

Presented by
Samuel Moore, Battelle Memorial Institute

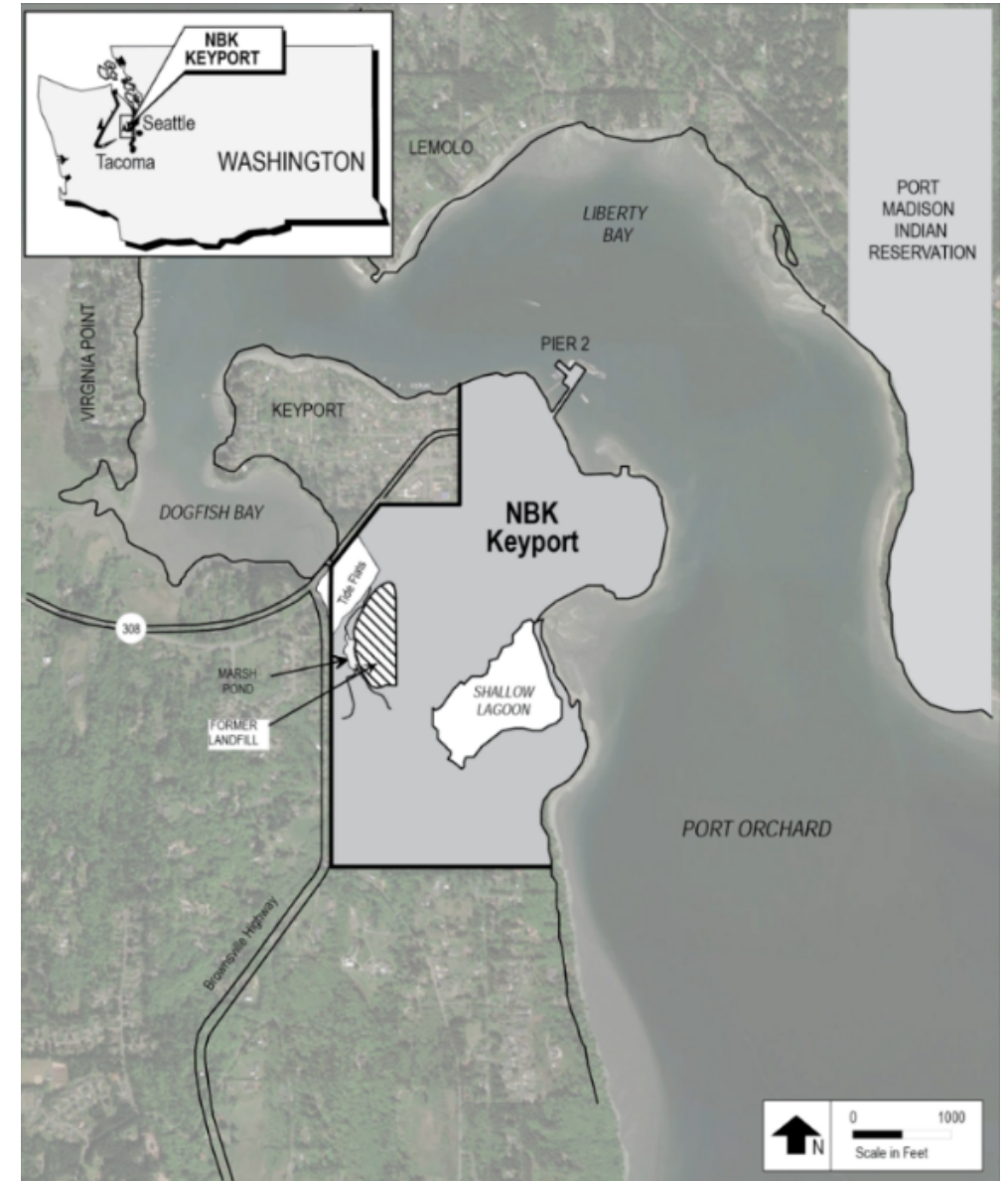
Intertidal Geophysics to Improve Characterization of Groundwater to Surface Water Contaminant Transport

Outline

- Background
 - Site background
 - Conceptual Site Model
 - Goals of the investigation
- Geophysical Evaluation Approach
 - Electrical resistivity tomography
 - Time lapse over low-low tide
- Implications for the Conceptual Site Model
 - Paleochannels as preferential pathways
 - Freshwater/marine water interface migration
- Future Work

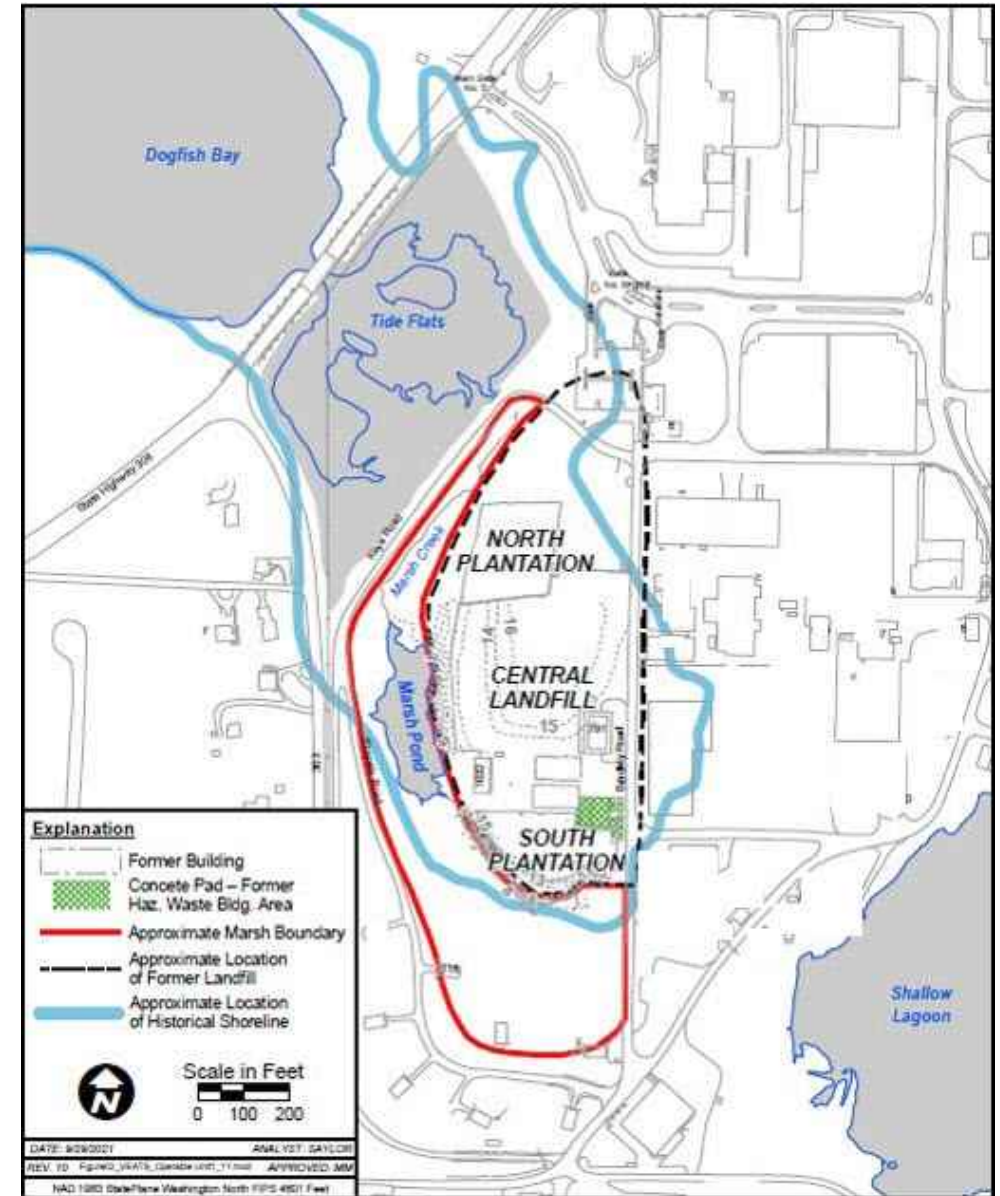
Site Background

- Naval Undersea Warfare Center Division, Keyport is based at Naval Base Kitsap Keyport
- 1998 ROD designated the former Installation landfill Operable Unit 1
- Received domestic and industrial waste, 1930s to 1973
- Waste layer, between 5 and 15 feet thick, fills portion of tidal marsh
- Shallow groundwater between 2.5 and 4 feet below grade
- COCs are TCE/TCA and daughter products

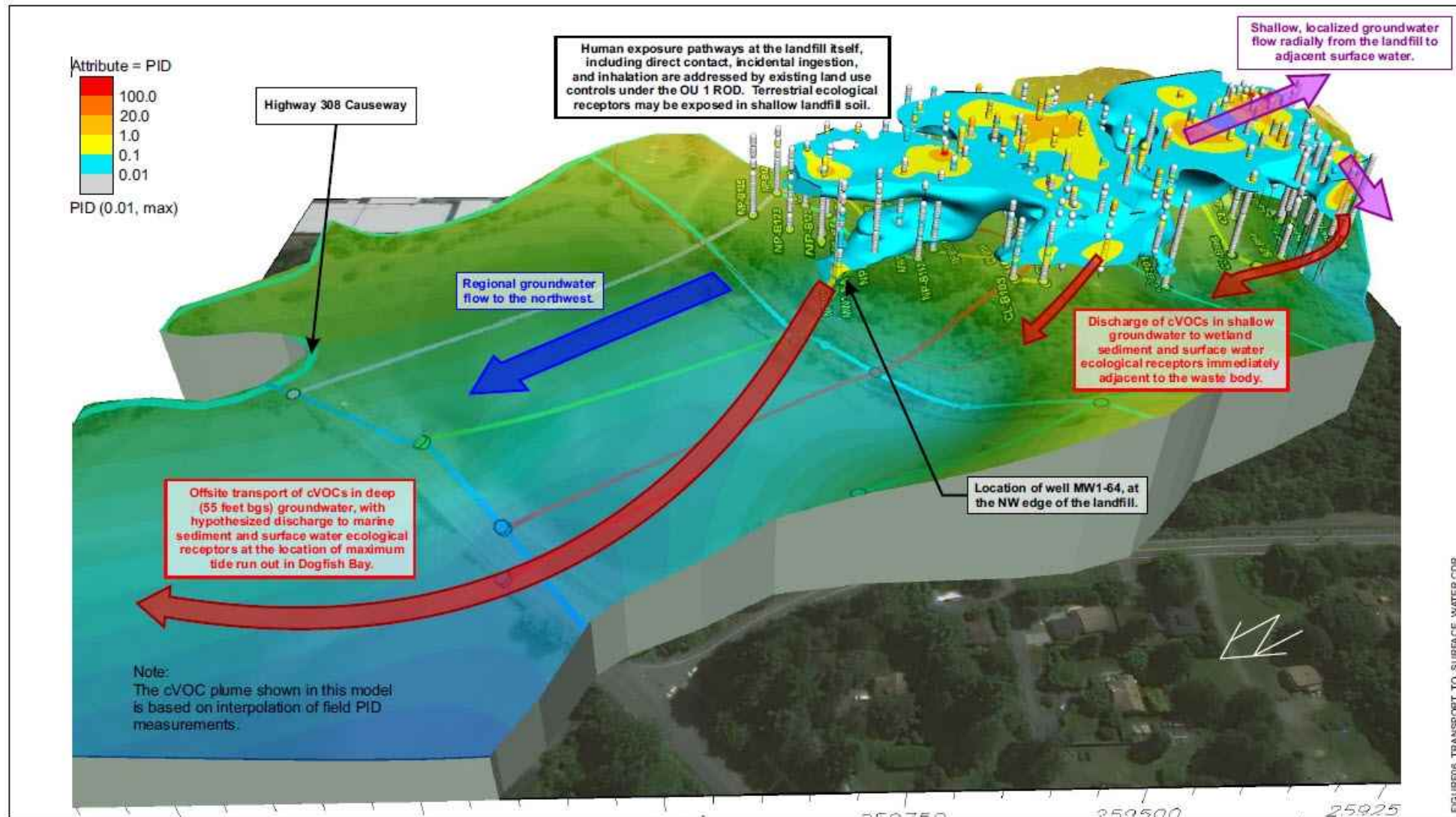


Site Background (Cont.)

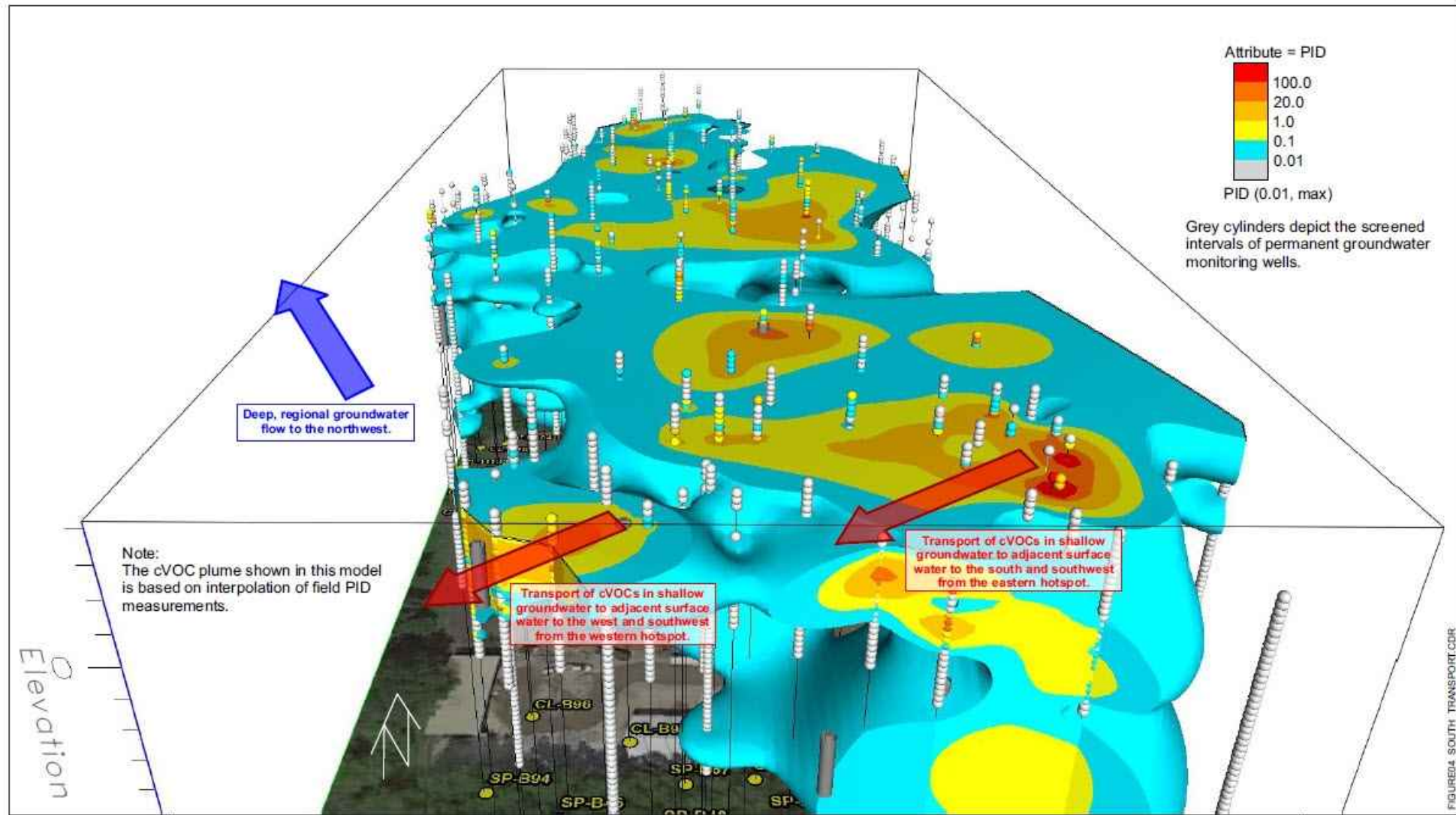
- Selected remedy includes:
 - Phytoremediation by hybrid poplar trees to treat hot spots, including a “north plantation” and “south plantation”
 - Monitored Natural Attenuation
 - Capping and Institutional Controls
- Remedy in place for over 20 years
- Plume size reduced, but cVOC concentrations remain very high beneath south plantation
- Phased investigations were implemented to address regulator and stakeholder concerns regarding the expected restoration timeframe



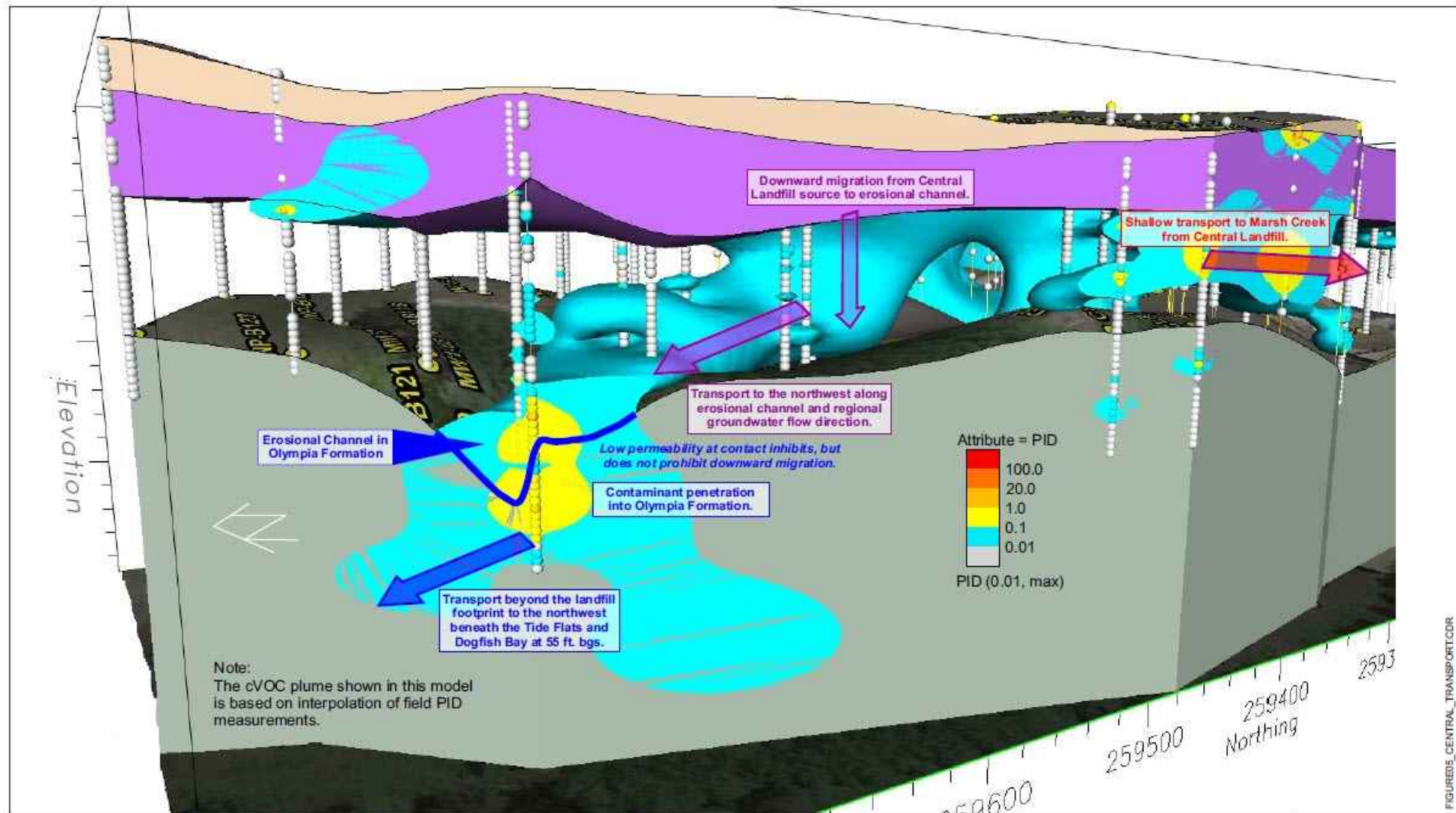
CSM – Groundwater to Surface Water



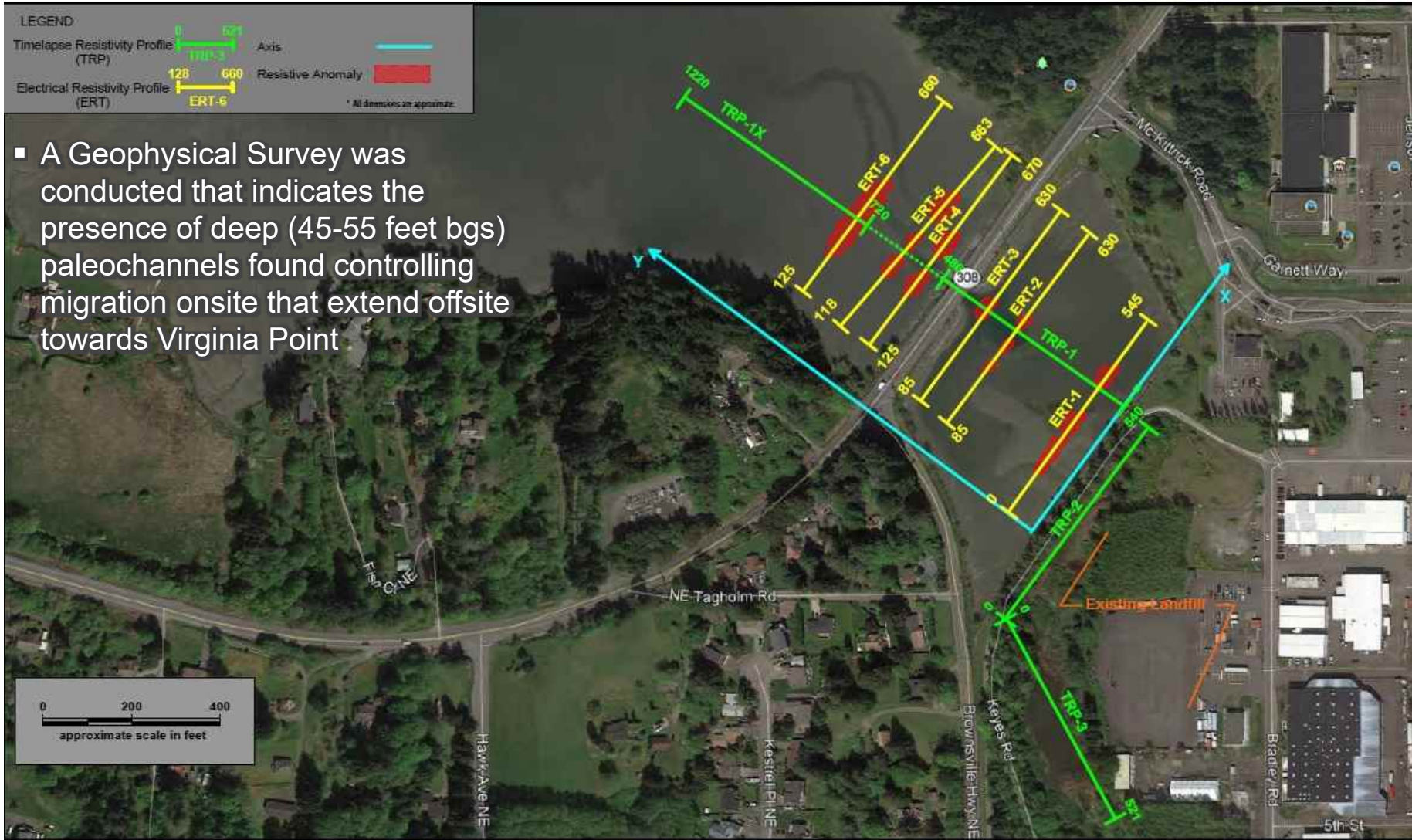
CSM – Southern Landfill



CSM – Central Landfill



Intertidal Geophysical Survey - Layout



Intertidal Geophysical Survey - Method



- High-resolution, multi-electrode electrical resistivity tomography
- Six “static” ERT transects
- Four “time-lapse” TRP transects
- Dipole-Dipole and Strong Gradient electrode configuration

Intertidal Geophysical Survey - Approach

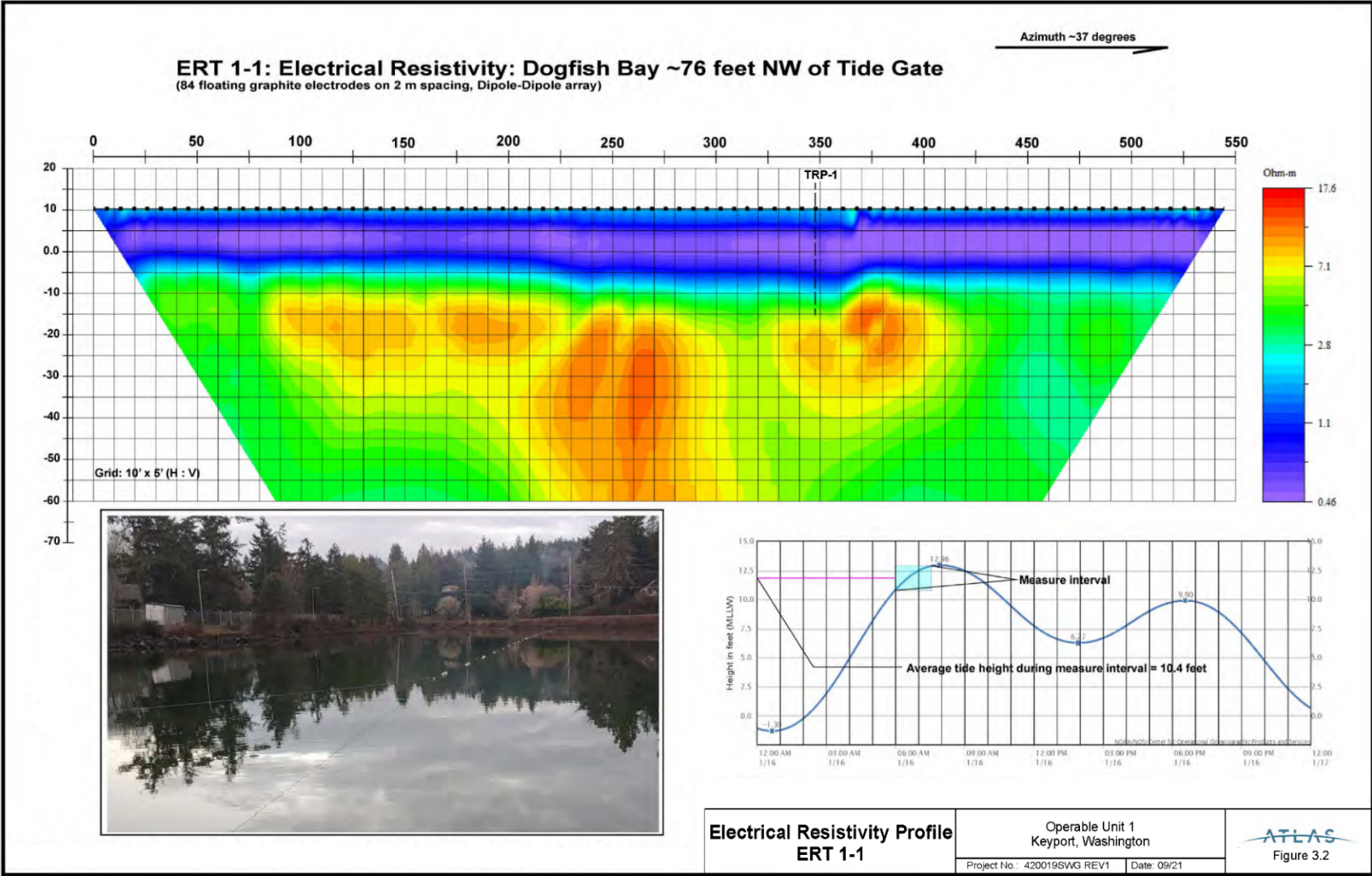


- ERT transects focused on stratigraphy, generally 3 collection cycles each
- TRP transects focused on freshwater/saltwater migration, continuously collected electrical resistivity data over a period of 22 hours

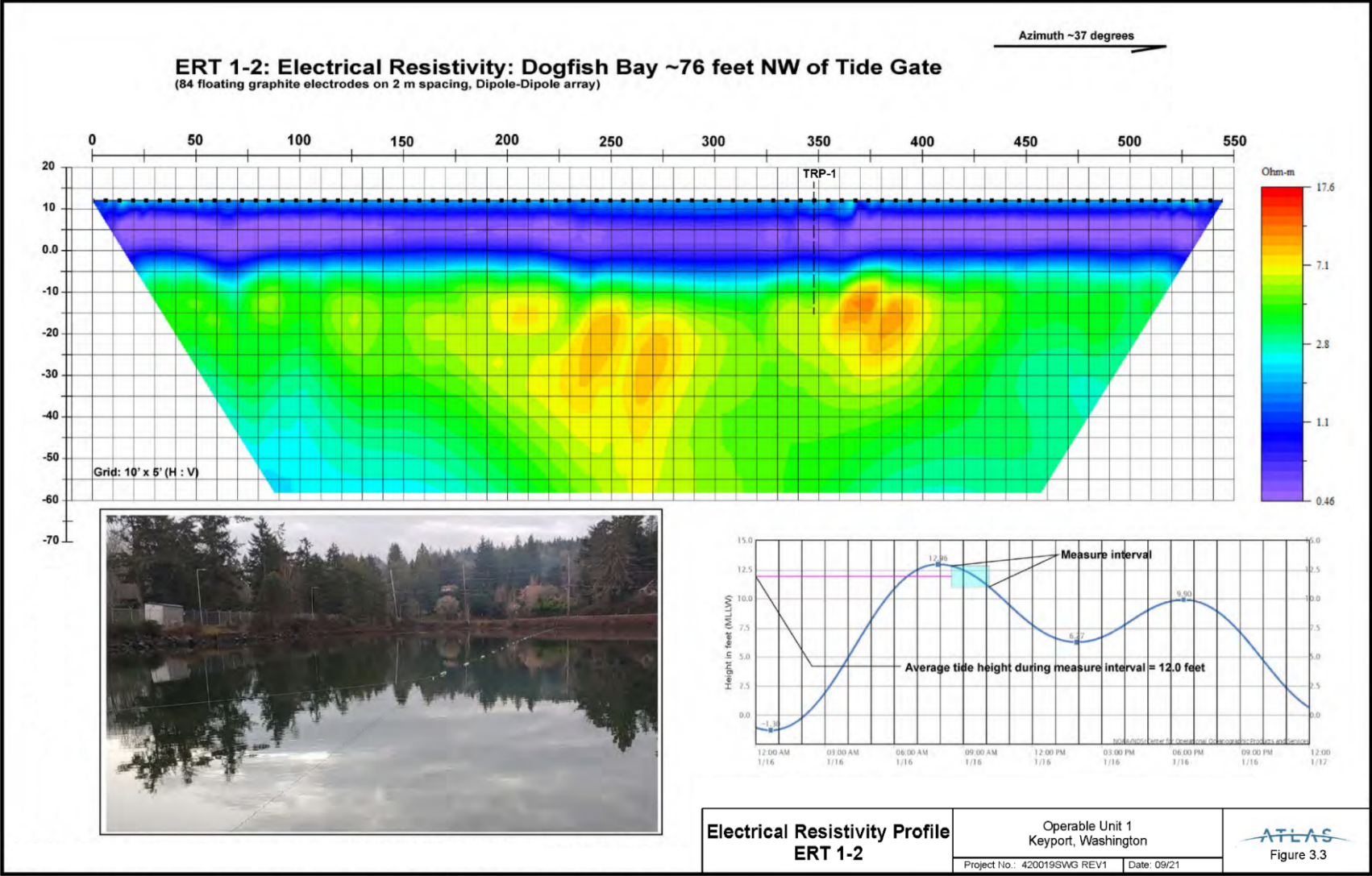
Intertidal Geophysical Survey - Results



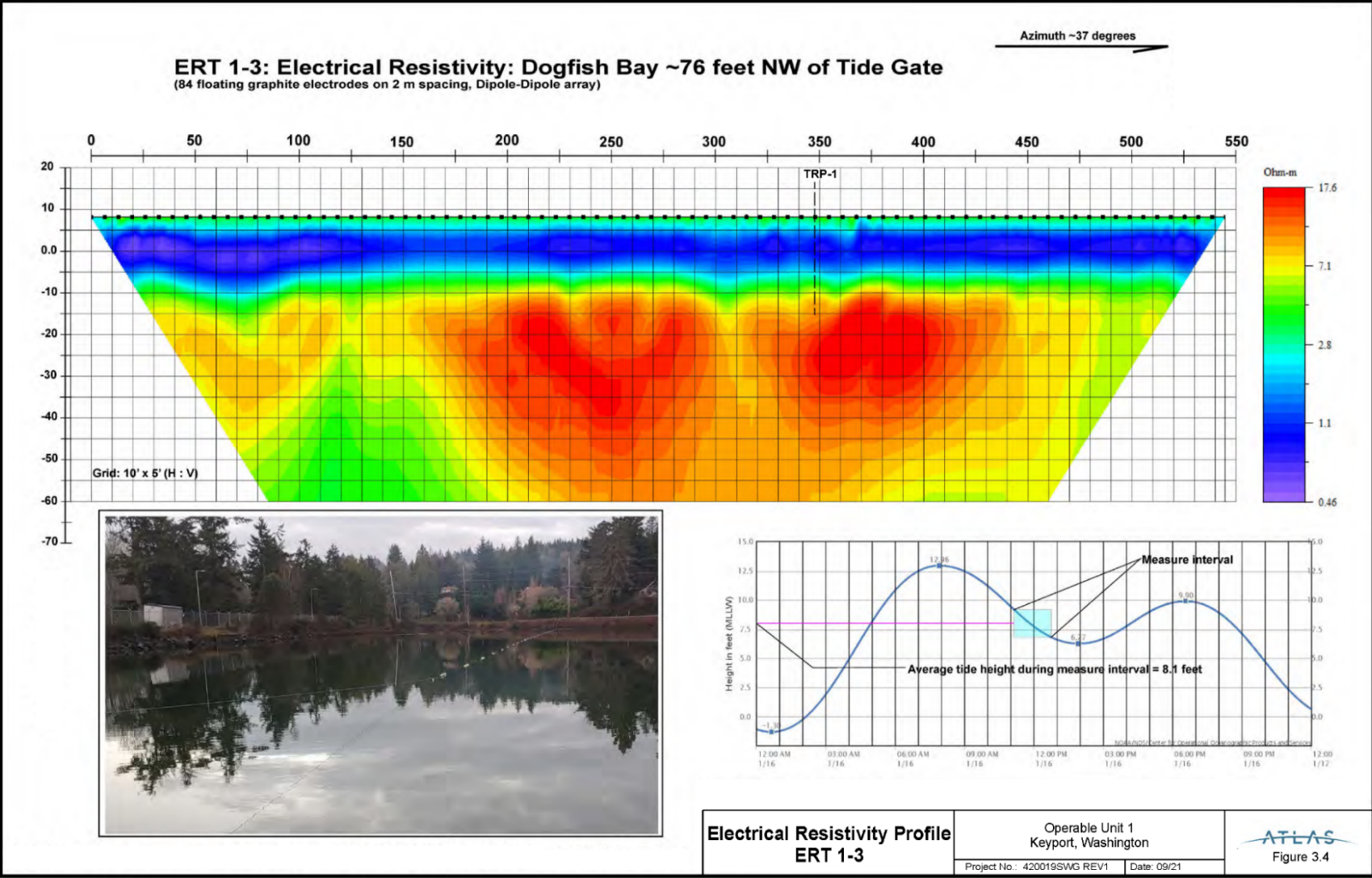
Intertidal Geophysical Survey - Results



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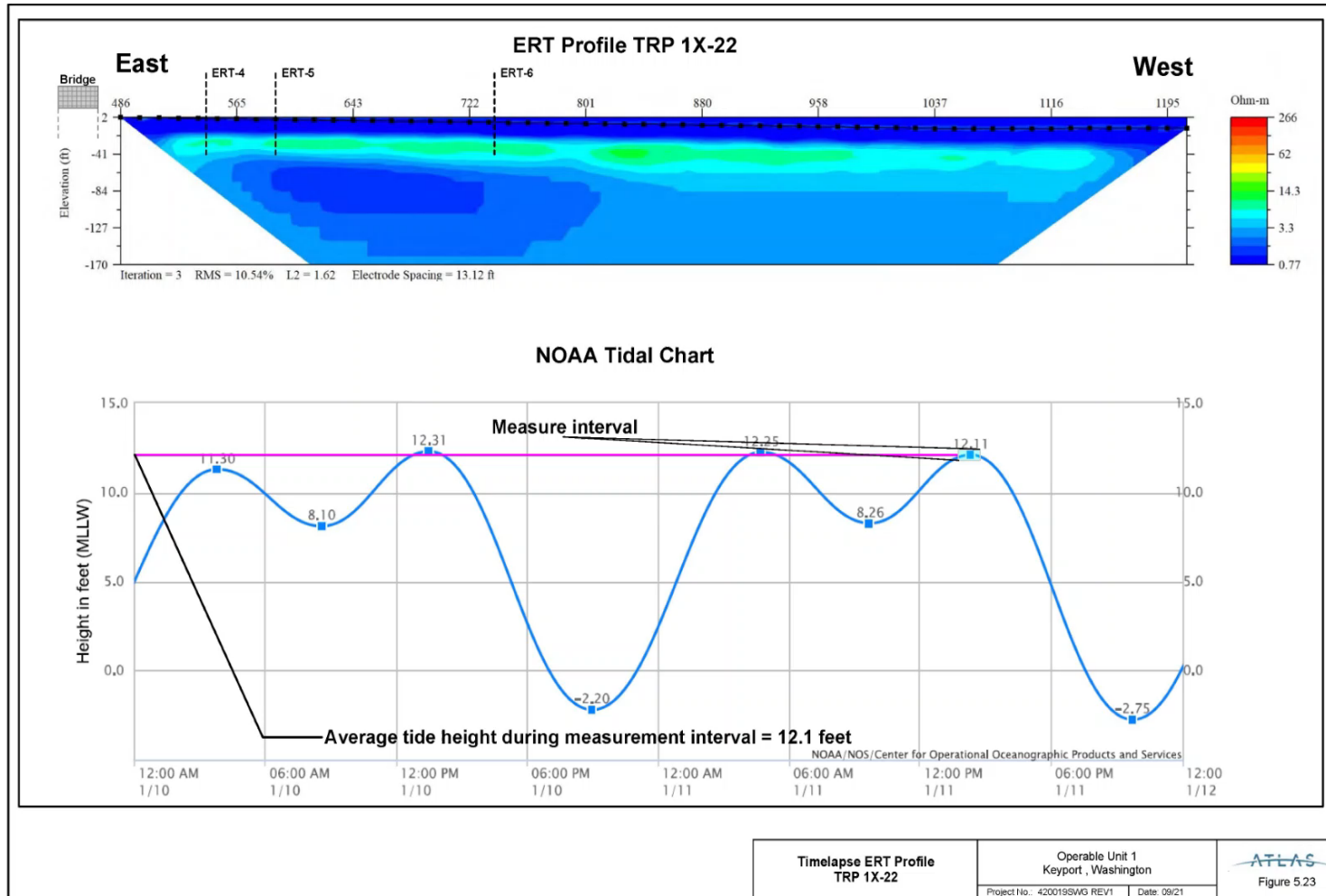


Intertidal Geophysical Survey - Results



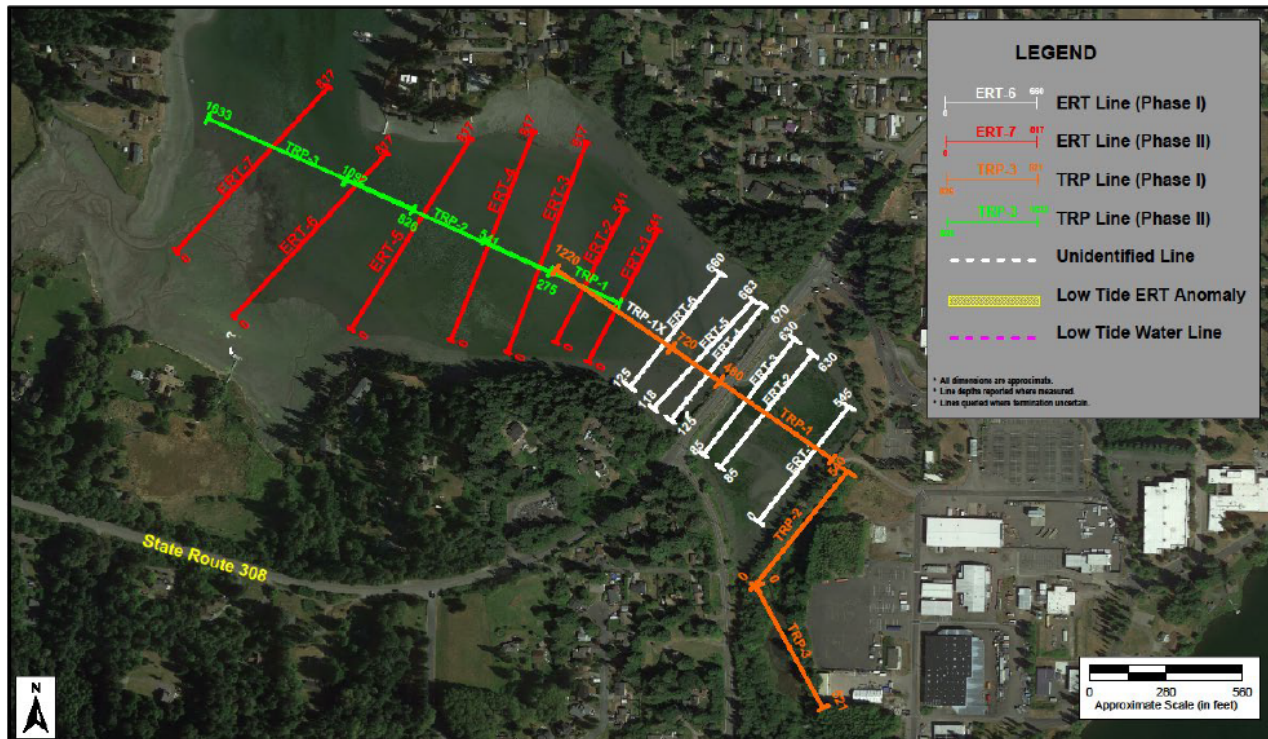
Paleochannels
mapped along
transects

Intertidal Geophysical Survey - Time Lapse





Future Work – Barge Sampling/Geophysics



- Planned Geophysical Survey and Barge Sampling will extend from existing data to Virginia Point
- Existing and new geophysical survey results will determine placement of borings to ensure sampling within identified Paleochannels

Questions?

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