Geotechnical Data Report

Columbia River Ship Channel Deepening Project

Prepared for

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Prepared by

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Contents

Appendixes

Tables

Introduction

Authorization

This report presents the findings of the geotechnical exploration program performed for the proposed Columbia River ship channel deepening project. This work is authorized by Task Order No. DACW 57-97-D-0004-0022, dated July 14, 2000.

Purpose and Scope

This geotechnical data report presents the findings of a geotechnical exploration for the proposed channel deepening. The scope of the project conformed to the statement of work provided by the U.S. Army Corps of Engineers, dated July 14, 2000. The specific tasks involved the following:

- Conducting geotechnical field explorations at various locations within the existing channel limits. This included 40 test pits, 184 jet probe holes, and 14 rock core borings.
- Evaluating of subsurface conditions at various locations in terms of excavation requirements.
- Preparing this report.

Background

Site Location

Our investigation included selected locations of the Columbia River ship channel between River Mile (RM) 42 and RM 104. Sampling locations were provided by the U.S. Army Corps of Engineers.

Project Description

The proposed Columbia River ship channel improvement consists of deepening the navigation channel 3 feet from its currently authorized channel depth of elevation -40 feet Columbia River Datum (CRD). With an additional 2 feet of advance maintenance, the actual planned excavation depth for the new channel is elevation -48 feet. In bedrock areas excavation would extend to elevation -48 feet.

Limitations

This report has been prepared for the exclusive use of the U.S. Army Corps of Engineers for specific application to the Columbia River channel deepening project between RM 42 and RM 104. This report has been prepared in accordance with generally accepted geotechnical engineering practice. No other warranty, expressed or implied, is made.

The test pit, jet probe, and boring logs indicate subsurface conditions only at specific locations and times, and only to the depths penetrated. Subsurface conditions at other locations may differ from conditions at these locations. In addition, the passage of time may result in a change in the conditions at these locations. If, during excavation, subsurface conditions are found to vary from those described in this report, the geotechnical data report may need to

be reevaluated. CH2M HILL is not responsible for any claims, damages, or liabilities associated with interpretation of subsurface data or reuse of the subsurface data or engineering analyses without the express written authorization of CH2M HILL.

Field Exploration Program

The field exploration program was conducted on August 7 through 30, 2000. The exploration consisted of advancing 40 test pits, 184 probe holes, and 14 rock core borings. An overview of the areas investigated is shown in Figures 1 through 4. The specific locations of each test pit, probe hole, and rock core boring are shown on figures presented in Appendix A. The purpose of the field exploration was to determine the presence or absence of bedrock that will extend above the excavation grade line for the planned new ship channel depth. All test pit, jet probe, and core borings were within a 5-foot radius of the proposed location, with the exception of four drill holes that were within 8 feet of the proposed location.

Personnel

Hickey Marine Enterprises performed the test pit and probe hole work. Geotech Explorations Inc., as the subcontractor to Hickey Marine, performed the rock core drilling operations. Minister-Glaeser established the horizontal control for the project and set up 15 staff gauges on the river so that river elevations could be determined at the time of each exploration.

CH2M HILL personnel were present during field explorations for the purpose of coordinating and observing the operations, verifying correct locations for the explorations, and logging the test pits, probe holes, and rock core borings. Subsurface materials recovered or encountered were recorded in the field.

Test Pit Operations

A 103- by 60-foot derrick barge (Hickey Marine's "Sea Vulture") with two 30-inch-diameter spuds and a 38- by 17-foot tugboat with 800 horsepower (the "Nova") were used for test pit operations. Test pit operations were conducted by using a barge-mounted crane (a 4600 Manitowoc) with an 8-cubic-yard rock bucket to dig the pits. The steel cable attached to the rock bucket was marked in 1-foot increments so that depths could be determined. Test pit sites were located using a differential global positioning system (GPS) with the antenna placed on the tip of the crane's boom. A computer and monitor placed in the crane operator's cabin showed the position of the top of the boom. Once the barge was securely spudded, the crane was brought into position and test pit coordinates were recorded and verified. A tide reading was taken before and after each test pit was excavated. Materials from each scoop were placed on a separate barge (Harvey, 120- by 40-foot) for the field personnel to observe and identify. After each scoop, the rock bucket was carefully lowered back into the existing hole with help of the GPS. The depth of the open bucket was recorded before every scoop. Digging in the same hole continued until an elevation of -50 feet CRD was reached. Materials were disposed of in the same general area after the hole was completed.

All 40 test pits were dug in the same general area near RM 66, close to the Lewis and Clark bridge that connects Longview, Washington, to Oregon. Test pit logs are shown in Appendix B. Table 1 shows a summary of the locations and depths of the test pits.

Jet Probe Operations

The jet probing operations were conducted as recommended by the U.S. Army Corps of Engineers. A procedure similar to that used for channel deepening explorations in Coos Bay, Oregon, was implemented for this work (COE, 1995). A 103- by 60-foot derrick barge (Hickey Marine's "Sea Vulture") with two 30-inch-diameter spuds and a 38- by 17-foot tugboat with 800 horsepower (the "Nova") were used for jet probe operations. An 84-foot-long jet pile driver was used for probing operations. The pipe size was 6 inches outside diameter with a wall thickness of 0.5 inch. The nozzle was approximately 1 foot long, which includes a 6-inch taper. The bottom jet opening was 1.5 inches wide, and three side jets located approximately 1.5 to 2 feet from the bottom jet had 1.5-inch-diameter openings. A three-stage diesel jet pump supplied water pressures ranging from 75 to 175 pounds per square inch (psi). Table 2 shows the location and depths of the jet probe holes.

A differential global positioning system was used to locate on the exploration sites, with the antenna placed on the tip of the crane's boom. A computer and monitor placed in the crane operator's cabin showed the position of the tip of the boom. Positioning was achieved to within 5 feet of the designed probe location. After the barge was securely spudded, the coordinates were verified. The tide was recorded while the probe was lowered to the river bottom so that the equivalent CRD of the top of the overburden material could be recorded.

It was common for the probe to sink a few inches into the sediments, but the slower penetration rate indicated when the probe was in sediment so that the river bottom elevation could be recorded. The probe tip was then raised approximately 1 foot above the bottom to ensure that the nozzle was not plugged and the water pump was turned on. The water pressure used for initial probing was 75 psi. The probe was lowered until refusal was obtained. The probe was then lifted approximately 1 to 2 feet and lowered two more times; the final depth was then recorded. This depth was assumed to be the top of weathered or partially decomposed rock. The probe was then raised about 1 foot and the water pressure was increased to the full pump capacity of 175 psi. The same procedures were repeated. The rate of penetration was observed as probing progressed to see whether refusal happened suddenly, which would indicate hard rock, or gradually, which could indicate gravel, weathered rock, or cemented sand. The bottom depth was recorded at refusal or upon reaching the termination elevation. The probe was retrieved to the surface to ensure that the nozzle was not blocked. Probes not encountering refusal were terminated around elevation -50 feet CRD.

A total of 184 jet probes were conducted between RM 42 and RM 104 of the Columbia River to identify areas where bedrock is present. Jet probe logs are shown in Appendix B. Table 2 shows a summary of the locations and depths of the jet probing.

Drilling Procedures

A 103- by 50-foot derrick barge (Hickey Marine's "Sea Lion") with two 30-inch-diameter spuds and a 40.6-by 13-foot tugboat (the "Viking") were used for drilling operations. The drill rig was placed on a separate flat-top barge, 173 by 39 feet, tied to the "Sea Lion."

A CME 75 truck-mounted drill rig was used for drilling operations. A 5-inch casing was used with an HQ-size core barrel with a split inner tube.

The crane (3900 Manitowoc) was used to load the drill rig onto the barge. Drilling was accomplished through an existing 2.5-foot-diameter opening through the barge deck. Drill rig sites were located using differential GPS. A computer and monitor placed in the crane operator's cabin showed the position of the drill rate. Once the barge was securely spudded, the drill hole coordinates were recorded. The 5-inch casing was lowered to the channel bottom and seated by being struck with a 140-pound hammer. The tide elevation was recorded, and the bottom elevation of the drill casing and the elevation of the river bottom were calculated by establishing the length of drill casing reaching from the water surface to the bottom. All core drilling was done within the casing. Varying lengths of casing and/or drill rods were added or deleted from the setup depending on tide fluctuations. Water and a face discharge, impregnated, tapered drill bit was used for the core drilling procedures.

A total of 14 borings were drilled between RM 41 and RM 88 to identify the nature of the bedrock material, if bedrock was present. Boreholes were sited in areas of rock removal from previous channel deepenings. An effort was made to determine if the rock encountered was loose and jumbled or more in place to assess what methods of removal would be necessary for the upcoming deepening. Ten feet of rock core drilling was required at each site. Therefore, some of the core borings extended beyond elevation -50 feet. All the core was logged, placed in core boxes, and photographed. Boring logs and core photos are shown in Appendix B and Appendix C, respectively. Table 3 shows the locations and depth of the core borings.

Findings

We refer to basalt fragments in this report if the basalt encountered during our core drilling operations was highly fractured, possibly as a result of previous blasting activities in the area. These basalt fragments may have been transported by the river and may not be at their original location. In many areas the basalt fragments were underlain by loose sands or soft sandstone indicating the basalt fragments have been transported to the area and lie above the original river bottom. Solid in-place basalt bedrock is referred to as basalt.

During jet probing, refusal at 175 psi was referred to as rock, indicating a very hard contact of the jet probe with the material encountered. It could not be determined whether this rock was solid bedrock, a boulder, or rock fragments. Jet probing was conducted before the core drilling. Therefore, a description of the materials encountered during drilling had not been available.

Test pit, jet probe, and core boring logs are attached in Appendix B. Summary tables of the test pit, jet probe, and core drilling exploration locations and depths are shown in Tables 1 through 3. Contour maps showing top of rock, or refusal, for all localized areas containing 10 or more probe and drill holes are provided in Appendix D.

Excavation of most of the materials encountered during our exploration can be completed with a clam shell bucket with rock teeth. Basalt bedrock was encountered in a few areas only, therefore blasting activities can possibly be limited to those areas. The actual channel depth was deeper than expected at many locations, so the quantities of material to be

excavated will be significantly smaller than initially expected assuming a river bottom elevation of –40 feet CRD. Dredging is another option for removal of materials. However, removal of basalt fragments scattered throughout the channel can most likely not be accomplished by dredging.

Area 42/1

Two borings (DH-41-1 and DH-41-2) and 10 jet probes (JP-41-1 through JP-41-10) were conducted in this area. The river bottom was encountered between elevation -46.6 feet and elevation -51.5 feet. Basalt fragments with an average thickness of 2 feet were encountered in the core borings at approximately elevation -47.5 feet. Coring below the basalt fragments yielded very poor recovery, with only several gravel-sized pieces of sandstone or cemented sand. Given the very poor recovery, it was not determined whether the material encountered is a sand, cemented sand, or possibly a weak sandstone. Refusal was encountered during our jet probe explorations at elevations as shallow as -47.6 feet. Not every jet probe encountered refusal above elevation -50 feet. We believe that no hard, in-place bedrock is present above elevation -50 feet.

Area 42/2

Two borings (DH-42-1 and DH-42-2) and 32 jet probes (JP-42-1 through JP-42-32) were conducted in this area. The river bottom was encountered between elevation -45.8 feet and elevation -54.0 feet. The core borings encountered basalt fragments between elevation -46.6 feet and elevation -50 feet, followed by what is possibly a sand, cemented sand, or very soft sandstone. Some of the jet probing indicated refusal starting at elevation -47.2 ft. We believe that no hard, in-place bedrock is present above elevation -50 feet.

Area 42/3

Three borings (DH-42-3, DH-42-4, and DH-42-5) and 32 jet probes (JP-42-33 through JP-42-64) were advanced in this area. The river bottom was encountered between elevation -46.2 feet and elevation -53.9 feet. The boreholes encountered basalt fragments in a matrix consisting of a soft or loose material. Basalt bedrock was encountered in DH-42-3 at elevation -62.2 feet. Jet probe refusal was not encountered above elevation -47.5 feet. We believe that no hard, in-place bedrock is present above elevation -50 feet.

Area 44

One jet probe (JP-44-1) was advanced in this area. The river bottom was encountered at elevation -45.1 feet. Probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

Area 46

One jet probe (JP-46-1) was advanced in this area. The river bottom was encountered at elevation -43.4 feet. Probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

Area 47

One jet probe (JP-47-1) was advanced in this area. The river bottom was encountered at elevation -44.5 feet. Probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

Area 56/1

One core boring (DH-55-1) and 15 jet probes (JP-55-1 through JP-55-15) were advanced in this area. The river bottom was encountered between elevation -47 feet and elevation -56.2 feet. Basalt fragments in a silty sand matrix were encountered in the core boring at elevation -52.5 feet. In general, the coring encountered highly fractured basalt with areas of sudden drops resulting in poor recovery, possibly indicating boulders or basalt flows with interbedded soft layers or sand. In-place basalt bedrock was encountered at elevation -64 feet. Jet probe refusal was observed as shallow as elevation -48 feet.

Area 56/2

One jet probe (JP-56-1) was advanced in this area. The river bottom was encountered at elevation -42.4 feet. Probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock encountered.

Area 61

One jet probe (JP-61-1) was advanced in this area. The river bottom was encountered at elevation -49.4 feet. Probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

Area 63

Four jet probes (JP-62-1, and JP-63-1 through JP-63-3) were advanced in this area. The river bottom was encountered between elevation -44.0 feet and elevation -50.4 feet. Probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

Area 66

Forty test pits (TP-66-1 through TP-66-40) were excavated in this area. None of the test pits encountered bedrock. Materials predominately consisted of sand and silt overlying gravel. Occasional basalt boulders up to 4 feet in diameter and scattered logs at the river bottom were encountered. The river bottom was encountered between elevation -41.3 feet and elevation -49.0 feet. Hard digging was encountered at several locations, but refusal was never achieved. Excavation of the majority of the test pits was easy. Boulders were scattered throughout the area explored, except for the northeast side where mainly Mt. St. Helens material was encountered. The test pits at the east half of the north side were very easy to excavate. In general, a 1- to 5-feet thick layer of Mt. St. Helens material was encountered on top of pre-Mt. St. Helens material.

Area 71

One jet probe (JP-70-1) was advanced in this area. The river bottom was encountered at elevation -40.6 feet. The probing indicated sandy materials slowly penetrated by the jet probe to elevation -50 feet using water pressures of 75 and 175 psi. No hard bedrock was encountered.

Area 75

One jet probe (JP-74-1) was advanced in this area. The river bottom was encountered at elevation -40.6 feet. The probing indicated sandy materials slowly penetrated by the jet probe to elevation -50 feet using water pressures of 75 and 175 psi. No hard bedrock was encountered.

Area 79

Three jet probes (JP-79-1, JP-79-2, and JP-79-3) were advanced in this area. The river bottom was encountered between elevation -43.4 feet and elevation -46.5 feet. The probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

Area 83

Three jet probes (JP-82-1, JP-82-2, and JP-82-3) were advanced in this area. The river bottom was encountered between elevation -42.1 feet and elevation -42.4 feet. The probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

Area 88/1

Four core borings (DH-87-1 through DH-87-4) and 46 jet probes (JP-87-1 through JP-87-46) were advanced in this area. The river bottom was encountered between elevation -39.2 feet and elevation -53 feet. Basalt fragments were encountered in the borings as shallow as elevation -43 feet (DH-87-2). Typically the basalt is highly fractured to a depth of approximately elevation -48 feet. The rock quality encountered in our borings was very poor (the rock quality designation, or RQD, was less than 18.3 percent) above elevation -50 feet and improved to poor (the RQD was 46 percent) in DH-87-1 between elevation -53.3 feet and elevation -56.2 feet. During our jet probing we encountered refusal, at all but four sites, possibly indicating basalt as shallow as elevation -43.6 feet.

Area 88/2

Two borings (DH-88-1 and DH-88-2) and 15 jet probes (JP-88-1 through JP-88-15) were advanced in this area. The river bottom was encountered between elevation -41.7 feet and elevation -47.5 feet. Basalt was encountered in our borings at elevation as shallow as -45.2 feet (DH-88-2). The jet probes encountered refusal, at all locations, possibly indicating basalt as shallow as elevation -44.5 feet. DH-88-1 and DH-88-2 yielded very poor rock quality (the RQD was 0 percent) to elevation -50.3 feet and elevation -48.6 feet, respectively.

Area 90

Two jet probes (JP-90-1 and JP-90-2) were advanced in this area. The river bottom was encountered at elevation -40.6 feet and elevation -44.1 feet. The probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

Area 93

One jet probe (JP-93-1) was advanced in this area. The river bottom was encountered at elevation -48.5 feet. The probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

Area 95

One jet probe (JP-95-1) was advanced in this area. The river bottom was encountered at elevation -47.0 feet. The probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

Area 100

Ten jet probes (JP-100-1 through JP-100-10) were advanced in this area. The river bottom was encountered from elevation -43.3 feet to below elevation -50.6 feet. The probing indicated soft materials easily penetrated by the jet probe to elevation -50 feet using a water pressure of 75 psi. No hard bedrock was encountered.

Area 104

Two jet probes (JP-104-1 and JP-104-2) were advanced in this area. The river bottom was encountered between elevation -44.5 feet and elevation -45.7 feet. Refusal of the probes was encountered at elevation -48.1 feet and elevation -48.4 feet. The material encountered was believed to be gravel rather than hard bedrock, given the slow penetration of the material and one gravel piece stuck at the bottom of the jet probe.

Geologic Setting

Geologic units beneath the Columbia River that are significant to this project (Walker and MacLeod, 1991; Walsh et al., 1987) include the following:

- Recent Columbia River alluvium. This consists of loose or soft sediment ranging in size from clay to boulders.
- Miocene-age Columbia River Basalt. Flow rock could be encountered from one or all of the following units: Pomona Member of the Saddle Mountain Basalt Formation, Frenchman Springs Member of the Wanapum Basalt Formation, and Grande Ronde Basalt Formation (Wells et al., 1989). These units originated in eastern Oregon or Washington and flowed westward to through a broad lowland in the approximate location of the Columbia River Gorge (Beeson et al., 1989).
- Miocene-age marine sedimentary rocks. These could include fine-grained, friable sandstone; massive to thin-bedded siltstone; and tuffaceous siltstone to sandstone.

Assessment of Exploration Methods

This section describes the effectiveness of each work method used to gain knowledge about the materials present in the areas of concern.

Test Pits

We were able to excavate all 40 test pit holes to the required depth of elevation -50 feet using a clamshell bucket with teeth. Potential problems with this method include the excavated hole caving in, so that the contact between different layers can only be estimated. However, the materials encountered in this excavation were easy to characterize, and this method worked very well for the area under investigation.

Excavating test pits using a clamshell bucket with rock teeth could also have been helpful in determining general excavatability in areas with basalt fragments.

Jet Probes

Materials encountered during jet probing were classified based on the rate of penetration and the reaction of the jet probe when lowered through the material. When penetrating sandy materials, the probe advanced at a steady pace. When advancing through gravel, the probe was observed to penetrate very slowly, sometimes resulting in refusal. When penetrating hard material and refusal was encountered at a low pressure (75 psi), the pressure was increased to 175 psi. If the probe was on top of basalt bedrock, it did not advance any further. If basalt fragments were encountered, the probe sometimes penetrated a little further because it bounced off a rock piece.

Without any visual information, the jet probes can be misleading in classifying the materials encountered during refusal. What was labeled as bedrock during probing was discovered during core drilling to be basalt fragments overlying a sand material. Therefore, caution should be used when evaluating the materials encountered during jet probing, especially at refusal.

Core Drilling

Core drilling was very effective in finding competent bedrock and enabling its characterization. Core drilling did not yield very good visual information about soft bedrock materials. It is possible that a cemented sand or sandstone was encountered. These materials could be difficult to excavate.

For this project the combination of jet probes and core drilling was adequate to define the existence of hard bedrock. The jet probes yielded valuable information on river bottom elevations and indicated whether there was soft or hard contact between the jet probe and the material encountered. The drilling verified the difference between hard basalt bedrock and basalt fragments. Without the core drilling operations, the jet probe information could have been misleading.

Core drilling procedures only gave a good indication of the nature of the basalt fragments if good recovery was achieved with in-place material or if jumbled material was rounded. It was hard to distinguish between blast fractures and natural joints, and only the highly

fractured nature of the blasted material aided in classification. Core drilling does not give a good indication of excavatability of the material encountered if gravel or basalt fragments are encountered.

Assessment of Excavatability and Characteristics of Rock Material

Areas Where Bedrock or Basalt Fragments Were Encountered above Elevation -45 Feet

At the following areas bedrock and/or hard materials were encountered at elevations shallower than elevation -45 feet. Each area is discussed separately, to address the excavatability of the rock material encountered. Rock excavation techniques such as blasting are required in areas where solid basalt bedrock was encountered. In areas where basalt fragments or in-place basalt broken up by previous blasting was encountered, excavation with a clam shell bucket with rock teeth might be sufficient due to the relatively thin layer needing removal. Should basalt fragments be too large in size, blasting might be required to break up those large pieces so that removal with a clam shell bucket with rock teeth can be completed later.

Area 88/1

Highly fractured basalt bedrock or basalt fragments were encountered during our jet probing above elevation -45 feet. Therefore, rock excavation techniques will be required in this area.

Area 88/2

Highly fractured basalt bedrock or basalt fragments were encountered during our jet probing above elevation -45 feet. Therefore, rock excavation techniques will be required in this area.

Areas Where Bedrock or Basalt Fragments Were Encountered between Elevation -45 Feet and Elevation -48 Feet

At the following areas, bedrock and/or hard materials were encountered between elevation -45 feet and elevation -48 feet. Each area is discussed separately, to identify the excavatability of the rock material encountered. Basalt fragments can be removed with a clam shell bucket with rock teeth. If boulder-size material is within the basalt fragments, and cannot be removed by a clam shell, blasting of these boulders might be required for removal.

Area 42/1

Basalt fragments were not encountered above elevation -45 feet but do occur between elevation -45 feet and elevation -48 feet. Therefore, rock excavation techniques will be required if the channel is deepened to elevation -48 feet.

Area 42/2

Basalt fragments were not encountered above elevation -45 feet but do occur between elevation -45 feet and elevation -48 feet. Therefore, rock excavation techniques will be required if the channel is deepened to elevation -48 feet.

Area 42/3

Basalt fragments were not encountered above elevation -45 feet but do occur between elevation -45 feet and elevation -48 feet. Therefore, excavation techniques that can accommodate boulder-sized material will be required if the channel is deepened to elevation -48 feet.

Area 56/1

Basalt fragments were not encountered above elevation -45 feet, but they do occur between elevation -45 feet and elevation -48 feet. Therefore, excavation techniques that can accommodate boulder-sized material will be required if the channel is deepened to elevation -48 feet.

Area 104

Gravel was encountered in probe holes between elevation -45 feet and elevation -48 feet. Therefore, excavation techniques that can accommodate boulder-sized rock will be required if the channel is deepened to elevation -48 feet.

Areas Where Bedrock or Basalt Fragments Were Not Encountered above Elevation -48 Feet

Most of our exploration resulted in river bottom elevations deeper than elevation -43 or even elevation -45 feet. This section addresses areas where basalt bedrock or hard material was encountered below elevation -48 feet, which is the deepest elevation of interest for this project. Based on our exploration results, excavation in the following areas can be accomplished using conventional dredging techniques for sandy materials:

- Area 44
- Area 46
- Area 47
- Area 56/2
- Area 61
- Area 63
- Area 66
- Area 71
- Area 75
- Area 79
- Area 83
- Area 90
- Area 93
- Area 95
- Area 100

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TABLE 1

Summary of Test Pit Explorations

Test Pit	Date Completed	Location		Starting El. (ft)	Final El. (ft)	Bedrock Encountered
		Northing	Easting			
TP-66-1	08/11/2000	1,371,477.11	901,680.78	-46.9	-50.5	No
TP-66-2	08/11/2000	1,371,787.88	901,370.69	-43.3	-50.3	No
TP-66-3	08/11/2000	1,371,916.28	901,990.39	-45.3	-50	No
TP-66-4	08/11/2000	1,372,015.29	901,701.28	-42.4	-50.1	No
TP-66-5	08/11/2000	1,372,233.24	901,241.32	-43	-50	No
TP-66-6	08/10/2000	1,372,382.60	901,256.31	-45.4	-50.1	No
TP-66-7	08/10/2000	1,372,724.98	900,933.40	-45.7	-50.2	No
TP-66-8	08/10/2000	1,373,186.43	900,616.67	-45.7	-50.2	No
TP-66-9	08/10/2000	1,373,606.23	900,311.11	-45.6	-50.1	No
TP-66-10	08/10/2000	1,373,629.15	899,648.05	-42.4	-50.3	No
TP-66-11	08/10/2000	1,373,976.44	899,820.60	-47	-50.1	No
TP-66-12	08/09/2000	1,374,054.54	899,405.28	-43.8	-50.3	No
TP-66-13	08/09/2000	1,374,332.57	899,237.91	-46	-50.3	No
TP-66-14	08/09/2000	1,374,362.85	899,428.60	-45.9	-50.1	No
TP-66-15	08/10/2000	1,374,374.22	899,658.70	-46.9	-50.3	No
TP-66-16	08/10/2000	1,374,401.97	899,744.62	-46.4	-50.1	No
TP-66-17	08/10/2000	1,374,747.85	899,637.85	-45.2	-50.3	No
TP-66-18	08/09/2000	1,374,993.93	898,857.34	-47.5	-50.1	No
TP-66-19	08/09/2000	1,375,212.96	899,124.08	-46.6	-50	No
TP-66-20	08/09/2000	1,375,309.02	899,300.28	-45.8	-50.7	No
TP-66-21	08/09/2000	1,375,425.31	898,813.41	-46	-50.1	No
TP-66-22	08/09/2000	1,375,638.95	899,101.01	-45.3	-50.2	No
TP-66-23	08/08/2000	1,375,651.02	898,456.32	-41.3	-50.3	No
TP-66-24	08/09/2000	1,375,777.81	898,746.36	-47.9	-50	No
TP-66-25	08/08/2000	1,375,875.82	898,371.98	-45.2	-50.1	No
TP-66-26	08/08/2000	1,376,069.22	898,223.47	-48	-50	No
TP-66-27	08/08/2000	1,376,445.46	898,572.76	-45	-50	No
TP-66-28	08/08/2000	1,376,488.17	898,496.61	-46.8	-50.2	No
TP-66-29	08/08/2000	1,376,515.30	897,955.79	-44.9	-50.2	No
TP-66-30	08/08/2000	1,376,643.14	898,233.05	-47	-50	No
TP-66-31	08/07/2000	1,376,725.50	897,834.47	-48.5	-50.6	No
TP-66-32	08/08/2000	1,376,736.65	898,385.83	-45.5	-50.1	No
TP-66-33	08/08/2000	1,376,922.30	898,303.49	-47.7	-50.6	No
TP-66-34	08/07/2000	1,377,092.20	898,005.50	-44.8	-50.5	No
TP-66-35	08/07/2000	1,377,217.65	898,098.76	-46	-50.6	No
TP-66-36	08/07/2000	1,377,221.43	897,837.70	-49	-50.1	No
TP-66-37	08/07/2000	1,377,363.12	898,016.13	-49	-50.7	No
TP-66-38	08/07/2000	1,377,654.33	897,643.40	-46.3	-50.8	No
TP-66-39	08/07/2000	1,377,855.01	897,711.80	-49	-50.8	No
TP-66-40	08/07/2000	1,378,106.26	897,579.30	-48.5	-50	No

Note:

All elevations refer to Columbia River Datum (CRD).

TABLE 2
Jet Probing: Columbia River Channel Deepening Project

Probe Number	Date	Time Start	Time End	Northing	Easting	River El. CRD/ Time	River Bottom El. (CRD)	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Encountered by Probe	Top of Rock El.	Miscellaneous Notes
41-01	08/24/2000	1151	1151	1264670.06	921977.16	4.5/1144	-51.5+	--	--	--	--	--	Below grade, stopped probe above bottom
41-02	08/24/2000	1148	1149	1264666.18	921997.77	4.5/1144	-48.4	-49.9	Y	75	Rock	-48.4	Hard contact.
	08/24/2000	1149	1150	1264666.18	921997.77	4.5/1144	-49.9	-50.2	Y	175	Rock		Difficult to advance.
41-03	08/24/2000	1134	1135	1265641.64	921000.88	4.6/1125	-46.9	-47.9	Y	75	Basalt fragments (?)	-47.4	Hard contact, loose rocks over hard.
	08/24/2000	1135	1136	1265641.64	921000.88	4.6/1125	-47.9	-48.4	Y	175	Rock		
41-04	08/24/2000	1145	1146	1265658.50	921014.71	4.5/1144	-46.6	-47.0	Y	75	Rock	-46.6	Hard contact, difficult to advance.
	08/24/2000	1146	1147	1265658.50	921014.71	4.5/1144	-47.0	-47.6	Y	175	Rock		Difficult to advance
41-05	08/24/2000	1137	1138	1265657.51	921035.57	4.6/1125	-47.8	-48.2	Y	75	Basalt fragments (?)	-47.8	Hard contact, difficult to advance.
	08/24/2000	1138	1139	1265657.51	921035.57	4.6/1125	-48.2	-48.2	Y	175	Rock		No gain
41-06	08/24/2000	1131		1265629.92	921034.47	4.6/1125	-48.4	-50.3	N	75	Sand over rock	-49.8	Easy at first, harder last 0.5 foot
41-07	08/24/2000	1129	1130	1265621.88	921052.21	4.6/1125	-49.2	-50.5	N	75	Basalt fragments (?)	-49.2	Work probe, moderate difficulty
41-08	08/24/2000	1125	1127	1265598.99	921039.77	4.6/1125	-46.9	-47.8	Y	75	Basalt fragments (?)	-46.9	Hard contact, difficult to advance
	08/24/2000	1127	1128	1265598.99	921039.77	4.6/1125	-47.8	-48.3	Y	175	Rock		Difficult to advance
41-09	08/24/2000	1121	1122	1265584.37	921057.21	4.6/1110	-47.9	-49.5	Y	75	Basalt fragments (?)	-47.9	Hard contact, difficult to advance
	08/24/2000	1122	1124	1265584.37	921057.21	4.6/1110	-49.5	-49.5	Y	175	Rock		No gain
41-10	08/24/2000	1112	1114	1265559.83	921073.19	4.6/1110	-48.4	-48.9	Y	75	Basalt fragments (?)	-48.4	Hard contact, difficult to advance
	08/24/2000	1114	1115	1265559.83	921073.19	4.6/1110	-48.9	-49.2	Y	175	Rock		Bouncing onto rock
42-01	08/24/2000	0948	0948	1265067.13	921741.26	3.70944	-52.8	--	--	--	Sand on bottom	--	Soft contact below grade
42-02	08/24/2000	0944	0944	1265094.64	921787.09	3.7/0944	-48.3	-50.3	N	75	Sand	--	Easy advance to 1 ft/sec
42-03	08/24/2000	0932	0932	1265014.13	921757.35	3.6/0928	-50.4	--	--	--	Sand	--	Soft contact below grade
42-04	08/24/2000	0940	0942	1265060.35	921813.87	3.7/0936	-48.7	-50.1	N	75	Rock	-48.7	"Bouncey" advance, moderate difficulty
42-05	08/24/2000	1037	1038	1265100.86	921844.14	4.3/1030	-48.2	-49.6	Y	75	Rock	-48.2	Hard contact, difficult to advance
	08/24/2000	1038	1040	1265100.86	921844.14	4.3/1030	-49.6	-49.7	Y	175	Rock		Difficult to advance
42-06	08/24/2000	0847	0848	1265947.99	920758.52	2.7/0840	-48.6	-49.3	Y	75	Basalt fragments (?)	-49.3	Hard contact
	08/24/2000	0848	0851	1265947.99	920758.52	2.7/0840	-49.3	-50.2	N	175	Rock		Work probe to grade with difficulty
42-07	08/24/2000	0929	0929	1265976.68	920784.19	3.6/0928	-48.4	-50.9	N	75	Sand	--	Easy advance at 1 ft/sec
42-08	08/24/2000	0937	0938	1265023.91	921842.66	3.7/0936	-47.5	-49.8	Y	75	Sand	-49.8	Soft, easy to 49.8
	08/24/2000	0938	0939	1265023.91	921842.66	3.7/0936	-49.8	-50.2	N	175	Basalt fragments (?)		Work probe to planned grade in rock
42-09	08/24/2000	1029	1030	1265073.03	921895.69	4.3/1030	-46.6	-46.8	Y	75	Basalt fragments (?)	-46.6	Hard contact, difficult to advance
	08/24/2000	1030	1030	1265073.03	921895.69	4.3/1030	-46.8	-47.2	Y	175	Rock		Difficult to advance
42-10	08/24/2000	0923	0925	1265976.15	920819.28	3.5/0921	-47.4	-47.7	Y	75	Basalt fragments (?)	-47.-4	Hard, slow, difficult progress
	08/24/2000	0925	0926	1265976.15	920819.28	3.5/0921	-47.7	-47.9	Y	175	Rock		Difficult to advance; check jets = okay
42-11	08/24/2000	0829	0829	1265884.45	920750.18	2.6/0829	-53.4	--	--	--	--	--	Well below grade
42-12	08/24/2000	0831	0832	1265902.24	920794.24	2.6/0829	-46.4	-48.2	Y	75	Sand	-48.2	Semi-soft, easy penetration at first
	08/24/2000	0832	0833	1265902.24	920794.24	2.6/0829	-48.2	-48.4	Y	175	Basalt fragments (?)		Stopped penetration like hard rock
42-13	08/24/2000	0845	0845	1265941.48	920846.36	2.7/0840	-48.6	-51.3	N	75	Sand	--	Soft contact, easy penetration
42-14	08/24/2000	0915	0916	1265979.44	920876.80	3.4/0912	-47.4	-47.8	Y	75	Basalt fragments (?)	-47.4	Hard contact, difficult to advance.

See NOTES at end of table

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Probe Number	Date	Time Start	Time End	Northing	Easting	River El. CRD/ Time	River Bottom El. (CRD)	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Encountered by Probe	Top of Rock El.	Miscellaneous Notes
	08/24/2000	0916	0917	1265979.44	920876.80	3.4/0912	-47.8	-47.8	Y	175	Rock		No progress, hard
42-15	08/24/2000	1025	1026	1265027.83	921936.95	4.2/1020	-48.8	-49.0	Y	75	Rock	-48.8	Firm bottom difficult to advance
	08/24/2000	1026	1027	1265027.83	921936.95	4.2/1020	-49.0	-49.0	Y	175	Rock		No gain
42-16	08/24/2000	0836	0837	1265903.35	920831.59	2.6/0835	-48.9	-49.9	Y	75	Sand	--	Semi-soft, easy at first then hard
	08/24/2000	0837	0838	1265903.35	920831.59	2.6/0835	-49.9	-50.7	N	175	Sand		Acted like moved rock out of way and then easy penetration
42-17	08/24/2000	0822	0822	1265860.18	920822.24	2.5/0821	-48.7	-51.0	N	75	Sand	--	Semi-soft, easy penetration 1 ft/sec
42-18	08/24/2000	0909	0911	1265941.42	920908.50	3.4/0912	-45.8	-48.8	Y	75	Sand	-48.8	Easy to 48.8 then hard
	08/24/2000	0911	0912	1265941.42	920908.50	3.4/0912	-48.8	-49.6	Y	175	Rock		Difficult to advance
42-19	08/24/2000	1023	1023	1265980.82	920959.23	4.2/1020	-50.8	--	--	--	Sandy bottom	--	Soft bottom below grade
42-20	08/24/2000	0811	0811	1265823.80	920801.16	2.0/0757	-51.8	--	--	--	Rock	-51.8	Hard contact below grade
42-21	08/24/2000	0819	0819	1265862.63	920857.57	2.3/0815	-48.5	-50.7	N	75	Sand	--	Semi-soft contact, easy penetration 1 ft/sec
42-22	08/24/2000	0840	0841	1265885.90	920891.33	2.7/0840	-47.5	-49.1	Y	75	Sand	-49.1	Soft contact, easy to 49.1 then hard
	08/24/2000	0841	0842	1265885.90	920891.33	2.7/0840	-49	-49.3	Y	175	Rock		Hard, difficult probing advance
42-23	08/24/2000	0902	0904	1265945.69	923949.10	3.2/0902	-48.8	-49.6	Y	75	Sand	-49.6	Easy at first then progress stopped
	08/24/2000	0904	0905	1265945.69	923949.10	3.2/0902	-49.6	-49.8	Y	175	Rock		Hard, difficult to advance
42-24	08/24/2000	0801	0801	1265741.94	920763.20	2.0/0757	-48.0	-51.0	N	75	Sand	--	Hard contact, easy penetration at 1 ft/sec
42-25	08/24/2000	0754	0754	1265781.74	920835.56	2.0/0757	-54.0	--	--	--	Rock	-54.0	Hard rock below grade of -50.0; no probing
42-26	08/24/2000	0814	0814	1265833.52	920884.55	2.0/0757	-51.0	--	--	--	Rock	-51.0	Hard contact below grade
42-27	08/24/2000	0816	0816	1265856.43	920915.95	2.3/0815	-52.0	--	--	--	Sand	--	Soft contact below grade
42-28	08/24/2000	0857	0857	1265902.03	920939.91	3.0/0857	-51.0	--	--	--	--	--	Hard contact but not like rock below grade
42-29	08/24/2000	0806	0808	1265720.71	920784.23	2.0/0757	-48.1	-48.1	Y	75	--	-48.1	Hard contact, no progress probing (hard)
	08/24/2000	0808	0810	1265720.71	920784.23	2.0/0757	-48.1	-48.9	Y	175	Basalt fragments (?)		Difficult to advance probe
42-30	08/24/2000	1059	1059	1266261.83	921028.59	4.5/1055	-45.5	-52.5	N	75	Sand	--	Soft contact, easy penetration at 1 ft/sec
42-31	08/24/2000	1057	1057	1266264.20	921048.27	4.5/1055	-45.5	-52.5	N	75	Sand	--	Soft contact, easy penetration at 1 ft/sec
42-32	08/24/2000	1050	1050	1266093.27	921227.27	4.4/1049	-45.6	-52.6	N	75	Sand	--	Firm contact, easy penetration at 1 ft/sec
42-33	08/23/2000	1440	1440	1266334.90	920361.95	1.6/1420	-53.4	--	N	--	Sand	--	Over grade depth of -50 feet, no test
42-34	08/23/2000	1412	1412	1266297.54	920365.65	1.7/1402	-49.5	-52.3	N	75	Sand	--	Good penetration at 0.5 ft/sec
42-35	08/23/2000	1437	1437	1266337.40	920399.31	1.6/1420	-47.6	-53.4	N	75	Sand	--	Steady penetration at 0.5 ft/sec
42-36	08/23/2000	1405	1405	1266253.66	920356.63	1.7/1402	-51.3	--	--	--	Silty sand	--	Semi-soft contact
42-37	08/23/2000	1408	1410	1266264.71	920394.30	1.7/1402	-47.3	-50.4	N	75	Sand	--	Hard (not like rock) penetrates like sand
42-38	08/23/2000	1420	1422	1266301.48	920427.14	1.6/1420	-48.3	-50.4	N	75	Sand	--	Semi-soft contact, steady slow penetration; check jets = okay.
42-39	08/23/2000	1429	1432	1266333.55	920446.06	1.6/1420	-47.4	-47.8	Y	75	Cemented breccia??	-47.4	Hard, but does not "feel" like rock
	08/23/2000	1432	1435	1266333.55	920446.06	1.6/1420	-47.8	-49.9	Y	175	Cemented breccia??		
42-40	08/23/2000	1403	1403	1266220.55	920384.65	1.7/1402	-51.3	--	--	--	Silty sand	--	Semi-soft contact

See NOTES at end of table

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42-41	08/23/2000	1425	1426	1266305.03	920474.97	1.6/1420	-48.2	-50.2	N	75	Sandy?	--	Semi-soft contact; "jerky" penetration; note irregular bottom values as much as 5 feet
42-42	08/23/2000	1505	1506	1266318.44	920513.21	1.5/1445	-47.6	-49.3	Y	75	Cemented sand?	-50.3	Semi-soft, probe settles in, does not "clank"
	08/23/2000	1506	1509	1266318.44	920513.21	1.5/1445	-49.3	-50.0	Y	175			Work it down slow to grade, does not "clank" like rock
42-43	08/23/2000	1400	1400	1266186.24	920388.29	1.7/1402	-53.3	--	--	--	Silty sand	--	Semi-soft contact
42-44	08/23/2000	1345	1347	1266225.00	920426.44	1.9/1338	-47.1	-49.9	Y	75	Basalt fragments (?)	-47.1	Hard contact
	08/23/2000	1347	1350	1266225.00	920426.44	1.9/1338	-49.9	-50.1	Y	175	Rock		
42-45	08/23/2000	1323	1324	1266189.38	920416.28	2.1/1316	-49.4	-50.2	Y	75	Basalt fragments (?)	-49.4	Hard contact
42-46	08/23/2000	1338	1340	1266236.19	920469.44	1.9/1338	-47.1	-47.1	Y	75	Basalt fragments (?)	-47.1	Hard contact
42-46	08/23/2000	1340	1342	1266236.19	920469.44	1.9/1338	-47.1	-48.1	Y	175	Rock		Skid off rock to make depth
42-47	08/23/2000	1459	1501	1266309.43	920561.53	1.5/1445	-47.6	-48.7	Y	75	Sand over rock	-48.7	Semi-soft contact
42-47	08/23/2000	1501	1503	1266309.43	920561.53	1.5/1445	-48.7	-48.7	Y	175	Rock		
42-48	08/23/2000	1321	1321	1266193.12	920454.16	2.1/1316	-51.7	--	--	--	--	-51.7	Hard contact below grade
42-49	08/23/2000	1318	1318	1266161.57	920438.63	2.1/1316	-53.9	--	--	--	--	-53.9	Hard contact below grade
42-50	08/23/2000	1330	1330	1266202.98	920494.19	2.1/1316	-51.6	--	--	--	--	-51.6	Hard contact below grade
42-51	08/23/2000	1454	1454	1266259.80	920566.08	1.5/1445	-51.1	--	N	--	Sand	--	Semi-soft contact below grade
42-52	08/23/2000	1314	1314	1266167.25	920474.49	2.1/1316	-52.9	--	--	--	--	-52.7	Hard contact below grade
42-53	08/23/2000	1445	1445	1266217.56	920542.85	1.5/1445	-51.3	--	N	--	Rock	-51.3	Hard bottom below grade
42-54	08/23/2000	1335	1335	1266182.87	920520.35	2.1/1316	-53.9	--	--	--	--	-53.9	Hard contact below grade
42-55	08/23/2000	1304	1304	1266045.12	920335.28	2.3/1253	-50.3	--	--	--	--	-50.3	Hard contact at below grade, okay -50.0 elevation
42-56	08/23/2000	1259	1300	1266023.84	920346.53	2.3/1253	-47.7	-48.4	Y	75	Basalt fragments (?)	-47.7	Hard contact
	08/23/2000	1300	1302	1266023.84	920346.53	2.3/1253	-48.4	-48.5	Y	175	Rock		Hard to make progress
42-57	08/23/2000	1255	1256	1266034.22	920369.99	2.3/1253	-49.3	-49.7	Y	75	Rock	-49.3	Hard contact
	08/23/2000	1256	1258	1266034.22	920369.99	2.3/1253	-49.7	-50.5	Y	175	Rock		Work to grade slow.
42-58	08/23/2000	1252	1253	1266015.55	920384.28	2.3/1253	-48.7	-49.3	Y	75	Rock	-48.7	Hard contact
	08/23/2000	1253	1254	1266015.55	920384.28	2.3/1253	-49.3	-50.4	Y	175	Rock		
42-59	08/23/2000	1244	1246	1266983.61	919382.02	2.8/1220	-48.0	-49.7	Y	75	Rock	-48	Hard contact
	08/23/2000	1246	1248	1266983.61	919382.02	2.3/1253	-49.7	-50.2	Y	175	Rock		Work probe up and down to get depth
42-60	08/23/2000	1239	1240	1266999.07	919401.16	2.8/1220	-48.7	-49.3	Y	75	Basalt fragments (?)	-48.7	Hard contact
	08/23/2000	1240	1242	1266999.07	919401.16	2.8/1220	-49.3	-50.2	Y	175	Rock		
42-61	08/23/2000	1231	1232	1266965.29	919399.19	2.8/1220	-46.9	-47.3	Y	75	Rock	-46.9	Hard contact
	08/23/2000	1232	1234	1266965.29	919399.19	2.8/1220	-47.3	-47.5	Y	175	Rock		Very hard to penetrate
42-62	08/23/2000	1235	1236	1266983.46	919415.78	2.8/1220	-48.3	-49.2	Y	75	Basalt fragments (?)	-48.3	Hard contact
	08/23/2000	1236	1238	1266983.46	919415.78	2.8/1220	-49.2	-50.0	Y	175	Rock		Worked down to grade
42-63	08/23/2000	1225	1226	1266961.97	919420.13	2.8/1220	-47.3	-47.7	Y	75	Rock	-47.3	Hard contact

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	08/23/2000	1226	1228	1266961.97	919420.13	2.8/1220	-47.7	-50.2	Y	175	Basalt fragments (?)		Gain 0.5 foot with pump pressure increased; worked to get to El.-50.2 ft.
42-64	08/23/2000	1221	1222	1266938.76	919426.07	2.8/1220	-48.0	-48.4	Y	75	Basalt fragments (?)	-48	Hard contact
	08/23/2000	1222	1224	1266938.76	919426.07	2.8/1220	-48.4	-48.7	Y	175	Basalt fragments (?)		Hard
42-65	08/23/2000	1449	1449	1266246.19	920565.36	1.5/1445	-50.2	-51.5	N	No pump	Sand	--	Semi-soft contact below grade; pick up and down to El.-51.5 ft.
44-01	08/23/2000	1138	1138	1278804.01	915898.80	3.9/1137	-45.1	-51.1	N	75	Sand	--	Soft contact soft easy probe at 0.5 to 1 foot/second
46-01	08/23/2000	1109	1110	1284076.30	915840.34	4.1/1109	-43.4	-51.4	N	75	Sand	--	Soft contact probe okay at 0.5 feet/second
47-01	08/23/2000	1044	1044	1292714.36	915139.05	4.5/1044	-44.5	-51.0	N	75	Sand	--	Soft contact eased in 1 foot/second penetration
55-01	08/23/2000	0855	0855	1333268.43	930342.50	4.3/0839	-49.5	-51.5	N	75	Fractured rock		Bumped rock out of way, went to -51.5
55-02	08/23/2000	0839	0839	1333291.21	930344.28	4.3/0839	-50.4	--	--	--	Rock	-50.4	Hard contact, over -50 elevation no need to pump
55-03	08/23/2000	0850	0851	1333265.93	930366.01	4.3/0839	-48.2	-48.7	Y	75	Basalt fragments (?)	-48.2	Hard contact, probe jumps around
	08/23/2000	0851	0853	1333265.93	930366.01	4.3/0839	-48.7	-49.2	Y	175	Basalt fragments (?)		
55-04	08/23/2000	0830	0831	1333286.61	930364.10	3.8/0807	-47.8	-50.2	Y	75	Basalt fragments (?)	-47.8	Probe "works" its way in after hard contact
	08/23/2000	0831	0832	1333286.61	930364.10	3.8/0807	-50.2	-49.4	Y	175	Rock		Pick up and cannot get back to same point
55-05	08/23/2000	0849	0849	1333246.31	930384.51	4.3/0839	-53.7	--	--	--	Rock	-53.7	Hard contact over El.-50 ft.
55-06	08/23/2000	0826	0827	1333285.42	930382.06	3.8/0807	-48.1	-49.0	Y	75	Rock	-48.1	Hard contact, rocks feel like they roll around
	08/23/2000	0827	0829	1333285.42	930382.06	3.8/0807	-49.0	-49.0	Y	175	Rock		Probe "skids" around
55-07	08/23/2000	0847	0847	1333258.97	930397.53	4.3/0839	-50.9	--	--	--	Rock	-50.9	Hard contact over El.-50 ft.
55-08	08/23/2000	0821	0822	1333282.17	930409.58	3.8/0807	-47.0	-47.0	Y	75	Rock	-47	Hard contact; difficult penetration (Basalt fragments (?))
	08/23/2000	0822	0823	1333282.17	930409.58	3.8/0807	-47.0	-48.0	Y	175	Rock		
55-09	08/23/2000	0820	0820	1333256.07	930420.57	3.8/0807	-55.7	--	--	--	Rock	--	Hard contact
55-10	08/23/2000	0816	0818	1333255.90	930440.25	3.8/0807	-56.2	--	--	--	Sand	--	Soft contact
55-11	08/23/2000	0816	0816	1333279.54	930438.56	3.8/0807	-50.7	--	--	--	Rock	--	
55-12	08/23/2000	0814	0814	1333244.85	930455.73	3.8/0807	-55.7	--	--	--	Rock	--	
55-13	08/23/2000	0811	0811	1333272.77	930471.63	3.8/0807	-54.2	--	--	--	Rock	--	Hard on contact
55-14	08/23/2000	0810	0810	1333249.26	930474.57	3.8/0807	-56.2	--	--	--	Sand over rock	--	
55-15	08/23/2000	0807	0807	1333266.28	930500.96	3.8/0807	-56.2	--	--	--	Sand over rock	--	Tagged bottom at over -50 elevation, no need to pump, soft then hard
56-01	08/22/2000	1412	1413	1336965.00	928321.39	2.1/1411	-42.4	-51.9	N	75	Sand	--	Soft, steady penetration at ~0.5 feet/second
61-01	08/22/2000	1255	1255	1356223.25	915108.06	1.8/1255	-49.4	-52.2	N	75	Sand	--	Soft, easy penetration at ~0.5 feet/second
62-01	08/22/2000	1225	1225	1364446.55	908273.64	2.0/1221	-45.0	-50.5	N	75	Sand	--	Soft, easy penetration at 0.5 foot/second
63-01	08/22/2000	1205	1205	1365162.66	908676.58	2.3/1205	-44.0	-51.7	N	75	Sand	--	Soft, easy penetration at 0.5 foot/second
63-02	08/22/2000	1149	1149	1366754.13	906960.97	2.6/1132	-47.4	-51.4	N	75	Sand	--	Soft, easy, fast penetration at 1 foot/second

See NOTES at end of table

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63-03	08/22/2000	1132	1132	1367522.58	906252.90	2.6/1132	-50.4	-51.4	N	75	Sand	--	Soft, easy penetration
70-01	08/22/2000	0942	0944	1394461.09	883580.78	3.6/0942	-40.6	-42.9	N	75	Sand	--	Soft stop on initial contact, slow penetration in soft material to stop
	08/22/2000	0944	0950				-42.9	-48.4	N	175	Sand	--	Better penetration; pulled up and could not get back (cave in), tried several times. Check jets = 2 side jets plugged with coarse sand; clean and retry at 175 penetration 11 in 22 seconds; okay
	08/22/2000	0952	0952				-40.6	-51.4	N	175	Coarse sand	--	
74-01	08/21/2000	1427	1427	1401777.77	863795.88	1.5/1424	-49.5	-53.5	N	75	Sand	--	Soft stop on initial contact with pump off; pump on = 1 second/1 foot easy penetration rate
79-01	08/21/2000	1317	1317	1411613.81	844826.22	1.9/1314	-46.3	-51.6	N	75	Sand	--	Soft stop on initial contact with pump off; pump on = 1 second/1 foot easy penetration
79-02	08/21/2000	1257	1257	1413257.94	843104.11	2.0/1256	-46.5	-52.0	N	75	Sand	--	Soft stop on initial contact with pump off; pump on = 6'/10 seconds, smooth even penetration
79-03	08/21/2000	1151	1151	1413839.98	840861.41	2.4/1149	-43.4	-52.1	N	75	Sand	--	Soft stop on initial contact (pump off); pump on lift up then cover 10' in 10 seconds; okay
82-01	08/21/2000	1103	1103	1412988.12	826242.91	2.6/1054	-42.4	-52.4	N	75	Sand	--	Soft stop on contact, no pump; pick up with pump on, blow out hole fast penetration
82-02	08/21/2000	1054	1054	1412555.93	826257.89	2.6/1054	-42.4	-51.0	N	75	Sand	--	Slow stop on contact, no pump; pump on pick up = smooth fast penetration
82-03	08/21/2000	1044	1044	1412874.58	825417.52	2.6/1043	-42.1	-50.9	N	75	Sand	--	Soft, even fast penetration; hard at first contact - sand
87-01	08/21/2000	0901	0901	1417077.99	801063.07	3.5/0900	-50.0	-52.5+	N	75	Sand/silt	>-52.5	First touch soft, easy fast penetration to over -52 elevation
87-02	08/21/2000	0852	--	1417006.03	801081.05	3.5/0849	-50.5	-52.0	N	--	Sand/silt	>-52.0	First touch bottom at -50.5 elevation, probe sink to 52 with pump off
87-03	08/21/2000	0845	0847	1417987.10	800027.60	3.5/0849	-45.5	-46.2	Y	75	Basalt fragments (?)	-46.2	Hard from start
	08/21/2000	0847	0848				-46.2	-46.5	Y	175	Rock		
87-04	08/21/2000	--	--	1417971.25	800104.96		-52.8+	--	N		Unknown	--	Bottom over -50.0 feet at this location
87-05	08/18/2000	1441	1443	1417926.10	800053.50	3.1/1438	-44.4	-45.4	Y	75	Rock	-45.4	Hard contact.
	08/18/2000	1443	1445				-45.4	-46.1	Y	175	Rock		Hard contact.
87-06	08/21/2000	0830	0831	1417901.15	800123.81	3.2/0825	-49.6	-52.8+	N	75	Sand, silt	>52.8	Soft <10 seconds to complete
87-07	08/18/2000	1433	1435	1416884.40	800984.77	3.1/1438	-43.2	-43.6	Y	75	Rock	-43.6	Hard contact.
	08/18/2000	1435	1437				-43.6	-43.9	Y	175	Rock		Hard contact.
87-08	08/18/2000	1425	1427	1417801.72	800126.55	3.2/1424	-48.1	-48.8	Y	75	Gravel over rock	-48.8	Probe holds, then surges ahead
	08/18/2000	1427	1429				-48.8	-49.1	Y	175	Rock		Hard contact.
87-09	08/18/2000	1402	1403	1417753.98	800023.67	3.3/1402	-43.7	-43.7	Y	75	Rock	-43.7	Hard, rock rolled
	08/18/2000	1403	1404				-43.7	-43.9	Y	175	Rock		
87-10	08/18/2000	1315	1317	1417727.44	800094.09	3.4/1315	-43.0	-43.9	Y	75	Small gravel?	--	Hard contact.

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	08/18/2000	1317	1318				-43.9	-50.6	Y	175	Gravel?	-50.6	Took off with increase in pump pressure
87-11	08/18/2000	1353	1354	1417669.90	800145.95	3.3/1350	-47.2	-47.4	Y	75	Rock	-47.4	Hard contact.
	08/18/2000	1354					-47.4	-47.7	Y	175	Rock		
87-12	08/18/2000	1335	1336	1417643.30	800210.58	3.3/1335	-45.8	-46.7	Y	75	Gravel?	-46.7	Hesitated, then quickly advanced 1 foot
	08/18/2000	1336	1337				-46.7	-46.7	Y	175	Rock		
87-13	08/18/2000	0922	0923	1417612.43	800264.55	4.8/0922	-39.2	-44.1	Y	75	Sand over rock	-44.1	Soft, easy then hard
	08/18/2000	0923					-44.1	-44.2	Y	175			
87-14	08/18/2000	1310	1312	1416714.82	800970.09	3.4/1310	-44.1	-44.1	Y	75	Rock	-44.1	Hard contact.
	08/18/2000	1312	1313				-44.1	-44.6	Y	175	Rock		
87-15	08/18/2000	1304	1306	1417665.59	800053.77	3.4/1304	-48.0	-48.4	Y	75	Rock, cobbles?	-48.4	Hard contact.
	08/18/2000	1306	1308				-48.4	-48.4	Y	175	Cobbles?		Seem to lose ground when moving probe
87-16	08/18/2000	1343	1344	1417633.62	800119.06	3.3/1340	-45.3	-46.0	Y	75	Gravel?	--	
	08/18/2000	1344	1345				-46.0	-47.2	Y	175	Gravel	-47.2	Hesitated, then dropped with pressure increase
87-17	08/18/2000	0927	0928	1417616.46	800161.87	4.8/0928	-43.7	-43.9	Y	75	Rock	-43.9	Hard contact.
	08/18/2000	0929					-43.9	-44.0	Y	175	Rock		Hard contact.
87-18	08/18/2000	0917	0919	1417598.85	800207.42	4.8/0917	-44.3	-44.4	Y	75	Rock	-44.4	Hard contact.
	08/18/2000	0919	0920				-44.4	-44.5	Y	175	Rock		
87-19	08/18/2000	0911	0912	1417581.81	800246.75	4.9/0911	-39.8	-44.4	Y	75	Sand over rock	-44.4	Soft, easy then hard
	08/18/2000	0912	0913				-44.4	-44.6	Y	175			
87-20	08/18/2000	0903	0905	1417573.60	800289.77	4.9/0903	-39.7	-44.4	Y	75	Silt/sand over rock	-44.4	Soft to 49.3 then hard
	08/18/2000	0905	0908				-44.4	-44.4	Y	175	Rock		Hard, no problem return to mark if pulled up
87-21	08/18/2000	1253	1254	1416664.48	800886.02	3.5/1252	-44.3	-45.0	Y	75	Rock	-45	Hard contact.
	08/18/2000	1254	1255				-45.0	-45.6	Y	175	Rock		
87-22	08/18/2000	1327	1328	1417577.31	800091.78	3.4/1324	-43.4	-43.6	Y	75	Cobbles?	-43.6	
	08/18/2000	1328	1330				-43.6	-43.8	Y	175	Cobbles on big rocks		Pick up and go back to same spot, can't get same depth
87-23	08/21/2000	0754	0756	1417555.25	800157.22	2.9/0754	-45.1	-45.7	Y	75	Basalt fragments (?)	-45.7	Hard, slow penetration
	08/21/2000	0756	0758				-45.7	-45.9	Y	175	Rock		
87-24	08/18/2000	0801	0802	1417536.97	800217.95	5.1/0800	-46.0	-46.0	Y	75	Rock	-46	Hard contact.
	08/18/2000	0803	0804				-46.0	-46.2	Y	175	Rock		
87-25	08/18/2000	0754	0755	1417520.40	800265.01	5.2/0752	-39.6	-45.0	Y	175	Silt/sand over rock	-45	Easy to Rock 10 sec/ft
	08/18/2000	0755	0756				-45.0	-45.0	Y	175	Rock		
87-26	08/18/2000	1008	1010	1417536.38	800108.07	4.7/1002	-44.2	-44.3	Y	75	Rock	-44.3	Hard contact.
	08/18/2000	1010	1011				-44.3	-44.3	Y	175	Rock		Hard contact.
87-27	08/18/2000	0808	0809	1417497.78	800210.96	5.1/0807	-44.7	-44.7	Y	75	Rock	-44.7	Hard, no progress
	08/18/2000	0809	0810				-44.7	-44.7	Y	175	Rock		
87-28	08/18/2000	0812	0813	1417479.58	800255.41	5.1/0812	-41.9	-44.8	Y	75	Silt/sand over rock	-44.8	Soft, easy at first
	08/18/2000	0814	0815				-44.8	-44.9	Y	175	Rock		
87-29	08/18/2000	1150	1152	1416589.02	800916.27	4.0/1145	-44.0	-45.0	Y	75	Sand over rock	-45	First 1.0 feet <10 seconds

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	08/18/2000	1152	1153				-45.0	-45.1	Y	175	Rock		
87-30	08/18/2000	1155	1156	1416558.11	800981.91	3.8/1159	-44.0	-44.7	Y	75	Sand over rock	-44.7	2 seconds to rock
	08/18/2000	1156	1157				-44.7	-45.0	Y	175	Rock		
87-31	08/18/2000	1126	1129	1417529.01	800033.03	4.1/1125	-44.9	-45.0	Y	75	Rock	-45	Hard contact.
	08/18/2000	1129	1130				-45.0	-45.0	Y	175	Rock		
87-32	08/18/2000	0837	0838	1417481.74	800125.21	5.0/0837	-44.1	-44.5	Y	75	Cobbles	-44.5	Lose ground when pick up probe as before
	08/18/2000	0838	0839				-44.5	-44.5	Y	175	Cobbles		
87-33	08/18/2000	0829	0831	1417462.36	800170.36	5.0/0829	-45.0	-45.2	Y	75	Rock, cobbles?	-45.2	Hard bottom, lose progress if pick up
	08/18/2000	0831	0832				-45.2	-45.3	Y	175	Rock, cobbles?		Probe and return to same point
87-34	08/18/2000	0818	0819	1417435.00	800216.50	5.1/0817	-45.3	-45.7	Y	75	Gravel over rock	-45.7	When pick up and go back acted like material sloughed in
	08/18/2000	0819	0820				-45.7	-45.7	Y	175	Rock		
87-35	08/18/2000	0848	0849	1417423.48	800172.90	4.9/0848	-45.1	-45.1	Y	75	Cobbles	-45.1	Jet skids around.
	08/18/2000	0849	0851				-45.1	-45.2	Y	175	Cobbles		
87-36	08/18/2000	1120	1121	1416510.86	800959.06	4.1/1120	-44.9	-45.4	Y	75	Sand over rock	-45.4	Easy at first, then hard
	08/18/2000	1121	1122				-45.4	-45.9	Y	175	Rock		Hard contact.
87-37	08/18/2000	1107	1108	1416500.49	800821.44	4.2/1107	-43.8	-44.1	Y	75	Rock	-44.1	Hard contact.
	08/18/2000	1108	1110				-44.1	-44.6	Y	175	Rock		
87-38	08/18/2000	1114	1116	1416478.09	800877.05	4.2/1114	-43.8	-44.3	Y	75	Rock	-44.3	Soft 0.5 feet over hard
	08/18/2000	1116	1117				-44.3	-44.4	Y	175	Rock		
87-39	08/18/2000	1028	1030	1416448.40	800943.08	4.6/1028	-43.9	-44.5	Y	75	Rock	-44.5	Hard, little progress. Note: river current increasing.
	08/18/2000	1030	1031				-44.5	-44.6	Y	175	Rock		
87-40	08/18/2000	1033	1034	1417418.44	800000.10	4.5/1035	-43.6	-45.5	Y	75	Sand over rock	-45.5	Soft, easy jetting to top of hard
	08/18/2000	1034	1035				-45.5	-45.7	Y	175	Rock		
87-41	08/18/2000	1141	1142	1416447.84	800796.71	4.0/1140	-43.1	-44.0	Y	75	Sand over rock	-4-4	Easy at first to top of rock
	08/18/2000	1142	1143				-44.0	-44.0	Y	175	Rock		
87-42	08/18/2000	1100	1101	1416417.93	800858.61	4.4/1048	-43.1	-43.6	Y	75	Sand over rock	-43.6	Easy for 5 feet then hard
	08/18/2000	1101	1102				-43.6	-43.7	Y	175	Rock		
87-43	08/17/2000	1430	1432	1416386.04	800920.40	3.0/1430	-43.8	-43.8	Y	75	Rock	-43.8	Very hard, no sediments
	08/17/2000	1432	1434	1416386.04	800920.40	3.0/1430	-43.8	-43.8	Y	175	Rock	-43.8	
87-44	08/17/2000	1442	1443	1416353.47	800979.20	3.0/1430	-46.8	-47.2	Y	75	Sand/silt over rock	-47.2	
	08/17/2000	1443	1444	1416353.47	800979.20	3.0/1430	-47.2	-47.2	Y	175	Rock	-47.2	
87-45	08/18/2000	0748	0749	1417467.53	800368.11	5.2/0747	-41.6	-46.6	Y	75	Silt/sand over rock	-46.6	
	08/18/2000	0749	0750				-46.6	-46.6	Y	175	Rock		
87-46	08/18/2000	0737	0738	1417333.97	800300.76	5.2/0735	-43.7	-44.6	Y	75	Silt/sand over rock	-44.6	
	08/18/2000	0738	0740				-44.6	-44.7	Y	175	Rock		
88-01	08/17/2000	1359	1401	1416904.30	799564.70	3.1/1359	-41.9	-48.9	Y	75	Sand/silt	-48.9	Moderate rate at first, then hard
	08/17/2000	1401	1402	1416904.30	799564.70	3.1/1359	-48.9	-49.2	Y	175	Sand/silt	-48.9	

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88-02	08/17/2000	1415	1416	1416840.39	799536.50	3.1/1359	-42.9	-47.0	Y	75	Sand/silt	-47.0	60 seconds/4.1 feet
	08/17/2000	1416	1416	1416840.39	799536.50	3.1/1359	-47.0	-47.1	Y	175	Sand/silt	-47.0	
88-03	08/17/2000	1406	1408	1416811.36	799606.20	3.1/1359	-41.7	-46.1	Y	75	Sand/silt	-46.1	Moderate rate at first, then hard
	08/17/2000	1408	1409	1416811.36	799606.20	3.1/1359	-46.1	-46.2	Y	175	Sand/silt	-46.1	Check jets = okay
88-04	08/17/2000	1325	1326	1416763.26	799503.61	3.3/1325	-45.9	-45.9	Y	75	Rock	-45.9	
	08/17/2000	1326	1328	1416763.26	799503.61	3.3/1325	-45.9	-45.9	Y	175	Rock	-45.9	Work probe, hard bottom
88-05	08/17/2000	1331	1332	1416751.54	799556.47	3.3/1325	-45.7	-45.9	Y	75	Rock	-45.9	
	08/17/2000	1332	1334	1416751.54	799556.47	3.3/1325	-45.9	-45.9	Y	175	Rock	-45.9	
88-06	08/17/2000	1337	1338	1416711.90	799600.92	3.3/1325	-44.2	-45.7	Y	75	Sand/silt over rock	-45.7	
	08/17/2000	1338	1339	1416711.90	799600.92	3.3/1325	-45.7	-46.0	Y	175	Rock	-45.7	Check jets = okay
88-07	08/17/2000	1344	1345	1416702.75	799516.74	3.3/1325	-44.7	-46.7	Y	75	Sand/silt over rock	-46.7	
	08/17/2000	1345	1346	1416702.75	799516.74	3.3/1325	-46.7	-47.0	Y	175	Rock	-46.7	
88-08	08/17/2000	1253	1255	1416625.93	799603.98	3.5/1252	-47.5	-47.5	Y	75	Rock	-47.5	
	08/17/2000	1255	1255	1416625.93	799603.98	3.5/1252	-47.5	-48.0	Y	175	Rock	-47.5	
88-09	08/17/2000	1118	1120	1416636.96	799510.25	4.0/1107	-44.4	-44.5	Y	75	Rock	-44.5	
	08/17/2000	1120	1122	1416636.96	799510.25	4.0/1107	-44.5	-44.5	Y	175	Rock	-44.5	
88-10	08/17/2000	1201	1202	1416608.96	799560.09	3.8/1205	-46.6	-46.7	Y	75	Rock	-46.7	
	08/17/2000	1202	1203	1416608.96	799560.09	3.8/1205	-46.7	-47.4	Y	175	Rock	-46.7	Moved probe around to check consistency
	08/17/2000	1203	1205	1416603.98	799560.86	3.8/1205	-46.7	-47.4	Y	175	Rock	-46.7	
88-11	08/17/2000	1156	1157	1416615.50	799440.96	4.0/1132	-44.8	-44.8	Y	75	Rock	-44.8	
	08/17/2000	1157	1159	1416615.50	799440.96	4.0/1132	-44.8	-44.8	Y	175	Rock	-44.8	Check jets = good
88-12	08/17/2000	1128	1128:30	1416585.74	799508.37	4.0/1107	-44.8	-45.0	Y	75	Rock	-45.0	
	08/17/2000	1128	1129	1416585.74	799508.37	4.0/1107	-45.0	-45.0		175	Rock	-45.0	Weren't making good progress; moved probe to new location
	08/17/2000	1129	1130	1416591.01	799509.16	4.0/1132	-45.0	-45.1	Y	175	Rock	-45.1	
88-13	08/17/2000	1134	1135	1416558.41	799572.24	4.0/1132	-46.0	-46.0	Y	75	Rock	-46.0	
	08/17/2000	1135	1137	1416558.41	799572.24	4.0/1132	-46.0	-46.1	Y	175	Rock	-46.0	Check jets = good
88-14	08/17/2000	1110	1111	1416563.08	799478.67	4.0/1107	-45.0	-46.0	Y	75	Rock?	-46.0	
	08/17/2000	1111	1112	1416563.08	799478.67	4.0/1107	-46.0	-46.0	Y	175	Rock?	-46.0	Move over
	08/17/2000	1113	1115	1416556.60	799482.01	4.0/1107	-46.3	-47.3	Y	175	Rock?	-47.3	Check jets = OK
88-15	08/17/2000	1150	1152	1416572.97	799438.66	4.0/1132	-45.0	-45.2	Y	75	Rock	-45.2	Operator feels hard surface under soft mud
	08/17/2000	1152	1153	1416572.97	799438.66	4.0/1132	-45.2	-45.3	Y	175	Rock	-45.2	
90-01	08/17/2000	1023	1024	1415509.90	788302.00	4.4/1025	-40.6	-50.6	N	75	Sand	--	30 second to 55 ft.
90-02	08/17/2000	1003	1003	1416905.16	787276.07	4.5/0958	-44.1	-51.5	N	75	Sand	--	<30 seconds
93-01	08/17/2000	0924	0924	1422797.30	775127.73	4.7/0920	-48.5	-51.3	N	75	Sand	--	<1 minute to 56' like each second
95-01	08/17/2000	0842	0845	1423203.08	763587.30	5.5/0840	-47.0	-50.5	N	75	Sand	--	<1 minute to 56'
100-01	08/16/2000	1506	1506	1420663.63	737057.91	3.3/1506	-50.6	-50.6	N	-	-	--	Top of overburden below final depth
100-02	08/16/2000	1423	1424	1420275.14	737098.78	3.5/1423	-46.8	-50.0	N	75	Sand	--	Fast to 53.5
100-03	08/16/2000	1451	1452	1420374.91	737370.71	3.4/1447	-48.4	-50.6	N	75	Sand	--	Fast to 54.0

See NOTES at end of table

TABLE 2
Jet Probing: Columbia River Channel Deepening Project

Probe Number	Date	Time Start	Time End	Northing	Easting	River El. CRD/ Time	River Bottom El. (CRD)	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Encountered by Probe	Top of Rock El.	Miscellaneous Notes
100-04	08/16/2000	1403	1405	1420351.24	736259.64	3.6/1403	-44.9	-50.4	N	75	Sand	--	Moderate to fast pace with 175 psi, maybe some obstructions
100-05	08/16/2000	1351	1355	1420126.99	736322.99	3.7/1351 3.7/1355	-43.3	-51.1	N	75-175	Sand	--	Fast to 53.7, increase pressure, stopped at 53.7, then very fast to 54.8
100-06	08/16/2000	1330	1332	1420902.43	735353.85	3.8/1332	-49.5	-50.3	N	75	Sand	--	Fast to 54.1 or (El.-50.3 CRD)
100-07	08/16/2000	1324	1325	1420739.32	735402.17	3.9/1323	-46.0	-54.0	N	75	Sand	--	Easy to 54 CRD; tried to go further
100-08	08/16/2000	1315	1317	1420677.32	735380.48	4.0/1315	-45.3	-50.1	N	75	Sand	--	Very fast to 54.1, <1 minute
100-09	08/16/2000	1306	1309	1420576.21	735442.98	4.0/1306 4.0/1309	-47.1	-50.2	N	75	Sand	--	Fast to 54.0, easy
100-10	08/16/2000	1248	1253	1420399.98	735500.82	3.8/1248 3.8/1252	-46.5	-50.2	N	75-175	Sand, gravel, loose	--	Slow to 53.0 ft, increase pressure to 54 ft
104-01	08/16/2000	0944	0956	1435832.96	725248.39	4.4/0925 4.1/0950	-45.7	-48.1	Y	175-180	Gravel?	-48.1	Slow advance; Troutdale Gravel
104-02	08/16/2000	1030	1040	1435716.70	725345.37	3.9/1025 3.8/1050	-44.5	-48.6	Y	75-175	Gravel and sand	-48.4	Fast to 51.5', slow to 52.2'; dacite gravel piece stuck at bottom of jet probe, when checked.

Notes:

- Materials encountered during jet probing were classified based on the rate of penetration and reaction of jet probe when lowered through the material.
- All elevations refer to Columbia River Datum (CRD).

See NOTES at end of table

TABLE 3
Summary of Drilling Explorations

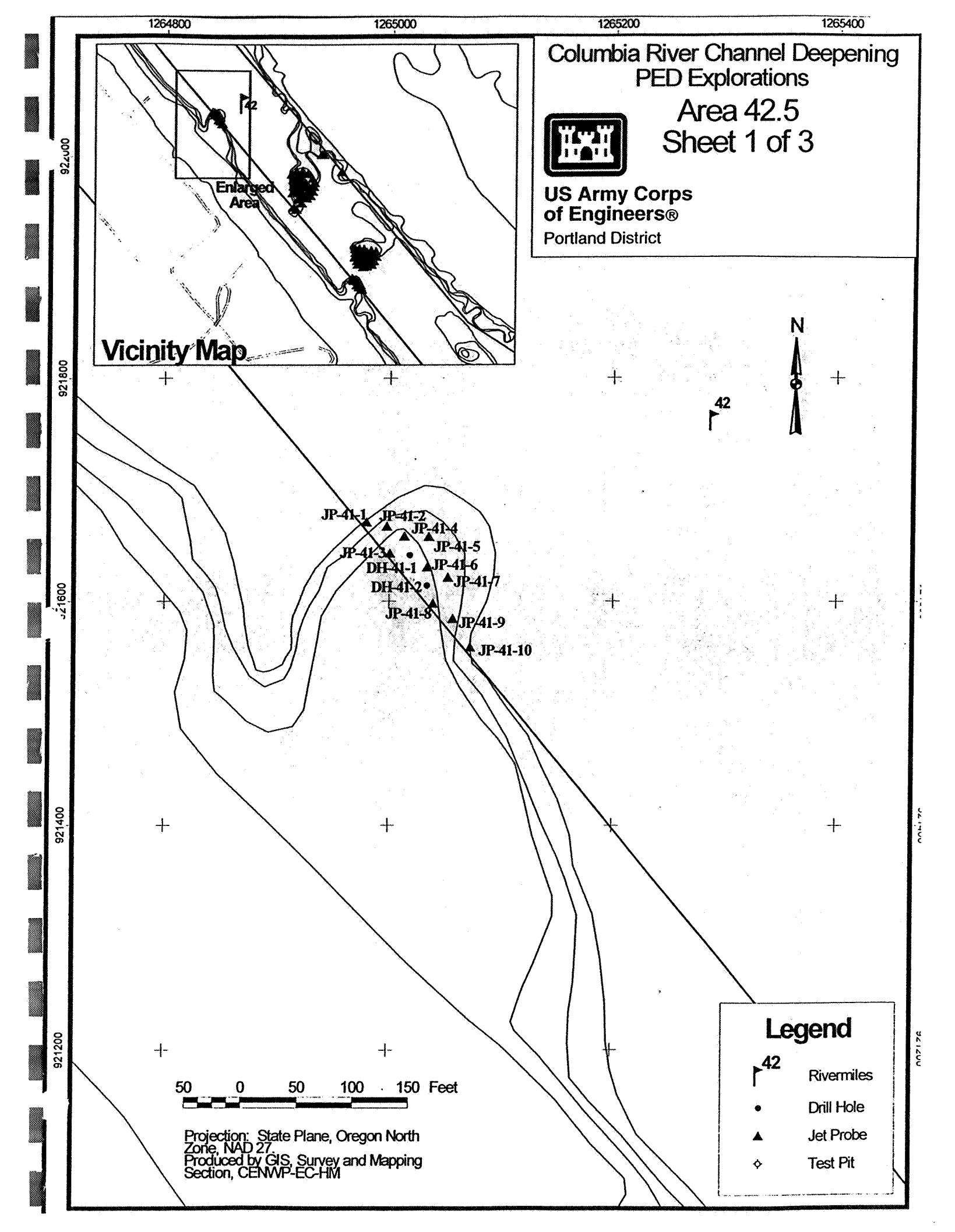
Drill Hole	Date	Locations		Top of Hole	Overburden	Top of Rock	Bottom of Hole	Remarks
		Northing	Easting	El. (CRD)	Thickness (ft)	El. (CRD)	El. (CRD)	
DH-41-1	08/30/2000	1265018.75	921639.82	-47.1	>18	N/A	-65.1	Basalt fragments on top of silt/sand.
DH-41-2	08/30/2000	1265031.41	921612.43	-47.5	>16	N/A	-63.5	Possibly very soft Sandstone at El. -49.5 ft (CRD)
DH-42-1	08/29/2000	**1265798.12**	**921016.16**	-47.9	>15.4	N/A	-63.3	Possibly very soft Sandstone at El. -60.5 ft (CRD)
DH-42-2	08/29/2000	**1265802.92**	**920934.03**	-46.6	>16.5	N/A	-63.1	Basalt fragments in sandy silt matrix. Basalt bedrock at El.-62.0 ft.
DH-42-3	08/25/2000	**1266454.61**	**920265.40**	-46.2	16	-62.0	-65.2	Basalt fragments in sandy silt matrix. Basalt bedrock at El.-62.0 ft.
DH-42-4	08/25/2000	1266512.11	920273.38	-46.8	>17.1	N/A	-63.9	Sand with occasional basalt fragments. Not in place.
DH-42-5	08/28/2000	1266366.21	920004.75	-51	>14.5	N/A	-65.5	Basalt fragments. Not in place.
DH-55-1	08/24/2000	1333423.53	930267.91	-51.5	5	-56.5	-69.4	Basalt fragments and sand. Basalt bedrock at El.-56.5 ft.
DH-87-1	08/21/2000	**1417053.23**	**800830.54**	-46	3.2	-49.2	-56.2	Bedrock is broken up at top 3.2 ft, possibly effects of previous blasting.
DH-87-2	08/23/2000	1416937.22	800793.07	-42	1	-43	-51.3	Bedrock is broken up at top 5 ft, possibly effects of previous blasting.
DH-87-3	08/22/2000	1416982.28	800629.47	-44.2	0	-44.2	-54.5	Basalt bedrock possibly affected by previous blasting activities.
DH-87-4	08/22/2000	1417157.49	800515.68	-44.3	0	-44.3	-54.3	Basalt bedrock possibly affected by previous blasting activities.
DH-88-1	08/21/2000	1416474.16	799704.44	-43.2	3	-46.2	-56.2	3 ft of sand on top of basalt bedrock.
DH-88-2	08/18/2000	1416475.90	799637.96	-43.2	2	-45.2	-55.7	1.5 ft of sand on top of basalt bedrock.

*Bold numbers are not within 5-foot radius of the proposed locations. Actual locations were within 8 feet of proposed.

*All elevations refer to Columbia River Datum (CRD)

APPENDIX A

Exploration Location Maps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Columbia River Channel Deepening
PED Explorations
Area 42.5
Sheet 1 of 3
US Army Corps
of Engineers®
Portland District
Vicinity Map
Enlarged
Area
42
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JP-41-5
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Projection: State Plane, Oregon North
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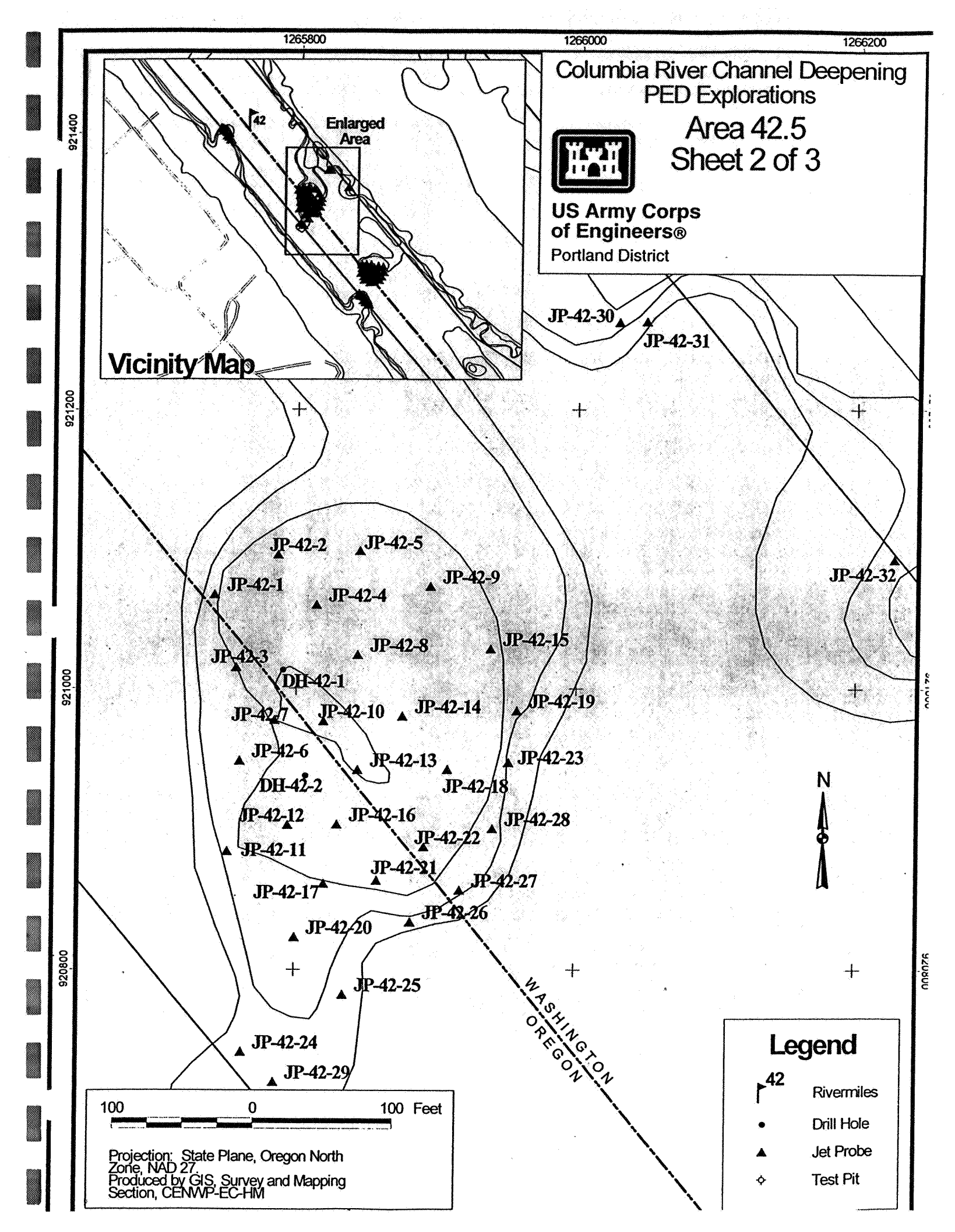
Produced by GIS, Survey and Mapping
Section, CENWP-EC-HM
Legend
42 Rivermiles
Drill Hole
Jet Probe
Test Pit


Columbia River Channel Deepening
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Area 42.5
Sheet 2 of 3
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Portland District
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921200
921000
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JP-42-32
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JP-42-3
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JP-42-7
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WASHINGTON
OREGON
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Legend
42 Rivermiles
Drill Hole
Jet Probe
Test Pit
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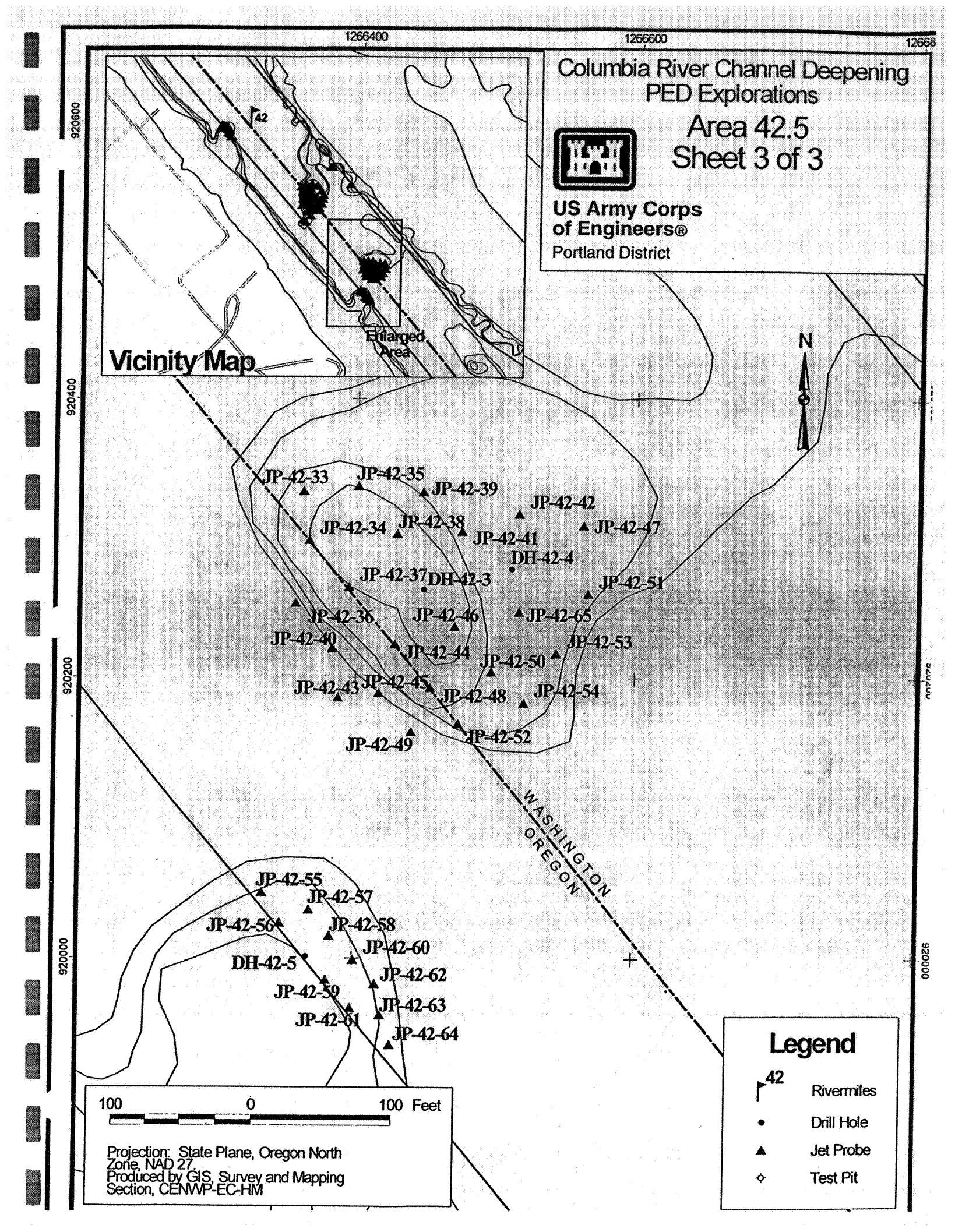
Produced by GIS, Survey and Mapping Section, CENWP-EC-HM


Columbia River Channel Deepening
PED Explorations
Area 42.5
Sheet 3 of 3
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Portland District
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Enlarged Area
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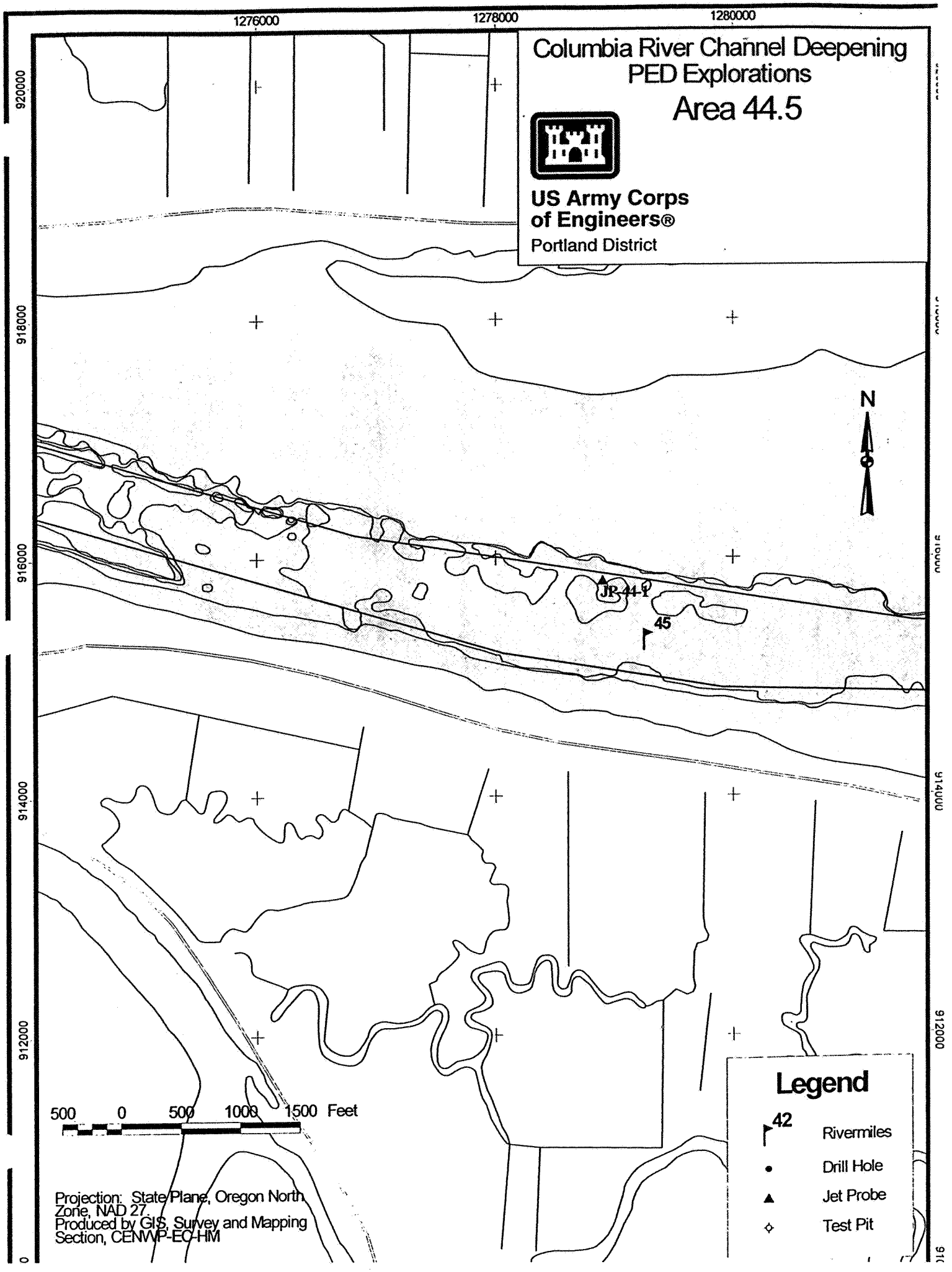
Projection: State Plane, Oregon North Zone, NAD 27.
Produced by GIS, Survey and Mapping Section, CENWP-EC-HM
Legend
42 Rivermiles
Drill Hole
Jet Probe
Test Pit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Drill Hole
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Test Pit
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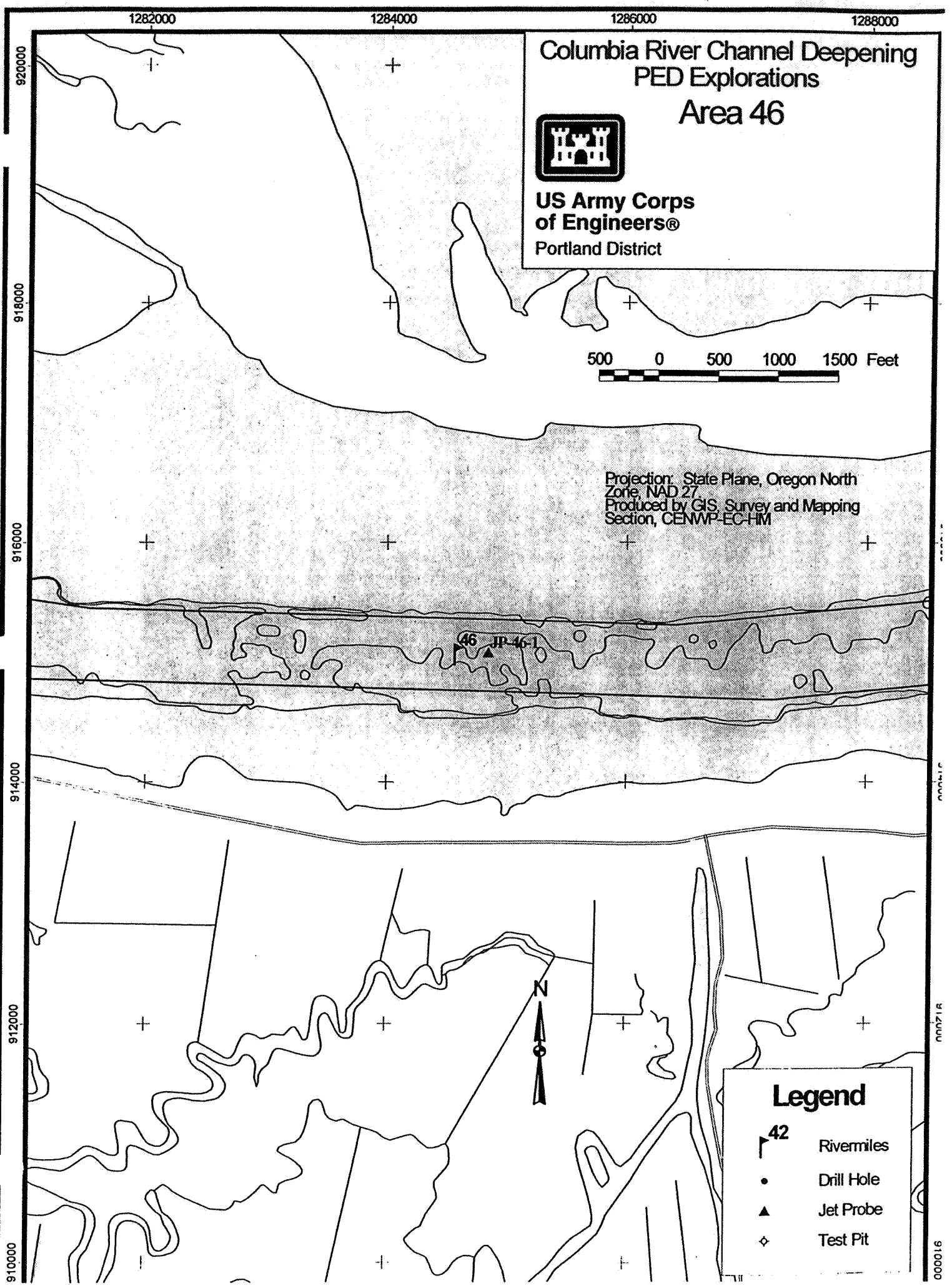
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US Army Corps
of Engineers®
Portland District
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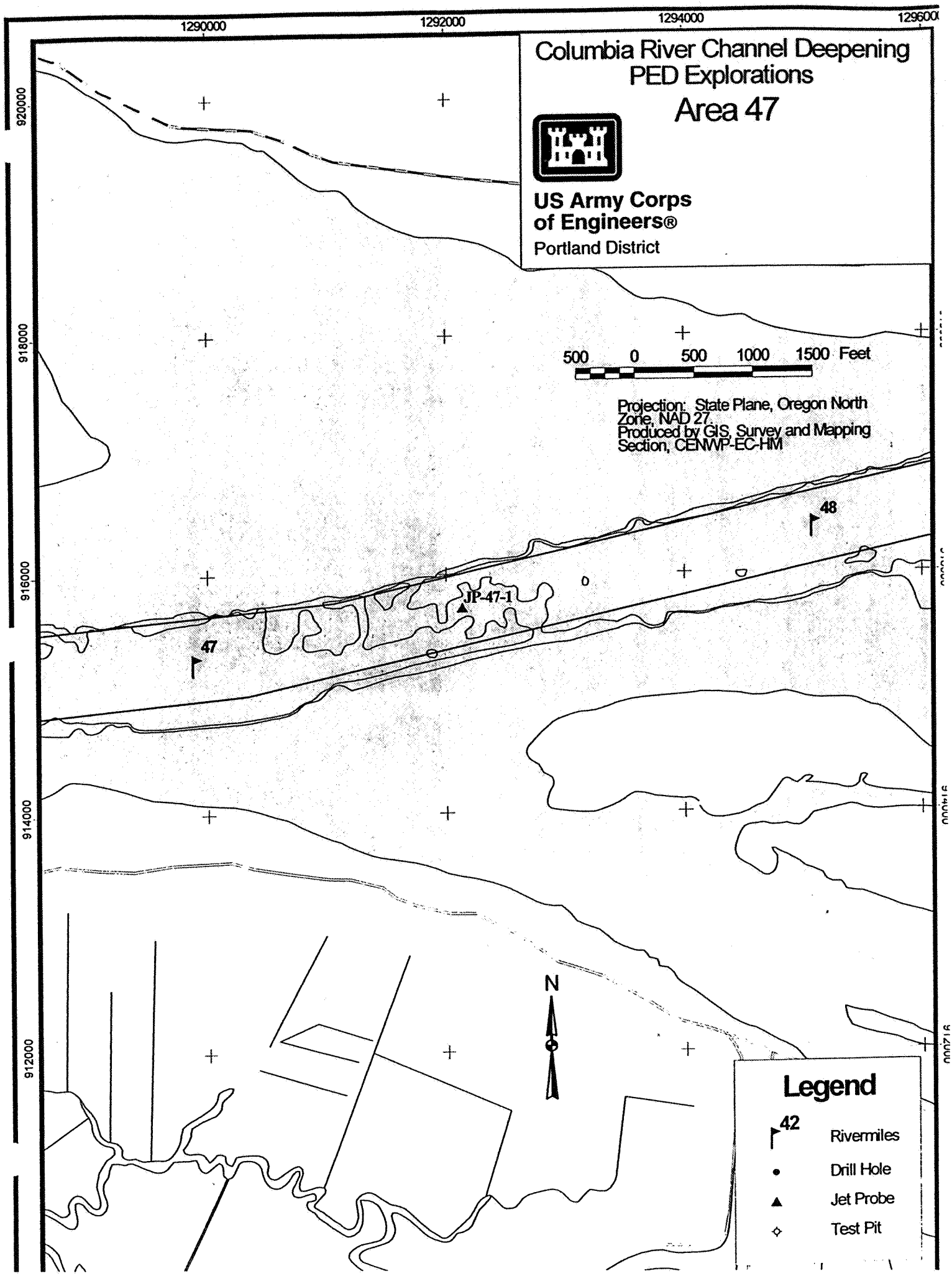
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US Army Corps
of Engineers®
Portland District
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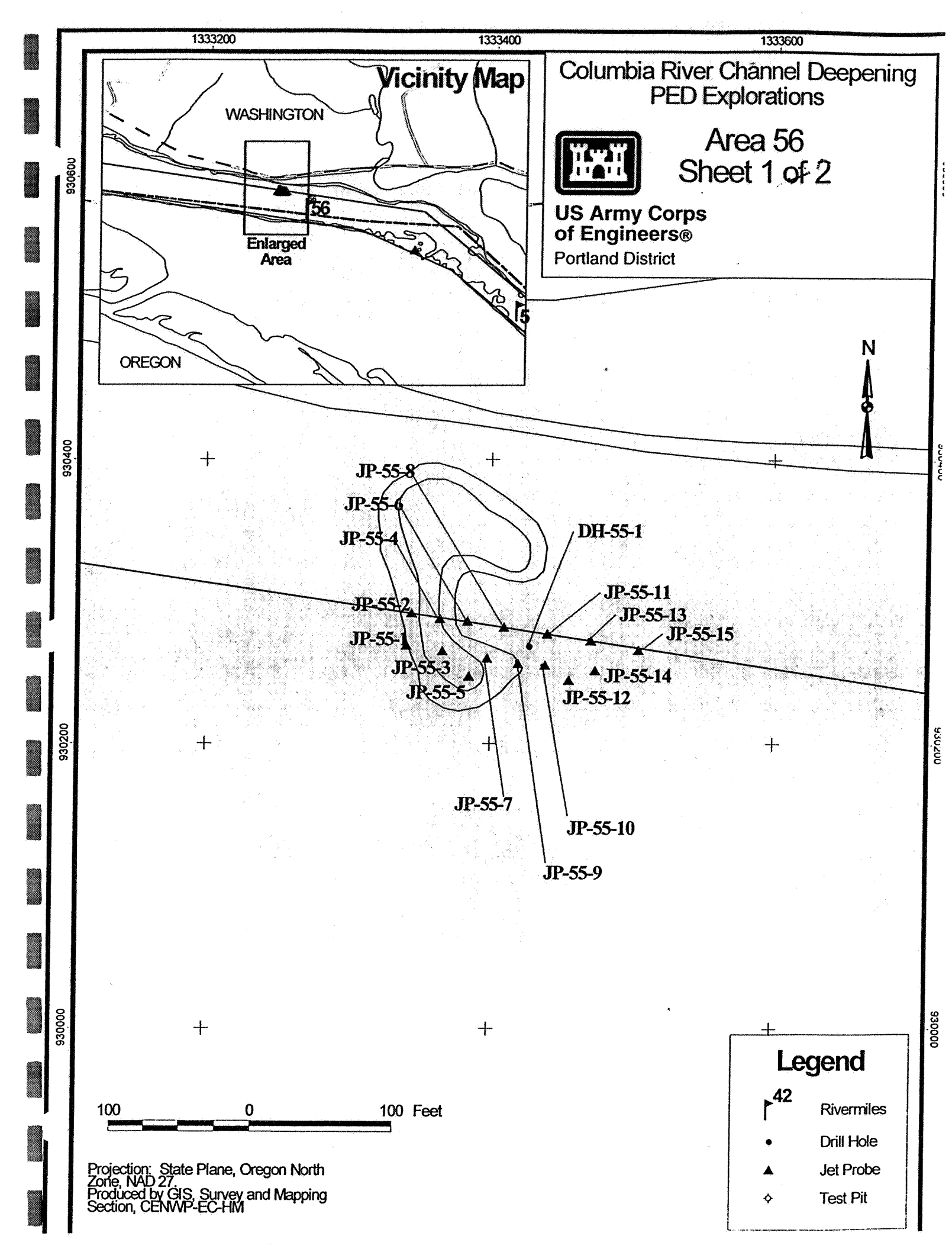
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Vicinity Map
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OREGON
56
Enlarged Area
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Columbia River Channel Deepening
PED Explorations
Area 56
Sheet 1 of 2
US Army Corps of Engineers®
Portland District
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100 0 100 Feet
Legend
42
Rivermiles
Drill Hole
Jet Probe
Test Pit
Projection: State Plane, Oregon North Zone, NAD 27.
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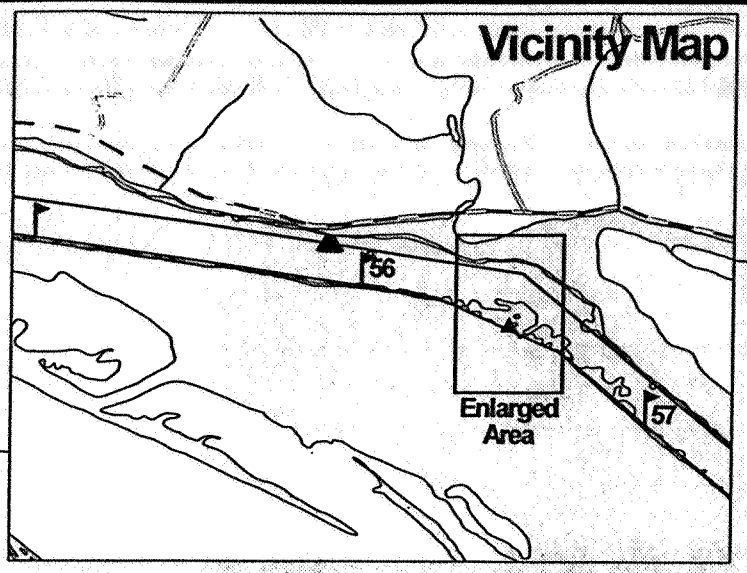
Columbia River Channel Deepening
PED Explorations

Area 56
Sheet 2 of 2

US Army Corps of Engineers®
Portland District



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JP-56-1

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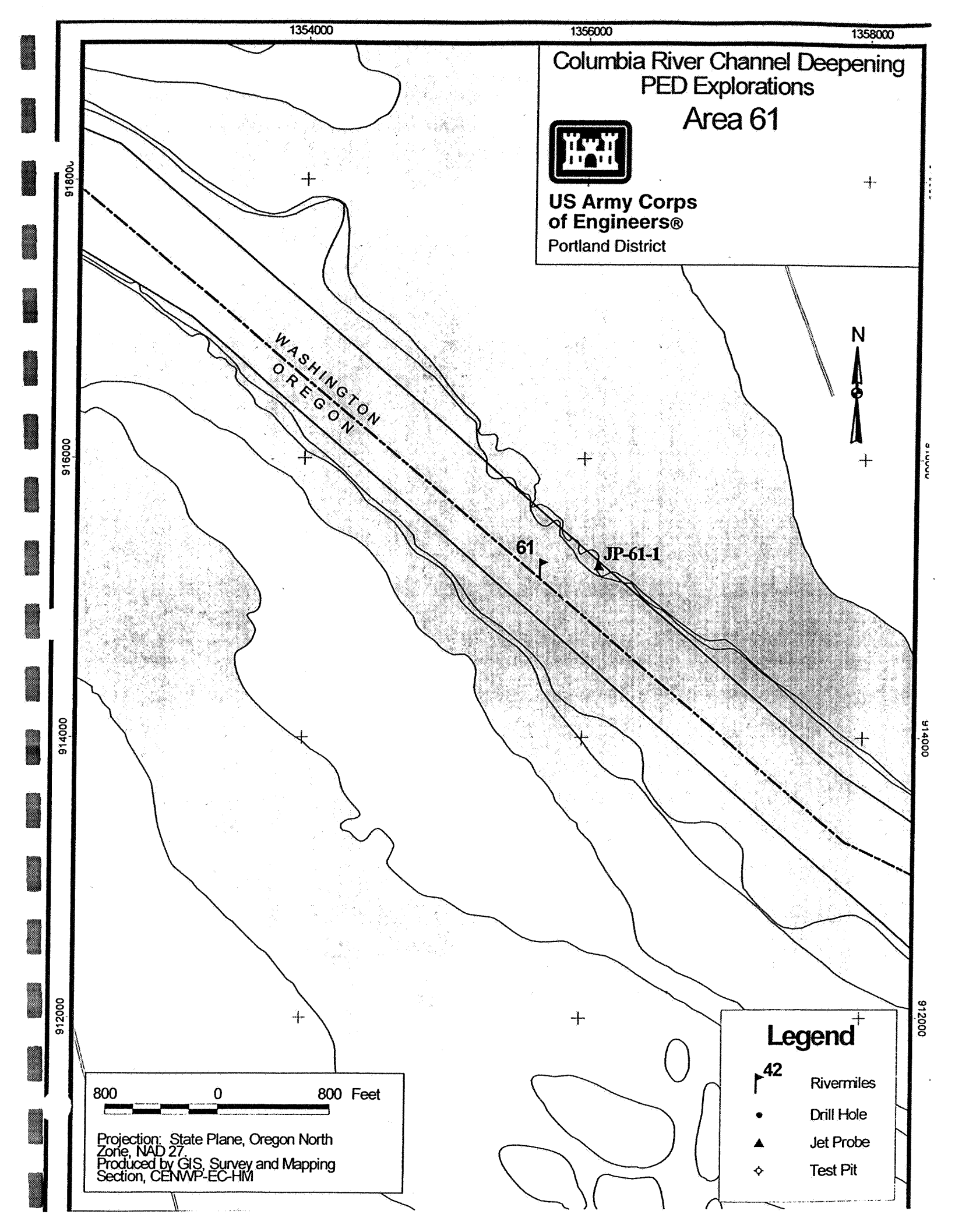
Legend

- 42 Rivermiles
- Drill Hole
- Jet Probe
- Test Pit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Projection: State Plane, Oregon North Zone, NAD 27.
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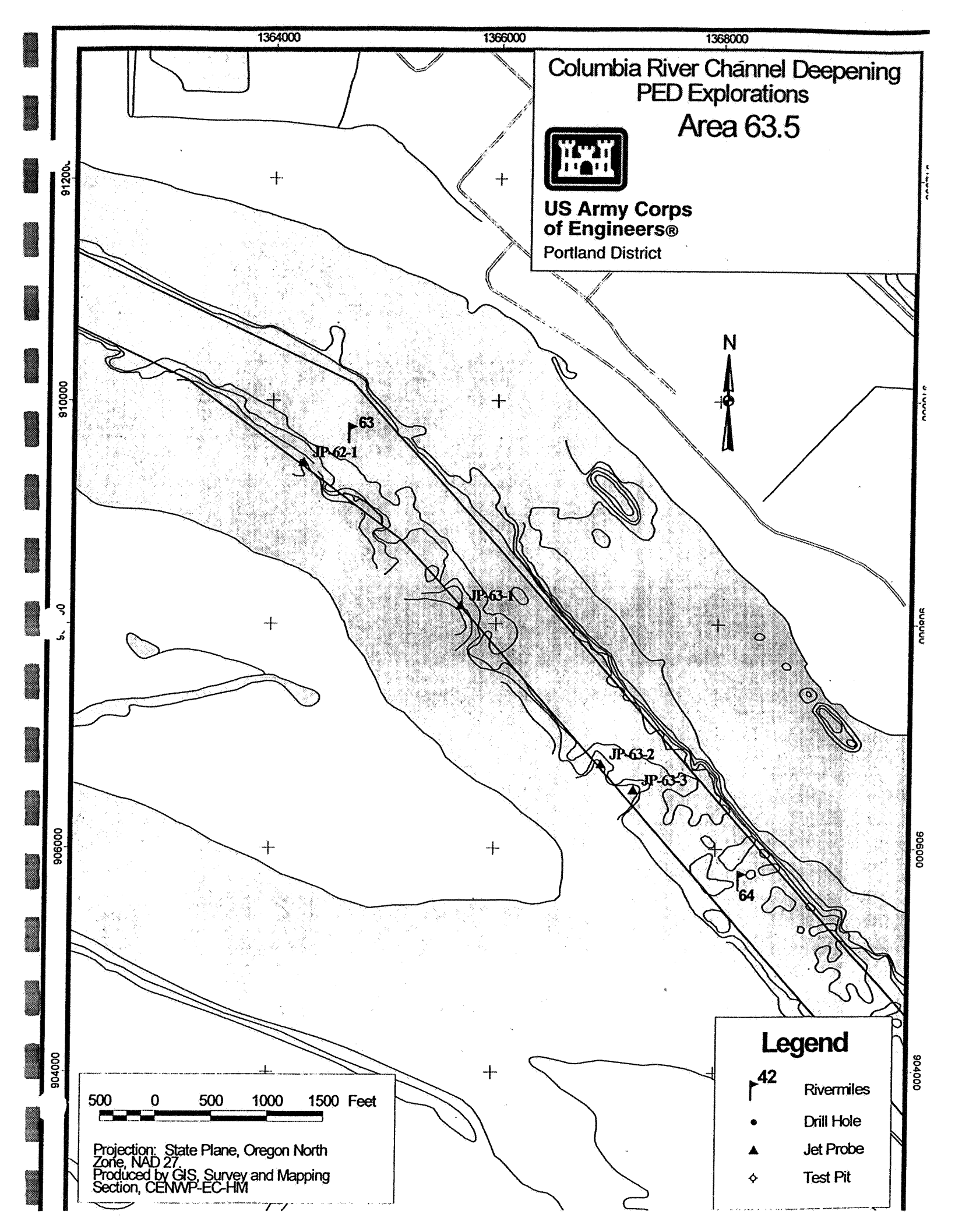
Test Pit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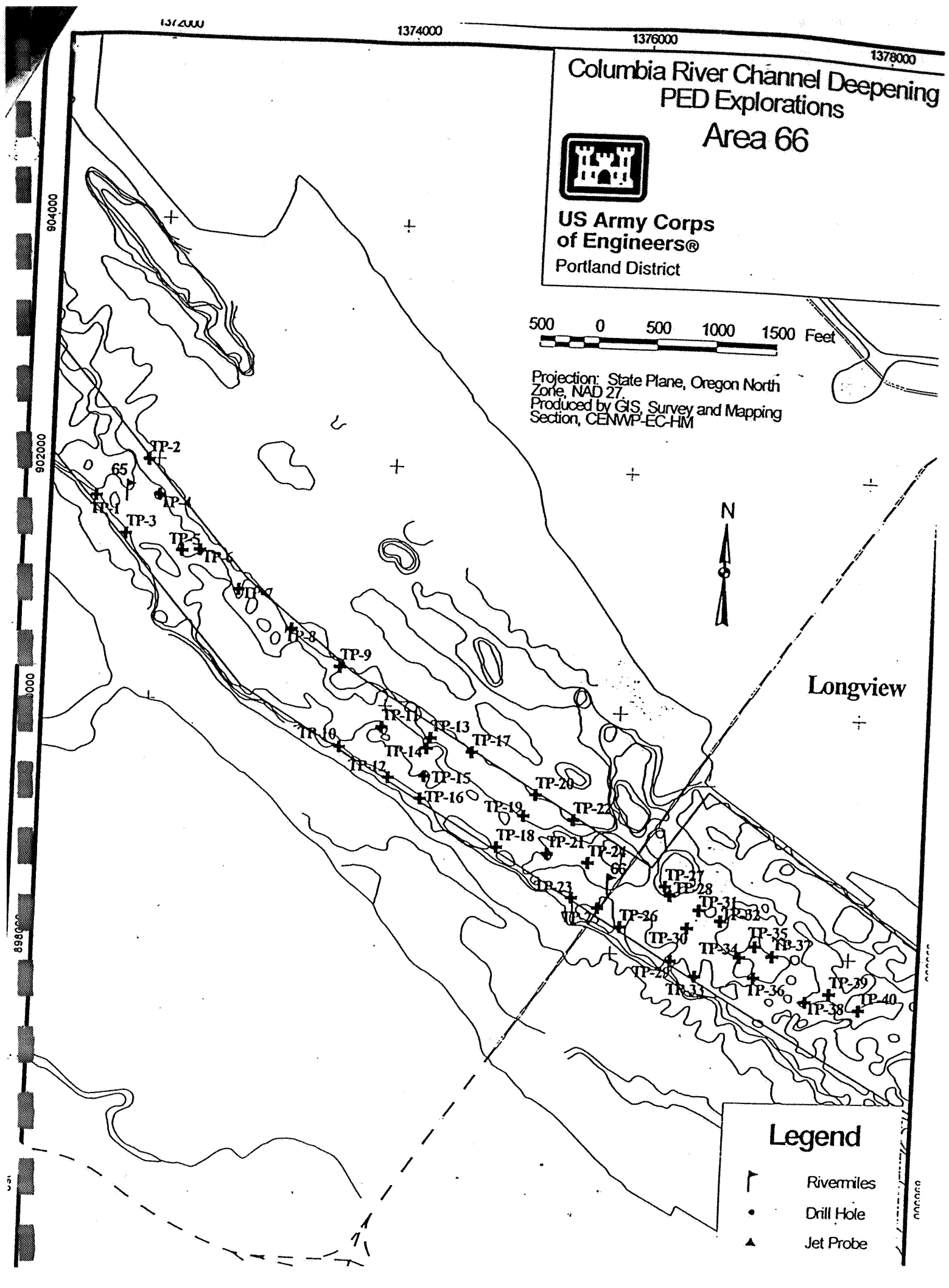
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Portland District
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Produced by GIS, Survey and Mapping Section, CENWP-EC-HM
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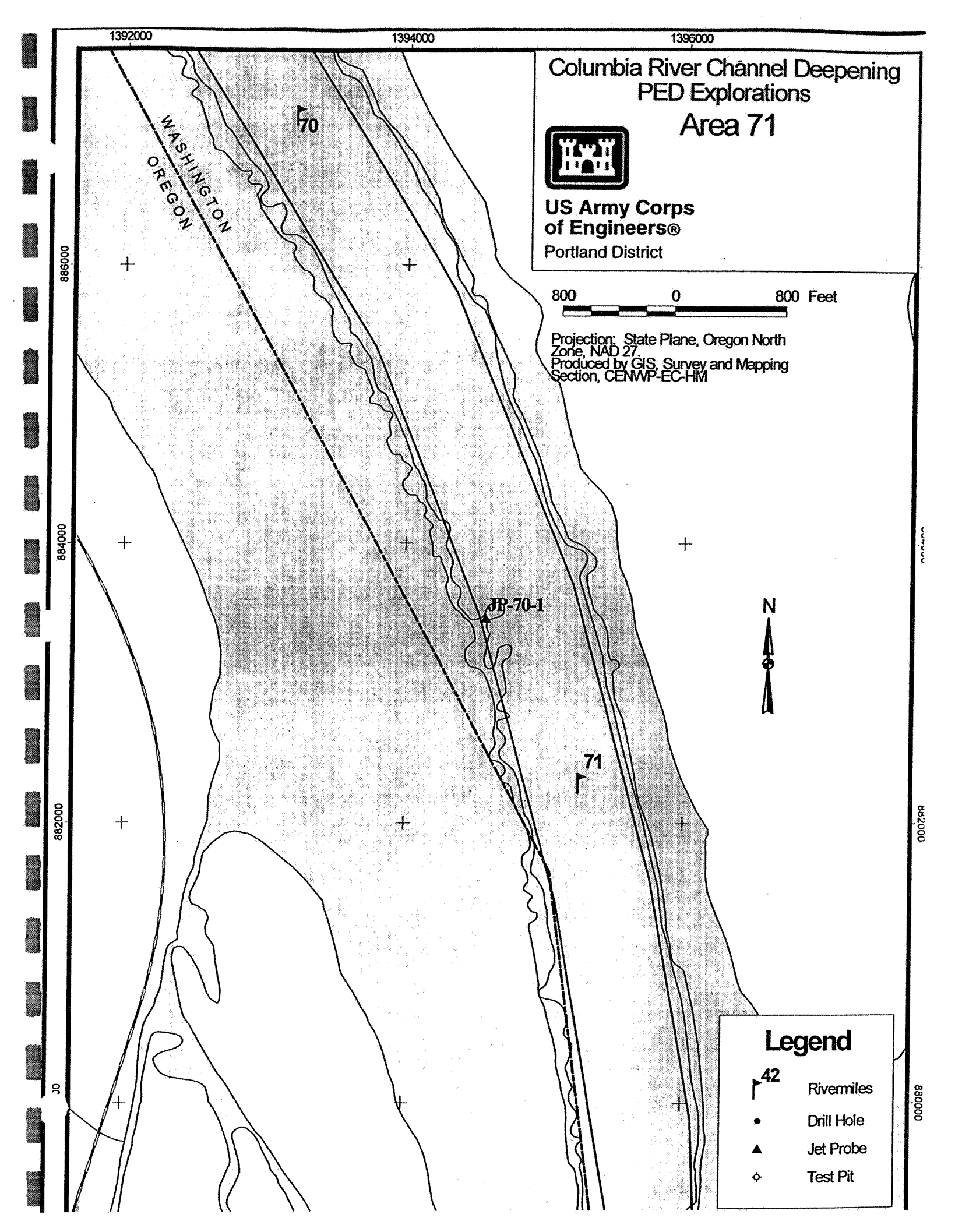
Jet Probe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Produced by GIS, Survey and Mapping Section, CENWP-EC-HM
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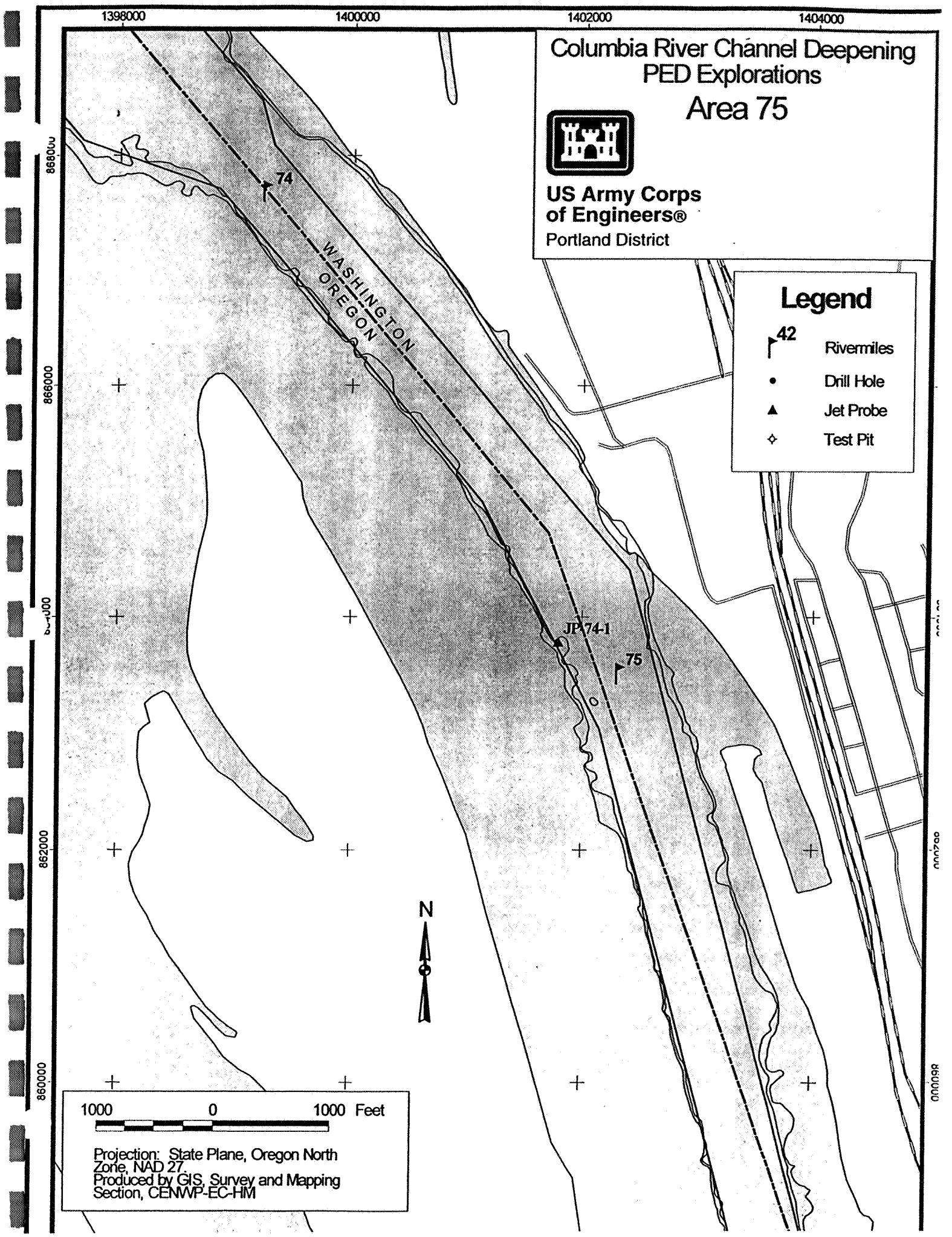
Drill Hole
Jet Probe
Test Pit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WASHINGTON
OREGON
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Legend
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Rivermiles
Drill Hole
Jet Probe
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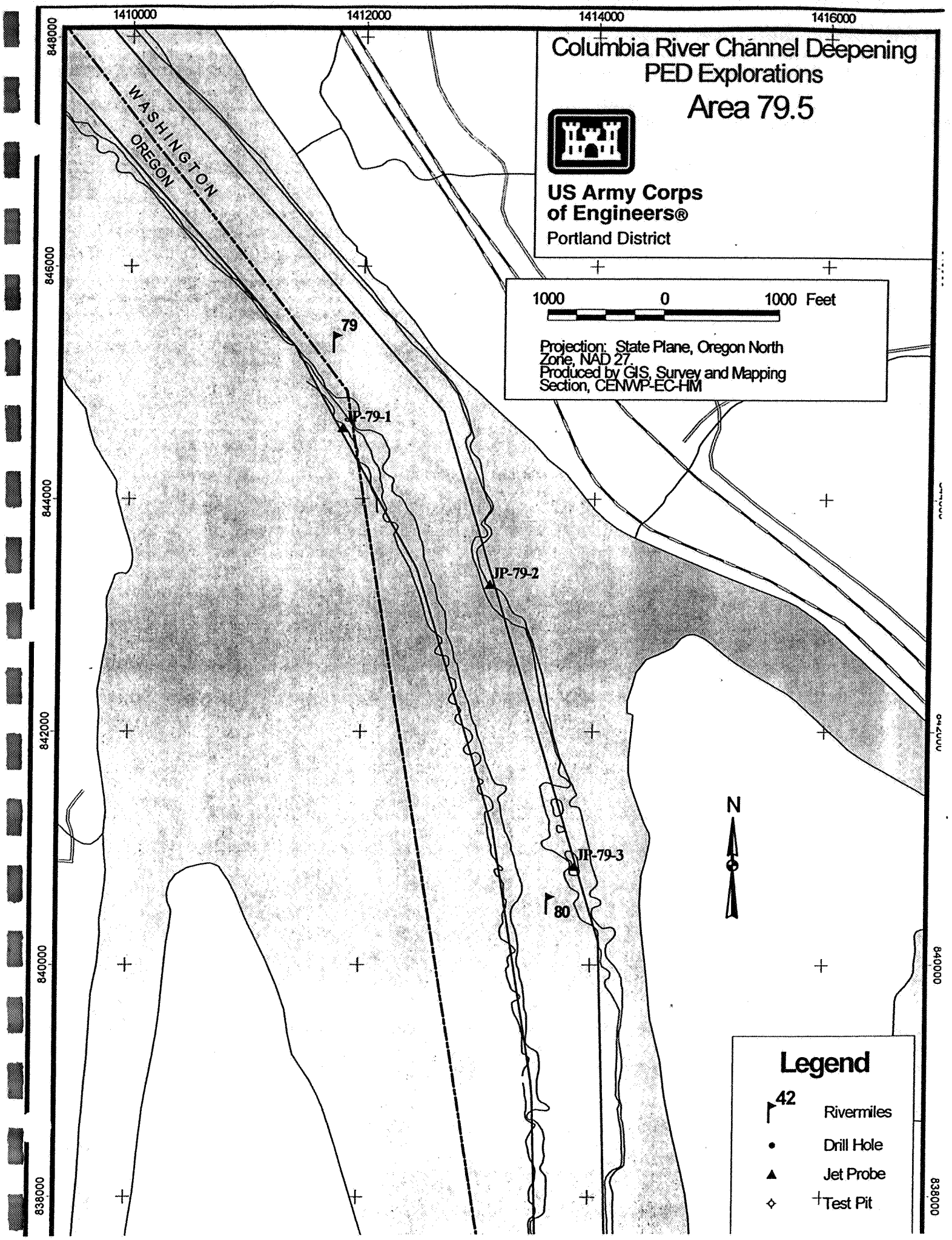
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PED Explorations
Area 79.5
US Army Corps
of Engineers®
Portland District
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OREGON
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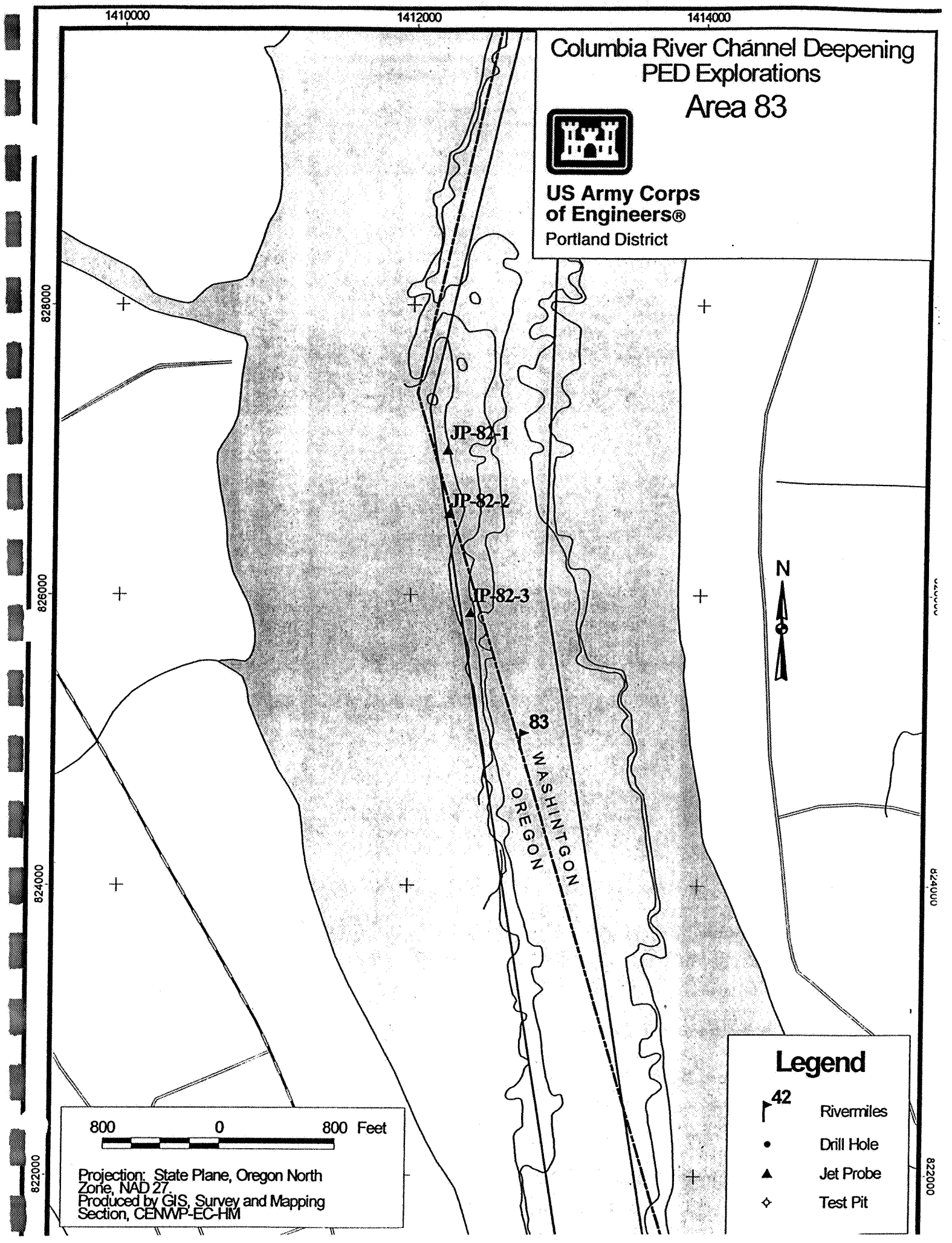
Legend
42 Rivermiles
Drill Hole
Jet Probe
Test Pit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Projection: State Plane, Oregon North Zone, NAD 27.
Produced by GIS, Survey and Mapping Section, CENWP-EC-HM
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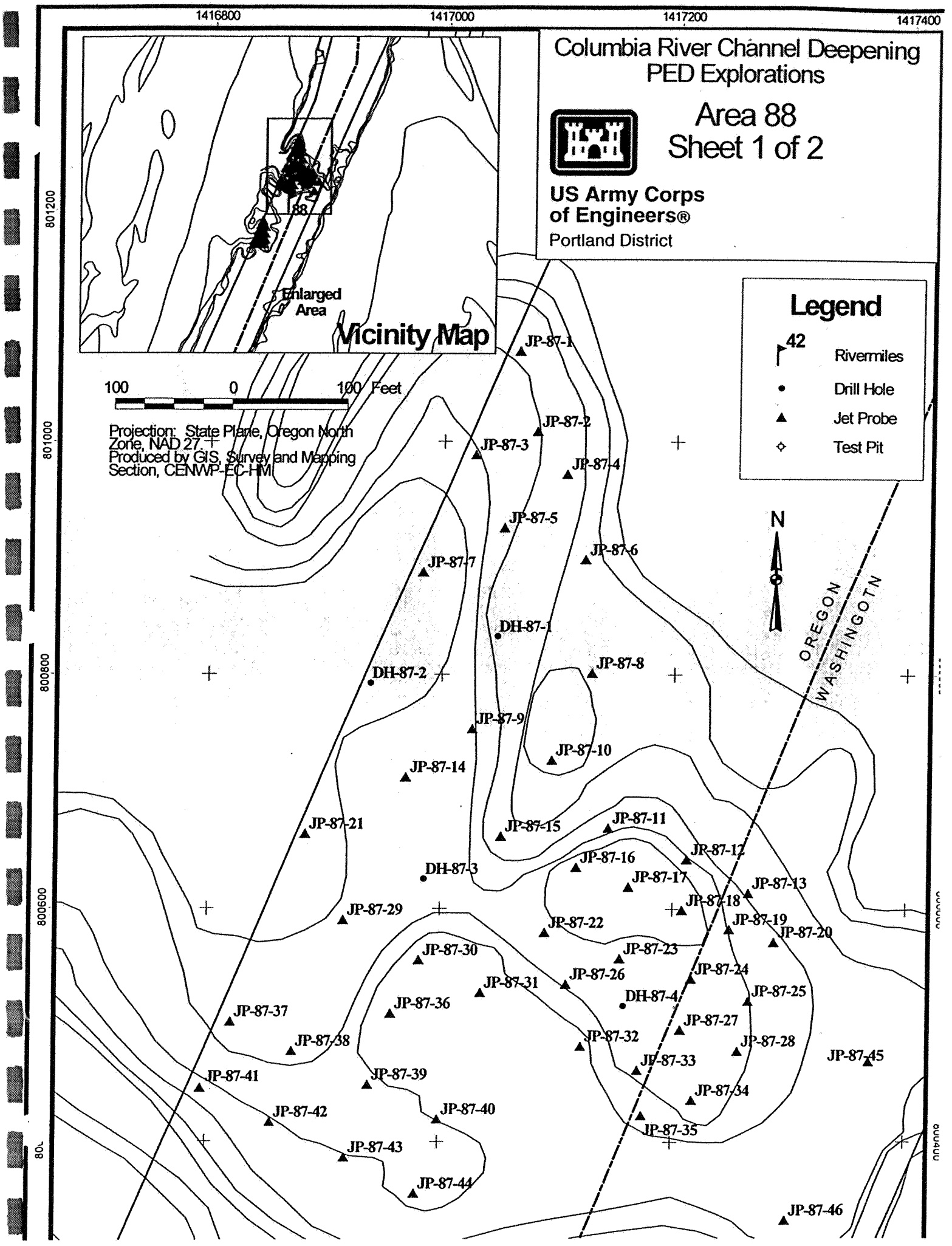
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Sheet 1 of 2
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Projection: State Plane, Oregon North
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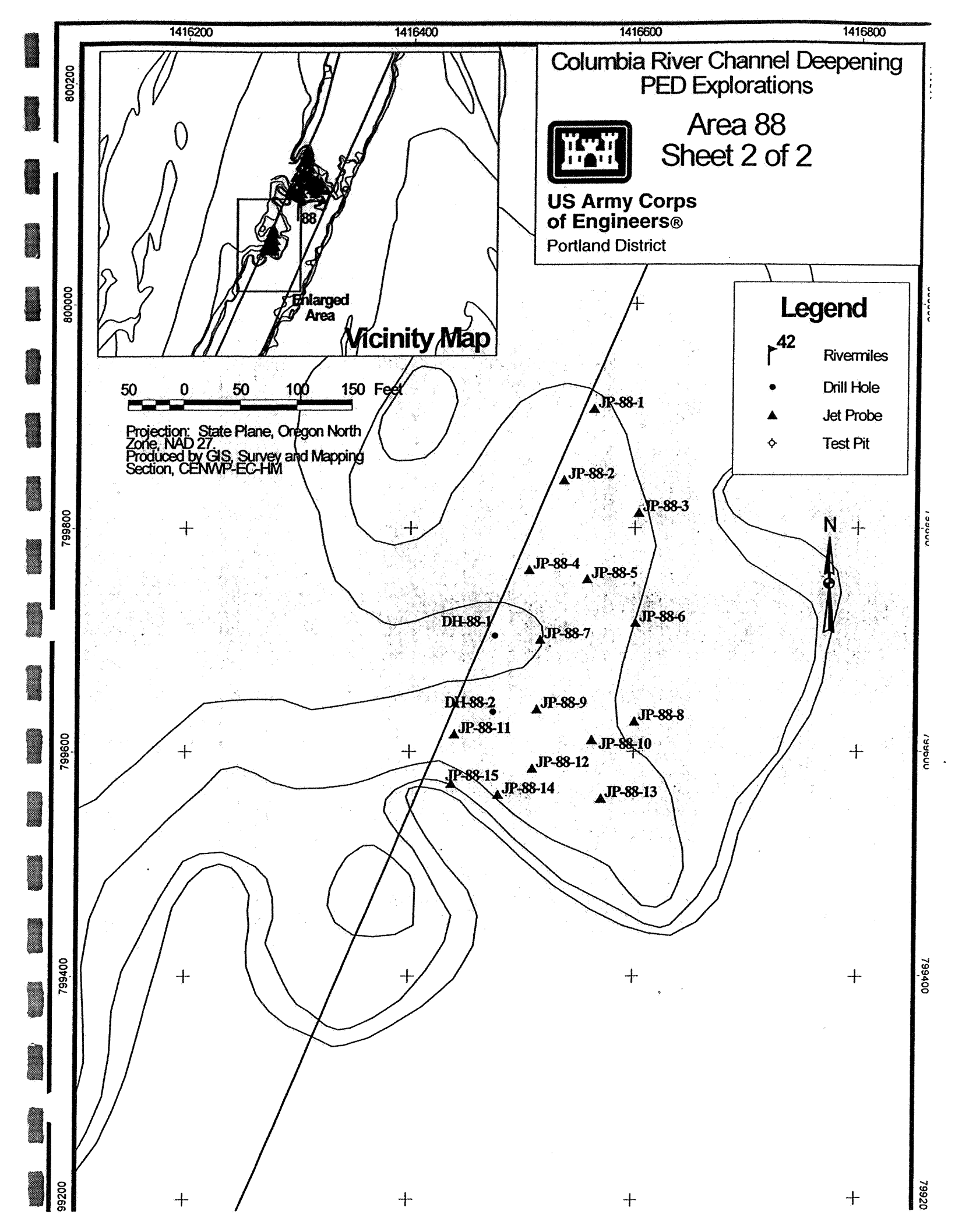
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Columbia River Channel Deepening
PED Explorations
Area 88
Sheet 2 of 2
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of Engineers®
Portland District
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Projection: State Plane, Oregon North
Zone, NAD 27
Produced by GIS, Survey and Mapping
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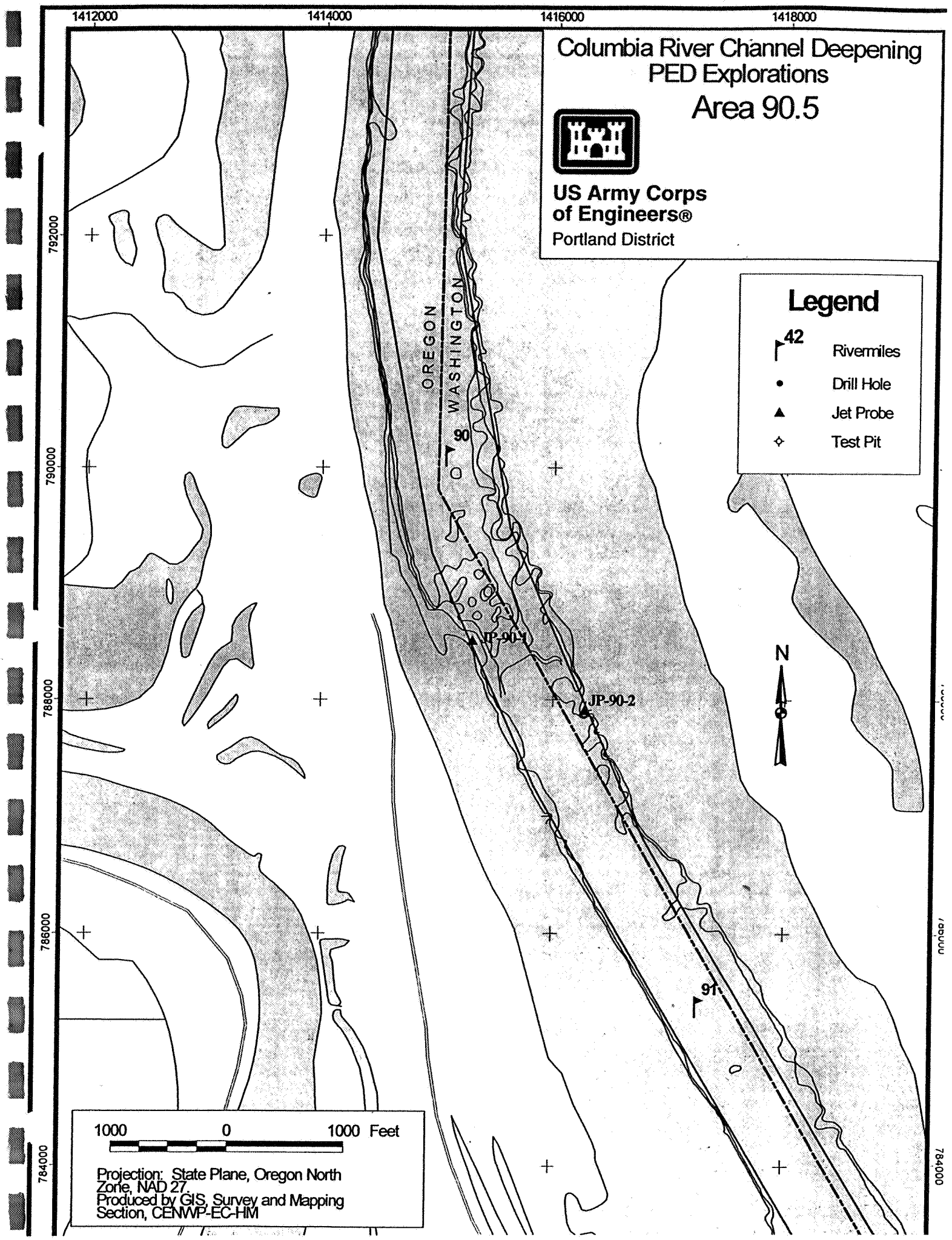
Columbia River Channel Deepening
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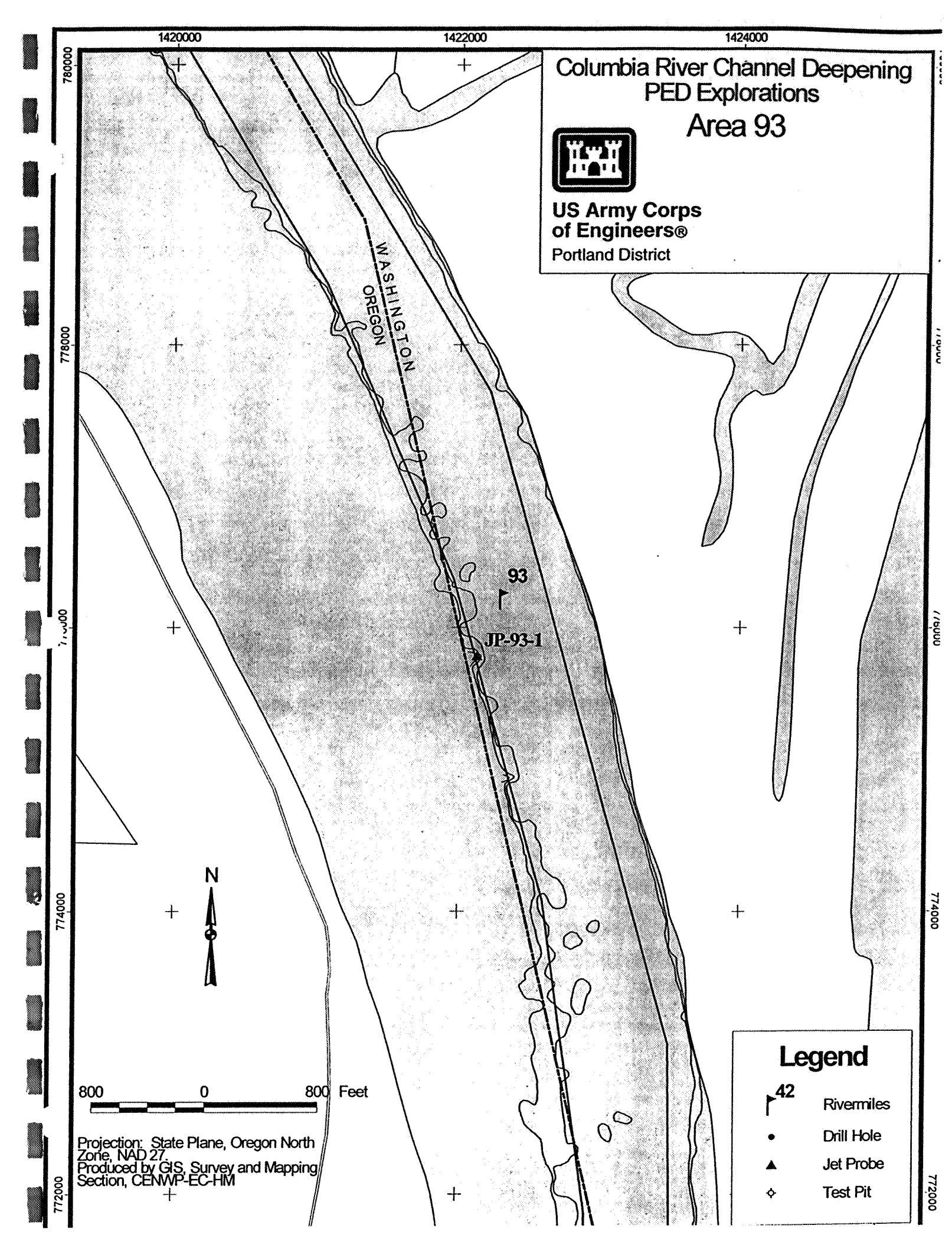
Columbia River Channel Deepening
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Projection: State Plane, Oregon North Zone, NAD 27.
Produced by GIS, Survey and Mapping Section, CENWP-EC-HM
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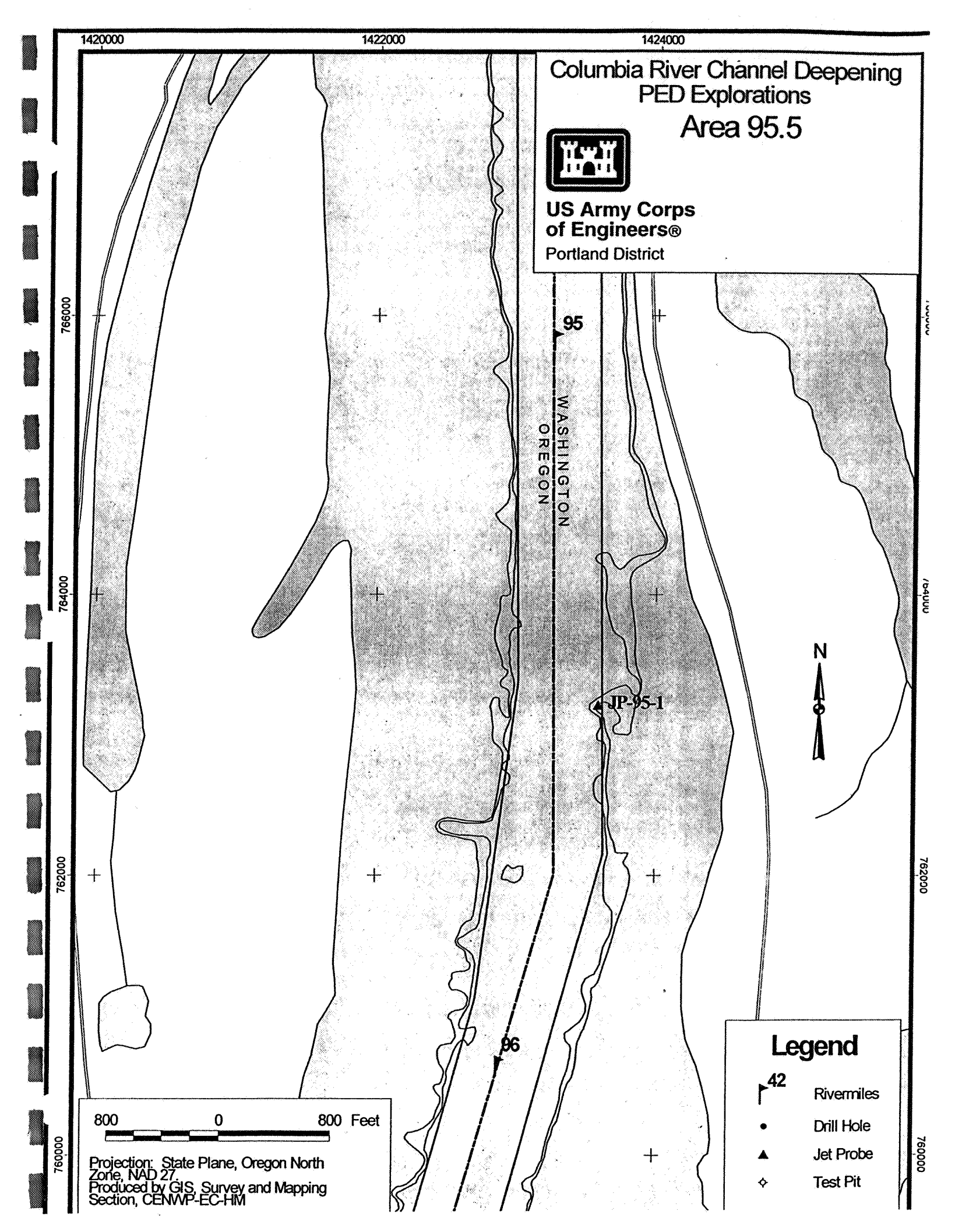
Rivermiles
Drill Hole
Jet Probe
Test Pit


Columbia River Channel Deepening
PED Explorations
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Projection: State Plane, Oregon North Zone, NAD 27.
Produced by GIS, Survey and Mapping Section, CENWP-EC-HM
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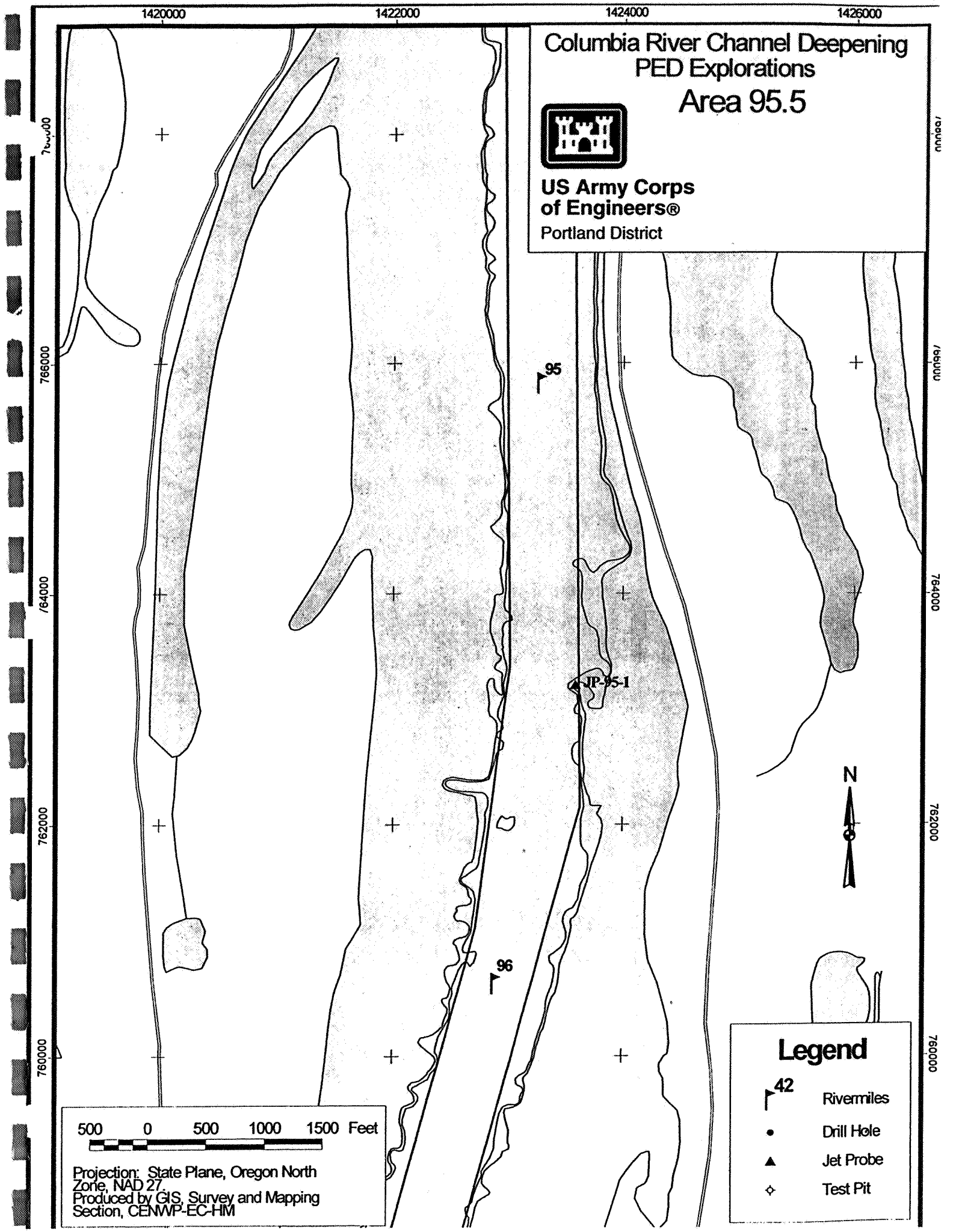
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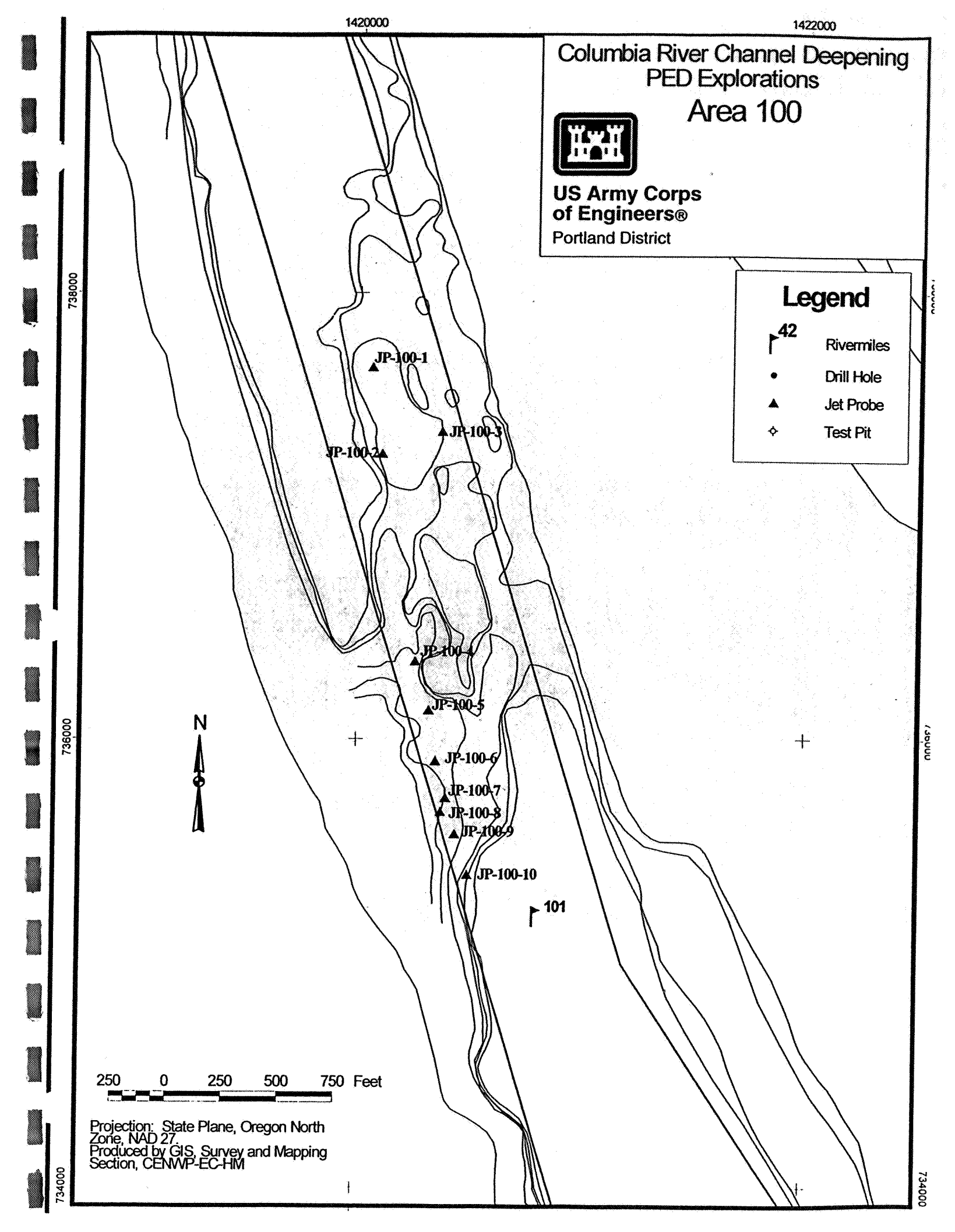
Projection: State Plane, Oregon North
Zone, NAD 27.
Produced by GIS, Survey and Mapping
Section, CENWP-EC-HM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Columbia River Channel Deepening
PED Explorations
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US Army Corps
of Engineers®
Portland District
Legend
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Rivermiles
Drill Hole
Jet Probe
Test Pit
JP-100-1
JP-100-2
JP-100-3
JP-100-4
JP-100-5
JP-100-6
JP-100-7
JP-100-8
JP-100-9
JP-100-10
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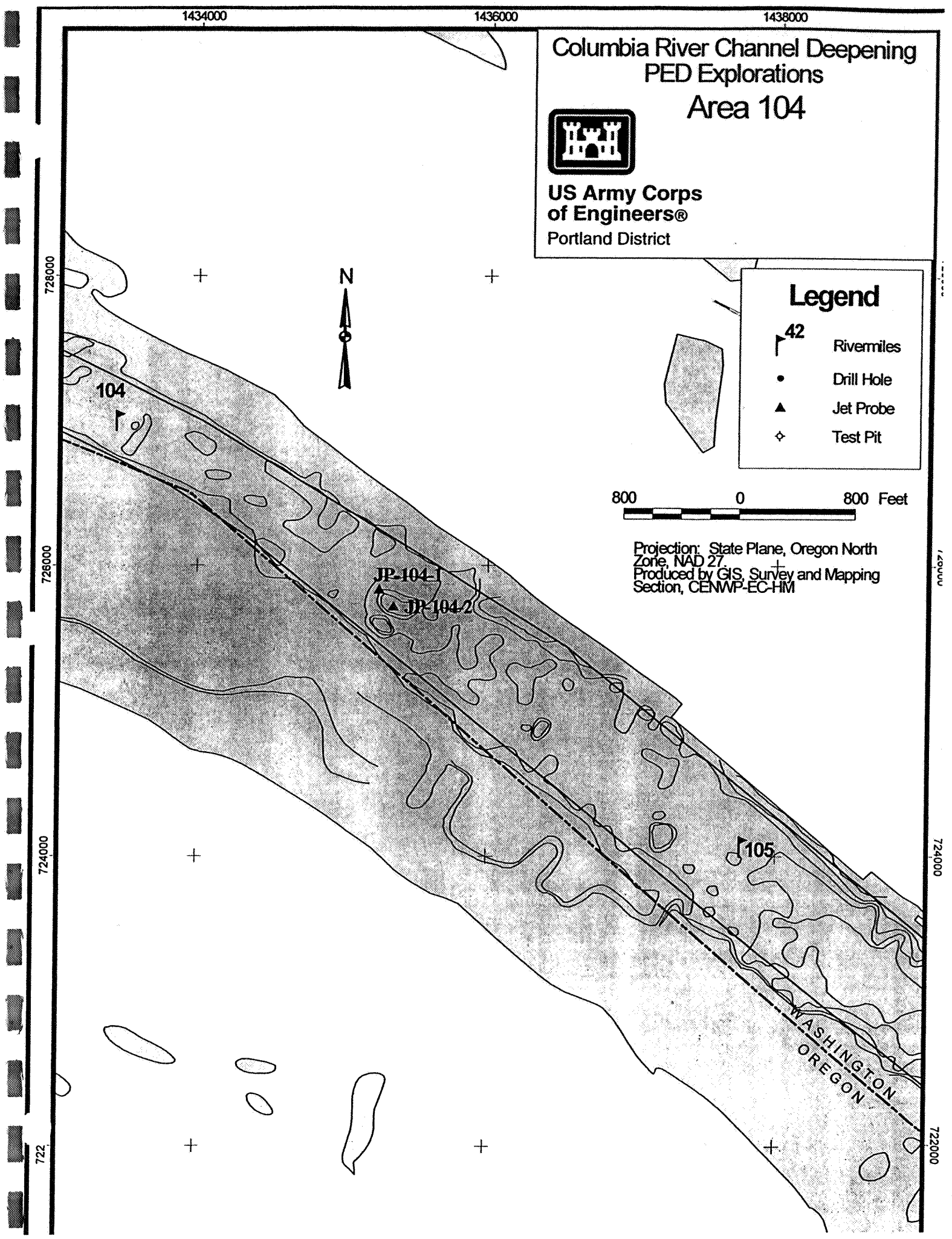
Projection: State Plane, Oregon North Zone, NAD 27.
Produced by GIS, Survey and Mapping Section, CENWP-EC-HM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Drill Hole
Jet Probe
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Projection: State Plane, Oregon North Zone, NAD 27.
Produced by GIS, Survey and Mapping Section, CENWP-EC-HM
WASHINGTON
OREGON

APPENDIX B

Exploration Logs

Test Pit Logs

SOIL DESCRIPTIONS

Sample log: Soil strength, modifier NAME; trace/some/matrix, color and color variations, moisture, plasticity or grain description, structure, cementation, torvane/PP, other.
Field Summary Log: Interpreted contacts, changes in drilling, drillers comments, unit descriptions such as interbedded, gradational changes, boulders, (unit name/origin).

Field Identification	Cohesive soils			Granular Soils	
	SPT	Su Tsf	Term	SPT	Term
Easily penetrated several inches by fist.	0 - 1	<0.125	Very Soft	0 - 4	Very Loose
Easily penetrated several inches by thumb.	2 - 4	0.125 - 0.25	Soft	5 - 10	Loose
Can be penetrated several inches by thumb with moderate effort.	5 - 8	0.25 - 0.50	Medium Stiff (Firm)	11 - 30	Medium Dense
Readily indented by thumb but penetrated only with great effort.	9 - 15	0.50 - 1.0	Stiff	31 - 50	Dense
Readily indented by thumbnail.	16 - 30	1.0 - 2.0	Very Stiff	> 50	Very Dense
Indented with difficulty by thumbnail.	31 - 60	> 2.0	Hard		

modifiers: 30-50%, silty, sandy, clayey, gravely, organic, or other significant modifier (angular, cemented)
NAME: SILT, SAND, CLAY, GRAVEL, COBBLES
with: some 15 - 30%, trace 5 - 15%
color: primary color - mottled, stained, etc.

Term	Soil Moisture Field Description
Dry	Absence of moisture. Dusty. Dry to the touch.
Damp	Soil has moisture. Cohesive soils are below plastic limit (BPL) and usually moldable.
Moist	Grains appear darkened, but no visible water. Silt/clay will clump. Sand will bulk. Soils are often at or near plastic limit.
Wet	Visible water on larger grain surfaces. Sand and cohesionless silt exhibit dilatancy. Cohesive silt/clay can be readily remolded. Soil leaves wetness on the hand when squeezed. "Wet" indicates that the soil is wetter than the optimum moisture content and above plastic limit (APL).

Term	PI	Plasticity Field Test
Nonplastic	0 - 3	Cannot be rolled into a thread.
Low plasticity	3 - 15	Can be rolled into thread with some difficulty.
Medium Plasticity	15 - 30	Easily rolled into thread.
High Plasticity	> 30	Easily rolled and rerolled into thread.

Grain lithology / Grain Shape: angular, subangular, subrounded, rounded
Gradation: well graded, poorly graded, uniformly graded, gap graded
Hardness and weathering of gravel and cobbles

Term	Soil Structure Criteria
Stratified	Alternating layers at least 1 inch thick - describe variation
Laminated	Alternating layers at less than 1 inch thick - describe variation
Fissured	Contains shears and partings along planes of weakness
Slikensides	Partings appear glossy or striated
Blocky	Breaks into lumps - crumbly
Lensed	Contains pockets of different soils - describe variation

Term	Soil Cementation Criteria
Weak	Breaks under light finger pressure
Moderate	Breaks under hard finger pressure
Strong	Will not break with finger pressure

(Unit Name/Origin): Origin of the deposit (residual, colluvial, alluvial, fill, etc.) and or name of commonly known mapped units (Willamette Silt).

Picture 1+2 of barge 'KOLL#1'
3 of pile

CH2M HILL

RIVER EL: +2.2 CRD 8:06 am
+2.0 CRD 8:30 am

PROJECT NUMBER 159184.B1.TP | TEST PIT NUMBER TP-1 | SHEET 1 OF 1

TEST PIT WALL LOG

PROJECT C.R. Channel Deepening LOCATION Longview Area 66 MAP OF WALL OF PIT
ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/11/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER H. Guettel
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

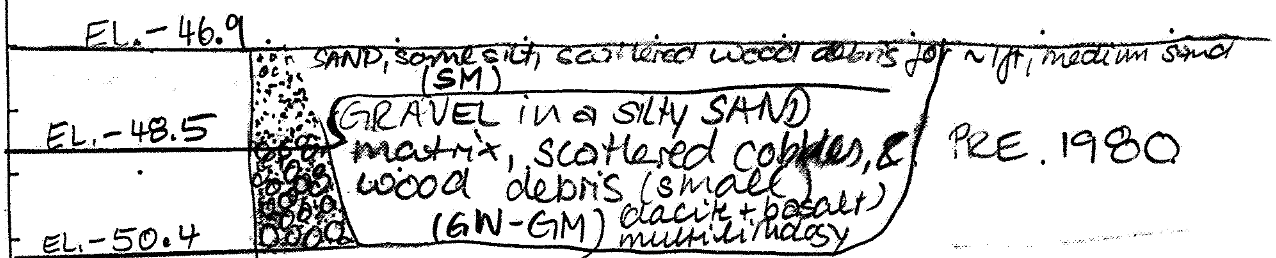
DEPTH BELOW SURFACE (FT) | SAMPLE: ~~INTERVAL~~ / NUMBER AND TYPE

Sample: CRD

1st - SAND, some gravel at bottom (SM)
2nd - -11- (SM)
3rd - -11- (SM)
4th - -11- maybe GRAVEL in silty SAND matrix. (GW-GM)
5th - GRAVEL, sand, scattered cobbles (GW-GM)
6th = -11-
7 = -11-
8th = -11-
9th = -11-
10th = -11-
11th = little gravel recovery
12th = GRAVEL, some sand
13' = double bite - GRAVEL (GW-GM)

GRAVEL IN A SILTY SAND MATRIX, SCATTERED COBBLES AND SMALL WOOD DEBRIS, GREY, WET, SOME IRON STAINING, ROUNDED & SUBROUNDED GRAVEL & COBBLES, GRAVEL IS WELL GRADED. MAX COBBLE SIZE ≈ 11", multilithology, (dacite + basalt)

49 - 46.9
50 - 47.9
48.9
52 - 49.9



LENGTH (FT)

COMMENTS

Start: 8:06 am
1st - 49.1' River bottom depth.
2nd - 49.5'
3rd - 50.5'
4th - 50.7'
5th - 50.7'
6th - 50.7'
7th - 50.8'
8th - 51.3'
9th - 51.5'
10th - 51.6'
11th - 51.5'
12th - 51.6'
13th - 51.8'
(Depths before scoop was taken.)
FINAL: 52.4'
(bottom of hole at EL. -50.4 ft)

Hard digging below EL. -48.5 ft.
End: 8:30 am

Figure 2

TEST PIT WALL LOG
FORM D1599

RIVER EL: +1.7' CRD 11 am
+1.9' CRD 11:25 am

PROJECT NUMBER	TEST PIT NUMBER	SHEET
159184.B1.TP	TP-3	1 of 1

TEST PIT WALL LOG

PROJECT CR. Channel Deepening LOCATION Area 66 MAP OF WALL OF PIT
ELEVATION CRD CONTRACTOR Hickey Marine DATE EXCAVATED 8/11/00
WATER LEVEL AND DATE EXCAVATION METHOD Shell Clam LOGGER H. Guettler
APPROXIMATE DIMENSIONS: LENGTH WIDTH DEPTH REMARKS

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE		
CRD			1st - SAND; 1 log ~8' long, 3" ø 2nd - SAND; some gravel at bottom, rest of log 10' (see above) 3rd - -11- no log 4th - -11- gravel probably at bottom 5th - scattered cobbles, more gravel, sand on top 6th - Gravel, some silt + sand, scattered cobbles 7th - -11- 8th - Gravel, scattered cobbles, rounded 9th - one angular boulder ≈ 13" long 6" wide, rest gravel 10th - SAND, some gravel 11th - Gravel, scattered cobbles, sand 12th - -11-
47 = 45.3			- EL. -45.3
48		Mt. St. Helens Post 1980	SAND; some silt; scattered gravel and wood debris, 1 large log, broken in 2 pieces, grey, wet, medium grained sand, rounded gravel, multilithology (SM)
47.3			EL. -47.7
50 = 48.3		Pre Mt. St. Helens	GRAVEL in a silty SAND matrix; scattered wood + cobbles debris, grey, wet, rounded, well graded gravel with multilithology, (dacite, basalt and shore). Biggest boulder (only 1) ≈ 13". cobbles up to 12". (GW-GM)
49.3			
52			BOTTOM OF TP-3 @ EL. -50 ft.

LENGTH (FT)

COMMENTS

Start: 11:00 am (RIVER BOTTOM)
1st - 47'
2nd - 48.5'
3rd - 48.8'
4th - 48.8'
5th - 50.1'
6th - 49.9'
7th - 49.9'
8th - 50.5'
9th - 50.2'
10th - 50.4'
11th - 51.5'
12th - 50'
13th - 51.9' FINAL

Depths indicate ground surface before scoop was taken.

FIRST EASY THEN HARDER DIGGING (below EL. -47.7 ft)
Bottom of TP-3 @ EL. -50 ft

END: 11:25 am

Figure 2

TEST PIT WALL LOG
FORM D1599

REV 7/86 FORM D1599

DIS202.11

Picture # 4 pile Roll #)

CRHILL

RIVER EL: +1.8 CRD 9:23am
+1.8 CRD 9:41 am

PROJECT NUMBER	TEST PIT NUMBER	SHEET	OF
159184.B1.TP	TP-2	1	1

TEST PIT WALL LOG

PROJECT C.R. Channel Deepening LOCATION Area 66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/11/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER H. Gustted
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE
	C	
	R	
	D	
45	43.2	
46	44.2	
	45.2	
48		
	47.2	
50		
51	49.2	
52	50.2	

1st – SAND, scattered gravel, scattered wood debris (small), (SM)
2nd – –11–
3rd – –11–
4th – –11–
5th – –11– 2 log ~ 3-4' long 3" ø
6th – SAND; scattered gravel + wood (small)
7th – –11–
8th – SAND; gravel with silt + sand @ bottom, diff. grey
9th – –11–
10th – –11– scattered cobbles up to 10", very round
11th – –11– scattered wood debris, no cobbles, log 1"~3" ø
12th – SAND, scattered gravel
13th –

EL. -43.3 ft

SAND; some silt, scattered gravel and wood debris, grey, wet, medium grained, poorly graded sand, rounded gravel (dacite), well graded gravel. (SM)

- Areas of concentrated gravel in silt & sand either in lenses or layers (thin). Almost all gravel is dacite.

Mt. St. Helens deposits

POST 1980

EL. -50.3 ft

COMMENTS

Start: 9:22
1st @ 45.1) RIVER BOTTOM
2nd @ 45.3'
3rd @ 47.5'
4th @ 48'
5th @ 48.5'
6th @ 48.8'
7th @ 49.0'
8th @ 50'
9th @ 50.3'
10th @ 50.6'
11th @ 51'
12th @ 51.7'
13th @ 52.1) FINAL

Depths before scoop was taken.

EASY DIGGING

END 9:41 a

Bottom of hole at EL. -50.3 ft.

Figure 2

TEST PIT WALL LOG
FORM D1599

LENGTH (FT)

Pi[redacted]ct[redacted] #5 Roll [redacted] #6 pile + gravel [redacted] [redacted]

CH2M HILL

RIVER EL: +2.7 CRD 12:09pm
+3.2 CRD 12:35pm
+3.4 CRD 12:44pm

PROJECT NUMBER 159184.B1.TP | TEST PIT NUMBER TP-5 | SHEET 1 OF 1

TEST PIT WALL LOG

PROJECT C.R. Channel Deepening LOCATION Area 66 MAP OF ___ WALL OF PIT
ELEVATION ___ CONTRACTOR Hickey Marine DATE EXCAVATED 8/11/00
WATER LEVEL AND DATE ___ EXCAVATION METHOD clam shell LOGGER H. Guettel
APPROXIMATE DIMENSIONS: LENGTH ___ WIDTH ___ DEPTH ___ REMARKS ___

DEPTH BELOW SURFACE (FT)	SAMPLE	NUMBER AND TYPE	Log	Comments
	CRD ①		1st - SAND; scattered gravel 2nd - -"- ; scattered wood debris ~ 9"; 3" ø 3rd - -"- some brownish gravel @ bottom w/silt 4th - more gravel w/ silt; some sand 5th - 1 boulder, some sand, not mud recover 1.5' ø 6th - SAND; some gravel, scattered cobbles = boulder 7th - -"- no boulders 8th - SAND; some gravel at bottom 9th - SAND; trace gravel 10th - -"-	Start: 12:09pm 1st - 45.7') RIVER BOTTOM 2nd - 46.9' 3rd - 47' 4th - 47.8' 5th - 48.7' 6th - 48.7' 7th - 49' 8th - 48.8' 9th - 49.4' 10th - 49.7' 11th = 50.2' 12th = 50.3' 13th = 50.4' 14th = 51.1' 15th = 51.2' 16th = 51.5' 17th = 50.7 18th = 52' 19th = 52.9' 20th = 52.9' 21st - 52.9' } Top of ground surface before each scoop.
45 42.3		EL-43.0'	SAND, some silt, scattered gravel and wood debris, grey, wet, medium grained, gravel is fine < 1", rounded multilithology gravel (SM) basalt + dacite; pieces of gravel in silt matrix; 3 boulders 1.5' ø EL-46.2 ft	11th - sand top, gravel bottom 12th - Gravel + 1 cobble 13th - -"- 14th - -"- 15th - -"- 16th - -"- 17th - gravel some cobbles 18th - 1 boulder scattered cobbles 19th - sand (top) gravel (bottom) 20th - cobbles + 2 boulders angular basalt partly rounded 21st - -"- 22nd - gravel, cobble PRE-AND POST 1980
47 44.3				
49 46.3		EL-46.2'	GRAVEL in a silt matrix, some sand, scattered cobbles + wood debris, occasional boulder, grey, some brown, wet, gravel is rounded, well graded, multilithology, cobbles are rounded, angular (broken up) and subangular, boulders mostly subangular, max boulder 1.5' ø basalt + dacite, cobbles up to ≥12". (GM)	
51 48.3				
53 50.3		EL-50'	BOTTOM OF TP-5 @ EL -50 ft	HARD DIGGING below EL-47 ft 22nd - 53' 23rd - 53.4' FINAL

LENGTH (FT) End at 12:45pm

Figure 2
TEST PIT WALL LOG
FORM D1599

RIVER DEPTH: +1.7' CRD 10:08a
+1.6' CRD 10:30am

PROJECT NUMBER	TEST PIT NUMBER	SHEET / OF
159184.81.TP	TP-4	1 OF 1

TEST PIT WALL LOG

PROJECT C.R. Channel Deepening LOCATION Area 66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/11/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER H. Guettel
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	
	C R D	1st – SAND; scattered gravel + wood debris 2nd – –11– 3rd – –11– 4th – –11– 5th – –11– 6th – SAND, some more gravel at bottom or a lens 7th – –11– 8th – –11– 9th – –11– brownish color with gravel 10th – –11– 11th – –11– 12th – –11– 1 cobble, rounded, basalt 13th – –11–
		EL. – 42.4 ft
44 – 42.3		SAND; some silt, scattered to trace gravel, occasional cobble (up to 10"), scattered wood debris (small), grey, some brownish silt, wet, iron stained in areas, medium sand, rounded gravel, mostly dacite some basalt, a.o., well graded gravel, mostly < 2" some up to 3". PRE- AND POST ST. HELENS DACITE. (SM)
45 – 43.3		
46		
47 – 45.3		
48		
49 – 47.3		
50		
51 – 49.3		EL. – 50.1 ft (End of TP-4)
52 – 50		

LENGTH (FT)

COMMENTS
Start: 10:08a RIVER BOTTOM
1st – 44.1'
2nd – 46'
3rd – 47'
4th – 48.1'
5th – 48.2'
6th – 49'
7th – 49'
8th – 49.8'
9th – 50'
10th – 50.2'
11th – 50.6'
12th – 50.6'
13th – 51.0'
Depths indicate top of ground surface before scoop was taken
FINAL: 51.7'

Bottom of TP-4 at EL. – 50.1 ft

EASY DIGGING

Same as TP-2

End 10:30 am

Figure 2

TEST PIT WALL LOG
FORM D1599

REV 7/86 FORM D1599

RIVER EL: +4.1 CRD 2:43p-
+4.1 CRD 3:05pm
+4.0 CRD 3:09pm

PROJECT NUMBER	TEST PIT NUMBER	SHEET
159184.31.TP	TP-6	(OF)

TEST PIT WALL LOG

PROJECT C.R. Channel Deepening LOCATION AREA 66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR HICKEY MARINE DATE EXCAVATED 8/10/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD ____ LOGGER H. Guettel
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE		
49	45		EL. -45.4 ft
50	46	EL-46.9	SAND, trace gravel + cobbles, some silt, scattered wood debris (SW-SM)
52	48		GRAVEL in a silty SAND matrix; scattered cobbles, boulders & wood debris, grey, wet, rounded gravel and cobbles; multilithology, basalt, diacite boulders are basalt, some look like they got broken up by clam shell bucket, max 4' boulder well graded gravel, fine to med. sand (GM)
54	50	EL-50.1	

1st - SAND, small log ~2" x 3' long
2nd - SAND, gravel with scattered cobbles + boulders 2' to 3' at bottom
3rd - SAND; scattered boulders 2' basalt, broken up - broken wood debris
4th - GRAVEL, SAND, SILT
5th - SAND; GRAVEL with sand + silt at bottom
6th - -11- scattered cobbles
7th - -11-
8th - -11- wood fragments 2"
9th - -11-
10th - gravel + sand + silt recovery
11th - -11-
12th - boulders, max 4' subrounded, basalt, -11-
13th - -same as above-
14th - -11- no boulders
15th - -11-
16th - -11-
17th - -11-
18th - silt, gravel, sand, cobbles

4' boulder basalt subrounded at EL-49.5 ft

COMMENTS
Start: 2:40 pm
1st - 49.5' RIVER BOTTOM
2nd - 50'
3rd - 50.6'
4th - 51.0'
5th - 51.2'
6th - 51.8'
7th - 51.7'
8th - 52'
9th - 53.1'
10th - 53.1'
11th - 53.5'
12th - 53.6'
13th - 53.5'
14th - 53.6'
15th - 53.6'
16th - 53.6'
17th - 53.7'
18th - 54.1' HARD!!!
Top of ground surface before each scoop

HARD DIGGING BELOW EL-47.0 ft

END 3:08 pm

LENGTH (FT) | PRE 1980

Figure 2

TEST PIT WALL LOG
FORM D1599

Bottom of TP-6 @ 50.1 ft.

REV 7/86 FORM D1599

IS202.11

Picture 25 Disposable #1 Clam Shell

RIVER EL: +4.4' CRD (2:10pm)
EL: 4.3' (2:22pm)

PROJECT NUMBER	TEST PIT NUMBER	SHEET
159184.81.TP	TP-7	1 OF 1

TEST PIT WALL LOG

PROJECT C.R. Channel Deepening LOCATION Area 66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8-10-00
WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER H. Guethel
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE
	C R 1	
50	45.7	POST 1980
51	46.7	
52		
53	48.7	PRE 1980
54		
55	50.7	

1st - SAND, trace gravel at bottom
2nd - —11—
3rd - GRAVEL, some sand + silt, rounded
4th - —11—
5th - (cobble) (boulder @ 13'.) —11—, basalt

(2) GRAVEL; with sand and silt scattered cobbles & wood debris (small) occasional boulder, rounded gravel, multilithology basalt + dacite, cobbles are rounded, boulder is basalt + subrounded. (GW-GM)

EL - 45.7' H
SAND, some silt, scattered wood debris + gravel, grey, wet, medium grained, rounded small gravel, dacite (SM)
EL - 47.6' H
(2) (GW-GM)
EL - 50.3' H

COMMENTS
START: 2:11 pm RIVER BOTTOM
1st - 50.1'
2nd - 51.5'
3rd - 52'
4th - 53'
5th - 54' } Top of each scoop
FINAL 54.5'
Bottom of TP-7 @ 50.3'

Easy to moderate digging

END 2:22pm
Backfill hole

LENGTH (FT)

Figure 2

TEST PIT WALL LOG
FORM D1599

IS208-11 REV 7/86 FORM D1599

Picture #24 Description #1

RIVER EL: +4.2 ' CRD 1:16pm
+4.3 CRD 1:36pm
+4.3 " 1:39p

PROJECT NUMBER	TEST PIT NUMBER	SHEET	OF
159184.31.TP	TP-8	1	1

TEST PIT WALL LOG

PROJECT C.R. Channel Deepening LOCATION Area 66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/10/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER H. GUETTEL
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE		
	C R D		1st – SAND, scattered gravel, cobbles & wood debris 2nd – SAND 3rd – GRAVEL, SAND, SCATTERED WOOD DEBRIS 4th – GRAVEL, sand, scattered cobbles + boulders (15"ø) 5th – 1 boulder, scattered cobbles, sand 6th – No boulder —"— 7th – GRAVEL, scattered cobbles, sand 8th – —"— 9th – —"— 10th – —"— . . iron staining, silt stuck to 11th – —"— gravel pieces, some angular 12th – —"— basalt cobbles & boulders (~13"-15") 13th – —"—
49			EL. – 49.7 ft
50	45.7	POST 1980 EL. 49.7	SAND, scattered gravel & wood debris, some silt, grey, wet, medium sand, poorly graded, multilithology, roundedge (SM)
51			
52	49.7	PRE 1980	GRAVEL in a sandy SILT matrix, scattered cobbles, boulders and wood debris, grey, iron stained, wet, rounded gravel, well graded, cobbles + boulders are mostly (angular, some subrounded, mostly basalt,
53			
54	49.7		multilithology gravel (basalt, dacite, ..) (GM)
			EL – 50.2 FT

LENGTH (FT)

COMMENTS
START: 1:15pm
1st – 49.9' RIVER BOTTOM
2nd – 50.1'
3rd – 51.2'
4th – 51.3'
5th – 51.3'
6th – 51.2'
7th – 52'
8th – 52.1'
9th – 52.5'
10th – 52.5'
11th – 53.1'
12th – 54'
13th – 54.1'
Depths indicate ground surface before scoop was taken
FINAL: 54.5'
END 1:39p

HARD DIGGING BELOW EL. – 47.5 ft

Bottom of TP-8 at EL. – 50.2 FT.

Figure 2

TEST PIT WALL LOG
FORM D1599

REV 7/86 FORM D1599

DIS202.11

CH2M HILL

RIVER EL: + 3.5' CRD (12:10 pm)
+ 3.8 CRD (12:30 pm)
12:35 pm

PROJECT NUMBER	TEST PIT NUMBER	SHEET	OF
159184.B1.TP	TP-9	1	1

TEST PIT WALL LOG

PROJECT C.R. Channel Deepening LOCATION Area 66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/10/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER H. GUETTEL
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE
46	C R D	
47		
48		
49	45.6	
50		
51	47.6	
52		
53	49.6	

1st – SAND
2nd – SAND, SILT, GRAVEL, COBBLES
3rd – —11— (11"-14" ø)
4th – 4 cobble to boulder size pieces, gravel, sand
5th – 1 boulder 15" ø, scattered cobbles, sand + gravel
6th – 3' ø boulder —11— sub angular
7th – SAND, COBBLES, WOOD up to 2' long 4" thick
8th – SAND, GRAVEL, COBBLES, ROUNDED
9th – —11—
10th – —11—
11th – GRAVEL, SAND, SCATTERED COBBLES
12th – —11—, scattered boulders
13th – —11— no boulders.

WOOD

iron staining, subrounded basalt boulders, broken by clam shell bucket

EL. – 45.6 ft

SAND, some silt, scattered gravel, wet, medium grain size, poorly graded, (SM)

EL. 47.4

GRAVEL in a silty SAND matrix, scattered cobbles, occasional boulders and wood debris, grey, iron-stained, wet, rounded to subrounded gravel, cobbles & boulders, gravel is well graded, boulders up to 3' ø, boulders are basalt. (GM)

EL. – 50.1

PRE 1980

LENGTH (FT)

COMMENTS

START: 12:10 pm
1st – 49.1' = RIVER BOTTOM
2nd – 50'
3rd – 50.4'
4th – 50.8'
5th – 51.2'
6th – 52.1'
7th – 52.5'
8th – 52.5'
9th – 52.6'
10th – 52.7'
11th – 53.5'
12th – 53.8'
13th – 53.8'
FINAL: 53.9'

DEPTHS INDICATE GROUND SURFACE BEFORE SCOOP WAS TAKEN

BOTTOM OF TP-9 @ EL. = 50.1 FT.

End 12:35p

HARD DIGGING BELOW EL. -48.0'

Figure 2

TEST PIT WALL LOG
FORM D1599

CH2MHILL

RIVER EL: +2.6' (11:14 am) CRD
+2.8' (11:36 am)

PROJECT NUMBER	TEST PIT NUMBER	SHEET	OF
159184.B1.TD	TP-10	1	1

TEST PIT WALL LOG

PROJECT C.R. CHANNEL DEEPENING LOCATION AREA 66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/10/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER H. Guethel
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	
			CRD
			1st – SAND
			2nd – SAND
			3rd – SAND; gravel at bottom
			4th – "
			5th – "
			6th – "
			7th – "
			8th = "
			9th = "
			10th = "
			11th = "
			12th = "
			gravel embedded in silt (lenses) scattered wood debris
45	42.4		EL-42.4 ft
46	43.4	POST 1980	SAND; scattered gravel (fine) and wood debris (small), some silt, grey, wet, medium sand, poorly graded, gravel is rounded multilithology. < 1/2". (SP-SM)
48	45.4		EL.-46.5 ft
50	47.4	PRE 1980	GRAVEL in a sandy SILT matrix; scattered wood debris (small), grey, wet, rounded gravel, fine to medium size (< 2.5"), fine sand. Gravel has multilithology; mostly diorite. (GM)
52	49.4	EL-50.5	NOTE: GRAVEL LAYER IS A GUESS. IT COULD BE LENSES IN SAND, BUT IT WAS ALWAYS AT BOTTOM OF CLAM SHELL.

LENGTH (FT)

COMMENTS

Start: 11:12 am
1st – 45' RIVER BOTTOM
2nd – 46'
3rd – 48'
4th – 49'
5th – 49.1'
6th – 49.5'
7th – 51.1'
8th – 51.5'
9th = 52.2'
10th = 52.5'
11th = 52.1'
12th = 52.1'
TOP OF EACH SCOOP INDICATES GROUND SURFACE BEFORE SCOOP WAS TAKEN

FINAL = 53.2'

BOTTOM OF TP-10 @ EL-50.5 ft
Moderate to easy digging THROUGHOUT

END: 11:35 am

Figure 2

TEST PIT WALL LOG
FORM D1599

REV 7/86 FORM D1599

IS202.11

Picture 23 Disposable #1

RIVER EL: + 1.8 CRD 10:10
+ 1.9 CRD 10:26

PROJECT NUMBER	TEST PIT NUMBER	SHEET / OF
159184.81.TP	TP-11	1 / 1

TEST PIT WALL LOG

PROJECT C.R. Channel Deepening LOCATION Area 66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/10/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER H. Guenther
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE
	CRD	
48	46.1	
50	48.1	
52	50.1	

1st – GRAVEL, some sand, silt, scattered cobbles + wood debris
2nd – GRAVEL, sand, rounded, silt brownish-grey
3rd – GRAVEL, sand, silt, scattered cobbles
4th – –11–
5th – –11–
6th: –11–
7th: –11– iron staining total 3 boulders 2' Ø. at EL.-49 and below

GRAVEL, in a silty SAND matrix, scattered cobbles and wood debris (very small), occasional boulders, grey, some brownish color probably fra iron staining, wet, rounded gravel, well graded, fine to medium grained sand, gravel is iron stained, mostly dacite, little basalt, subrounded boulders. (GM)

EL. -47.0 ft

POST 1980
EL.-48'

PRE 1980

EL-50.1 ft

GRAVEL, some sand + silt, (GM) scattered cobbles & boulders (2-3')

COMMENTS

Start: 10:10
1st – 48.8' RIVER BOTTOM
2nd – 49.2' GROUND SURFACE BEFORE SCOOP WAS TAKEN
3rd – 50.4'
4th – 50.9'
5th – 51.0'
6th – 51.7'
7th – 51.8'
FINAL 52'
End: 10:26 am

BOTTOM OF TP-11 @ EL-50.1 FT.

HARD DIGGING from top

Figure 2

TEST PIT WALL LOG
FORM D1599

LENGTH (FT)

REV 7/86 FORM D1599

RIVER EL: +4.0 CRD 1:45pm
+3.9 CRD 2:05pm
±3.8-3.9 CRD 2:15pm (high waves)

PROJECT NUMBER	TEST PIT NUMBER	SHEET
159184.31.TP	TP-12	1 OF 1

TEST PIT WALL LOG

PROJECT C.R. Channel Deepening LOCATION Area 66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/9/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER H. Guettel
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT) | SAMPLE: INTERVAL, NUMBER AND TYPE

CRD

1st: SAND
2nd: Sand, some gravel at the bottom of bucket
3rd: Sand, " " one boulder, approx 2'ø
4th: Sand; some gravel
5th: SAND..., scattered gravel, 1 cobble
6th: SAND, some silt, scattered gravel
7th: " " wood fragment
8th: Sand; gravel at bottom
9th: " "
10th: " "
11th: " "
12th: sand some gravel up to 3" at bottom; silt
13th: 2 boulders, rounded, 2'ø
14th: 1 boulder, 2'ø
15th: SAND; trace gravel, 1 small boulder ~ 12"ø
16th: SAND; scattered cobbles, trace gravel

47
48 -44 EL-43.8

PRE: 1980

SAND, some to trace gravel, and silt, scattered cobbles, boulders, wood debris, grey, wet, rounded gravel, medium grained sand, gravel up to 2½", sand is poorly graded, gravel is mostly dacite (some basalt boulders are basalt) SUB angular to subrounded cobbles are mixed lithology (SM)

50 -46

EL-48.1

52 -48

GRAVEL in a silty SAND matrix, scattered cobbles, boulders and wood fragments; grey, wet, rounded gravel, subangular boulders, dacite gravel + cobbles, basalt boulders & cobbles (GM)

54 -50

EL-50.2

55

17th: SAND GRAVEL, scattered cobbles

LENGTH (FT)

COMMENTS

Start: 1:45pm
1st @ 47.8' RIVER BOTTOM
2nd @ 48.9'
3rd @ 49.8'
4th @ 50.9'
5th @ 51.0'
6th @ 51.0'
7th @ 52.0'
8th @ 52.0'
9th @ 52.1'
10th @ 52.5'
11th @ 52.5'
12th @ 53'
13th @ 53.5'
14th @ 53.5'
15th @ 53.6'
16th @ 53.8
17th @ 53.8
FINAL @ 54.1'

DEPTHS INDICATE TOP OF GROUND SURFACE BEFORE SCOOP WAS TAKEN

HARD DIGGING BELOW EL-48ft

END 2:15pm

Figure 2

TEST PIT WALL LOG FORM D1599

BOTTOM OF TP-12 @ EL-50.2ft

IS202.11

REV 7/86 FORM D1599

Picture 22 Disposable #1

RIVER EL: +1.5 CRD 9:24 am
+1.6 CRD 9:42 am

PROJECT NUMBER 15 9184.81.TP | TEST PIT NUMBER TP-13 | SHEET 1 OF 1

TEST PIT WALL LOG

PROJECT CR Channel Deepening LOCATION Area 66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/10/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER H. Guenther
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	
	C R D		1st: - sand, silt, trace gravel, scattered boulders, 2' ø subrounded 2 pieces angular cobbles, grey-brown color
			2nd - SAND. -11-
			3rd - 1 log = 3.5' long, 5" ø, sand, trace gravel
			4th: SAND, trace gravel, silt, scattered cobbles
			5th: -11-
			6th: sand, trace gravel, scattered cobbles
			7th: sand, trace gravel with cobbles
			8th: ~~more~~ gr SAND, some gravel, scattered cobbles
			9th: -11- 2 boulders, basalt, sub-angular
			10th: sand, gravel, cobbles, boulders
			11th: -11- 1 boulder 3.5' ø Dacite reddish, subround
			12th: GRAVEL, scattered cobbles wood debris
46			13th: -11-
			14th: GRAVEL & SAND; scattered cobbles, rounded
	45.4		EL. -46.4 FT
48	46.4	PRE 1980	SAND, some silt, trace gravel, scattered cobbles, boulders & wood debris, grey, wet, medium sand, rounded gravel, subrounded + subangular cobbles + boulders, gravel is mostly dacite, some basalt, basalt + c+b (SM)
	47.4		EL. -48.7 FT
50	48.4		GRAVEL in a silty SAND matrix, scattered cobbles & boulders & wood debris, grey, wet, rounded gravel, some subrounded, N3½' ø dacite boulder (subrounded), mixed lithology cobbles, mostly dacite. (GM)
	49.4		EL. -50.1 FT
52	50.4		

LENGTH (FT)

COMMENTS

Start: 9:22 am
1st: 47.9' RIVER BOTTOM
2nd: 48.3'
3rd: 48.6'
4th: 49.0'
5th: 49.7'
6th: 50'
7th: 50'
8th: 50.3'
9th: 50.5'
10th: 50.8'
11th: 50.9'
12th: 51.3'
13th: 51.5'
14th: 51.6'
DEPTHS INDICATE GROUND SURFACE BEFORE SCOOP WAS TAKEN
FINAL: 51.7'

Hard diggins below EL -

End 9:42 am

Bottom of TP-13 @ EL-50.1'

Figure 2

TEST PIT WALL LOG
FORM D1599

REV 7/86 FORM D1599

RIVER EL: +1.6 CRD 9:00 am
1.5 CRD 9:10 am

PROJECT NUMBER	TEST PIT NUMBER	SHEET
159184.B1.TP	TP-14	1 OF 1

TEST PIT WALL LOG

PROJECT C.R. Channel Deepening LOCATION Area 66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/10/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER H. Guethel
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	
CRD		1st – SAND, trace to some gravel, scattered cobbles 2nd – –11– 3rd – sand, some gravel, scattered cobbles, angular basalt cobbles 4th – gravel, some sand, silt. 5th – –11– scattered cobbles iron stained, rounded, diacite basalt scattered wood boulders (13'-15')
47		SAND, trace to some gravel and silt, scattered cobbles, boulders and wood debris, grey, wet, medium sand, rounded gravel, iron-stained, multilithology, mostly diacite, few basalt pieces, basalt boulders and cobbles; some diacite c+b, basalt cobbles+boulders are subangular and partly weathered. (SM)
48 = 46.5		EL. -46.9
49 = 47.5		POST-AND PRE-1980 (SM)
50 = 48.5		
51 = 49.5		EL. -50.3 FT
52 = 50.5		
53		

No big wood pieces

LENGTH (FT)

COMMENTS
Start: 9:00 am
1st – 48.5' RIVER BOTTOM
2nd – 49.0'
3rd –
4th – 50.7'
5th – 51.3'
FINAL: 51.8' TOP OF GROUND SURFACE BEFORE SCOOP WAS TAKEN
End 9:10 am

Moderate Digging Throughout

Bottom of TP-14 @ EL -50.3 ft

Figure 2

TEST PIT WALL LOG
FORM D1599

REV 7/86 FORM D1599

DIS202.11

Picture #21 of pile displ...

RIVER EL: +4.1' CRD 12:48 pm
+4.1' CRD

PROJECT NUMBER	TEST PIT NUMBER	SHEET
159184.B1.TP	TP-15	1 OF 1

Manitowoc Crane 4600

TEST PIT WALL LOG

PROJECT C.R. Channel Deepening LOCATION Area 66 MAP OF 1 WALL OF PIT
ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/9/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER H. Gruebel
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE	
	CRD		1st: GRAVEL & SAND and some boulders and cobbles 2nd: GRAVEL & SAND, scattered boulders and cobbles 3rd: GRAVEL and scattered cobbles in sand matrix 4th: GRAVEL, scattered cobbles in sand matrix 5th: same as above 6th: - same as above with 2 boulders ~2' ø) 7th: - GRAVEL one cemented boulder size piece, brittle, easy to break, weakly cemented 8th: - 1 boulder -11- . . . 9th: - GRAVEL 10th: - GRAVEL, some cobbles 11th: - -11- . . . some iron staining.
45.9			EL. -45.9 FT
50			PRE 1980
51			GRAVEL in a silty SAND matrix, (GM) scattered to dense cobbles, scattered boulders and wood debris, grey, some iron staining, wet, rounded gravel in all sizes, medium to fine sand, dacite and basalt gravel + cobbles, basalt boulders, subangular
52	47.9		EL. -50.1 FT
53			(GM)
54	49.9		
55			

No big wood pieces
Largest boulder ≈ 1.5'

LENGTH (FT)

COMMENTS
Start: 12:48 pm
1st @ 50' RIVER BOTTOM
2nd @ 50.5'
3rd @ 51'
4th @ 51.3'
5th @ 51.5'
6th @ 52'
7th @ 52.5'
8th @ 52.8'
9th @ 53.0'
10th @ 53.2'
11th @ 53.5'
12th @ 54.2'
DEPTHS OF GROUND SURFACE BEFORE EACH SCOOP WAS TAKEN
END 1:10 pm

Moderate digging throughout
BOTTOM OF TP-15 @ EL -50.1 FT

Figure 2

TEST PIT WALL LOG
FORM D1599

REV 7/86 FORM D1599

Picture 20 disposition 1

PILE

RIVER EL: +4.0' CRD 12:12 am
+4.0' CRD 12:30 am

PROJECT NUMBER	TEST PIT NUMBER	SHEET	OF
159184.B1.TP	TP-16	1	1

TEST PIT WALL LOG

PROJECT C.R. channel Deepening LOCATION Area 66 MAP OF WALL OF PIT
ELEVATION CONTRACTOR Hickey Marine DATE EXCAVATED 8/9/00
WATER LEVEL AND DATE EXCAVATION METHOD clam shell LOGGER H. Guethel
APPROXIMATE DIMENSIONS: LENGTH WIDTH DEPTH REMARKS

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER	SAMPLE TYPE
50	46	POST 1980
51	47	-47.3'
52	48	
53	49	PRE 1980
54	50	
55		

CRD

1st - SAND and cobbles + boulders, not much recovery, open cla
2nd - 1 log, 2½' long, 3" ø; SAND, some gravel → recovery fell out, due to open bucket (boulder stuck between teeth)
3rd - GRAVEL IN SAND; scattered cobbles
4th - log 3' long; 4" ø, SAND, cobbles (scattered)
5th - SAND, GRAVEL, scattered cobbles
6th - GRAVEL, SAND; scattered cobbles
7th - iron-stained gravel, sand + silt, few cobbles
8th - log; SAND; some gravel (log - 3" ø; 2' long)
9th - boulder, scattered cobbles, gravel + sand
weathered basalt cobbles, easy to break (crumbly)

EL. -46.0 FT

medium grained sand rounded gravel

SW-SM
SAND, some gravel, trace silt, scattered wood debris + cobbles and boulders, grey + wet

(GM)
GRAVEL in silty SAND matrix, scattered cobbles & boulders, scattered wood debris, grey, wet, rounded gravel, iron stained, mostly dacite, some basalt

dacite gravel, basalt + dacite cobbles, basalt boulders

Basalt cobbles + boulders are weathered and angular, crumble under finger pressure

EL. -47.3'

EL. -50.3'

COMMENTS

Start: 12:12 am
1st - 50' = RIVER BOTTOM
2nd - 50.5'
3rd - 51'
4th - 51'
5th - 51.3'
6th - 51.7'
7th - 52'
8th - 53'
9th - 53.2'
10th - 54.3' (FINAL)

DEPTHS INDICATE TOP OF GROUND SURFACE BEFORE SCOOP

END 12:30 am

Moderate to hard digging below EL. -47.0 FT

BOTTOM OF TP-16 at EL -50.3'

LENGTH (FT)

Figure 2

TEST PIT WALL LOG
FORM D1599

REV 7/86 FORM D1599

DIS202.11

RIVER EL: + 1.9' CRD 7:55 am
+ 1.8' CRD 8:06 am

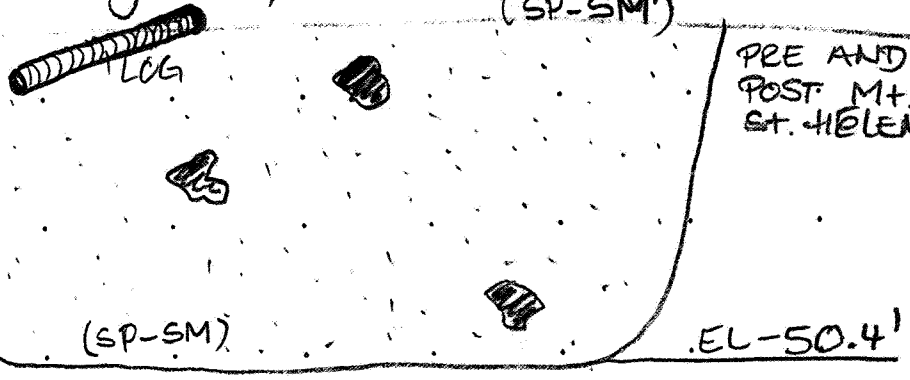
PROJECT NUMBER	TEST PIT NUMBER	SHEET
159184.31.TP	TP-17	1 OF 1

TEST PIT WALL LOG

PROJECT C.R. CHANNEL DEEPENING LOCATION Area 66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/10/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER H. Guethel
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE
	CRD	
47	45.2	
48	46.2	
49	47.2	
50	48.2	
51	49.2	
52	50.2	
53	51.1	

1st - SAND, 1 Log ~ 12"; 6ft Ø
2nd - SAND; some gravel 3 cobbles (angular basalt)
3rd - SAND; some gravel, scattered cobbles
4th - -"- wood debris
5th - SAND & GRAVEL
6th - SAND, GRAVEL, scattered cobbles (SILT)
7th - 1 boulder ≈ 12" Ø; basalt; Lost the rest
8th - GRAVEL, rounded, some sand, scattered cobbles
9th - GRAVEL, sand; scattered cobbles & boulders (12"-16" Ø)
(-45.2' to -50.4')
SAND; some gravel and silt, scattered cobbles, boulders and wood debris, grey, wet, medium sand, poorly graded, rounded gravel, multilithology (dacite, basalt)
(SP-SM)
EL. -45.2



boulders up to 15" Ø
one "red" one probably dacite rest basalt; subangular

LENGTH (FT)

COMMENTS
Start @ 7:50 am
1st @ 47.1' RIVER BOTTOM
2nd @ 48.2'
3rd @ 49.1'
4th @ 49.8'
5th @ 50.3'
6th @ 51.2'
7th @ 51.5'
8th @ 50.5'
9th @ 51.7'
DEPTHS BEFORE SCOOP WAS TAKEN
FINAL @ 52.2'
End 8:06 am

Moderate Diggings

FINAL DEPTH @ EL. -50.4 FT

Figure 2

TEST PIT WALL LOG
FORM D1599

REV 7/86 FORM D1599

Picture No 19 USP #1

RIVER EL: + 3.8 CRD (11:29 am)
+ 3.9 CRD (11:45a)

Clam bucket

KEY HILL

PROJECT NUMBER	TEST PIT NUMBER	SHEET	OF
159184.81.TP	TP-18	1	1

TEST PIT WALL LOG

PROJECT C.R. Channel Deepening LOCATION Area 66 MAP OF ____ WALL OF PIT

ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/9/00

WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER H. Guettel

APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE
	CRD	
48		
50	46.1	
52	48.1	
54	50.1	

1st – GRAVEL and sand, bottom was 1/2 - 1/2 in bucket, 3 boulders ~12"; scattered wood debris

2nd – same as above, but no cobbles or boulders

3rd – –11–

4th – –11–

5th – all GRAVEL, 1-2 cobbles, silt + sand

6th – –11–

7th – GRAVEL, scattered cobbles; 1 boulder

8th – –11–

51.3 – 53': SAND and GRAVEL, trace silt, scattered boulders, cobbles and wood debris, grey, wet. sand is medium, gravel is rounded, iron stained, all sizes, mostly dacite schist basalt, basalt boulders, subangular (SP-SM)

53 – 54': GRAVEL in a silty SAND matrix; grey, wet, rounded gravel in all sizes, fine to medium grained sand, gravel is iron stained, some angular cobbles (basalt), subangular boulders (basalt) max = 3' (GM)

EL. -47.5 ft

EL. -49.1'

SAND & GRAVEL, trace silt, scattered cobbles & boulders, wood debris (SP-SM)

predominately post 1980.

Pre 1980.

EL. -50.1 ft

GRAVEL in a silty sand matrix (GM)

LENGTH (FT)

COMMENTS

START:

1st @ 51.3') RIVER BOTTOM

2nd @ 51.5'

3rd @ 52.7') DEPTHS INDICATE GROUND SURFACE BEFORE SCOOP WAS TAKEN

4th @ 52.8'

5th @ 53.0'

6th @ 53.2'

7th @ 53.2'

8th @ 53.5'

FINAL @ 54'

End 11:45 am.

Harder digging of last 2 ft

FINAL DEPTH @ EL. -50.1 FT

Figure 2

TEST PIT WALL LOG FORM D1599

REV 7/86 FORM D1599

IS202.11

Pic. of boulders Disposable #1 Nr. 17+85

RIVER EL: +3.4' CRD 11:02
+3.5' CRD 11:12

PROJECT NUMBER	TEST PIT NUMBER	SHEET
159184.81.TP	TP-19	1 OF 1

TEST PIT WALL LOG

PROJECT C.R. Channel Deepening LOCATION Area 66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/9/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER H. Guettel
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE
	C R D	
46		
48		
50	46.5	
52	48.5	
54	50.5	

1st - SAND, trace to some silt, trace gravel, scattered wood
2nd - same as above, 1 boulder ±basalt ~12"
3rd - -11- 1 boulder, 2-3 cobbles
4th - boulder ±4' in size, mostly gravel in sand/silt matrix scattered cobbles & boulders
5th - gravel, scattered boulders + cobbles

50' - ±52'. SAND, trace to some silt, trace gravel, scattered wood debris, grey, wet, medium grained sand, poorly graded, gravel is rounded, all sizes, mostly glacial, no big wood pieces. (SP-SM)

52'-53.5'. GRAVEL in a silty SAND matrix, scattered cobbles and boulders and wood fragments, grey, wet, gravel is rounded, boulders are subrounded and angular, mostly basalt, dacite and basalt gravel + cobbles (GM)

EL.-46.6 ft

SAND, trace gravel + silt (SP-SM)

POST MT. ST HELENS

EL.-48.5 FT

PRE 1980

EL.-50.0 ft

GRAVEL (GM)

LENGTH (FT)

COMMENTS

Start 11:03 am
1st @ 50' = RIVER BOTTOM
2nd @ 51'
3rd @ 51.7'
4th @ 53'
5th @ 53'
6th @ 53.5'
} DEPTHS BEFORE SCOOP WAS TAKEN

End @ 11:12

Easy digging.

BOTTOM OF TP-19 @ EL. -50.0 ft

Figure 2

TEST PIT WALL LOG
FORM D1599

REV 7/86 FORM D1599

RIVER EL: + 2.8 CRD (10:28a)
+ 3.0 CRD 10:40

PROJECT NUMBER 159184.81.TP | TEST PIT NUMBER TP-20 | SHEET 1 OF 1

TEST PIT WALL LOG

PROJECT C.R. Channel Deepening LOCATION Area 6k MAP OF WALL OF PIT
ELEVATION CRD CONTRACTOR Hickey Marine DATE EXCAVATED 8/9/00
WATER LEVEL AND DATE EXCAVATION METHOD Clam Shell LOGGER H. Guethel
APPROXIMATE DIMENSIONS: LENGTH WIDTH DEPTH REMARKS

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	
		1st – SAND, scattered gravel and wood debris, some silt
		2nd – – " –
		3rd – – " – at bottom more greyish gravel
		4th – same as above
		5th – – " –
		6th – same as above
		SAND, scattered to trace gravel, scattered wood debris, and cobbles, trace to some silt, grey, wet, medium to coarse sand, poorly graded, rounded gravel, up to 3" in size, multilithology, mostly dacite, cobbles are dacite, rounded up to 7", wood has max length of 10" and ø 4". (SM)
47		
48	45	EL. -48 ft
49	46	SAND, scattered gravel increasing to trace gravel with depth scattered cobbles and. wood debris trace to some silt (SM) Post 1980
50	47	
51	48	
52	49	
53	50	EL. -50.7 ft

LENGTH (FT)

COMMENTS

Wait for ship from 10:05 am to 10:28a
Start @ 10:30a
1st @ 48.6' RIVER BOTTOM
2nd @ 49.5'
3rd @ 50'
4th @ 51'
5th @ 52'
6th @ 52.7'
Final @ 53.7'
DEPTHS BEFORE SCOOP WAS TAKEN.

End @ 10:40 am

Easy digging

Bottom of TP-20 @ EL -50.7 ft)

Figure 2

TEST PIT WALL LOG FORM D1599

REV 7/86 FORM D1599

2 pictures, DISPOSABLE #1
off gravel Pic. 13+14

RIVER EL: 2.0' CRD 7:55
1.9' CRD 8:15

PROJECT NUMBER	TEST PIT NUMBER	SHEET	OF
159184.B1.TP	TP-21	1	1

TEST PIT WALL LOG

PROJECT CR CHANNEL DEEPENING LOCATION LONGVIEW AREA 66 MAP OF WALL OF PIT
ELEVATION CRD CONTRACTOR HICKEY MARINE DATE EXCAVATED 8/9/00
WATER LEVEL AND DATE EXCAVATION METHOD CLAM SHELL LOGGER H. GUETTEL
APPROXIMATE DIMENSIONS: LENGTH WIDTH DEPTH REMARKS

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	
48	46	EL-46' POST 1980
49	47	PRE 1980
50	48	
51	49	
52	50	
53		

1st - SAND, some gravel, scattered cobbles + boulders
2nd - same as above, rounded gravel angular
3rd - GRAVEL, trace sand + silt, scattered cobbles + boulders rounded gravel
4th - -11-
5th - -11-
6th - same as above, looks like silt matrix
7th - 1 boulder, 1 eq. 4"ø, 1.5 long, gravel.
8th - GRAVEL, silt, sand
9th - GRAVEL in silt matrix, rounded
10th - angular cobbles + boulders with silt + sand
11th - GRAVEL in silt matrix, scattered cobbles + boulders (angular) (up to 15")
12th - same as above

- gravel is iron stained
- Basalt boulders up to 2.5 ft ø

TOP LAYER - 46 - 46.5'
SAND, trace to some gravel & silt, scattered cobbles and boulders, and wood debris, grey, wet, medium grained sand, poorly graded, rounded gravel in all sizes, mainly dacite gravel (SP-SM)

EL: 46.5' SAND, trace to some gravel, scattered cobbles + boulders (SP-SM)

GRAVEL in a silty SAND/sandy SILT matrix, scattered cobbles, boulders and wood debris, grey, wet, fine to medium grained sand, rounded gravel, iron stained, all sizes, boulders are angular (GM)

GRAVEL IS MOSTLY DACITE, BOULDERS ARE BASALT, COBBLES MIXED

EL. -50.1 ft

Max wood size = 1.5' long, 4"ø
~2-5% of recovery is boulders (of material) up to 15"ø.

LENGTH (FT)

COMMENTS

Start: 7:55 am RIVER BOTTOM
1st @ 48'
2nd @ 48.5'
3rd @ 48.5'
4th @ 48.7'
5th @ 49.0'
6th @ 49'
7th @ 49.4'
8th @ 50.1'
9th @ 50.3'
10th @ 50.5'
11th @ 51'
12th @ 51.5'
FINAL 52'
END 8:15 a

DEPTHS BEFORE SCOOP WAS TAKEN

HARD DIGGING BELOW EL-46.5 FT

Bottom of TP-21 @ EL-50.1 ft

Figure 2

TEST PIT WALL LOG
FORM D1599

REV 7/86 FORM D1599

[redacted] Richmond Dredge #1 (Pile) [redacted]

RIVER EL: +2.4 CRD 9.36
2.4 CRD 9:50

PROJECT NUMBER	TEST PIT NUMBER	SHEET	OF
159184.B1.TP	TP-22	1	1

TEST PIT WALL LOG

PROJECT C.R. Channel Deepening LOCATION Area 66 MAP OF WALL OF PIT
ELEVATION CONTRACTOR Hickey Marine DATE EXCAVATED 8/9/00
WATER LEVEL AND DATE EXCAVATION METHOD Clam Shell LOGGER
APPROXIMATE DIMENSIONS: LENGTH WIDTH DEPTH REMARKS

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	
	C	1st - SAND; scattered gravel + wood debris
	R	2nd - SAND; scattered gravel
	D	3rd - " "
		4th - SAND, some gravel
		5th SAND, some gravel, lighter, probably at bottom
		SAND; scattered gravel and wood debris, some silt; grey wet, medium sand, poorly graded, rounded gravel up to 2", gravel is multi-lithology, mostly dacite. (SM)
47		EL. -45.3 FT
48	45.6	SAND, scattered gravel and wood debris (SM) — mostly post 1980 material.
50	47.6	EL. -47.9'
		increasing gravel content, different grey color (SM)
		EL -50.2 FT
53	50.6	

LENGTH (FT)

COMMENTS

START: 9:36
1st @ 47.7 = River Bottom
2nd @ 49.0'
3rd @ 50.0'
4th @ 50.5'
5th @ 51.5'
} DEPTHS BEFORE EACH SCOOP

FINAL @ 52.6

EASY DIGGING

End 9:55

Bottom of TP-22 @ EL - 50.2 FT.

Figure 2

TEST PIT WALL LOG
FORM D1599

REV 7/86 FORM D1599

DIS202.11

[redacted] Disposable #1
tug boat #3 pile of material

RIVER EL: +3.5' CRD 1:31 pm
+3.4' CRD 1:52 pm
+3.2' 2:10

CRHILL

PROJECT NUMBER	TEST PIT NUMBER	SHEET
159184.B1.TP	TP-23	1 OF 2

TEST PIT WALL LOG

PROJECT CR Channel Deepening LOCATION MP:66 Longview MAP OF WALL OF PIT
ELEVATION CONTRACTOR HICKEY MARINE DATE EXCAVATED 8/8/00
WATER LEVEL AND DATE EXCAVATION METHOD CLAM SHELL LOGGER H. GUETTEL
APPROXIMATE DIMENSIONS: LENGTH WIDTH DEPTH REMARKS

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	LENGTH (FT)
	CRD	
45		
44	-40.5	44
46	-42.5	46
48	-44.5	48
50	-46.5	50
52	-48.5	52
54	-50.5	54

1st = SAND, scattered gravel? and wood debris
2nd = SAND — " —
3rd = same as above
4th = SAND; scattered fine gravel
5th = same as above
6th = — " —
7th = SAND; some grey gravel + silt at bottom of bucket
8th = SAND; trace grey gravel + silt
9th = — " —
10th = — " — 1 boulder (16"ø)
11th = — " —
12th = — " —
13th = SAND, trace gravel + silt, grey
14th = SAND, increasing gravel
15th = — " —
16th = — " —
17th = scattered cobbles
18th = SAND; some gravel
19th = — " — some silt around gravels

1-2 boulders (12"-14")
Gravel most likely at bottom and hole keeps on caving in

EL -41.3 FT

SAND (SM) (1) Post 1980

EL -47.5 FT.

MORE GRAVEL, some silt embedment scattered cobbles (GM) (2) PRE 1980

EL. -50.3 FT

see backside for (1)+(2)

COMMENTS
START 1:31 pm
1st @ 44.8' RIVER BOTTOM
2nd @ 46.0'
3rd @ 47'
4th @ 48.5'
5th @ 49.0'
6th @ 49.4'
7th @ 51'
8th @ 50.5'
9th @ 50'
10th @ 50.8'
11th @ 52'
12th @ 52.5'
13th @ 52.0'
14th @ 52'
15th @ 52.3'
16th @ 52.7'
17th @ 52.7'
18th @ 53.2'
19th @ 53.2'
20th @ 53.5' FINAL

Figure 2

TEST PIT WALL LOG
FORM D1599

Relatively easy digging hole kept on caving in

REV 7/86 FORM D1599

DIS202.11

(1)+(2) see backside

(-41.3 FT TO -47.5 FT)

① SAND; trace silt, scattered gravel and wood debris (fine), grey, wet, medium grained sand, rounded fine gravel 0.2"-2", gravel is mostly dacite, some basalt (SM)

(-47.5 to -50.3 FT)

② GRAVEL IN A SILTY SAND MATRIX, + scattered cobbles grey, wet, gravel is fine to coarse (0.2"-3"), rounded & subrounded sand is fine to medium grained, gravel is mostly basalt, some dacite, cobbles up to 9" wide (GM)

C.R. 5 DISPOSABLE #1 DIVER'S UP TWIST

RIVER EL: 1.9' CRD
2.0 CRD 9:13

PROJECT NUMBER	TEST PIT NUMBER
159184.81.TP	TP-24 SHEET 1 OF 1

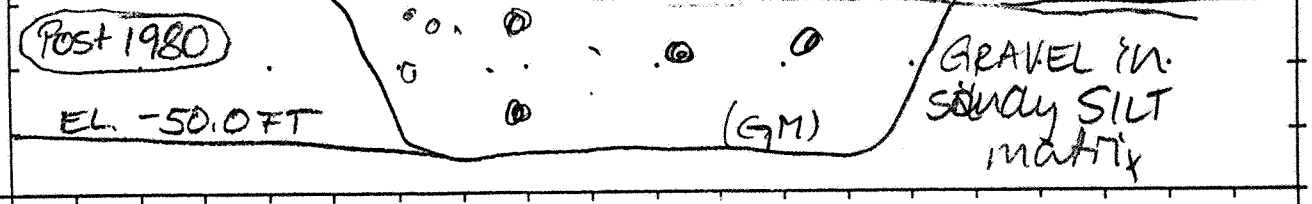
TEST PIT WALL LOG

PROJECT C.R. CHANNEL DEEPENING LOCATION AREA 66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/9/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD CLAM SHELL LOGGER H. GUETTEL
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	
	CRD	
48		
	-47	
50	-48	
	-49	
52	-50	

1st - GRAVEL, SILT, SAND; scattered cobbles + boulders, brownish grey, scattered wood, rounded gravel, angular boulders
2nd - 1 boulder (14") + gravel, not much recovery
3rd - GRAVEL; SAND; SILT, (COBBLES, BOULDERS scattered) (7" to 17"ø)
4th - GRAVEL, some silt, scattered cobbles + boulders (up to 15"ø)

GRAVEL in a sandy SILT matrix; scattered cobbles and boulders, no wood encountered, grey, wet, fine sand, gravel is rounded, multilithology, mostly dacite, most cobbles and boulders are basalt and angular, some angular basalt gravel encountered (weathered boulder?), gravel is iron stained (GM)
Boulders are scattered throughout test pit (up to 17" in diameter)



COMMENTS
START: 9:03 am
1st - 49.8 } RIVER BOTTOM
2nd - 50.5' } TOP OF SCOOP
3rd - 50.3'
4th - 51.1'
FINAL 52.0 FT
END 9:13 am

EASY DIGGING

Bottom of TP-24 @ EL -50.0 Ft

Figure 2

TEST PIT WALL LOG
FORM D1599

REV 7/86 FORM D1599

5202.11

Picture 10+11 Disposable #1

○ rock piece

River level: +3.8 CRD 12:41
+3.7 CRD 12:50

CH2MHILL

PROJECT NUMBER	TEST PIT NUMBER	SHEET	OF
159184.B1.TP	TP-25	1	1

TEST PIT WALL LOG

PROJECT CR Channel Deepening LOCATION Under Bridge MP66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/8/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER H. Gutekel
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE
CRD		
48		
49	45.2	
50	46.2	
	47.2	
	49.2	
	50.2	
55		

1st - SAND, trace to scattered gravel
2nd - SAND, scattered gravel.
3rd - gravelly SAND, probably GRAVEL AT BOTTOM
4th - GRAVEL, scattered cobbles
5th - -11- some sand
6th - GRAVEL, some sand
7th
8th - GRAVEL + SAND
9th - GRAVEL + SAND & 1 BOULDER
10th - SAND, some gravel
11th - Gravel in sand matrix
12th - Sand, gravel, scattered cobbles

EL. -45.2 FT

SAND, trace silt, trace to scattered gravel, scattered wood, grey, wet (SP-SM)

EL -47.0 FT

SAND, some gravel and silt, scattered wood, grey, wet, medium sand, rounded gravel, multilithology, scattered cobbles (basalt up to 11") some iron staining (SM)

EL. -50.1 FT

POST 1980

1-2 boulders max 12"

PRE 1980

COMMENTS

Start @ 12:41 pm

1st @ 49' } RIVER BOTTOM
2nd @ 50'
3rd @ 50.8'
4th @ 51'
5th @ 51'
6th @ 51.7'
7th @ 52'
8th @ 52'
9th @ 52.2'
10' @ 52.8'
11' @ 53'
12' @ 53.2
FINAL 53.8'

DEPTHS INDICATE GROUND SURFACE BEFORE EACH SCOOP WAS TAKEN

Harder digging below EL-48 FT but not close to refusal. Found rock.

Bottom of TP-25 @ EL -50.1 FT

Figure 2
TEST PIT WALL LOG
FORM D1599

Picture 4 Disposable #1

RIVER EL: + 4.0' CRD 12pm

PROJECT NUMBER	TEST PIT NUMBER	SHEET
159184.B1.TP	TP-26	1 OF 1

TEST PIT WALL LOG

PROJECT CR Channel Deepening LOCATION MP 66 MAP OF WALL OF PIT
ELEVATION CRD CONTRACTOR Hickey Marine DATE EXCAVATED 8/8/00
WATER LEVEL AND DATE EXCAVATION METHOD Clam Shell Bcy+z LOGGER H. Guettel
APPROXIMATE DIMENSIONS: LENGTH WIDTH DEPTH REMARKS

DEPTH BELOW SURFACE (FT)	SAMPLE RECOVERY	SAMPLE NUMBER AND TYPE
	CRD	
49	45	
50		
51		
52	48	
53	49	
54	50	
55		

1st - full size log ~ 10"ø, 20' Long, put back into river next to barge.
- SAND, trace gravel.
2nd - GRAVEL, iron stained
(52.5'-54')
GRAVEL in a silty sand MATRIX; scattered (GM) wood debris, grey, wet, gravel is rounded, iron stained ranges up to 3", scattered cobbles ≤ 1%, coarse sand, dacite + basalt gravel
(52'-52.5')
SAND; trace gravel, scattered wood debris; trace silt, grey, wet, medium sand, rounded gravel, dacite + basalt gravel. (SP-SM)

EL.-48 FT
EL.-52.5 SAND (SP-SM)
EL.-50 FT GRAVEL (GM)

Pic and post 1980.

COMMENTS
Start: 12:03pm
1st at 52' RIVER BOTTOM
2nd @ 52.5' } Topo/ scoop
3 FINAL 54' }

EASY DIGGING THROUGHOUT

Bottom of TP-26 @ EL.-50 FT

LENGTH (FT)

Figure 2

TEST PIT WALL LOG
FORM D1599

REV 7/86 FORM D1599

RIVER EL: +4.0 CRD 11:21
11:32

PROJECT NUMBER	TEST PIT NUMBER	SHEET
159184B1, TP	TP-27	1 OF 1

TEST PIT WALL LOG

PROJECT CR Channel Deepening LOCATION Bridge MP66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/8/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER Heike Guethel
APPROXIMATE DIMENSIONS: LENGTH ±15 WIDTH 7' DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE
	CRD	
49	45	
50	46	
51	47	
52	48	
53	49	
54	50	
55		

1st - Sand, scattered gravel + wood debris
2nd - —11—
3rd - same gravel has different grey color
4th - —11—
5th - SAND, trace gravel
6th

(EL -45 TO EL -50 FT)
SAND, scattered to trace gravel, trace silt, scattered wood fragments, grey, wet, sand is medium grained to 52' and grades to coarse below 52', poorly graded, gravel is rounded, fine to medium in size, trosley, dacite (SP-SM)

EL -45 FT

(SP-SM)
medium sand

POST 1980 MATERIAL

EL -50 FT

COARSE SAND

COMMENTS
START 11:21 am
1st @ 49' = RIVER BOTTOM
2nd @ 51'
3rd @ 51.5'
4th @ 52.5'
5th @ 53'
6th @ 54' FINAL
} TOP OF GROUND BEFORE EACH SCOOP

EASY DIGGING

Bottom of TP-27 @ -50 FT

LENGTH (FT)

Figure 2

TEST PIT WALL LOG
FORM D1599

REV 7/86 FORM D1599

RIVER EL. + 4.0 10:52a

PROJECT NUMBER	TEST PIT NUMBER	SHEET
159184.31.TP	TP-28	1 OF 1

TEST PIT WALL LOG

PROJECT CR CHANNEL DEEPENING LOCATION BRIDGE MP 66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR HICKEY MARINE DATE EXCAVATED 8/8/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD CLAM SHELL LOGGER Heike Guenkel
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	
48	CBJ	1st - sand, wood debris, 1 bag 2nd - WOOD DEBRIS - BIG LOGS 3' LONG; 17" ∅ 3rd - BIG LOG - 3' LONG; 8" ∅ SAND; trace silt, scattered gravel and wood, grey, wet, sand is mostly medium grained, some coarse lenses, gravel is fine to medium <5", rounded diorite, few scattered basalt pieces, (SP-SM)
49		
50		
51	47	EL-46.8 FT POST 1980 MATERIAL
52	48	
53	49	Log some brownish grey colored lenses
54	50	EL.-50.2 FT (SP-SM)
55		

COMMENTS
START @ 10:50am
1st @ 50.8' RIVER BOTTOM
2nd @ 52' } TOP OF
3rd @ 53' } SCOOP
4th @ 54.2 FINAL

Leevy digging!

TP-28 ends at EL-50.2'

LENGTH (FT)

Figure 2

TEST PIT WALL LOG
FORM D1599

REV 7/86 FORM D1599

Pictures 1+2 disposable #1

4 1 2 3 5

CH2M HILL

RIVEREL: +2.2 CRD start + end

PROJECT NUMBER	TEST PIT NUMBER	
159184.B1.TP	TP-29	SHEET 1 OF 1

TEST PIT WALL LOG

PROJECT CR channel Deepening LOCATION LONGVIEW MP 66 MAP OF ____ WALL OF PIT

ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/8/00

WATER LEVEL AND DATE ____ EXCAVATION METHOD CLAM SHELL LOGGER Heike Guertal

APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE RECOVERY	SAMPLE NUMBER AND TYPE	
45	CRD		1st - SAND 2nd - SAND, scattered gravel 3rd - Sand, gravel, different grey color 4th - sand, 1 log (1-2" ø x 3' long) trace gravel 5th - Sand, trace gravel 6th - Sand, some to trace gravel 7th - Sand, some to trace gravel (- gravel interbedded in silt occurs in lenses 8th = sand, trace gravel
	44.8		EL. -44.9 FT
48	45.8		EL. -45.5' (SM) SAND, scattered fine gravel / POST 1980 trace to some silt SAND, scattered gravel & wood debris, grey, wet, medium sand, poorly graded, fine to medium gravel (1/2"-2 1/2"), rounded gravel. PRE 1980 1-2 cobbles ~ 6-7" ø (SM)
49			
50	47.8		
51			EL -49.2 FT
52	49.8		some silt SAND, trace to some gravel, grey, wet, medium sand (SP-SM) gravel size: 1/2"-4"
	50.5		EL -50.2 FT
55			-GRAVEL: - mainly basalt, some dacite - Dacite at top 2 ft. of test pit (above EL - 46.8 FT)

LENGTH (FT)

COMMENTS

START: 7:52 am

1st: 47.1 ft } River bottom

2nd: 47.8 ft } Top of each

3rd: 49.8 ft } layer

4th: 50.8'

5th: 50.3' dug w/ scoop

6th: 52.0'

7th: 52.0

8th: 52.6

Easy digging

final 52.4

Bottom of TP-29 @ EL -50.2 FT

Figure 2

TEST PIT WALL LOG FORM D1599

3+4 are of ship
2 pictures of boulders 5+6 12

RIVER EL: +2.8 CRD start + end

PROJECT NUMBER	TEST PIT NUMBER	SHEET	OF
159184.B1.TP	TP-30	1	1

TEST PIT WALL LOG

PROJECT CR CHANNEL DEEPENING LOCATION LONGVIEW MP 66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR HICKEY MARINE DATE EXCAVATED 8/8/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD CLAM SHELL LOGGER HG
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	
	CRD	
48		
49		
50	-47	
51	-48	
52	-49	
53	-50	

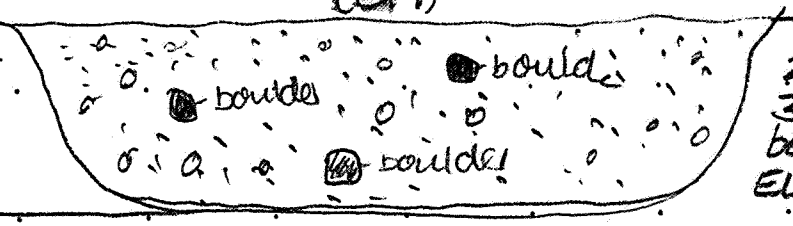
1st. sand, some silt, scattered gravel, grey, wet
2nd. same as above
3rd: logs, wood debris, 1 boulder, rest same as above
4th: 2 big boulders, 3-4' ø, same as above
5th: cobble, sand, some gravel . . .

SAND; trace to some silt, trace gravel, scattered wood debris (up to 1' in ø), grey, wet, sand is medium, gravel ranges from 0.5"–6", scattered cobbles (max. 6 pieces), rounded and subrounded gravel, gravel is mostly basalt & diacite. (SM)

EL. -47.0 FT

PRE & POST 1980

EL. -50 FT



2 boulders 3-4' ø between EL-49' & EL-50'

COMMENTS

Start 8:55 am
1st @ 49.8' = River bottom
2nd @ 50.1'
3rd @ 51.0'
4th @ 52.0
5th @ 52.5
} Top of each scoop.
Final @ 52.8'

Easy digging

Bottom of TP-30 @ EL-50.0'

LENGTH (FT)

Figure 2

TEST PIT WALL LOG
FORM D1599

Clam shell unloading
Picture 8 Disposable #1

RIVER EL: +3.9' CRD (10:15)
+3.9 CRD (10:25)

CH2MHILL

PROJECT NUMBER	TEST PIT NUMBER	SHEET
159184.B1.TP	TP-31	1 OF 1

TEST PIT WALL LOG

PROJECT CR CHANNEL DEEPENING LOCATION MP 6B BRIDGE MAP OF 1 WALL OF PIT
ELEVATION _____ CONTRACTOR HICKEY MARINE DATE EXCAVATED 8/8/00
WATER LEVEL AND DATE _____ EXCAVATION METHOD CLAM SHELL LOGGER Heike Guethe
APPROXIMATE DIMENSIONS: LENGTH _____ WIDTH _____ DEPTH _____ REMARKS _____

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE		
	CRD		1st - SAND, scattered gravel
			2nd - SAND; - " -
			3rd - - " -
			4th - Sand, scattered to trace gravel, wood debris
			5th - - " -
			6th - - " -
47			SAND; scattered gravel, trace silt, scattered wood
48			debris, grey, wet, medium to coarse sand,
49	45.1	45.5	fine to medium gravel, rounded, sand is poorly
50	46.1		graded, gravel is mostly dacite, scattered basalt. (SP-SM)
51	47.1		POST 1980 EL. 47.5 — SAND, scattered gravel, trace silt, scattered wood debris, (SP-SM), grey, wet; medium to coarse sand, rounded, poorly graded, mostly dacite, scattered basalt. Increasing gravel content towards bottom
52	48.1		PRE 1980
53	49.1		
54	50.1		EL -51.0 FT
55			
			- logs 5" ø 1-2' long in upper 2 ft of hole.

LENGTH (FT)

COMMENTS
START: 10:15 am
1st @ 49.4' = RIVER BOTTOM
2nd @ 51'
3rd @ 51.5'
4th @ 52.7'
5th @ 53.1'
6th @ 53.5'
FINAL @ 54'
TOP OF EACH SCOOP

EASY DIGGING

Bottom of TP-31 @ EL -50.1 FT

Figure 2

TEST PIT WALL LOG
FORM D1599

Picture 7 Disposable #1

CH2MHILL

RIVER EL: +3.2 CRD (9:40)
+3.3 CRD 9:47

PROJECT NUMBER	TEST PIT NUMBER	SHEET	OF
159184.B1.TP	TP-32	1	1

TEST PIT WALL LOG

PROJECT CR CHANNEL DEEPENING LOCATION MP 66 ; bridge MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR HICKEY MARINE DATE EXCAVATED 8/8/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER Heine Guelich
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	
	CRD	
48		
49		
50		
51	47.8	
52	48.8	
53	49.8	
54	50.8	

1st. SAND, scattered gravel
2nd. SAND, gravel
3rd. SAND, scattered gravel.
4th. SAND, "

SAND; trace to some silt, scattered to trace gravel, scattered wood debris, grey, wet, medium to coarse sand, fine to medium gravel 0.1 - 4", 2 cobbles ~6", gravel is all dacite, rounded and sub-rounded, poorly graded sand. (Hole is uniform) (SM)

EL -47.7

POST 1980

EL -50.6 FT (SM)

NO BOULDERS

LENGTH (FT)

COMMENTS
Start @ 9:40 am
1st @ 50.9 ft RIVER BOTTOM
2nd @ 51.5' } TOP
3rd @ 53.0' } OF
4th @ 53.2' } SCOOP.

FINAL : 53.9 FT

Easy digging

BOTTOM of TP-32
@ EL. -50.6 FT

Figure 2

TEST PIT WALL LOG
FORM D1599

REV 7/86 FORM D1599

CH2MHILL

RIVER EL: 2.5 FT CRD 14:15
2.4 CRD 14:29

PROJECT NUMBER	TEST PIT NUMBER	SHEET	OF
159184.B1.TP	TP-33	1	1

TEST PIT WALL LOG

PROJECT CR DEEPENING LOCATION LONGVIEW MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR HICKEY MARINE DATE EXCAVATED 8/7/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD CLAM SHELL LOGGER HG
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	
45	CRD	
50	49.5	
51	48.5	
52	49.5	
53	50.5	

1st boulders + cobbles
2nd → cobblest gravel

clam shell does not close properly due to gravel cobbles

GRAVEL in a SILT matrix, ~~some~~ to trace sand, scattered wood fragments, grey, wet, rounded gravel, subrounded boulders, fine sand. BOULDERS UP TO 3 FT Ø → 4 large boulders, & basalt., some dacite gravel and cobbles. Gravel ranged between 0.5" and 4" in size (GM)

EL - 48.5 FT

scattered boulders (GM)

PRE 1980

EL. -50.6 FT

LENGTH (FT)

COMMENTS

START: 14:15
1st @ 51' RIVER BOTTOM
2nd @ 51'
3rd @ 52'
4th @ 52½'
5th @ 53'
FINAL @ 53'
TOP OF EACH SCOOP

Easy digging. Hole caved in easily.

No big logs

Bottom of TP-33 at EL. -50.6'

Figure 2

TEST PIT WALL LOG
FORM D1599

6 4 2 3 1 5

RIVER EL: 2.6 CRD 1:25 pm
2.5 CRD 1:47 pm
2.5 CRD 2pm

CH2M HILL

PROJECT NUMBER	TEST PIT NUMBER	SHEET
159184.B1.TP	TP-34	1 OF 1

TEST PIT WALL LOG

PROJECT CR CHANNEL DEEPENING LOCATION LONGVIEW MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR HICKEY MARINE DATE EXCAVATED 8/7/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD CLAM SHELL LOGGER Heike Guethel
APPROXIMATE DIMENSIONS: LENGTH 15 WIDTH 7 DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	
	CRD	
47	-44.5	
	-46.5	
50	-48.5	
52		
53	-50.5	

1st big log 4-5" long ~0.7" thick
2nd piece of ~~metal rod (CM)~~ → plexiglas

5th wood debris, gravel layer within SAND, rounded Basalt + dacite up to 3"
6th wood 1' wide; 3' long; some basalt gravel
- wood debris on top of each bucket

EL. -44.6

POST 1980 EL-46.5'

SAND; some silt, scattered gravel + wood, grey, wet, mostly medium sand some grades to coarse fine to medium gravel, rounded (SM)

PRE 1980

EL-50.5 FT

LENGTH (FT)

COMMENTS

START 1:25pm
1st @ 47.2' River Bottom
2nd @ 49.0'
3rd @ 50'
4th @ 51.2'
5th @ 51.5'
6th @ 52'
FINAL @ 53'

TOP OF EACH SCOOP

EASY DIGGING

Bottom of TP-34 @ EL.-50.5 FT

Figure 2

TEST PIT WALL LOG
FORM D1599

REV 7/86 FORM D1599

RIVER EL: +3 (CRD)
END: 13:00 +2.9 CRD

PROJECT NUMBER	TEST PIT NUMBER	SHEET
159184.31.TP	TP-35	1 OF 1

TEST PIT WALL LOG

PROJECT CR CHANNEL DEEPENING LOCATION Area 66 MAP OF ____ WALL OF PIT
ELEVATION ____ CONTRACTOR HICKEY Marine DATE EXCAVATED 8/7/00
WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam shell LOGGER Heike Guenzel
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	
CRD		
45		
49	-46	
50	-47	
51	-48	
52	-49	
53	-50	
54		
55		

49-51 (1) SAND, some silt, scattered gravel and wood, grey, wet, coarse sand, fine gravel < 1", pumice

51-52 : same as above + rubber tire

52-53½: sand grades to medium, some (2) light bluish-grey color variation, some basalt gravel in 4th bucket gravel up to 3", rounded

EL. -46.0 FT

(1) SAND (SM) POST 1980

EL. -48.0 FT

(2) SAND (SP-SM)

EL. -50 FT PRE 1980

EL. -50.5 FT BASALT INFLUENCE

basalt gravel and dacite gravel

COMMENTS

START 12:50 pm
1st @ 49' RIVER BOTTOM
2nd @ 51' } TOP OF SOOP
3rd @ 52' }
rubber tire in 3rd bucket
4th @ 52.5'
FINAL: 53.5'

EASY DIGGING

TP-35 ends at EL -50.5 ft

Figure 2

TEST PIT WALL LOG
FORM D1599

LENGTH (FT)

7/86 M D15

River EL: +3.1 (CBR)

PROJECT NUMBER	TEST PIT NUMBER	SHEET / OF
1591184.B1.TP	TP-36	1 / 1

TEST PIT WALL LOG

PROJECT: CR CHANNEL DEEPENING — LOCATION: Area 66 — MAP OF ____ WALL OF PIT
ELEVATION: ____ — CONTRACTOR: HICKEY MARINE — DATE EXCAVATED: 8/7/00
WATER LEVEL AND DATE: ____ — EXCAVATION METHOD: Clamshell — LOGGER: Heike Gruetzner
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE
45	CRD	
50		
52	-48	
54	-49	
55	-50	

① SAND, some silt, trace to scattered gravel and wood, scattered boulders & cobbles, grey, (2 large boulders 3-4 ft ø; basalt) (1 dacite cobble) (SM)
wet, fine to medium sand, rounded gravel.
- boulders in each bucket
- wood, logs mostly in 2nd bucket.
- wood debris in 1st bucket

EL. -48.0 FT

(SM) ① SAND some silt trace to scattered boulders + cobbles

EL. -50 FT

PRE 1980

2 basalt boulders 3-4' in diameter

COMMENTS

Start: 12 pm
1st bucket @ 52.1' } River bottom
2nd @ 52 1/2 } Top of scoop
FINAL: 53.2

EASY DIGGING

Bottom of TP-36 @ EL -50.1 FT

LENGTH (FT)

Figure 2

TEST PIT WALL LOG
FORM D1599

RIVER EL: +3 (CRB)

PROJECT NUMBER	TEST PIT NUMBER	
159184.B1.TP	TP-37	SHEET 1 OF 1

TEST PIT WALL LOG

PROJECT CR CHANNEL DEEPENING LOCATION Area 66 MAP OF ____ WALL OF PIT

ELEVATION ____ CONTRACTOR Trichey Marine DATE EXCAVATED 8/7/00

WATER LEVEL AND DATE ____ EXCAVATION METHOD Clam Shell LOGGER HG

APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE INTERVAL	SAMPLE NUMBER AND TYPE
	CRD	

① SAND, trace silt, scattered gravel, few scattered wood pieces, grey, wet, medium to coarse sand, fine to medium gravel, poorly graded (SP-SM)

- Gravel 0.2"-5".
- pumice, dacite gravel
- no boulders or logs

50

EL: -49 FT

52 49

53 50 ① SAND (SP-SM) trace silt, scattered gravel / POST 1980

EL. -50.7 Ft

54 51

55

COMMENTS

START 12:26pm

1st @ 52' River bottom

2nd @ 52.8' } Top of scoop

FINAL: 53.7 }

Rocky @ bottom.

EASY DIGGING.

Bottom of TP-37 at EL -50.7 ft

LENGTH (FT)

Figure 2

TEST PIT WALL LOG
FORM D1599

RIVER EL. +3.7 (CED)

CH2MHILL

PROJECT NUMBER	TEST PIT NUMBER	
159.184.B1.TP	TP-38	SHEET 1 OF 1

TEST PIT WALL LOG

PROJECT CR CHANNEL DEEPENING LOCATION RIVER MAP OF ____ WALL OF PIT

ELEVATION ____ CONTRACTOR HICKEY MARINE DATE EXCAVATED 8/7/00

WATER LEVEL AND DATE ____ EXCAVATION METHOD CAM SHELL LOGGER Heike Guettel

APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	
45	CED	SAND, trace SILT, scattered gravel and wood, grey, wet; coarse sand, medium to small gravel
46		- fine sandy SILT lenses with interbedded fine gravel, rounded gravel
47		- gravel consists of mainly pumice, dacite, then basalt starting at EL-48.7ft
48		3rd Basalt gravel - rounded, quartzite
49		Wood up to 2" ø ; 2' long
50	-46.3	- 1 shell (mussel)
51	-47.3	EL-46.3 Wood debris
52	-48.3	coarse sand, scattered dacite gravel
53	-49.3	some gravel, dacite, 0.3 - 2½" (SP-SM) POST 1980
54	-50.3	some basalt gravel, mostly dacite PRE 1980
55		gravel, basalt rounded, dacite, 0.5 - 3"
56		EL-50.7

LENGTH (FT)

COMMENTS

START AT · 11:13 on River bottom

1st Bucket @ 50'
2nd " @ 50.5'
3rd " @ 52'
4th @ 53½' } Top of each scoop

FINAL Depth = 54.5'

EASY DIGGING

Bottom of TP-38 at EL-50.7ft

Figure 2

TEST PIT WALL LOG
FORM D1599

DIS202.11

REV 7/86 FORM D1599

START: 10:50 am

CH2MHILL

River EL: +4 CRD

PROJECT NUMBER	TEST PIT NUMBER	
159184.81.TP	TP-39	SHEET 1 OF 1

TEST PIT WALL LOG

PROJECT C & D Channel Deepening LOCATION TP-39 MAP OF ____ WALL OF PIT

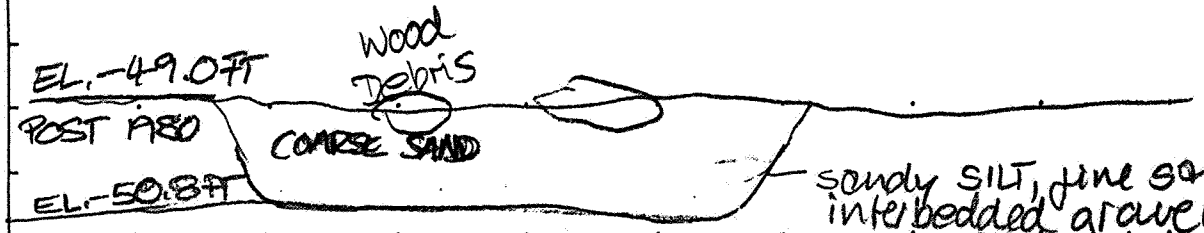
ELEVATION ____ CONTRACTOR Hickey Marine DATE EXCAVATED 8/7/00

WATER LEVEL AND DATE ____ EXCAVATION METHOD clam shell LOGGER ____

APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE NUMBER AND TYPE	
	CRD	
50		
51		
52		
53	49	
54	50	
55	51	

SAND, some to trace silt, trace to scattered gravel, ~~scattered~~ wood (tree stumps), grey, wet, coarse sand, medium to fine gravel, rounded gravel



Lithology - Pumice Gravel
- tree stump ~ 3½'
- some logs 3-4" ϕ
- Dacite
- Gravel colors red, greenish grey, white (pumice),
- Gravel size: 0.2" - 6".

COMMENTS

1st bucket @ 53' River bottom
2nd " @ 53.9' Top of scoop
FINAL DEPTH = 54.8'

Easy digging

Bottom of TP-39 at EL. -50.8ft

LENGTH (FT)

Figure 2

TEST PIT WALL LOG
FORM D1599

START AT 10:10 am – 10:20 a

CH2M HILL

RIVER EL. +4 (CRD)

PROJECT NUMBER	TEST PIT NUMBER	SHEET	OF
159184.B1.TP	TP-40	1	1

TEST PIT WALL LOG

PROJECT COLUMBIA RIVER CHANNEL... LOCATION TP-40 MAP OF ____ WALL OF PIT

ELEVATION ____ CONTRACTOR HICKEY MARINE DATE EXCAVATED 8/7/2000

WATER LEVEL AND DATE ____ EXCAVATION METHOD CLAM SHELL LOGGER Heike Guettel

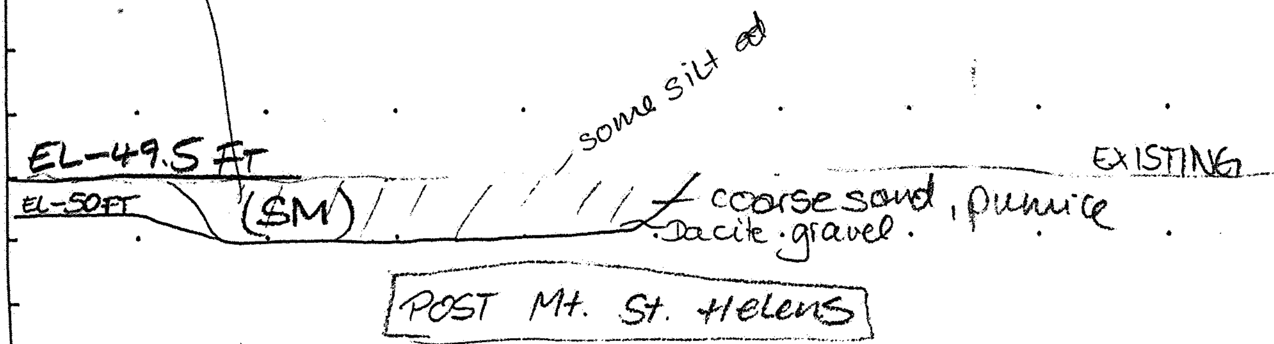
APPROXIMATE DIMENSIONS: LENGTH ____ WIDTH ____ DEPTH ____ REMARKS ____

DEPTH BELOW SURFACE (FT)	SAMPLE	NUMBER AND TYPE
	C R D	
53.5	-49.5	
54.5	-50.5	
55.5		

MATERIAL:
- TOOK 2 BUCKETS. 1st: 53.5' depth. 2nd 54' depth

SAND, some silt, scattered to trace gravel, scattered wood, grey, wet, sand is coarse grained, gravel is fine to medium, rounded gravel (SM)

Lithology: Dacite pieces up to 2"
Pumice (Mt. St. Helens) ~ -2'
Wood up to 6" in ø and 2½' long



LENGTH (FT)

COMMENTS
weather: cloudy ~60°F
water: calm

EASY DIGGING

Bottom of TP-40 @ EL. – 50.0 FT

Figure 2

TEST PIT WALL LOG
FORM D1599

Jet Probe Logs

[redacted]ing [redacted]ora[redacted]s Co[redacted]bia [redacted] Ch[redacted]el D[redacted]ning [redacted]oject [redacted]

Date: 8/16/00 Logger: Heike Guethel

Probe Number JP-	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden ( )CRD	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures (psi)	Assumed Material Penetrated by Probe	Top of Rock El. CRD	Misc. Notes
104-1	9:44	9:56	832,96	248,39	4.4/9:25 4.1 9:50	50.1 (45.7)	52.2 (48.1)	Y	175-180	GRAVEL?	48.1'	SLOW advance Thin sand Gravel
104-2	10:30	10:40	716,7	345,57	3.9 / 10:25 3.8 / 10:50	48.5 (44.5)	52.2 (48.6)	Y	75-175	GRAVEL, little sand	48.4'	fast to 51.5'; slow to 52,2' GRAVEL PIECE @ bottom (Dacite)
100-10	12:48	12:53	399,98	500.82	3.8 / 12:48 3.8 / 12:52	50.3 (46.5)	54.0 (50.2)	N	75-175	SAND, gravel Loose	?	slow to 53.0 → increase pressure → 54
100-9	1:06	1:09	576,21	442.98	4.0 / 1:06 4.0 / 1:09	51.8 (47.1)	54.2 (50.2)	N	75-	SAND	—	fast to 54' → easy
100-8	1:15	1:17	677,32	380,46	4.0 / 13:15	49.3 (45.3)	54.1 (50.1)	N	75	SAND	—	very fast to 54.1' ← limit
100-7	1:24	1:25	739,32	402,17	3.9 / 1:23	50.0 (46.0)	+5.8 (54.0')	N	75	SAND	—	easy to 54 CRD, Tried if we can go further
100-6	1:30	1:32	902,43	355,85	3.8 / 1:32	49.5	54.1 (50.3)	N	75	SAND	—	fast to 54' not (50.3 CRD)
100-5	1:51	1:55	1269,99	322,99	3.7 / 1:51 3.7 / 1:55	47.0 (43.3)	54.8 (51.1)	N	75-175	SAND	—	fast to 52.7' increase pressure stopped @ 53.7 then very fast to 54.8
100-4	2:03	2:05	351,24	259.64	3.6 / 2:03	48.5 44.9	54.0 50.4	N	75-	Sand	—	moderate to fast pace, maybe some obstruction with 175 psi
100-2	2:23	2:24	275,14	098.78	3.5 / 2:23	50.3 (46.8)	53.5 (50.0)	N	75-	Sand	—	fast to 53.5
100-3	2:51	2:52	374,91	370,71	3.4 / 2:47	51.8 (48.4)	54.8 (50.6)	N	75-	Sand	—	fast to 54.0
100-1	3:06	3:06	663,63	057.91	3.3 / 3:06	58.9 54.6	53.9 (50.6)	N	—	—	—	Top of overburden below final depth.
8/17/00												
95-1	8:42	8:45	2033	589.48	5.5 / 8:40	52.5 (47.0)	56 (50.5)	N	75-	Sand, silt?	—	easy to 56.0'
93-1	9:25	2:25	797,84	128.10	4.7 / 9:20	53.2 (48.5)	56 (51.3)	N	75	Sand, silt?	—	easy ~ 20s for 3'
90-2	10:03	10:04	904.97	276.11	4.5 / 9:58	48.6 (44.4)	55.9 (51.4)	N	75-	Sand, silt	—	20sec easy
90-1	10:23	10:24	509,53	302.01	4.4 / 10:20	45 (40.5)	54.9 (50.5)	N	75	Sand, Silt	—	40 sec - easy
88-14	11:10	11:15	562,39	478.81	4.0 / 11:06	49 (45)	50.0	Y	75-175	Rock	49.8'	hard move over 3-5' at 2 locations close by refusal
88-9						48.4	48.5	Y		Rock	L	

Probing Explorations Columbia River Channel Deepening Project

Date: 8/18/00 G. UEDERA

	Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
JP	87-46	0737	0738	333.97	300.76	5.2/0735	48.9 (43.7)	49.8 (44.6)	Y	75	SILT/SAND OVER ROCK	44.6	
		0738	0740				49.8 (44.6)	49.9 (44.7)	Y	175	ROCK		
JP	87-45	0748	0749	467.53	368.11	5.2/0747	46.8 (41.6)	51.8 (46.6)	Y	75	SILT AND SAND OVER ROCK	46.6	
		0749	0750				51.8 (46.6)	51.8 (46.6)	Y	175	ROCK		
JP	87-25	0754	0755	520.46	265.01	5.2/0752	44.8 (39.6)	50.2 (45.0)	Y	75	SAND AND SILT OVER ROCK	45.0	EASY TO ROCK 10/FT
		0755	0756				50.2 (45.0)	50.2 (45.0)	Y	125	ROCK		
JP	87-24	0801	0802	536.97	217.95	5.1/0800	51.1 (46.0)	51.1 (46.0)	Y	75	ROCK	46.0	HARD
		0803	0804				51.1 (46.0)	51.3 (46.2)	Y	175	ROCK		
JP	87-27	0808	0809	497.78	210.96	5.1/0807	49.8 (44.7)	49.8 (44.7)	Y	75	ROCK	44.7	HARD NO PROGRESS
		0809	0810				49.8 (44.7)	49.8 (44.7)	Y	175	ROCK		
JP	87-28	0812	0813	479.58	255.41	5.1/0812	47.0 (41.9)	49.9 (44.8)	Y	75	SAND/SILT OVER ROCK	49.8	SOFT EASY AT FIRST
		0814	0815				49.9 (44.8)	50.0 (44.9)	Y	175	ROCK		
JP	87-34	0818	0819	435.00	216.50	5.1/0817	50.4 (45.3)	50.8 (45.7)	Y	75	GRAVEL OVER ROCK	45.7	WHEN PU AND GO BACK ACTED LIKE MATERIAL SLOUGHING IN
		0819	0820				50.8 (45.7)	50.9 (45.7)	Y	175	ROCK		
JP	87-33	0829	0831	462.36	170.36	5.0/0829	50.0 (45.0)	50.2 (45.2)	Y	75	ROCK COBBLES ?	45.2	HARD BOTTOM LOSE PROGRESS IF PICK UP
		0831	0832				50.2 (45.2)	50.3 (45.3)	Y	175	ROCK COBBLES ?		PROBE AND RETURN TO SAME POINT
JP	87-32	0837	0838	481.74	125.21	5.0/0837	49.1 (44.1)	49.5 (44.5)	Y	75	COBBLES	44.5	LOSE GROUND WHEN PU PROBE AS BEFORE
		0838	0839				49.5 (44.5)	49.5 (44.5)	Y	175	COBBLES		
JP	87-35	0848	0849	423.48	172.90	4.9/0848	50.0 (45.1)	50.0 (45.1)	Y	75	COBBLES	45.1	JET SKIMS AROUND SOME
		0849	0851				50.0 (45.1)	50.1 (45.2)	Y	175	COBBLES		
JP	87-20	0903	0905	573.60	289.77	4.9/0903	44.6 (39.7)	49.3 (44.4)	Y	75	SILT/SAND ROCK	44.4	SOFT T/ 49.3 THEN HARD
		0905	0910				49.3 (44.4)	49.3 (44.4	Y	175	ROCK		HARD, NO PROBLEM RTN TO WHERE IT PULLED UP

Probing Explorations Columbia River Channel Deepening Project

Date: 8/18/00 G. VEDERA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
87-19	0911	0912	551.81	246.75	4.9/0911	44.7 (39.8)	49.3 (44.4)	Y	75	SAND OVER ROCK	44.4	SOFT, EASY THEN HARD
	0912	0913				49.3 (44.4)	49.5 (44.6)	Y	175			
87-18	0917	0919	598.89	207.42	4.8/0917	49.1 (44.3)	49.2 (44.4)	Y	75	ROCK	44.4	HARD
	0919	0920				49.2 (44.4)	49.3 (44.5)	Y	175	ROCK		
87-13	0922	0923	612.43	264.55	4.8/0922	44.0 (39.2)	48.9 (44.1)	Y	75	SAND OVER ROCK	44.1	SOFT, EASY THEN HARD
	0923					48.9 (44.1)	49.0 (44.2)	Y	175			
87-17	0927	0928	618.46	162.83	4.8/0928	48.5 (43.7)	48.7 (43.9)	Y	75	ROCK	43.9	HARD
	0929					48.7 (43.9)	48.8 (44.0)	Y	175	ROCK		HARD
87-26	1008	1010	536.38	108.07	4.7/1002	48.9 (44.2)	49.0 (44.3)	Y	75	ROCK	44.3	HARD
	1010	1011				49.0 (44.3)	49.0 (44.3)	Y	175	ROCK		HARD CURRENT
87-39	1028	1030	448.40	943.09	4.6 /1028	48.5 (43.9)	49.1 (44.5)	Y	75	ROCK	44.5	HARD, LITTLE PROGRESS
	1030	1031				49.1 (44.5)	49.2 (44.6)	Y	175	ROCK		
87-40	1033	1034	418.44	000.10	4.5/1035	48.2 (43.6)	50.1 (45.5)	Y	75	SAND OVER ROCK	45.5	SOFT, EASY JETTING TO TOP OF HARD.
	1034	1035				50.1 (45.5)	50.3 (45.7)	Y	175	ROCK		
87-42	1100	1101	417.93	858.61	4.4/1048	47.5 (43.1)	48.0 (43.6)	Y	75	SAND OVER ROCK	43.6	EASY 1.5 FT THEN HARD
	1101	1102				48.0 (43.6)	48.1 (43.7)	Y	175	ROCK		
87-37	1107	1108	500.49	821.44	4.2/1107	48.0 (43.8)	48.3 (44.1)	Y	75	ROCK	44.1	HARD
	1108	1110				48.3 (44.1)	48.8 (44.6)	Y	175	ROCK		
87-38	1114	1116	478.09	877.05	4.2/1114	48.0 (43.8)	48.5 (44.3)	Y	75	ROCK	44.3	SOFT 0.5 FT OVER HARD
	1116	1117				48.5 (44.3)	48.6 (44.4)	Y	175	ROCK		
87-36	1120	1121	510.86	959.06	4.1/1120	49.0 (44.9)	49.5 (45.4)	Y	75	SAND OVER ROCK	45.4	EASY AT FIRST, THEN HARD
	1121	1122				49.5,	50.0	Y	175	ROCK		HARD

Probing Explorations Columbia River Channel Deepening Project

Date: 8/18/00 G. VEDERA

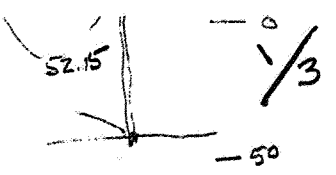
Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
87-31	1126	1129	529.01	033.03	4.1/1125	49.4 (44.9)	49.1 (45.0)	Y	75	ROCK	45.0	HARD
	1129	1130				49.1 (45.0)	49.1 (45.0)	Y	175	ROCK		
87-41	1141	1142	447.84	796.71	4.0/1140	47.1 (43.1)	48.0 (44.0)	Y	75	SAND OVER ROCK	44.0	EASY AT FIRST TO TOP OF ROCK
	1142	1143				48.0 (44.0)	48.0 (44.0)	Y	175	ROCK		
87-29	1150	1152	589.02	916.27	4.0/1145	48.0 (44.0)	49.0 (45.0)	Y	75	SAND OVER ROCK	45.0	FIRST 1.0FT 2 10SEC
	1152	1153				49.0	49.1	Y	175	ROCK		
87-30	1155	1156	558.11	981.91	3.9/1159	48.0 (44.0)	48.7 (44.7)	Y	75	SAND OVER ROCK	44.7	2 SEC TO ROCK
	1156	1157				48.7 (44.7)	49.0 (45.0)	Y	175	ROCK		
87-21	1253	1254	664.48	886.02	3.5/1252	47.8 (44.3)	48.5 (45.00)	Y	75	ROCK	45.00	HARD
	1254	1255				48.5 (45.00)	49.1 (45.6)	Y	175	ROCK		
87-15	1304	1306	665.59	053.71	3.4/1304	51.4 (48.0)	51.8 (48.4)	Y	75	ROCK COBBLES?	48.4	HARD
	1306	1308				51.8 (48.4)	51.8 (48.4)	Y	175	COBBLES?		SEEM TO LOSE GROUND WHEN MOVING PROBE
87-14	1310	1312	744.82	970.09	3.4/1310	47.5 (44.1)	47.5 (44.1)	Y	75	ROCK	44.1	HARD
	1312	1313				47.5 (44.1)	48.0 (44.6)	Y	175	ROCK		
87-10	1315	1317	727.44	094.09	3.4/1315	46.4 (43.0)	47.3 (43.9)	Y	75	SMALL GRAVEL?	—	HARD
	1317	1318				47.3 (43.9)	54.0 (50.6)	Y	175	GRAVEL?	50.6	TOOK OFF W/ INCREASE IN PUMP PRESSURE
87-22	1327	1328	577.31	091.78	3.4/1324	46.8 (43.4)	47.0 (43.6)	Y	75	COBBLES?	43.6	
	1328	1330				47.0 (43.6)	47.2 (43.8)	Y	175	COBBLES OR BIG ROCKS		PICK UP AND GO BACK TO SAME SPOT CAN'T GET SAME DEPTH
87-12	1335	1336	643.30	210.58	3.3/1335	49.1 (45.8)	50.0 (46.7)	Y	75	GRAVEL?	46.7	HESITATED THEN QUICKLY ADVANCED 1 FOOT
	1336	1337				50.0 (46.7)	50.0 (46.7)	Y	175	ROCK		
87-16	1343	1344	633.62	119.06	3.3/1340	48.6 (45.3)	49.3 (46.0)	Y	75	GRAVEL?	—	
	1344	1345				49.3 (46.0)	50.5 (47.2)	Y	175	GRAVEL?	47.2	HESITATED THEN DROPPED W/ PRESSURE INCREASE

Probing Explorations Columbia River Channel Deepening Project

Date: 8/18/00 G. VEDERA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
87-11	1353	1354	669.90	145.95	8.3/1350	~~50.5~~ (47.2)	50.7 (47.4)	Y	75	ROCK	47.4	1350 CK ON GPS = 3' HAND
	1354					50.7 (47.4)	51.0 (47.7)	Y	175	ROCK		
87-09	1402	1403	753.98	023.67	3.3/1402	47.0 (43.7)	~~46.9~~ ~~47.0~~ (43.7)	Y	75	ROCK	43.7	HARD ROCK ROLLED
	1403	1404				~~46.9~~ ~~47.0~~ (43.7)	47.2 (43.9)	Y	175	ROCK		
87-08	1425	1427	801.72	126.55	3.2/1424	~~50.3~~ (48.1)	52.0 (49.8)	Y	75	GRAVEL OVER ROCK	48.8	PROBE HOLDS THEN SURGES AHEAD
	1427	1429				52.0 (48.8)	52.3 (49.1)	Y	175	ROCK		HAND
87-07	1433	1435	~~850.40~~	984.77	3.1/1438	46.3 (43.2)	46.7 (43.6)	Y	75	ROCK	43.6	HAND
	1435	1437				46.7 (43.6)	47.0 (43.9)	Y	175	ROCK		HAND
87-05	1441	1443	926.10	~~053.50~~	3.1/1438	47.5 (44.4)	48.5 (45.4)	Y	75	ROCK	45.4	HAND
	1443	1445				48.5 (45.4)	49.2 (46.1)	Y	175	ROCK		HAND

Probing Explorations Columbia River Channel Deepening Project



Date: 8/17/00 G. VEDERA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden (CRD)	Probe Penetration Elevation (CRD)	Probe Refusal	Water Jet Pressures PSI	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
JP-95	0842	0845	203.08	587.30	5.5/0840	52.5 (47.0)	56.0 (50.5)	N	75	SAND	—	<1 MIN T/56'
JP-93	0924	0924	791.30	127.98	4.7/0920	53.2 (48.5)	56.0 (51.3)	N	75	SAND	—	<1 MIN T/56' LIKE 20 SEC
JP-90-2	1003	1003	905.16	276.07	4.5/0958	48.6 (44.1)	56.0 (51.5)	N	75	SAND	—	<30 SEC
JP-90-1	1023	1024	509.90	302.00	4.4/1025	45.0 (40.6)	55.0 (50.6)	N	75	SAND	—	N 30 SEC T/55
JP-88-14	1110	1111	563.08	478.67	4.0/1107	49.0 (45.0)	50.0 (46.0)	Y	75	ROCK?	46.0	
	1111	1112	"	"	"	50.0 (46.0)	50.0 (46.0)	Y	175	"	46.0	MOVE OVER
	1113	1115	556.60	482.01	"	50.3 (46.3)	51.3 (47.3)	Y	175	"	47.3	CHECH JETS = OK
JP 88-9	1118	1120	636.96	510.25	"	46.4 (44.4)	48.5 (44.5)	Y	75	ROCK	44.5	
	1120	1122	"	"	"	46.5 (44.5)	48.5 (44.5)	Y	175	"	44.5	
JP 88-12	1128	1128:30	585.74	508.37	"	48.8 (44.8)	49.0 (45.0)	Y	75	ROCK	45.0	
	1128	1129	"	"	"	49.0 (45.0)	49.0 (45.0)		175	"	45.0	MOVE
	1129	1130	591.01	509.16	4.0/1132	49.0 (45.0)	49.1 (45.1)	Y	175	"	45.1	
JP 88-13	1134	1135	558.41	512.24	"	50.0 (46.0)	50.0 (46.0)	Y	75	ROCK	46.0	
	1135	1137	"	"	"	50.0 (46.0)	50.1 (46.1)	Y	175	"	46.0	CHECK JETS = GOOD

Date: 8/17/00 G. VENERA

	Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
JP	88-15	1150	1152	572.97	438.66	4.0/1132	49.0 (45.0	49.2 (45.2)	Y	75	ROCK	45.2	OPERATOR FEELS AHEAD SCRAPING UNDER SOFT MUD
		1152	1153	"	"	"	49.2 (45.2)	49.3 (45.3	Y	175	ROCK	45.2	
JP	88-11	1156	1157	615.50	440,90	"	48.8 (44.8)	48.8 (44.8)	Y	75	ROCK	44.8	
		1157	1159	"	"	"	48.8 (44.8)	48.8 (44.8)	Y	175	ROCK	44.8	CHECK JETS - GOOD
JP	88-10	1201	1202	603,96	560.09	3.8/1205	50.4 (46.6)	50.5 (46.7)	Y	75	ROCK	46.7	
		1202	1203	"	"	"	50.5 (46.7)	51.2 (47.4)	Y	175	ROCK	46.7	MOVED PROBE AROUND
		1203	1205	603.98	560.86	"	50.5 (46.7)	51.2 (47.4)	Y	175	ROCK	46.7	TO CHECK CONSISTENCY
													LUNCH BREAK 12:00-12:30
JP	88-8	1253	1255	625.93	603.98	3.5/1252	51.0 (47.5)	51.0 (47.5)	Y	75	ROCK	47.5	
		1255	1255	"	"	"	51.0 (47.5)	51.5 (48.0)	Y	175	ROCK	47.5	
JP	88-4	1325	1326	763.26	503.61	3.3/1325	49.2 (45.9)	49.2 (45.9)	Y	75	ROCK	45.9	
		1326	1328	"	"	"	49.2 (45.9)	49.2 (45.9)	Y	175	ROCK	45.9	WORK PROBE, HARD BOTTOM
JP	88-5	1331	1332	751.54	556.47	3.3/1325	49.0 (45.7)	49.2 (45.9)	Y	75	ROCK	45.9	
		1332	1334	"	"	"	49.2 (45.9)	49.2 (45.9)	Y	175	ROCK	45.9	
JP	88-6	1337	1338	711.90	600.98	3.3/1325	47.5 (44.2)	49.0 (45.7)		75	SAND/SILT OVER ROCK	45.7	
		1338	1339	"	"	"	49.0 (45.7)	49.3 (46.0)		175	ROCK	45.7	CHECK JETS = OK

Probing Explorations Columbia River Channel Deepening Project

Date: 8/17/00 G. VEDERA

	Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
JP	88-7	1344	1345	702.75	516.74	3.3/1325	48.0 (44.7)	50.0 (46.7)	Y	75	SAND/SILT OVER ROCK	46.7	
		1345	1346	"	"		50.0 (46.7)	50.3 (47.0)	Y	175	ROCK	46.7	
JP	88-1	1359	1401	904.30	564.70	3.1/1359	45.0 (41.9)	52.0 (48.9)	Y	75	SAND/SILT	48.9	MODERATE RATE AT FIRST THEN HARD
		1401	1402	"	"		52.0 (48.9)	52.3 (49.2)	Y	175	"	48.9	
JP	88-3	1406	1408	811.36	606.20	3.1/1359	44.8 (41.7)	49.2 (46.1)	Y	75	SAND/SILT	46.1	MODERATE RATE AT FIRST THEN HARD
		1408	1409	"	"		49.2 (46.1)	49.3 (46.2)	Y	175	"	46.1	CHECK JETS = OK
JP	88-2	1415	1416	849.39	536.50	3.1/1359	46.0 (42.9)	50.1 (47.0)	Y	75	SAND/SILT	47.0	60SEC/4.1 FT.
		1416	1416	"	"		50.1 (47.0)	50.2 (47.1	Y	175	"	47.0	
JP	87-43	1430	1432	586.68	920.40	3.0/1430	46.8 (43.8)	46.8 (43.8)	Y	75	ROCK	43.8	V. HARD, NO SEDIMENTS
		1432	1434	"	"		46.8 (43.8)	46.8 (43.8)	Y	175	ROCK	43.8	
JP	87-44	1442	1443	353.47	979.20	3.0/1430	49.8 (46.8	50.2 (47.2)	Y	75	SAND/SILT OVER ROCK	47.2	
		1443	1444	"	"		50.2 (47.2)	50.2 (47.2)	Y	175	ROCK	47.2	

21 TOTAL LOCATIONS F/DAY

Probing Explorations Columbia River Channel Deepening Project

Date: 8/21/00 G. VEDERA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
87-13	0754	0756	555.25	157.22	2.9/0754	48.0 (45.1)	48.6 (45.7)	Y	75	WEATHERED ROCK	45.7	HARD, SLOW PENETRATION
	0756	0758				48.6 (45.7	48.8 (45.9	Y	175	ROCK		
87-6	0830	0830	901.15	125-81	3.2/0825	52.8 (49.6)	56.0+ (52.8+)	N	75	SAND, SLT	>52.8	SOFT <0.10SEC TO CONTACT
87-4	—	—	971.25	104.96		56+ (52.8+)	—	N	75 175	UNKNOWN	—	BOTTOM OVER - 50.0 FT AT THIS LOCATION
87-3	0845	0847	967.10	027 60	3.5/0849	49.0 (45.5)	49.7 (46.2)	Y	75	WEATHERED ROCK	46.2	HARD FROM START
	0847	0848				49.7 (46.2)	50.0 (46.5)	Y	175	ROCK		
87-2	0852	—	006.03	081.85	3.5/0849	54.0 (50.5)	55.5 (52.0)	N	—	SAND/SILT	>52.0+	FIRST TOUCH BTWN 50 S IELEV PROBE SINK TO 52 W/ PUMP OFF
87-1	0901	0901	077.41	663.01	3.5/0900	53.5 (50.0)	56.0+ (52.5+)	N	75	SAND/SILT	>52.5	FIRST TOUCH SOFT - LEAST FAST PENETRATION TO OVER 52 ELEV
82-3	1044	1044	874.58	417.52	2.6/1043	44.7 (42.1)	53.5 (50.9)	N	75	SAND	—	SOFT EVEN FAST PENETRATION HARD AT FIRST CONTACT = SAND
82-2	1054	1054	555.93	257.89	2.6/1054	45.0 (42.4)	53.6 (51.0)	N	75	SAND	— slow	STOP ON CONTACT NO PUMP. PUMP ON PU = SMOOTH FAST PENETRATION
82-1	1103	1103	988.12	242.91	2.6/1054	45.0 (42.4)	55 (52.4	N	75	SAND	—	SOFT STOP ON CONTACT, NO PUMP PU W/ PUMP ON, BLEW OUT HOLE FAST PENT.
79-3	1151	1151	839.98	061.41	2.4/1149	45.8 (43.4)	54.5 (52.1)	N	75	SAND	—	SOFT STOP ON INITIAL CONTACT (PUMP OFF) PUMP ON LIFT UP THEN LOWER 10' IN 10SEC. OK
79-2	1257	1257	257.94	104.11	2.0/1256	48.5 (46.5)	54.0 (52.0)	N	75	SAND	—	SOFT STOP ON INITIAL CONTACT W/ PUMP OFF PUMP ON = 6'/10SEC SMOOTH EVEN PENT.
79-1	1317	1317	613.81	826.22	1.9/1314	48.2 (46.3)	53.5 (51.6)	N	75	SAND	—	SOFT STOP ON INITIAL CONTACT W/ PUMP OFF PUMP ON = 1SEC/1FT EASY PENT.
74-1	1427	1427	777.77	795.88	1.5/1424	51.0 (49.5) 44.2	55 (53.5)	N	75	SAND	—	SOFT STOP ON INITIAL CONTACT W/ PUMP OFF PUMP ON = 1SEC/1FT PENT. PLATE
	8/22/00		G. VEDERA									
70-1	0942	0944	461.09	380.78	3.1/0942	44.2 (40.6)	46.5 (42.9)	N	75	SAND	—	SOFT STOP ON INITIAL CONTACT SLOW PENETRATION IN SOFT MATERIAL STOP
↓	0944	0950	↓	↓	↓	46.5 (42.9)	52.0 (48.4)	N	175	SAND	—	BETTER PENETRATION, PULLED UP AND COULDN'T GET BACK (CAVE IN
												TRIED SEVERAL TIMES. CHECK JETS = 2 SIDE JETS PLUGGED
↓	0952	0952	↓	↓	↓	44.2 (40.6)	53.0 (51.40)	N	175	COARSE SAND	—	WITH COARSE SAND, CONCRETE @ 175 PENT. 11' IN 22SEC. OK
63-3	1132	1132	522.58	252.90	2.6/1132	53.0 50.4)	54.0 (51.4)	N	75	SAND	—	SOFT EASY PENETRATION

Probing Explorations Columbia River Channel Deepening Project

Date: 8-22-00 G. VEDERA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
63-2	1149	1149	754.13	960.97	2.6/1132	50.00 (47.4)	54.0 (51.4)	N	75	SAND	—	SOFT, EASY, FAST PENETRATION @ 1 FT/SEC
63-1	1205	1205	162.66	676.58	2.3 /1205	46.3 (44.0)	54.0 (51.7)	N	75	SAND	—	SOFT EASY PENETRATION @ 0.5 FT/SEC
62-1	1225	1225	496.55	278.64	2.0/1221	47.0 (45.0)	52.5 (50.5)	N	75	SAND	—	SOFT, EASY, PENETRATION @ 0.5FT/SEC
61-1	1255	1255	223.25	108.06	1.8/1255	51.8 (49.4)	54.0 (52.2)	N	75	SAND	—	SOFT, EASY, PENETRATION @ ~0.5 FT/SEC
56-1	1412	1413	96500	32139	2.1/1411 ±000?	44.5 (42.4)	54.0 (51.9)	N	75	SAND	—	SOFT, STEADY PENETRATION @ ~0.5 FT/SEC
	8-23-00 G. VEDERA					MAKE NORTH ADJACENT TO 56-1						
55-15	0807	0807	266.23	500.96	3.8/0807	60.0 (56.2)	—	N/A	—	SAND OVER ROCK	—	TAGGED BTM @ OVER-50 ELEV NO NEED TO PUMP SOFT THEN HARD
55-14	0810	0810	249.26	474.57		60.0 (56.2)	—	N	—	SAND OVER ROCK	—	
55-13	0811	0811	232.77	471.63		58.0 (54.2)	—	N	—	ROCK	—	HARD ON CONTACT
55-12	0814	0814	244.85	455.73		59.5 (55.7)	—	N	—	ROCK	—	
55-11	0816	0816	279.54	438.56		54.5 (50.7)	—	N	—	ROCK	—	
55-10	0818	0818	255.90	440.25		60.0 (56.2)	—	N	—	SAND	—	SOFT CONTACT
55-9	0820	0820	256.08	420.57		59.5 (55.7)	—	N	—	ROCK		HARD CONTACT
55-8	0821	0822	282.17	409.58		50.8 (47.0)	50.8 (47.0)	Y	75	ROCK	47.0	HARD CONTACT, DIFFICULT PENETRATION (WEATHERED ROCK)
↓	0822	0823	↓	↓		50.8 (47.0)	51.8 (48.0)	Y	175	ROCK		
55-6	0826	0827	285.42	382.06		51.9 (48.9)	52.8 (49.8)	Y	75	ROCK	48.1	HARD CONTACT, ROCKS FEEL LIKE THEY ROLL AROUND
↓	0827	0829	↓	↓		52.8 (49.8)	52.8 (49.8)	Y	175	ROCK		PROBE "SKIDS" AROUND
55-4	0830	0831	286.61	364.10		51.6 (47.8)	54.0 (50.8)	Y	75	WEATHERED ROCK	47.8	PROBE "WORKS" ITS WAY IN AFTER HARD CONTACT
↓	0831	0832	↓	↓	↓	54.0 (50.8)	53.2 (49.4)	Y	175	ROCK		NO AND CAN'T GET BACK TO SAME POINT
55-2	0839	0839	291.21	344.28	4.3/0839	54.7 (50.4)	—	—	—	ROCK	50.4	HARD CONTACT, OVER-50 ELEV NO NEED TO PUMP
55-7	0847	0847	258.97	397.53		55.8 (51.9)	—	—	—	ROCK	50.9	HARD CONTACT OVER-50 ELEV
55-5	0849	0849	246.31	384.51	↓	58.0 (53.7)	—	—	—	ROCK	53.7	HARD CONTACT OVER-50 ELEV

@ 1311 * 6 @ 1410 IE NORTH OF 56-1 ADJACENT

Probing Explorations Columbia River Channel Deepening Project

Date: 8-23-00 G. VEDERA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
55-3	0850	0857	265.93	366.01	4.3/0839	52.5 (48.2)	53.0 (48.7)	Y	75	WEATHERED ROCK	48.2	HARD CONTACT. PROBE JUMPS AROUND
↓	0851	0853	↓	↓	↓	53.0 (48.7)	53.5 (49.2)	Y	175	WEATHERED ROCK		
55-1	0855	0855	268.43	342.50	↓	53.8 (49.5)	55.8 (51.5)	N	75	FRACTURED ROCK	~~49.5~~	BUMPED ROCK OUT OF WAY WENT TO ~51.5
47-1	1044	1044	719.36	139.05	4.5/1044	49.0 (44.5)	55.5 (51.00)	N	75	SAND	—	SOFT CONTACT, EASED IN 1 FT/SEC PENT.
46-1	1109	1110	076.30	040.34	4.1/1109	47.5 (43.4)	55.5 (51.4)	N	75	SAND	—	SOFT CONTACT PROBE OK @ 0.5 FT/SEC
44-1	1138	1138	004.01	398.80	3.9/1137	49.0 (45.1)	55.0 (51.1)	N	75	SAND	—	SOFT CONTACT SOFT EASY PROBE @ 0.5 TO 1 FT/SEC
42-64	1221	1222	958.76	426.07	2.8/1220	50.8 (48.0)	51.2 (48.4)	Y	75	WEATHERED ROCK	48.0	HARD CONTACT
↓	1222	1224	↓	↓	↓	51.2 (48.4)	51.5 (48.7)	Y	175	WEATHERED ROCK		HARD
42-63	1225	1226	961.97	420.13	↓	50.1 (47.3)	50.5 (47.7)	Y	75	ROCK	47.3	HARD CONTACT
↓	1226	1228	↓	↓	↓	50.5 (47.7)	53.0 (50.2)	Y	175	WEATHERED ROCK		GAIN .5 FT W/ PUMP PRESS. INCR. WORKED T/ GET T/ ~50.2 ELEV
42-61	1231	1232	965.29	399.19	↓	49.7 (46.9)	50.1 (47.3)	Y	75	ROCK	46.9	HARD CONTACT
↓	1232	1234	↓	↓	↓	50.1 (47.3)	50.3 (47.5)	Y	175	ROCK		VERY HARD TO PENETRATE
42-62	1235	1236	983.46	415.78	↓	51.1 (48.3)	52.0 (49.2)	Y	75	WEATHERED ROCK	48.3	HARD CONTACT
↓	1236	1238	↓	↓	↓	52.0 (49.2)	52.8 (50.0)	Y	175	ROCK		WORKED DOWN TO GRADE
42-60	1239	1240	999.02	408.16	↓	51.5 (48.7)	52.1 (49.3)	Y	75	WEATHERED ROCK	48.7	HARD CONTACT
↓	1240	1242	↓	↓	↓	52.1 (49.3)	~~52.8~~ (50.0)	Y	175	ROCK		
42-59	1244	1246	983.61	382.02	↓	50.8 (48.0)	52.5 (49.7)	Y	75	ROCK	48.0	HARD CONTACT
↓	1246	1248	↓	↓	2.3/1253	52.5 (49.7)	52.9 (50.2)	Y	175	ROCK		WORK PROBE UP AND DN TO GET DEPTH
42-58	1252	1253	015.55	384.28	2.3/1253	51.0 (48.7)	51.6 (49.3)	Y	75	ROCK	48.7	HARD CONTACT
↓	1253	1254	↓	↓	↓	51.6 (49.3)	52.7 (50.4)	Y	175	ROCK		
42-57	1255	1256	034.22	369.99	↓	51.6 (49.3)	52.0 (49.7)	Y	75	ROCK	49.3	HARD CONTACT
↓	1256	1258	↓	↓	↓	52.0 (49.7)	52.8 (50.5)	Y	175	ROCK		WORK T/ GRADE SLO

WATER 0:30

Probing Explorations Columbia River Channel Deepening Project

Date: 8-23-00 G. VENERA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
42-56	1259	1300	623.84	346.53	2.3/1253	50.0 (47.7)	50.7 (48.4)	Y	75	WEATHERED ROCK	47.7	HARD CONTACT
↓	1300	1302	↓	↓	|	50.7 (48.4)	50.8 (48.5)	Y	175	ROCK		HARD TO MAKE PROGRESS
42-55	1304	1304	045.12	33528	↓	52.6 (50.3)	—	—	—	~~ROCK~~	50.3	HARD CONTACT @ BELOW GRADE OF −50.0 ELEV.
42-52	1314	1314	167.25	474.49	2.1/1316	55.0 (52.9)	—	—	—	~~ROCK~~	52.7	HARD CONTACT BELOW GRADE
42-49	1318	1318	161.57	438.63	↓	56.0 (53.9)	—	—	—	~~ROCK~~	53.9	HARD CONTACT BELOW GRADE
42-48	1321	1321	193.12	454.16	↓	53.8 (51.7)	—	—	—	~~ROCK~~	51.7	HARD CONTACT BELOW GRADE
42-45	1323	1324	189.38	416.28	↓	51.5 (49.4)	52.3 (50.2)	Y	75	WEATHER ROCK	49.4	HARD CONTACT.
42-50	1330	1330	202.98	494.19	↓	53.7 (51.6)	—	—	—	—	51.6	HARD CONTACT BELOW GRADE
42-54	1335	1335	188.87	520.35	↓	56.0 (53.9)	—	—	—	—	53.9	HARD CONTACT BELOW GRADE
42-46	1338	1340	236.19	469.44	1.9/1338	49.0 (47.1)	49.0 (47.1)	Y	75	WEATHERED ROCK	47.1	HARD CONTACT.
↓	1340	1342	↓	↓	↓	49.0 (47.1)	50.0 (48.1)	Y	175	ROCK		SKID OFF ROCK TO MAKE DEPTH
42-44	1345	1347	225.00	426.44	↓	49.0 (47.1)	51.8 (49.9)	Y	75	WEATHERED ROCK	47.1	HARD CONTACT
↓	1347	1350	↓	↓	↓	51.8 (49.9)	52.0 (50.1)	Y	175	ROCK		
42-43	1400	1400	186.24	388.29	1.7/1402	55.0 (53.3)	—	—	—	SILTY SAND	~~53.3~~	SEMI SOFT CONTACT
42-40	1403	1403	20055	384.65	↓	53.0 (51.3)	—	—	—	↓	~~51.3~~	↓
42-36	1405	1405	253.66	356.63	↓	53.0 (51.3)	—	—	—	↓	~~51.3~~	↓
* 42-37	1408	1410	264.71	314.30	↓	49.0 (47.3)	52.1 (50.4)	N	75	SAND	~~47.3~~	HARD (NOT LIKE ROCK) PENTRATES LIKE SAND
42-34	1412	1412	297.54	36565	↓	51.2 (49.50)	54.0 (52.3)	N	75	SAND	~~49.5~~	GOOD PENETRATION @ 0.5 FT/SEC
42-38	1420	1422	301.48	427.14	1.6/1420	49.9 (48.3)	52.0 (50.4)	N	75	SAND	~~48.3~~	SEMI SOFT CONTACT. STEADY SLOW PENTR. CK JETS = OK
* 42-41	1425	1426	305.03	474.97	↓	49.8 (48.2)	51.8 (50.2)	N	75	SAND?	~~48.2~~	SEMI SOFT CONTACT. "JERKY" PENETRATION.
42-51												NOTE: MEDIUM BOTTOM
												VALUES AS MUCH AS 5 FT

Date: 8/23/00 G. VEDELA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
42-39	1429	1432	333.55	446.06	1.6/1420	49.0 (47.4)	49.8 (47.8)	Y	75	CEMENTED BYLICHA??	47.4	HARD, BUT DOESN'T FEEL LIKE ROCK
↓	1432	1435	↓	↓	↓	49.8 (47.8)	51.0 (49.4)	Y	175	11		
42-35	1437	1437	337.40	399.31	↓	49.2 (47.6)	55.0 (53.4)	N	75	SAND	~~49.6~~	STEADY PENETRATION @ 0.5 FT/SEC
42-33	1440	1440	334.90	361.95	↓	55.0 (53.4)	—	N	—	SAND	~~53.4~~	OVER GRADE DEPTH OF -50FT NO TEST
42-53	1445	1445	217.56	592.85	1.5/1445	52.8 (51.3)	—	N	—	ROCK	~~51.3~~	HARD BOTTOM BELOW GRADE
42-65	1449	1449	246.14	565.36	↓	51.7 (50.2)	53.0 (51.5)	N	NO PUMP	SAND	~~50.2~~	SEMI SOFT CONTACT BELOW GRADE. PUMP DN T/ 51.5 ELEV.
42-51	1454	1454	259.80	566.08	↓	52.6 (51.1)	—	N	—	SAND	~~51.1~~	SEMI SOFT CONTACT BELOW GRADE.
42-47	1459	1501	309.43	561.53	↓	49.1 (47.6)	50.2 (48.7)	Y	75	SAND OVER ROCK	48.7	SEMI SOFT CONTACT.
↓	1501	1503	↓	↓	↓	50.2 (48.7)	50.2 (48.7)	Y	175	ROCK		
42-42	1505	1506	318.44	515.21	↓	49.1 (47.6)	~~50.8~~ (49.3)	Y	75	CEMENTED SAND?	50.8	SEMI SOFT. PROBE SETTLES IN, DOESN'T "CLANK"
↓	1506	1509	↓	↓	↓	~~50.8~~ (49.3)	51.5 (50.0?)	Y	175			WORK IT DOWN, SLOW TO GRADE. DOESN'T CLANK LIKE ROCK
	8-24-00 G. VEDELA											
42-25	0754	0754	781.74	835.56	2.0/0757	56.0 (54.0)	—	—	—	ROCK	54.0	HARD ROCK BELOW GRADE OF -50.0', NO PROBING
42-24	0801	0801	741.94	763.20	↓	50.0 (48.0)	53.0 (51.0)	N	75	SAND	—	HARD CONTACT. EASY PENETRATION @ 1FT/SEC
42-29	0806	0808	720.71	784.23	↓	50.1 (48.1)	50.1 (48.1)	Y	75	—	48.1	HARD CONTACT. NO PROGRESS PROBING (HAND)
↓	0808	0810	↓	↓	↓	50.1 (48.1)	50.9 (48.9)	Y	175	WEATHERED ROCK		DIFFICULT TO ADVANCE PROBE
42-20	0811	0811	823.80	801.16	↓	53.8 (51.8)	—	—	—	ROCK	51.8	HARD CONTACT BELOW GRADE
42-26	0814	0814	833.52	884.55	↓	53.0 (51.0)	—	—	—	ROCK	51.0	HARD CONTACT BELOW GRADE
42-27	0816	0816	856.43	915.95	2.3/0815	54.0 (52.0)	—	—	—	SAND	—	SOFT CONTACT BELOW GRADE
42-21	0819	0819	862.63	857.57	↓	50.8 (49.5)	53.0 (50.7)	N	75	SAND	—	SEMI SOFT CONTACT. EASY PENETRATION 1 FT/SEC
42-17	0822	0822	860.18	812.24	2.4/0821	51.2 (48.7)	53.5 (51.00)	N	75	SAND	—	SEMI SOFT EASY PENETRATION 1 FT/SEC
42-11	0829	0829	884.45	750.18	2.6/0829	56.0 (53.4)	—	—	—	—	—	WELL BELOW GRADE

WHAT IT *

WHAT IS IT *

Probing Explorations Columbia River Channel Deepening Project

Date: 8/24/00 G. VERELA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
42-12	0831	0837	902.24	794.24	2.6/0829	49.0 (46.4	50.8 (48.2)	Y	75	SAND	48.2	SEMI SOFT. EASY PENETR. AT FIRST
↓	0832	0833	↓	↓	↓	50.8 (48.2)	51.0 (48.4)	Y	175	WEATHERED ROCK		STOPPED PENETRATING LIKE HARD ROCK
42-16	0836	0837	908.35	831.59	2.6/0835	51.5 (48.9)	52.5 (49.9)	Y	75	SAND	—	SEMI SOFT. EASY AT FIRST THEN HARD
↓	0837	0838	↓	↓	↓	52.5 (49.9)	53.3 (50.7)	N	175	SAND		ACTED LIKE MOVED ROCK OUT OF WAY AND THEN EASY PENETR.
42-22	0840	0841	885.90	891.33	2.7/0840	50.2 (47.5)	51.8 (49.1)	Y	75	SAND	49.1	SOFT CONTACT EASY TO 49.1 THEN HARD
↓	0841	0842	↓	↓	↓	51.8 (49.)	52.0 (49.3	Y	175	ROCK		HARD DIFFICULT PROBE ADVANCE
42-13	0845	0845	941.48	846.36	↓	51.3 (48.6)	54.0 (51.3)	N	75	SAND	—	SOFT CONTACT EASY PENETR.
42-6	0847	0848	947.99	758.52	2.↓	51.3 (48.6)	52.0 (49.3)	Y	75	WEATHERED ROCK	49.3	HARD CONTACT
↓	0848	0851	↓	↓	↓	52.0 (49.3)	52.9 (50.2)	N	175	ROCK		WORK PROBE TO GRADE W/ DIFFICULTY
42-28	0857	0857	902.03	939.91	3.0/0857	54.0 (51.0)	—	—	—	—	—	HARD CONTACT BUT NOT LIKE ROCK BELOW GRADE
42-23	0902	0904	945.69	949.10	3.2/0902	52.6 (48.8)	52.8 (49.6)	Y	75	SAND	49.6	EASY AT FIRST THEN PROGRESS STOPPED
↓	0904	0905	↓	↓	↓	52.8 (49.6)	53.0 (49.8)	Y	175	ROCK		HARD DIFFICULT TO ADVANCE
42-18	0909	0911	941.42	908.50	3.4/0912	49.2 (45.8)	52.2 (48.8)	Y	75	SAND	48.8	EASY TO 48.8 THEN HARD
↓	0911	0912	↓	↓	↓	52.2 (48.8)	53.0 (49.6)	Y	175	ROCK		DIFFICULT TO ADVANCE
42-14	0915	0916	979.44	876.80	↓	50.8 (47.4)	51.2 (47.8)	Y	75	WEATHERED ROCK	47.4	HARD CONTACT. DIFFICULT TO
↓	0916	0917	↓	↓	↓	51.2 (47.8)	51.2 (47.8)	Y	175	ROCK		NO PROGRESS. HARD
42-10	0923	0925	976.15	819.28	3.5/0921	50.9 (47.4	51.2 (47.7)	Y	75	WEATHERED ROCK	47.4	HARD. SLOW DIFFICULT PROGRESS
↓	0925	0926	↓	↓	↓	51.2 (47.7)	51.4 (47.9)	Y	175	ROCK		DIFFICULT TO ADVANCE CK JETS = OK
42-7	0929	0929	976.68	784.19	3.6/0928	52.0 (48.4)	54.5 (50.9)	N	75	SAND	—	EASY ADVANCE @ 1FT/SEC
42-3	0932	0932	014.13	757.35	3.↓	54.0 (50.4)	—	—	—	SAND	—	SOFT CONTACT BELOW GRADE
42-8	0937	0938	023.91	842.66	3.7/0936	51.2 (47.5)	53.5 (49.8)	Y	75	SAND	49.8	SOFT EASY TO 49.8
↓	0938	0939	↓	↓	↓	53.5 (49.8)	53.9 (50.2)	N	175	WEATHERED ROCK		WORK PROBE TO PLANED GRADE IN ROCK

Probing Explorations Columbia River Channel Deepening Project

Date: 8/24/00 G. VIVERA

Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
42-4	0940	0942	060.35	813.87	3.7/0936	52.4 (48.7)	53.8 (50.1)	N	75	ROCK	48.7	BOUNCEY ADVANCE. MODERATE DIFFICULTY
42-2	0944	0944	094.64	787.09	3.7/0944	52.0 (48.3)	54.0 (50.3)	N	75	SAND	—	EASY ADVANCE @ 1 FT/SEC.
42-1	0948	0948	067.13	741.26	3.7/↓	56.5 (52.8)	—	—	—	SAND ON ATM	—	SOFT CONTACT BELOW GRADE
42-19	1023	1023	980.82	959.23	4.2/1020	55.0 (50.8)	—	—	—	SAND ATM	—	SOFT BOTTOM BELOW GRADE
42-15	1025	1026	029.93	936.95	↓	53.0 (48.8)	53.2 (49.0)	Y	75	ROCK	48.8	FIRM BOTTOM DIFFICULT TO ADVANCE
↓	1026	1027	↓	↓	↓	53.2 (49.0)	53.2 (49.0)	Y	175	ROCK		NO GAIN
42-9	1029	1030	073.03	895.69	4.3/1030	50.9 (46.6)	51.1 (46.8)	Y	75	WEATHERED ROCK	46.6	HARD CONTACT, DIFFICULT TO ADVANCE
↓	1030	1031	↓	↓	↓	51.1 (46.8)	51.5 (47.2)	Y	175	ROCK		DIFFICULT TO ADVANCE
42-5	1037	1038	100.86	844.14	↓	52.5 (48.2)	53.9 (49.6)	Y	75	ROCK	48.2	HARD CONTACT. DIFFICULT TO ADVANCE
↓	1038	1040	↓	↓	4.3/1040	53.9 (49.6)	54.0 (49.7)	Y	175	ROCK		DIFFICULT TO ADVANCE
42-32	1050	1050	093.27	227.27	4.4/1049	50.0 (45.8)	57.0 (52.6)	N	75	SAND	—	FIRM CONTACT EASY PENTR. @ 1 FT/SEC
42-31	1059	1057	244.20	048.27	4.5/1055	50.0 (45.5)	57.0 (52.5)	N	75	SAND	—	SOFT CONTACT. EASY PENTR @ 1 FT/SEC
42-30	1059	1059	261.83	028.59	↓	50.0 (45.5)	57.0 (52.5)	N	75	SAND	—	SOFT CONTACT. EASY PENTR. @ 1 FT/SEC
41-10	1112	1114	559.83	073.19	4.6/1110	53.0 (48.4)	53.5 (48.9)	Y	75	WEATHERED ROCK	48.4	HARD CONTACT. DIFFICULT TO ADVANCE
↓	1114	1115	↓	↓	↓	53.5 (48.9)	53.8 (49.2)	Y	175	ROCK		BOUNCING ONTO OF ROCK
41-9	1121	1122	584.57	057.21	↓	52.5 (47.9)	54.1 (49.5)	Y	75	WEATHERED ROCK	47.9	HARD CONTACT. DIFFICULT TO ADVANCE
↓	1122	1124	↓	↓	↓	54.1 (49.5)	54.1 (49.5)	Y	175	ROCK		NO GAIN
41-8	1125	1127	598.99	039.77	4.6/1125	51.5 (46.9)	52.4 (47.8)	Y	75	WEATHERED ROCK	46.9	HARD CONTACT. DIFFICULT TO ADVANCE
↓	1127	1128	↓	↓	↓	52.4 (47.8)	52.9 (48.3)	Y	175	ROCK		DIFFICULT TO ADVANCE
41-7	1129	1130	621.88	052.21	↓	53.8 (49.2)	55.1 (50.5)	N	75	WEATHERED ROCK	49.2	WORK PROBE MODERATE DIFFIC
41-6	1131		629.92	034.49	↓	53.0 (48.4)	54.9 (50.3)	N	75	SAND OVER ROCK	49.8	EASY AT FIRST. HARDER LAST 0.5 FT

Probing Explorations Columbia River Channel Deepening Project

Date: 8/24/00 G. VERELA

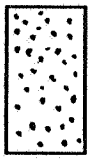
Probe Number	Time Start	Time End	Northing	Easting	River El. CRD/ Time	Top of Over-burden	Probe Penetration Elevation	Probe Refusal	Water Jet Pressures	Assumed Material Penetrated by Probe	Top of Rock El.	Misc. Notes
41-3	1134	1135	641.64	000.88	4.6/1125	51.5 (46.9)	52.5 (47.9)	Y	75	~~LOOSE MATERIAL AND~~ ROCK	47.4	~~HARD~~ CONTACT. LOOSE ROCKS OVER HARD
↓	1135	1136	↓	↓	↓	52.5 (47.9)	53.0 (48.4)	Y	175	ROCK		
41-5	1137	1138	657.57	035.57	↓	52.4 (47.8)	52.8 (48.2)	Y	75	WEATHERED ROCK	47.8	~~HARD~~ CONTACT. DIFFICULT
↓	1138	1139	↓	↓	↓	52.8 (48.2)	52.8 (48.2)	Y	175	ROCK		NO GAIN
41-4	1145	1146	658.50	014.71	4.5/1144	51.1 (46.6)	51.5 (47.0)	Y	75	ROCK	46.6	~~HARD~~ CONTACT. DIFFICULT
↓	1146	1147	↓	↓	↓	51.5 (47.0)	52.1 (47.6)	Y	175	ROCK		DIFFICULT TO ADVANCE
41-2	1148	1149	666.18	997.77	↓	53.4 (48.4)	54.4 (49.9)	Y	75	ROCK	~~48.4~~	~~HARD~~
↓	1149	1150	↓	↓	↓	54.4 (49.9)	54.7 (50.2)	Y	175	ROCK		DIFFICULT
41-1	1151	1151	670.06	977.16	↓	56+ (51.5+)	—	—	—	—	—	BELOW GRADE. STOPPED 1 FOOT ABOVE BOTTOM

Core Boring Logs

Legend for Core Drilling Logs

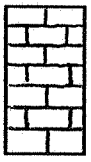
Basalt

Basalt Fragments

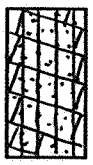


Sand

Silt



Sandstone



Basalt Fragments in Silt/Sand Matrix

CH2MHILL

PROJECT NUMBER: 159184.B1.CD **BORING NUMBER:** DH-41-1
Sheet: 1 of 1

ROCK CORE LOG

PROJECT: Columbia River Channel Deepening **LOCATION:** River Mile 42
BARGE ELEVATION: 0.9 to 2.7 ft (CRD). **DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR
DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME 75 **ORIENTATION:** Vertical
WATER LEVEL: Fluctuating **START:** 8/30/00 **FINISH:** 8/30/00 **LOGGER:** H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS	GRAPHIC LOG	LITHOLOGY: ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
46							WATER.	
47							-47.1	Driller indicated casing is seated at El.-47.1 (CRD)
48	1-HQ	18 %	0%	N/A	No bedrock encountered.		BASALT FRAGMENTS IN A SILTY SAND MATRIX, dark grey, fresh, difficult to scratch with a pocket knife, fine grained, gravel size, subangular.	Driller drove casing 4 ft into solid material, first hard then easy.
49								Basalt fragments possibly originating from previous blasting activities in the area. Not in place.
50							Some gravel sized intact pieces of cemented sand, up to 2.5", brown fine grained,moderately to highly weathered, dent quality, some black, light grey and reddish mottling.	12:45-13:15
51								
52								
53								
54								
55								
56								
57								
58	2-HQ	0 %	0%	N/A			No recovery.	Drilling was very easy. Driller tried to go slower to get better recovery, but drilling was very fast.
59								
60								Driller indicated possibly drilling through sand.
61								
62								
63								
64								
65					End of Boring at El.-65.1 ft CRD.			

CH2MHILL

PROJECT NUMBER: 159184.B1.CD **BORING NUMBER:** DH-41-2
Sheet: 1 of 1

ROCK CORE LOG

PROJECT: Columbia River Channel Deepening **LOCATION:** River Mile 42
BARGE ELEVATION: 0.5 to 1 ft CRD **DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR
DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75 **ORIENTATION:** Vertical
WATER LEVEL: Fluctuating **START:** 8/30/00 **FINISH:** 8/30/00 **LOGGER:** H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS	GRAPHIC LOG	LITHOLOGY: ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
47							Water.	Driller indicated casing is seated at El.-47.5 (CRD)
							-47.5	
48							BASALT FRAGMENTS, dark grey, fresh, difficult to scratch with a pocket knife, fine grained, gravel to cobble size, subangular, some iron staining, few vesicles.	Driller drove casing 4 ft into solid material, first hard then easy.
49								
50								Basalt fragments possibly originating from previous blasting activities in the area. Not in place.
51							SILTY SAND, some gravel size intact pieces of cemented sand, brown, fine grained, highly weathered.	
52								
53	1-HQ	21.6%	0%	N/A	No bedrock encountered.			
54								Easy drilling.
55								
56								
57								
58								
59							SILTY SAND, some gravel size intact pieces of cemented sand, brown, fine grained, highly weathered.	5 minute run.
60								
61	2-HQ	23.3%	0%	N/A				Driller indicated that drilling was easy. It felt like drilling through sand.
62								
63								
64					End boring at El.-63.5 ft (CRD).			
65								
66								

CH2MHILL

PROJECT NUMBER: 159184.B1.CD **BORING NUMBER:** DH-42-1
Sheet: 1 of 1

ROCK CORE LOG

PROJECT: Columbia River Channel Deepening **LOCATION:** River Mile 42
BARGE ELEVATION: 1.6 to 3.7 ft CRD **DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR
DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75 **ORIENTATION:** Vertical
WATER LEVEL: Fluctuating **START:** 8/29/00 **FINISH:** 8/29/00 **LOGGER:** H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS	GRAPHIC LOG	LITHOLOGY: ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
47							Water.	Driller indicated casing is seated at El.-47.9 (CRD)
							-47.9	
48							No recovery, possibly sand or silt.	Driller drove casing 1.8 ft into solid material, 1 foot soft then hard.
49					No recvovery.			
50								Driller indicated easy drilling, possibly through sand. 1 to 2 feet of gravel fragments between El. -47.9 and El.49.9.
51								
52								
53	1-HQ	0 %	0%	N/A				
54								Easy drilling.
55								
56								
57								
58								
59								5 minute run.
60							-60	
61	2-HQ	52.5%	0%	N/A			SANDSTONE, brownish grey, fine grained, moderately weathered, soft to moderately hard, dent quality, thick to massive bedding.	Driller indicated top of run very soft.
62								
63								
64					End boring at El.-63.3 ft (CRD).			
65								
66								

CH2MHILL

PROJECT NUMBER: 159184.B1.CD **BORING NUMBER:** DH-42-2
Sheet: 1 of 1

ROCK CORE LOG

PROJECT: Columbia River Channel Deepening **LOCATION:** River Mile 42
BARGE ELEVATION: -1.1 ft CRD. **DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR
DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75 **ORIENTATION:** Vertical
WATER LEVEL: Fluctuating **START:** 8/29/00 **FINISH:** 8/29/00 **LOGGER:** H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS	GRAPHIC LOG	LITHOLOGY: ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
46							Water.	
							-46.6	Driller indicated casing is seated at El.-46.6 ft (CRD).
47	1-HQ	16 %	0%	N/A	Broken up basalt fragments. No bedrock encountered.		BASALT FRAGMENTS in sand/silt matrix, dark grey, iron stained, fresh to slightly weathered, subangular.	Driller drove casing 3 ft into solid material, 2 ft soft then hard.
48								
49								
50								Basalt fragments possibly result from previous blasting in the area.
51							BASALT FRAGMENTS in sand/silt matrix, dark grey, iron stained, fresh to slightly weathered, subangular.	
52	2-HQ	30%	0%	N/A				
53								
54								
55								Driller indicated very easy drilling, possibly through sand/silt. 3-HQ took less than 5 minutes.
56							Recovery consists of one gravel piece, basalt with some sandy silt staining, brown, iron staining, subangular.	
57								
58								
59	3-HQ	3%	0%	N/A				
60								
61								
62								
63								
64					End boring at El.-63.1 ft (CRD).			
65								

CH2MHILL

PROJECT NUMBER: 159184.B1.CD **BORING NUMBER:** DH-42-3
Sheet: 1 of 1

ROCK CORE LOG

PROJECT: Columbia River Channel Deepening **LOCATION:** River Mile 42
BARGE ELEVATION: 4.8 ft CRD **DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR
DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75 **ORIENTATION:** Vertical
WATER LEVEL: Fluctuating **START:** 8/25/00 **FINISH:** 8/25/00 **LOGGER:** H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS	GRAPHIC LOG	LITHOLOGY: ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
46							Water. -46.2	
47					No bedrock encountered. Broken up basalt fragments.		BASALT FRAGMENTS in sandy silt matrix, dark grey, iron stained, basalt, slightly weathered, subangular, one piece with large vesicles (0.5"), one piece of pumice on top.	Driller indicated casing is seated at El. -46.2 ft (CRD) Driller drove casing 4.5 ft into solid material.
48								
49								
50								According to driller we went through gravel on top followed by sand and back into rock approx. 3 feet thereafter.
51	1-HQ	35 %	0%	N/A				
52								Basalt fragments possibly result from previous blasting in the area. Not in place.
53								
54								
55								
56								
57							BASALT FRAGMENTS in a sandy Silt matrix, dark grey, pieces to not fit together.	
58								
59								
60	2-HQ	41%	0%	N/A				
61								
62					-62.0 to -63.7, 3 joints, 45 to 60 deg, rough, planar, secondary mineralization.		-62	
63	3-HQ	7 %	0%	7	-62.7 to -63.7 ft, 2 joints, 40 deg., randomly jointed, 1 vertical joint.		BASALT, dark grey, fine grained, secondary mineralization, fresh, difficult to scratch, no vesicles, some healed joints, some fine hairline cracks.	Rock fractures seem to be healed joints possibly opened up by rough drilling action on water. Core appears to be in place bedrock.
64				10+	-63.7 to -65.2 ft, joints are between 15 and 50 deg., others randomly oriented, some vertical joints, secondary mineralization, planar, rough.			
65				8+				
66					End boring at El.-65.2 ft (CRD).			

CH2MHILL

PROJECT NUMBER: 159184.B1.CD **BORING NUMBER:** DH-42-4
Sheet: 1 of 1

ROCK CORE LOG

PROJECT: Columbia River Channel Deepening **LOCATION:** River Mile 42
BARGE ELEVATION: 1 to 3.1 ft CRD **DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR
DRILLING METHOD AND EQUIPMENT: HQ-core - CME 75 truck mounted **ORIENTATION:** Vertical
WATER LEVEL: Fluctuating **START:** 8/25/00 **FINISH:** 8/25/00 **LOGGER:** H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS	GRAPHIC LOG	LITHOLOGY: ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
46							Water.	
							-46.8	
47	1-HQ	5.3 %	0%	N/A	No bedrock encountered.		SAND WITH OCCASIONAL BASALT FRAGMENTS, recovered only 2 pieces of gravel size basalt, dark grey, fine grained, iron stained, fresh, hard, difficult to scratch with knife.	Driller indicated casing is seated at El.-46.8 (CRD)
48								Driller drove casing 5.7 ft into solid material.
49								
50								Driller indicated that there is a 1 to 2 ft gravel layer on top of sand.
51								
52								
53								
54	2-HQ	0 %	0%	N/A	No Recovery.		No recovery, possibly SAND.	
55								
56								
57								
58								
59								
60								Driller indicated possibly drilling through sand. Very easy coring.
61								
62								
63								
64					End Boring at El.-63.9 ft (CRD).			
65								

CH2MHILL

PROJECT NUMBER: 159184.B1.CD **BORING NUMBER:** DH-42-5
Sheet: 1 of 1

ROCK CORE LOG

PROJECT: Columbia River Channel Deepening **LOCATION:** River Mile 42
BARGE ELEVATION: -1.5 ft CRD **DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR
DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75 **ORIENTATION:** Vertical
WATER LEVEL: Fluctuating **START:** 8/28/00 **FINISH:** 8/28/00 **LOGGER:** H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS	GRAPHIC LOG	LITHOLOGY: ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
50							Water.	
51							-51	Driller indicated casing is seated at El.-51 ft (CRD)
52	1-HQ	53%	0%	N/A	Broken up basalt fragments. No bedrock encountered.		BASALT FRAGMENTS, dark grey, iron stained, secondary mineralization, fine grained, fresh, some vesicles, subangular, 0.5 to 2.5".	
53								
54							BASALT FRAGMENTS, dark grey, iron stained, secondary mineralization, fine grained, fresh, some vesicles, subangular to angular, 0.5 to 3.5".	Basalt fragments possibly result from previous blasting in the area. Not in place.
55								
56								
57								
58	2-HQ	29%	0%	N/A				
59								
60								
61								
62								
63							BASALT FRAGMENTS, dark grey, iron stained, secondary mineralization, fine grained, fresh, some vesicles, subangular, 0.5 to 2.5".	
64	3-HQ	64%	0%	N/A				
65								
66					End boring at El.-65.5 ft (CRD).			
67								
68								
69								

CH2MHILL

PROJECT NUMBER: 159184.B1.CD **BORING NUMBER:** DH-55-1
Sheet: 1 of 1

ROCK CORE LOG

PROJECT: Columbia River Channel Deepening **LOCATION:** River Mile 55
BARGE ELEVATION: 3.7 to 4.0 ft CRD **DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR
DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75 **ORIENTATION:** Vertical
WATER LEVEL: Fluctuating **START:** 8/24/00 **FINISH:** 8/24/00 **LOGGER:** H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS	GRAPHIC LOG	LITHOLOGY: ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
51							Water.	Driller indicated casing is seated at El.-51.5 ft (CRD)
							-51.5	Driller drove casing 1.5 feet into the ground.
52							BASALT FRAGMENTS, dark grey, iron stained, secondary mineralization, fine grained, fresh, no vesicles, subangular, 0.5 to 3.5", possibly broken up in place by previous blasting activities.	(9:50-10:05)
53				2	Broken up basalt fragments.			Hard bumpy drilling.
54	1-HQ	40%	0%	5				Driller indicated he drilled through sand at beginning and end of run 1-HQ.
55				2				
56							-56.5	
57				4	-56.5 to -61.5, randomly oriented joints, planar, rough, iron stained, some secondary mineralization (greenish), no infilling visible, some fine healed joints.		BASALT, dark grey, fine grained, hard, vesicular.	(10:15-10:30)
58				5				Core looks like it was in place, not loose material.
59	2-HQ	66%	14%	>10				
60				>10				
61								
62				>6	-61.5 to -62 ft, fractured rock, randomly oriented.			(10:50-11:15)
63								Driller indicated areas of sudden drops, material changes from hard to soft.
64	3-HQ	54%	34%	2	-63.6 to -65.8 ft, joints are between 10 and 20 deg., planar, smooth to rough, secondary mineralization visible, no healed joints.		BASALT, dark grey, fine grained, fresh, hard, no vesicles, difficult to scratch.	
65				3				
66				0				Core broken to fit box.
67				0	-66.5 to -69.4 ft, joints are between 5 and 20 deg., planar, smooth to rough, secondary mineralization (light green), some healed joints			(11:35-11:55)
68	4-HQ	100%	100%	0			BASALT, dark grey, fine grained, fresh, hard, no vesicles, difficult to scratch.	Core broken to fit box.
69				1				
				1				
70					End boring at El.-69.4 ft (CRD).			

CH2MHILL

PROJECT NUMBER: 159184.B1.CD **BORING NUMBER:** DH-87-1
Sheet: 1 of 1

ROCK CORE LOG

PROJECT: Columbia River Channel Deepening **LOCATION:** River Mile 88
BARGE ELEVATION: 2.4 ft CRD **DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR
DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75 **ORIENTATION:** Vertical
WATER LEVEL: Fluctuating **START:** 8/21/00 **FINISH:** 8/21/00 **LOGGER:** H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS	GRAPHIC LOG	LITHOLOGY: ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
46							Water. -46	Driller indicated bottom of river at El.-46 ft (CRD). Driller drove casing 2.5 feet into the ground, consisting of fractured rock. (13:15-13:45) Hard drilling. Blasting conducted previously in the area. (14:00-15:05) Hard drilling (15:20-15-45)
47	1-HQ	100%	0%	>20	-46 to -49.2 ft, broken up basalt fragments, angular, secondary mineralization		BASALT FRAGMENTS, dark grey, fine grained, fresh, some vesicles, subangular, possibly broken up in place due to previous blasting activities.	
48				>20				
49				>20			-49.2	
50	2-HQ	100%	0%	>20	-49.2 to -51.6 ft, highly fractured, randomly oriented joints, planar, rough, secondary mineralization		BASALT, dark grey, fine grained, fresh, hard,some vesicles, difficult to scratch, no reaction (field compressive strength), in place bedrock.	
51				>20				
52				>15	-51.6 to -53.3 ft, highly fractured, randomly oriented joints, planar, rough.			
53				>15				
54	3-HQ	100%	46%	>10	-53.3 to -54.3 ft, highly fractured, randomly oriented joints, planar, rough.		BASALT, dark grey, fine grained, fresh, hard,some vesicles, difficult to scratch, no reaction (field compressive strength), in place bedrock.	
55				>8	-54.3 to -56.2 ft, joints are 0 to 20 deg., randomly oriented, planar, rough.			
56				5				
57					End boring at El.-56.2 ft (CRD).			
58								
59								
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62								
63								
64								
65								

CH2MHILL

PROJECT NUMBER: 159184.B1.CD **BORING NUMBER:** DH-87-2
Sheet: 1 of 1

ROCK CORE LOG

PROJECT: Columbia River Channel Deepening **LOCATION:** River Mile 88
BARGE ELEVATION: 1.9 ft CRD **DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR
DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75 **ORIENTATION:** Vertical
WATER LEVEL: Fluctuating **START:** 8/23/00 **FINISH:** 8/23/00 **LOGGER:** H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS	GRAPHIC LOG	LITHOLOGY: ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
41							Water.	Driller indicated top of overburden at El.-42 ft (CRD). Driller drove casing 2 feet into the ground, 1.5 ft easy 0.5 ft hard.
42							-42	
				N/A			River bottom sediments.	
43							-43	
44	1-HQ	60%	0%	>10	-43 to -47.8 ft, broken rock core, some joints apparent, FEOX staining.		BASALT FRAGMENTS, dark grey, fine grained, fresh, gravel size, some small vesicles, angular to subangular, possibly broken up in place due to previous blasting activities.	(9:00-9:30) Blasting previously conducted in the area.
45				>10				
46	2-HQ	87%	0%	>10				(9:30-9:40)
47				>10			-47.8	
48	3-HQ	100%	0%	>10	-48.5 to -51.3 ft, intensely fractured rock, randomly jointed, secondary mineralization, brownish yellow staining between -47.8 and -49.5 ft, some healed joints.		BASALT, dark grey, fine grained, fresh, hard,some vesicles, difficult to scratch, no reaction (field compressive strength).	(9:45-10:15) Core looks like it is in place.
49				>10				
50				>10				
51	4-HQ	100%	0%	+5				(10:45-11:30)
					End boring at El.-51.3 ft (CRD).			Boring terminated after core bit sheared off.
52								
53								
54								
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60								

CH2MHILL

PROJECT NUMBER: 159184.B1.CD **BORING NUMBER:** DH-87-3
Sheet: 1 of 1

ROCK CORE LOG

PROJECT: Columbia River Channel Deepening **LOCATION:** River Mile 88
BARGE ELEVATION: 2 to 2.5 ft CRD **DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR
DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75 **ORIENTATION:** Vertical
WATER LEVEL: Fluctuating **START:** 8/22/00 **FINISH:** 8/22/00 **LOGGER:** H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS	GRAPHIC LOG	LITHOLOGY: ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
44							Water. -44.2	
45	1-HQ	100%	0%	>10 >10	-44.2 to -48.7ft, intensely fractured rock, random joints, mostly 0 to 10 deg. and 60 deg. to vertical, secondary mineralization visible, planar, rough.		BASALT, dark grey, fine grained, fresh, hard, some vesicles, difficult to scratch with knife, field compressive strength test shows no reaction.	Driller indicated river bottom at El.-44.2 ft (CRD). (12:15-13:45) Blasting previously conducted in the area.
46				>10				
47				>10				Hard drillling.
48				8				
49	2-HQ	100%	10%	8+	-48.7 to -49.7 ft, mostly 0 deg joints, some randomly oriented.			(14:00-14:35)
50				11+	-49.7 to -50.7, randomly oriented joints.		BASALT, dark grey, fine grained, fresh, hard, some vesicles, difficult to scratch with knife, field compressive strength test shows no reaction.	All core looked like it was in place bedrock.
51				9+	-50.7 to -52.5 ft, mostly 0 to 10 deg. joints, some randomly oriented, secondary mineralization, planar, rough, hairline cracks.			
52				>10	-52.5 to -53.7 ft, randomly fractured broken up rock, secondary mineralization.			
53	3-HQ	100%	25%	5+				(14:38-14:50)
54				1	-53.7 to -54.5 ft, 2 joints, 10 deg., rough, healed joints.			
55					End boring at El.-54.5 ft (CRD).			
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63								

CH2MHILL

PROJECT NUMBER: 159184.B1.CD **BORING NUMBER:** DH-87-4
Sheet: 1 of 1

ROCK CORE LOG

PROJECT: Columbia River Channel Deepening **LOCATION:** River Mile 88
BARGE ELEVATION: 2.2 ft CRD **DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR
DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75 **ORIENTATION:** Vertical
WATER LEVEL: Fluctuating **START:** 8/22/00 **FINISH:** 8/22/00 **LOGGER:** H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS	GRAPHIC LOG	LITHOLOGY: ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
44							Water -44.3	Uneven ground surface.
45	1-HQ	100%	18%	>12 >10 >12 3 4	-44.3 to -48 ft, intensely to highly fractured, random joints, planar, rough secondary mineralization visible in joints, hairline cracks. -48 to -49.3 ft, joints are between 10 and 60 deg., highly fractured.		BASALT, dark grey, fine grained, fresh, hard, some vesicles, difficult to scratch with knife, field compressive strength test shows no reaction, some iron staining at top 1".	Driller indicated river bottom at El.-44.3 ft (CRD). (9:00-10:20) Core looks like in place bedrock. Hard bumpy drillling.
50	2-HQ	100%	45%	5+ 6+ 4+ 5+ 6+	-49.3 to -50.2 ft, joints are randomly oriented, some 10 deg, and 45 to 50 deg. -50.2 to -52.2 ft, predominately 0 to 20 deg. joints, some vertical joints. -52.2 to -54.3 ft, randomly oriented joints, 10 to 60 deg., planar, rough, intensely to highly fractured, secondary mineralization.		BASALT, dark grey, fine grained, fresh, hard, some vesicles, difficult to scratch with knife, field compressive strength test shows no reaction.	(10:30-11:00) Blasting previously conducted in the area.
54					End boring at El.-54.3 ft (CRD).			
55								
56								
57								
58								
59								
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61								
62								
63								

CH2MHILL

PROJECT NUMBER: 159184.B1.CD **BORING NUMBER:** DH-88-1
Sheet: 1 of 1

ROCK CORE LOG

PROJECT: Columbia River Channel Deepening **LOCATION:** River Mile 88
BARGE ELEVATION: 3.3 ft CRD **DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR
DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75 **ORIENTATION:** Vertical
WATER LEVEL: Fluctuating **START:** 8/21/00 **FINISH:** 8/21/00 **LOGGER:** H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS	GRAPHIC LOG	LITHOLOGY: ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
43							Water. -43.2	
44				N/A			Driller indicated that he went through 3 feet of sand.	Driller indicated river bottom at El.-43.2 ft (CRD).
45								Driller drove casing 3 ft into sandy material.
46							-46.2	
47	1-HQ	100%	0%	8+ 10+	-46.2 to -48.8 ft, intensely to highly fractured, random joints, planar, rough secondary mineralization, some healed joints.		BASALT, dark grey, fine grained, fresh, hard, some small vesicles, difficult to scratch with knife, field compressive strength test shows no reaction and some shattering.	Highly fractured rock is possible effect of previous blasting.
48								Core looks like in place bedrock.
49				9+ 7+	-48.8 to -50.2 ft, joints are greater than 70 deg., some horizontal, highly fractured to intensely fractured, some healed joints, secondary mineralization.			
50								Core blocked off after 4 inches.
51	2-HQ	100%	42%	4+	-50.2 to -56.2 ft, intensely to highly fractured, random joints, planar, rough, secondary mineralization, between -51 and -51.7 ft, 2 joints, 23 deg.			
52				4+ 5			BASALT, dark grey, fine grained, fresh, hard, some small vesicles, difficult to scratch with knife, field compressive strength test shows no reaction and some shattering.	2-HQ took 30 min.
53				9+				Blasting previously conducted in the nearby area.
54								
55	3-HQ	100%	38%	2 5				(11:25-11:40)
56								
57					End boring at El.-56.2 ft (CRD).			River was very rough. High waves.
58								
59								
60								
61								
62								

CH2MHILL

PROJECT NUMBER: 159184.B1.CD **BORING NUMBER:** DH-88-2
Sheet: 1 of 1

ROCK CORE LOG

PROJECT: Columbia River Channel Deepening **LOCATION:** River Mile 88
BARGE ELEVATION: 3 to 3.3 ft CRD **DRILLING CONTRACTOR:** Geotech Explorations, Tualatin, OR
DRILLING METHOD AND EQUIPMENT: HQ-triple core barrel - CME-75 **ORIENTATION:** Vertical
WATER LEVEL: Fluctuating **START:** 8/18/00 **FINISH:** 8/18/00 **LOGGER:** H. Guettel

NEGATIVE ELEVATION CRD (FT)	CORE NUMBER	CORE RECOVERY	DISCONTINUITIES: RQD (%)	DISCONTINUITIES: FRACTURES PER FOOT	DISCONTINUITIES: DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS	GRAPHIC LOG	LITHOLOGY: ROCK TYPE, COLOR, MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS CHARACTERISTICS	SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING, ROD DROPS, TEST RESULTS, ETC.
43							Water. -43.2	
44				N/A			Driller indicated that he went through 1.5 feet of sand/silt. -44.7	Driller indicated river bottom at El.-43.2 ft (CRD).
45	1-HQ	60%	0%	>8	-45.2 to -48.2 ft, intensely to highly fractured, random joints, undulating, rough, secondary mineralization visible in joints, some healed joints.		BASALT, dark grey, fine grained, fresh, hard, some small vesicles, difficult to scratch with knife, field compressive strength test shows no reaction.	Rough drilling. Lost circulation.
46				>4				
47				>5				HQ-1 took 20 min.
48				>2				
49	2-HQ	109%	49%	2	-48.2 to -48.6 ft, highly fractured basalt. -48.6 to -50.2 ft, joints approx. 60 deg., undulating, smooth to rough surface.			(16:00-16:45)
50				4	-50.2 to -51.7 ft, random joints, undulating, smooth to rough.		BASALT, dark grey, fine grained, fresh, hard, some small vesicles, difficult to scratch with knife, field compressive strength test shows no reaction.	Core looks like in place bedrock.
51				4				
52				2	-51.7 to -52.2 ft, joint 60 deg. undulating, rough.			
53	3-HQ	100%	73%	1	-52.7 to -53.7 ft, joint, 30 deg. planar, rough, some healed joints.			(16:50-17:05)
54				2	-53.7 to -55.7 ft, joints 10 deg, stepped, rough.			
55				2				
56					End boring at El.-55.7 ft (CRD).			
57								
58								
59								
60								
61								
62								

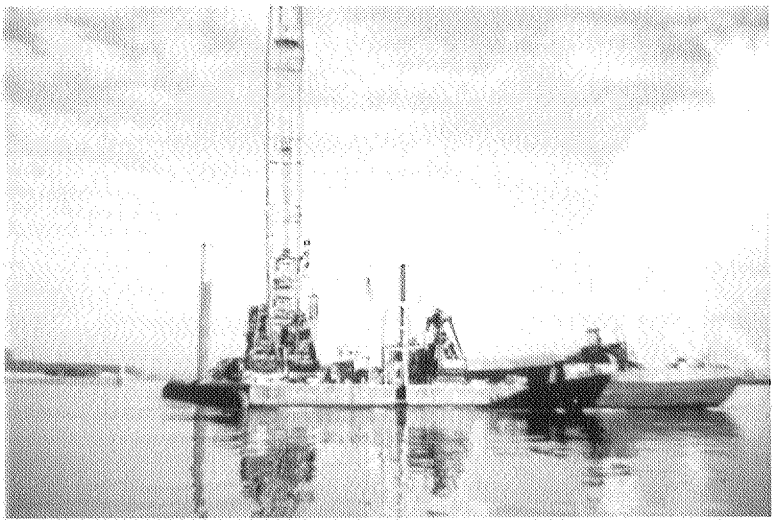
APPENDIX C

Photographs

Test Pits

Test Pits

"Sea Vulture"—Barge Used for Test Pits and Jet Probe Holes
IMG001.JPG



"Sea Vulture"
IMG002.JPG

Test Pits

Materials Encountered in TP-1
IMG003.JPG

Materials Encountered in TP-5
IMG006.JPG

Test Pits

Materials Encountered in TP-7
IMG008.JPG

Materials Encountered in TP-8
IMG009.JPG

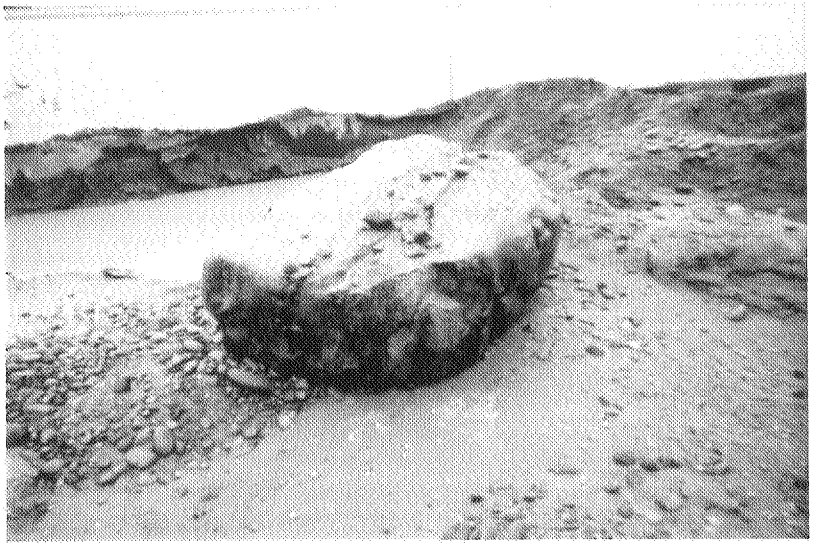
Test Pits

Materials Encountered in TP-11
IMG010.JPG

Materials Encountered in TP-30
IMG011.JPG

Test Pits

Materials Encountered in TP-30
IMG012.JPG



Materials Encountered in TP-19
IMG015.JPG

Test Pits

Materials Encountered in TP-19
IMG016.JPG

Materials Encountered in TP-22
IMG017.JPG

Test Pits

Materials to Be Returned to the Water
IMG018.JPG

Materials Encountered in TP-21
IMG019.JPG

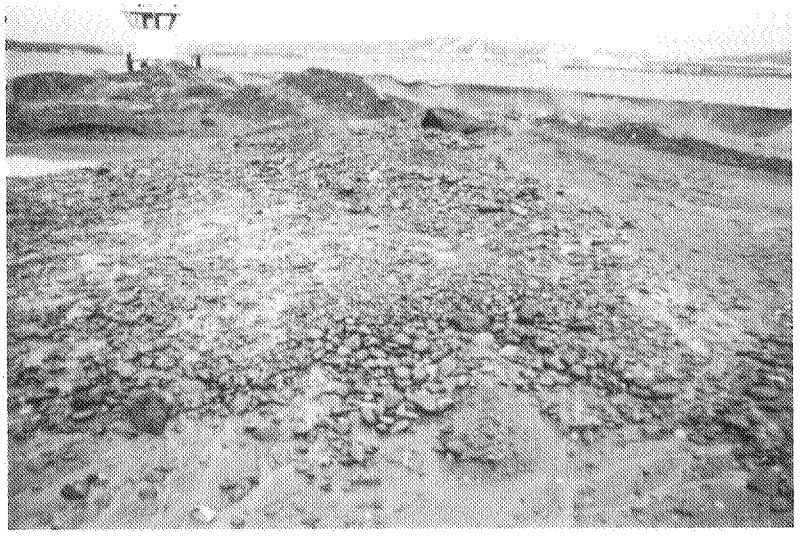
Test Pits

Materials Encountered in TP-23
IMG021.JPG

Tugboat "Nova"
IMG022.JPG

Test Pits

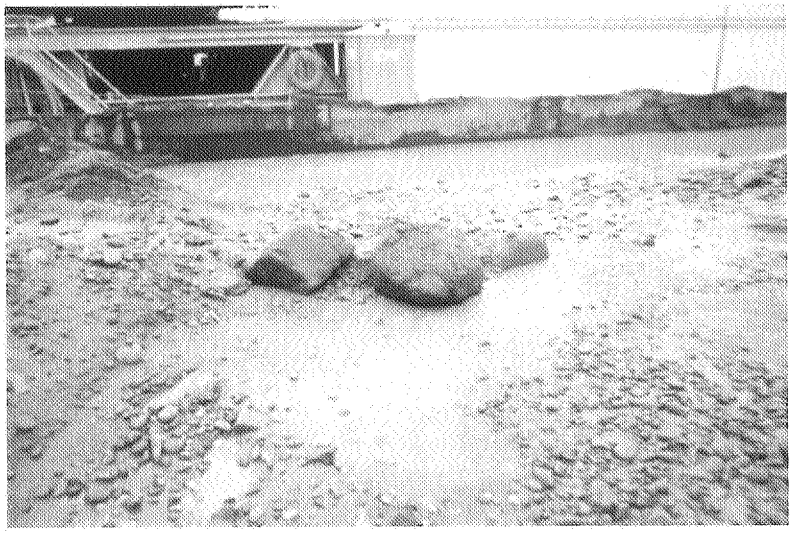
Dozer Piling up Material from TP-13
IMG023.JPG



Materials Encountered in TP-15
IMG024.JPG

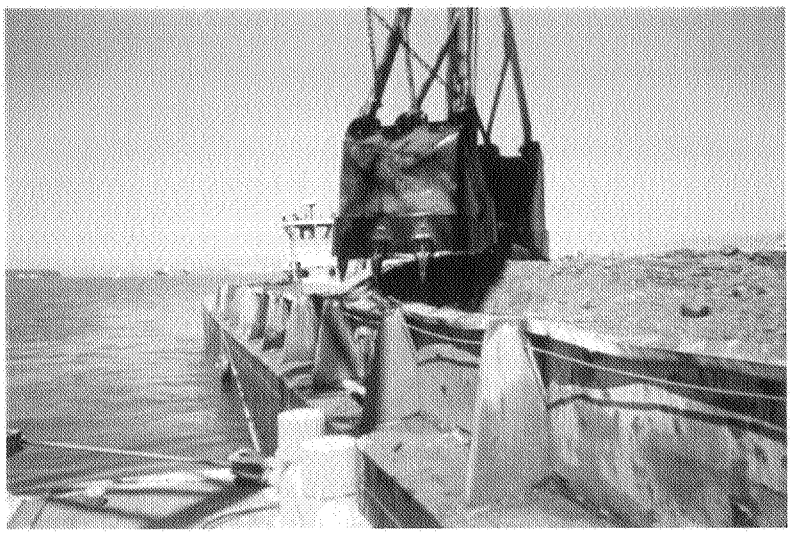
Test Pits

Clamshell Bucket Recovering Material from TP-31
IMG025.JPG

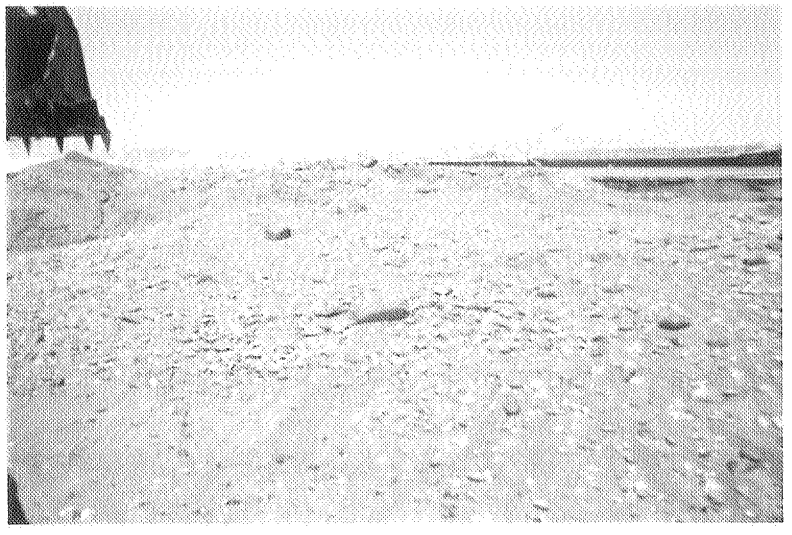


Materials Encountered in TP-18
IMG026.JPG

Test Pits



Materials Encountered in TP-25
IMG027.JPG



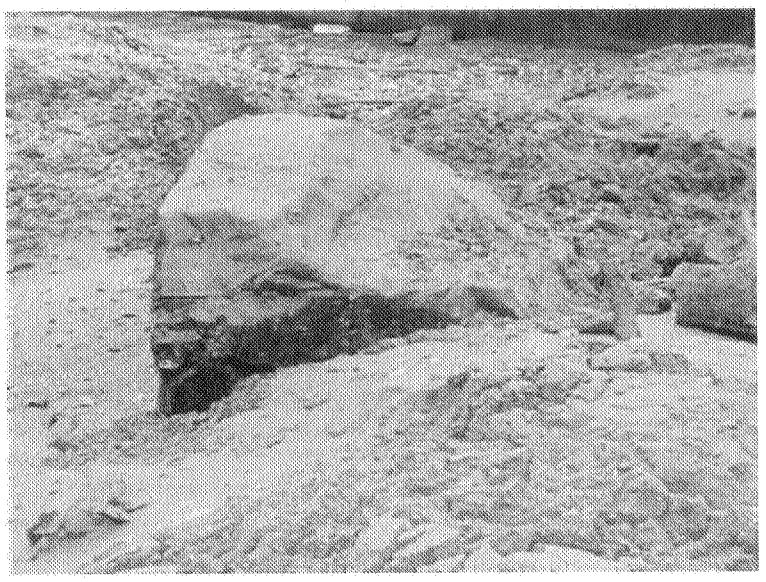
Materials Encountered in TP-26
IMG028.JPG

Test Pits

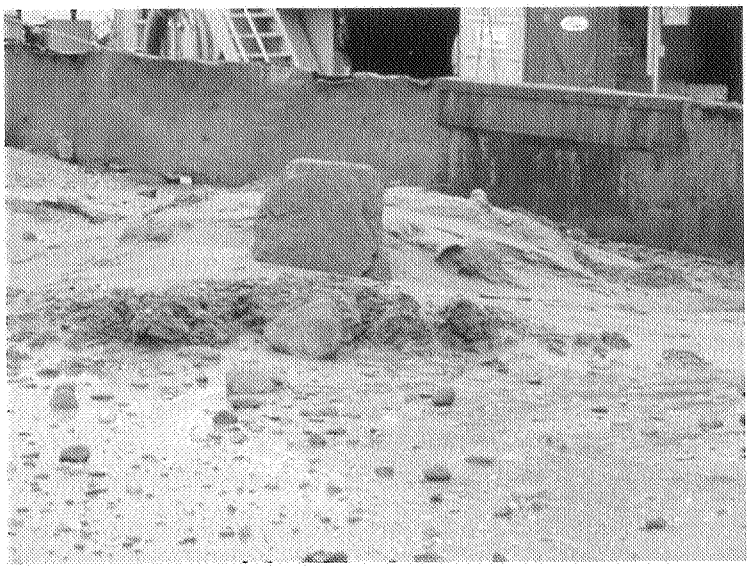
Materials Encountered in TP-32
IMG029.JPG

Materials Encountered in TP-29
IMG031.JPG

Test Pits

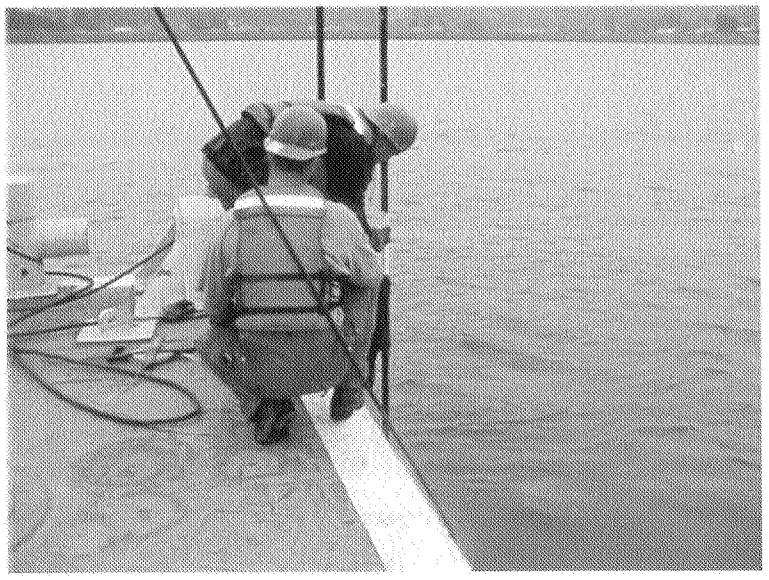


Materials Encountered in TP-36
BOULDER2.JPG



Materials Encountered in TP-36
BOULDERS1.JPG

Test Pits

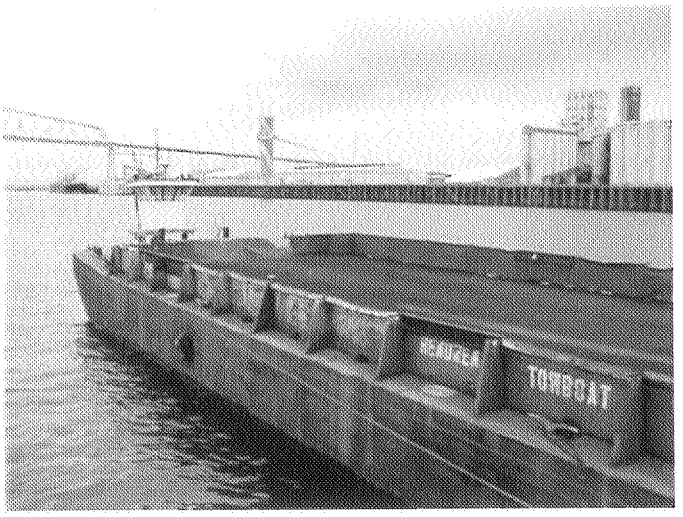


Barge Crew Marking Cable of Clamshell Bucket in 1-Foot Increments
CABLE_MARKING.JPG

Derrick and Flattop Barge Used for Test Pits
DERRICKNFLATTOP.JPG

Test Pits

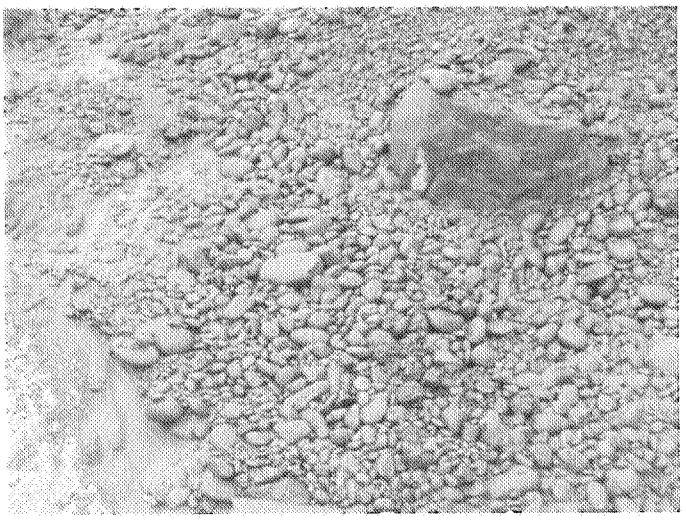
Materials Encountered in TP-40
GRAVELS.JPG



Flattop Barge and Tugboat ("Nova")
DUMP_BARGE_SMALL_TUG.JPG

Test Pits

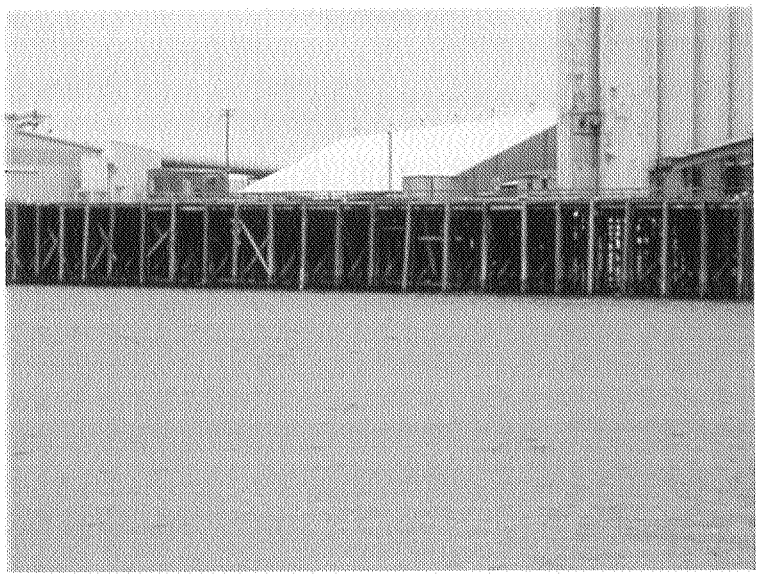
Materials Encountered in TP-38
RIVER_GRAVEL2.JPG



Materials Encountered in TP-38
RIVER_GRAVEL1.JPG

Test Pits

Materials Encountered in TP-36
ROCK.JPG



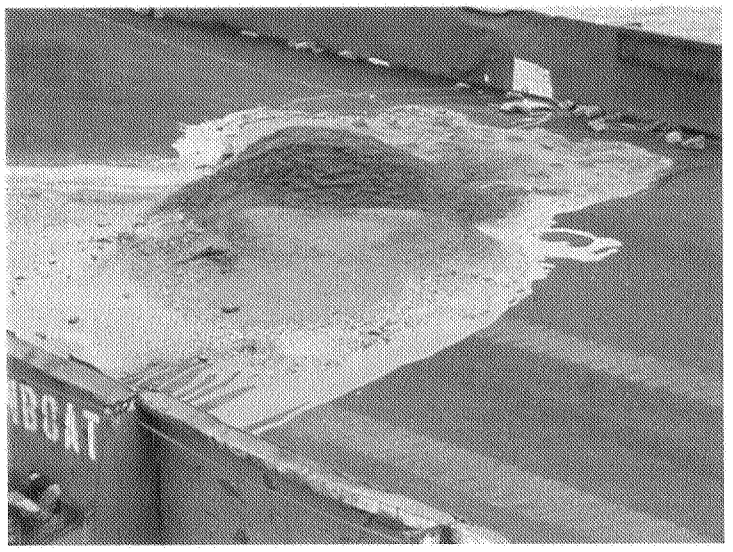
Staff Gauge
STAFF_GAGE.JPG

Test Pits

Materials Encountered in TP-39
TP_.JPG

Tree Stump in TP-39
TP_STUMP.JPG

Test Pits

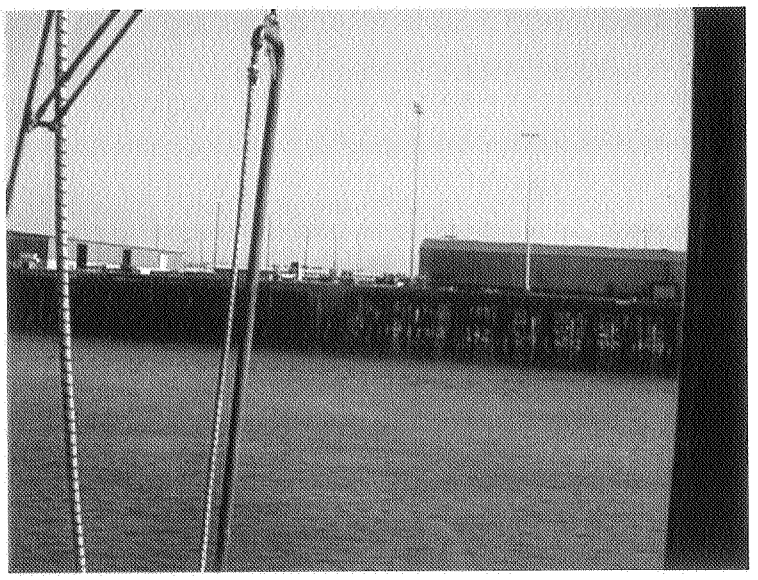


Materials Encountered in TP-40
TP40.JPG

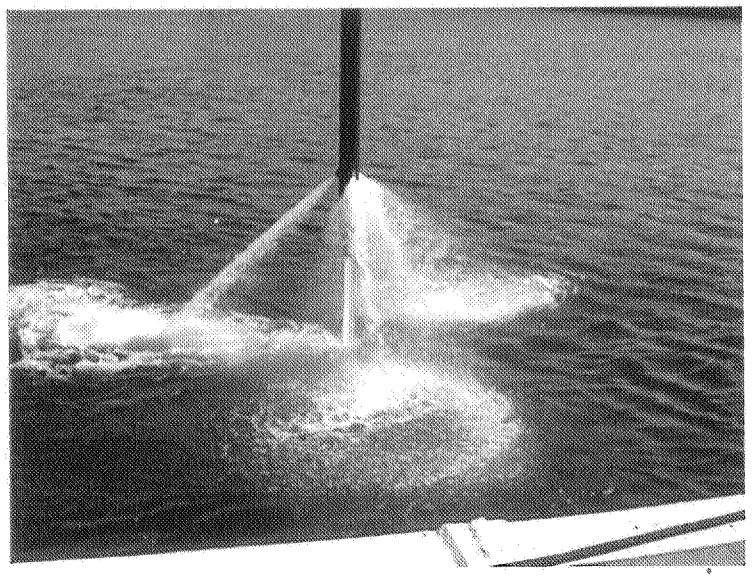
Materials Encountered in TP-40
TP40_2.JPG

Jet Probes

Jet Probes

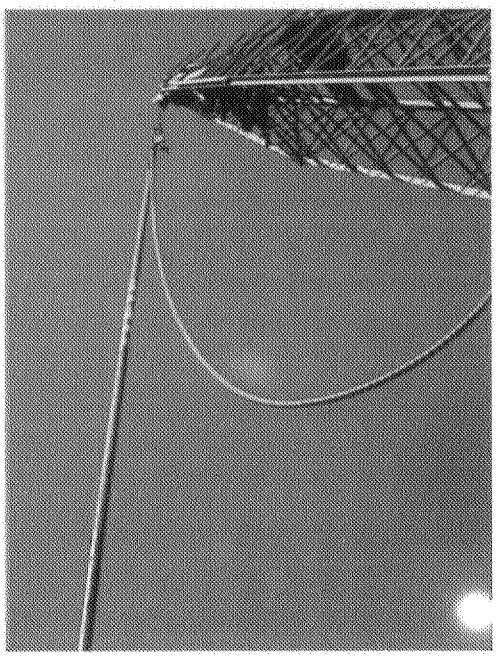


Jet Probe Pipe and Water Hose Assembly
R0100001.JPG

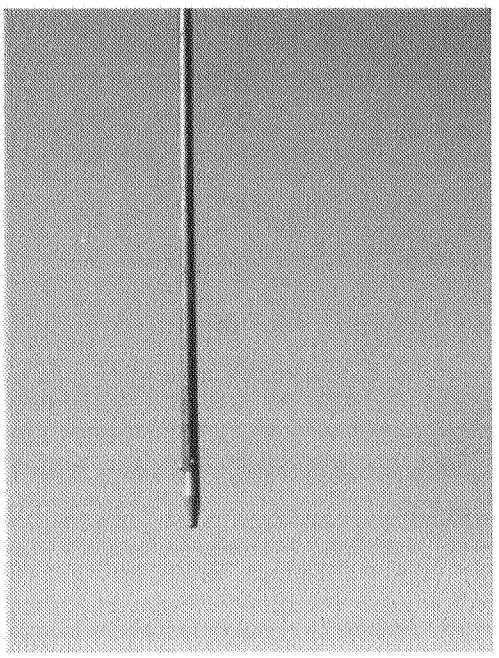


Jet Probe Pressure Produced from 175-psi Pump Pressure
R0100005.JPG

Jet Probes

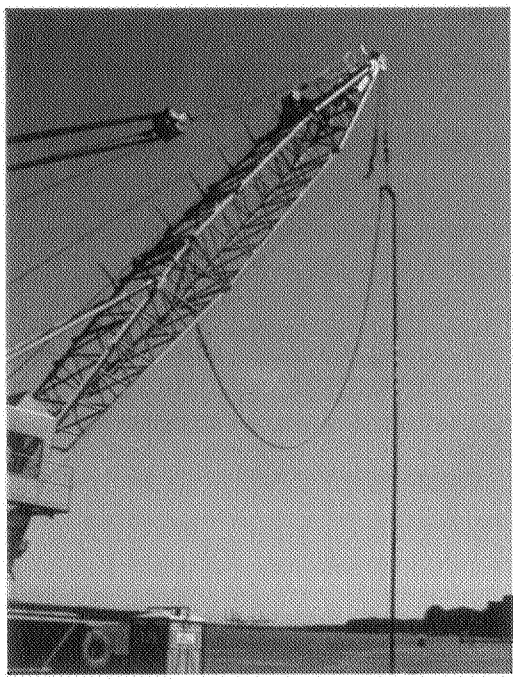


Jet Probe Attached to Tip of Boom
R0100006.JPG



Jet Probe Nozzle
R0100008.JPG

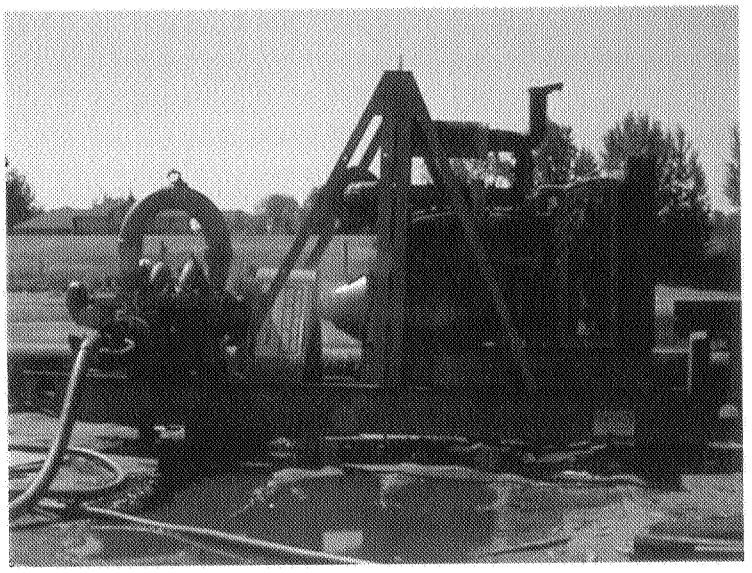
Jet Probes



Jet Probe Operations Setup
R01000015.JPG

4600 Manitowoc Derrick, "Sea Vulture"
R01000016.JPG

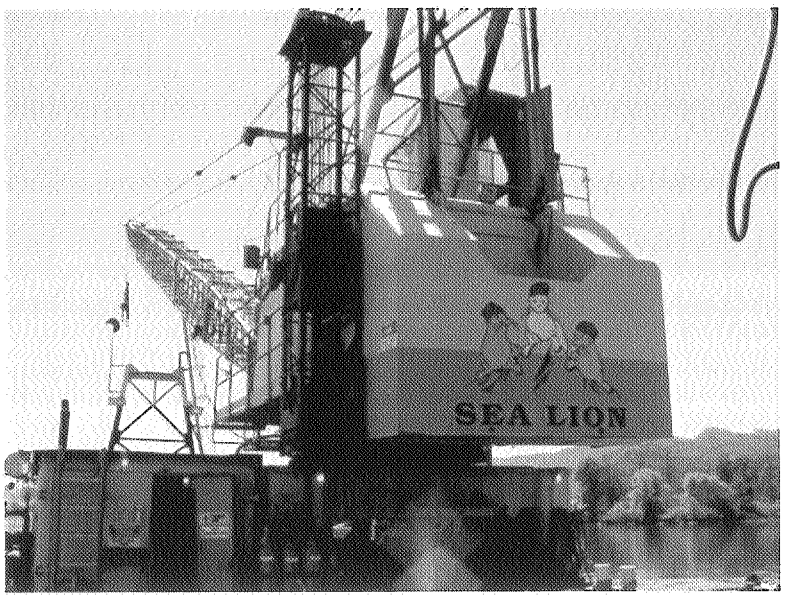
Jet Probes



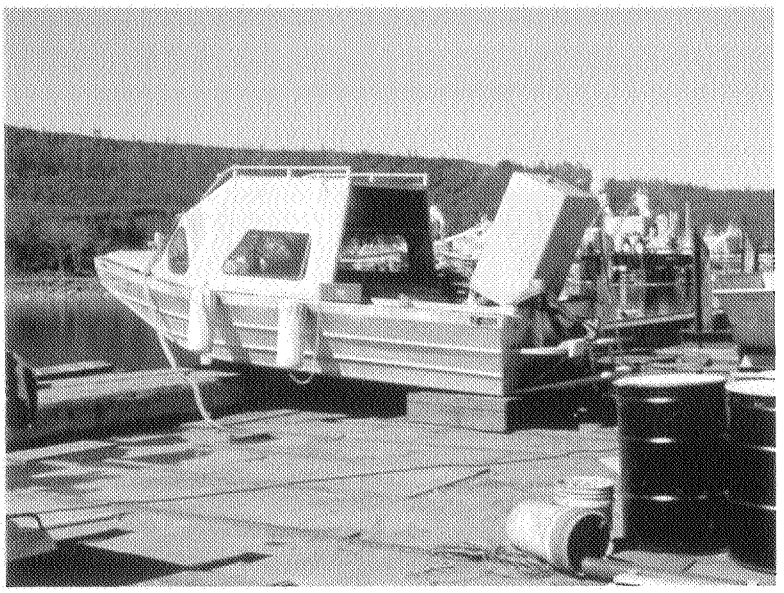
Pump Used for Jet Probe Operations
R01000017.JPG

Core Drilling

Core Drilling



"Sea Lion" Derrick Barge
DSC00133.JPG



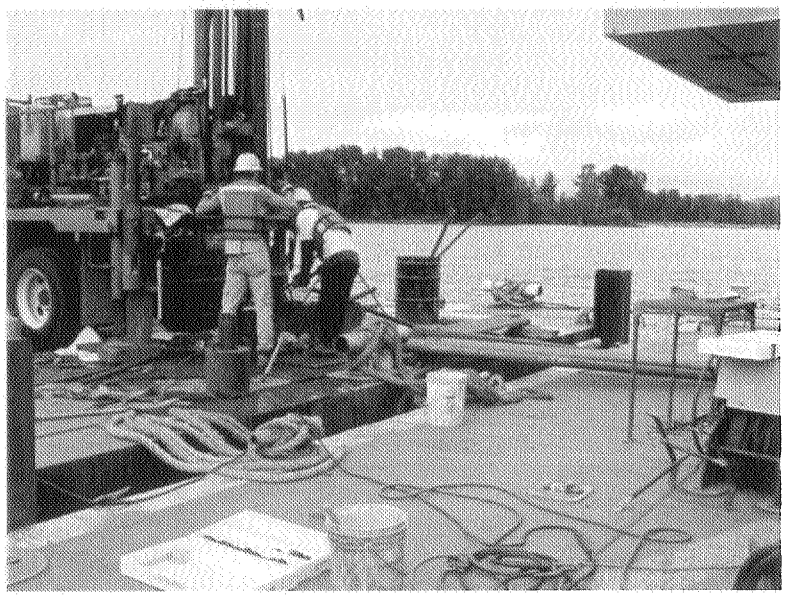
Motorboat Used to Get onto Barge
DSC00132.JPG

Core Drilling

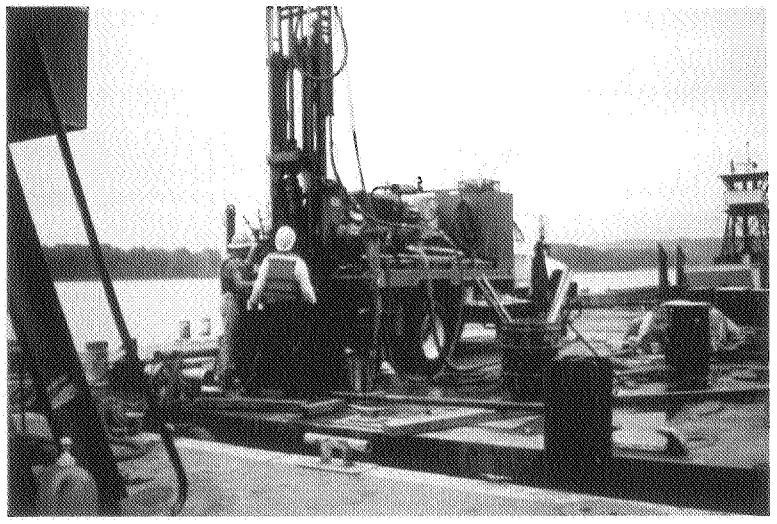
Tugboat "Viking"
DSC00135.JPG

Drill Setup
DSC00134.JPG

Core Drilling

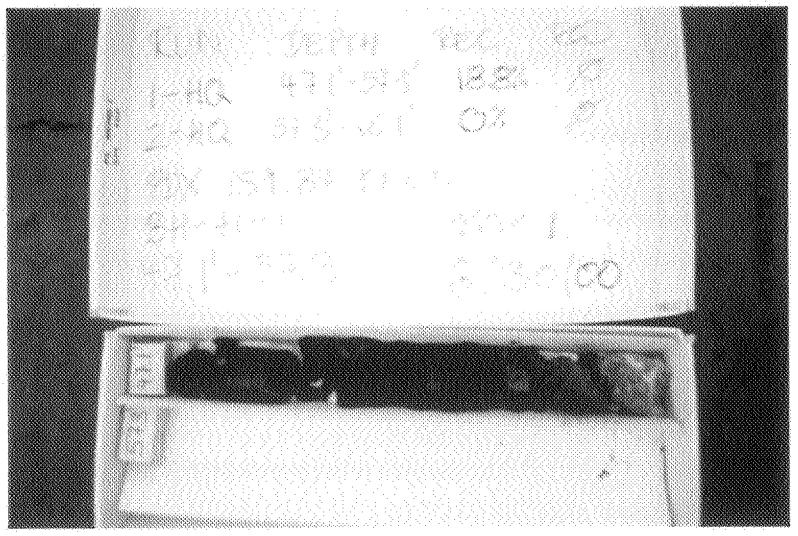


Drill Rig Setup
DSC00145.JPG

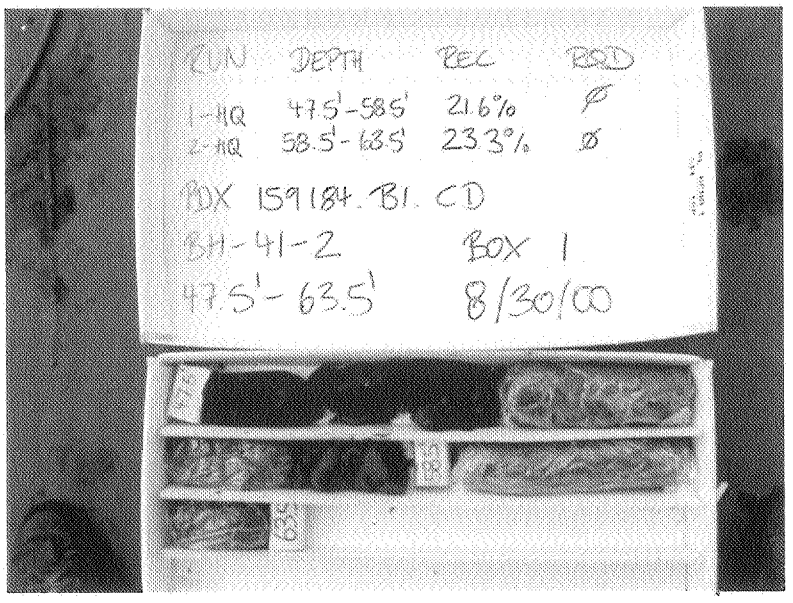


Drill Rig
IMG067.JPG

Core Drilling

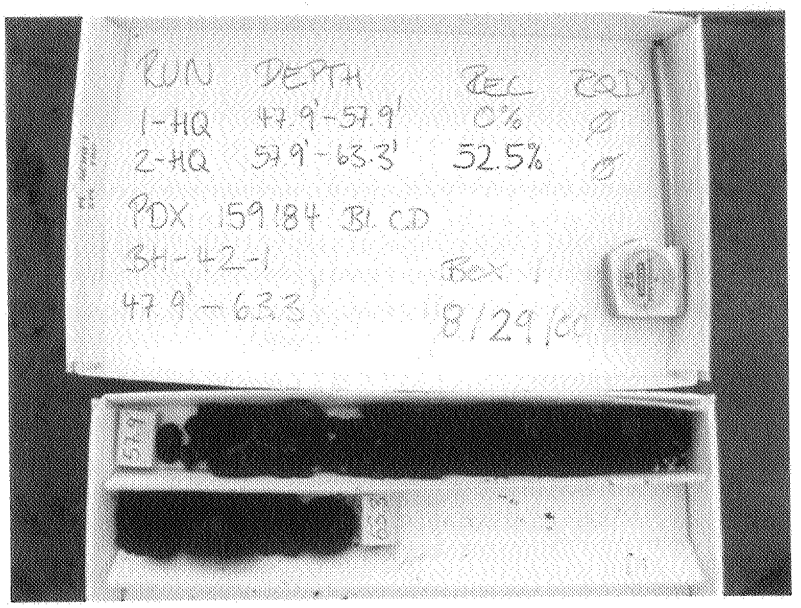


DH-41-1, 47.1 to 57.3 feet, Box 1
IMG058.JPG

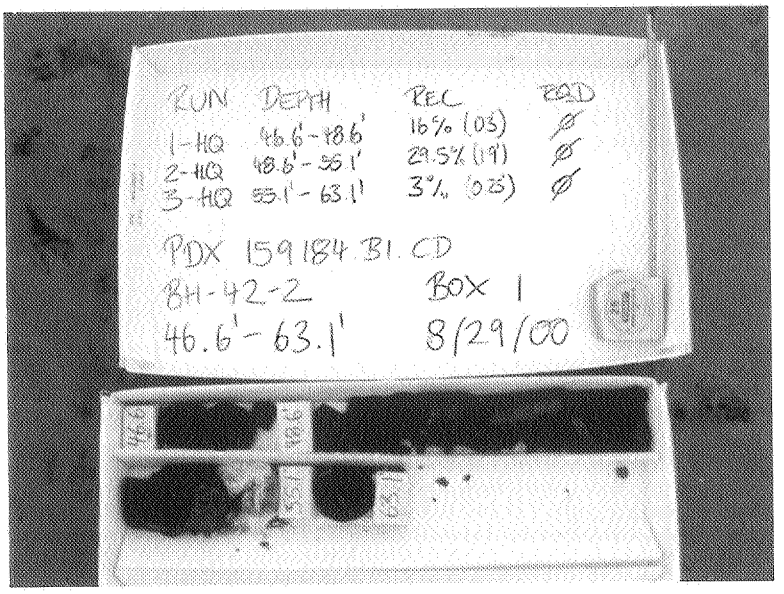


DH-41-2, 47.5 to 63.5 feet, Box 1
IMG149.JPG

Core Drilling

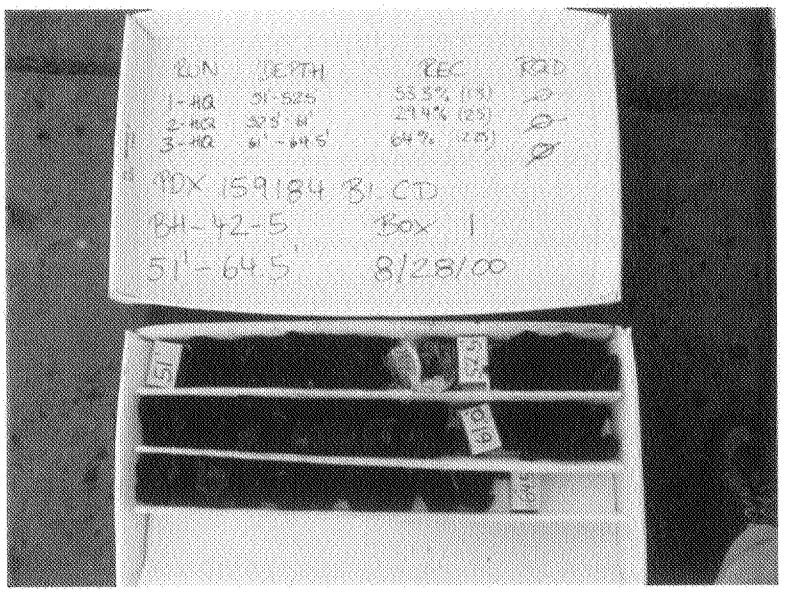


DH-42-1, 47.9 to 63.3 feet, Box 1
DSC00142.JPG

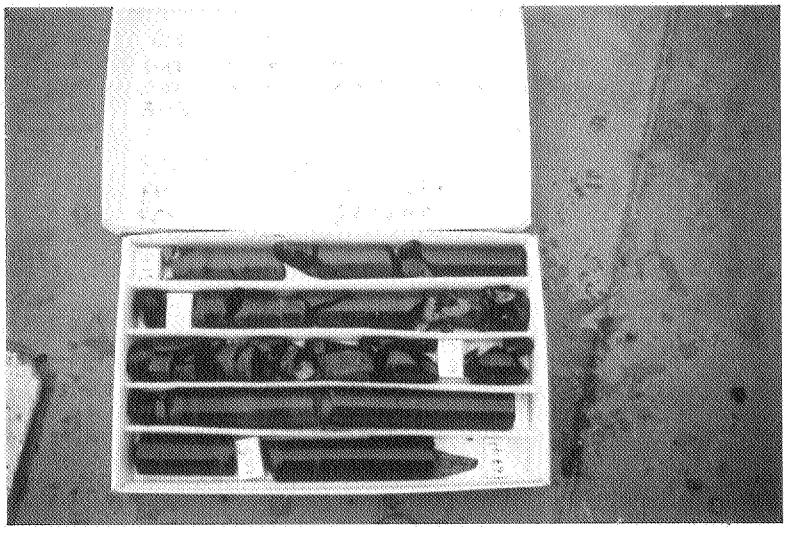


DH-42-2, 46.6 to 63.1 feet, Box 1
DSC00140.JPG

Core Drilling

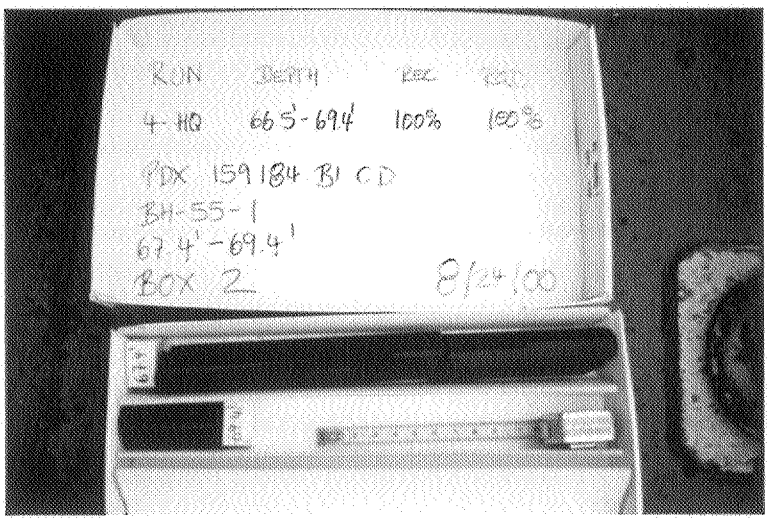


DH-42-5, 51 to 64.5 feet, Box 1
DSC00139.JPG

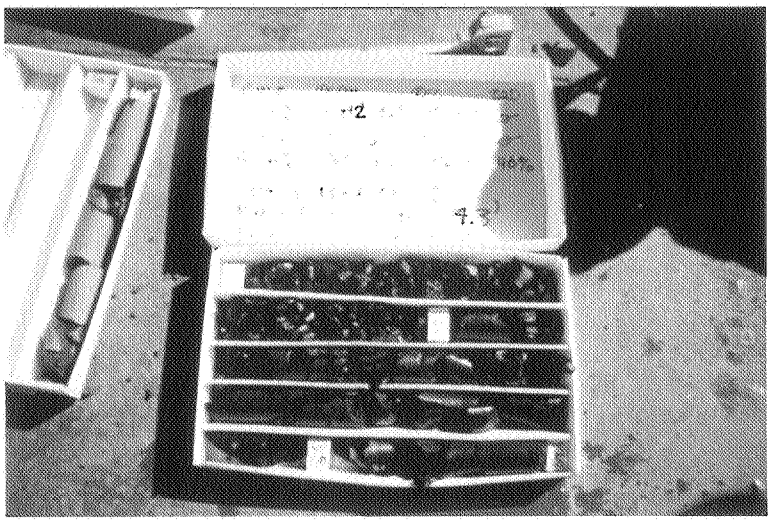


DH-55-1, 51.5 to 67.4 feet, Box 1
IMG069.JPG

Core Drilling

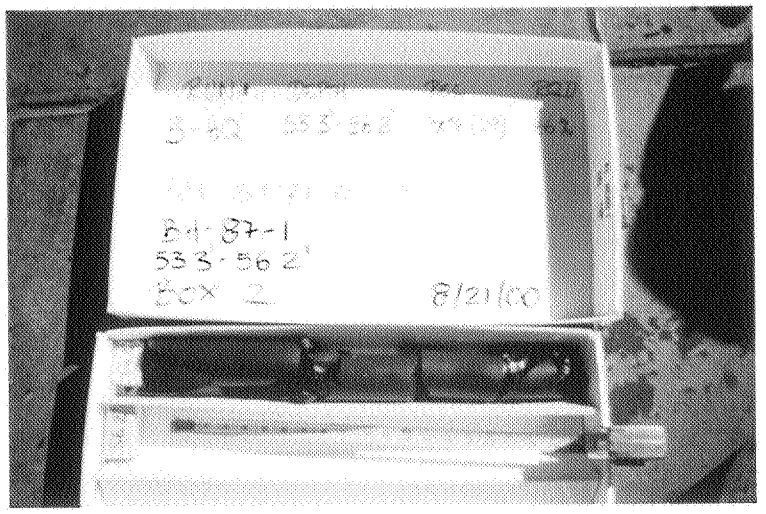


DH-55-1, 67.4 to 69.4 feet, Box 2
IMG070.JPG



DH-87-1, 46 to 54.3 feet, Box 1
IMG040.JPG

Core Drilling

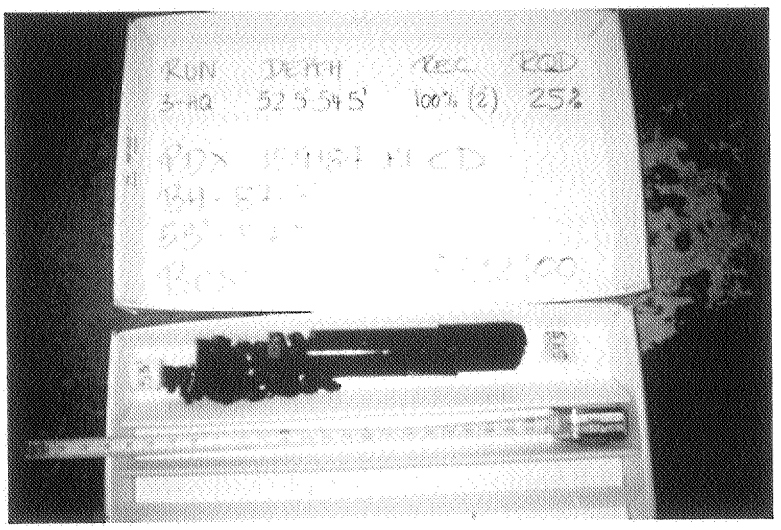


DH-87-1, 53.3 to 56.2 feet, Box 2
IMG042.JPG

DH-87-2, 43 to 51.3 feet, Box 1
IMG073.JPG

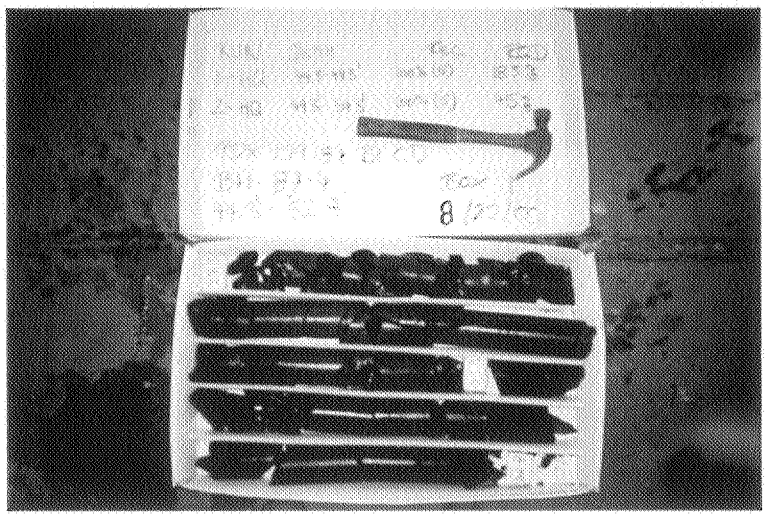
Core Drilling

DH-87-3, 44.2 to 53 feet, Box 1
IMG071.JPG

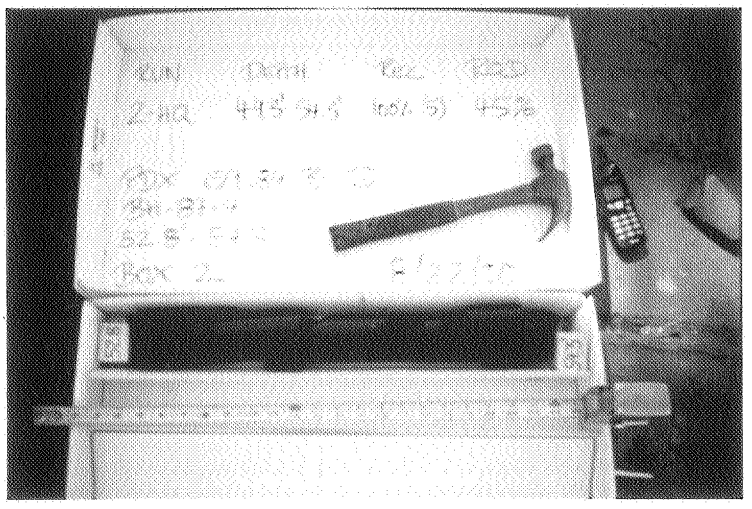


DH-87-3, 53 to 54.5 feet, Box 2
IMG076.JPG

Core Drilling

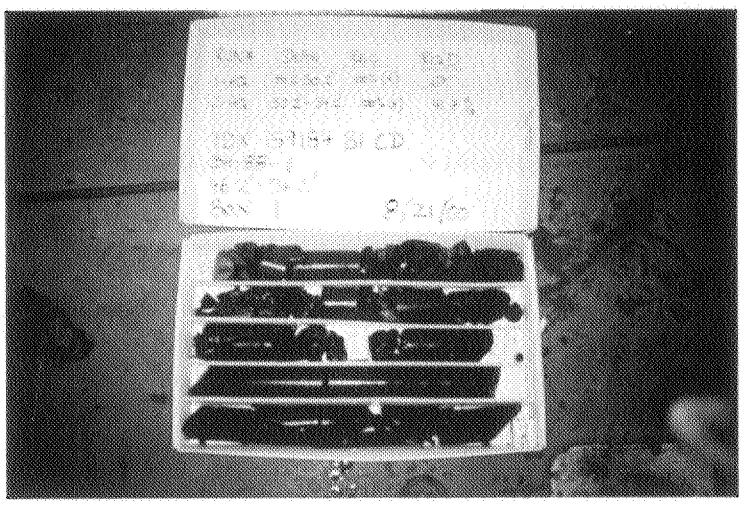


DH-87-4, 44.3 to 52.8 feet, Box 1
IMG037.JPG

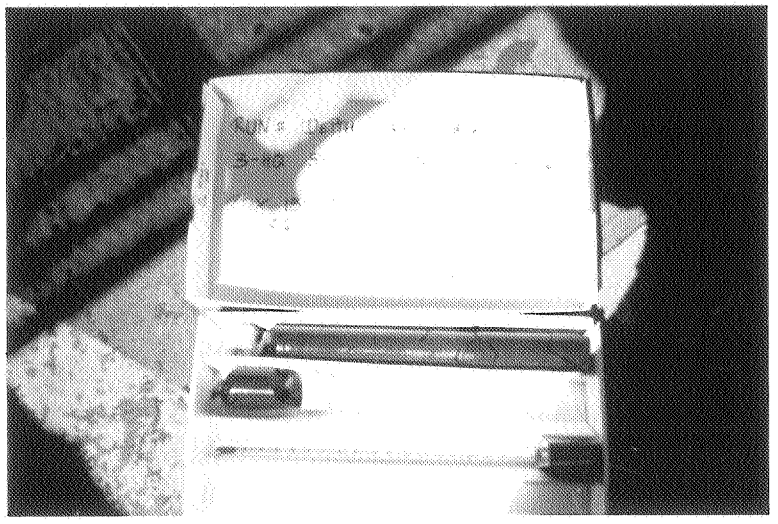


DH-87-4, 52.8 to 54.3 feet, Box 2
IMG039.JPG

Core Drilling



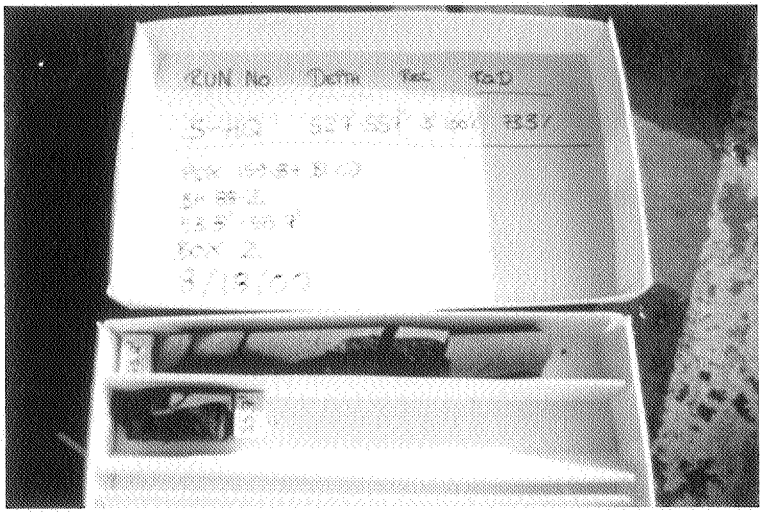
DH-88-1, 46.2 to 54.2 feet, Box 1
IMG055.JPG



DH-88-1, 54.2 to 56.2 feet, Box 2
IMG048.JPG

Core Drilling

DH-88-2, 43.2 to 53.8 feet, Box 1
IMG057.JPG



DH-88-2, 53.8 to 55.7 feet, Box 2
IMG053.JPG

APPENDIX D

Contour Maps

The following maps are for those exploration areas where 10 or more explorations were conducted.

The contours shown are estimated based on explorations, whether drill holes or jet probes, which indicated a top of rock elevation (based on the core sample if a drill hole or refusal if a jet probe).

The elevation of the jet probe refusal or the drill hole core top of rock are indicated.

If refusal was not encountered, the bottom elevation of the jet probe is indicated.

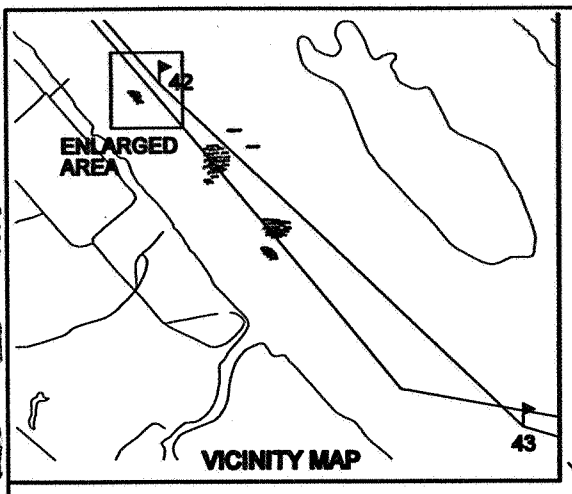
If the drill hole did not encounter rock, it is indicated with a N/A.

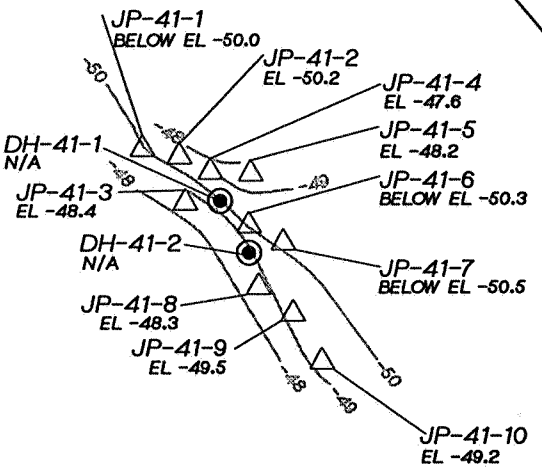
The contour locations are based on our judgement and should be used with caution.

US ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT

AREA 42.5
SHEET 1 OF 3

COLUMBIA RIVER CHANNEL DEEPENING
PED EXPLORATIONS

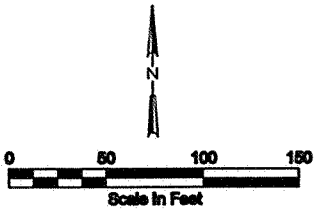




42

LEGEND:

- RIVERMILES
- DRILL HOLE
- JET PROBE
- TEST PIT
- *EL -48.3* JET PROBE REFUSAL ELEVATION
- **(EL - 47.0)** TOP OF BEDROCK ELEVATION.
- *N/A* NOT APPLICABLE, NO REFUSAL OR BEDROCK ENCOUNTERED



PROJECTION: STATE PLANE, OREGON NORTH ZONE, NAD 27.
PRODUCED BY GIS, SURVEY AND MAPPING SECTION, CENWP-EC-HM

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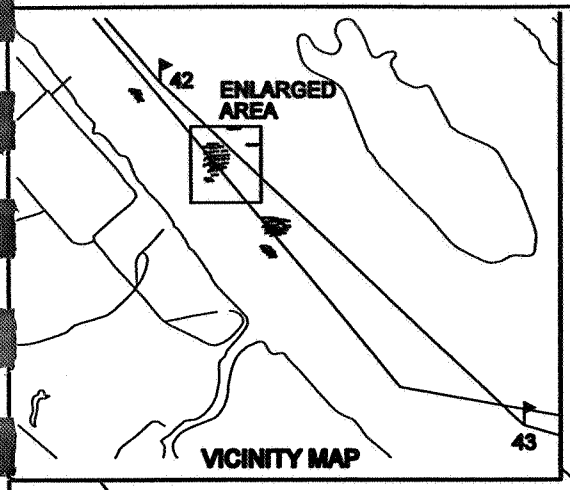

US ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT

AREA 42.5
SHEET 2 OF 3

COLUMBIA RIVER CHANNEL DEEPENING
PED EXPLORATIONS

JP-42-30
BELOW EL -52.5

JP-42-31
BELOW EL -52.5

JP-42-32
BELOW EL -52.6

JP-42-2
BELOW EL -50.3

JP-42-5
EL -49.7

JP-42-1
BELOW EL -52.8

JP-42-9
EL -47.2

JP-42-4
BELOW EL -50.1

JP-42-3
BELOW EL -50.4

JP-42-8
BELOW EL -50.2

JP-42-15
EL - 49.0

DH-42-1
N/A

JP-42-10
EL -47.9

JP-42-14
EL -47.8

JP-42-19
BELOW EL -50.8

JP-42-7
BELOW EL -50.9

JP-42-13
BELOW EL -51.3

JP-42-18
EL -49.6

JP-42-6
BELOW EL -50.2

JP-42-23
BELOW EL -49.8

DH-42-2
N/A

JP-42-16
EL -50.7

JP-42-22
EL -49.3

JP-42-12
BELOW EL -48.4

JP-42-28
BELOW EL -51.0

JP-42-11
BELOW EL -53.4

JP-42-21
BELOW EL -51.7

JP-42-17
BELOW EL -51.0

JP-42-27
BELOW EL -52.0

JP-42-20
BELOW EL -51.8

JP-42-26
BELOW EL -51.0

JP-42-25
BELOW EL -54.0

JP-42-24
BELOW EL -51.0

JP-42-29
EL -48.9

-48
-50
-49

LEGEND:

- RIVERMILES
- DRILL HOLE
- JET PROBE
- TEST PIT
- EL -48.3 JET PROBE REFUSAL ELEVATION
- (EL. - 47.0) TOP OF BEDROCK ELEVATION.
- N/A NOT APPLICABLE, NO REFUSAL OR BEDROCK ENCOUNTERED

N

0 50 100 150
Scale in Feet

PROJECTION: STATE PLANE, OREGON NORTH ZONE, NAD 27.
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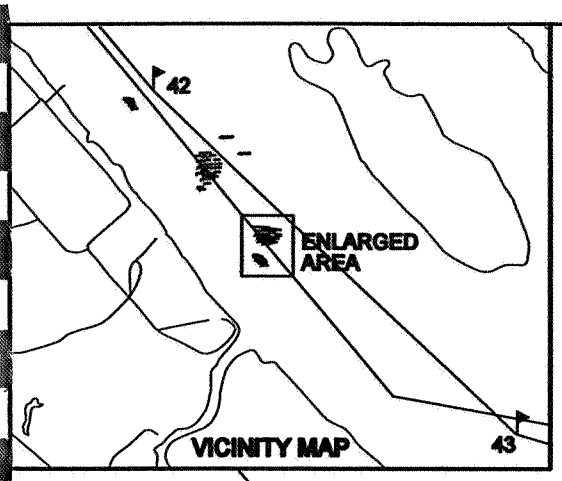
US ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT

AREA 42.5
SHEET 3 OF 3

COLUMBIA RIVER CHANNEL DEEPENING
PED EXPLORATIONS



JP-42-35
BELOW EL -53.4
JP-42-33
BELOW EL -53.4
JP-42-39
EL -49.9
JP-42-38
BELOW EL -50.4
JP-42-42
EL -50.0
JP-42-47
EL - 48.7
JP-42-34
BELOW EL -52.3
JP-42-41
BELOW EL -50.2
DH-42-4
N/A
JP-42-37
EL - 50.4
DH-42-3
(EL - 62.0)
JP-42-51
BELOW EL -51.1
JP-42-36
BELOW EL -51.3
JP-42-44
EL -50.1
JP-42-46
EL -48.1
JP-42-65
BELOW EL -51.5
JP-42-40
BELOW EL -51.3
JP-42-50
BELOW EL -51.3
JP-42-53
BELOW EL -51.3
JP-42-43
BELOW EL - 53.3
JP-42-54
BELOW EL -53.9
JP-42-45
EL -50.2
JP-42-49
BELOW EL -53.9
JP-42-52
BELOW EL -52.9
JP-42-48
BELOW EL -51.7

WASHINGTON
OREGON

NO BEDROCK EXPECTED ABOVE EL -50

JP-42-55
BELOW EL -50.3
JP-42-57
EL -50.5
JP-42-56
EL -48.5
JP-42-58
EL -50.4
JP-42-60
EL -50.2
DH-42-5
N/A
JP-42-62
EL -50.0
JP-42-59
EL -50.2
JP-42-63
EL -50.2
JP-42-61
EL -47.5
JP-42-64
EL -48.4

LEGEND:

- RIVERMILES
- DRILL HOLE
- JET PROBE
- TEST PIT
- EL -48.3 JET PROBE REFUSAL ELEVATION
- (EL - 47.0) TOP OF BEDROCK ELEVATION
- N/A NOT APPLICABLE, NO REFUSAL OR BEDROCK ENCOUNTERED

N

0 50 100 150
Scale in Feet

PROJECTION: STATE PLANE, OREGON NORTH ZONE, NAD 27.
PRODUCED BY GIS, SURVEY AND MAPPING SECTION, CENWP-EC-HM

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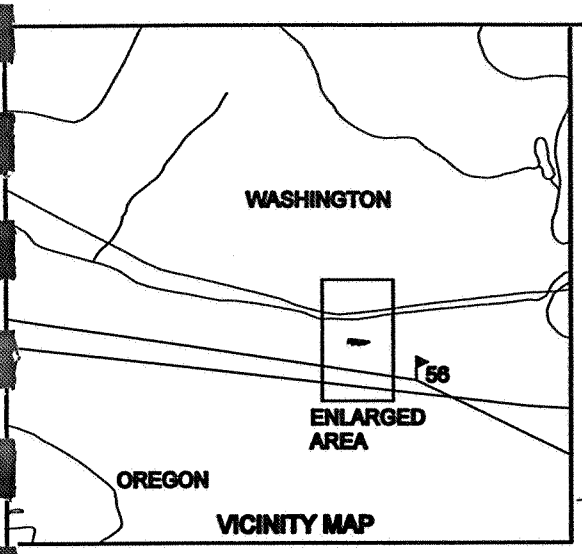
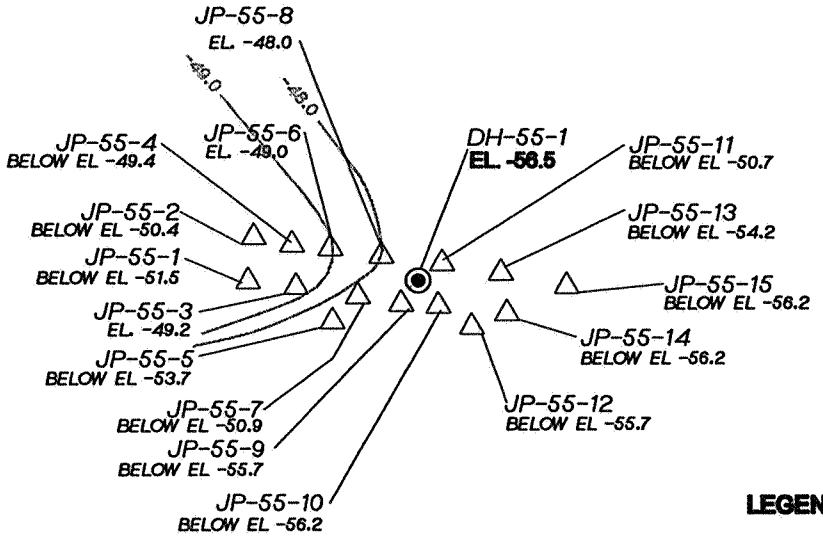
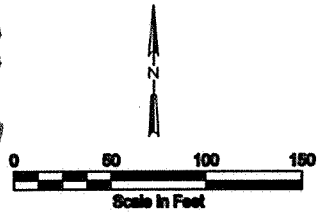
US ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT

AREA 56
SHEET 1 OF 2

COLUMBIA RIVER CHANNEL DEEPENING
PED EXPLORATIONS







LEGEND:

- RIVERMILES
- DRILL HOLE
- JET PROBE
- TEST PIT
- *EL -48.3* JET PROBE REFUSAL ELEVATION
- **(EL - 47.0)** TOP OF BEDROCK ELEVATION.
- *N/A* NOT APPLICABLE, NO REFUSAL OR BEDROCK ENCOUNTERED

PROJECTION: STATE PLANE, OREGON NORTH ZONE, NAD 27.
PRODUCED BY GIS, SURVEY AND MAPPING SECTION, CENWP-EC-HM

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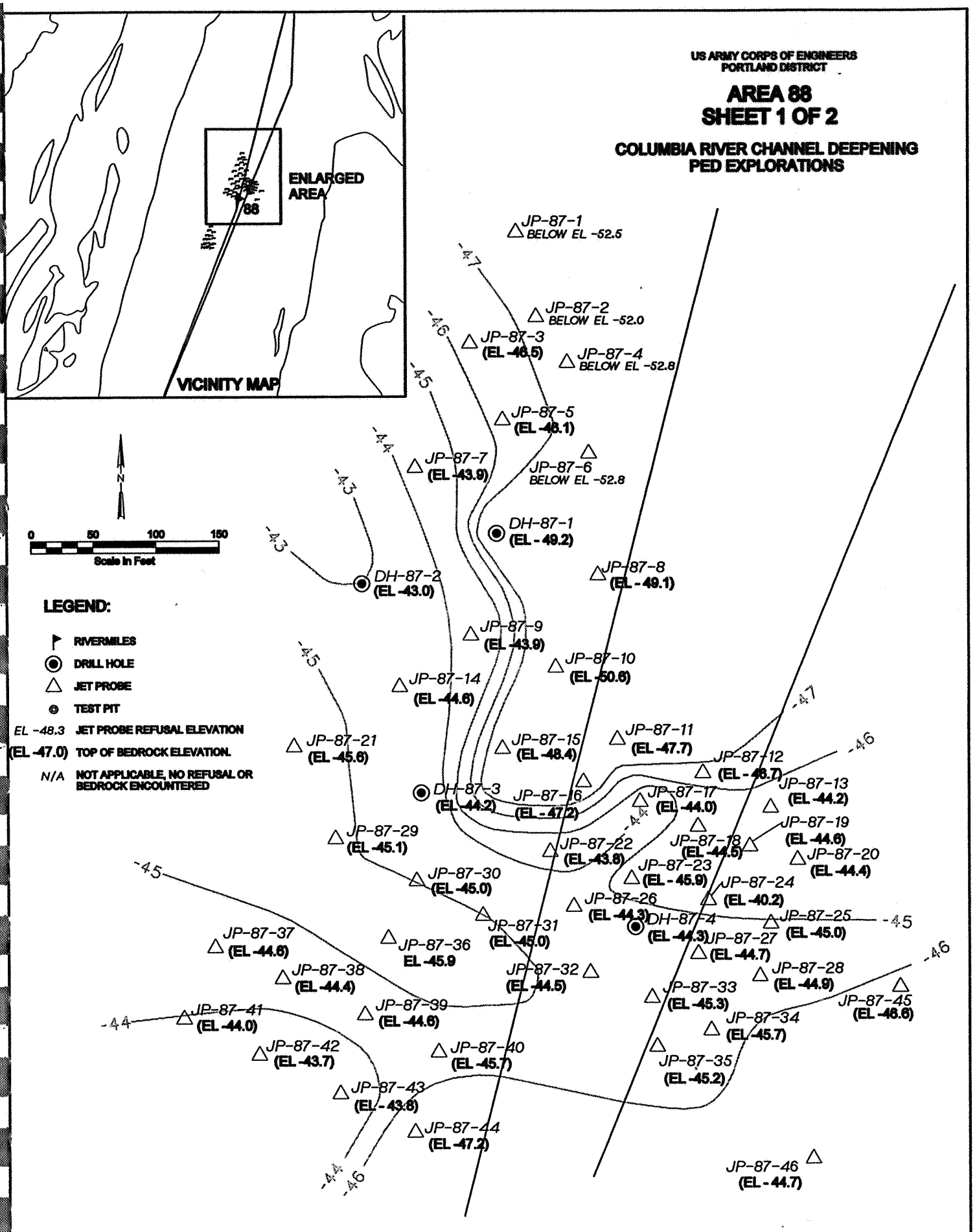

PROJECTION: STATE PLANE, OREGON NORTH ZONE, NAD 27.
PRODUCED BY GIS, SURVEY AND MAPPING SECTION, CENWP-EC-HM

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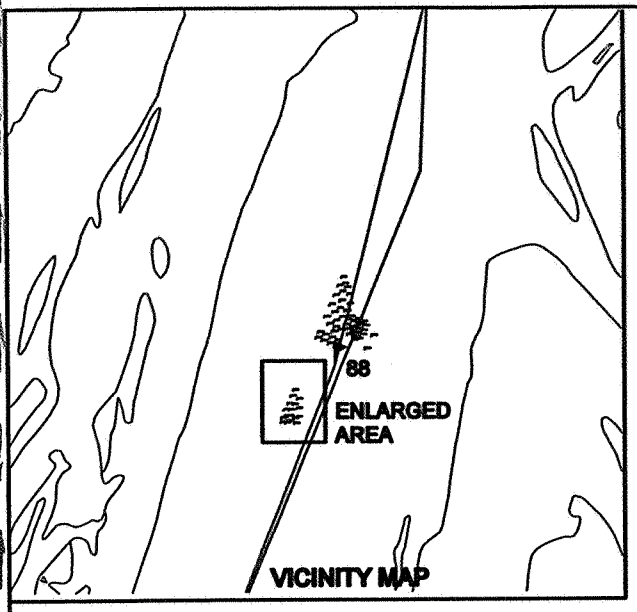
US ARMY CORPS OF ENGINEERS
PORTLAND DISTRICT

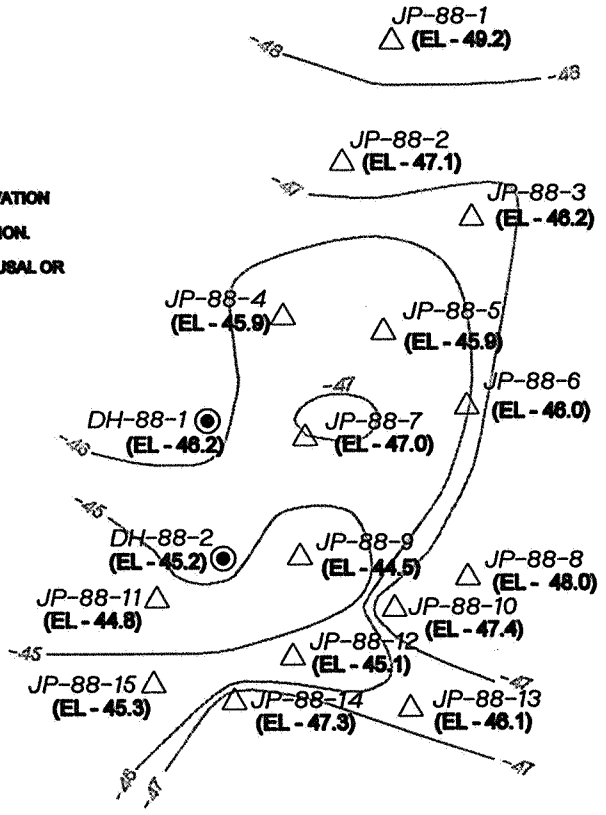
AREA 88
SHEET 2 OF 2

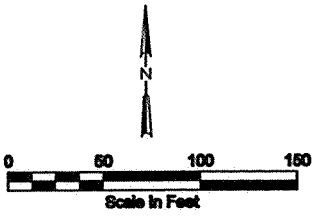
COLUMBIA RIVER CHANNEL DEEPENING
PED EXPLORATIONS



LEGEND:

- RIVERMILES
- DRILL HOLE
- JET PROBE
- TEST PIT
- EL -48.3 JET PROBE REFUSAL ELEVATION
- (EL - 47.0) TOP OF BEDROCK ELEVATION.
- N/A NOT APPLICABLE, NO REFUSAL OR BEDROCK ENCOUNTERED





LEGEND:

- RIVERMILES
- DRILL HOLE
- JET PROBE
- TEST PIT

PROJECTION: STATE PLANE, OREGON NORTH ZONE, NAD 27.
PRODUCED BY GIS, SURVEY AND MAPPING SECTION, CENWP-EC-HM

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