LOWER DUNGENESS RIVER
SECTION 544
ECOSYSTEM RESTORATION

APPENDIX G

GEOTECHNICAL ENGINEERING

DRAFT Detailed Project Report and Environmental Assessment

US Army Corps of Engineers®
Seattle District

DUNGENESS ECOSYSTEM RESTORATION PROJECT

DECISION DOCUMENT

APPENDIX – GEOTECHNICAL

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G-7. Original Project Detailed Report from 1963

Appendix G-1: Design Process Documentation

Initial work to develop conceptual designs, levee sections, and geotechnical assumptions was based on the original Federal project construction documents and as-builts produced in 1963. Further refinement was based on current USACE Regulations and Engineering Manuals, in addition to project-specific requirements.

The original levee project (existing condition) section typically has a 10-foot-wide gravel crown and side slopes ranging from 2H to 2.5H:1V. Riprap erosion protection, as well as a bedding layer of spall rock, is provided as required throughout the project, ranging in thickness from 1 to 2 feet on top of 9 inches of bedding material. The rock toe is buried wherever possible with a weighted toe elsewhere. Grass cover is provided in the absence of gravel or rock.

This existing condition was used as a starting point for the proposed setback levee section, although several changes were made to modernize the design and to incorporate expected O&M activities. The levee crown was widened to 12 feet to conform to modern common practice and to enhance accessibility. Riprap erosion protection and bedding spall rock was again provided as required along the proposed setback alignment. Based on current hydraulic models, riprap erosion protection is only required along a small portion of the downstream end of the proposed setback alignment. Where required, the riprap blanket thickness was increased to 2.5 feet on top of 1 foot of spall rock filter blanket. A buried toe is included at the downstream end, where the project ties into an existing bridge. Here, the buried toe is critical to maintain the channel alignment through the bridge crossing. Where riprap is not required, grass cover will be required and integral to the project. As a result, regular operations and maintenance (O&M) activities, such as mowing and maintenance of the grass cover, is essential to project function. To that end, levee slopes were flattened to 3H:1V, as recommended in EM 1110-2-1913 Design and Construction of Levees; a 3H:1V slope is the steepest slope upon which a mower can drive.

For a detailed list of all assumptions utilized, see Appendix G-2 – MFR Geotechnical Design Assumptions. This documents many assumptions gathered from the original as-builts (Appendix G-6) and construction documents (Appendix G-7).

Although subsurface exploration has already occurred and a final field report produced by the drill crew in Omaha District (NWO), the original proposal for subsurface exploration to be conducted for investigation of the setback alignment is included in Appendix G-4. This scope of work includes summary items and describes relevant borings logs found in the original as-builts (Appendix G-6).

Appendix G-2: MFR Geotechnical Design Assumptions 2013.06.18

MEMORANDUM FOR RECORD

Date: 18JUN2013
Subject: Dungeness River ERP – Geotechnical Assumptions for 10% Design

From: Travis Macpherson, Soils Section, EN-GB-SS
To: Civil Design Section, EN-DB-CS

ASSUMPTIONS:

1. Levee embankment material removed from the existing levee will be reused first, prior to import of any materials. Levee would be removed to natural ground. The landward slope will need approximately 6 inches of clearing (grass sod). Otherwise, the entire levee embankment prism should be reusable.
2. Existing riprap and spall rock will be reused to the maximum extent possible. Several sections have been repaired in the last 20 years, meaning that they would have new riprap. An investigation will need to be conducted to determine condition and quality of existing rock. Rock may have weathered over time. A conservative figure would be to reuse 50% of the available rock. An additional consideration with riprap removal is the elevation to remove down to. Pending environmental assessments and consultation, riprap in the river channel or wetlands may not be removable.
3. Clearing and grubbing will remove soil to a depth of 1 foot. See **Typical Levee Section – Enclosure 1**.
4. Overexcavation to a depth of 2 feet may be required through slough or creek crossings. This is consistent with original construction.
5. Overbuild levee by approximately 1 foot to account for settlement and consolidation. An overbuild of 2 feet minimum was used in 1963 Dungeness DPR Supporting Notes 3 due to "utilization of wet borrow materials and soft foundation conditions". We will not have the wet borrow material conditions, so an overbuild of that magnitude is not warranted.
6. Final levee heights are likely to decrease pending further H&H analyses and modeling.
7. Quantity and size of riprap and spalls may change pending H&H analyses and modeling.
8. Riprap is only anticipated toward the downstream end of the setback project, as the levee joins back to the existing alignment near the bridge. This is based on preliminary H&H models, wherein most flow velocities were less than 4 feet per second. In the absence of riprap erosion protection, grass sod cover will be required. See **Plan View with Alignment - Enclosure 2** with notes describing locations of riprap for each alternative.
9. Levee slopes in original construction are predominantly 2.5H:1V, with some sections being steeper at 2H:1V. The new setback levee will depend on grass sod cover for erosion protection, rather than riprap, making it essential to properly maintain the grass sod on the levee. According to EM 1110-2-1913 Levee Design and Construction, a 3H:1V slope is the steepest to be able to drive a mower on. Brushing and mowing on the existing levee is limited to the reach

of an extendable arm from the levee crown, as noted in recent Continuing Eligibility Inspection reports (CEI). Setting the slopes to 3H:1V would allow the sponsor to drive along the levee slopes and mow more easily. For this reason, and because it is only marginally more material, slopes will be set to 3H:1V, rather than 2.5H:1V.

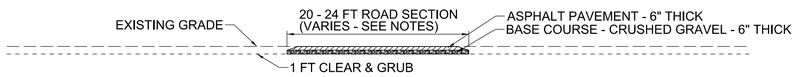
10. There is an area near the downstream end of the Meadowbrook alignment where no levee is included or shown on the site plan; instead an access road is shown. See **Plan View with Alignment Enclosure 2** between flood elevations of “28.3” to “27.5”. For 10% design, this length of setback project should be quantified as a levee, due to the uncertainty in depending on the natural ground as part of the Dungeness River flood protection project. Additionally, it would continue to offer flood protection to the properties on the high ground. Including this section as levee will marginally reduce the total area of restoration within the project site and may have increased wetland impacts. These details will be flushed out during the next phase of design.

Enclosures:

Typical Levee Section
Plan View with Alignment

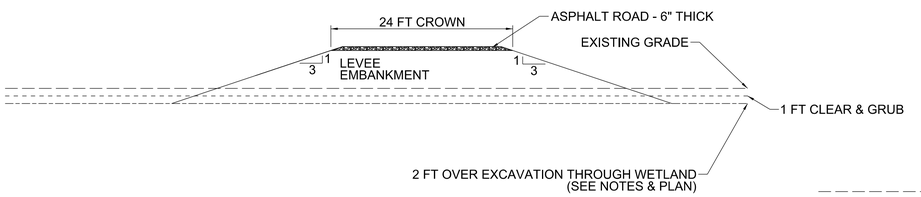
Travis Macpherson
Soils Section

Appendix G-3: Typical Sections



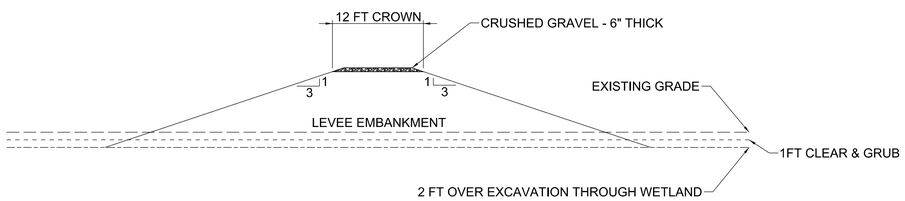
1 TYPICAL ROAD SECTION

NTS



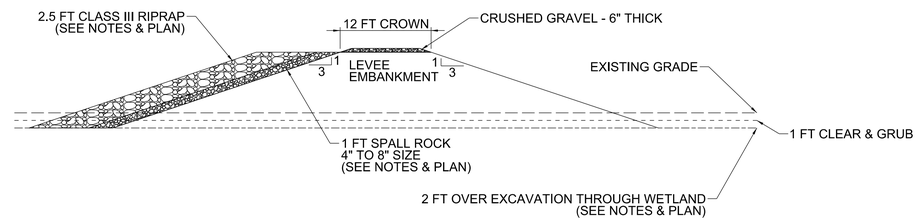
2 TYPICAL ROAD ON TOP OF LEVEE

NTS



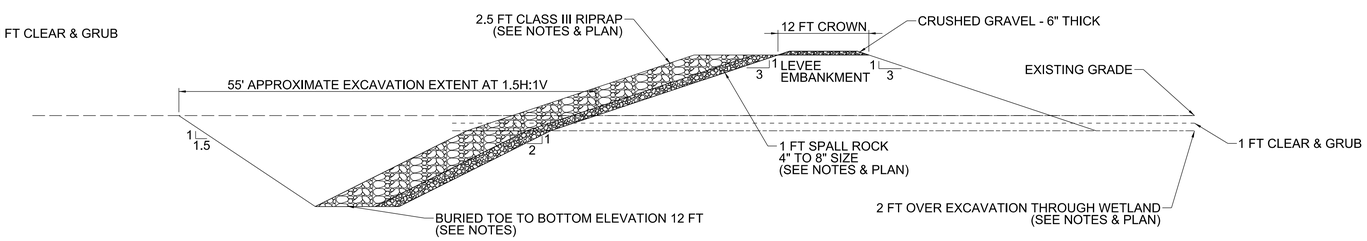
3 TYPICAL LEVEE SECTION

NTS



4 TYPICAL LEVEE WITH ARMORING

NTS



5 TYPICAL LEVEE WITH ARMORING AND BURIED TOE

NTS

NOTES:

1. LEVEE SIDE SLOPES 3H:1V.
2. LEVEE SLOPES ARE GRASS COVER, EXCEPT WHERE RIPRAP NOTED ON PLAN VIEW.
3. BURIED TOE ONLY PRESENT AT DOWNSTREAM END OF SETBACK FOR BRIDGE APPROACH. SEE PLAN.
4. BURIED TOE ONLY TO ELEVATION 12 FEET NAVD 88 (BOTTOM OF RIVER CHANNEL).
5. LEVEE TOP ELEVATION VARIES. SEE PLAN VIEW FOR TOP ELEVATIONS. HEIGHT VARIES.
6. CLEAR & GRUB TO DEPTH OF 1 FT. THROUGH WETLAND CROSSINGS, OVER-EXCAVATE TO DEPTH OF 2 FT.
7. OVERBUILD LEVEE BY 1 FT TO ACCOUNT FOR SETTLEMENT & CONSOLIDATION.
8. SORT AND REUSE EXISTING LEVEE ROCK AND EMBANKMENT MATERIAL.
9. TOWN ROAD IS 24 FEET WIDE. SOUTHERN ACCESS ROAD IS 20 FEET WIDE (12 FT MINIMUM).
10. TOWN ROAD WILL BE BUILT AT-GRADE THROUGH RESTORATION SITE.
11. SOUTHERN ACCESS ROAD MAY BE AT-GRADE OR ABOVE.

US Army Corps of Engineers®
SEATTLE DISTRICT

MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT
SEATTLE, WASHINGTON

DESIGNED BY: LEF 2PC TBM
DWN BY: MCP TBM
CKD BY:
SUBMITTED BY: JACKSON
SIZE: ANSI D
FILE NAME:
DATE: 17 JULY 2013
SOLICITATION NO.: X000XX-00-X-0002
CONTRACT NO.: X000XX-00X-4000
FILE NUMBER: 000XX00-00-00
PLOT DATE: 15 JULY 2013
PLOT TIME: 1:17:10 AM

DUNGENESS RIVER ENVIRONMENTAL RESTORATION
CLALLAM COUNTY, WASHINGTON
PN 325138

TYPICAL LEVEE SECTIONS

SHEET IDENTIFICATION
C-300
SHEET OF

DESIGN FILE: I:\AECDesigns\FY17_PN325138_DRER\Con_Docs\CAD_Sheets

DATE AND TIME PLOTTED: 9/3/2014

Appendix G-4: Dungeness ERP Field Report with Boring Logs and Sample Locations

DUNGENESS RIVER LEVEE
DUNGENESS RIVER ENVIRONMENTAL RESTORATION PROJECT
DUNGENESS, WASHINGTON
FIELD INVESTIGATION REPORT
29 NOVEMBER 2013

Field Investigations

A geotechnical investigation was conducted from 20 to 25 September 2013 for the Dungeness River Environmental Restoration Project (Dungeness ERP) in the Town of Dungeness, Callam County, Washington. The site is located along two possible alignments for a relocated setback levee along the Dungeness River. The work was conducted for the United States Army Corps of Engineers (USACE) Seattle District in Seattle, Washington.

Ten borings, numbered DERP-13-1 through DERP-13-10, were drilled, and sampled. Boring DERP-13-11 was eliminated, and DERP-13-2 through DERP-13-5 were completed using a hand auger due to access issues. The termination depths of the soil borings ranged from 7 to 30 feet below ground surface (bgs). The soil borings advanced with the drill rig were drilled to the planned depths, and the soil borings advanced with the hand auger were advanced until the boring collapsed upon itself preventing collection of additional meaningful samples. The boring locations, total depths, collapse depths, groundwater information, and offsets are outlined on **Table 1**. In the drilled soil borings, disturbed soil samples were collected and logged from the borings every 2.5 feet for the first 10 feet and every 5 feet thereafter. In the hand augered soil borings, soil material was collected continuously with samples collected at the material changes and near the bottom of the boring. Disturbed soil samples were retained for geotechnical analysis from all sample intervals. No Shelby tube samples were collected. All field documentation including drill logs and sample transmittals are included in the Appendix at the end of this document.

The Point of Contact (POC) for the Dungeness ERP staked the boring locations, submitted, and obtained the dig permits. No intrusive work was completed prior to receiving the completed dig permit for the site. The boring locations were outlined on a map with GPS coordinates provided by the POC. Soil borings DERP-13-1 and DERP-13-7 were offset 35 feet south and 20 feet west, respectively, due to access issues. A map showing the boring locations is included in the Appendix.

The USACE Omaha District Drill Crew performed drilling, soil sampling, and logging. Drilling at borings DERP-13-1 and DERP-13-6 through DERP-13-10 was accomplished with the use of a Gus Pech 1300C drill rig equipped with 4.25-inch inside diameter (ID), hollow-stem augers (HSA). A 4-inch center bit was used to advance the boring between split spoon samples. These borings had a diameter of approximately 8.5 inches. The remaining soil borings were advanced using a hand auger due to the soft surface soil conditions, which did not allow the drill rig to drive to the boring locations.

No resistivity testing was scheduled or performed at the site for this project.

Disturbed soil sampling at the boring locations where the drill rig was used was conducted using a 2-foot long, 2-inch-outside-diameter, stainless steel, standard split-spoon sampler without liners, C_S. Standard penetration tests were performed by utilizing an automatic trip hammer dropping a 140-pound weight a distance of 30 inches to advance the split-spoon sampler. The energy ratio, $C_{E,}$ of the automatic trip hammer is approximately 0.83. In calculating corrected blow counts, the rod length, $C_{R,}$ should be the rod length that is below ground surface plus an additional five feet. These penetration tests were performed in accordance with ASTM D 1586, "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils." Representative samples of the subsurface material were taken from each split-spoon interval, placed into one-pint jars, and sealed with at least three wraps of electrical tape. Disturbed soil sampling at the hand augered soil boring locations was conducted by advancing a 3 ¼ inch diameter hand auger through the soil in 4 to 6 inch increments until the auger bucket was full then removing the hand auger from the ground to inspect the soil. Soil samples were obtained at approximate 2.5-foot intervals and placed into one-pint jars that were sealed with at least three wraps of electrical tape.

Undisturbed samples were neither requested nor collected from these soil borings.

No bulk samples were requested or collected from these soil borings.

Fifty disturbed soil samples were hand delivered to the POC at the site. The jars containing the disturbed samples were placed in cardboard boxes specifically designed for sample handling and shipment.

The borings were backfilled with bentonite chips and cuttings. The remaining cuttings were disposed of by spreading them out at the drill site as directed by the POC.

Site Geology and Description

Bedrock was not encountered in any of the ten soil borings. The overburden encountered at the site consisted of alternating layers of fat clay (CH), well graded sand (SW), clayey sand with gravel (SC), clayey gravel with sand (GC), poorly graded gravel with sand (GP), clayey sand (SC), sandy silt (ML), poorly graded sand (SP), silty gravel with sand (GM), silt with sand (ML), silt (ML), and well graded sand with gravel (SW). All of the borings except DERP-13-9 and DERP-13-10 encountered at least 6.5 feet of fat clay in the near surface underlain by sandy or gravelly material (SW, SC, SP, GC, ML) with varying amounts of silt, clay and gravel followed by alternating layers of sands, silts, and gravels. Soil boring DERP-13-9 encountered silt with sand (ML) in the near surface underlain by poorly graded sand, silt, well graded sand with gravel, and fat clay. Boring DERP-13-10 encountered silt in the near surface underlain by fat clay. In all of the soil borings the near surface materials (fat clay and silts) were soft to medium stiff (fat clay), or loose to medium dense (silts). The thickness of the fat clay was from a minimum of 6.6 feet in boring DERP-13-7 to a maximum of 20 feet in boring DERP-13-6. The near

surface sandy silt in soil boring DERP-13-9 was 7 feet thick underlain by poorly graded sand, which was very loose to loose, and extended to a depth of 15 feet. This sand was underlain by loose silt, followed by well-graded sand with gravel, and fat clay. In soil boring DERP-13-10, the near surface silt also extended to a depth of 7 feet, but was underlain by fat clay, which was stiff to at least 13 feet and soft from there to the bottom of the boring.

Groundwater

Readily detectible groundwater was encountered in all of the borings advanced at the site. Groundwater was initially encountered at depths ranging from 1.5 feet bgs in DERP-13-5 to 16.5 feet bgs in DERP-13-10. Collapse depths ranged from 4 feet bgs in DERP-13-5 to 16 feet bgs in boring DERP-13-7. Depth to groundwater may change in response to seasonal precipitation trends.

APPENDIX

DOCUMENTATION

Table 1							
Boring Number	**Total Depth Drilled**	**Water level**	**Collapse Depth**	**Disturbed Samples Collected**	**Northing (ft)**	**Easting (ft)**	**Offset (ft)**
Dungeness River Environmental Restoration Project							
DERP-13-1	30	3.2	10.5	7	423182.758	1079969.37	35' South
DERP-13-2	10	2.3	7	2	423279.043	1080787.097	0
DERP-13-3	7	4.2	6	2	423811.561	1081113.75	0
DERP-13-4	7	5	6	2	424255.519	1081138.893	0
DERP-13-5	8.5	1.5	4	2	424374.01	1080908.227	0
DERP-13-6	30	3.3	13.5	7	422829.498	1078480.601	0
DERP-13-7	30	4	16	7	423758.738	1079739.378	20' West
DERP-13-8	30	12.2	9.8	7	424385.247	1080010.189	0
DERP-13-9	30	3	12	7	425123.168	1079892.836	0
DERP-13-10	30	16.5	8	7	425214.535	1079978.298	0

All units are in feet below ground surface.
Northing and Easting are the staked locations

LEGEND

Boring Locations Staked in Field

N

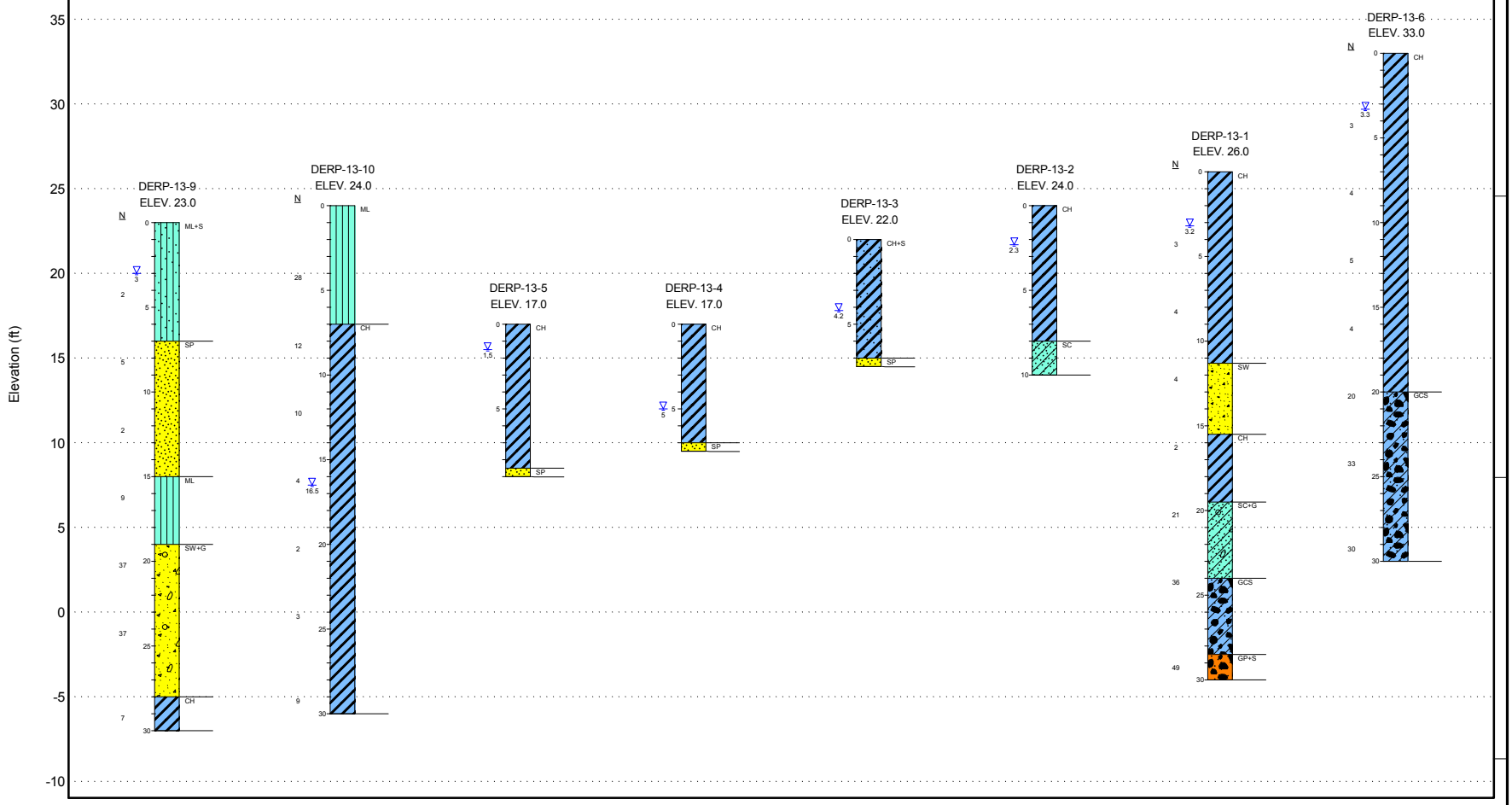
0 180 360 540
Feet

U.S. Army Corps of Engineers
Omaha District

Dungeness ERP
Dungeness, WA

Boring Locations Staked In Field

September 18, 2013 | FIGURE 1



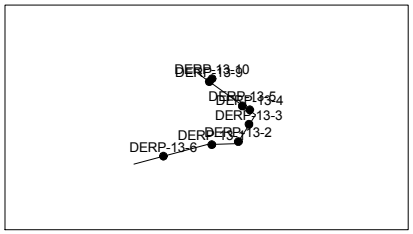
LITHOLOGY GRAPHICS

- CH - Fat Clay (CH)
- CH+S - Fat Clay with Sand (CH)
- GC+S - Clayey Gravel with Sand (GC)
- SC - Clayey Sand (SC)
- ML - Silt (ML)
- ML+S - Silt with Sand (ML)
- SC+G - Clayey Sand with Gravel (SC)
- SP - Poorly Graded Sand (SP)
- SW - Well-Graded Sand (SW)
- SW+G - Well-Graded Sand with Gravel (SW)
- GP+S - Poorly Graded Gravel with Sand (GP)

Depth Groundwater Encountered (during drilling)

433 0 433 866 1299

Horizontal Scale in Feet



US ARMY CORPS OF ENGINEERS
OMAHA DISTRICT

MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

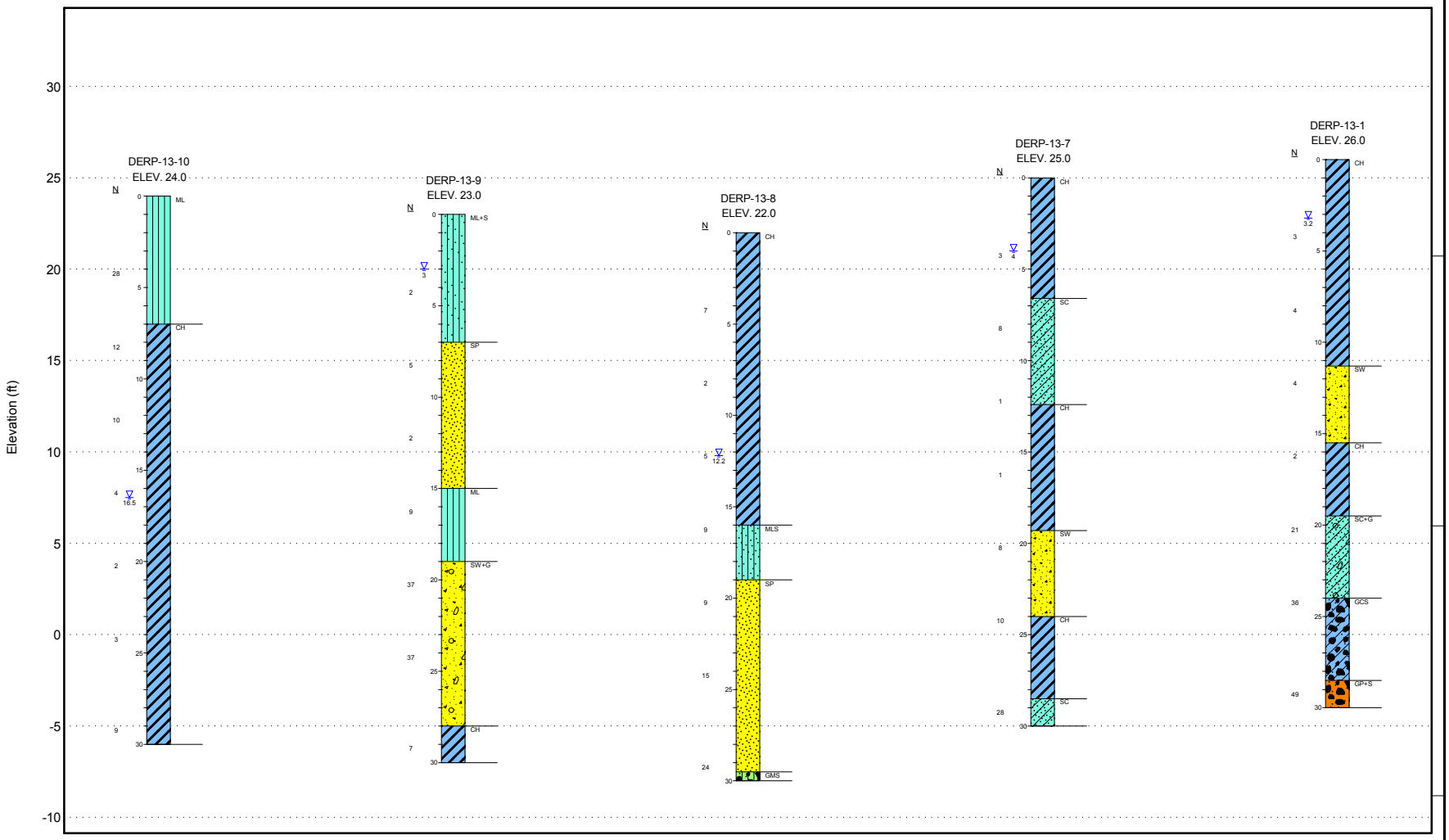
DESIGNED BY: | DATE: 11/26/13
DWN BY: | CKD BY: | SOLICITATION NO.:
SUBMITTED BY: | CONTRACT NO.:
FILE NAME: | FILE NUMBER:
SIZE: | PLOT SCALE: | PLOT DATE:

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

Dungeness River Environmental Restoration Project
Dungeness, WA
Dungeness River ERP

SHEET IDENTIFICATION NUMBER
2

NWO_FENCE_A_SIZE DUNGENESS ERP_WA.GPJ USACE_NWO.GDT 11/26/13



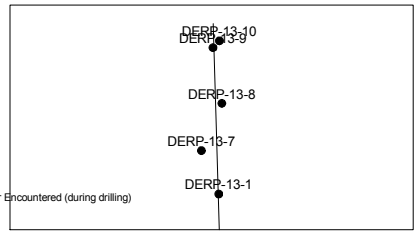
LITHOLOGY GRAPHICS

- CH - Fat Clay (CH)
- GC+S - Clayey Gravel with Sand (GC)
- SC - Clayey Sand (SC)
- ML - Silt (ML)
- ML+S - Silt with Sand (ML)
- MLS - Sandy Silt (ML)
- SC+G - Clayey Sand with Gravel (SC)
- GM+S - Silty Gravel with Sand (GM)
- SP - Poorly Graded Sand (SP)
- SW - Well-Graded Sand (SW)
- SW+G - Well-Graded Sand with Gravel (SW)
- GP+S - Poorly Graded Sand with Gravel (GP)

187 0 187 374 561

Horizontal Scale in Feet

Depth Groundwater Encountered (during drilling)



US ARMY CORPS OF ENGINEERS
OMAHA DISTRICT

MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
OMAHA, NEBRASKA

DESIGNED BY: | DATE: 11/25/13
DWN BY: | CKD BY: | SOLICITATION NO.:
SUBMITTED BY: | CONTRACT NO.:
FILE NAME: | FILE NUMBER:
SIZE: | PLOT SCALE: | PLOT DATE:

Dungeness River Environmental Restoration Project
Dungeness, WA
Dungeness River ERP

SHEET IDENTIFICATION NUMBER
3

NWO_FENCE_A_SIZE DUNGENESS ERP_WA.GPJ USACE_NWO.GDT 11/25/13

DRILLING LOG	DIVISION NWD	INSTALLATION Dungeness River Levee	SHEET 1 OF 4 SHEETS

1. PROJECT Dungeness River Environmental Restoration Project	9. COORDINATE SYSTEM State Plane; HORIZONTAL; VERTICAL
	10. SIZE AND TYPE OF BIT 4 1/4" ID HSA
2. HOLE NUMBER DERP-13-1; LOCATION COORDINATES 423182.758N 1079969.370E	11. MANUFACTURER'S DESIGNATION OF DRILL Gus Pech 1300C
3. DRILLING AGENCY USACE, Omaha District	12. TOTAL SAMPLES; DISTURBED 7; UNDISTURBED 0
4. NAME OF DRILLER Sam Thomas	13. TOTAL NUMBER CORE BOXES
	14. ELEVATION GROUND WATER
5. DIRECTION OF BORING ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL ---; BEARING	15. DATE BORING; STARTED 9/20/13; COMPLETED 9/20/13
6. THICKNESS OF OVERBURDEN 30 ft	16. ELEVATION TOP OF BORING 26.00 ft
7. DEPTH DRILLED INTO ROCK 0 ft	17. TOTAL CORE RECOVERY FOR BORING N/A
8. TOTAL DEPTH OF BORING 30 ft	18. SIGNATURE AND TITLE OF INSPECTOR George A. Filpovich Geologist

LOCATION SKETCH/COMMENTS

SCALE:

▼ Static Water Level ▽ Depth Groundwater Encountered

Collapse depth 10.5 feet.
Boring offset 35-feet south, could not make the turn past the gate due to length of the rig and a piece of contractor's equipment that blocked the path.
Ground surface elevation from Google Earth.

PROJECT	HOLE NO
Dungeness River Environmental Restoration Project Dungeness, WA	DERP-13-1

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 2 OF 4 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Fat clay (CH) high plasticity, soft, moist, brown to gray.					
				0 1 2	3	100	D-1, 3.5' - 5'	
			@ 7 ft, olive to dark gray.					
				1 2 2	4	100	D-2, 7.5' - 9'	

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 3 OF 4 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Fat clay (CH) high plasticity, soft, moist, olive to dark gray, (con't.).					
14.7	11.3							
			Well graded sand (SW) no plasticity, very loose, wet, dark gray, fine to coarse grained.	3 3 1	4	100	D-3, 11.5' - 13'	
10.5	15.5							
			Fat clay (CH) high plasticity, very soft, wet, dark gray.	1 1 1	2	100	D-4, 15.5' - 17'	
6.5	19.5							
			Clayey sand with gravel (SC) no plasticity, medium dense, wet, dark gray.	5				

10 11 12 13 14 15 16 17 18 19 20

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 4 OF 4 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Clayey sand with gravel (SC) no plasticity, medium dense, wet, dark gray, fine to coarse grained, with fine to coarse gravel, (con't.).	9 12	21	100	D-5, 19.5' - 21'	
2.0	24.0			8				
			Clayey gravel with sand (GC) no plasticity, dense, wet, brown, fine grained, with fine to coarse sand, trace coarse gravel.	19 17	36	100	D-6, 24' - 25'	
-2.5	28.5							
			Poorly graded gravel with sand (GP) no plasticity, dense, wet, brown, fine grained, with fine to coarse sand, trace coarse gravel.	21 24 25	49	100	D-7, 28.5' - 30'	
-4.0	30.0		Bottom of boring at 30 ft bgs					

20 21 22 23 24 25 26 27 28 29 30

DRILLING LOG	DIVISION NWD	INSTALLATION Dungeness River Levee	SHEET 1 OF 2 SHEETS

1. PROJECT Dungeness River Environmental Restoration Project	9. COORDINATE SYSTEM State Plane; HORIZONTAL; VERTICAL
	10. SIZE AND TYPE OF BIT Hand Auger
2. HOLE NUMBER DERP-13-2; LOCATION COORDINATES 423279.043N 1080787.097E	11. MANUFACTURER'S DESIGNATION OF DRILL Hand Auger
3. DRILLING AGENCY USACE, Omaha District	12. TOTAL SAMPLES; DISTURBED 2; UNDISTURBED 0
4. NAME OF DRILLER Sam Thomas	13. TOTAL NUMBER CORE BOXES
5. DIRECTION OF BORING ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL ---; BEARING	14. ELEVATION GROUND WATER
	15. DATE BORING; STARTED 9/25/13; COMPLETED 9/25/13
6. THICKNESS OF OVERBURDEN 10 ft	16. ELEVATION TOP OF BORING 24.00 ft
7. DEPTH DRILLED INTO ROCK 0 ft	17. TOTAL CORE RECOVERY FOR BORING N/A
8. TOTAL DEPTH OF BORING 10 ft	18. SIGNATURE AND TITLE OF INSPECTOR George A. Filpovich Geologist

LOCATION SKETCH/COMMENTS

SCALE:

▼ Static Water Level ▽ Depth Groundwater Encountered

Collapse depth 7 feet.
Boring was advanced using a hand auger because boring location could not be accessed with the drill rig.
Ground surface elevation from Google Earth.

PROJECT	HOLE NO
Dungeness River Environmental Restoration Project Dungeness, WA	DERP-13-2

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 2 OF 2 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Fat clay (CH) high plasticity, soft to medium stiff, moist, brown.					
			@ 1.8 ft, light gray.					
			@ 2.3 ft, saturated.					
							D-1, 5' - 6'	
16.0	8.0		Clayey sand (SC) medium plasticity, loose to medium dense, wet, fine grained.				D-2, 8' - 9'	
14.0	10.0		Bottom of boring at 10 ft bgs					

0 1 2 3 4 5 6 7 8 9 10

DRILLING LOG	DIVISION NWD	INSTALLATION Dungeness River Levee	SHEET 1 OF 2 SHEETS
1. PROJECT Dungeness River Environmental Restoration Project		9. COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL
		10. SIZE AND TYPE OF BIT Hand Auger	
2. HOLE NUMBER DERP-13-3	LOCATION COORDINATES 423811.561N 1081113.750E	11. MANUFACTURER'S DESIGNATION OF DRILL Hand Auger	
3. DRILLING AGENCY USACE, Omaha District		12. TOTAL SAMPLES	DISTURBED 2 / UNDISTURBED 0
4. NAME OF DRILLER Sam Thomas		13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING ☒ VERTICAL ☐ INCLINED	DEG FROM VERTICAL --- / BEARING	14. ELEVATION GROUND WATER	
		15. DATE BORING	STARTED 9/25/13 / COMPLETED 9/25/13
6. THICKNESS OF OVERBURDEN 7.5 ft		16. ELEVATION TOP OF BORING 22.00 ft	
7. DEPTH DRILLED INTO ROCK 0 ft		17. TOTAL CORE RECOVERY FOR BORING N/A	
8. TOTAL DEPTH OF BORING 7.5 ft		18. SIGNATURE AND TITLE OF INSPECTOR George A. Filpovich Geologist	

LOCATION SKETCH/COMMENTS

SCALE:

▼ Static Water Level ▽ Depth Groundwater Encountered

Collapse depth 6 feet.
Boring was advanced using a hand auger because boring location could not be accessed with the drill rig.
Ground surface elevation from Google Earth.

PROJECT	HOLE NO
Dungeness River Environmental Restoration Project Dungeness, WA	DERP-13-3

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 2 OF 2 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Fat clay with sand (CH) high plasticity, soft to medium stiff, moist, brown, some fine sand.					
							D-1, 1' - 2'	
			@ 4.2 ft, saturated.					
							D-2, 6' - 7'	
15.0	7.0		Poorly graded sand (SP) loose to medium dense, saturated, fine grained, Lost sample. Sand on edge of auger bucket..					
14.5	7.5		Bottom of boring at 7.5 ft bgs					

0 1 2 3 4 5 6 7 8 9 10

DRILLING LOG	DIVISION NWD	INSTALLATION Dungeness River Levee	SHEET 1 OF 2 SHEETS

1. PROJECT Dungeness River Environmental Restoration Project	9. COORDINATE SYSTEM State Plane; HORIZONTAL; VERTICAL
	10. SIZE AND TYPE OF BIT Hand Auger
2. HOLE NUMBER DERP-13-4; LOCATION COORDINATES 424255.519N 1081138.893E	11. MANUFACTURER'S DESIGNATION OF DRILL Hand Auger
3. DRILLING AGENCY USACE, Omaha District	12. TOTAL SAMPLES; DISTURBED 2; UNDISTURBED 0
4. NAME OF DRILLER Sam Thomas	13. TOTAL NUMBER CORE BOXES
	14. ELEVATION GROUND WATER
5. DIRECTION OF BORING ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL ---; BEARING	15. DATE BORING; STARTED 9/25/13; COMPLETED 9/25/13
6. THICKNESS OF OVERBURDEN 7.5 ft	16. ELEVATION TOP OF BORING 17.00 ft
7. DEPTH DRILLED INTO ROCK 0 ft	17. TOTAL CORE RECOVERY FOR BORING N/A
8. TOTAL DEPTH OF BORING 7.5 ft	18. SIGNATURE AND TITLE OF INSPECTOR George A. Filpovich Geologist

LOCATION SKETCH/COMMENTS

SCALE:

▼ Static Water Level ▽ Depth Groundwater Encountered

Collapse depth 6 feet.
Boring was advanced using a hand auger because boring location could not be accessed with the drill rig.
Ground surface elevation from Google Earth.

PROJECT	HOLE NO
Dungeness River Environmental Restoration Project Dungeness, WA	DERP-13-4

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 2 OF 2 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Fat clay (CH) high plasticity, soft to medium stiff, moist, brown, iron oxide staining.					
							D-1, 4' - 5'	
			@ 5 ft, saturated.					
			@ 5.7 ft, dark gray to blueish gray.					
							D-2, 6' - 7'	
10.0	7.0							
			Poorly graded sand (SP) loose to medium dense, Lost sample. Sand on edge of auger bucket..					
9.5	7.5		Bottom of boring at 7.5 ft bgs					

0 1 2 3 4 5 6 7 8 9 10

DRILLING LOG	DIVISION NWD	INSTALLATION Dungeness River Levee	SHEET 1 OF 2 SHEETS

1. PROJECT Dungeness River Environmental Restoration Project	9. COORDINATE SYSTEM State Plane; HORIZONTAL; VERTICAL
	10. SIZE AND TYPE OF BIT Hand Auger
2. HOLE NUMBER DERP-13-5; LOCATION COORDINATES 424374.010N 1080908.227E	11. MANUFACTURER'S DESIGNATION OF DRILL Hand Auger
3. DRILLING AGENCY USACE, Omaha District	12. TOTAL SAMPLES; DISTURBED 2; UNDISTURBED 0
4. NAME OF DRILLER Sam Thomas	13. TOTAL NUMBER CORE BOXES
	14. ELEVATION GROUND WATER
5. DIRECTION OF BORING ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL ---; BEARING	15. DATE BORING; STARTED 9/25/13; COMPLETED 9/25/13
6. THICKNESS OF OVERBURDEN 9 ft	16. ELEVATION TOP OF BORING 17.00 ft
7. DEPTH DRILLED INTO ROCK 0 ft	17. TOTAL CORE RECOVERY FOR BORING N/A
8. TOTAL DEPTH OF BORING 9 ft	18. SIGNATURE AND TITLE OF INSPECTOR George A. Filpovich Geologist

LOCATION SKETCH/COMMENTS

SCALE:

▼ Static Water Level ▽ Depth Groundwater Encountered

Collapse depth 4 feet.
Boring was advanced using a hand auger because boring location could not be accessed with the drill rig.
Ground surface elevation from Google Earth.

PROJECT	HOLE NO
Dungeness River Environmental Restoration Project Dungeness, WA	DERP-13-5

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 2 OF 2 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Fat clay (CH) high plasticity, soft to medium stiff, moist, gray mottled with brown.					
			@ 1.5 ft, saturated.					
							D-1, 2' - 3'	
			@ 3.6 ft, blueish gray.					
			@ 7.5 ft, trace organics.				D-2, 7' - 8'	
8.5	8.5		Poorly graded sand (SP) loose to medium dense, Lost sample. Sand on edge of auger bucket..					
8.0	9.0		Bottom of boring at 9 ft bgs					

0 1 2 3 4 5 6 7 8 9 10

DRILLING LOG	DIVISION NWD	INSTALLATION Dungeness River Levee	SHEET 1 OF 4 SHEETS

1. PROJECT Dungeness River Environmental Restoration Project		9. COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL
		10. SIZE AND TYPE OF BIT 4 1/4" ID HSA	
2. HOLE NUMBER DERP-13-6	LOCATION COORDINATES 422829.498N 1078480.601E	11. MANUFACTURER'S DESIGNATION OF DRILL Gus Pech 1300C	
3. DRILLING AGENCY USACE, Omaha District		12. TOTAL SAMPLES	DISTURBED 7 / UNDISTURBED 0
4. NAME OF DRILLER Sam Thomas		13. TOTAL NUMBER CORE BOXES	
5. DIRECTION OF BORING ☒ VERTICAL ☐ INCLINED	DEG FROM VERTICAL --- / BEARING	14. ELEVATION GROUND WATER	
		15. DATE BORING	STARTED 9/20/13 / COMPLETED 9/20/13
6. THICKNESS OF OVERBURDEN 30 ft		16. ELEVATION TOP OF BORING 33.00 ft	
7. DEPTH DRILLED INTO ROCK 0 ft		17. TOTAL CORE RECOVERY FOR BORING N/A	
8. TOTAL DEPTH OF BORING 30 ft		18. SIGNATURE AND TITLE OF INSPECTOR George A. Filpovich Geologist	

LOCATION SKETCH/COMMENTS

SCALE:

▼ Static Water Level ▽ Depth Groundwater Encountered

Collapse depth 13.5 feet.
Ground surface elevation from Google Earth.

PROJECT	HOLE NO
Dungeness River Environmental Restoration Project Dungeness, WA	DERP-13-6

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 2 OF 4 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Fat clay (CH) high plasticity, soft, moist, gray mottled with brown, iron oxide staining.					
			@ 3.5 ft, wet.	1 1 2	3	100	D-1, 3.5' - 5'	
				1 1 3	4	100	D-2, 7.5' - 9'	

0 1 2 3 4 5 6 7 8 9 10

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 3 OF 4 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Fat clay (CH) high plasticity, soft, wet, gray mottled with brown, iron oxide staining, (con't.).					
				1 2 3	5	100	D-3, 11.5' - 13'	
				1 2 2	4	100	D-4, 15.5' - 17'	
				14				
13.0	20.0							

10 11 12 13 14 15 16 17 18 19 20

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 4 OF 4 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Clayey gravel with sand (GC) no plasticity, medium dense to dense, wet, gray, fine grained, some coarse gravel, some fine to coarse sand.	12 8	20	100	D-5, 19.5' - 21'	
				10 18 15	33	100	D-6, 23.5' - 25'	
				17 16 14	30	47	D-7, 28.5' - 30'	
3.0	30.0		Bottom of boring at 30 ft bgs					

20 21 22 23 24 25 26 27 28 29 30

DRILLING LOG	DIVISION NWD	INSTALLATION Dungeness River Levee	SHEET 1 OF 4 SHEETS

1. PROJECT Dungeness River Environmental Restoration Project	9. COORDINATE SYSTEM State Plane; HORIZONTAL; VERTICAL
	10. SIZE AND TYPE OF BIT 4 1/4" ID HSA
2. HOLE NUMBER DERP-13-7; LOCATION COORDINATES 423758.738N 1079739.378E	11. MANUFACTURER'S DESIGNATION OF DRILL Gus Pech 1300C
3. DRILLING AGENCY USACE, Omaha District	12. TOTAL SAMPLES; DISTURBED 7; UNDISTURBED 0
4. NAME OF DRILLER Sam Thomas	13. TOTAL NUMBER CORE BOXES
	14. ELEVATION GROUND WATER
5. DIRECTION OF BORING ☒ VERTICAL ☐ INCLINED; DEG FROM VERTICAL ---; BEARING	15. DATE BORING; STARTED 9/20/13; COMPLETED 9/20/13
6. THICKNESS OF OVERBURDEN 30 ft	16. ELEVATION TOP OF BORING 25.00 ft
7. DEPTH DRILLED INTO ROCK 0 ft	17. TOTAL CORE RECOVERY FOR BORING N/A
8. TOTAL DEPTH OF BORING 30 ft	18. SIGNATURE AND TITLE OF INSPECTOR George A. Filpovich Geologist

LOCATION SKETCH/COMMENTS

SCALE:

▼ Static Water Level ▽ Depth Groundwater Encountered

Collapse depth 16 feet.
Boring offset 20-feet west. Drill rig sank in the soft topsoil, could not move further east.
Ground surface elevation from Google Earth.

PROJECT	HOLE NO
Dungeness River Environmental Restoration Project Dungeness, WA	DERP-13-7

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 2 OF 4 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Fat clay (CH) high plasticity, soft, moist, gray mottled with red, iron oxide staining.					
				1 1 2	3	100	D-1, 3.5' - 5'	
18.4	6.6		Clayey sand (SC) low plasticity, loose, wet, dark gray.					
				3 4 4	8	100	D-2, 7.5' - 9'	

0 1 2 3 4 5 6 7 8 9 10

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 3 OF 4 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Clayey sand (SC) low plasticity, loose, wet, dark gray, (con't.).					
				0				
12.6	12.4			0	1	100		
			Fat clay (CH) high plasticity, very soft, wet, dark gray, with organic matter.	1			D-3, 12.4' - 13'	
				0				
				0	1	100	D-4, 15.5' - 17'	
				1				
5.7	19.3							
			Well graded sand (SW) no plasticity, loose, wet, dark gray, fine to coarse grained.	3				

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 4 OF 4 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Well graded sand (SW) no plasticity, loose, wet, dark gray, fine to coarse grained, (con't.).	4 4	8	100	D-5, 19.5' - 21'	
				3				
1.0	24.0							
			Fat clay (CH) high plasticity, stiff, wet, olive gray, trace fine sand.	4 6	10	100	D-6, 24' - 25'	
-3.5	28.5							
			Clayey sand (SC) no plasticity, medium dense, wet, dark gray, fine to coarse grained.	3 8 20	28	100	D-7, 28.5' - 30'	
-5.0	30.0		Bottom of boring at 30 ft bgs					

20 21 22 23 24 25 26 27 28 29 30

DRILLING LOG	DIVISION NWD	INSTALLATION Dungeness River Levee	SHEET 1 OF 4 SHEETS

1. PROJECT Dungeness River Environmental Restoration Project		9. COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL
		10. SIZE AND TYPE OF BIT 4 1/4" ID HSA	
2. HOLE NUMBER DERP-13-8	LOCATION COORDINATES 424385.247N 1080010.189E	11. MANUFACTURER'S DESIGNATION OF DRILL Gus Pech 1300C	
3. DRILLING AGENCY USACE, Omaha District		12. TOTAL SAMPLES	DISTURBED 7 / UNDISTURBED 0
4. NAME OF DRILLER Sam Thomas		13. TOTAL NUMBER CORE BOXES	
		14. ELEVATION GROUND WATER	
5. DIRECTION OF BORING ☒ VERTICAL ☐ INCLINED	DEG FROM VERTICAL --- / BEARING	15. DATE BORING	STARTED 9/23/13 / COMPLETED 9/23/13
6. THICKNESS OF OVERBURDEN 30 ft		16. ELEVATION TOP OF BORING 22.00 ft	
7. DEPTH DRILLED INTO ROCK 0 ft		17. TOTAL CORE RECOVERY FOR BORING N/A	
8. TOTAL DEPTH OF BORING 30 ft		18. SIGNATURE AND TITLE OF INSPECTOR George A. Filpovich Geologist	

LOCATION SKETCH/COMMENTS

SCALE:

▼ Static Water Level ▽ Depth Groundwater Encountered

Collapse depth 9.8 feet.
Ground surface elevation from Google Earth.

PROJECT	HOLE NO
Dungeness River Environmental Restoration Project Dungeness, WA	DERP-13-8

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 2 OF 4 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Fat clay (CH) high plasticity, soft to medium stiff, moist, gray mottled with brown, trace organics, iron oxide staining.					
				3 3 4	7	100	D-1, 3.5' - 5'	
				0 1 1	2	100	D-2, 7.5' - 9'	

0 1 2 3 4 5 6 7 8 9 10

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 3 OF 4 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Fat clay (CH) high plasticity, soft to medium stiff, moist, gray mottled with brown, trace organics, iron oxide staining, (con't.).					
				1				
				2	5	67	D-3, 11.5' - 13'	
				3				
				2				
6.0	16.0		Sandy silt (ML) low plasticity, loose, wet, gray, very fine grained.	3	9	73	D-4, 16' - 17'	
				6				
3.0	19.0		Poorly graded sand (SP) no plasticity, loose to medium dense, wet, dark gray, very fine to fine grained.					
				2				

10 11 12 13 14 15 16 17 18 19 20

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 4 OF 4 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Poorly graded sand (SP) no plasticity, loose to medium dense, wet, dark gray, very fine to fine grained, (con't.).	3 6	9	100	D-5, 19.5' - 21'	
				5 7 8	15	100	D-6, 23.5' - 25'	
				8 11 13	24	100	D-7, 29.5' - 30'	
-7.5	29.5		Silty gravel with sand (GM) no plasticity, medium dense, wet, gray, fine grained, rounded, with fine to medium sand.					
-8.0	30.0		Bottom of boring at 30 ft bgs					

20 21 22 23 24 25 26 27 28 29 30

DRILLING LOG	DIVISION NWD	INSTALLATION Dungeness River Levee	SHEET 1 OF 4 SHEETS

1. PROJECT Dungeness River Environmental Restoration Project		9. COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL
		10. SIZE AND TYPE OF BIT 4 1/4" ID HSA	
2. HOLE NUMBER DERP-13-9	LOCATION COORDINATES 425123.168N 1079892.836E	11. MANUFACTURER'S DESIGNATION OF DRILL Gus Pech 1300C	
3. DRILLING AGENCY USACE, Omaha District		12. TOTAL SAMPLES	DISTURBED 7 / UNDISTURBED 0
4. NAME OF DRILLER Sam Thomas		13. TOTAL NUMBER CORE BOXES	
		14. ELEVATION GROUND WATER	
5. DIRECTION OF BORING ☒ VERTICAL ☐ INCLINED	DEG FROM VERTICAL --- / BEARING	15. DATE BORING	STARTED 9/24/13 / COMPLETED 9/24/13
6. THICKNESS OF OVERBURDEN 30 ft		16. ELEVATION TOP OF BORING 23.00 ft	
7. DEPTH DRILLED INTO ROCK 0 ft		17. TOTAL CORE RECOVERY FOR BORING N/A	
8. TOTAL DEPTH OF BORING 30 ft		18. SIGNATURE AND TITLE OF INSPECTOR George A. Filpovich Geologist	

LOCATION SKETCH/COMMENTS

SCALE:

▼ Static Water Level ▽ Depth Groundwater Encountered

Collapse depth 12 feet.
Ground surface elevation from Google Earth.

PROJECT	HOLE NO
Dungeness River Environmental Restoration Project Dungeness, WA	DERP-13-9

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 2 OF 4 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Silt with sand (ML) medium plasticity, loose, wet, dark gray, very fine grained.					
			@ 3 ft, saturated.					
				0 1 1	2	100	D-1, 3.5' - 5'	
16.0	7.0		Poorly graded sand (SP) no plasticity, very loose to loose, wet, dark gray, fine to medium grained, trace coarse sand.					
				2 3 2	5	80	D-2, 7.5' - 9'	

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 3 OF 4 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Poorly graded sand (SP) no plasticity, very loose to loose, wet, dark gray, fine to medium grained, trace coarse sand, (con't.).					
			@ 11.5 ft, some coarse gravel.	1 1 1	2	47	D-3, 11.5' - 13'	
8.0	15.0		Silt (ML) medium plasticity, loose, wet, dark gray.					
				1 3 6	9	100	D-4, 15.5' - 17'	
4.0	19.0		Well graded sand with gravel (SW) no plasticity, dense, wet, dark gray, fine to coarse grained, some fine gravel.	4				

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 4 OF 4 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Well graded sand with gravel (SW) no plasticity, dense, wet, dark gray, fine to coarse grained, some fine gravel, (con't.).	10 27	37	100	D-5, 19.5' - 21'	
				7 17 20	37	33	D-6, 23.5' - 25'	
-5.0	28.0		Fat clay (CH) high plasticity, medium stiff, wet.					
				3 4 3	7	100	D-7, 28.5' - 30'	
-7.0	30.0		Bottom of boring at 30 ft bgs					

20 21 22 23 24 25 26 27 28 29 30

DRILLING LOG	DIVISION NWD	INSTALLATION Dungeness River Levee	SHEET 1 OF 4 SHEETS

1. PROJECT Dungeness River Environmental Restoration Project		9. COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL
		10. SIZE AND TYPE OF BIT 4 1/4" ID HSA	
2. HOLE NUMBER DERP-13-10	LOCATION COORDINATES 425214.535N 1079978.298E	11. MANUFACTURER'S DESIGNATION OF DRILL Gus Pech 1300C	
3. DRILLING AGENCY USACE, Omaha District		12. TOTAL SAMPLES	DISTURBED 7 / UNDISTURBED 0
4. NAME OF DRILLER Sam Thomas		13. TOTAL NUMBER CORE BOXES	
		14. ELEVATION GROUND WATER	
5. DIRECTION OF BORING ☒ VERTICAL ☐ INCLINED	DEG FROM VERTICAL --- / BEARING	15. DATE BORING	STARTED 9/23/13 / COMPLETED 9/23/13
6. THICKNESS OF OVERBURDEN 30 ft		16. ELEVATION TOP OF BORING 24.00 ft	
7. DEPTH DRILLED INTO ROCK 0 ft		17. TOTAL CORE RECOVERY FOR BORING N/A	
8. TOTAL DEPTH OF BORING 30 ft		18. SIGNATURE AND TITLE OF INSPECTOR George A. Filpovich Geologist	

LOCATION SKETCH/COMMENTS

SCALE:

▼ Static Water Level ▽ Depth Groundwater Encountered

Collapse depth 8 feet.
Ground surface elevation from Google Earth.

PROJECT	HOLE NO
Dungeness River Environmental Restoration Project Dungeness, WA	DERP-13-10

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 2 OF 4 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Silt (ML) low plasticity, medium dense, dry, brown.					
				8 12 16	28	100	D-1, 3.5' - 5'	
17.0	7.0		Fat clay (CH) high plasticity, stiff, slightly moist, light brown.					
				4 6 6	12	100	D-2, 7.5' - 9'	

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 3 OF 4 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Fat clay (CH) high plasticity, stiff, slightly moist, light brown, (con't.).					
				3 4 6	10	100	D-3, 11.5' - 13'	
			@ 15.5 ft, soft, moist, gray.					
				1 2 2	4	100	D-4, 15.5' - 17'	
			@ 16.5 ft, wet.					
				0				

DRILLING LOG (Cont Sheet)	INSTALLATION Dungeness River Levee	SHEET 4 OF 4 SHEETS
PROJECT Dungeness River Environmental Restoration Project	COORDINATE SYSTEM State Plane	HORIZONTAL / VERTICAL

ELEV	DEPTH	LEGEND	FIELD CLASSIFICATION OF MATERIALS (Description)	Blows/ 0.5 ft	N_f	% REC	Sample Number	REMARKS
			Fat clay (CH) high plasticity, soft, wet, gray, (con't.).	1 1	2	100	D-5, 19.5' - 21'	
				1 1 2	3	100	D-6, 23.5' - 25'	
			@ 28.5 ft, stiff.	3 5 4	9	100	D-7, 28.5' - 30'	
-6.0	30.0		Bottom of boring at 30 ft bgs					

20 21 22 23 24 25 26 27 28 29 30

SAMPLE TRANSMITTAL RECORD

CORPS OF ENGINEERS — LABORATORY

PROJECT Dungeness River Environmental Restoration Project	HOLE NO. DERP-13-1
LOCATION: PLAN Dungeness WA	TOP ELEVATION
SAMPLING METHOD SPT	INSPECTOR Filpovich

DATE SAMPLED	SAMPLE SIZE	SAMPLE TYPE	SAMPLE NO.	LAB. SER.NO.	DEPTH IN FEET	FIELD LOG AND REMARKS
9/20/13	Pint	Jar	1	D-1	3.5-5	CH
				D-2	7.5 9	CH
				D-3	11.5 13	SP
				D-4	15.5 17	CH
				D-5	19.5 21	SC
				D-6	23.5 25	GC/GP
				D-7	28.5 30	GP

SAMPLE RECEIVED BY: DATE:

MRO FORM 1 NOV 65 1241

(Formerly MRD Form 0193, Which may be used.)

SAMPLE TRANSMITTAL RECORD

CORPS OF ENGINEERS

LABORATORY

PROJECT Dungeness ERP	HOLE NO. DERP-13-2
LOCATION: PLAN Dungeness WA	TOP ELEVATION
SAMPLING METHOD Hand Auger	INSPECTOR Filpovich

DATE SAMPLED	SAMPLE			LAB. SER.NO.	DEPTH IN FEET	FIELD LOG AND REMARKS
	SIZE	TYPE	NO.			
9/25/13	Pint	Jar	1	D-1	5-6'	CH
"	"	"	"	D-2	8-9'	SC

SAMPLE RECEIVED BY: DATE:

MRO FORM 1 NOV 65 1241

(Formerly MRD Form 0193, Which may be used.)

SAMPLE TRANSMITTAL RECORD

CORPS OF ENGINEERS

LABORATORY

PROJECT Dunnigans EAP

HOLE NO. DERP-13-3

LOCATION: PLAN Dunnigans WA

TOP ELEVATION

SAMPLING METHOD Hand Auger

INSPECTOR Filipovich

DATE SAMPLED	SAMPLE			LAB. SER.NO.	DEPTH IN FEET	FIELD LOG AND REMARKS
	SIZE	TYPE	NO.			
9/25/13	Pint	Jar	1	D-1	1-2'	CH
"	"	"	"	D-2	6-7'	CH

SAMPLE RECEIVED BY:

DATE:

MRO FORM 1 NOV 65 1241

(Formerly MRD Form 0193, Which may be used.)

SAMPLE TRANSMITTAL RECORD

CORPS OF ENGINEERS

LABORATORY

PROJECT Dungeness ERP	HOLE NO. DERP-13-4
LOCATION: PLAN Dungeness WA	TOP ELEVATION
SAMPLING METHOD Hand Auger	INSPECTOR Filipovich

DATE SAMPLED	SAMPLE SIZE	SAMPLE TYPE	SAMPLE NO.	LAB. SER.NO.	DEPTH IN FEET	FIELD LOG AND REMARKS
9/25/13	Pint	Jar	1	D-1	4-5'	CH
"	"	"	"	D-2	6-7'	CH

SAMPLE RECEIVED BY:

DATE:

MRO FORM 1 NOV 65 1241

(Formerly MRD Form 0193, Which may be used.)

SAMPLE TRANSMITTAL RECORD

CORPS OF ENGINEERS

LABORATORY

PROJECT Dungeness ERP	HOLE NO. DERP-13-5
LOCATION: PLAN Dungeness WA	TOP ELEVATION
SAMPLING METHOD SPT	INSPECTOR Filpovich

DATE SAMPLED	SAMPLE			LAB. SER.NO.	DEPTH IN FEET	FIELD LOG AND REMARKS
	SIZE	TYPE	NO.			
9/25/13	Pint	Jar	1	D-1	2-3'	CH
"	"	"	"	D-2	7-8'	CH

SAMPLE RECEIVED BY: DATE:

MRO FORM 1 NOV 65 1241

(Formerly MRD Form 0193, Which may be used.)

SAMPLE TRANSMITTAL RECORD

CORPS OF ENGINEERS

LABORATORY

PROJECT Dungeness ERP	HOLE NO. DERP-13-6
LOCATION: PLAN Dungeness WA	TOP ELEVATION
SAMPLING METHOD SPT	INSPECTOR Filpovich

DATE SAMPLED	SAMPLE SIZE	SAMPLE TYPE	SAMPLE NO.	LAB. SER.NO.	DEPTH IN FEET	FIELD LOG AND REMARKS
9/20/13	Pint	Jar	1	D-1	3.5 - 5	CH
				D-2	7.5 - 9	CH
				D-3	11.5 - 13	CH
				D-4	15.5 - 17	CH
				D-5	19.5 - 21	GC
				D-6	23.5 - 25	GC
				D-7	28.5 - 30	GC

SAMPLE RECEIVED BY:

DATE:

MRO FORM 1 NOV 65 1241

(Formerly MRD Form 0193, Which may be used.)

SAMPLE TRANSMITTAL RECORD

CORPS OF ENGINEERS

LABORATORY

PROJECT Dungeness ERP	HOLE NO. DERP-13-7
LOCATION: PLAN Dungeness WA	TOP ELEVATION
SAMPLING METHOD SPT	INSPECTOR Filpovich

DATE SAMPLED	SAMPLE SIZE	SAMPLE TYPE	SAMPLE NO.	LAB. SER.NO.	DEPTH IN FEET	FIELD LOG AND REMARKS
9/20/13	Pint	Jar	1	D-1	3.5-5	CH
				D-2	7.5-9	SC
				D-3	11.5-13	CH
				D-4	15.5-17	CH
				D-5	19.5-21	SP
				D-6	23.5-25	CH
				D-7	28.5-30	SC

SAMPLE RECEIVED BY:

DATE:

MRO FORM 1 NOV 65 1241

(Formerly MRD Form 0193, Which may be used.)

SAMPLE TRANSMITTAL RECORD

CORPS OF ENGINEERS

LABORATORY

PROJECT Dungeness ERP	HOLE NO. DERP-13-8
LOCATION: PLAN Dungeness WA	TOP ELEVATION
SAMPLING METHOD SPT	INSPECTOR Fitzwick

DATE SAMPLED	SAMPLE SIZE	SAMPLE TYPE	SAMPLE NO.	LAB. SER.NO.	DEPTH IN FEET	FIELD LOG AND REMARKS
9/23/13	Pint	Jar	1	D-1	3.5-5	CH
				D-2	7.5-9	CH
				D-3	11.5-13	CH
				D-4	15.5-17	ML
				D-5	19.5-21	SW
				D-6	23.5-25	SW
				D-7	28.5-30	GM

SAMPLE RECEIVED BY:

DATE:

MRO FORM 1 NOV 65 1241

(Formerly MRD Form 0193, Which may be used.)

SAMPLE TRANSMITTAL RECORD

CORPS OF ENGINEERS — LABORATORY

PROJECT Dungeness ERP — **HOLE NO.** DERP-13-9

LOCATION: PLAN Dungeness WA — **TOP ELEVATION**

SAMPLING METHOD SPT — **INSPECTOR** Filpovich

DATE SAMPLED	SAMPLE SIZE	SAMPLE TYPE	SAMPLE NO.	LAB. SER.NO.	DEPTH IN FEET	FIELD LOG AND REMARKS
9/24/13	Pint	Jar	1	D-1	3.5-5	MH
				D-2	7.5-9	SP
				D-3	11.5-13	SP
				D-4	13.5-17	MH
				D-5	19.5-21	SP
				D-6	23.5-25	SP
				D-7	28.5-30	CH

SAMPLE RECEIVED BY: — **DATE:**

MRO FORM 1241
1 NOV 65

(Formerly MRD Form 0193, Which may be used.)

SAMPLE TRANSMITTAL RECORD

CORPS OF ENGINEERS

LABORATORY

PROJECT Dungeness ERP	HOLE NO. DERP-13-10
LOCATION: PLAN Dungeness WA	TOP ELEVATION
SAMPLING METHOD SPT	INSPECTOR Filipovich

DATE SAMPLED	SAMPLE SIZE	SAMPLE TYPE	SAMPLE NO.	LAB. SER.NO.	DEPTH IN FEET	FIELD LOG AND REMARKS
9/23/13	pint	Jar	1	D-1	3.5-5	ML
				D-2	7.5 9	CH
				D-3	11.5 13	CH
				D-4	15.5 17	CH
				D-5	19.5 21	CH
				D-6	23.5 25	CH
				D-7	28.5 28	CH

SAMPLE RECEIVED BY: DATE:

MRO FORM 1 NOV 65 1241

(Formerly MRD Form 0193, Which may be used.)

Appendix G-5: Proposed Scope of Work for Drilling and Subsurface Exploration

PROJECT: Dungeness River Environmental Restoration Project (Dungeness ERP)
LOCATION: Town of Dungeness, Clallam County, Washington
Latitude 48.138857, Longitude -123.129315
SUBJECT: Geotechnical Boring and Subsurface Exploration Scope
DATE: 22JUL2013

BACKGROUND: The project involves the removal and setback of a portion of the Dungeness River Federal Levee Project. Two alignments are currently under consideration by the project team. Prior to initiation of the drilling phase, the PDT would like to have selected the preferred alignment. Approximate alignments are shown in **Figure 1** below. For the **Figure**, "orange" represents an alignment shared by both alternatives, while "yellow" is strictly for Alternative #1, and "red" is strictly for Alternative #2. Again, prior to drilling, only one specific alignment will be selected. Please base any assumptions on the longer and more difficult alignment. Alt #1 is mostly along an existing County road, while Alt #2 is through a field near a creek.

Based on the As-Built drawings, which included boring logs, soils are predominantly silts, with various deposits of sands, gravels, and clay (see **As-Builts**; below is a list of explorations in the project area). As you can see on the boring logs, several drilling methods were used: hand auger, power auger, backhoe, porter sampler. Borings performed in the as-built drawings are all along the river, where the existing levee is now.

APPLICABLE BORINGS FROM AS-BUILTS:

62-PA-9, 10, 12, 13, 14, 15, 16

62-HA-11

62-BH-8, 26, 27, 28, 29, 30, 33, 34, 35

NUMBER OF HOLES: Alignment #1 (Town Road) is approximately 4,000 feet long. With an assumed spacing of 500 feet, we would need **8+** borings. Alignment #2 (Meadowbrook Creek) is approximately 5,300 feet long. With an assumed spacing of 500 feet, we would need **10+** borings.

DEPTH: According to EM 1110-2-1913, the depth should be at least equal to the levee height. On average, our new levee will be 8-10 feet tall, with a range from 3-13 feet (varies with topography). We would either consider drilling all holes to **30 feet** or do 2 holes to 35-40 feet with the rest at 25 feet.

TESTING/SAMPLING: SPT with soil sampling to occur every 2.5 feet or material change. Approximately 2 undisturbed Shelby Tube samples may be obtained, depending on soil conditions. Laboratory material tests would be conducted by a separate testing agency utilizing samples provided by the drill crew.

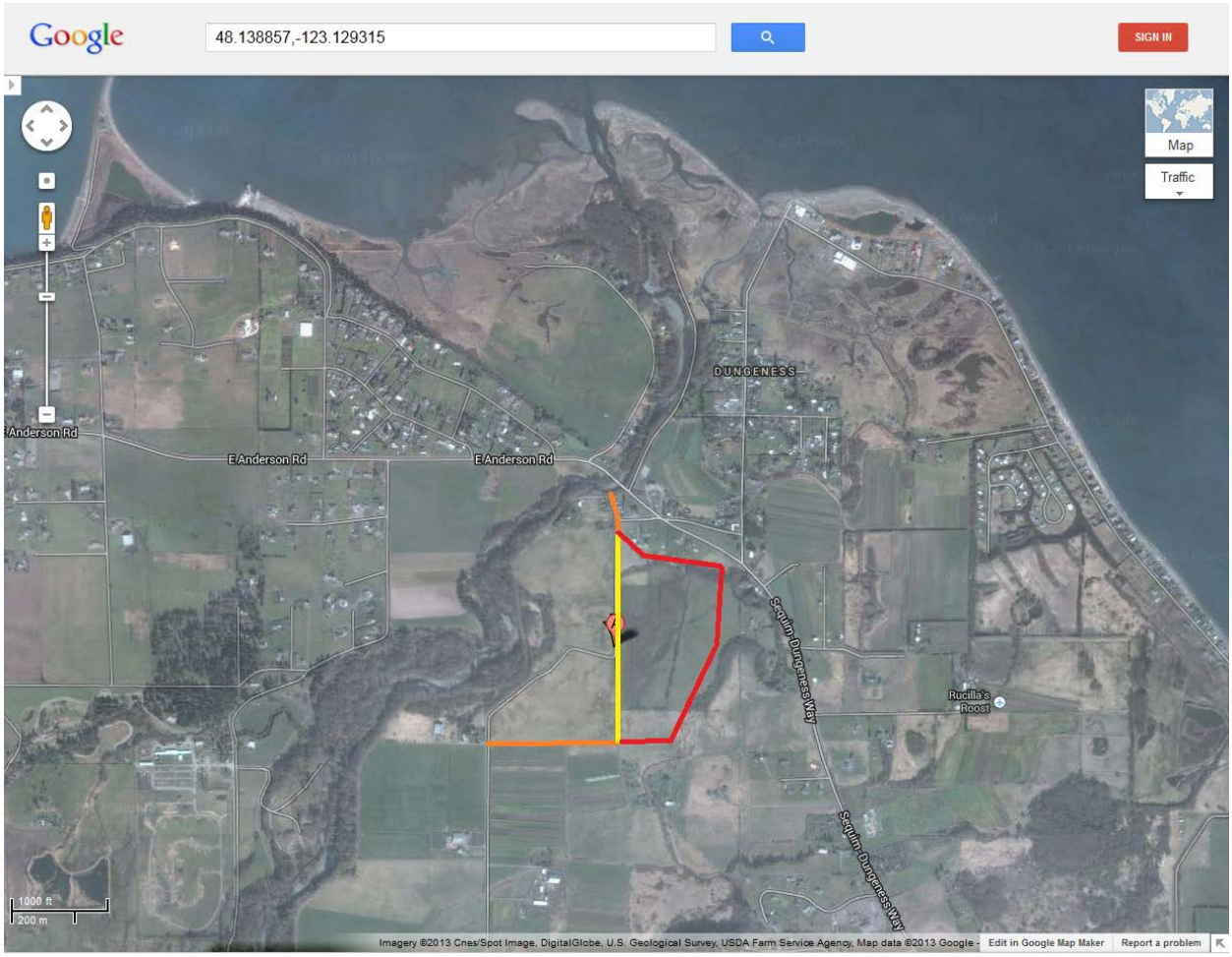
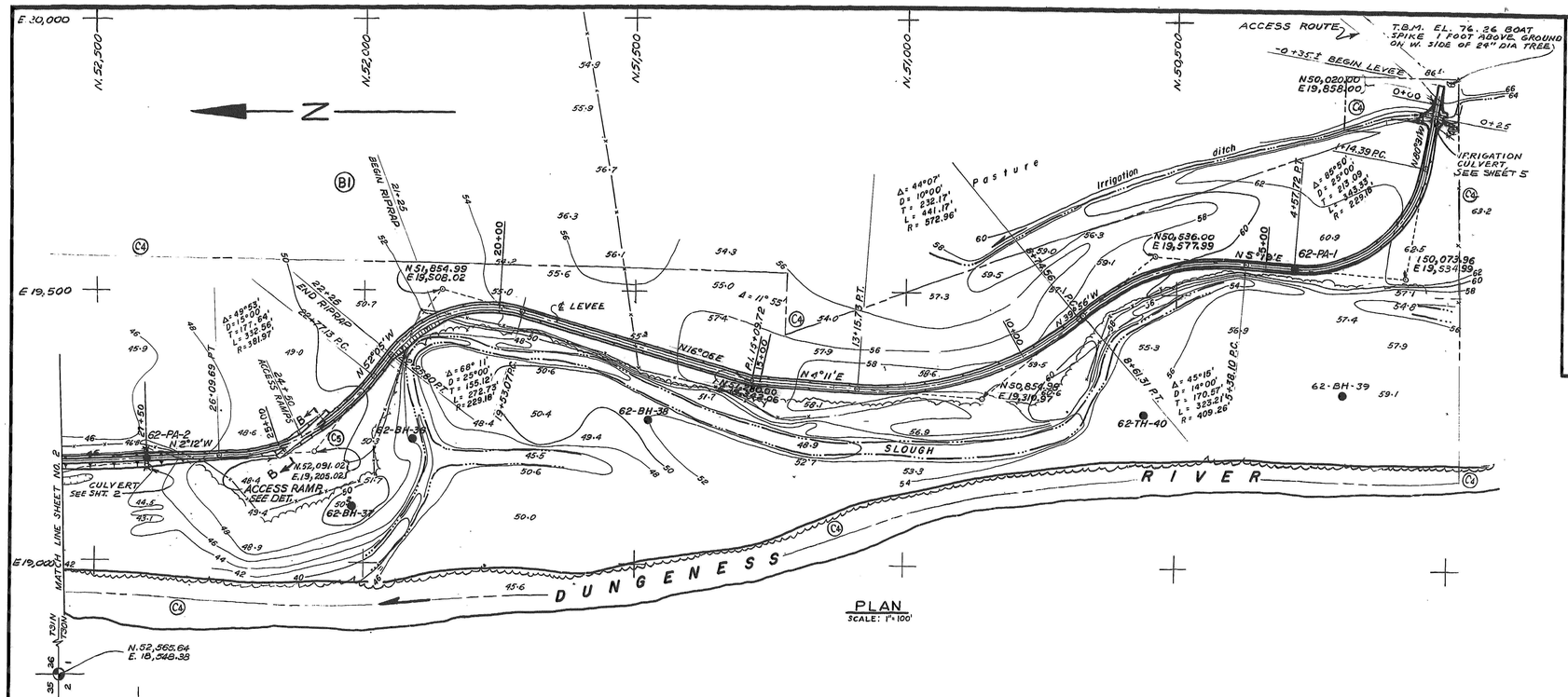
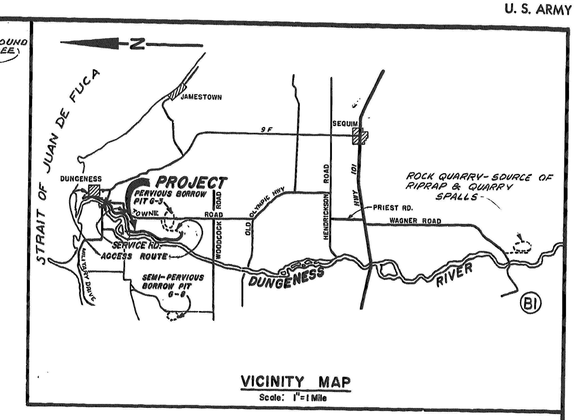


Figure 1: Project location map with approximate alignments for setback levees. "Orange" represents an alignment shared by both alternatives, while "yellow" is strictly for Alternative #1, and "red" is strictly for Alternative #2. Note the Latitude/Longitude coordinates of the project area.

Appendix G-6: Original Project Construction As-Builts from 1963



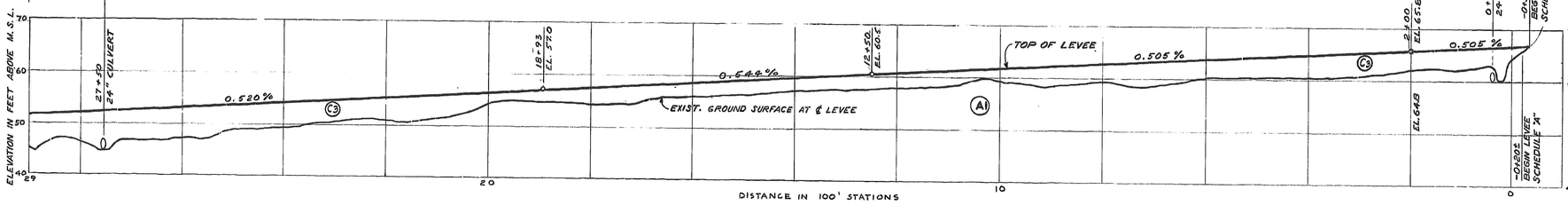
PLAN
SCALE: 1" = 100'



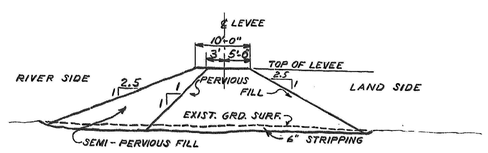
VICINITY MAP
Scale: 1" = 1 Mile

DRAWING INDEX

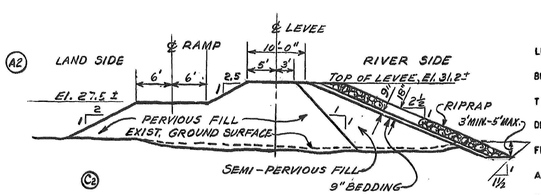
DRAWING NO.	SHEET NO.	TITLE
E-43-1-16	1	PLAN & PROFILE I
"	2	" " II
"	3	" " III
"	4	" " IV
"	5	DETAILS
"	6	FDN. EXPLORATION LOG REC. I
"	7	" " " " II



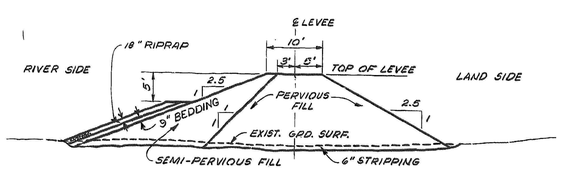
PROFILE
SCALE: HORIZ. 1" = 100'
VERT. 1" = 10'



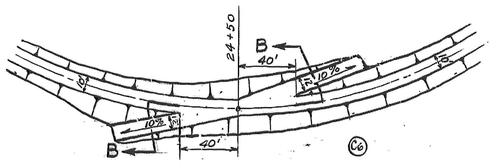
TYPICAL SECTION THRU LEVEE
STA. -0+35± TO 21+25
22+25 TO 38+25
SCALE: 1" = 10'



SECTION A-A THRU LEVEE, NEAR STA. 74+50
SCALE: 1" = 10'



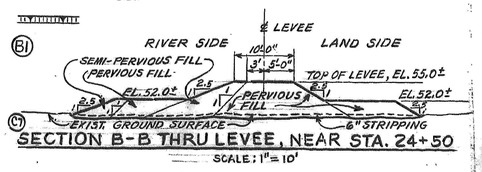
TYPICAL SECTION THRU LEVEE
STA. 21+25 TO 22+25
STA. 38+25 TO 55+00
STA. 58+00 TO 70+00
SCALE: 1" = 10'



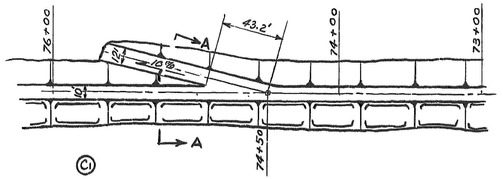
PLAN-ACCESS RAMPS STA. 24+50
SCALE: 1" = 40'

LEGEND

ITEM	THIS CONTRACT	EXISTING	TO BE REMOVED BY OTHERS
LEVEE			
BUILDING			
TIMBER AREA			
DRILL HOLE AND NO.		62-BH-37	
FENCE		-x-x-	-x-----x-
ACCESS ROUTES			
FINISH GRADE	17.3		
CULVERT			
RIPRAPPED SLOPE WITH BURIED OR WEIGHTED TOE			
R/W LINE			
GROUND ELEVATION		86.1	
RIPRAPPED SLOPE WITHOUT BURIED OR WEIGHTED TOE			



SECTION B-B THRU LEVEE, NEAR STA. 24+50
SCALE: 1" = 10'



PLAN-ACCESS RAMP STA. 74+50
SCALE: 1" = 40'

SYMBOL	DESCRIPTION	DATE	APPROVAL
C	(1) ADDED PLAN-ACCESS RAMP STA. 74+50 (2) ADDED SECTION A-A, STA. 74+50 (3) DELETED SCHEDULE A ON PROFILE (4) RELOCATED EASEMENT ON PLAN (5) ADDED ACCESS RAMP (6) ADDED PLAN-ACCESS RAMPS (7) ADDED SECTION B-B (8) ADDED RIPRAP & BEDDING (9) ADDED TYPICAL SECTION	23 JAN 64	
B	(1) ADDED RIPRAP & BEDDING (2) REVISED LIMITS OF STATIONS.	16 Nov 63	
A	(1) ADDED SCHEDULE A & B TO PROFILE. (2) DELETED DISPOSAL AREA FOR STRIPPED MATERIAL	15 MAY 63	

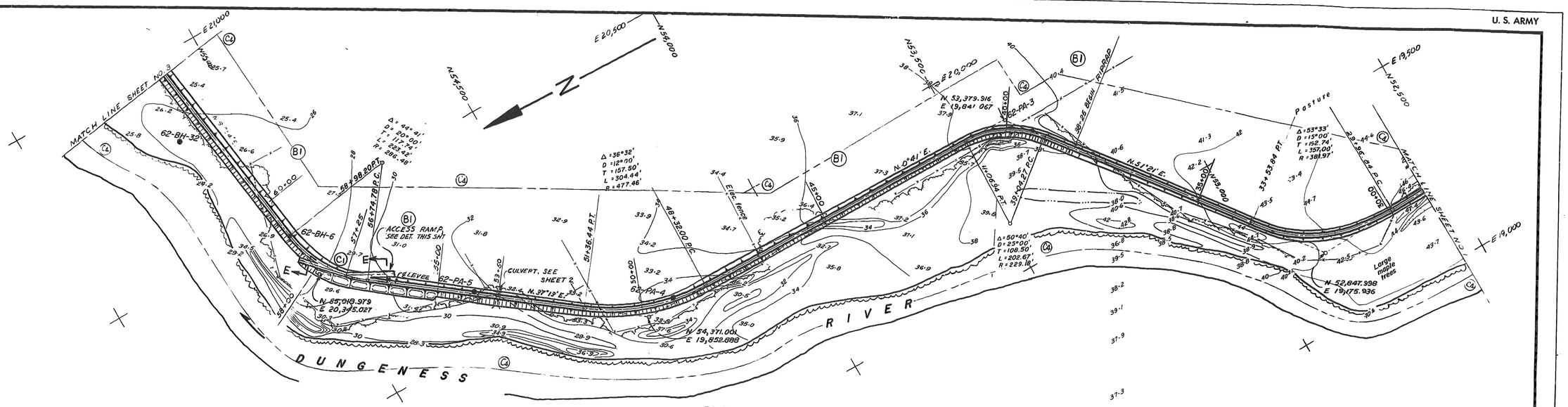
REVISIONS

U. S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS, SEATTLE, WASHINGTON

DESIGNED BY: M. PERKINS
DRAWN BY: WATERMAN
CHECKED BY: UOMOTO, H. MILLER
PREPARED:
ASST. CHIEF, DESIG. BR. CIVIL WK.
REVIEWED:
CHIEF, SPECS. & REVIEW SECT.
SUBMITTED:
CHIEF, DESIGN BRANCH
RECOMMENDED:
CHIEF, ENGINEERING DIVISION

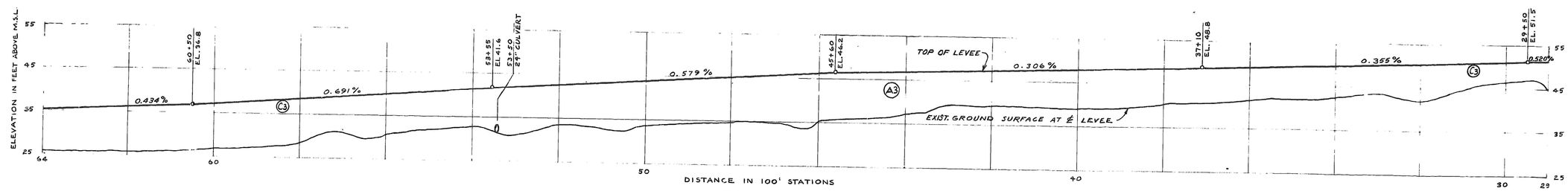
DUNGENESS RIVER, WASHINGTON
RIGHT BANK, BELOW WOODCOCK ROAD
LEVEE
PLAN AND PROFILE I

APPROVED: Ernest A. Perry
COLONEL, CORPS OF ENGINEERS
DATE: 29 Apr. 1963
SCALE: AS SHOWN
SPEC. NO. CIV. 63-41
DRAWING NUMBER: AS-BLT E-43-1-16
SHEET 1 OF 7



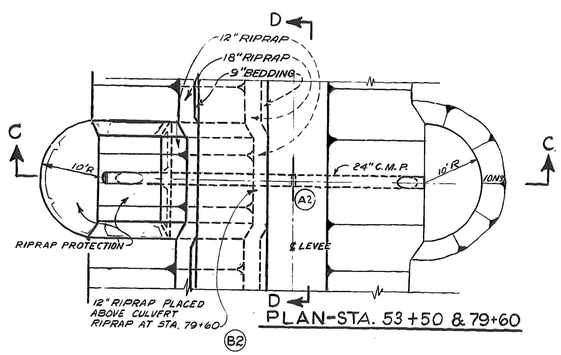
PLAN

SCALE: 1" = 100'

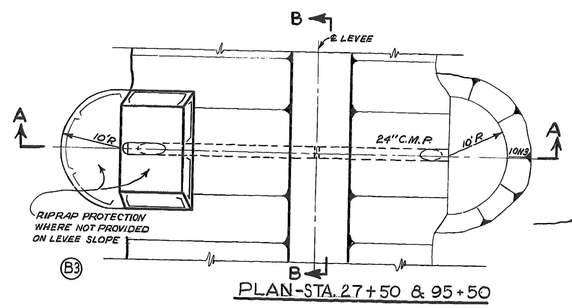


PROFILE

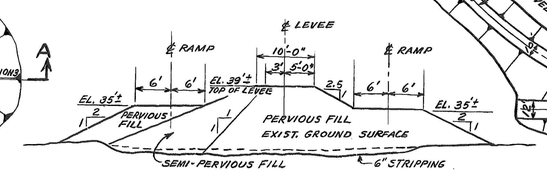
SCALE: HORIZ. 1" = 100'
VERT. 1" = 10'



PLAN-STA. 53+50 & 79+60

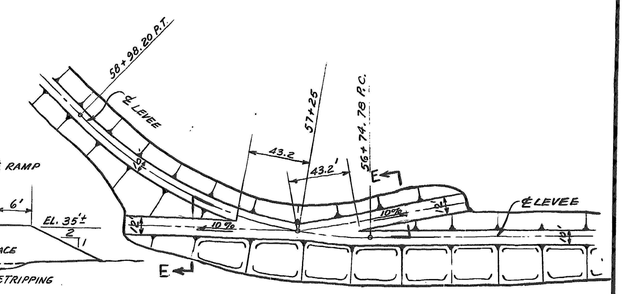


PLAN-STA. 27+50 & 95+50



SECTION E-E

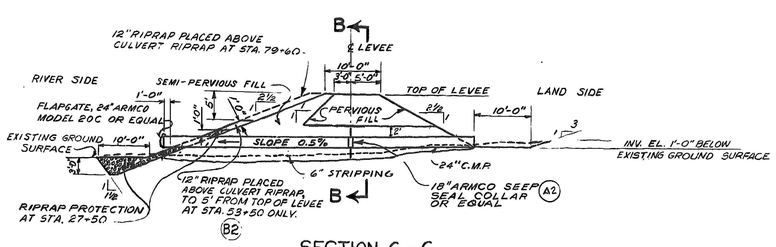
SCALE: 1" = 1'-0"



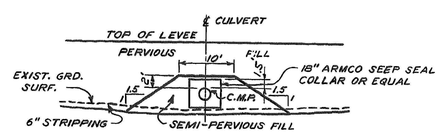
PLAN

SCALE: 1" = 40'

ACCESS RAMP STATION 57+25



SECTION C - C



SECTION D - D

TYPICAL CULVERT INSTALLATION

(FOR CULVERT AT STA. 27+50, 53+50, 79+60 & 95+50)

SCALE: 1" = 10'

SYMBOL	DESCRIPTION	DATE	APPROVAL
C	ADDED ACCESS RAMP TO PLAN (2) ACCESS RAMP STATION 57+25 DETAILS AND SCHEDULE & PROFILE (3) REPORTED TO ACCESS RAMP	23 JAN 64	
B	(1) ADDED RIPRAP (2) ADDED RIPRAP INFORMATION AT CULVERT-STA. 53+50 & 79+60 (3) ADDED PLAN-STA. 27+50 & 95+50	18 Nov. 63	
A	(1) ADDED SECTION B-B (2) ADDED [illegible] COLLAR (3) ADDED SCHEDULE A&B TO PROFILE	5 MAY 63	

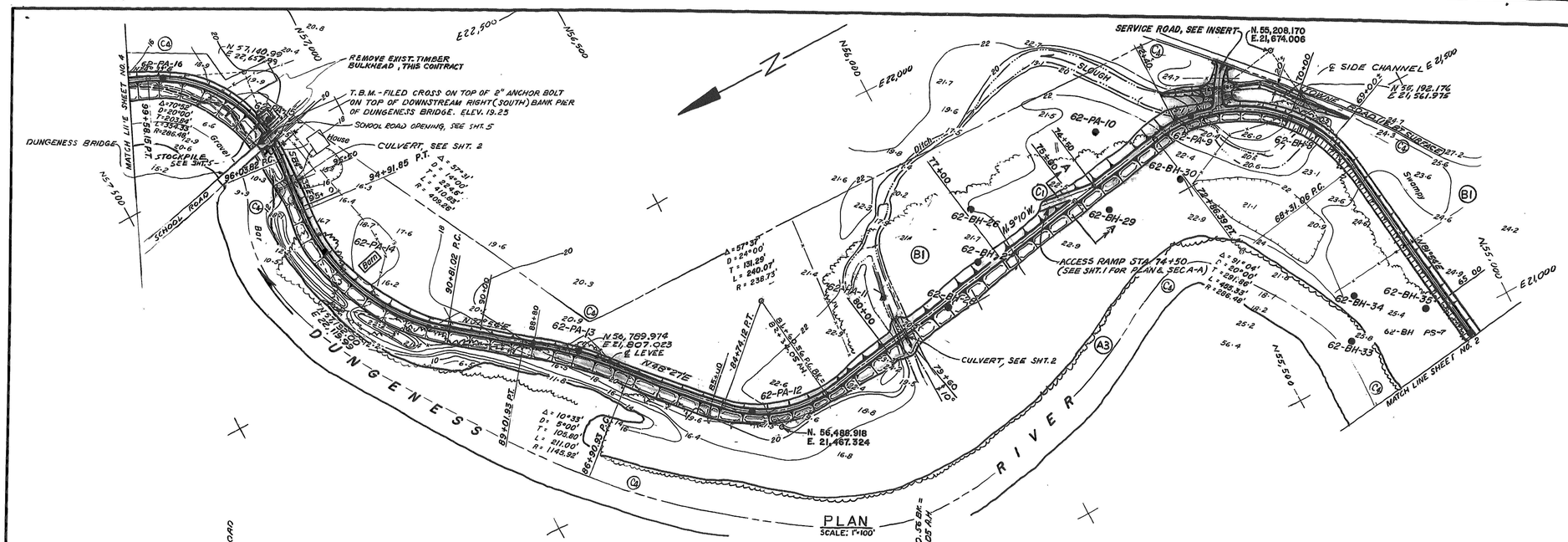
REVISIONS

U. S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS, SEATTLE, WASHINGTON

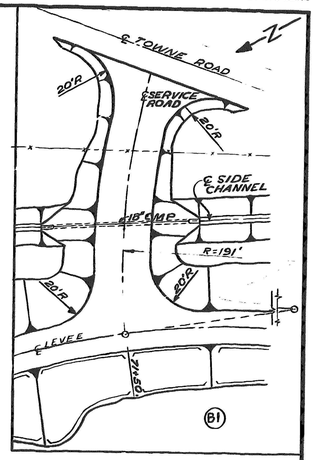
DESIGNED BY: M. PERKINS
DRAWN BY: KANE
CHECKED BY: UCHOTTO BUTTERFIELD
PREPARED: CHIEF, CIVIL WORKS DESIG.
REVIEWED: CHIEF, SPECS & REVIEW SECT.
SUBMITTED: ASSIST. CHIEF, DESIGN BRANCH, CIVIL WORKS
RECOMMENDED: CHIEF, DESIGN BRANCH

DUNGENESS RIVER, WASHINGTON
RIGHT BANK, BELOW WOODCOCK ROAD
LEVEE
PLAN AND PROFILE II

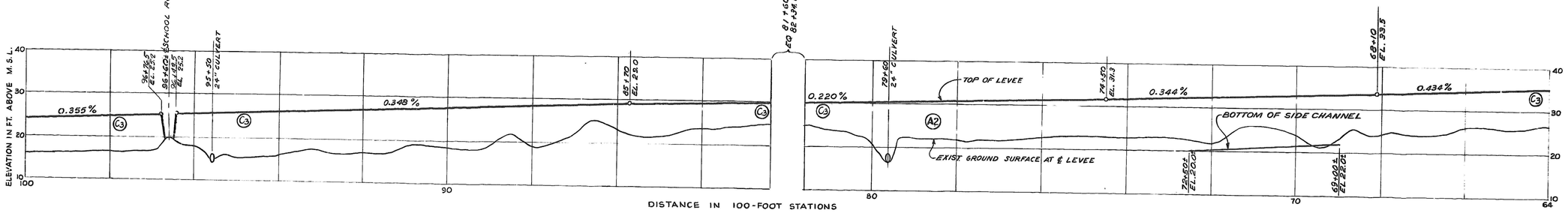
APPROVED FOR THE DISTRICT ENGINEER: CHIEF, ENGINEERING DIVISION
DATE: 29 Apr., 1963
SCALE: AS SHOWN
SPEC. NO.
DRAWING NUMBER: AS-BLT E-43-1-16
SHEET 2 OF 7



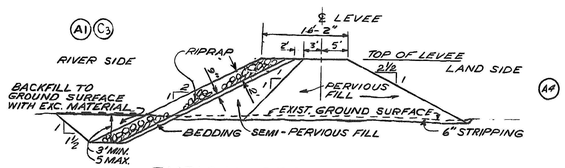
PLAN
SCALE: 1"=100'



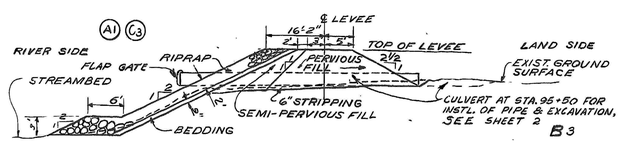
INSERT
SCALE: 1"= 20'



PROFILE - LEVEE
SCALE: HORZ. 1"= 100'
VERT. 1"= 10'



TYPICAL SECTION THRU LEVEE
STA. 85+00 TO 88+00
STA. 88+00 TO 88+50 TRANSITION TO WEIGHTED TOE
STA 91+00 TO 124+00



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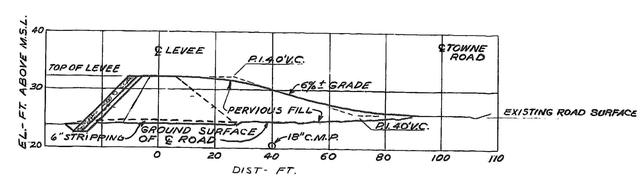
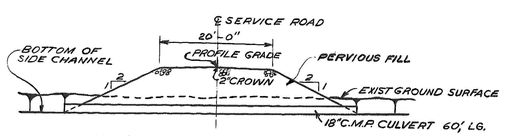
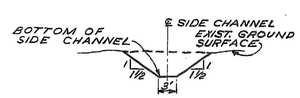
STA. 88+50 TO 90+50
STA 90+50 TO 91+00, TRANSITION TO BURIED TOE



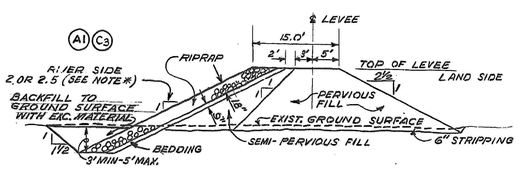
PROFILE ON ℄ SERVICE ROAD
SCALE: HORZ. 1"= 20'
VERT. 1"= 10'



TYPICAL SECTION THRU SERVICE ROAD
SCALE: 1"=10'



TYPICAL SECTION THRU SIDE CHANNEL
SCALE: 1"=10'



TYPICAL SECTION THRU LEVEE
* STA. 55+00 TO 58+00 — 1 ON 2 SLOPE
* STA. 70+00 TO 85+00 — 1 ON 2 SLOPE
SCALE: 1"=10' — 1 ON 2.5 SLOPE

SYMBOL	DESCRIPTION	DATE	APPROVAL
C	(1) ADDED ACCESS RAMP (2) CHANGED STATIONING OF TYPICAL SECTION (3) DELETED SCHEDULE A ON PLANS, SEC. (4) RELOCATED BASEMENT "AS BUILT"	23 JAN '64	
B	(1) ADDED RIPRAP (2) REVISED STATIONING (3) REVISED NOTE	18 Nov 63	
A	(1) NOTED ADDITIVE ITEM (2) ADDED SCHEDULE A & B TO PROFILE (3) DELETED CURVE DATA (4) DELETED DISPOSAL AREA FOR STRIPPED MATERIAL.	15 MAY 63	

REVISIONS

U. S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS, SEATTLE, WASHINGTON

DESIGNED BY: M. PERKINS
DRAWN BY: WATERMAN
CHECKED BY: WOMACK / BUTTERFIELD
PREPARED: CHIEF, CIVIL WORKS DESIGN
REVIEWED: CHIEF, SPECS & NEGOTIATION BRANCH
SUBMITTED: ASSIST. CHIEF, DESIGN BRANCH, CIVIL WORKS
RECOMMENDED: CHIEF, DESIGN BRANCH

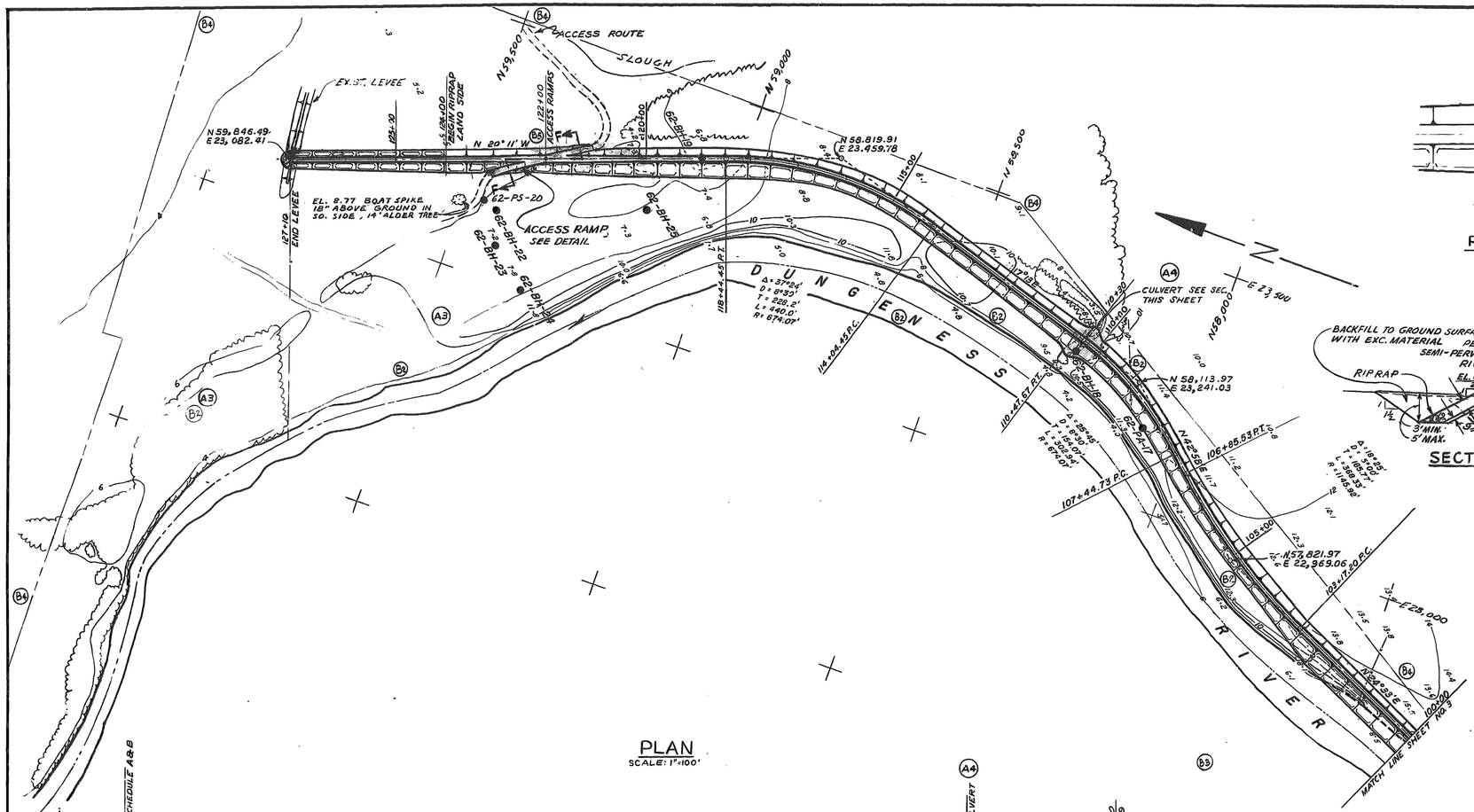
DUNGENESS RIVER, WASHINGTON
RIGHT BANK, BELOW WOODCOCK ROAD
LEVEE

PLAN AND PROFILE III

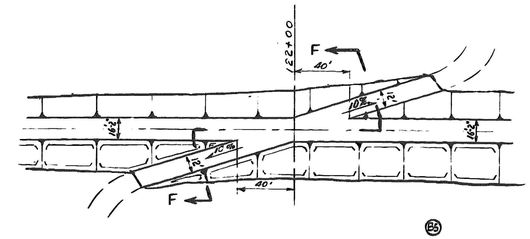
APPROVED FOR THE DISTRICT ENGINEER: CHIEF, ENGINEERING DIVISION
DATE: 29 Apr. 1963
SCALE: AS SHOWN
SPEC. NO.
DRAWING NUMBER: AS-BLT E-43-1-16
SHEET 3 OF 7

E 43-1-16 Sheet 3 of 7

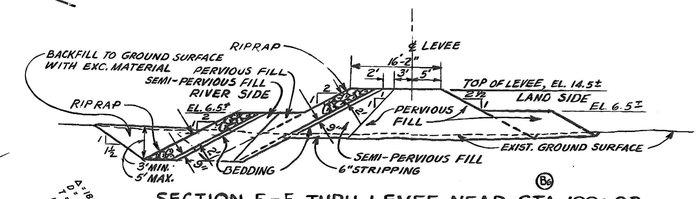
CONTRACT No CIVIL ENGRG 63-127



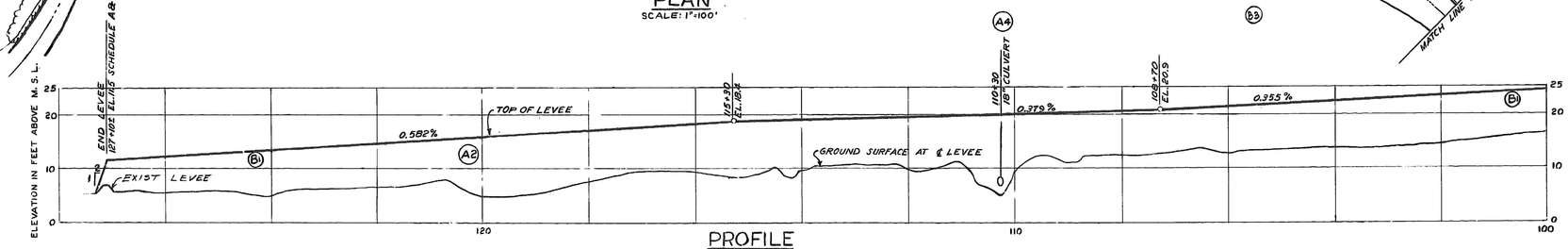
PLAN
SCALE: 1"=100'



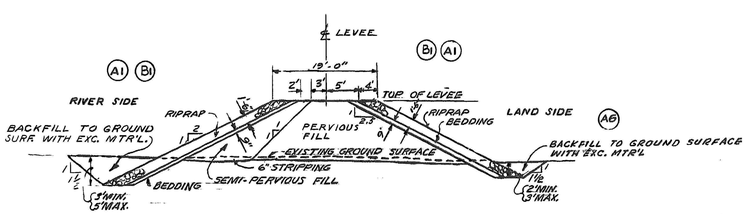
PLAN-ACCESS RAMPS STA. 122+00
SCALE: 1"= 40'



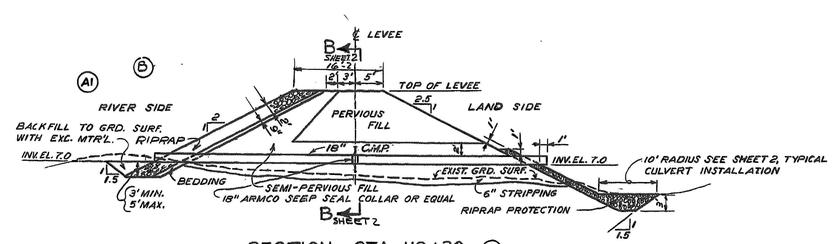
SECTION F-F THRU LEVEE NEAR STA. 122+00
SCALE: 1"=1'-0"



PROFILE
SCALE: HORIZ. 1"=100'
VERT. 1"=10'



TYPICAL SECTION THRU LEVEE
STA. 124+00 TO 127+10
SCALE: 1"=10'



SECTION STA. 110+30
SCALE: 1"=10'

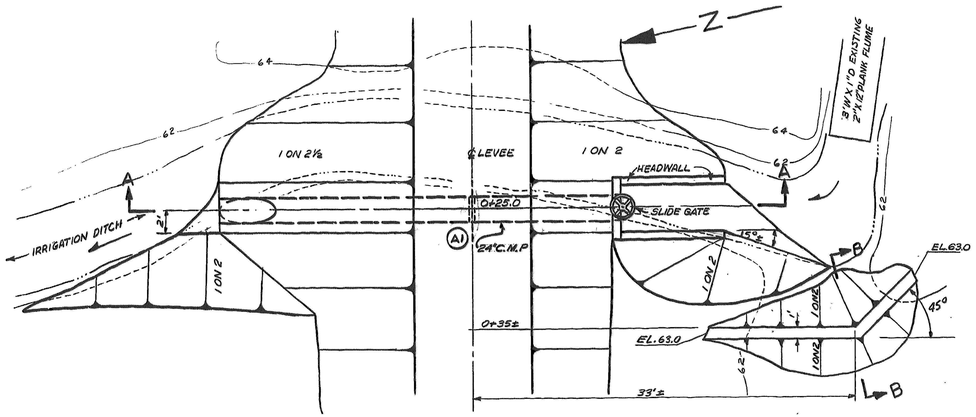
SYMBOL	REVISIONS	DATE	APPROVAL
B	(1) DELETED SCHEDULE A FROM PROFILE OR SECTION (2) DELETED CLEARING NOTES, TREES & BRUSH (3) DELETED RAILROAD NOTE (4) RELOCATED EASEMENT LINE (5) ADDED ACCESS RAMPS, STA. 122+00 (6) ADDED SECTION A-A, "AS BUILT"	25 JUL 66	
A	(1) NOTED ADDITIVE ITEM (2) ADDED SCHEDULE A&B TO PROFILE (3) CHANGED CLEARING REQUIREMENTS (4) ADDED CULVERT AT STA. 110+30 (5) ADDED SECTION B-B (6) DELETED DISPOSAL AREA FOR STRIPPED MATERIAL	15 MAY 63	

U. S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS, SEATTLE, WASHINGTON

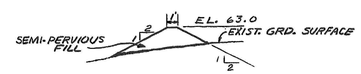
DESIGNED BY: M. PERKINS
DRAWN BY: KANE
CHECKED BY: UDMOTT, BUTTERFIELD
PREPARED: CHIEF, CIVIL WORKS DESIGN
REVIEWED: CHIEF, TECHNICAL REPORTS SECT.
SUBMITTED: ASSIST. CHIEF, DESIGN BRANCH, CIVIL WORKS
RECOMMENDED: CHIEF, DESIGN BRANCH

DUNGENESS RIVER, WASHINGTON
RIGHT BANK, BELOW WOODCOCK ROAD
LEVEE
PLAN AND PROFILE IV

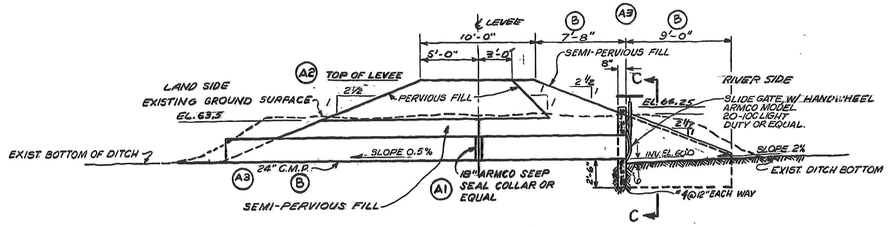
APPROVED FOR THE DISTRICT ENGINEER: CHIEF, ENGINEERING DIVISION
DATE: 29 Apr. 1963
SCALE: AS SHOWN
SPEC. NO.
DRAWING NUMBER: AS-BLT E-43-1-16
SHEET 4 OF 7



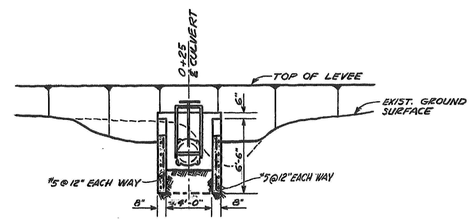
PLAN



SECTION B-B



SECTION A-A

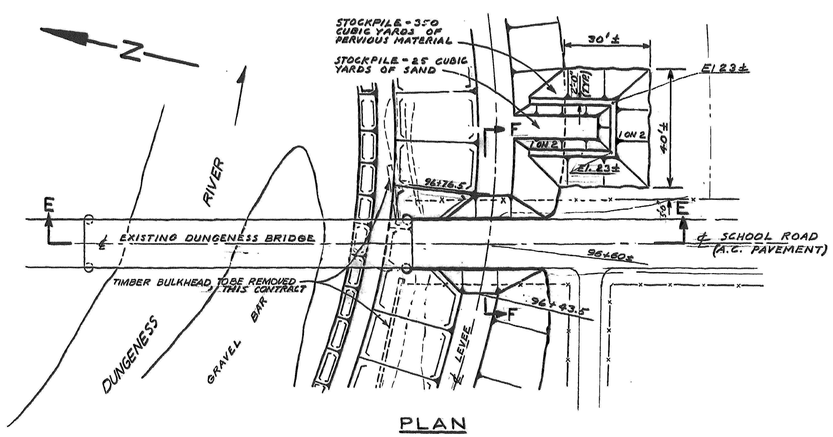


SECTION C-C

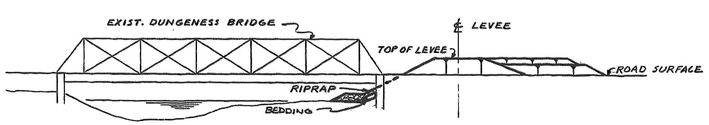
IRRIGATION CULVERT INSTALLATION

(AT STATION 0+25)

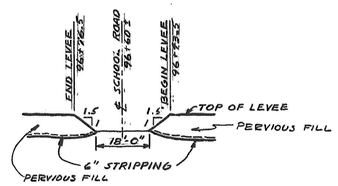
SCALE: 1" = 5'



PLAN



SECTION E-E



SECTION F-F

SCHOOL ROAD OPENING

SCALE: 1" = 20'

SYMBOL	DESCRIPTION	DATE	APPROVAL
B	DELETED DIMENSIONS FOR SCHEDULE A, "AS BUILT"	23 JAN '64	CHJ
A	ADDED SEEP SEAL COLLAR (B) DELETED EL. (C) ADDED DIMENSIONS FOR SCHEDULE A	18 MAY 63	M. Perkins

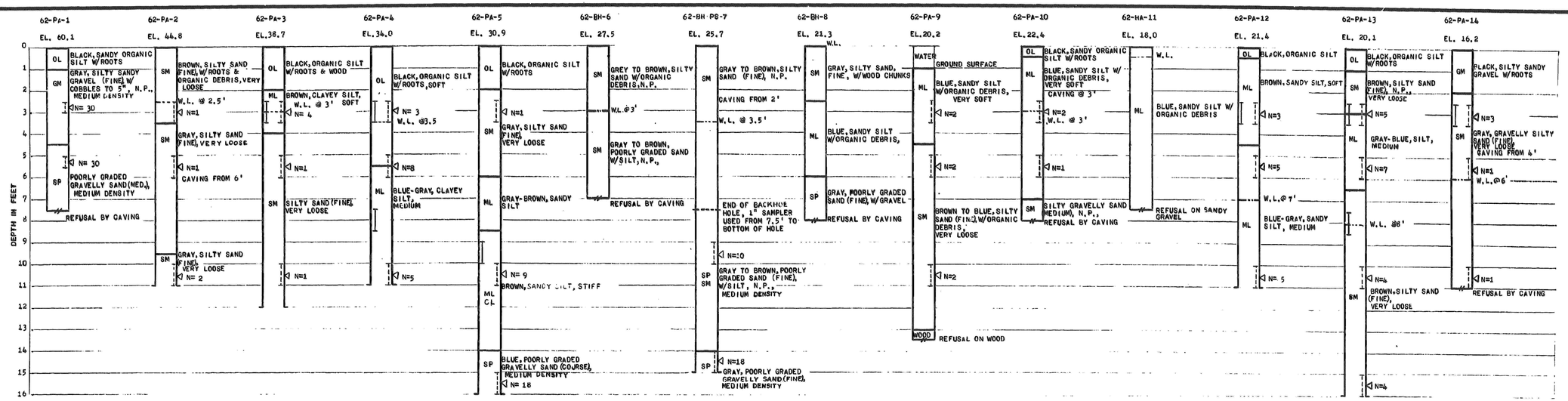
REVISIONS

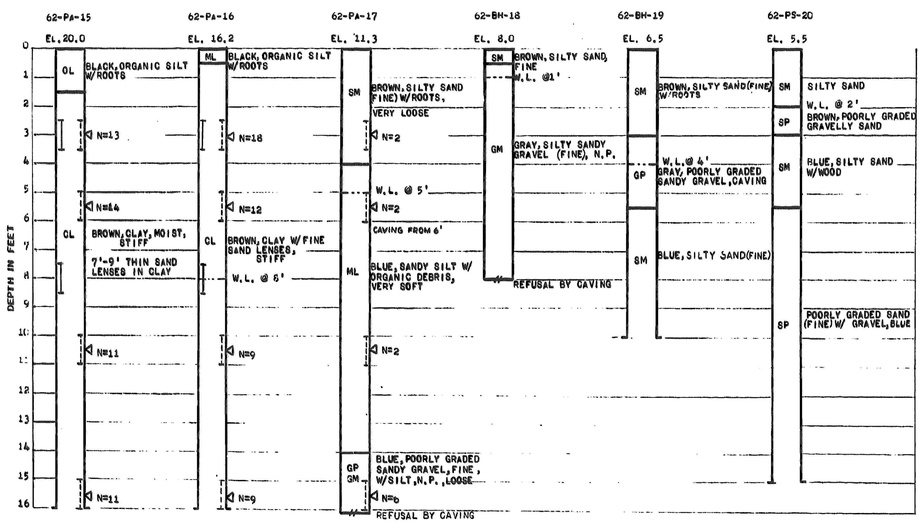
U. S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS, SEATTLE, WASHINGTON

DESIGNED BY: M. PERKINS
DRAWN BY: KANE
CHECKED BY: YOMOTO, BUTTERFIELD
PREPARED: James Mullin
CHIEF, DESIGN BRANCH
REVIEWED: W. Good
SUBMITTED: Frank Lamb
ASST. CHIEF, DESIGN BRANCH, CIVIL WORKS
RECOMMENDED: Dennis
CHIEF, DESIGN BRANCH

DUNGENESS RIVER, WASHINGTON
RIGHT BANK, BELOW WOODCOCK ROAD
LEVEE
DETAILS

APPROVED FOR THE DISTRICT ENGINEER: W. Hanney
CHIEF, ENGINEERING DIVISION
DATE: 29 Apr. 1963
SCALE: AS SHOWN
SPEC. NO.
DRAWING NUMBER AS-BLT E-43-1-16
SHEET 5 OF 7





SOILS LEGEND

62-HA-11 - HAND AUGER, TEST HOLE & NO.

62-BH-6 - BACKHOE, TEST HOLE & NO.

62-PS-20 - 1" PORTER SAMPLER, TEST HOLE & NO.

OL - ORGANIC SILT

ML - SILT, LOW PLASTICITY

SM - SILTY SAND

SP - POORLY GRADED SAND

GP - POORLY GRADED GRAVEL

CL - LEAN CLAY

GM - SILTY GRAVEL

N.P. - NON PLASTIC

62-PA-1 - POWER AUGER, TEST HOLE & NO.

N=5/6 - STANDARD PENETRATION TEST USING SPLIT SPOON SAMPLER. N= THE NUMBER OF BLOWS PER FOOT

- UNDISTURBED DRIVE SAMPLE

NOTES

1. HOLES 62-PA-1 THROUGH 62-PS-20 DRILLED 14-21 FEB. 1962
2. REFUSAL IS DEFINED AS THE POINT BEYOND WHICH FURTHER PENETRATION IS IMPOSSIBLE WITH THE METHOD OF EXPLORATION USED.
3. THE GROUND WATER LEVELS RECORDED ON THE DRILL LOGS ARE APPLICABLE ONLY FOR THE DATES INDICATED AND AT THE LOCATION OF BORING.

SYMBOL	DESCRIPTION	DATE	APPROVAL

REVISIONS

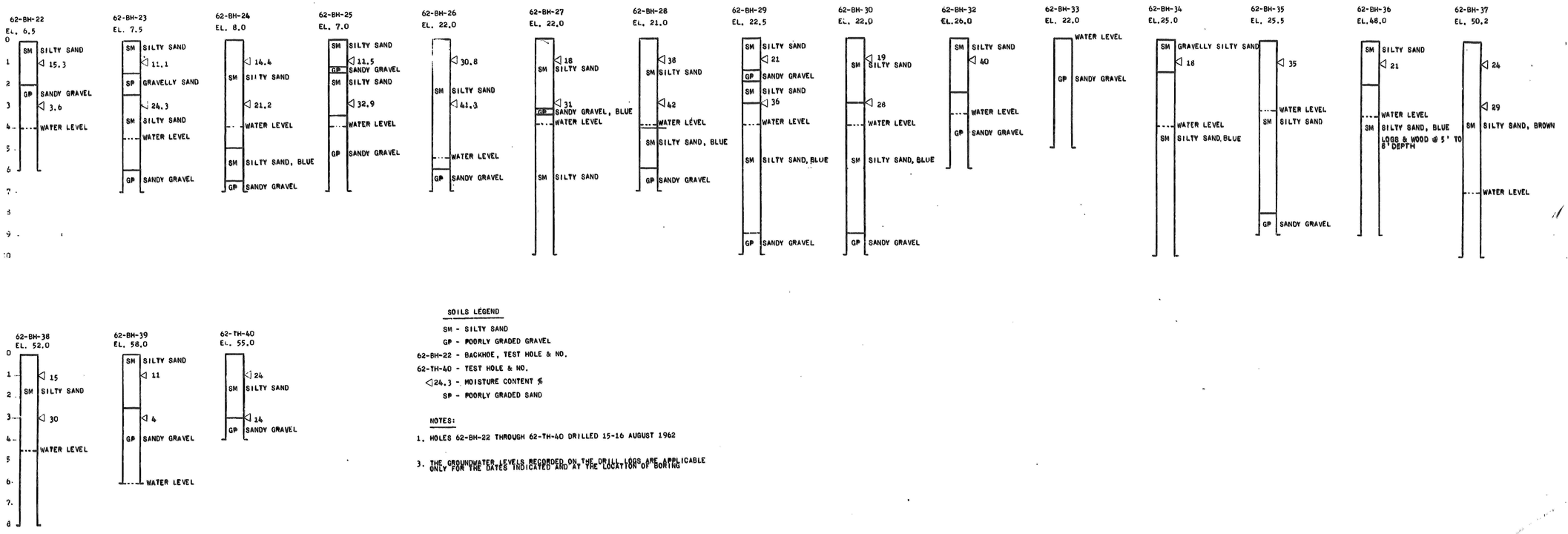
U. S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS, SEATTLE, WASHINGTON

DESIGNED BY:
DRAWN BY: RDW
CHECKED BY: SABO
PREPARED: CHIEF, FDN. & MAT. BR.
REVIEWED: CHIEF, SPECS & REVIEW BRCH.
SUBMITTED: ASSIST. CHIEF, DESIGN BRANCH, CIVIL WORKS
RECOMMENDED: CHIEF, DESIGN BRANCH

DUNGENESS RIVER, WASHINGTON
RIGHT BANK, BELOW WOODCOCK ROAD
LEVEE

FOUNDATION EXPLORATION
LOG RECORDS I

APPROVED FOR THE DISTRICT ENGINEER: CHIEF, ENGINEERING DIVISION
DATE: 29 Apr. 1963
SCALE: AS SHOWN
SPEC. NO.
DRAWING NUMBER AS-BLT E-43-1-16
SHEET 6 OF 7



SOILS LEGEND

SM - SILTY SAND
GP - POORLY GRADED GRAVEL
62-BH-22 - BACKHOE, TEST HOLE & NO.
62-TH-40 - TEST HOLE & NO.
◁24.3 - MOISTURE CONTENT %
SP - POORLY GRADED SAND

NOTES:

1. HOLES 62-BH-22 THROUGH 62-TH-40 DRILLED 15-16 AUGUST 1962

3. THE GROUNDWATER LEVELS RECORDED ON THE DRILL LOGS ARE APPLICABLE ONLY FOR THE DATES INDICATED AND AT THE LOCATION OF BORING

SYMBOL	DESCRIPTION	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS, SEATTLE, WASHINGTON

DESIGNED BY:
DRAWN BY: RDW
CHECKED BY: SABO
PREPARED: CHIEF, FDN. & MAT. BR.
REVIEWED: CHIEF, SPECS & REVIEW. SECT.
SUBMITTED: ASSIST. CHIEF, DESIGN BRANCH, CIVIL WORKS
RECOMMENDED: CHIEF, DESIGN BRANCH

DUNGENESS RIVER, WASHINGTON
RIGHT BANK, BELOW WOODCOCK ROAD
LEVEE
FOUNDATION EXPLORATION
LOG RECORDS II

APPROVED FOR THE DISTRICT ENGINEER: CHIEF, ENGINEERING DIVISION
DATE: 29 Apr., 1963
SCALE: AS SHOWN
SPEC. NO.
DRAWING NUMBER
AS-BLT E-43-1-16
SHEET 7 OF 7

Appendix G-7: Original Project Detailed Report from 1963

CE/NPS/DPR-63/00

Plan Data File

DUNGENESS RIVER, WASHINGTON
BELOW WOODCOCK ROAD

Plan Retain

88550006551

1105-2-10b Sm CW Proj
DUNGENESS RIVER - DPR
Permanent
1962

DETAILED PROJECT REPORT ON FLOOD CONTROL

10 APRIL, 1963

U.S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON

ARMY-SEA.DIST.,WN.

DETAILED PROJECT REPORT ON FLOOD CONTROL

ALONG DUNGENESS RIVER BELOW WOODCOCK ROAD, WASHINGTON

1. PROJECT AUTHORIZATION

Authority for study and preparation of this report under Section 205 of the 1948 Flood Control Act, as amended by Public Law 685, 84th Congress, is contained in Office, Chief of Engineers 2d Indorsement dated 26 October 1961, subject, "Reconnaissance Report on Flood Problem Along Dungeness River Below Woodcock Road." No previous flood control project has been authorized for this locality.

2. INVESTIGATIONS

a. Previous Investigations. - No previous detailed study has been made of flood problems along the Dungeness River. In 1951 the U. S. Bureau of Reclamation prepared a report on the possibilities of improving the irrigation and drainage facilities in the valley area. At that time, the Corps of Engineers made an appraisal of the damage caused by floods on the Dungeness River for the Bureau of Reclamation.

b. Present Investigations. - No public hearing was held in connection with this study. Field investigations included topographic surveys, exploration and sampling of proposed levee materials and foundation. Office work included hydrological and hydraulic studies; tests of proposed levee fill and foundation materials; design of typical levee sections; and cost and benefit studies for the recommended project.

3. LOCAL COOPERATION

a. Concurrence with the recommended project was obtained through conferences and correspondence with local interests. By resolution (Exhibit 2), the County Commissioners of Clallam County approved the recommended plan and agreed to:

(1) Furnish without cost to the United States all lands, easements, rights-of-way, and rights-of-entry, including royalty-free quarry and borrow areas, necessary for the construction of the project.

(2) Perform all necessary alterations to utilities and raise the School Road bridge not less than 7.8 feet or construct a new bridge having a horizontal clearance of not less than 113 feet and a vertical clearance of not less than 25.2 feet above mean sea level.

(3) Hold the United States free from any claims for damages arising out of the construction;

(4) Maintain and operate the project works, after construction; and

(5) Prevent any encroachment on the completed work.

b. The estimated first cost of local cooperation is $62,000. The estimated cost of annual maintenance is $4,400. Clallam County is financially capable and willing to fulfill the local cooperation requirements. As no windfall land enhancement benefits are anticipated, local interests were not requested to make a cash contribution.

4. LOCATION OF PROJECT AND TRIBUTARY AREA

a. The Dungeness River Basin, about 200 square miles in area, is in the northeasterly part of the Olympic Peninsula in Clallam and Jefferson Counties, Washington as shown on Plate 1. The river rises high up in the Olympic Mountains and flows northerly a distance of 32 miles to tidewater on the Strait of Juan de Fuca. Two large tributaries, Matriotti Creek and Greywolf River, join it at Mile 2 and 15 respectively, above its mouth. The reach under consideration, shown on Plate 2, is just upstream from the village of Dungeness and is bounded on the north and east by the Straight of Juan de Fuca, on the south by Woodcock Road, and on the west by McDonald Creek. (See Plate 1).

b. The recommended improvement and the 954 acre area to be protected are shown on Plates 2 and 3. The area includes a school, two cafes, gun club, cabin camp, two stores, pumphouse, church, office building, creamery, cheese factory; numerous residences, barns and appurtenant farm buildings; bridges, roads, streets; electrical, water and sanitary facilities. Protection of the recently completed State Fish Hatchery just below Woodcock Road, which is operated in conjunction with the Fish Hatchery farther upstream, is not a part of this project.

5. ECONOMIC DEVELOPMENT

a. Population. - The following table indicated the population trend in Clallam County and the two urban areas in and near the basin:

Year	Clallam County (Total)	Clallam County Rural	Sequim	Dungeness (Est.)
1930	20,449	10,265	534	150
1940	21,848	12,432	676	185
1950	26,396	15,163	1,044	212
1960	30,022	17,369	1,164	250

b. Agriculture. - Farming is confined to the lower valley where the alluvial soils are suited for all types of agriculture. Dairying, livestock and poultry raising are the principal agricultural pursuits, but forest products, field crops, fruits and vegetables are also important crops.

c. Timber Resources. - Originally, most of the Dungeness River basin was timbered, but the lower valley was logged off many years ago and no virgin stands remain in that area. Most of the area above the mouth of the canyon is heavily covered with timber, predominantly hemlock, fir and cedar. Lumber and pulp mills in Port Angeles, and sawmills in Carlsborg and Sequim provide full-time and seasonal employment.

d. Irrigation. - The average annual precipitation of 16 inches, most of which falls during the winter months, is not sufficient for plant growth. Therefore, most of the 18,000 acres of farm land within the Dungeness River basin are irrigated by water diverted from the Dungeness River through irrigation ditches, and water is applied with sprinklers. Within the drainage basin are four irrigation districts, five irrigation companies, and ten privately owned diversion works.

e. Transportation Facilities. - The area is amply supplied with all-weather roads, water transportation, railroad, power transmission lines, and air lines. All-weather roads lead to Port Angeles and Port Townsend where water transportation is available. U. S. Highway 101 passes through the tributary area. A new floating bridge crossing Hoods Canal, completed in 1961, improves access to metropolitan Seattle.

f. Tourism. - Recent developments in the Sequim - Port Angeles area are related to increases in tourism, and to the desirability of the area for suburban and summer residential developments. The 1962 bridge crossings of the new Hoods Canal bridge have been twice the 1961 ferry crossings. The average daily traffic volume on all highways shows a steady long range increase. Angler trips to the San Juan fishing areas has tripled in the last 10 years. The trend of visitation to the Olympic National Park indicates an increase of 100% in twenty years. Recognizing these favorable trends, Seattle investors are making large land purchases in the area and property is being subdivided into residential tracts.

g. Flood Plain Development. - The flooded area within the zone of the proposed flood protection comprises 954 acres of land along the right bank of the lower 2-1/2 mile reach of the Dungeness River. The present land use and valuation is shown below:

Urban - Suburban	Acreage	Est. Land Value
Town of Dungeness	80	$154,000
Residential lots (133)	54	402,000
Waterfront (7200')	33	333,000
Rural		
Improved Agricultural Land	630	315,000
Unimproved Agricultural Land	157	16,000
Total land value		$1,220,000

Flood plain developments in the rural area consist of 8 residences with outbuildings and fences, 3600 feet of drainage ditches, irrigation systems, roads, 6 public bridges and numerous private bridges. The urban-suburban area has 61 buildings, including a school; 2 cafes, gun club, cabin camp, 2 stores, church, office building, streets and utility systems.

6. RECOMMENDED PLAN

The recommended plan, shown on Plates 2 through 6, includes a levee about 2.4 miles long along the right bank of the Dungeness River. Above the Dungeness River bridge it will be located along the edge of the uncleared area adjacent to the river and 100 to 300 feet landward from the river bank. The tree growth between the levee and the river bank affords some protection to the levee. Below the Dungeness River bridge, the area between the river and levee will be cleared to increase the river's velocity. The levee will be tied into high ground on the upper end, and a low existing levee on the lower end. Four culverts with flap gates and seep collars will be provided to prevent ponding along the landward toe of the levee. Local interests will raise the existing Dungeness River bridge at Station 96 + 60 not less than 7.8 feet, or construct a new bridge having a horizontal clearance of not less than 113 feet and a vertical clearance of not less than 25.2 feet above mean sea level.

7. HYDROLOGY AND CLIMATOLOGY

a. Precipitation. - The average annual precipitation varies from 16 inches in the lower portion of the basin to more than 120 inches in the upper portion. More than 75 percent of the annual precipitation falls during the winter months (October through March), the maximum being in December.

b. Runoff. - Although the annual peak discharge usually occurs in December, the maximum monthly runoff occurs in June. The annual peak discharges are the result of high intensity rainfalls from cyclonic storms moving across the Olympic Mountains from the Pacific Ocean. The maximum monthly runoff volume results from melting of the accumulated snowpack in the upper portion of the basin. The mean annual flow of the Dungeness River near Sequim for the 30 year period of record (1923 to 1930 and 1937 to 1960) is 371 cfs. The maximum discharge (8400 cfs) occurred on 15 January 1961, and the minimum (77 cfs) occurred on 10 September 1928.

c. Temperature. - The temperatures in the basin are typically those of a humid marine climate. At Sequim the mean annual temperature is 49.2° F; the extreme maximum being 99° F and minimum -3° F. The mean annual temperatures in the upper reaches of the basin are considerably higher. The average growing season in the lower portion of the basin is 170 days.

8. HYDRAULIC AND DESIGN CRITERIA

a. The computed water surface profile for the 200-year frequency flood (14,200 cfs) has been selected as the design flood and is shown on Plates 4, 5 and 6. As the protected area includes the town of Dungeness, a 3-foot freeboard above the design flood (14,200 cfs) will be provided.

b. It was assumed in the computations that:

(1) The Dungeness River bridge at Station 96 + 60 would be modified so it would not impose a restriction on the channel capacity.

(2) At some future date a levee would be constructed on the left bank below the Dungeness River bridge.

(3) The area on the right bank below the Dungeness bridge between the main channel and the proposed levee would be cleared to increase the river's velocity.

(4) The flow upstream from the Dungeness River bridge would be contained between the proposed levee on the right bank and Ward Road on the left bank.

c. It is not feasible to tie the downstream end of the levee into natural high ground. Water flowing around the lower end of the levee will not increase flood stage in the town of Dungeness above high tide elevation (6.44 feet m.s.l. datum) because:

(1) As soon as the water flows past the end of the levee, unlimited area for conveyance to the sea is available.

(2) The small portion of the flow that does spread toward the town will be intercepted by the large slough east of the levee and be diverted toward the sea.

(3) The proposed levee has been tied into an old existing levee with a top elevation of 6.2 feet above m.s.l.

d. Interior drainage would be provided for by the installation of four 24-inch corrugated metal pipe culverts, with flap gates and seep collars, placed at or as near to one percent slope as topography allows. Minor ditching to facilitate drainage would be required in the vicinity of Station 71 + 00. A 24-inch corrugated metal pipe culvert, with an irrigation type slide gate on the upstream end, would be installed in the irrigation ditch at Station 0 + 37 to control the flow in the irrigation ditch.

9. FOUNDATION AND MATERIALS INVESTIGATIONS

a. Field Exploration. -

(1) Exploration of the levee foundation consisted of 13 power auger holes 7.5 to 17.0 feet deep; four test pits, excavated with a backhoe, 7.0 to 10.0 feet deep; one Porter sampler hole 15 feet deep; one hand auger hole 7.5 feet deep; and one combination test pit and Porter hole 15 feet deep. Standard penetration tests were performed at varying depths within representative foundation materials. Four-inch drive tubes were used to take undistrubed samples of the foundation materials. Locations and logs of all borings are shown on Plates 4, 5, 6, 7 and 8.

(2) Representative samples were taken from four established granular borrow pits, three river bottom pits, and one rock quarry to determine the gradation of granular material and the specific gravity of rock. The locations of the borrow pits and quarry are shown on Plate 4. Locations and logs of borrow pit exploratory holes are shown on Plates 4, 5, 6, 7 and 8.

b. Laboratory Tests. - Levee foundation tests consisted of 42 gradations, 6 Atterberg Limits, and 10 dry density determinations. One typical gradation from each of the seven common borrow sources, and one specific gravity test of rock from the quarry, were made.

c. Levee Foundation. -

(1) Between Stations 0 + 00 to 60 + 00, the foundation generally consists of 1 to 5 feet of organic silt overlying silty, fine sand to a maximum depth of 7.5 feet. In slough crossings, the sand is overlain by soft, clayey silt. In the area near the bluff, some gravel and medium sand were encountered below the organic silt topsoil. Depths to ground water between Stations 27 + 00 and 60 + 00 vary from 2.5 to 3.5 feet.

(2) Between Stations 60 + 00 and 71 + 00, the foundation is soft, and swampy. Exploration showed the foundation to be primarily 2.5 to 14.0 feet of silty, fine sand with organic debris near the surface, underlain by medium-dense, poorly graded, fine sand. Near Station 71 + 00, exploratory hole BH-8 shows a 3.5 foot lens of blue, sandy silt with organic debris 2.5 feet below the surface, which is typical of the foundation material existing in the adjoining slough. Ground water ranges from the surface to a depth of 3.5 feet.

(3) Between Stations 71 + 00 and 82 + 00, the foundation is a high water flood deposit consisting of 3.5 to 7.0 feet of blue, sandy silt with organic debris overlying a very loose, silty, fine sand of varying gravel content. An active, flowing slough meanders through this reach and discharges water from the swampy area previously mentioned.

Ground water ranges from the surface to a depth of 3.0 feet. Approximately half the foundation area within this reach is covered with brush and timber.

(4) Between Station 82 + 00 and the School Road bridge crossing near Station 96 + 60, the foundation is essentially pasture land. Exploration showed the foundation to consist primarily of 0.5 to 1.0 foot of black, organic silt and roots, which overlies 2.0 to 3.5 feet of very loose, silty, fine sand that overlies 3.5 to 6.5 feet of blue, sandy silt of medium consistency. From Station 93 + 00 to Station 98 + 00, the foundation appears to be a gravel fill. Depth to ground water in this reach varies from 6 to 8 feet.

(5) Between the School Road bridge crossing and Station 105 + 00, the foundation is the pasture land abutting the river bank. Exploration showed the foundation to consist of 0.5 to 1.5 feet of black, organic silt with roots which is underlain by stiff clay with scattered, fine, sand lenses. Most of the river bank in this reach is nearly vertical. The depth to ground water is 8 feet.

(6) Between Stations 105 + 00 and 127 + 15, the foundation area is basically a high water flood plain, which is approximately half covered with brush and trees. A high water slough exists near Station 110 + 20. Exploration showed the foundation to consist primarily of 3.0 to 5.5 feet of very loose, silty sand with roots and woody debris near the surface, underlain by clean lenses of poorly graded, sandy gravel and fine sand. Exploratory hole BH-18 shows the foundation of a slough to be composed essentially of silty, sandy, fine gravel. The foundation transition from valley land to high water flood plain is typified by exploratory hole PA-17. The depth to ground water ranges from 5 feet to 2 feet at the upstream and downstream ends, respectively.

d. Levee Design. - The proposed levee has been designed with a 12-foot top width, 1 on 2 side slopes on the riverward side and 1 on 2.5 on the landward side. As equipment will be operating on top of the levee during flood stages it is felt that a 12-foot top width is definitely needed. The landward side, (zone 1) of the levee will be composed of river-deposited, sandy gravel and gravelly sand; and the riverward side (zone 2) will be composed of semi-impervious material from borrow pit G-2. As the duration of flooding is relatively short, steady seepage through the levee is not expected. An average of 12 inches of stripping will be required throughout the foundation area to remove organic and wood debris. High-water sloughs in the foundation area will be excavated to a depth of 2 feet. Based on the assigned strength of materials, the proposed levee section will be safe under design conditions. The riverward side of the levee will be riprapped downstream of Station 88 + 82 where it is not protected by brush and trees between the levee and the river (see Plate 6). Estimated velocities upstream of Station 88 + 82 are

1 to 3 feet per second. Downstream from Station 88 + 82, except between Stations 95 + 40 and 103 + 17, riprap will have a maximum weight of 150 pounds and will be 12 inches thick where estimated river velocities are between 4 and 6 feet per second. Between Stations 95 + 40 and 103 + 17, riprap will have a maximum weight of 250 pounds and be 18 inches thick where river velocities are between 8 to 10 feet per second. The toe of the riprap will be buried to prevent undermining, except where river flows preclude excavation of a toe trench. Although the typical sections on Plate 6 show a bedding under the riprap, the bedding can be eliminated if the material in zone 2 is sandy gravel. Outlet ends of all culverts through the levee will be protected with riprap against erosion caused by either erosive action of river flows or culvert damage.

10. OTHER PLANS INVESTIGATED

a. Detail studies of several other protective schemes were outlined in the reconnaissance report. One scheme was similar to the recommended plan, except that it would have provided a lower degree of protection. This plan was rejected because the degree of protection (against a 50-year flood) was not considered adequate for suburban development.

b. Other plans considered included protection of the development on the left, as well as the right bank. Protection of the left bank is not economically justifiable.

11. DESCRIPTION OF PROPOSED STRUCTURES AND IMPROVEMENTS

a. The recommended plan of improvement would protect all of the development on the right bank below Woodcock Road, except the recently constructed fish ponds owned by the State of Washington. As that installation is small, its protection is not economically justifiable. The development on the right bank includes the unincorporated village of Dungeness, an area of 43 acres; a school, two cafes, gun club, cabin camp, two stores, pumphouse, church, office building, creamery, and cheese factory; numerous residences, barns and appurtenant farm buildings; bridges, roads, and streets; electrical, water and sanitary systems. The proposed levee would have a total length of 2.4 miles, be constructed to provide protection against 200-year frequency floods, and have a 3-foot freeboard. It would have a crest width of 12 feet to facilitate maintenance; side slopes of 1 on 2 on the riverward side, and 1 on 2.5 on the landward side; and be riprapped between station 88 + 82 and 127 + 15. The alinement, profiles, and typical sections are shown on Plates 2 through 6.

12. SOURCES OF CONSTRUCTION MATERIALS

Semi-impervious material for the levee embankment is available from borrow pit G-2, and pervious material from borrow pits G-3, G-5, G-6 and G-7. As access to and from the borrow pits is over a wet foundation, the

Contractor will be given the option of selecting the borrow pit, provided the material is suitable for levee embankment. Location of the borrow pits is shown on Plate 4. Ample rock of excellent quality can be obtained approximately five miles southwest of the town of Sequim (see Plate 4). Clallam County will pay the royalties on the quarry and borrow pits.

13. REAL ESTATE REQUIREMENTS

The authorizing legislation (PL 685) requires that local interests provide without cost to the United States all lands, easements and rights-of-way necessary for construction of the project. At the time the plans and specifications are prepared, the requirements for real estate will be definitely established. Arrangements will then be made with local interests for necessary acquisitions under the terms of local cooperation. A tentative taking line for levee right-of-way acquisitions have been established at 15 feet beyond the toes of the levee. No difficulty is presently anticipated in obtaining the rights-of-way.

14. COST ESTIMATES

a. The estimated cost of the project at 1962 prices is summarized in the following tabulation:

Federal Costs	Quantity	Unit	Unit Cost	Total Cost
Levee embankment	177,300	CY	1.00	177,300
Riprap	10,364	Tons	4.97	51,510
Bedding - Gravel	4,000	CY	1.00	4,000
Exc and backfill - toe trench	5,400	CY	0.80	4,320
Stripping - 12" Ave. depth	31,000	CY	.80	24,800
Remove wood wall	1	Job	300.00	300
Slope bank (for riprap)	350	CY	0.60	210
Clearing - Medium	15	Ac	350.00	5,250
Culverts, Corr. Metal - 24" (with seep rings)	260	LF	8.77	2,280
Flap Gates - 24"	4	Ea	85.00	340
Slide Gate - 24" irrigation type	1	Ea	110.00	110
Riprap around culvert outlets	8	Tons	10.00	80
Excavation - side channel - wet	500	CY	1.20	600
Contingencies - 15%				39,100
Pre-authorized studies				21,000
Engineering				22,800
Supervision, Insp, Admin & OH				24,000
Total Federal Cost				378,000

Local Costs	Quantity	Unit	Unit Cost	Total Cost
Royalty on borrow pits	181,300	CY	0.10	18,130
Royalty on rock	10,372	Tons	0.10	1,040
Fencing - 3 wire-remove & replace	3,000	LF	0.80	2,400
Rectify Dungeness bridge	1	Job	20,000.00	20,000
Rights-of-Way	24	Ac	300.00	7,200
Contingencies - 15%				7,090
Engineer and Legal				6,140
Total local costs				62,000
Total local and Federal costs				440,000

b. Estimated Annual Charges:

(1) Federal annual charges (50-year amortization period)

First cost - $378,000
Interest - $378,000 x .02875 = 10,868
Amortization - $378,000 x .009198 = 3,477
Total Federal annual charges $14,345

(2) Non-Federal annual charges

First cost = $62,000
Interest = 62,000 x .02875 = 1,783
Amortization = 62,000 x .009198 = 570
Maintenance 4,400
Total Non-Federal annual charges = 6,753
Total Federal and Non-Federal annual charges = 21,098

15. FLOOD DAMAGES

a. Following the 1949 flood, a detailed appraisal was made of flood damage. In May 1962, flood damages were reevaluated by a field study. Estimated damages from the 1949 flood, and from a flow of 12,100 cfs under 1962 prices and conditions, are summarized below for the flood plain on the right bank within the zone of the proposed flood protection.

Item	Estimated Damages	
	1949 H.W. 6,820 cfs	100 yr. flood 12,100 cfs
Roads and streets	1,900	9,400
Bridges	6,000	11,800
Traffic Interruptions	1,300	20,300
Irrigation and drainage ditches	2,000	11,500
Wire Lines	0	6,800
Automobiles	0	1,400
Care of refugees	0	11,300
Flood fighting	200	15,000
Land and crops	5,200	12,000
Land erosion	2,100	8,100
Fences	100	800
Buildings, Urban	7,500	45,100
Buildings, Rural	900	8,200
Livestock	0	10,000
TOTALS	27,200	171,700

b. Curves relating damage to discharge and frequency are attached (Exhibits 3, 4 and 5). The average annual flood damage prevented is $9,200 based on 1962 prices and conditions. Without flood protection, growth in the area will at least approximate the local historical trend (estimated to average 33-1/3%) for the next 50 years. On this basis, the total average annual flood damage at 1962 prices and future development, would be $12,300.

16. FLOOD CONTROL BENEFITS

The plan of improvement would realize average annual benefits of $12,300 from protection against a flood having a frequency occurrence of 200 years. Protection against a flood of this magnitude would enhance the value of land by making higher land use possible and by increasing agricultural production. In June 1962, a detailed real estate appraisal was made of the area to determine the effect of the proposed flood control project on the value of urban and rural land over the 50-year project life. This appraisal revealed that the waterfront has been recently subdivided and part of it has been sold. Existing land values were estimated to be $1,220,000. On the basis of real estate activity and future projects, land values would increase to $1,908,000 in 20 years, and to $3,785,000 in 50 years, without flood control. After completion of the proposed flood control project, land values would increase to $1,482,000 within a year, to $2,933,000 in 20 years, and $7,565,000 in 50 years. The net income from land was estimated to be 6% of its value on the basis of loan values in the locality. The equivalent annual increase in income for a 50-year project life was derived by using 2-7/8% interest, after discounting it by present worth methods. The annual flood

damage to land and crops prevented by the contemplated project was subtracted from the equivalent annual increase in income to arrive at the annual enhancement benefit. Results are summarized below:

Present worth of 50% of increased annual income at 2-7/8% 1/	$1,124,385
Annual equivalent at 2-7/8%	43,000
Less average annual flood damage to land, crops, fences and livestock, prevented by project	3,000
Net annual land enhancement benefit	40,000

1/ Assumed 50% of increase due to improvements, and 50% due directly to flood control.

Dikes along the right bank would eliminate some overbank channel storage, their effect on flood heights on the left bank are slight. The increase in annual damage to the left bank is estimated at $500.00.

17. COMPARISON OF BENEFITS AND COSTS

As indicated above, the total average annual benefits will be $51,800 ($12,300 + $40,000 -$500), and the annual charges $21,098. The benefit-cost ratio would therefore be 2.5, and the project is economically feasible.

18. SCHEDULE FOR DESIGN AND CONSTRUCTION

Plans and specifications can be completed in three months at a cost of $10,000. The estimated time required for construction of the project is six months; consequently, all funds required to complete the project should be provided in a lump sum. Construction should be initiated during the late spring months. The work will be done under contract. Ample time should be allowed for acquisition of real estate and rectification of the Dungeness bridge at Station 96 + 60.

19. OPERATION AND MAINTENANCE

Upon completion, the project would be turned over to Clallam County for maintenance and operation. The notice of transfer would be accompanied by copies of an operation and maintenance manual which is estimated to cost $1,500. The manual would cover all operation and maintenance needs, describe the organization required, and the procedures and principles to be followed during critical high water periods.

20. RECOMMENDATIONS

Recommend that the plan described in this report for flood control of the Dungeness River below Woodcock Road be approved; and that funds in the amount of $378,000 be allocated under authority of Public Law 685, contingent on local interests furnishing the local cooperation recommended herein.

7 Incls

1. Exhibit 1 - Letter to Clallam County dated 12 March 1963
2. Exhibit 2 - Resolution
3. Exhibit 3 - Frequency Curve
4. Exhibit 4 - Discharge - Damage Curve
5. Exhibit 5 - Damage - Frequency Curve
6. Exhibit 6 - Comments of U. S. Fish and Wildlife Service
7. Dwg E-43-1-13 (Plates 1 through 8)

SWEENEY/bc/650
12 March 1963

NPSEN-PR-R

Clallam County Board of
Commissioners
Courthouse
Port Angeles, Washington

Gentlemen:

Please refer to our letter of 8 November 1962 pertaining to assurances of local cooperation, Dungeness River.

Review of the project by higher authority resulted in certain revisions to the project plan. The revised drawings are attached. The levee height has been adjusted to reflect a higher degree of protection, and it has been extended about 275 feet farther downstream. In so doing, it was necessary to revise the inclosed resolution to assume obligations of local cooperation. If the revised resolution meets with your approval, it is requested that all three commissioners sign the inclosed resolution and return two copies to us by 22 March 1963. The third copy is for your retention.

We are revising the estimate of the quantity of rock and borrow material required. You will be furnished a copy when it becomes available.

Sincerely yours,

/s/SYDNEY STEINBORN
CHIEF, ENGINEERING DIVISION

4 Incl
1. Dwg E-43-1-13, plate 4
2. Dwg E-43-1-13, plate 5
3. Dwg E-43-1-13, plate 6
4. Resolution (trip)

Exhibit 1

County of Clallam, State of Washington

IN THE MATTER OF FLOOD CONTROL ON Dungeness RIVER in Clallam COUNTY, Washington) RESOLUTION TO ASSUME OBLIGATIONS OF LOCAL COOPERATION

WHEREAS, the United States has made available funds for a project for flood control on Dungeness River, in Clallam County, Washington, substantially as shown on Drawing No. E-43-1-13 in 3 sheets, dated March 1963, attached hereto and made a part hereof; and

WHEREAS, In accordance with the provisions of the Flood Control Act, approved 22 June 1936, as amended (33 USC Section 701c), and pertinent administrative determinations such funds cannot be used until a responsible local agency has given assurances satisfactory to the Secretary of the Army that it will:

a. Furnish without cost to the United States all lands, easements, rights-of-way, and rights-of-entry, including royalty-free quarry and borrow areas, necessary for the construction of the project.

b. Perform all necessary alterations to utilities and raise the School road bridge not less than 7.8 feet or construct a new bridge having a horizontal clearance of not less than 113 feet and a vertical clearance of not less than 25.2 feet above mean sea level.

DATE 19 April 1963 OFFICE OF COUNSEL

Exhibit 2

c. Hold the United States free from any claims for damages arising out of the construction;

d. Maintain and operate the project works, after construction; and

e. Prevent any encroachment on the completed work.

WHEREAS, Clallam County, is empowered by the laws of the State of Washington, to furnish the local cooperation above set forth, and to levy taxes in the amounts necessary to fulfill the terms of cooperation.

NOW, THEREFORE, BE IT RESOLVED BY Board of Commissioners of Clallam COUNTY, Washington, that said _____ does hereby assume and agree to perform the above-named obligations; and there is hereby granted to the United States of America, its agents and its Contractors, the right to enter on and use any lands owned by or under the control of said County for the purpose of constructing the project.

DATED this 19 day of April, 1963

Thos. H. Mansfield

by G. K. Critchfield

Harry Crockett

ATTEST:

Hazel A. Fleming

~~Secretary~~

Clerk of the Board

NPS FORM 107
May 1959

Exhibit 2

County of Clallam, State of Washington

IN THE MATTER OF FLOOD CONTROL ON Dungeness) RESOLUTION TO
) ASSUME OBLIGATIONS
RIVER in Clallam COUNTY, Washington) OF LOCAL COOPERATION

WHEREAS, the United States has made available funds for a project for flood control on Dungeness River, in Clallam County, Washington, substantially as shown on Drawing No. E-43-1-13 in 3 sheets, dated March 1963, attached hereto and made a part hereof; and

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Exhibit 2

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DATED this _____ day of _____, 19__.

_____

by _____

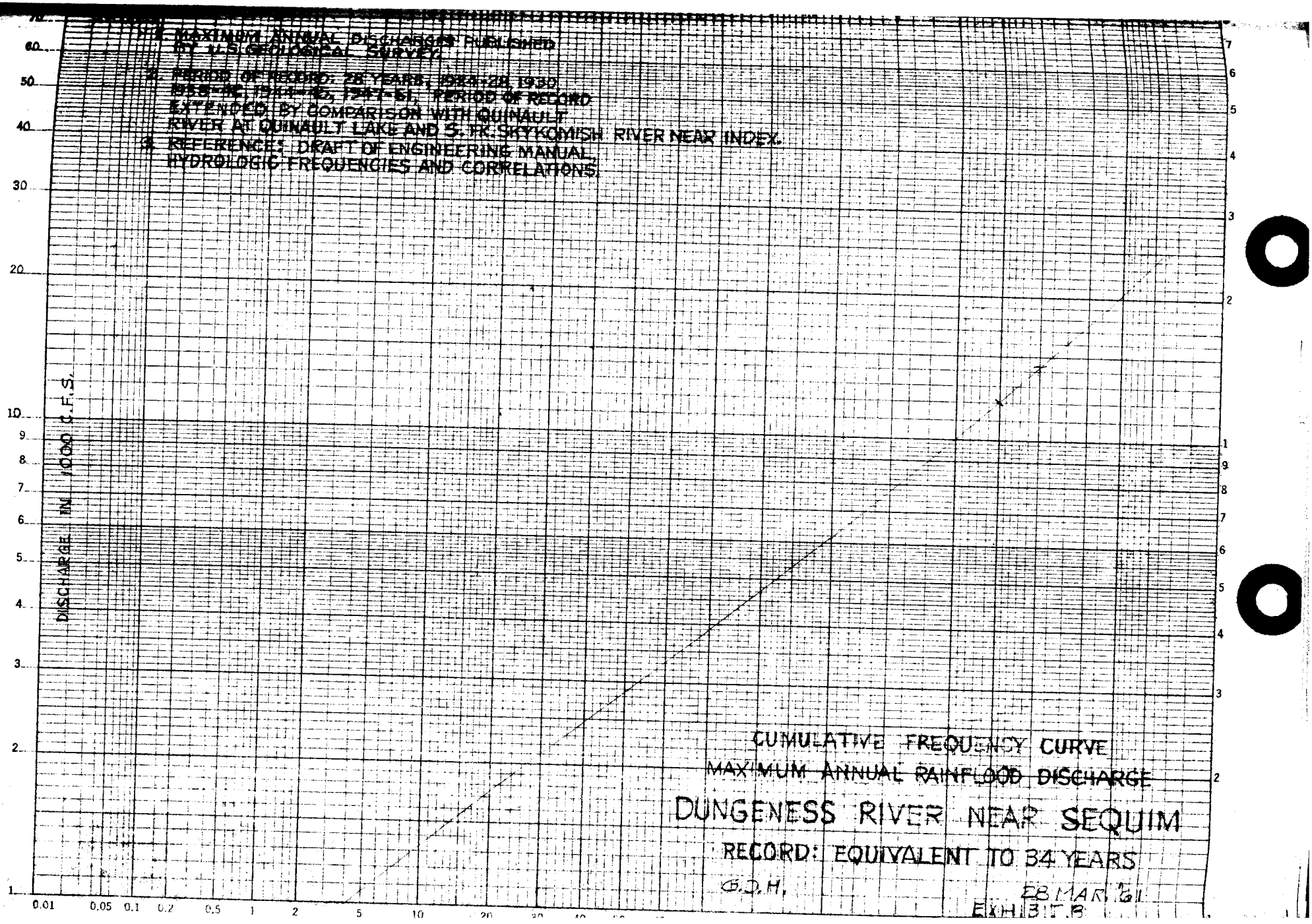
_____

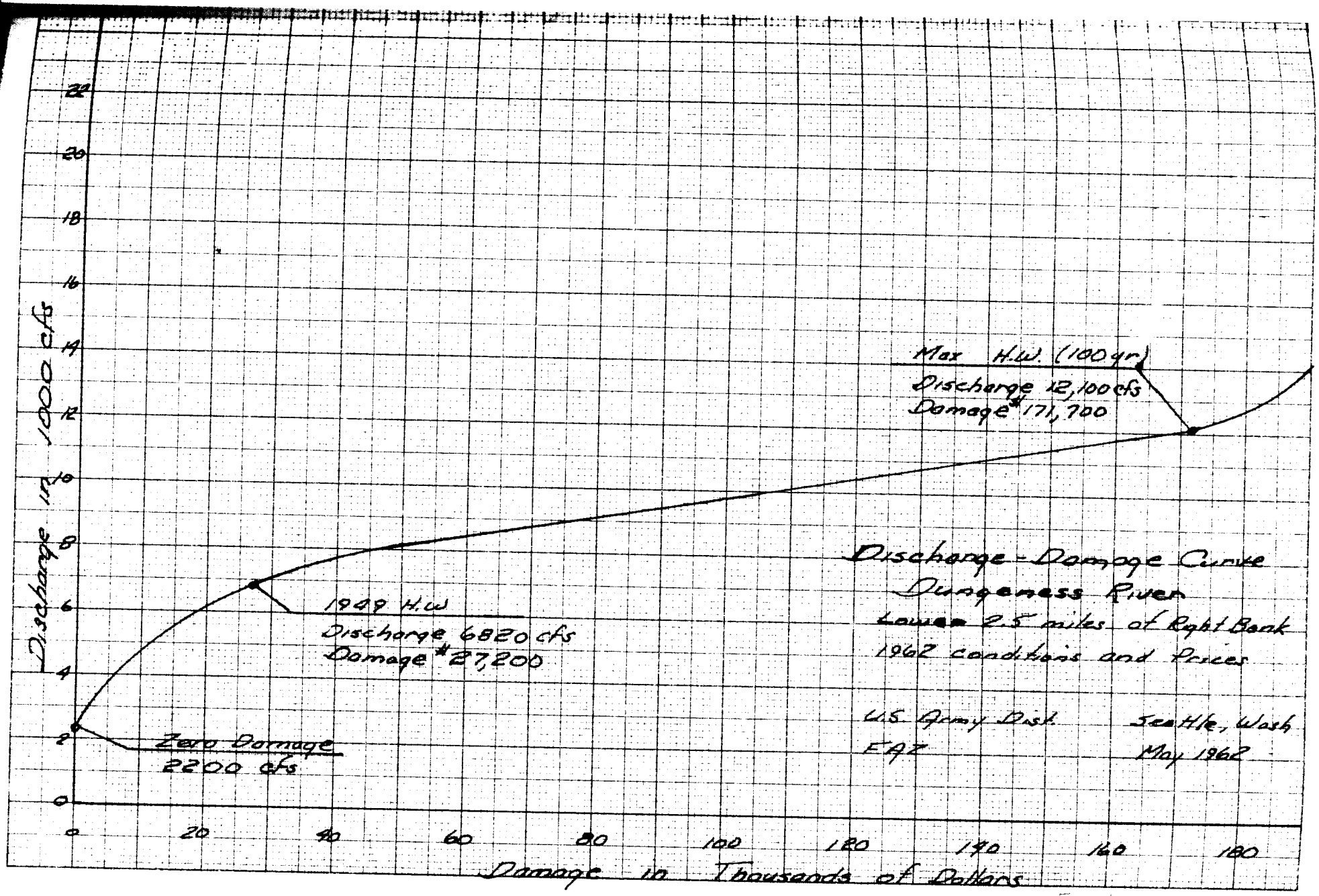
ATTEST:

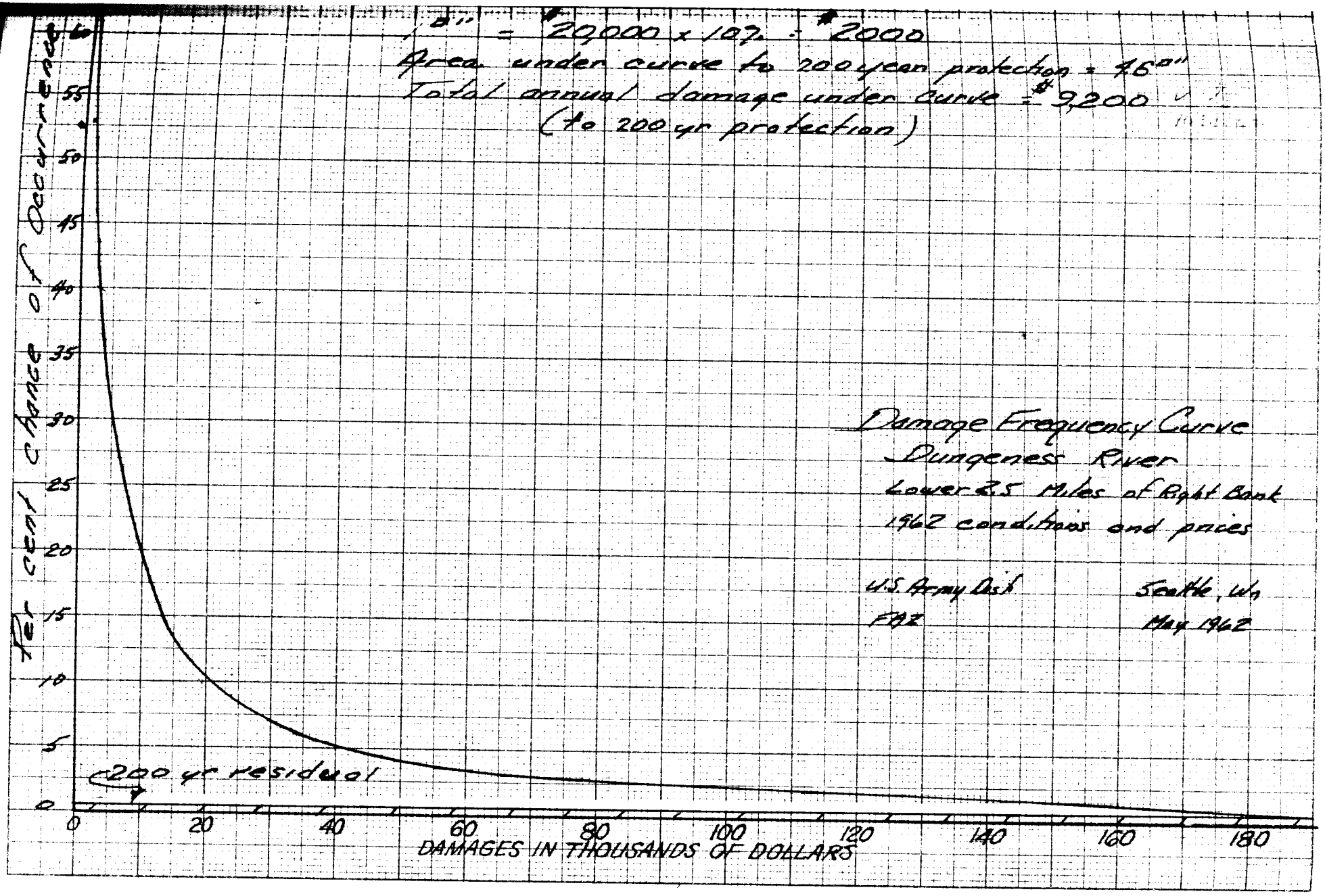
Secretary

NPS FORM 107
May 1959

Exhibit 2


1. MAXIMUM ANNUAL DISCHARGES PUBLISHED BY U.S. GEOLOGICAL SURVEY.
2. PERIOD OF RECORD: 28 YEARS, 1923-28, 1930, 1938-46, 1944-46, 1947-61. PERIOD OF RECORD EXTENDED BY COMPARISON WITH QUINAULT RIVER AT QUINAULT LAKE AND S. FK. SKYKOMISH RIVER NEAR INDEX.
3. REFERENCE: DRAFT OF ENGINEERING MANUAL, HYDROLOGIC FREQUENCIES AND CORRELATIONS.
DISCHARGE IN 1000 C.F.S.
CUMULATIVE FREQUENCY CURVE
MAXIMUM ANNUAL RAINFLOOD DISCHARGE
DUNGENESS RIVER NEAR SEQUIM
RECORD: EQUIVALENT TO 34 YEARS
G.D.H.
28 MAR. '61
EXHIBIT B


Discharge-Damage Curve
Dungeness River
Lower 2.5 miles of Right Bank
1962 conditions and Prices
U.S. Army Dist.
Seattle, Wash.
EAT
May 1962
Max H.W. (100 yr)
Discharge 12,100 cfs
Damage $171,700
1949 H.W.
Discharge 6820 cfs
Damage $27,200
Zero Damage
2200 cfs
Discharge in 1000 cfs
Damage in Thousands of Dollars
0
2
4
6
8
10
12
14
16
18
20
22
0
20
40
60
80
100
120
140
160
180


$2" = $20,000 x 10% = $2000
Area under curve to 200 year protection = 46.0"
Total annual damage under curve = $9,200
(to 200 yr protection)
Damage Frequency Curve
Dungeness River
Lower 2.5 Miles of Right Bank
1962 conditions and prices
U.S. Army Dist
FDZ
Seattle, Wn
May 1962
Per cent chance of Occurrence
0
5
10
15
20
25
30
35
40
45
50
55
60
200 yr residual
0
20
40
60
80
100
120
140
160
180
DAMAGES IN THOUSANDS OF DOLLARS

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
1002 N. E. HOLLADAY STREET (1-RB)
P. O. BOX 3737
PORTLAND 8, OREGON

PACIFIC REGION
(REGION 1)
CALIFORNIA
IDAHO
MONTANA
NEVADA
OREGON
WASHINGTON

RESS ONLY THE
ONAL DIRECTOR

October 31, 1962

Your file:
NPSGW-R

District Engineer
Seattle District, Corps of Engineers
1519 South Alaskan Way
Seattle 4, Washington

Dear Sir:

This is our Bureau's report concerning effects the proposed Dungeness River flood control project, Washington would have on fish and wildlife resources. It is in reply to your letter of September 10, 1962, requesting comments on the recommended plan. This report has been prepared under the authority and in accordance with the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) from engineering data accompanying your letter.

The Washington Departments of Game and Fisheries and the Bureau of Commercial Fisheries have reviewed and concur in this report. Copies of letters from Director John A. Biggs of the Department of Game, dated October 10, 1962, and Director George C. Starlund of the Department of Fisheries, dated October 23, 1962, are attached. Mr. Starlund stated that encroachment, near the road crossing the Dungeness River at the lower end of the proposed project, is not to reduce channel capacity to a degree of causing a velocity block to fish passage. We concur in this statement.

The project is designed to control a 100-year frequency flood and would protect the community of Dungeness and an associated agricultural area. The plan of development would include construction of a levee extending along the east bank of Dungeness River from the mouth upstream for a distance of 12,440 feet. The levee would be situated 100 to 200 feet from the riverbank and would average 10 feet in height and 12 feet in crest width. The riverward side would be partially riprapped. Portions would also be back-filled and bermed. A short side channel would be excavated

Exhibit G

oxbow draining into the main channel to allow flowage of water from py area which would be closed off from the river by the dike. Tribu- rains would be equipped with flap gates.

ea to be protected is on the river delta and soils are mostly fine loams. Eastward from the dike soils are principally silty clay loams. plain lands are primarily cultivated. Irrigated and dry-farmed crops ts, wheat, hay, and potatoes. The stream sector proposed for diking nged by a dense growth of trees and brush situated riverward from te of the dike.

ess River supports runs of coho, pink, chum, spring and fall chinook and steelhead, searun cutthroat, and Dolly Varden trout. There ident stocks of rainbow and cutthroat trout in the upper drainage. runs have declined since diversion of water for irrigation began 1909. This stream ranked 13th in the state in total catch of steel- n the 1960-61 winter angling season.

l population of black-tailed deer inhabits river bottom lands. Hunter is low. The project area supports relatively low populations of cked pheasants, Hungarian partridges, band-tailed pigeons, snow- bbits, and California quails. All species receive heavy hunting e. Muskrats, minks, raccoons, skunks, river otters, and weasels the area but trapping pressure is low. The agricultural lands ute important feeding and hunting areas for waterfowl and there is ck nesting along the irrigation canals and drains. Dungeness l Wildlife Refuge is situated about one-half mile northwest of the mouth.

cipate that project effects on fish would not be significant if con- on equipment is not operated in the wet portion of the riverbed. In n, diking material should not be obtained from the stream bottom.

c winter and spring flooding of delta lands benefits waterfowl by ng resting and feeding areas, so project construction would result es of habitat to this wildlife group. Conversely, elimination of g would probably benefit upland game and fur animals. Destruction y cover along the river would be harmful to all species except wl. If levees are mowed during the nesting period, loss of nesting nests and young would occur.

rall effect of the project on fish and wildlife may be considered ble if precautionary measures are adopted for the protection of esources.

nterest of fish and wildlife resources, it is recommended:

That construction equipment not be operated in or diking material d from wet portion of Dungeness riverbed.

2. That diking material be obtained outside woody vegetation area
t essential cover for big game and upland game would be disturbed
ttle as possible.

3. That first mowing of levee each year be postponed until after
bird and waterfowl nesting period or be accomplished at a time
ined by Washington Department of Game.

4. That such reasonable modifications be made in the authorized pro-
acilities as may be agreed upon by Directors, Washington Departments
heries and Game; Commissioner, U.S. Fish and Wildlife Service; and
of Engineers, Corps of Engineers, for conservation and development
h and wildlife resources.

reciate the opportunity to review your plan. Please inform us of
ture changes in details or scope of the project.

Sincerely yours,

Richard E. Griffith

Acting Regional Director

ments

Game Commissioners / Albert T. Prichard, Chairman, Kennewick
Arthur S. Coffin, Yakima; Charles T. Graham, Colville;
James H. Ralls, Wilson Creek; Richard S. Seward, Seattle;
Harold A. Pebbles, Olympia

Director of Game / John A. Biggs

DEPARTMENT OF GAME

600 North Capitol Way / Olympia, Washington

October 10, 1962

Regional Director
Bureau of Sport Fisheries and Wildlife
P. O. Box 3737
Portland 8, Oregon

Attention: Travis Roberts, Regional Supervisor, River Basin Studies.

Dear Sir:

Reference is made to the report concerning the effects on fish and wildlife of the Dungeness River Flood Control Project. We have reviewed the report and concur with it as written.

Very truly yours,

John A. Biggs

John A. Biggs, Director
THE DEPARTMENT OF GAME

RWL/ne

cc: Dept. of Fisheries

STATE OF
HINGTON
T D. ROSELLINI
GOVERNOR

DEPARTMENT OF
FISHERIES
GEORGE C. STARLUND
DIRECTOR

4015 20TH AVENUE WEST
FISHERMEN'S TERMINAL AT SALMON BAY
SEATTLE 99, WASHINGTON
ATWATER 2-0266

October 23, 1962

ureau of Sport Fisheries & Wildlife
.O. Box 3737
002 N.E. Holladay
ortland 8, Oregon

Attn: Mr. Grant Wooley

Re: Flood Control - Dungeness River

Gentlemen:

This department has reviewed the proposed flood control project for the Dungeness River. The project, as proposed, is not considered to have any ill effect upon the fishery of the stream.

With the levee placed 100 to 200 feet from the river bank there should be no necessity for any equipment in the stream. The only point of encroachment is near the road crossing the river at the downstream end of the project. This encroachment is not to cut down the channel capacity to a degree of causing a velocity block to fish passage. All material is to be placed from the bank.

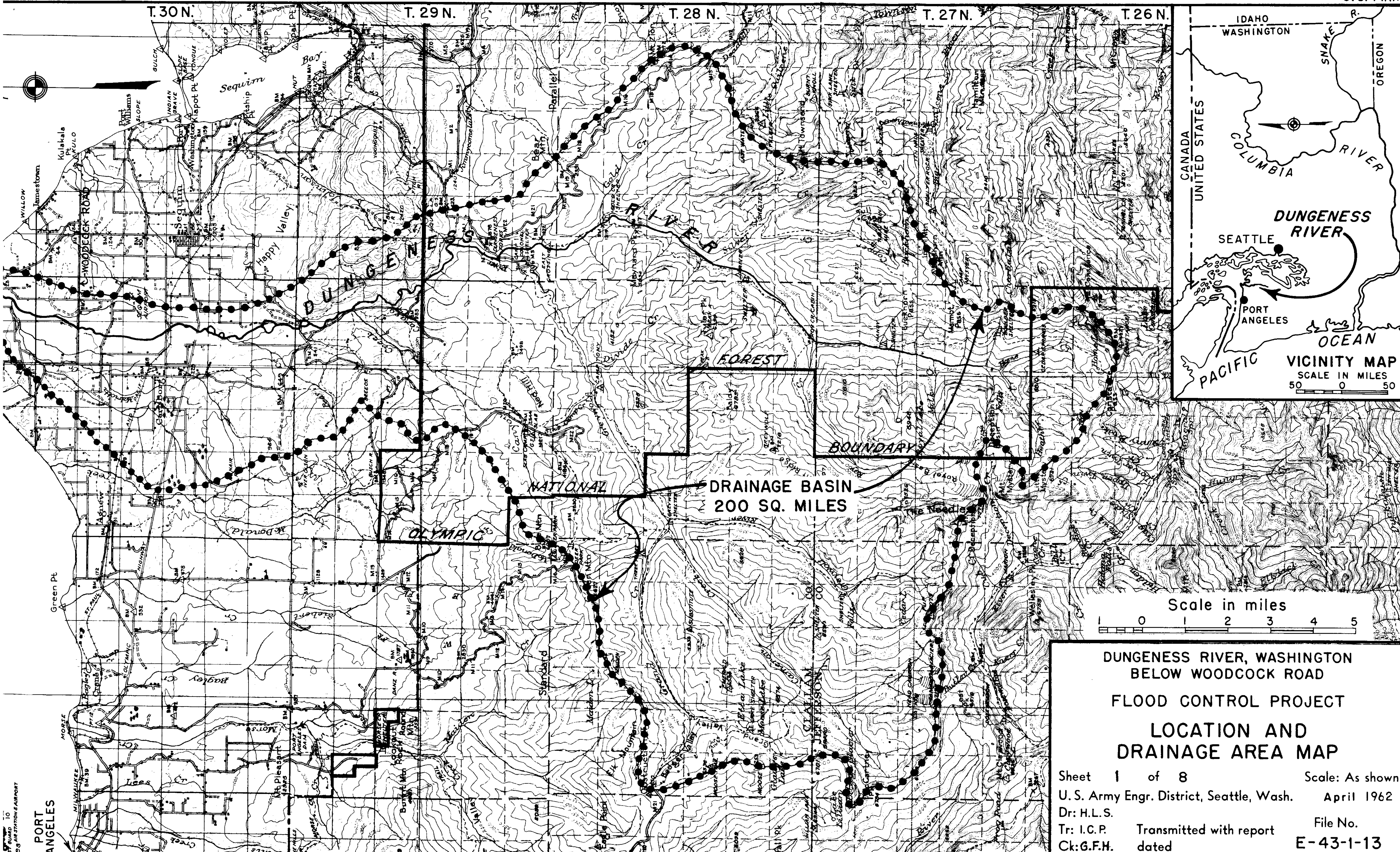
Regarding dike construction, the materials are not to be removed from the stream channel.

Very truly yours,

George C. Starlund
Director

Waters Clerk
1 of 15 FISH

U.S. ARMY



DUNGENESS RIVER, WASHINGTON
BELOW WOODCOCK ROAD

FLOOD CONTROL PROJECT

LOCATION AND DRAINAGE AREA MAP

Sheet 1 of 8 Scale: As shown

U.S. Army Engr. District, Seattle, Wash. April 1962

Dr: H.L.S.

Tr: I.C.P. Transmitted with report

Ck: G.F.H. dated

File No. E-43-1-13

PLATE 1

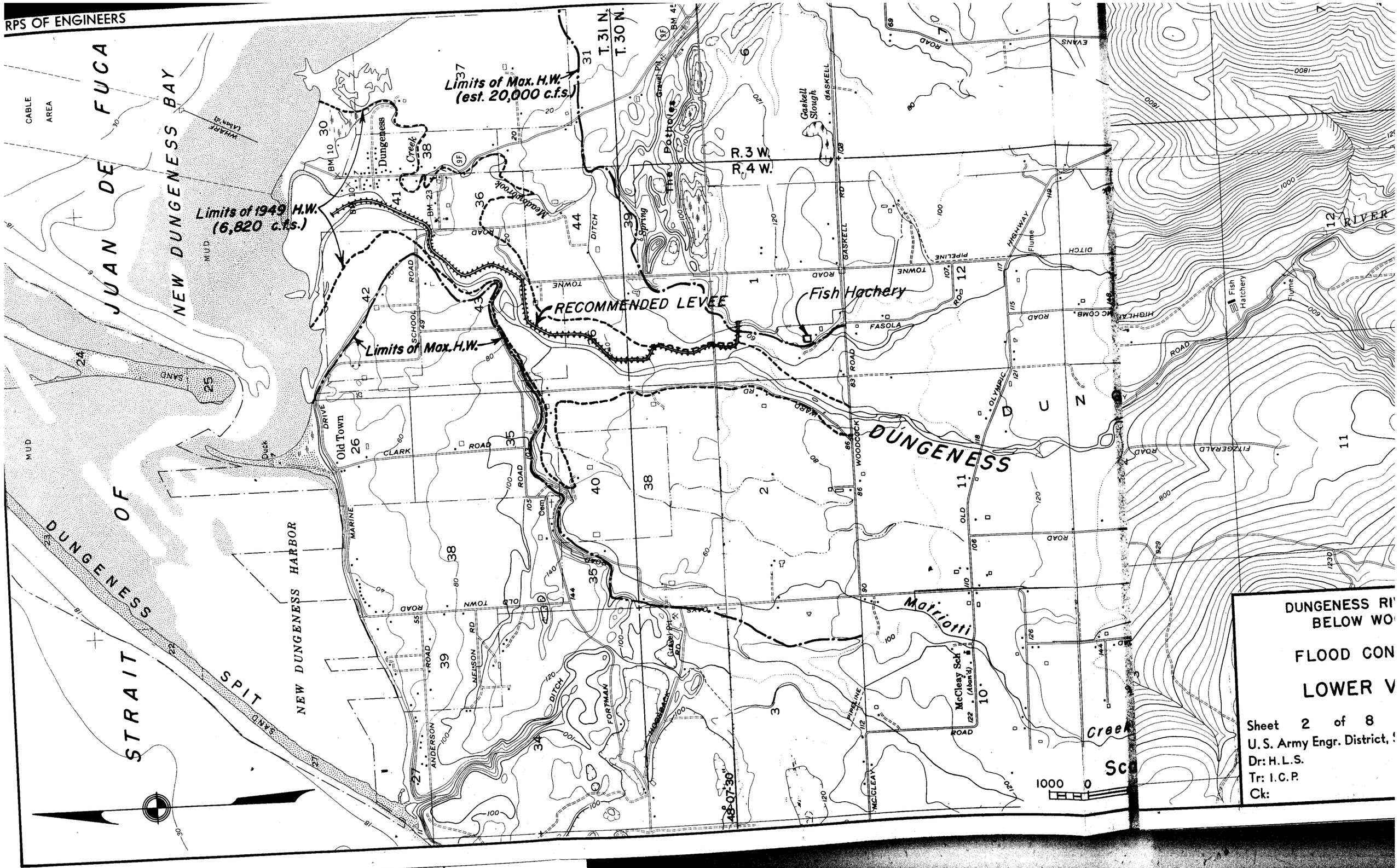
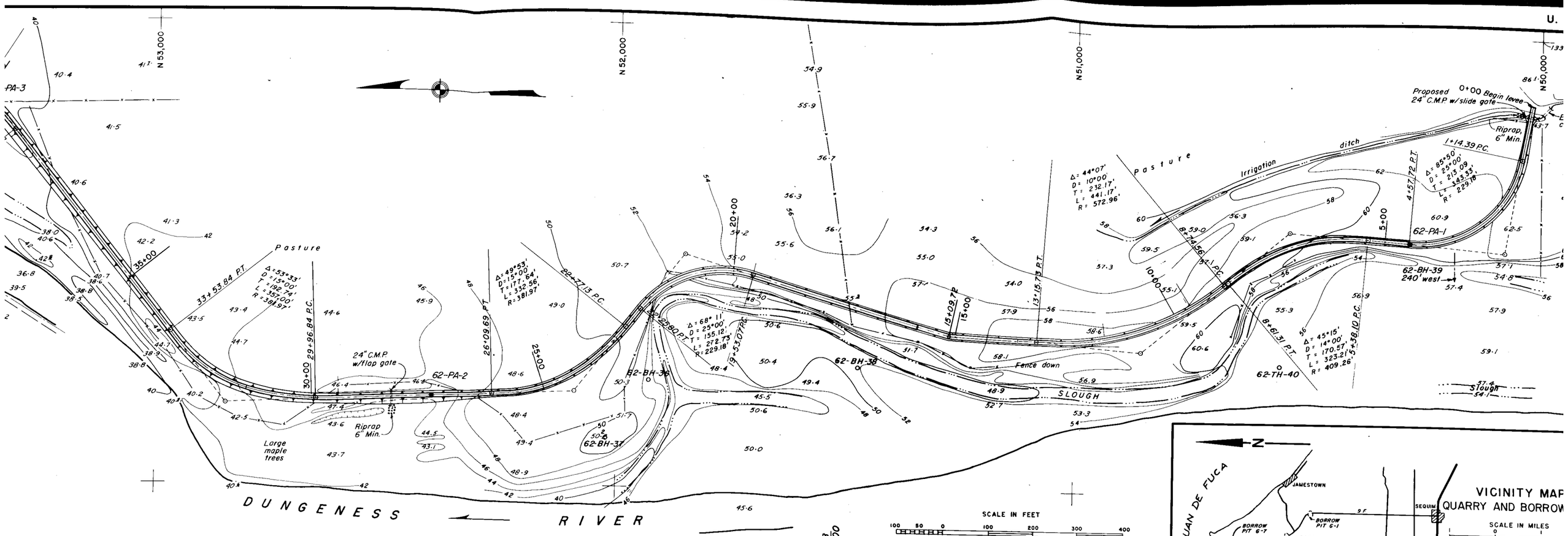
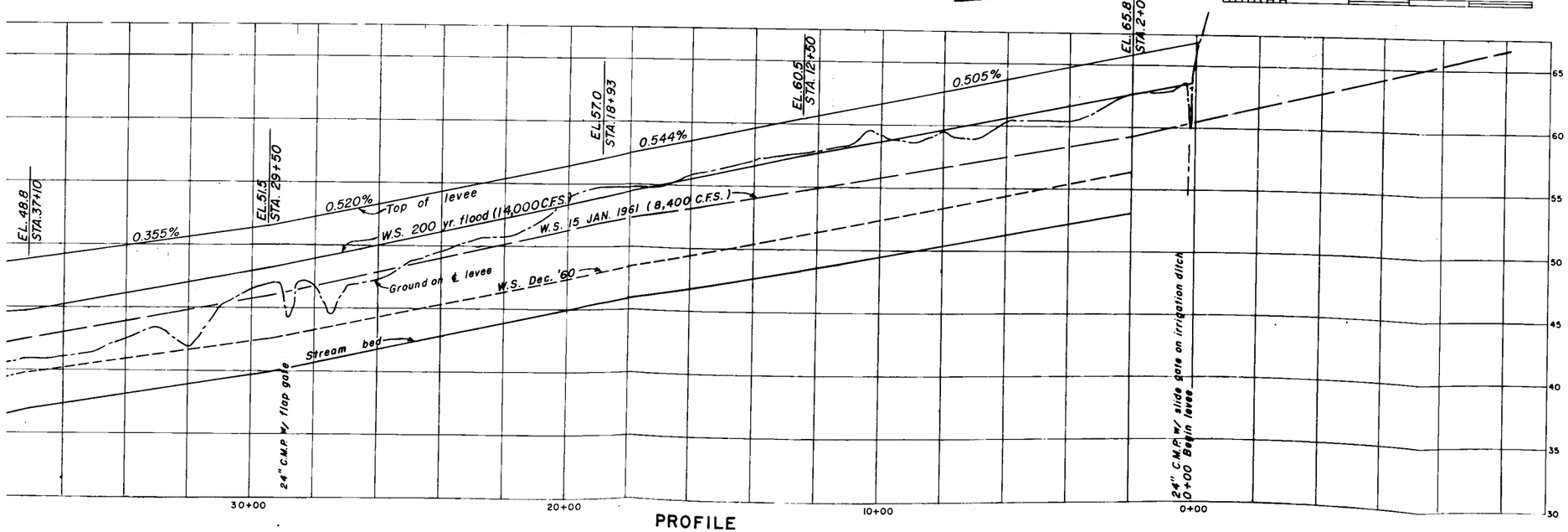
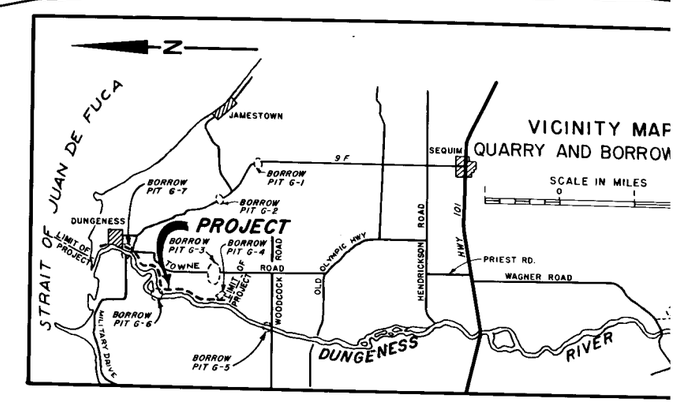

JUAN DE FUCA
STRAIT OF
NEW DUNGENESS BAY
NEW DUNGENESS HARBOR
DUNGENESS SPIT
CABLE AREA
Limits of Max. H.W. (est. 20,000 c.f.s.)
Limits of 1949 H.W. (6,820 c.f.s.)
Limits of Max. H.W.
RECOMMENDED LEVEE
Fish Hachery
Fish Hatchery
Old Town
Dungeness
Meadowbrook Creek
The Potholes
Gaskell Slough
Marriotti Creek
McCleay Sch. (Aban'd)
DUNGENESS RIVER
T. 31 N.
T. 30 N.
R. 3 W.
R. 4 W.
48°07'30"
1000 0
DUNGENESS RI
BELOW WO
FLOOD CON
LOWER V
Sheet 2 of 8
U.S. Army Engr. District,
Dr: H.L.S.
Tr: I.C.P.
Ck:

PLATE 3







● 62-PA-2 EXPLORATION HOLE

DUNGENESS RIVER, WASHINGTON
RIGHT BANK, BELOW WOODCOCK ROAD
FLOOD CONTROL PROJECT

RECOMMENDED PLAN & PROFILE OF LEV

In 8 sheets Sheet No. 4 Scale: A

U. S. Army Engineer District, Seattle, Wash. Marc

Prepared: Submitted:

Chief,

Recommended: Approved:

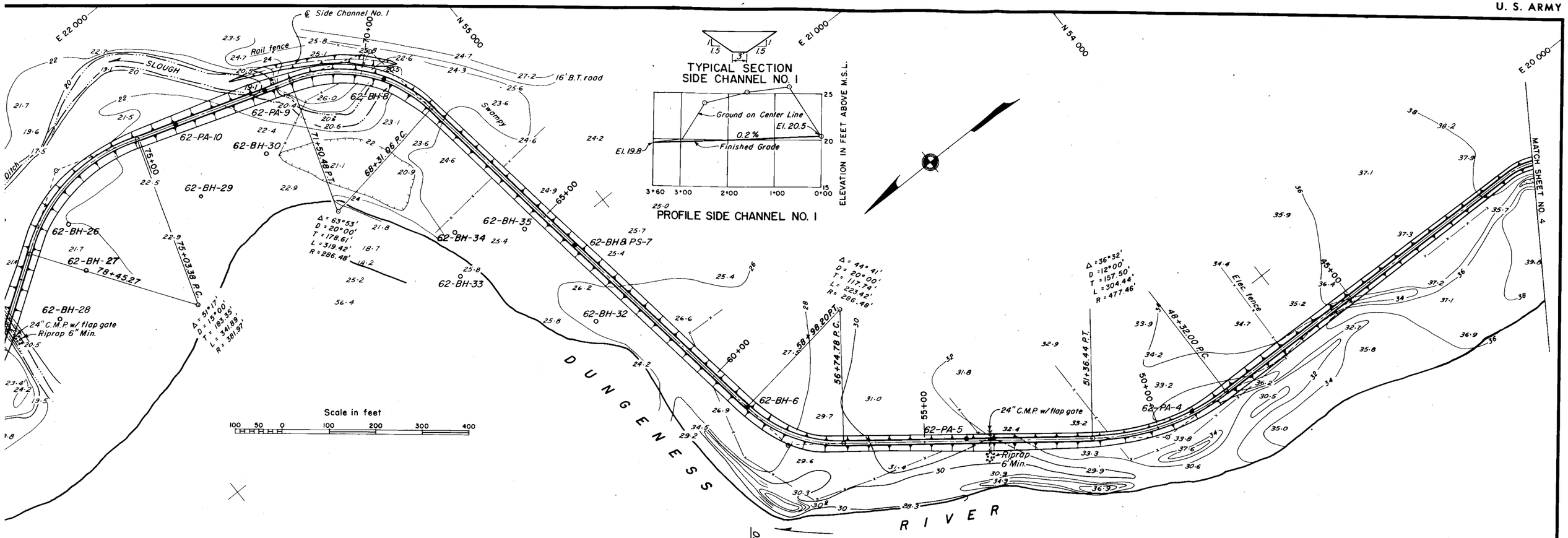
Chief, Planning & Reports Branch Chief, Engineering Division

Drawn by: H.L.S.
Traced by: I.C.P.
Checked by: G.F.H.

Transmitted with report dated

File No. E-43-1-13

PLA



DUNGENESS RIVER, WASHINGTON
RIGHT BANK, BELOW WOODCOCK ROAD
FLOOD CONTROL PROJECT

RECOMMENDED PLAN & PROFILE OF LEVEE

In 8 sheets Sheet No. 5 Scale: As shown

U. S. Army Engineer District, Seattle, Wash. March 1963

Prepared: Submitted:

Recommended: Approved:

Chief, Planning & Reports Branch Chief, Engineering Division

Drawn by: H.L.S.
Traced by: I.C.P.
Checked by: G.F.H.

Transmitted with report dated

File No. E-43-1-13

L SECTION
0 TO 88+82

. SECTION
TO 95+40 AND
17 TO 127+15

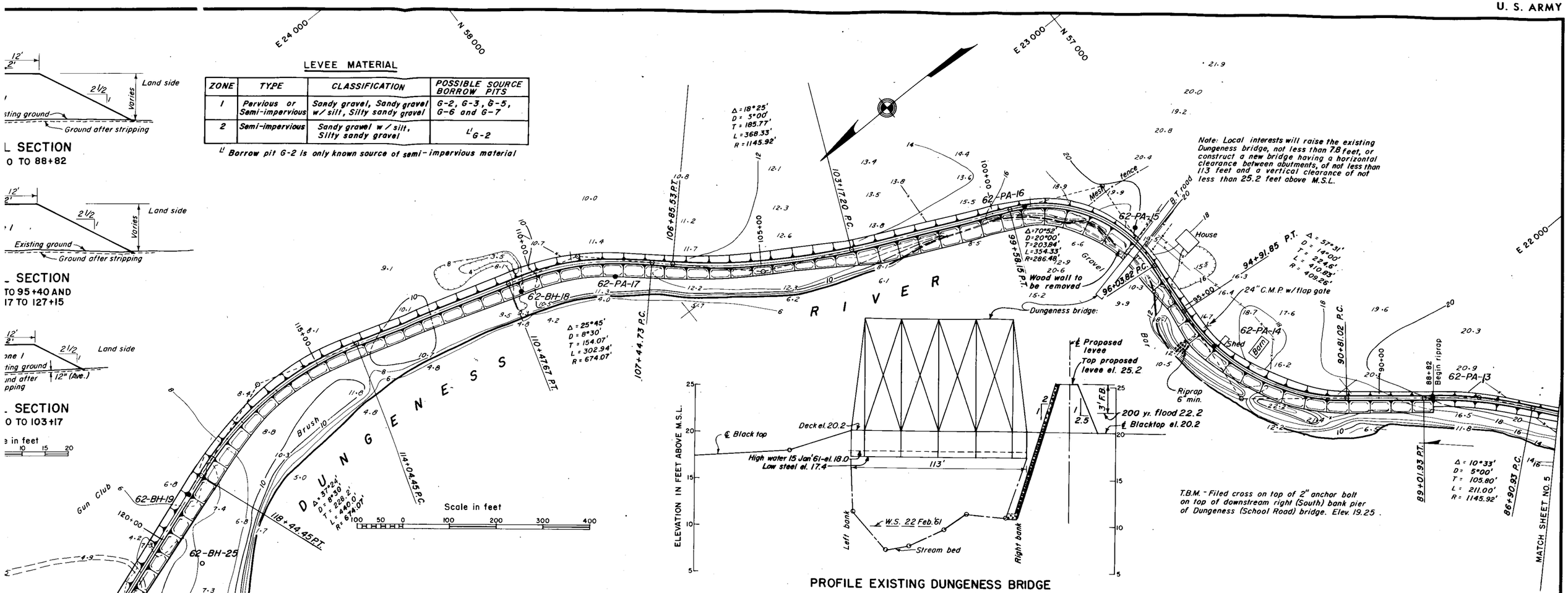
. SECTION
0 TO 103+17

e in feet
10 15 20

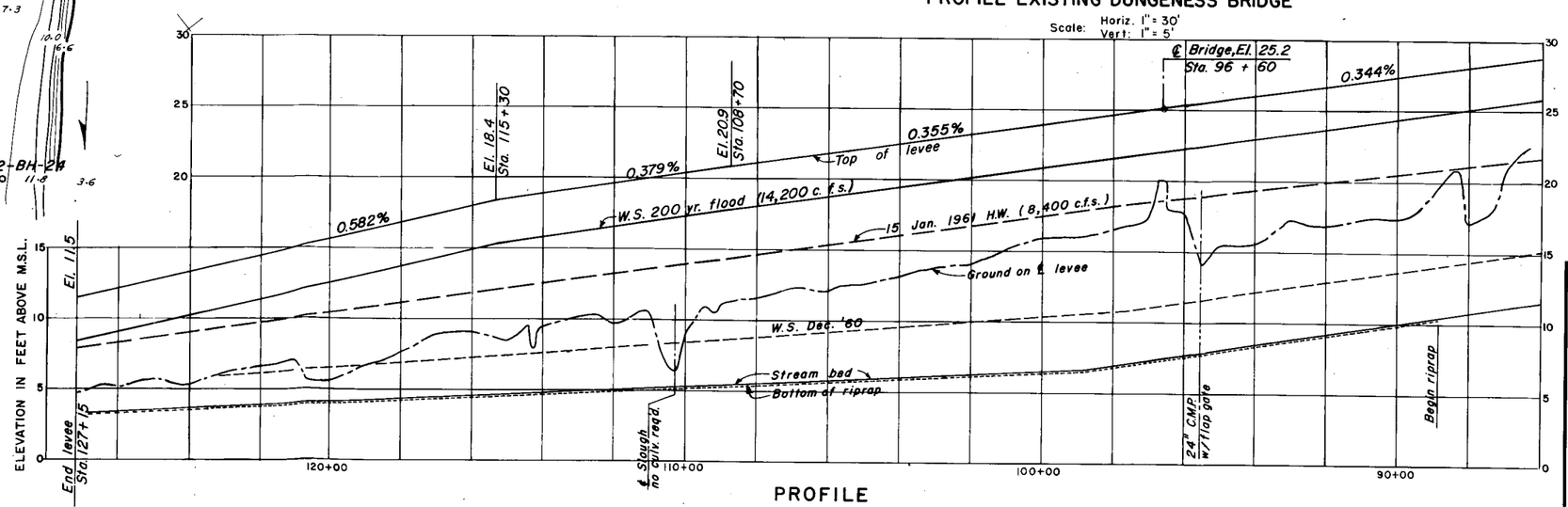
ZONE	TYPE	CLASSIFICATION	POSSIBLE SOURCE BORROW PITS
1	Pervious or Semi-impervious	Sandy gravel, Sandy gravel w/ silt, Silty sandy gravel	G-2, G-3, G-5, G-6 and G-7
2	Semi-impervious	Sandy gravel w / silt, Silty sandy gravel	L'G-2

LEVEE MATERIAL

L' Borrow pit G-2 is only known source of semi-impervious material



PROFILE EXISTING DUNGENESS BRIDGE



PROFILE

DUNGENESS RIVER, WASHINGTON
RIGHT BANK, BELOW WOODCOCK ROAD
FLOOD CONTROL PROJECT

RECOMMENDED PLAN & PROFILE OF LEVEE

In 8 sheets Sheet No. 6

U. S. Army Engineer District, Seattle, Wash.

Scale: As shown
March 1963

Prepared:

Submitted:

Recommended:

Chief, Approved:

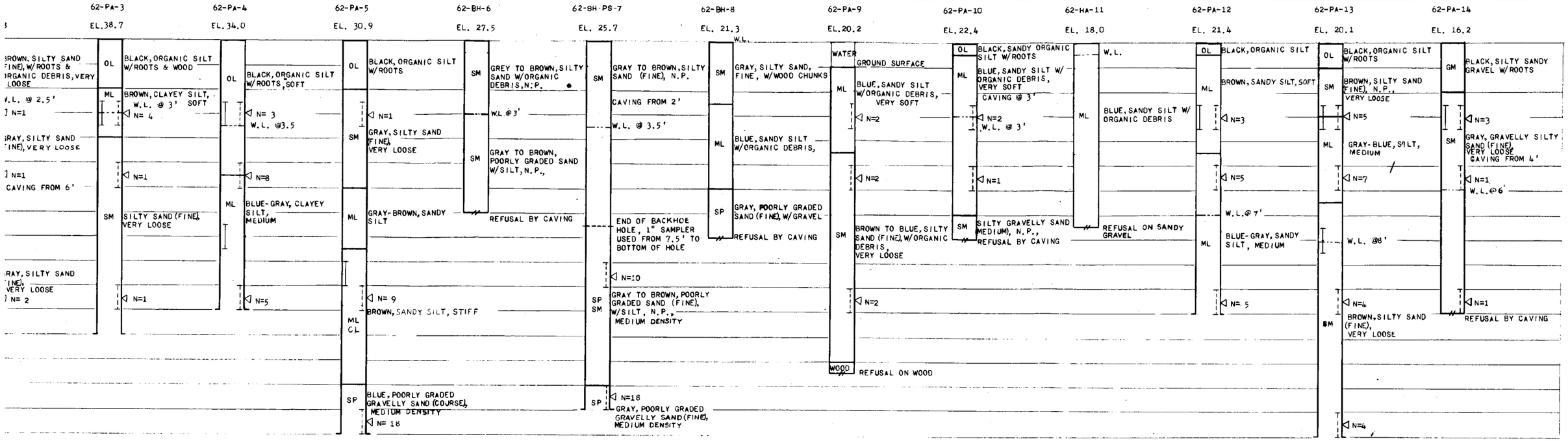
Chief, Planning & Reports Branch

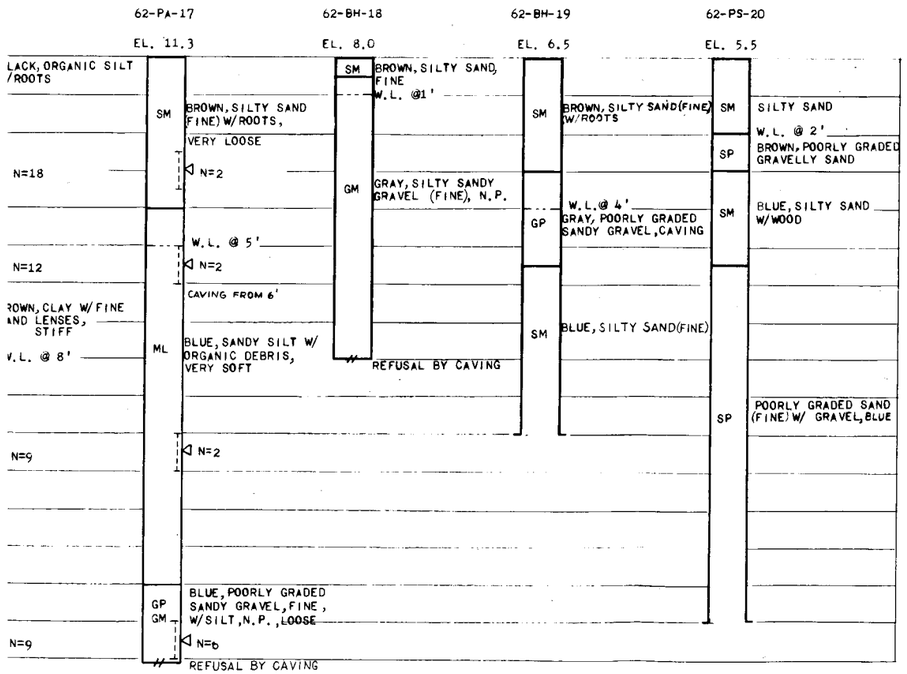
Chief, Engineering Division

Drawn by: H.L.S.
Traced by: I.C.P.
Checked by: G.F.H.

Transmitted with report dated

File No.
E-43-1-13





SOILS LEGEND

62-HA-11 - HAND AUGER, TEST HOLE & NO.

62-BH-6 - BACKHOE, TEST HOLE & NO.

62-PS-20 - 1" PORTER SAMPLER, TEST HOLE & NO.

OL - ORGANIC SILT

ML - SILT, LOW PLASTICITY

SM - SILTY SAND

SP - POORLY GRADED SAND

GP - POORLY GRADED GRAVEL

CL - LEAN CLAY

GM - SILTY GRAVEL

N.P. - NON PLASTIC

62-PA-1 - POWER AUGER, TEST HOLE & NO.

N=5/6 - STANDARD PENETRATION TEST USING SPLIT SPOON SAMPLER. N= THE NUMBER OF BLOWS PER FOOT

I - UNDISTURBED DRIVE SAMPLE

NOTES

1. HOLES 62-PA-1 THROUGH 62-PS-20 DRILLED 14-21 FEB. 1962
2. REFUSAL IS DEFINED AS THE POINT BEYOND WHICH FURTHER PENETRATION IS IMPOSSIBLE WITH THE METHOD OF EXPLORATION USED.
3. THE GROUND WATER LEVELS RECORDED ON THE DRILL LOGS ARE APPLICABLE ONLY FOR THE DATES INDICATED AND AT THE LOCATION OF BORING.

THIS DRAWING HAS BEEN REDUCED TO APPROXIMATELY ONE-HALF THE ORIGINAL SCALE.

DUNGENESS RIVER, WASHINGTON
RIGHT BANK, BELOW WOODCOCK ROAD
FLOOD CONTROL PROJECT

FOUNDATION EXPLORATION

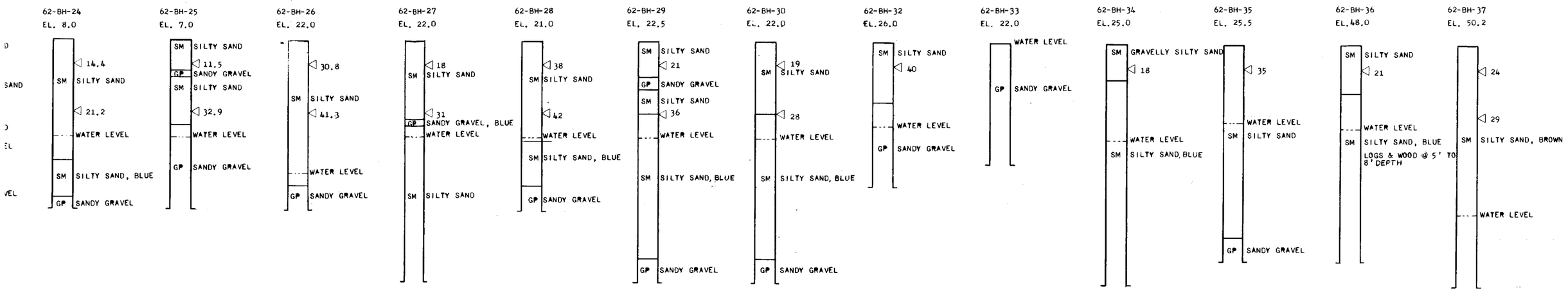
In 8 sheets Sheet No. 7 Scale: As shown

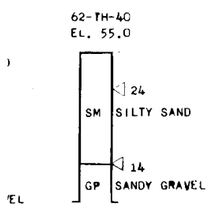
U. S. Army Engineer District, Seattle, Wash. August 1962

Prepared: Chief, Exploration Section
Submitted: Chief, Section
Recommended: Chief, Foundation & Materials Branch
Approved: Chief, Engineering Division

Drawn by:
Traced by:
Checked by:
Transmitted with report dated

File No. E-43-1-13





SOILS LEGEND

SM - SILTY SAND
GP - POORLY GRADED GRAVEL
62-BH-22 - BACKHOE, TEST HOLE & NO.
62-TH-40 - TEST HOLE & NO.
◁24.3 - MOISTURE CONTENT %
SP - POORLY GRADED SAND

NOTES:

1. HOLES 62-BH-22 THROUGH 62-TH-40 DRILLED 15-16 AUGUST 1962

3. THE GROUNDWATER LEVELS RECORDED ON THE DRILL LOGS ARE APPLICABLE ONLY FOR THE DATES INDICATED AND AT THE LOCATION OF BORING

4. SEE SHEETS 4 THROUGH 6 FOR LOCATION OF TEST HOLES

THIS DRAWING HAS BEEN REDUCED TO APPROXIMATELY ONE-HALF THE ORIGINAL SCALE.

DUNGENESS RIVER, WASHINGTON
RIGHT BANK, BELOW WOODCOCK ROAD
FLOOD CONTROL PROJECT

FOUNDATION EXPLORATION

In 8 sheets Sheet No. 8 Scale: As shown
U. S. Army Engineer District, Seattle, Wash.
Prepared: Submitted:
Recommended: Chief, Approved: Section
Chief, Planning & Reports Branch Chief, Engineering Division
Drawn by:
Traced by: Transmitted with report dated
Checked by:
File No. E-43-1-13