

Dungeness Reservoir Progress Update to Clallam County Board of Commissioners

Presented by:

David Rice, PE – Anchor QEA

August 14, 2023



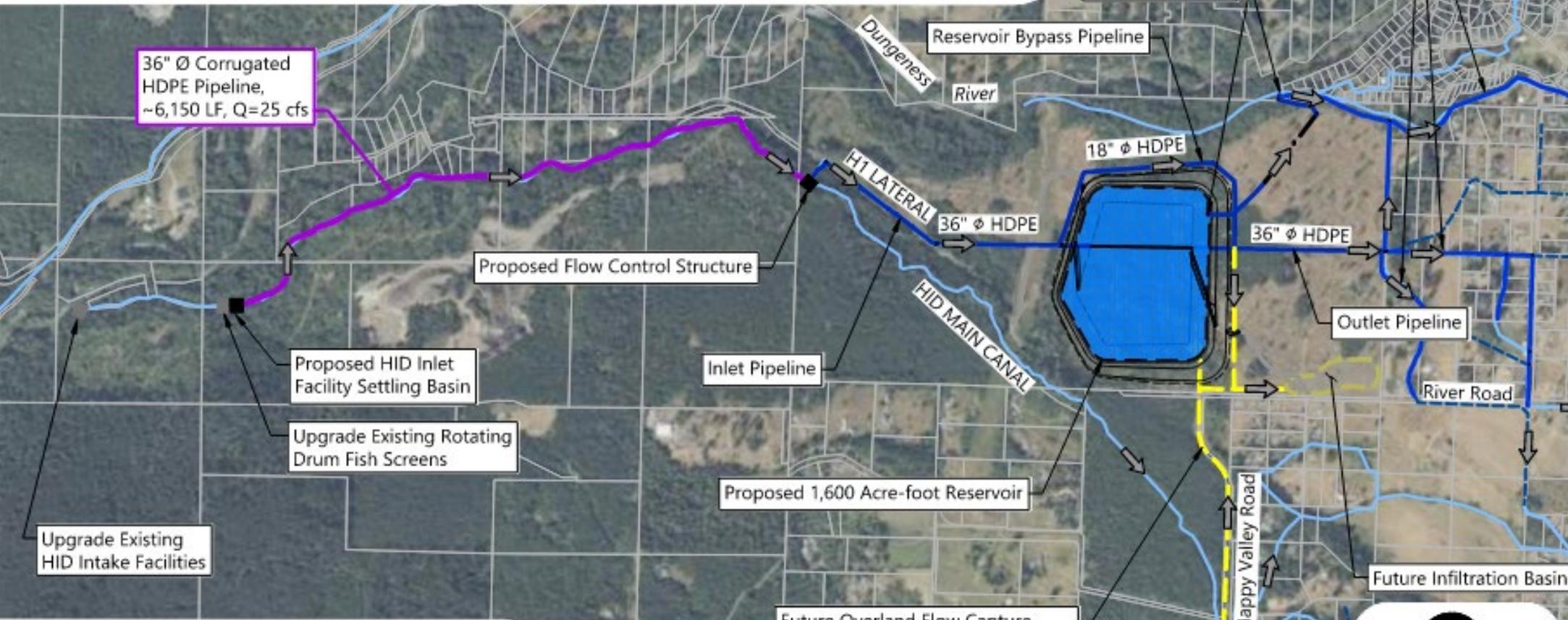
Overview of Presentation

- Summary of outreach and coordination since preliminary design
- Summary of field work completed since preliminary design
- Summary of additional reservoir configurations evaluated
- Recommended next steps

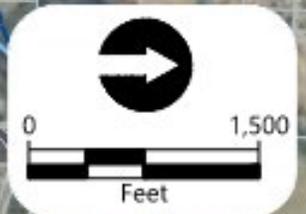
Overview - Key Project Elements

LEGEND:

- Parcels (Clallam County GIS)
- Existing Irrigation Ditches and Laterals (GIS 2021)
- Existing Irrigation Pipelines (GIS 2021)
- Proposed HID Main Canal Pipeline
- Other Proposed Irrigation Pipelines
- Future Pipeline (Not part of this project)
- Proposed Reservoir
- Future Infiltration Area (Not part of this project)
- Existing Structure
- Proposed Structure
- Future Structure (Not part of this project)
- Flow Direction

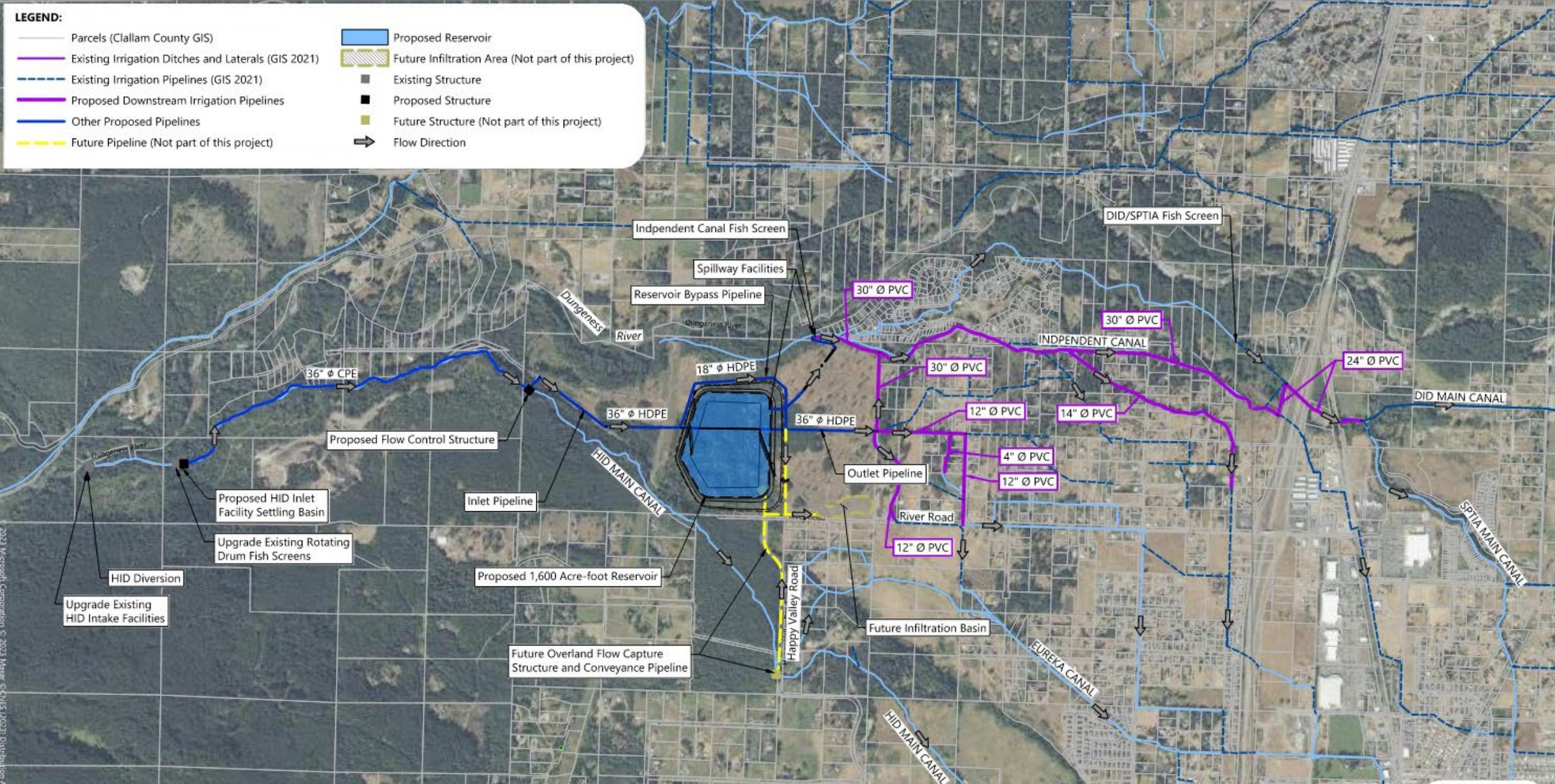


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HORIZONTAL DATUM: Washington State Plane North Zone, NAD83, U.S. Survey Feet
VERTICAL DATUM: NAVD88



LEGEND:

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- Existing Irrigation Pipelines (GIS 2021)
- Proposed Downstream Irrigation Pipelines
- Other Proposed Pipelines
- Future Pipeline (Not part of this project)
- Proposed Reservoir
- Future Infiltration Area (Not part of this project)
- Existing Structure
- Proposed Structure
- Future Structure (Not part of this project)
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Comprehensive Project Overview

Why This Reservoir Location?

- Ability to fill and release water from reservoir by gravity
- Location within watershed, upslope of most of the irrigation demand on east side of Dungeness River
- Proximity to existing irrigation infrastructure
- Large site with areas cleared by relatively recent timber harvest
- Anticipated availability of suitable on-site earthen materials for embankment construction
- Access to glacial till layer for use as liner, embankment core material

Summary of Work Completed

Public Outreach, Coordination with Dungeness Reservoir Work Group

Public Comment and Response

- Public Meeting held December 6, 2023
- Additional comments provided via web site, email, phone calls to County Project Manager
- Comments reviewed and discussed with consultant team
- Frequently Asked Questions (FAQ) document prepared to address key questions and provide additional information to public
- FAQ document is available via project web site
- Request that reservoir height and volume of water stored above-ground be reviewed and reduced, if possible

Coordination with Dungeness Reservoir Work Group

- Engaged in additional meetings with members of the Dungeness River Work Group based on specific topics of concern:
 - Fish passage, HID intake/screening facility modifications, flow benefit
 - WDFW, Jamestown S’Klallam Tribe
 - Water rights, water balance
 - Dungeness Water Users Association, Clallam Conservation District
- Monthly meetings with Dungeness River Work Group
- Response to Dungeness River Work Group comments
 - Key members have provided comment letters
 - Comments have been entered into a tracking table and responses have been provided by the County and their consultant team

Summary of Work Completed

Field Investigations

Additional Field Work Completed

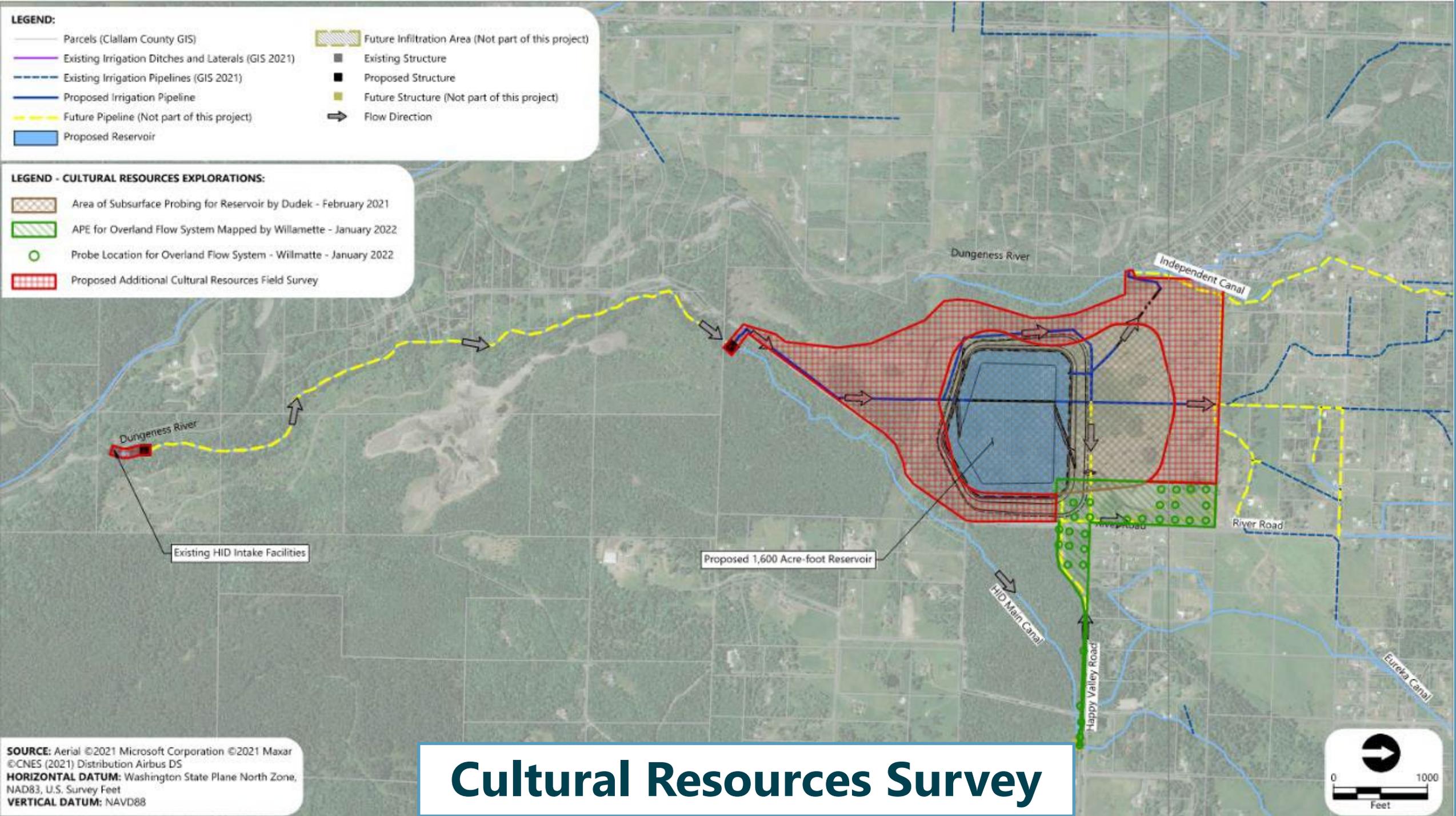
- Supplemental topographic survey
- Cultural resources
- Utility location in River Road with City of Sequim
- Geotechnical
 - Geophysical survey
 - Borings on HID Canal near intake facilities and at location of flow control structure
 - Seismic reconnaissance

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- Flow Direction

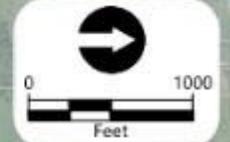
LEGEND - CULTURAL RESOURCES EXPLORATIONS:

- Area of Subsurface Probing for Reservoir by Dudek - February 2021
- APE for Overland Flow System Mapped by Willamette - January 2022
- Probe Location for Overland Flow System - Willamette - January 2022
- Proposed Additional Cultural Resources Field Survey



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Cultural Resources Survey



Seismic Review – Prior to Preliminary Design

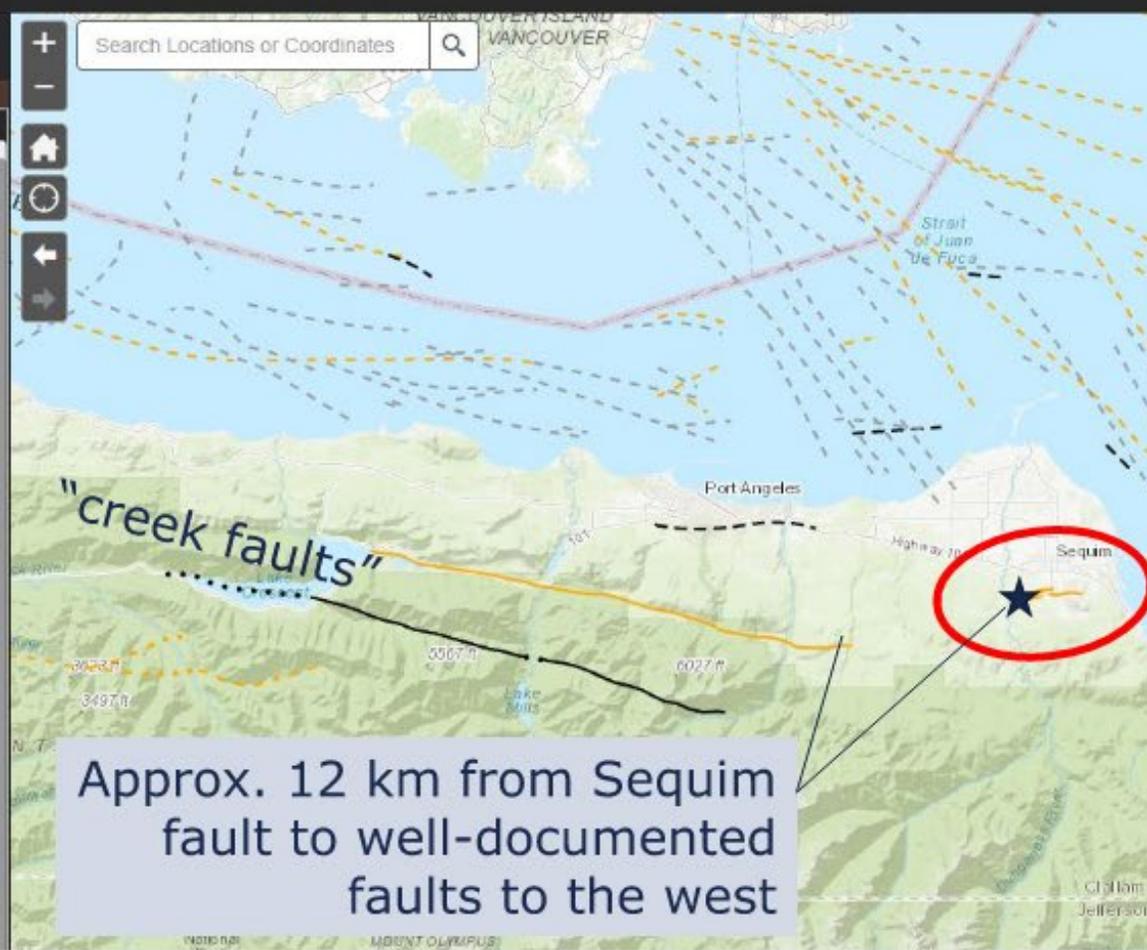
- 2007 USGS Study
 - Fault line mapped at site, referred to as “Sequim Fault”
 - Study did not provide explanation or basis for mapping
- 2020 PanGEO Report
 - County contracted with PanGEO to complete feasibility review
 - Review of available geologic information
 - Site review with geologists from USGS
 - Initial geologic map and LiDAR topographic data review
 - Found no explanation of mapping of “Sequim Fault”
 - Found “no identifiable evidence of faulting in the project area”
 - Recommended review of excavations for any “soil anomalies”

Legend

Qfaults

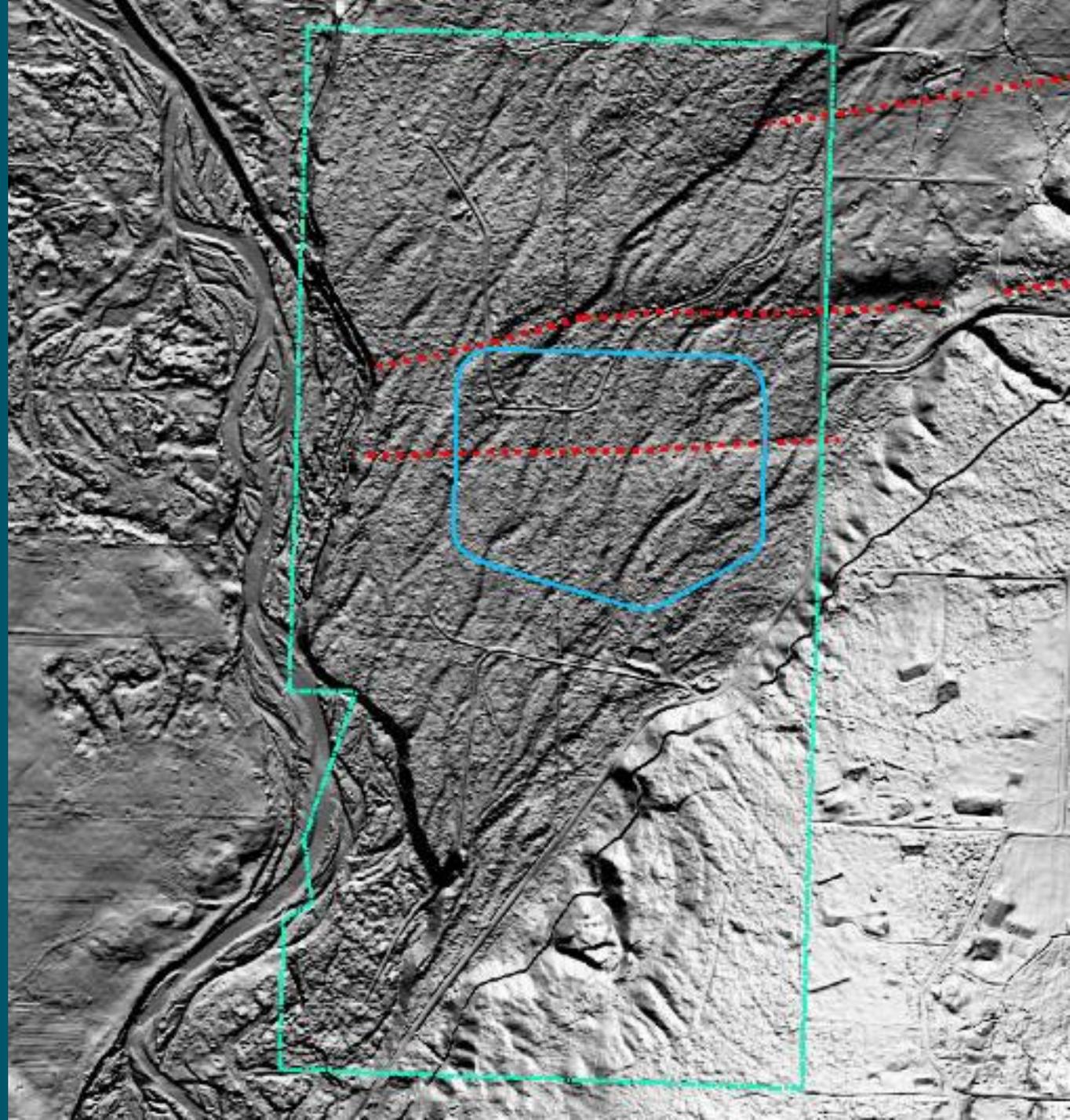
National Database

- Historic (< 150 years), well constrained location
- Historic (< 150 years), moderately constrained location
- Historic (< 150 years), inferred location
- Latest Quaternary (<15,000 years), well constrained location
- Latest Quaternary (<15,000 years), moderately constrained location
- Latest Quaternary (<15,000 years), inferred location
- Late Quaternary (< 130,000 years), well constrained location
- Late Quaternary (< 130,000 years), moderately constrained location
- Late Quaternary (< 130,000 years), inferred location
- Middle and late Quaternary (< 750,000 years), well constrained location
- Middle and late Quaternary (< 750,000 years), moderately constrained location
- Middle and late Quaternary (< 750,000 years), inferred location
- Undifferentiated Quaternary (< 1.6 million years), well constrained location
- Undifferentiated Quaternary (< 1.6 million years), moderately constrained location
- Undifferentiated Quaternary (< 1.6 million years), inferred location
- Unspecified age, well constrained location
- Unspecified age, moderately constrained



2023 Review by Shannon & Wilson

- Desktop review, including analysis and interpretation of LiDAR topographic data for potential surface deformation
- Site review
- Identified subtle linear topographic features (lineaments) that suggest presence of faults



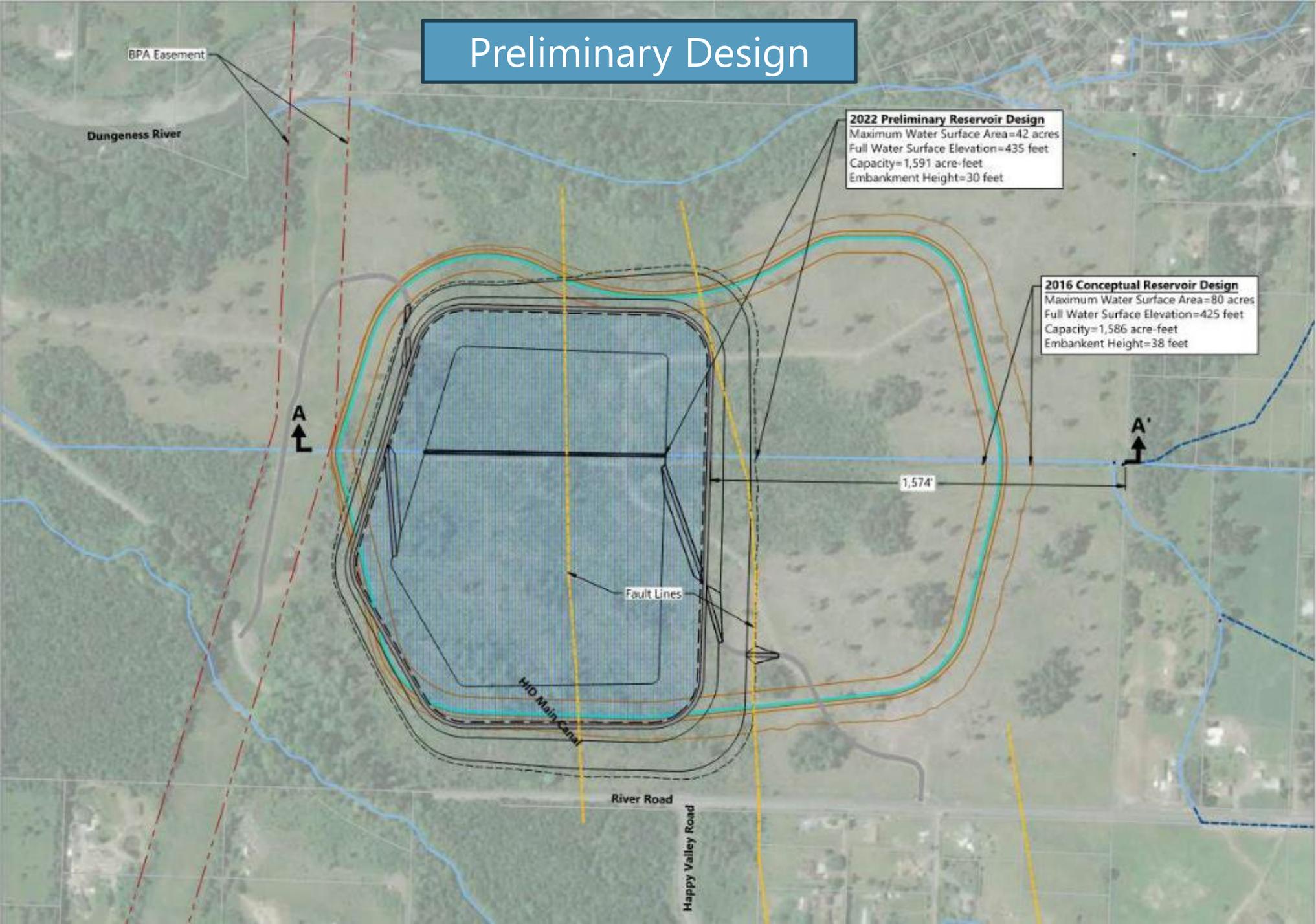
Summary of Design Analysis

Additional Reservoir Configurations

Seismic Review – Prior to Preliminary Design

- Preliminary Design
- Options A - C
 - Designed to be responsive to public comment about height of embankment and volume of water stored above-ground
- Option D
 - Completed after seismic reconnaissance to look at potential for shifting reservoir south to avoid overlap with fault zone mapped by Shannon & Wilson
 - Also designed to be responsive to public comment about height of embankment and volume of water stored above-ground
 - Configured to minimize impact on BPA easement

Preliminary Design

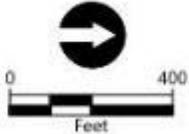


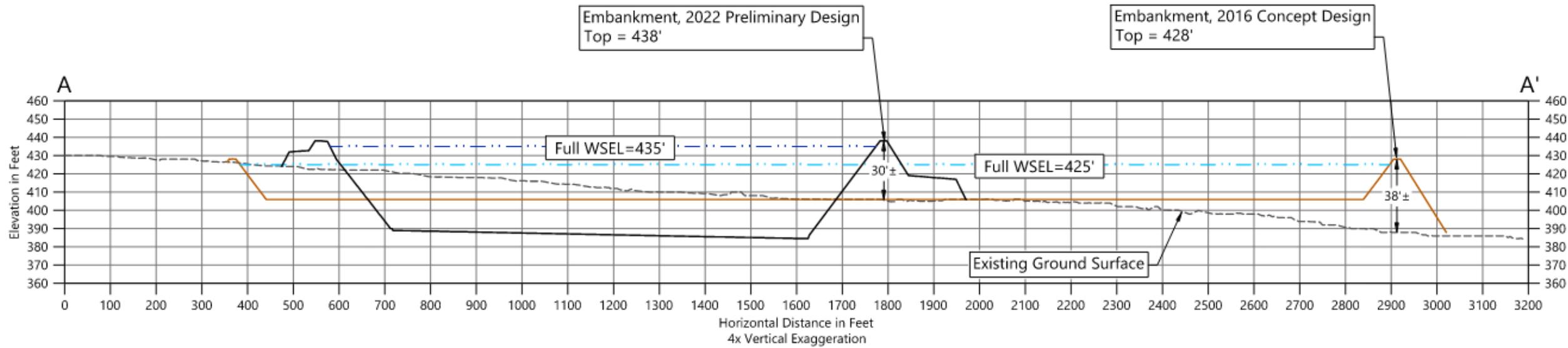
2022 Preliminary Reservoir Design
Maximum Water Surface Area=42 acres
Full Water Surface Elevation=435 feet
Capacity=1,591 acre-feet
Embankment Height=30 feet

2016 Conceptual Reservoir Design
Maximum Water Surface Area=80 acres
Full Water Surface Elevation=425 feet
Capacity=1,586 acre-feet
Embankment Height=38 feet

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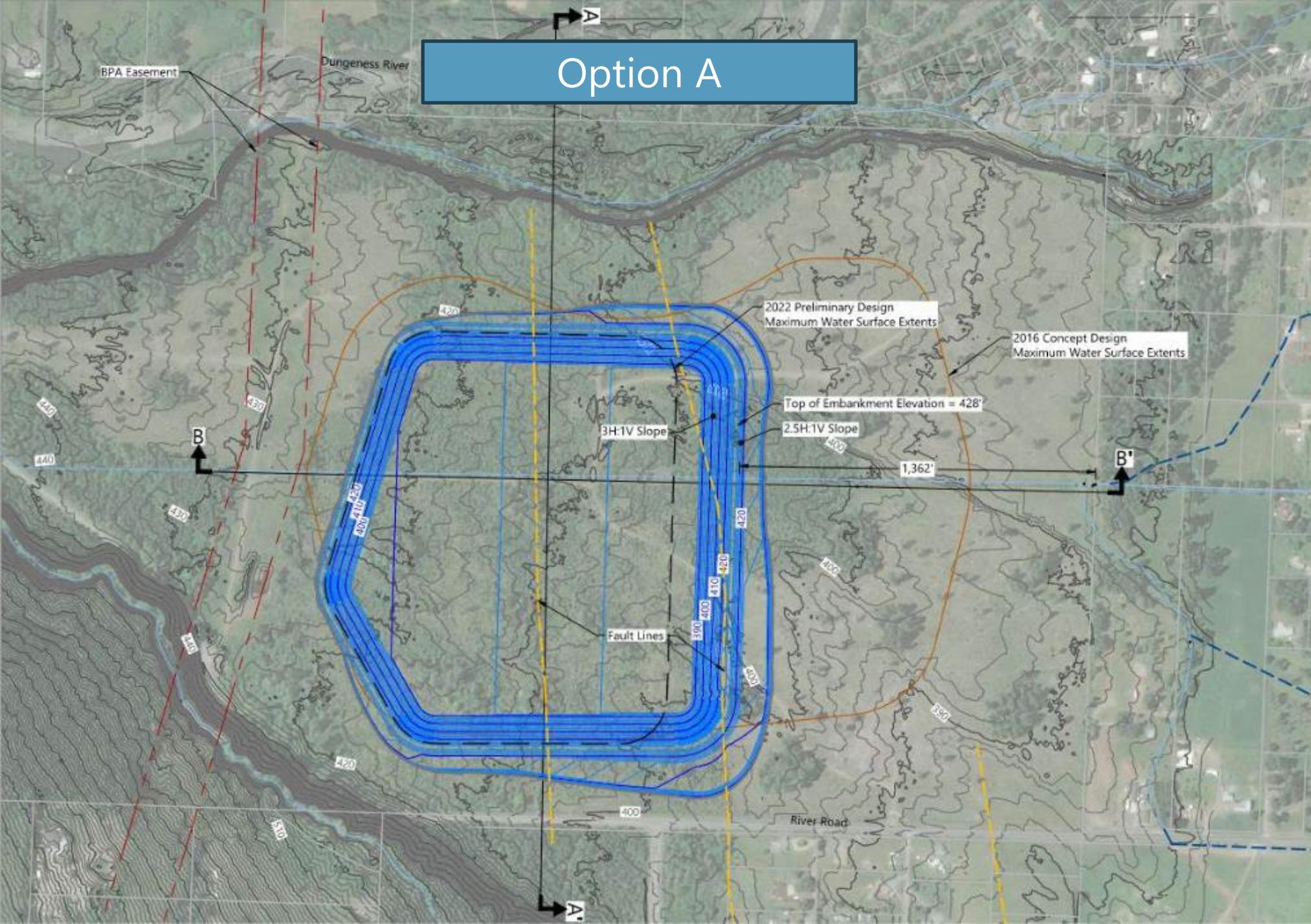
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 - - - Existing BPA Easement
 - Topographic lineaments mapped through detailed seismic reconnaissance that indicate presence of past movement due to fault
- A**
↑
L
- Cross Section Location and Designation





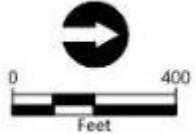
Preliminary Design Compared to 2016 Concept Design

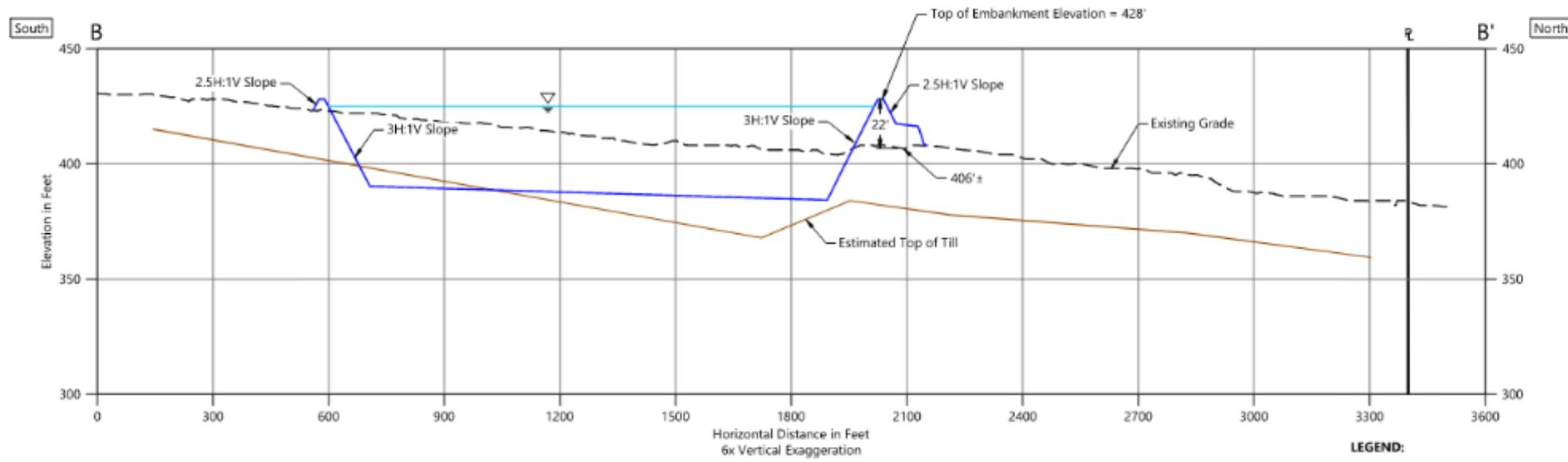
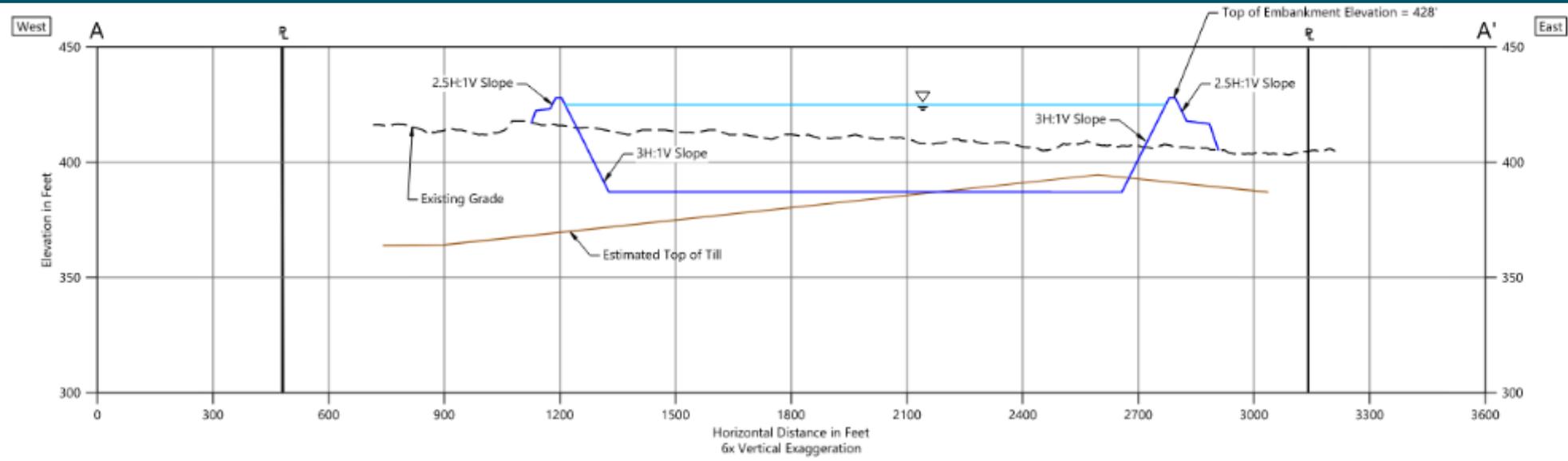
Option A



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- LEGEND:**
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 - Existing Contours (2' & 10' Intervals)
 - Proposed Contours (2' & 10' Intervals)
 - Existing BPA Easement
 - Topographic lineaments mapped through detailed seismic reconnaissance that indicate presence of past movement due to fault
 - Proposed Full Reservoir Water Surface from 2016 Concept Design
 - Proposed Full Reservoir Water Surface from 2021 30% Design
 - Cross Section Location and Designation

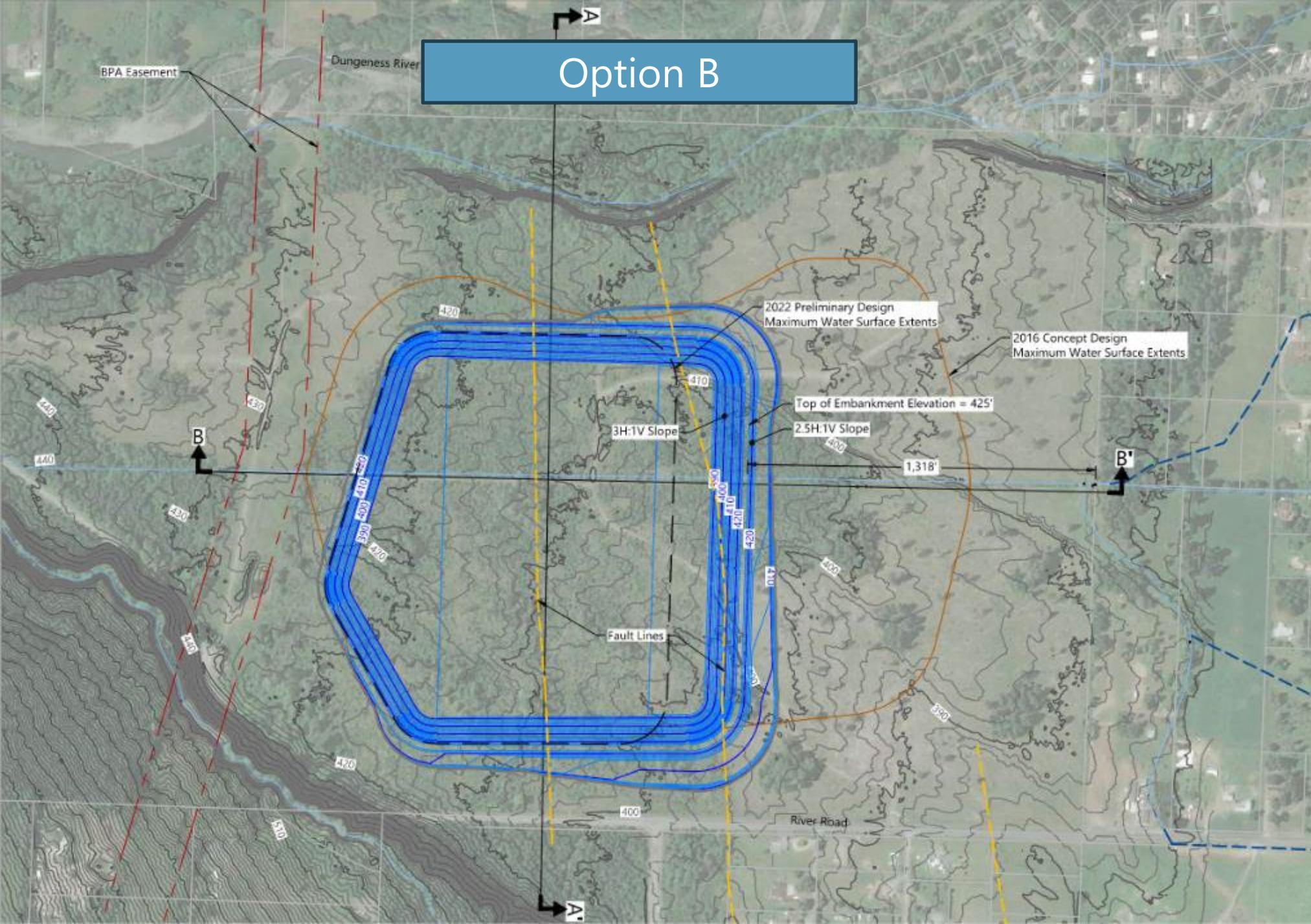




- LEGEND:**
- Existing Grade
 - Proposed Grade
 - ▽ Proposed Water Surface Elevation
 - Estimated Till

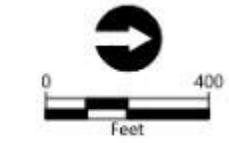
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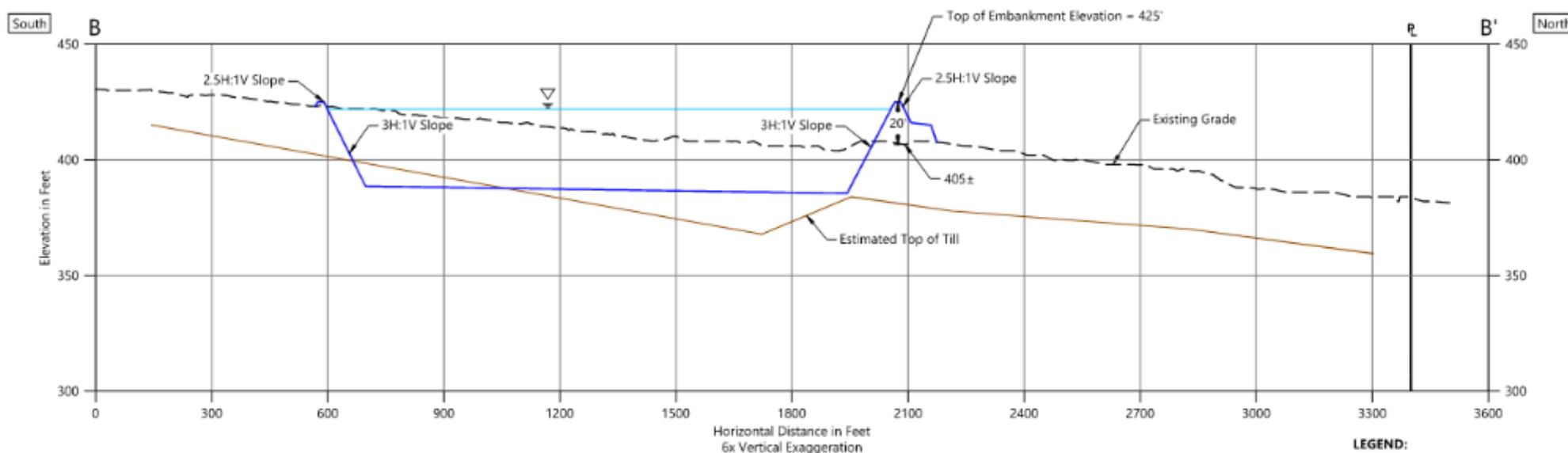
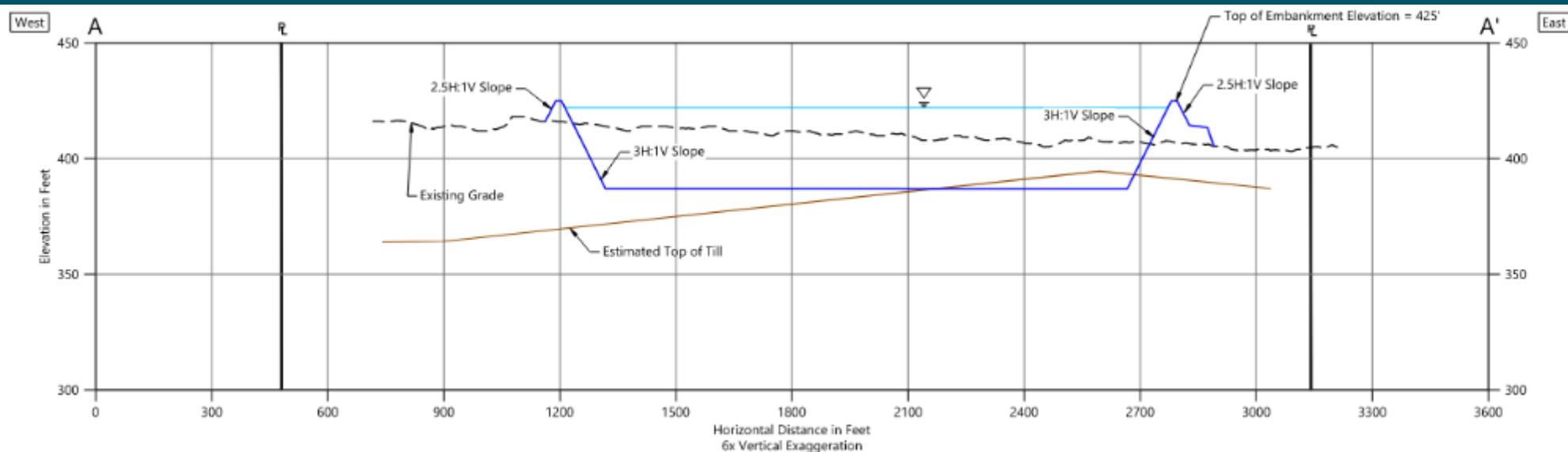
Option B



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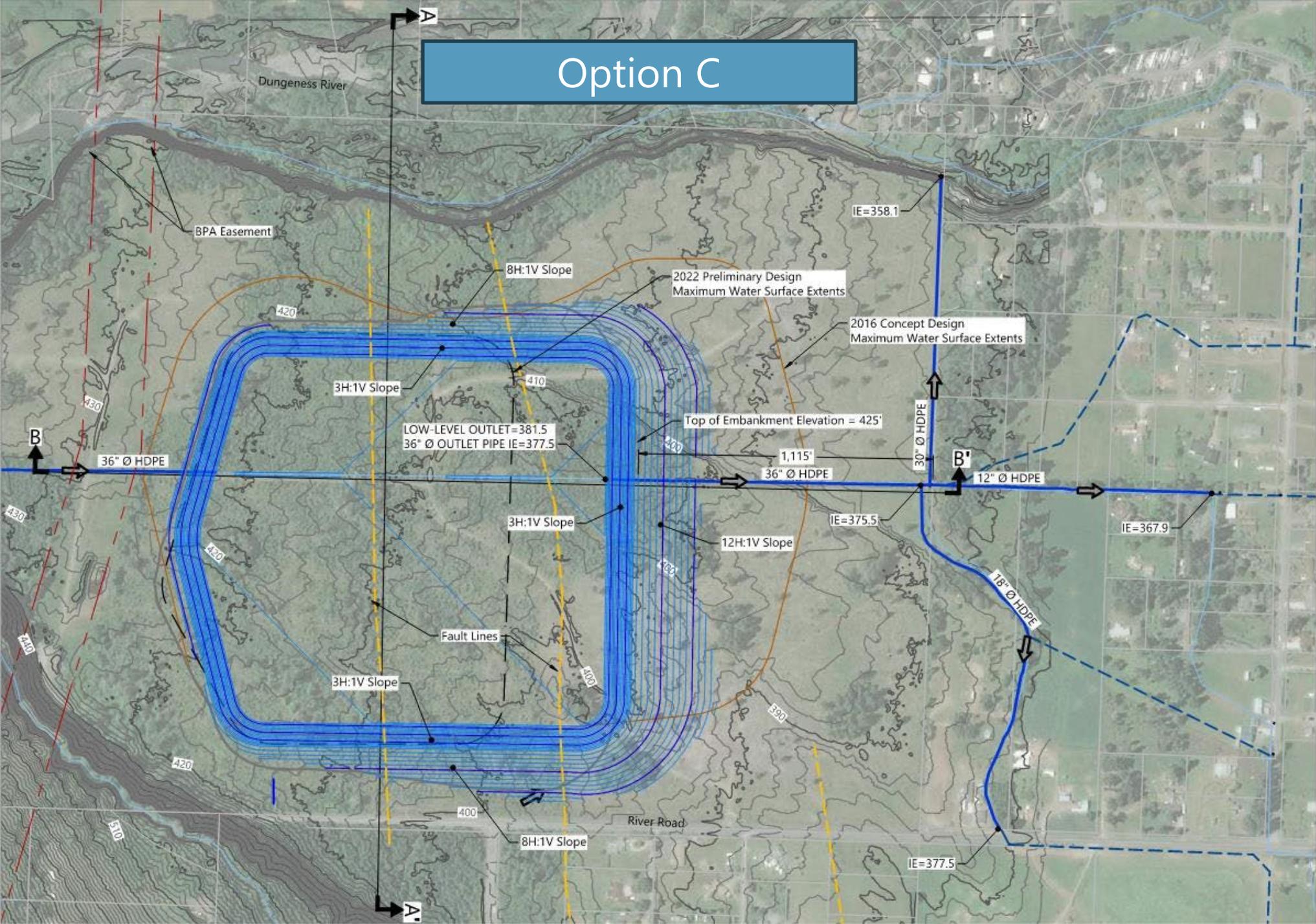




Option B

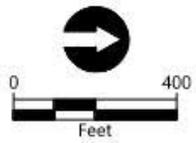
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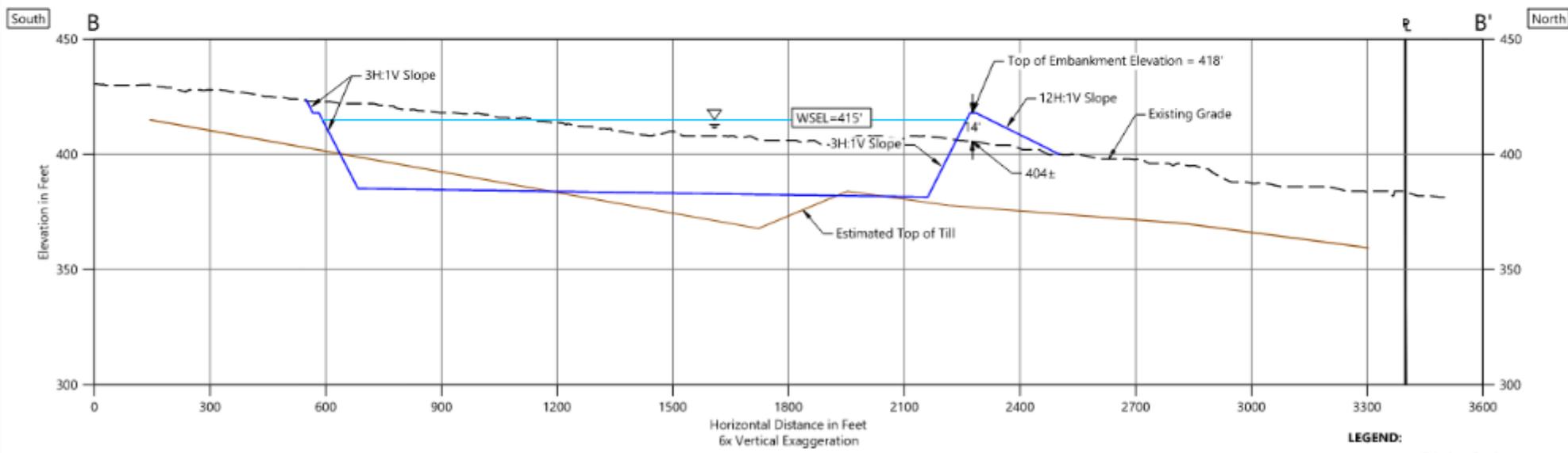
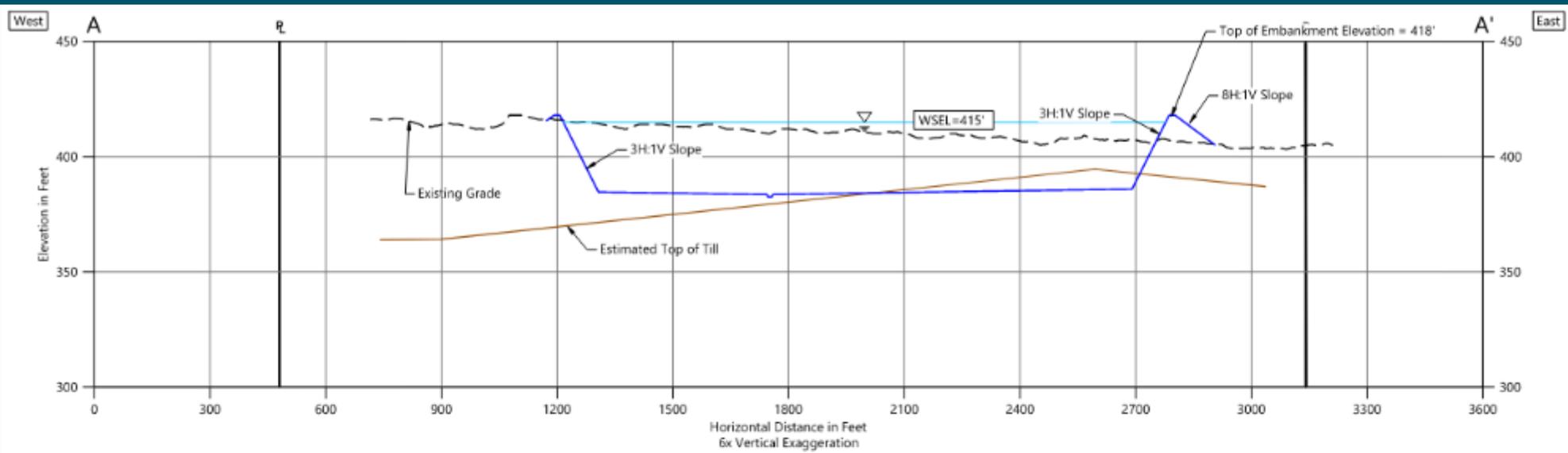
Option C



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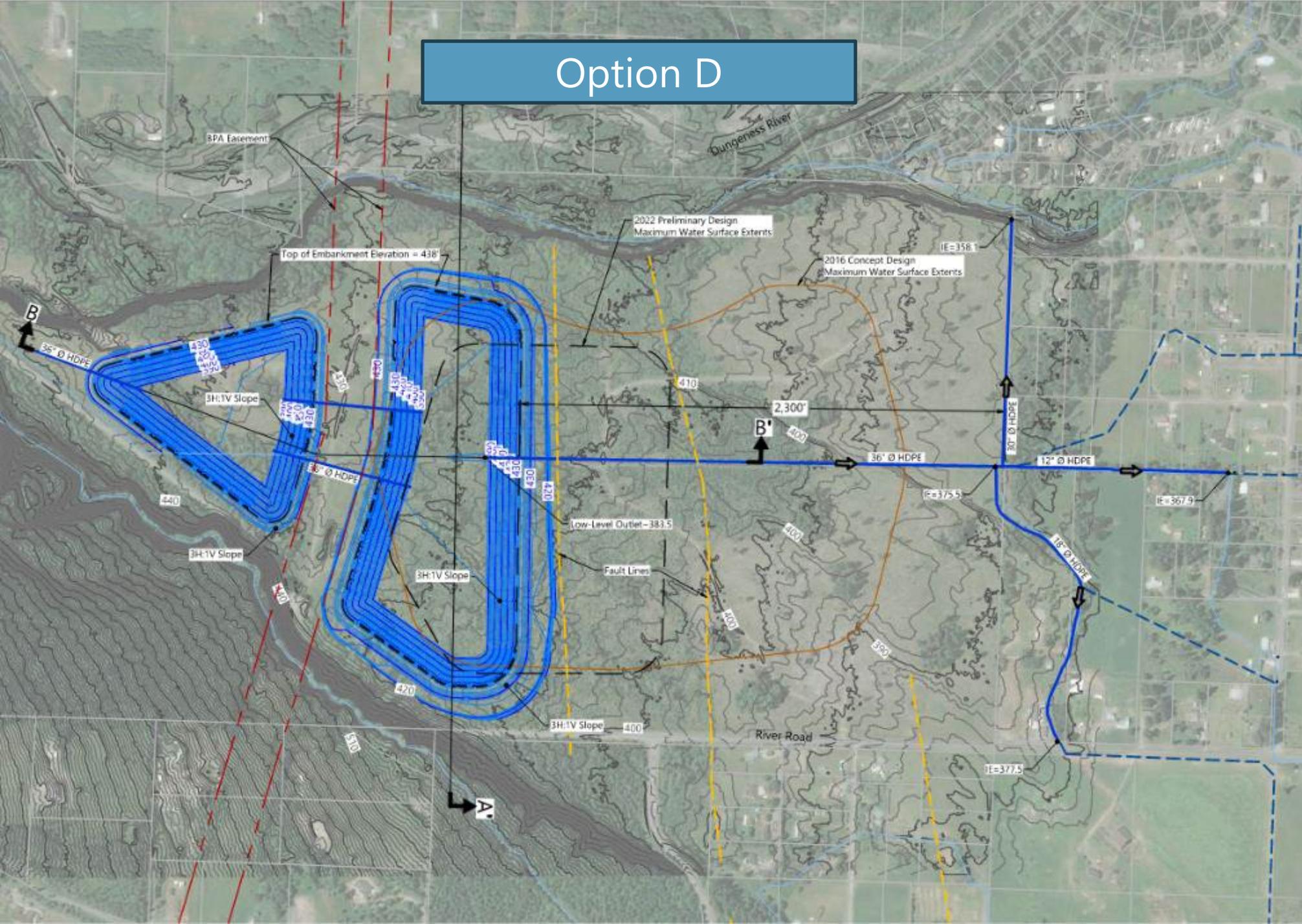




- LEGEND:**
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 - Proposed Grade
 - ▽ Proposed Water Surface Elevation
 - Estimated Till

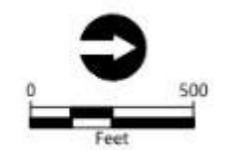
Option C

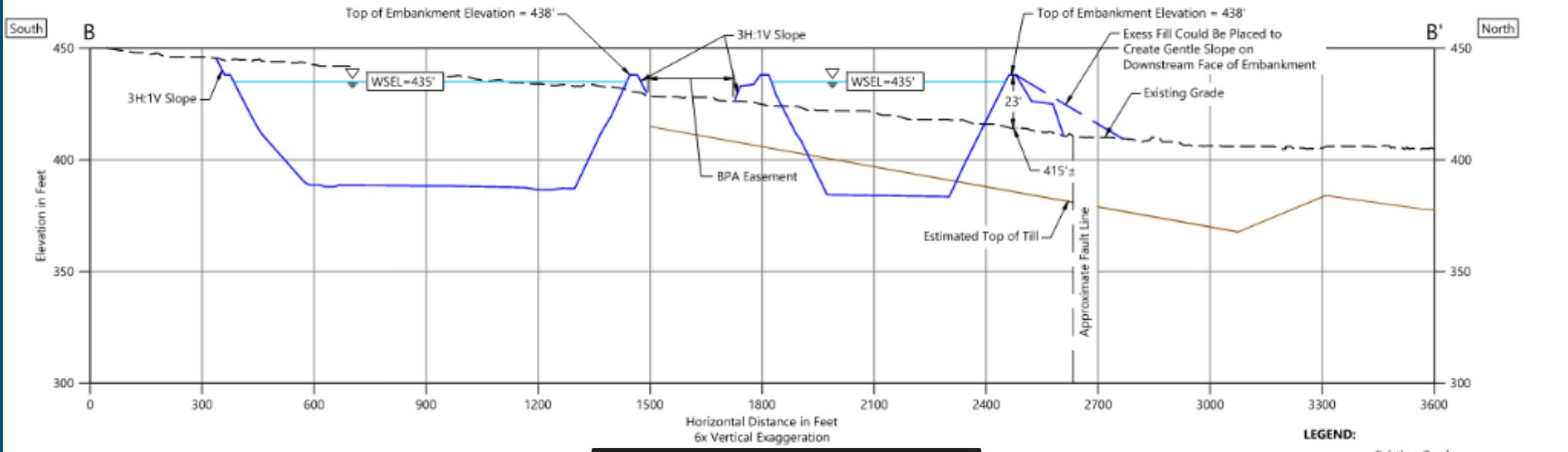
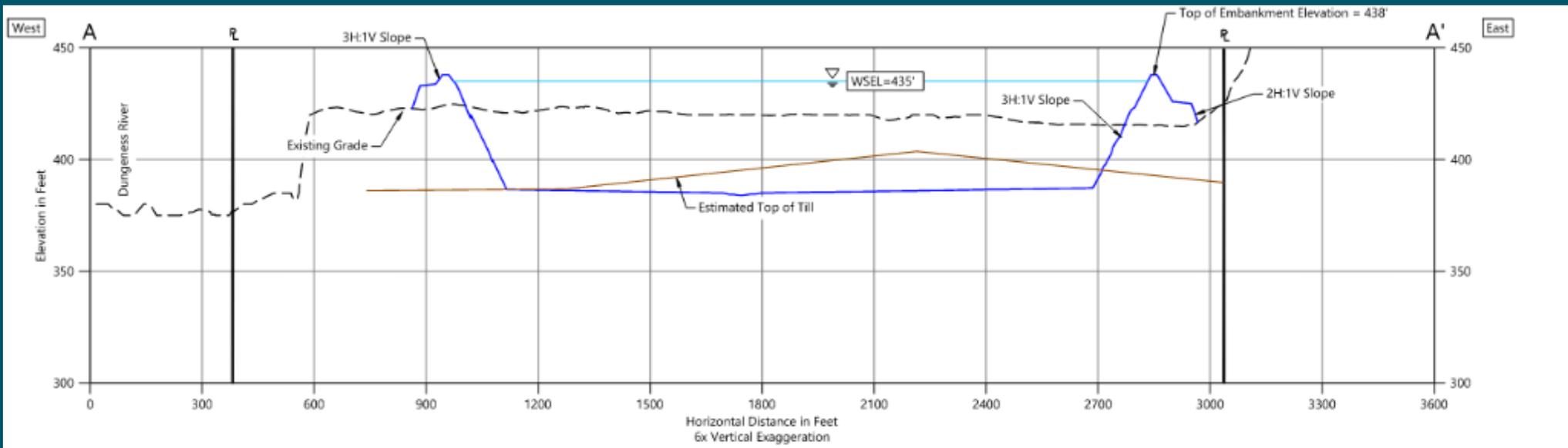
Option D



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 - Cross Section Location and Designation





- LEGEND:**
- Existing Grade
 - Proposed Grade
 - ▽ Proposed Water Surface Elevation
 - Estimated Till

Option D

Summary of Option Reservoir Configurations

Design Variable	Preliminary Design	Option A	Option B	Option C	Option D
Maximum WSEL	435 feet	425 feet	422 feet	415 feet	435 feet
Storage Capacity	1,591 Acre-feet	1,595 Acre-feet	1,544 Acre-feet	1,591 Acre-feet	1,420 Acre-feet
Height of N Embankment	30 feet±	22 feet±	20 feet±	14 feet±	23 feet±
Maximum Depth of Water Above Ex Ground	27 feet±	19 feet±	17 feet±	11 feet±	20 feet±
Total Excavation	1,243,501 CY	1,590,557 CY	1,681,850 CY	2,603,569 CY	1,745,452 CY
Distance from N Property Boundary	1,574 feet	1,362 feet	1,320 feet	1,115 feet	2,285 feet
Total Fill Required	642,529 CY	364,723 CY	280,226 CY	274,989 CY	363,563 CY
Cost of Key Elements	\$38.8 million	\$41.2 million	\$42.4 million	\$44.5 million	\$43.6 million

Notes:

CY: Cubic Yard

Ex: Existing

N: North

WSEL: Water Surface Elevation

Other Potential Design and Permitting Costs

- Additional field work, analysis, re-design of the embankment, and coordination with Ecology's Dam Safety Office in response to seismic reconnaissance findings;
+ \$380,000 to \$1,010,000 (based on design configuration selected)
- Additional field work, re-design, and permitting work related to shifting or expanding the footprint of the reservoir from what was included in preliminary design
+ \$5,000 to \$140,000 (based on design configuration selected)
- Design of other elements that the Work Group has requested be included in the project, including downstream irrigation pipelines and a drought pump station
+ \$550,000 to \$750,000 (based on elements included)

Other Potential Construction Costs

- Added materials and labor costs for an expanded embankment needed to address the potential movement or rupture along or near fault lines
+\$2,200,000 to \$8,400,000 (based on design configuration selected)
- Construction of other elements the Work Group has requested be included in the project, including downstream irrigation pipelines and a drought pump station
+\$4,550,000 to \$6,000,000 (based on elements included)
- Inflation from the time unit prices were developed to for the preliminary opinion of cost (February 2022) to the time of construction
+\$1,900,000 to \$4,400,000 (depending on inflation, time of construction)

Next Steps

Recommended Next Steps

- Develop a phased plan for investigating and characterizing the fault zone identified by Shannon & Wilson
- Review plan with Ecology's Dam Safety Office
- Complete initial phase of investigation, as allowed by Land Lease or Property Acquisition with DNR (or investigate at off-site locations)
- Based on information gathered, determine whether additional investigation is needed
- Based on information gathered, verify which design configurations are viable and select a preferred configuration
- Proceed with additional geotechnical investigations (as needed), permitting, and detailed design
- Continue to identify and secure funding to support design, permitting and construction



Questions and Discussion