US Army Corps
of Engineers®
Seattle District

Grays Harbor Juvenile Detention Center
Section 14 Stream bank Protection Project

Appendix A Engineering

November 2025

Appendix A

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Engineering Appendix Soils

The Juvenile Detention Center (JDC)is situated on land that was once low-lying tidal flats and/or wetlands. That land was filled with approximately 4 feet of dredged river sediment, prior to the site development. According to Natural Resources Conservation Service (NRCS) web soil survey, the, soil classification is made up of sandy and loamy river dredgings, and it is non-hydric. This unit is described as not having a representative profile, as these soils are made up of local dredge material that would vary with location of the dredge source. The nature of this soil may contribute to its susceptibility to erosion. Visual observations along the eroding shoreline made during a site visit found the soils to be silty clay with trace sand, or clayey silt with trace sand in the upper six feet of the soil profile.

A soil core was obtained in July 2025 and will be analyzed for site specific characteristics in the D&I phase of the project. The results of the analysis will inform design refinement in the next phase of the project.

The undeveloped land adjacent to the JDC is mapped as tidal flats with Ocosta silty clay loam soil. Ocosta is a hydric soil and it supports wetlands.

Engineering Appendix

Analysis of Wind Generated Waves and River Flow Conditions to Inform Riprap Sizing

To inform the proposed shoreline stabilization action, flow conditions and wind-generated waves were analyzed for the project location as described below.

Flow Conditions

The project site is located adjacent to the Grays Harbor Navigation Channel, roughly STA 1390+00, where it enters the lower part of the Chehalis River. The JDC’s proximity to the Pacific Ocean and its location along the streambank, means the project site is impacted by both tidal fluctuations and riverine flows. The lower part of the river is subjected to erosion caused by the ebb and flood of tides, where the water in immediate contact with the streambank rises and falls according to the tidal cycle. Tides in the area range on the order of 8-10 feet with spring tides being the highest and reaching 12-13 feet differences between low tide and high tide.

Seasonally higher river flows and occasional river flooding events also contribute to ongoing streambank erosion. Elliott Slough, a small tributary to the Chehalis, enters the river in a way that results in opposing flows at the confluence point. It is unclear whether Elliot Slough contributes flow or if it is a stagnant body of water relying on backwater effects from the Chehalis to generate flow. It is unlikely we will find out given its small size and relative obscurity, but visual inspection does not show it connecting to any other river or body of water. The confluence point is located close enough to the project site so that any hydrodynamic features such as eddies and/or vortexes created by opposing flows could contribute to the ongoing erosion of the slopes.

Currents and river flows will influence the stability of any solution placed to prevent erosion of the shoreline. Because of its tidally influenced nature, an existing model developed by USACE Engineering Research and Development Center (ERDC) was used to estimate current velocities due to the rise and fall of tides which came out to about 2.5 feet per second at the JDC project site. Latest bathymetric data for the Chehalis was sourced from the National Oceanic and Atmospheric Administration (NOAA) and is dated 2005. A more localized bathymetry/lidar dataset was collected by USACE in support of this project early 2025. A combination of both datasets was used in generating a typical cross section of the Chehalis River which is shown in Figure 1.

In summer 2013 extensive modeling of the Chehalis River was performed by West Consultants in their 6 June 2013 report titled “Chehalis Basin Ecosystem Restoration General Investigation Study Baseline Hydrology and Hydraulics Modeling”. This remains, to date, the best modeling effort available to extract river flow data from. Velocities from this model as well as wind generated wave attack help inform the rock sizes for the project.

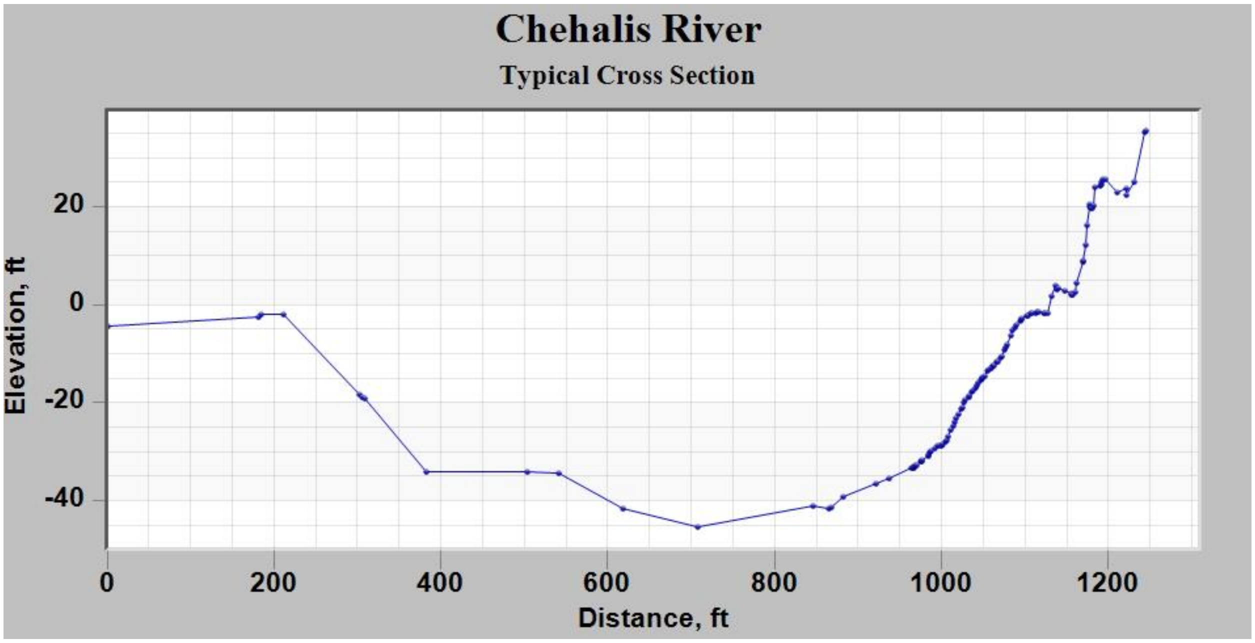


Figure 1. Chehalis River typical cross section at the JDC project site.

Wind Generated Waves

A third factor that contributes to bank erosion is wave impact. Wind waves are generated when the wind blows unimpededly along the surface of a body of water for long distances, which are called the wind fetches. Prevailing winds impacting the project site are incoming from the west and south and will require further evaluation to determine extents of impact for the final design.

<u>Wind Data:</u>

Wind data was obtained from National Weather Service's Hoquiam Bowerman Airport station in Hoquiam, Washington. The National Weather Service is a government agency that provides weather forecasts, warnings, and other weather-related information for the United States. It's part of NOAA and operates through a network of local Weather Forecast Offices, regional and national centers, and also uses the NOAA Weather Radio All Hazards network for disseminating information. Purdue University's Mid-Western Climate Research Centers cli-MATE tool (http://mrcc.purdue.edu/CLIMATE) was utilized to construct the wind rose in Figure 2 using data from years 1996 through 2026 from the Hoquiam Bowerman Airport's anemometer.

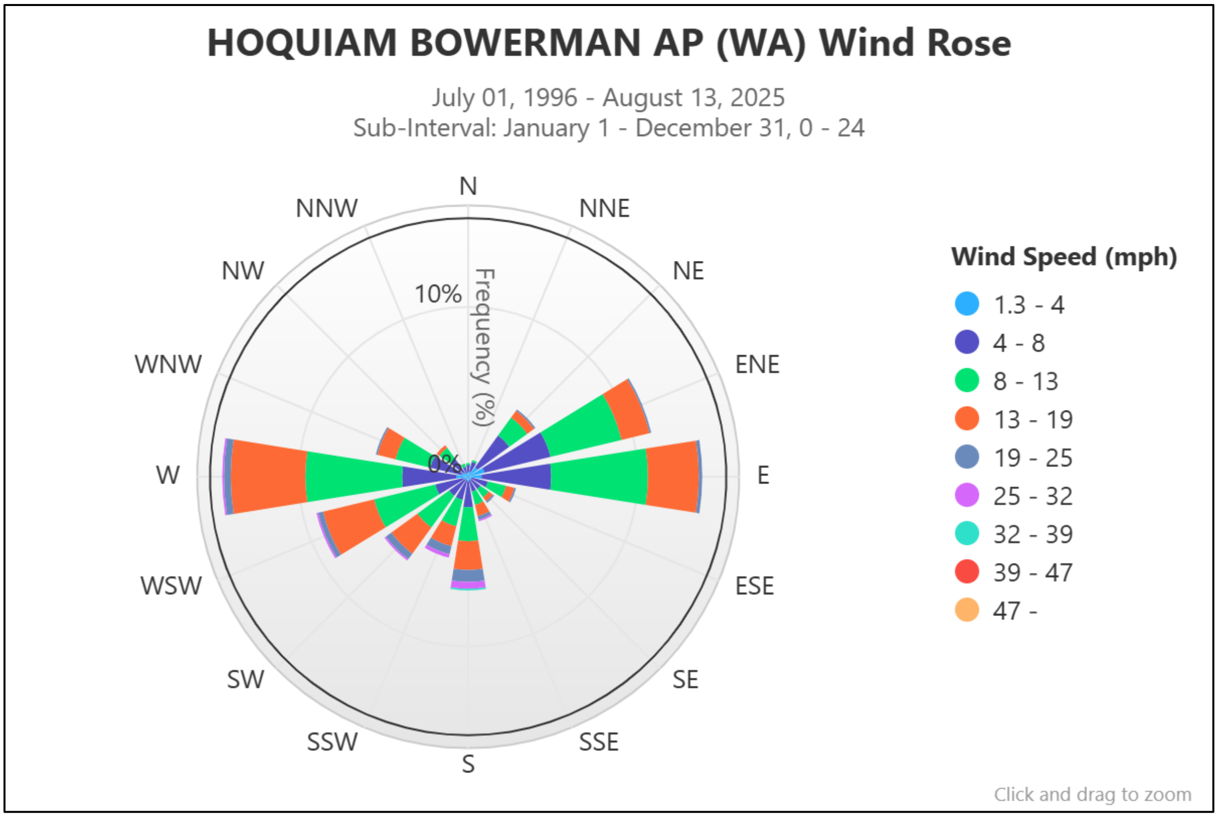


Figure 2. Hourly wind rose - critical wind speed, 25 miles per hour, westerly wind.

Wind Fetch:

Wind fetch is defined as the distance over a body of water which the wind can blow unimpeded. It will result in the interaction between wind and water generating waves that will propagate landward and eventually reach the shoreline. Several fetches, impacting the site at different angles, were evaluated. A visual representation of the evaluated fetches is shown below in Figure 3, and fetch information is shown in Table 1.

Figure 3. Wind fetch geometry.

Table 1. Wind fetch information. Critical fetch data highlighted red.

Fetch	Angle, clockwise degrees from north	Length, ft
1	169	5,856
2	189	2,302
3	209	1,235
4	229	1,064
5	259	1,268
6	**265**	**5,164**

Wind Wave Calculations:

Wind generated waves were calculated using the Automated Coastal Engineering System. This system is a collection of coastal engineering design and analysis software developed by ERDC. A combination of the critical fetch and the highest wind speed yielded the critical wave height impacting the JDC site as a 1.34-foot wave (Table 2).

Item	Value	Units
El of Observed Wind (Zobs)	1.00	feet
Observed Wind Speed (Uobs)	25.00	mph
Air Sea Temp. Diff. (dT)	0.00	deg F
Dur of Observed Wind (DurO)	60.00	min
Dur of Final Wind (DurF)	3.00	hours
Lat. of Observation (LAT)	47.00	deg
Results		
Wind Fetch Length (F)	5164.00	FEET
Avg Fetch Depth (d)	35.00	feet
Eq Neutral Wind Speed (Ue)	34.15	mph
Adjusted Wind Speed (Ua)	45.47	mph
Wave Height (Hmo)	1.34	feet
Wave Period (Tp)	1.93	sec

Figure 4. Critical wave height data.

Guidance for calculating a stable rock size under wave attack can be found in the form of Hudson's equation as presented in USACE's EM 1110-2-1100 Coastal Engineering Manual. By inputting our calculated wave height and typical riprap material properties into Hudson's equation we calculate a stable D50 of 0.5 ft.

Input:	
H_s =	1.34 ft
ρ_s =	167.0 lbf/ft^3
ρ_w =	64.0 lbf/ft^3
cotan(α) =	2.00
K_D =	2
Output:	
Δ =	1.61
M_{n50} =	0,024 lb
D_{n50} =	**0.5 ft**
W_{n50} =	**0.0 tons**

Figure 5. Hudson Formula calculation of median diameter.

Chehalis River Flow

The Chehalis River basin is located in southwest Washington, encompassing a drainage area of approximately 2,100 square miles. The river rises in the Willapa Hills and runs generally east, then north, and then west to its mouth at Grays Harbor. Elevations range from over 3,000 feet in the vicinity of the Chehalis River and major tributary headwater locations to 170 feet in the Twin Cities area to sea level at the mouth. Major tributaries include the Satsop, Wynoochee, Skookumchuck, and Newaukum Rivers. oThe upper portions of tributaries such as the South Fork Chehalis River, the Newaukum River, and the Skookumchuck River are located in steep, mountainous terrain, with steep channel slopes and very narrow floodplains. The lower portions of these tributaries, as well as the smaller tributaries that join the Chehalis River lower in the basin are characterized by lower gradient, meandering channels with broad floodplains. These reaches offer much more temporary flood storage than many of the reaches located at the higher elevations within the basin.

In 2013 West Consultants performed hydrologic-hydraulic analysis of the basin in support the potential damming of the river upstream. The model looked at several flow conditions of various return periods with and without damming of the river. The highest velocity found while browsing through the model results is 4.64 feet-per second (rounding up to 5 feet-per-second) and corresponds to a 500-year return period flow under the no-dam condition (without project) at river mile 0.7 (see Figures 4 and 5)

Figure 6. River Mile 0.7, closest section to project site.

Profile Output Table - Standard Table 1

File Options Std. Tables Locations Help

HEC-RAS Locations: User Defined Profile: Max WS

River	Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
LOWER CHEHALIS	REACH 26	0.7	Max WS	WO Project 100yr	27896.40	-40.94	10.49		10.68	0.000064	3.52	40119.59	3906.65	0.11
LOWER CHEHALIS	REACH 26	0.7	Max WS	WO Project 200yr	48717.90	-40.94	11.08		11.33	0.000082	4.00	42776.66	4998.71	0.12
LOWER CHEHALIS	REACH 26	0.7	Max WS	WO Project 500yr	79840.00	-40.94	12.01		12.33	0.000106	4.64	47984.36	6113.02	0.14
LOWER CHEHALIS	REACH 26	0.7	Max WS	WO Proj 50 Yr	10727.20	-40.94	10.03		10.18	0.000051	3.10	38509.42	3191.36	0.09
LOWER CHEHALIS	REACH 26	0.7	Max WS	WO PROJ 20 YR	91240.05	-40.94	9.57		9.67	0.000036	2.60	37172.79	2496.66	0.08
LOWER CHEHALIS	REACH 26	0.7	Max WS	WO PROJ 10 YR	75182.55	-40.94	9.23		9.31	0.000026	2.17	36421.38	1965.77	0.07
LOWER CHEHALIS	REACH 26	0.7	Max WS	WO Proj 5 Yr	62236.40	-40.94	9.00		9.05	0.000018	1.81	35996.58	1769.89	0.06
LOWER CHEHALIS	REACH 26	0.7	Max WS	WO PROJ 1.5 YR	37708.56	-40.94	8.67		8.69	0.000007	1.11	35427.25	1663.51	0.03
LOWER CHEHALIS	REACH 26	0.7	Max WS	WO PROJ 2 YR	44822.14	-40.94	8.75		8.78	0.000010	1.31	35562.41	1682.99	0.04

Figure 7. Maximum Flow Velocity for representative cross section, river mile 0.7

Rock stability is investigated using equation 3-3 as presented in USACE's EM 1110-2-1601 Hydraulic Desing of Flood Control Channels. Inputting geometric characteristics of the channel near our site and utilizing 5 feet per second as our design velocity we calculate a stable rock size of 0.83 ft.

Revetment riprap sized using the USACE EM 1601 method						
γs=	165	lb/ft^3				
γ_w=	62.4	lb/ft^3				
g=	32.2	ft/s^2				
Φ (repose)=	40	deg=	0.69813	rad		
side slope=	2	(1/z)=	0.46365	rad=	26.57	deg
θ (side)=	0.4636	rad				
C_t=	1	(1 for thickness D100, 1.5 for thickness 1.5d50)				
Curvature:	bend					
C_s=	0.3	(0.3 for angular,0.375 for round rock)				
SF=	1.3	(minimum 1.1)				
V=	5.00	ft/s, velocity over toe				
Channel type:	natural					
Rc=	1000	ft, bend radius				
Bt=	1075	ft, top width		Rc/W=	0.93	
d=	10.00	ft, flow depth over toe				
C_v=	1.289					
V_{ss}=	8.782					
K1=	0.718					
D_{30}=	0.68	ft				
D_{85}/D_{15}=	2	(1.5 to 2.5 coefficient of uniformity)				
D_{50}=	0.9	ft =	10.3	in		
D_{100}	18	in				
Layer thickness	18.0	in	1.5	ft		
K	0.036					
Mannings n	0.091					

Figure 8. EM 1110-2-1601 calculation of stable rock diameter

Riprap Sizing Preliminary Determination

After analyzing rock stability both under wave attack and river flow currents, it is determined that a gradation with a D50 of 0.90 feet will adequately withstand the conditions present at the site. To that effect, the sponsor emergency repair utilized 1-ft rock and has stood the test of time. This is consistent with the findings of this analysis. Following guidance contained in Seattle District USACE Memorandum for Record: Designation of Riprap Sizing Specifications for River Armoring Projects (28 October 2019), a combination of Class II and class IV riprap are recommended for use in the project to account for variations in field conditions (Figure 9).

Class	I	II	III	IV	V	VI
Percent Passing	Inches*					
100	12	20	27	29	34	42
50	9	14	16	17	21	27
10	7	9	10	11	13	19
Cu	1.5	1.9	2.2	2.2	2.2	1.9

Figure 9. Riprap Class Definitions by Size (a deviation of +/- 4% is allowed).

Final Design Specifications

The Preferred Alternative/TSP design, which is considered to be at a "35-percent" design maturity, includes a mixture of riprap sizes with Class II and Class IV riprap, with Class IV riprap as the primary protection at the base of the repair. These rock sizes are consistent with the emergency repair performed by the sponsor about ten years ago where rock size with a diameter of about 12 inches was placed in front of parts of the eroding bank and with the findings of the preliminary analysis. The final design will be further refined in the next phase of the project.

GENERAL NOTES:

1. PROJECT ENTRY: FROM HWY 12 SOUTH TURN LEFT ONTO JUNCTION CITY RD/SARGENT BLVD, THEN IN APPROXIMATELY 0.4MILES TURN RIGHT INTO THE PARKING LOT FOR THE GRAYS HARBOR COUNTY JUVENILE COURT. THE STAGING AREA IS LOCATED TO THE WEST SIDE OF THE GRAYS HARBOR COUNTY JUVENILE COURT.
2. THIS DRAWING SET REPRESENTS A DRAFT 30% LEVEL OF DESIGN TO DEMONSTRATE PROJECT FEASIBILITY.
3. HORIZONTAL CONTROL BASED ON WASHINGTON STATE PLANE COORDINATE SYSTEM SOUTH ZONE, NAD83, FEET.
4. VERTICAL CONTROL BASED ON MLLW.

A1 ACCESS AND HAUL ROUTE

1" = 60'

0 60' 120'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

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

DESIGNED BY: A. ROTHERY	ISSUE DATE: 28 MAR 2025
DRAWN BY: A. ROTHERY	SOLICITATION NO.:
CHECKED BY: J. CHECKER	CONTRACT NO.:
SUBMITTED BY: J. CURRAN	FILE NO.:
SIZE: ANSI D	

GRAYS HARBOR, WA
CAP SEC 14
DETENTION CENTER

ACCESS AND HAUL ROUTE

SHEET ID

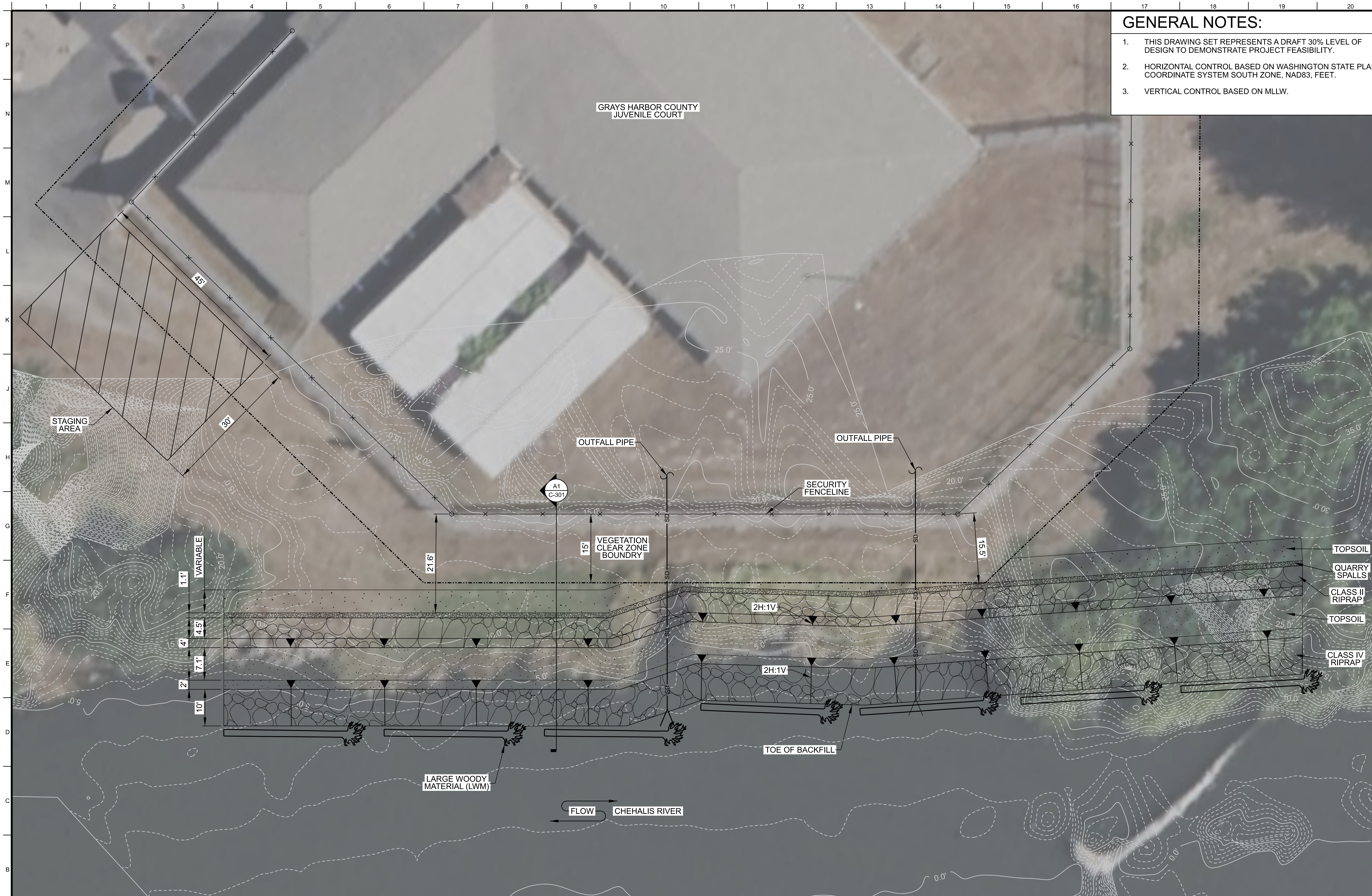
C-101

pw://PWINT-WPC.EIS.DS.USACE.ARMY.MIL:CENWS - Seattle District/Documents/Civil Works/Grays Harbor, WA/FY26_P2-484032_GHDC/Plan Sets/03_Sheets/FY26_P2484032_GHDC_C-101 - ACCESS AND HAUL ROUTE.dgn
Plot Date: 10:20:37 AM 6/30/2025 PD: AEC_pdf.pltcfg DS: NWS_AEC_Screen_FullSize.dscript

Draft

GENERAL NOTES:

1. THIS DRAWING SET REPRESENTS A DRAFT 30% LEVEL OF DESIGN TO DEMONSTRATE PROJECT FEASIBILITY.
2. HORIZONTAL CONTROL BASED ON WASHINGTON STATE PLANE COORDINATE SYSTEM SOUTH ZONE, NAD83, FEET.
3. VERTICAL CONTROL BASED ON MLLW.



A1 PROPOSED SITE PLAN
1" = 10'

0 10' 20'

US Army Corps of Engineers®

MARK | DESCRIPTION | DATE

DESIGNED BY: A. ROTHERY
DRAWN BY: A. ROTHERY
CHECKED BY: J. CHECKER
SUBMITTED BY: J. CURRAN
SIZE: ANSI D
ISSUE DATE: 28 MAR 2025
SOLICITATION NO.:
CONTRACT NO.:
FILE NO.:

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

GRAYS HARBOR, WA
CAP SEC 14
DETENTION CENTER

PROPOSED SITE PLAN

SHEET ID
CS101

Draft

GENERAL NOTES:

1. PROJECT SITE EXTENDS FOR 237 FT LINEAL FEET. THIS DOES NOT INCLUDE TRANSITIONS. THE ACTUAL CROSS SECTIONS WILL VARY DEPENDING ON FEILD CONDITIONS.
2. WHERE HISTORICAL RIVERWARD TO EXCEED THE EXTENT OF THE REPAIR, EFFORT SHOULD BE MADE FOR THE EXISITNG MATERIAL TO REMAIN INTACT SUCH THAT SAFE CONSTRUCTION PRACTICES AND STABLE SLOPES ARE STILL MAINTAINED.

TABLE 1: RIPRAP GRADATIONS (ASSUMED SPECIFIC GRAVITY = 2.60)

DISTRIBUTION	SIZE (IN)*			WEIGHT (LBS)**		
	4"-8" QUARRY SPALL ROCK	CLASS II RIPRAP	CLASS IV RIPRAP	4"-8" QUARRY SPALL ROCK	CLASS II RIPRAP	CLASS IV RIPRAP
100% SMALLER THAN	12	20	29	150	600	2000
10% SMALLER THAN	7	9	10	25	62	112

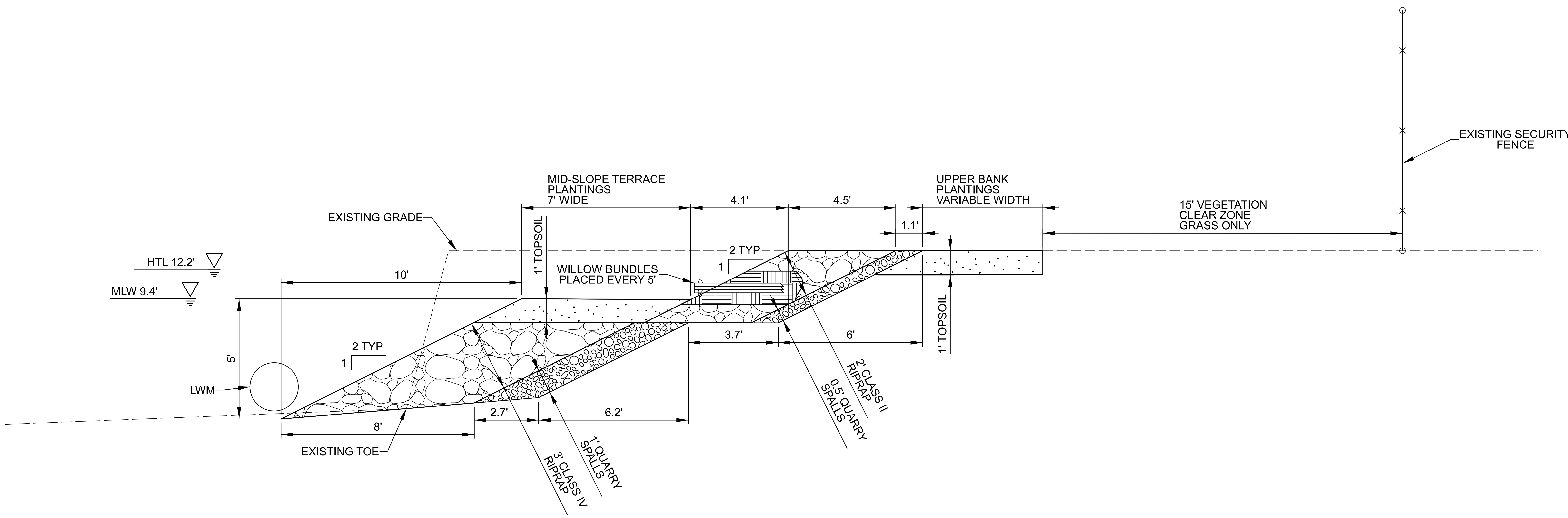
*A DEVIATION OF +/- 4% IS ALLOWED FOR SIZE
**A DEVIATION OF +/- 10% IS ALLOWED FOR WEIGHT

TABLE 2: ENGINEERED TOPSOIL GRADATION

SIEVE SIZE	PRECENT PASSING BY WEIGHT
1/2"	100
NO. 4	75-100
NO. 10	40-75
NO. 16	25-55
NO. 40	25-50
NO. 200	10-20

TABLE 3: MATERIAL QUANTITIES

	LENGTH (FT)	4"-8" QUARRY SPALL ROCK (CY)	CLASS II RIPRAP (CY)	CLASS IV RIPRAP (CY)	TOPSOIL (CY)	HYDROSEED (ACRES)
SITE	237	93	74	216	147	0.134



A1 TYPICAL CROSS SECTION
NOT TO SCALE

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

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

DESIGNED BY: A. ROTHERY
DRAWN BY: A. ROTHERY
CHECKED BY: J. CHECKER
SUBMITTED BY: J. CURRAN
SIZE: ANSI D

ISSUE DATE: 28 MAR 2025
SOLICITATION NO.:
CONTRACT NO.:
FILE NO.:

GRAYS HARBOR, WA
CAP SEC 14
DETENTION CENTER

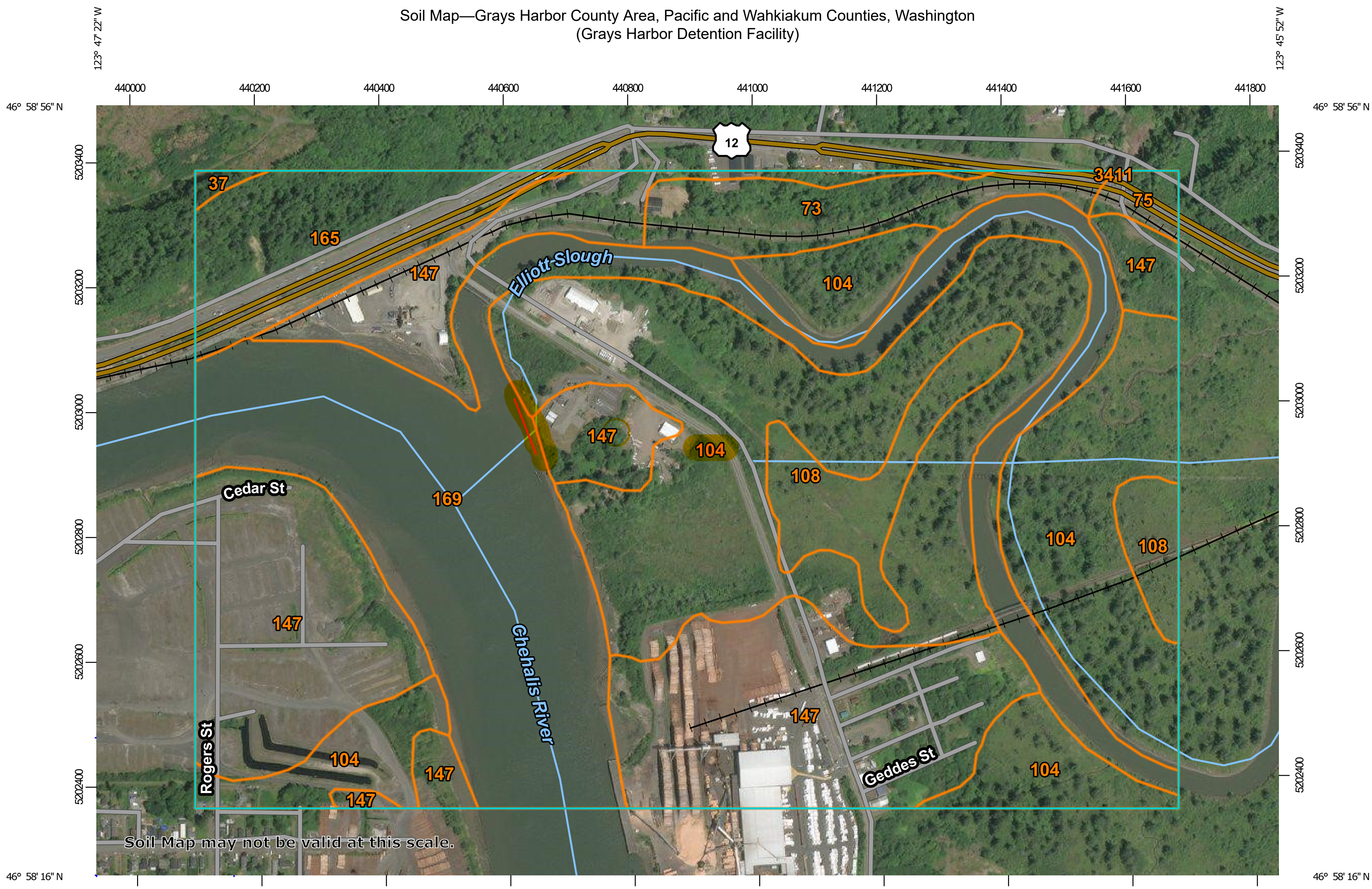
PROPOSED CROSS SECTIONS

SHEET ID
C-301

pw://PWINT-WPC.EIS.DS.USACE.ARMY.MIL:CENWS - Seattle District/Documents/Civil Works/Grays Harbor, WA/FY26_P2-484032_GHDC/Plan Sets/03_Sheets/FY26_P2484032_GHDC_C-301 - PROPOSED CROSS SECTIONS.dgn
Plot Date: 10:33:34 AM 7/23/2025 PD: AEC_pdf.pltcfg DS: NWS_AEC_Screen_FullSize.dscript

Draft

Soil Map—Grays Harbor County Area, Pacific and Wahkiakum Counties, Washington
(Grays Harbor Detention Facility)



Map Scale: 1:8,690 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 400 800 1600 2400

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Grays Harbor County Area, Pacific and Wahkiakum Counties, Washington
Survey Area Data: Version 20, Aug 23, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Sep 29, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
37	Elochoman silt loam, 8 to 30 percent slopes	0.8	0.2%
73	Lytell silt loam, 8 to 30 percent slopes	15.7	3.9%
75	Lytell silt loam, 65 to 90 percent slopes	2.7	0.7%
104	Ocosta silty clay loam	137.1	34.2%
108	Orcas peat	18.3	4.6%
147	Udorthents, level	108.8	27.2%
165	Zenker silt loam, 65 to 90 percent slopes	22.7	5.7%
169	Water	94.4	23.6%
3411	Skamo medial silt loam, 0 to 8 percent slopes	0.1	0.0%
Totals for Area of Interest		**400.6**	**100.0%**

Grays Harbor County Area, Pacific and Wahkiakum Counties, Washington

104—Ocosta silty clay loam

Map Unit Setting

National map unit symbol: 2gj6
Elevation: 20 to 150 feet
Mean annual precipitation: 70 to 100 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 180 to 250 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Ocosta and similar soils: 85 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ocosta

Setting

Landform: Flood plains, deltas
Parent material: Clayey alluvium

Typical profile

H1 - 0 to 12 inches: silty clay loam
H2 - 12 to 20 inches: silty clay
H3 - 20 to 60 inches: clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Ecological site: R004AB200OR - Tidal Marsh and Estuary
Forage suitability group: Seasonally Wet Soils (G004AC202WA)
Other vegetative classification: Seasonally Wet Soils (G004AC202WA)
Hydric soil rating: Yes

Minor Components

Rennie

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

Nuby

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

Seastrand

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Grays Harbor County Area, Pacific and Wahkiakum Counties, Washington
Survey Area Data: Version 20, Aug 23, 2021

Grays Harbor County Area, Pacific and Wahkiakum Counties, Washington

147—Udorthents, level

Map Unit Setting

National map unit symbol: 2gkq
Elevation: 0 to 200 feet
Mean annual precipitation: 60 to 80 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 150 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Udorthents and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Landform: Tidal flats
Parent material: Sandy and loamy river dredgings

Typical profile

H1 - 0 to 6 inches: sandy loam
H2 - 6 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 24 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A
Hydric soil rating: No

Data Source Information

Soil Survey Area: Grays Harbor County Area, Pacific and Wahkiakum Counties, Washington
Survey Area Data: Version 20, Aug 23, 2021