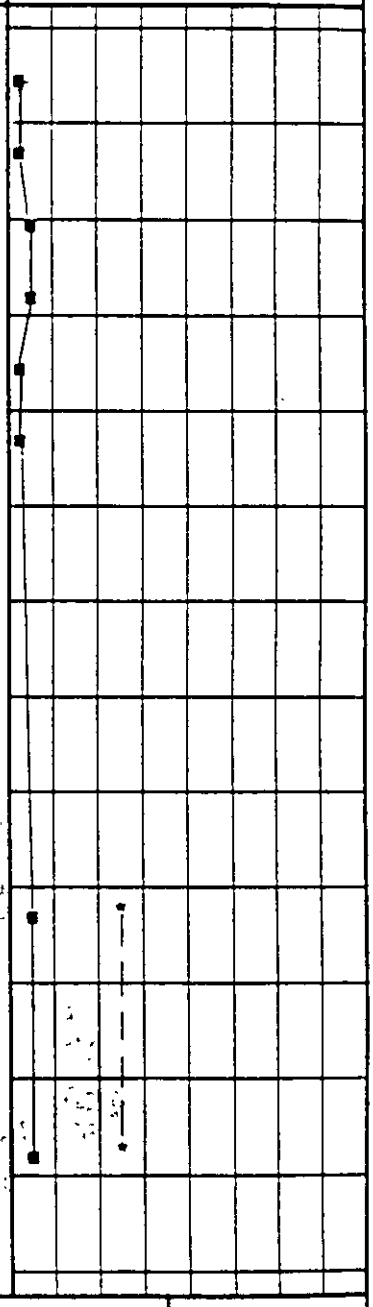
Figure 5

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS |
|---|---|---|---|
| 0 | DEPTH TO MUDLINE 36.0' | | * NOTE: samples above 10 feet taken with 3" OD sampler driven with 300 pound hammer |
| | Very loose, gray, fine sandy SILT: wood fragments noticeable organic odor in sample (ML) | | |
| 2 | Loose, gray, silty fine SAND: some wood (SM) | | |
| | Loose, dark gray, fine SAND: trace small wood fragments and peaty material (SP) | | |
| 4 | | | |
| 6 | Loose, gray, silty fine SAND: (SP to SM) | | |
| 8 | | | |
| 10 | | | |
| 12 | Loose, dark and medium gray, interbedded, silty, fine SAND and fine SAND w/trace to some medium sand: trace of plant debris, (SM & SP) | | |
| 14 | | | |
| 16 | | | |
| 18 | - fir needles | | |
| 20 | | | |
| 22 | | | |
| | - silty fine SAND: 2 inch wood chunk at 23 feet | | |
| 24 | | | |
| 26 | | | |




| | PROJECT | DATE 9/6/89 | HOLE NUMBER |
|---|---|---|---|
| | TERMINAL 4 ASSESSMENT | LOGGED BY RFF | |
| SHEET | LOCKHEED SHIPYARD | ELEVATION MUDLINE | D-1 |
| 1 of 3 | SEATTLE, WASHINGTON | DEPTH 54.0' | |

Note: Boring log prepared from Hong Consulting Engineers, Inc.

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Figure A-27 1/3

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS | MOISTURE CONTENT % (•) / SPT RESISTANCE (■) 10 20 30 40 50 60 70 |
|---|---|---|---|---|
| 26 | | | | |
| 28 | Medium dense, dark gray, fine to medium SAND: thin bedded and laminated, silty fine sand beds ½ inch thick over 2 to 3 inch beds of coarse material, (SM & SP) | | | |
| 30 | | | | |
| 32 | – trace of very fine shell fragments | | | |
| 34 | | | | |
| 36 | | | | |
| 38 | | | | |
| 40 | | | | |
| 42 | | | | |
| 44 | Loose, interbedded, gray fine SAND, silty fine SAND & fine sandy SILT: wood in top 6 inches, deformed bedding, (SM) | | | |
| 46 | | | | |
| 48 | | | | |
| 50 | | | | |
| 52 | | | | |

| SHEET | PROJECT | DATE 9/6/89 | HOLE NUMBER |
|---|---|---|---|
| 2 of 3 | TERMINAL 4 ASSESSMENT | LOGGED BY RFF | D-1 |
| | LOCKHEED SHIPYARD | ELEVATION MUDLINE | |
| | SEATTLE, WASHINGTON | DEPTH 54.0' | |

Note: Boring log prepared from Hong Consulting Engineers, Inc.

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Figure A-27 2/3

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS | MOISTURE CONTENT % (*) / SPT RESISTANCE (■) 10 20 30 40 50 60 70 |
|---|---|---|---|---|
| 52 | - Medium dense, dark gray, silty fine SAND to fine sandy SILT: (SM to ML) | | | |
| 54 | END OF BOREHOLE<br>borehole abandoned due to apparent hole deviation and drilling difficulties | | | |
| 56 | | | | |
| 58 | | | | |
| 60 | | | | |
| 62 | | | | |
| 64 | | | | |
| 66 | | | | |
| 68 | | | | |
| 70 | | | | |
| 72 | | | | |
| 74 | | | | |
| 76 | | | | |
| 78 | | | | |

| | PROJECT | | |
|---|---|---|---|
| SHEET 3 of 3 | TERMINAL 4 ASSESSMENT<br>LOCKHEED SHIPYARD<br>SEATTLE, WASHINGTON | DATE 9/6/89<br>LOGGED BY RFF<br>ELEVATION MUDLINE<br>DEPTH 54.0' | HOLE NUMBER D-1 |

Note: Boring log prepared from Hong Consulting Engineers, Inc.

HARTCROWSER
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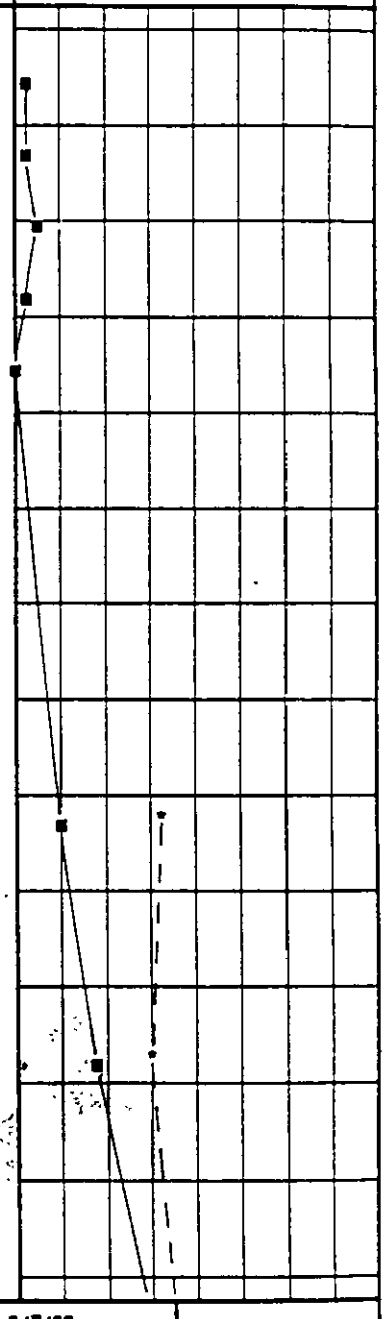
Figure A/27 3/3

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS |
|---|---|---|---|
| 0 | LLW WATER DEPTH TO MUDLINE 39.9 FEET | | |
| | Very loose to loose, gray, very silty fine SAND & fine sandy SILT: numerous wood fragments in top 12"; trace below; shell fragments; strong organic odor in top 12", slight to 3 ft. (SM-SP) | | * NOTE: Samples above 10 feet taken with 3" OD sampler driven with 300 pound hammer. |
| 2 | | | |
| 4 | | | |
| 6 | -no shell of wood fragments | | |
| 8 | | | |
| 10 | | | |
| 12 | | | |
| 14 | Medium dense to dense, dark gray to gray, fine to medium SAND: silty in places, bedded to laminated in places (SM and SP) | | |
| 16 | -2 inch silty bed at 16.3 | | |
| 18 | | | |
| 20 | | | |
| 22 | Medium dense to dense, gray, very silty to silty, fine SAND & fine sandy SILT: trace of shell and wood fragments | | Note: driller's comment, harder drilling below 23 feet |
| 24 | | | |
| 26 | -gray, silty fine SAND: few indistinct beds ¼ to ½ inches thick | | |




| | PROJECT | DATE 9/7/89 | HOLE NUMBER |
|---|---|---|---|
| SHEET 1 of 3 | TERMINAL 4 ASSESSMENT<br>LOCKHEED SHIPYARD<br>SEATTLE, WASHINGTON | LOGGED BY RFF<br>ELEVATION SEA LEVEL LLW<br>DEPTH 61' | D-2 |

Note: Boring log prepared by Hong Consulting Engineers, Inc.

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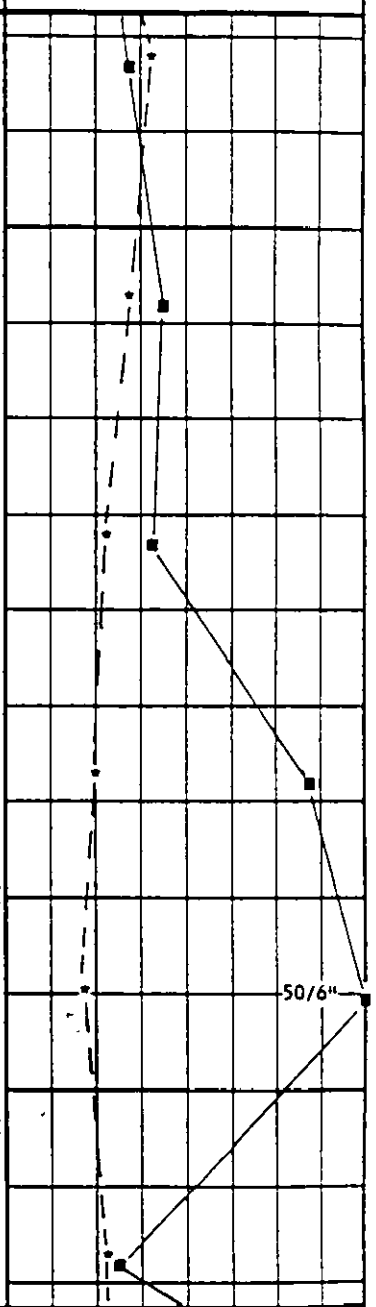
Figure A-28 1/3

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS |
|---|---|---|---|
| 26 | | X | |
| 28 | | | |
| 30 | -beds of fine SAND | X | |
| 32 | | | |
| 34 | | | |
| 36 | Dense to very dense, dark gray, silty fine SAND: (SP) | X | |
| 38 | | | |
| 40 | | | |
| 42 | | X | |
| 44 | | | |
| 46 | | X | |
| 48 | | | |
| 50 | - minor amounts of wood debris | X | |
| 52 | | | |




| | | | |
|---|---|---|---|
| SHEET 2 of 3 | PROJECT<br>TERMINAL 4 ASSESSMENT<br>LOCKHEED SHIPYARD<br>SEATTLE, WASHINGTON | DATE 9/7/89<br>LOGGED BY RFF<br>ELEVATION SEA LEVEL LLW<br>DEPTH 61' | HOLE NUMBER<br>D-2 |

Note: Boring log prepared from Hong Consulting Engineers, Inc.

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Figure A-28 2/3

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS | MOISTURE CONTENT % (•) / SPT RESISTANCE (■) 10 20 30 40 50 60 70 |
|---|---|---|---|---|
| 52 | | | | |
| 54 | | | | |
| | Very dense, dark gray, very silty fine SAND: (SM) | | | |
| 56 | | | Note: driller's comment, soil a lot "tighter" below 56 feet | 50/6" |
| 58 | | | | |
| 60 | | | | 50/7" |
| | END OF BOREHOLE | | | |

| | PROJECT | DATE 9/7/89 | HOLE NUMBER |
|---|---|---|---|
| | TERMINAL 4 ASSESSMENT | LOGGED BY RFF | |
| SHEET | LOCKHEED SHIPYARD | ELEVATION SEA LEVEL LLW | D-2 |
| 3 of 3 | SEATTLE, WASHINGTON | DEPTH 61' | |

Note: Boring log prepared by Hong Consulting Engineers, Inc.

HARTCROWSER

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Figure A-28 3/3

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

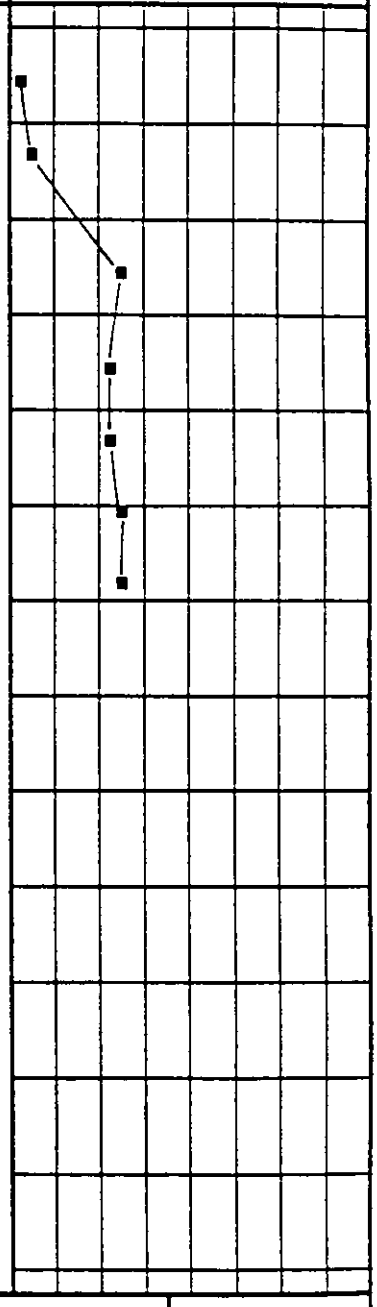
PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS |
|---|---|---|---|
| 0 | MUDLINE DEPTH 24.5' | | |
| | Loose, very dark gray, fine to medium SAND: occasional thin interbeds of silt or silty sand, grass, worms, plastic tape | | * NOTE: Samples taken with 3" OD sampler driven with 300 pound sampler. |
| 2 | | | |
| 4 | | | |
| | – medium dense | | Note: blow count may be unreliable due to heave inside auger |
| 6 | | | |
| 8 | | | NR |
| 10 | | | NR |
| | | | NR |
| 12 | HOLE ABANDONED AT 12 FEET MOVED 5 FEET | | |
| 14 | | | |

MOISTURE CONTENT % *

SPT RESISTANCE ■

10 20 30 40 50 60 70



| SHEET | PROJECT | DATE 9/5/89 | HOLE NUMBER |
|---|---|---|---|
| 1 of 1 | TERMINAL 4 ASSESSMENT | LOGGED BY RFF | D-3 |
| | LOCKHEED SHIPYARD | ELEVATION SEA LEVEL LLW | |
| | SEATTLE, WASHINGTON | DEPTH 12.0' | |

Note: Boring log prepared by Hong Consulting Engineers, Inc.

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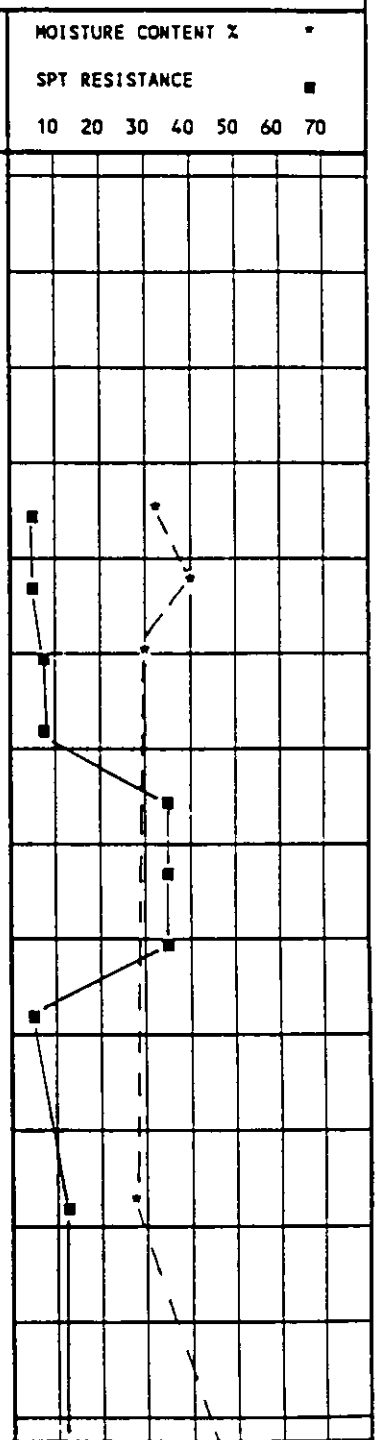
Figure A-29 1/1

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS |
|---|---|---|---|
| 0 | MUDLINE DEPTH 43.0' | | |
| | Loose, dark gray, silty fine SAND: wire at 7.0 feet, minor amounts of organic material at 6.5 feet, (SP) | | |
| 2 | | | |
| 4 | | | |
| 6 | | | |
| 8 | - grades downward into fine sand, some silt | | |
| | - fine twigs and fir needles | | |
| 10 | - "staple" wire | | |
| 12 | - medium dense, very small shell fragments, massive | | |
| 14 | | | |
| 16 | | | NR |
| | Loose to medium dense, dark gray, fine SAND: occasional thin beds and laminae of silty fine sand, (SP/SM) | | |
| 18 | | | |
| 20 | | | |
| 22 | | | |
| 24 | | | |
| 26 | | | |




| SHEET | PROJECT | DATE 9/5/89 | HOLE NUMBER |
|---|---|---|---|
| 1 of 3 | TERMINAL 4 ASSESSMENT | LOGGED BY RFF | D-3A |
| | LOCKHEED SHIPYARD | ELEVATION SEA LEVEL LLW | |
| | SEATTLE, WASHINGTON | DEPTH 77.0' | |

Note: Boring log prepared from Hong Consulting Engineers, Inc.

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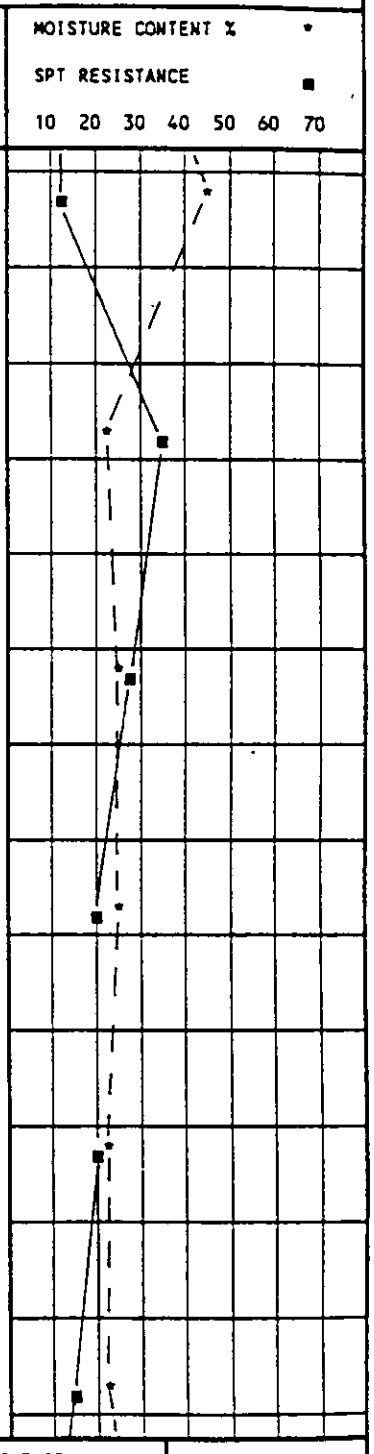
Figure A-30 1/3

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS |
|---|---|---|---|
| 26 | Medium dense, gray, interbedded, silty, fine SAND & fine sandy SILT: (SM/ML) | | |
| 28 | | | |
| 30 | | | |
| 32 | Medium dense to dense, dark gray, fine SAND: some medium sand, few small shell fragments | | |
| 34 | | | |
| 36 | | | |
| 38 | | | |
| 40 | | | |
| 42 | | | |
| 44 | | | |
| 46 | | | |
| 48 | | | |
| 50 | | | |
| 52 | slightly silty at 51.5 to 52 | | |




| | PROJECT | DATE 9/5/89 | HOLE NUMBER |
|---|---|---|---|
| SHEET 2 of 3 | TERMINAL 4 ASSESSMENT<br>LOCKHEED SHIPYARD<br>SEATTLE, WASHINGTON | LOGGED BY RFF<br>ELEVATION SEA LEVEL LLW<br>DEPTH 77.0' | D-3A |

Note: Boring log prepared by Hong Consulting Engineers, Inc.

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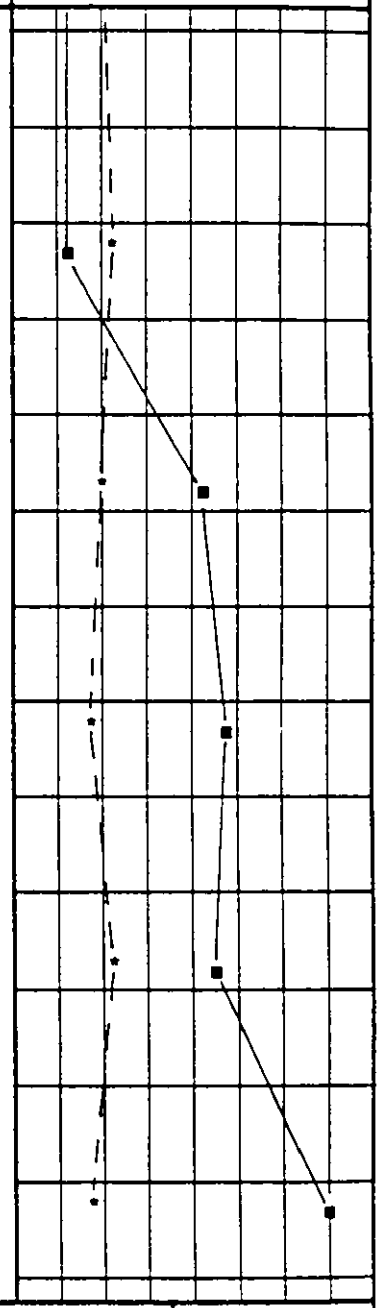
Figure A-30 2/3

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS |
|---|---|---|---|
| 52 | | | |
| 54 | | | |
| 56 | - trace of silt @ 56.5 | X | |
| 58 | | | |
| 60 | | | |
| 62 | - dense | X | Driller's comment: harder drilling at 61 feet |
| 64 | | | |
| 66 | | X | |
| 68 | | | |
| 70 | | | |
| 72 | - sand, as above, scattered wood fragments | X | |
| 74 | | | |
| 76 | - very dense, silty | X | |
| 78 | END OF BOREHOLE | | |




| SHEET | PROJECT | DATE 9/5/89 | HOLE NUMBER |
|---|---|---|---|
| 3 of 3 | TERMINAL 4 ASSESSMENT | LOGGED BY RFF | D-3A |
| | LOCKHEED SHIPYARD | ELEVATION SEA LEVEL LLW | |
| | SEATTLE, WASHINGTON | DEPTH 77.0' | |

Note: Boring log prepared by Hong Consulting Engineers, Inc.

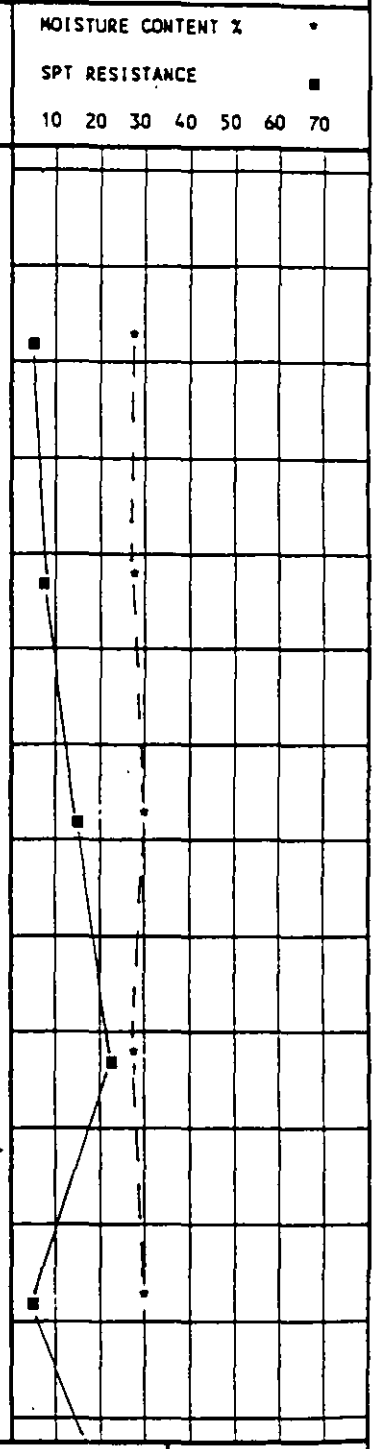
HARTCROWSER
J-3528 7/92
Figure A-30 3/3

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS |
|---|---|---|---|
| 0 | MUDLINE DEPTH 51.7' | | |
| | Loose, light gray, silty fine SAND & fine sandy SILT (SM-SP) | | |
| 2 | | | |
| 4 | | | |
| 6 | | | |
| | Loose to medium dense, dark gray, silty fine SAND: laminated to thin bedded with fine sand beds | | |
| 8 | | | |
| 10 | | | |
| 12 | | | |
| | - fine sand beds, 3 to 4 inches thick, with 1 inch thick medium sand beds; 2 ball bearings or steel shot at 12.6 feet | | |
| 14 | | | |
| 16 | | | |
| | - fine sand with 10% medium sand in beds 3 to 6 inches thick with thin interbeds of silty fine sand; occasional shell fragments | | |
| 18 | | | |
| 20 | | | Positive head maintained below 22.5 |
| 22 | | | |
| | - sloping beds at 23.6, 2 or 3 shell bits at 23.0 | | |
| 24 | | | |
| 26 | | | |




| | | | |
|---|---|---|---|
| SHEET 1 of 4 | PROJECT<br>TERMINAL 4 ASSESSMENT<br>LOCKHEED SHIPYARD<br>SEATTLE, WASHINGTON | DATE 9/15/89<br>LOGGED BY RFF<br>ELEVATION SEA LEVEL LLW<br>DEPTH 94.0' | HOLE NUMBER<br>D-4B |

Note: Boring log prepared by Hong Consulting Engineers, Inc.

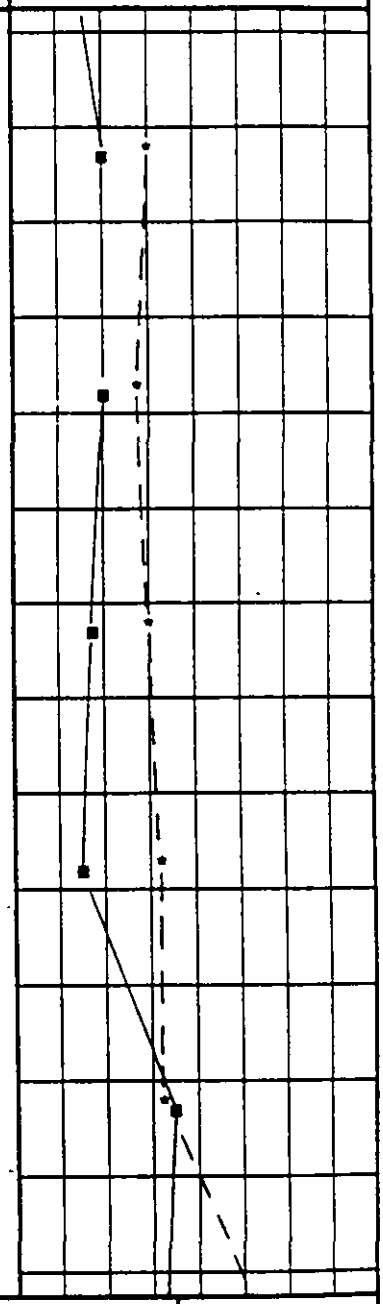
HARTCROWSER
J-3528 7/92
Figure A-33 1/4

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS |
|---|---|---|---|
| 26 | | | |
| 28 | Loose to medium dense, dark gray, silty, fine SAND & fine sandy SILT: beds horizontal (SP/SM/ML) | X | |
| 30 | | | |
| 32 | | | |
| | - interbedded silty fine sand and fine sand, beds ½ to 1½ inches thick | X | |
| 34 | | | |
| 36 | | | |
| 38 | | X | |
| 40 | | | |
| 42 | | | |
| | - fine sandy SILT: beds 1 to 2 inches thick, some distortion of beds | X | |
| 44 | | | |
| 46 | Medium dense to dense, dark gray, interbedded, silty fine SAND & fine sandy SILT: (SP/ML) | | |
| 48 | - massive, blocky fracture, wood fragments at 48.4 | X | |
| 50 | | | |
| 52 | | | |




| SHEET | PROJECT | DATE 9/15/89 | HOLE NUMBER |
|---|---|---|---|
| 2 of 4 | TERMINAL 4 ASSESSMENT | LOGGED BY RFF | D-4B |
| | LOCKHEED SHIPYARD | ELEVATION SEA LEVEL LLW | |
| | SEATTLE, WASHINGTON | DEPTH 94.0' | |

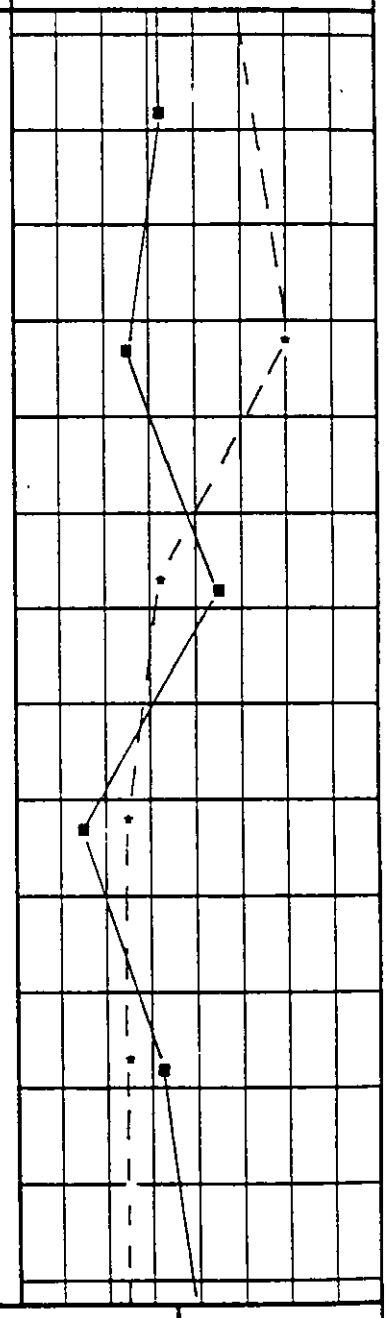
HARTCROWSER
J-3528 7/92
Figure A-33 2/4

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS |
|---|---|---|---|
| 52 | | | |
| 54 | | | |
| 56 | | | |
| 58 | – fine sandy silt over highly organic 4 inch thick bed at 58.4', with leaves and wood fine sand below | | |
| 60 | | | |
| 62 | | | |
| 64 | – fine sand with occasional light gray silt laminae | | |
| 66 | | | |
| 68 | – silty fine sand | | |
| 70 | | | |
| 72 | | | |
| 74 | | | |
| 76 | | | |
| 78 | | | |




| | PROJECT | DATE 9/15/89 | HOLE NUMBER |
|---|---|---|---|
| | TERMINAL 4 ASSESSMENT | LOGGED BY RFF | |
| SHEET 3 of 4 | LOCKHEED SHIPYARD | ELEVATION SEA LEVEL LLW | D-4B |
| | SEATTLE, WASHINGTON | DEPTH 94.0' | |

Note: Boring log prepared from Hong Consulting Engineers, Inc.

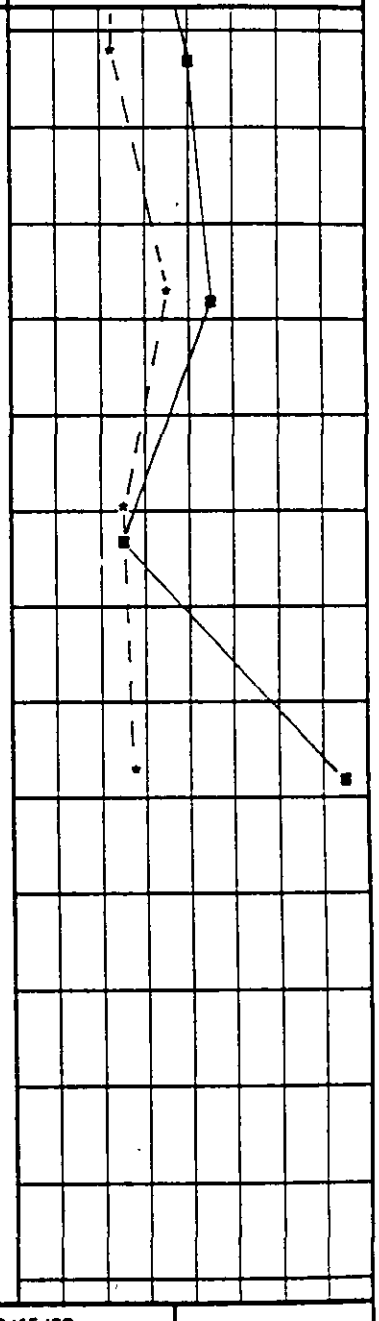
HARTCROWSER
J-3528 7/92
Figure A-33 3/4

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS |
|---|---|---|---|
| 78 | - massive, blocky fracture | | |
| 80 | | | |
| 82 | | | |
| 84 | | | |
| 86 | | | |
| 88 | - occasional shell fragments, some wood | | |
| 90 | | | |
| 92 | Very dense, dark gray, fine SAND: some deformed bedding, (SP) | | |
| 94 | END OF HOLE | | |
| 96 | | | |




| SHEET | PROJECT | DATE 9/15/89 | HOLE NUMBER |
|---|---|---|---|
| 4 of 4 | TERMINAL 4 ASSESSMENT | LOGGED BY RFF | D-4B |
| | LOCKHEED SHIPYARD | ELEVATION SEA LEVEL LLW | |
| | SEATTLE, WASHINGTON | DEPTH 94.0' | |

Note: Boring log prepared from Hong Consulting Engineers, Inc.

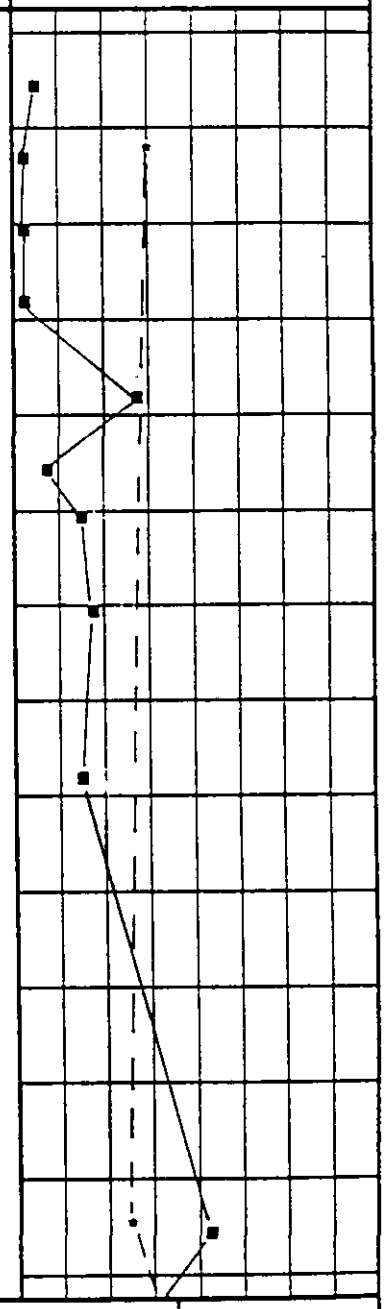
HARTCROWSER
J-3528 7/92
Figure A-33 4/4

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS |
|---|---|---|---|
| 0 | MUDLINE DEPTH 43.9' | | |
| | Very loose, very dark gray, fine to medium SAND: "cemented" layer at 1.0, copper band below, pieces of possible tar, petroleum odor | | * NOTE: Samples above 16 feet taken with 3" OD sampler driven with 300 pound hammer. |
| 2 | - trace silt, shell and wood fragments | | |
| 4 | | | NR |
| | | | NR |
| 6 | - thin bedded, trace wood fragments, twigs and possible grass | | |
| | - trace coarse sand, shell fragments | | |
| 8 | | | |
| 10 | Loose to medium dense, dark gray to gray, fine to medium SAND: silty in places, thin bedded to laminated, minor shell and wood at top | | |
| 12 | | | |
| 14 | | | |
| 16 | | | |
| 18 | | | |
| 20 | | | |
| 22 | | | |
| 24 | - interbedded silty fine sand and fine sand beds to ½ inch thick, minor wood debris | | |
| 26 | | | |




| | PROJECT | DATE 9/13/89 | HOLE NUMBER |
|---|---|---|---|
| | TERMINAL 4 ASSESSMENT | LOGGED BY RFF | |
| SHEET 1 of 5 | LOCKHEED SHIPYARD | ELEVATION SEA LEVEL LLW | D-5A |
| | SEATTLE, WASHINGTON | DEPTH 108.0' | |

Note: Boring log prepared by Hong Consulting Engineers, Inc.

HARTCROWSER
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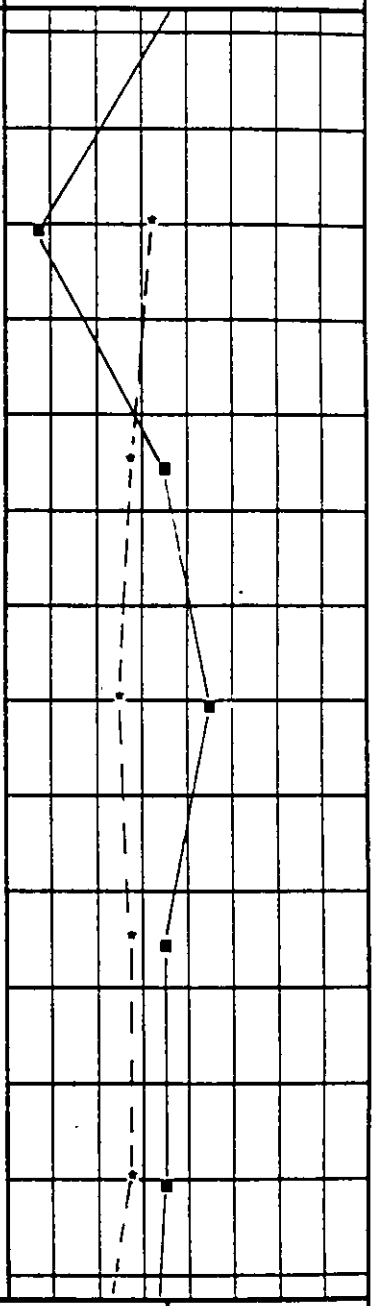
Figure A-35 1/5

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS |
|---|---|---|---|
| 26 | | | |
| 28 | | | |
| 30 | - fir needles, other organic debris | X | |
| 32 | | | |
| 34 | - dense, interbedded sands, few fir needles | X | |
| 36 | Medium dense to dense, dark gray fine SAND: some silt, trace of organic debris (small wood fragments, fir needles) & interbedded silty sand | | |
| 38 | | | |
| 40 | | X | |
| 42 | | | |
| 44 | - dense, dark gray, fine SAND: some med. sand massive | X | |
| 46 | | | |
| 48 | | | |
| 50 | - leaf fragment at 50.7 | X | |
| 52 | | | |




| SHEET | PROJECT | DATE 9/13/89 | HOLE NUMBER |
|---|---|---|---|
| 2 of 5 | TERMINAL 4 ASSESSMENT | LOGGED BY RFF | D-5A |
| | LOCKHEED SHIPYARD | ELEVATION SEA LEVEL LLW | |
| | SEATTLE, WASHINGTON | DEPTH 108.0' | |

Note: Boring log prepared from Hong Consulting Engineers, Inc.

HARTCROWSER
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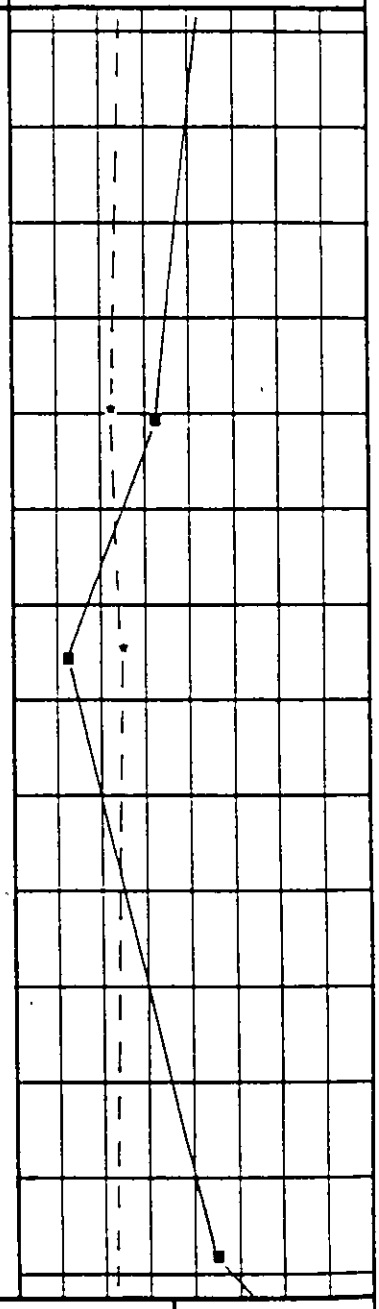
Figure A-35 2/5

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS |
|---|---|---|---|
| 52 | Sand as above | | |
| 54 | | X | Heave |
| 56 | | | |
| 58 | | | |
| 60 | - fine sand; trace organic - mostly fir needles; poorly graded | X | |
| 62 | | | |
| 64 | - massive, fine sand | X | |
| 66 | | | |
| 68 | | | |
| 70 | | | |
| 72 | | | |
| 74 | | | |
| 76 | | | |
| 78 | | X | NR |




| SHEET | PROJECT | DATE 9/13/89 | HOLE NUMBER |
|---|---|---|---|
| 3 of 5 | TERMINAL 4 ASSESSMENT | LOGGED BY RFF | D-5A |
| | LOCKHEED SHIPYARD | ELEVATION SEA LEVEL LLW | |
| | SEATTLE, WASHINGTON | DEPTH 108.0' | |

Note: Boring log prepared by Hong Consulting Engineers, Inc.

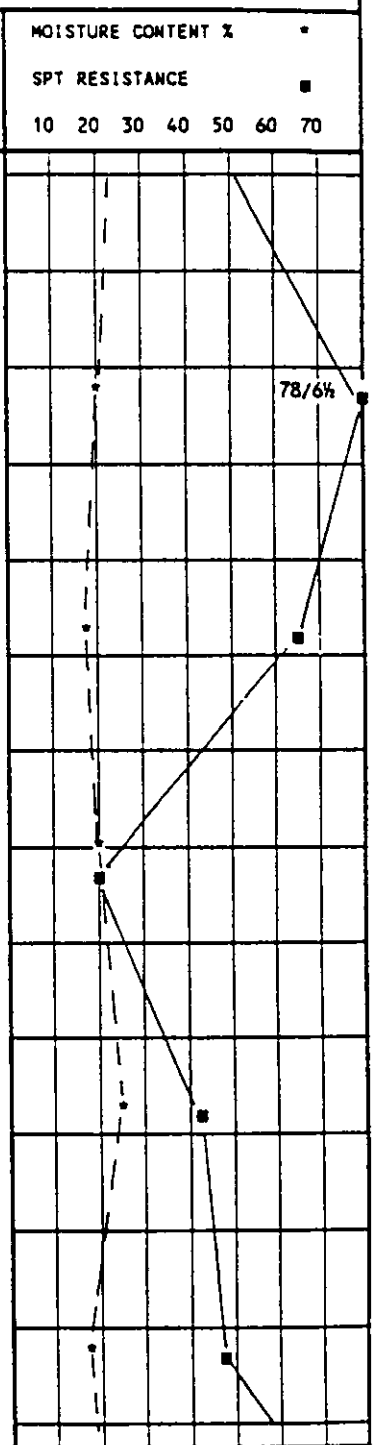
HARTCROWSER
J-3528 7/92
Figure A-35 3/5

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS |
|---|---|---|---|
| 78 | | | |
| 80 | | | |
| 82 | - dense, dark gray, fine SAND: some medium sand; silty in places, massive | | |
| 84 | | | |
| 86 | | | |
| 88 | | | |
| 90 | | | |
| 92 | | | |
| 94 | | | |
| 96 | | | |
| 98 | | | |
| 100 | | | |
| 102 | - trace of shell fragments | | |
| 104 | | | |




| | | | |
|---|---|---|---|
| SHEET 4 of 5 | PROJECT<br>TERMINAL 4 ASSESSMENT<br>LOCKHEED SHIPYARD<br>SEATTLE, WASHINGTON | DATE 9/13/89<br>LOGGED BY RFF<br>ELEVATION SEA LEVEL LLW<br>DEPTH 108.0' | HOLE NUMBER<br>D-5A |

Note: Boring log prepared by Hong Consulting Engineers, Inc.

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Figure A-35 4/5

# HONG CONSULTING ENGINEERS, INC.

## BOREHOLE LOG

PROJ. NO. 8949

| DEPTH (feet) | SOIL DESCRIPTION | SAMPLE | REMARKS | MOISTURE CONTENT % • / SPT RESISTANCE ■ (10 20 30 40 50 60 70) |
|---|---|---|---|---|
| 104 | | | | |
| 106 | – very dense, dark gray, fine SAND: trace silt; massive, few shell fragments | X | | |
| 108 | END OF BOREHOLE | | | |
| 110 | | | | |
| 112 | | | | |

| | PROJECT | DATE 9/13/89 | HOLE NUMBER |
|---|---|---|---|
| | TERMINAL 4 ASSESSMENT | LOGGED BY RFF | |
| SHEET 5 of 5 | LOCKHEED SHIPYARD | ELEVATION SEA LEVEL LLW | D-5A |
| | SEATTLE, WASHINGTON | DEPTH 108.0' | |

Note: Boring log prepared from Hong Consulting Engineers, Inc.

HARTCROWSER

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