Port of Olympia Budd Inlet Cleanup Project Update

ANCHOR QEA

Presented by

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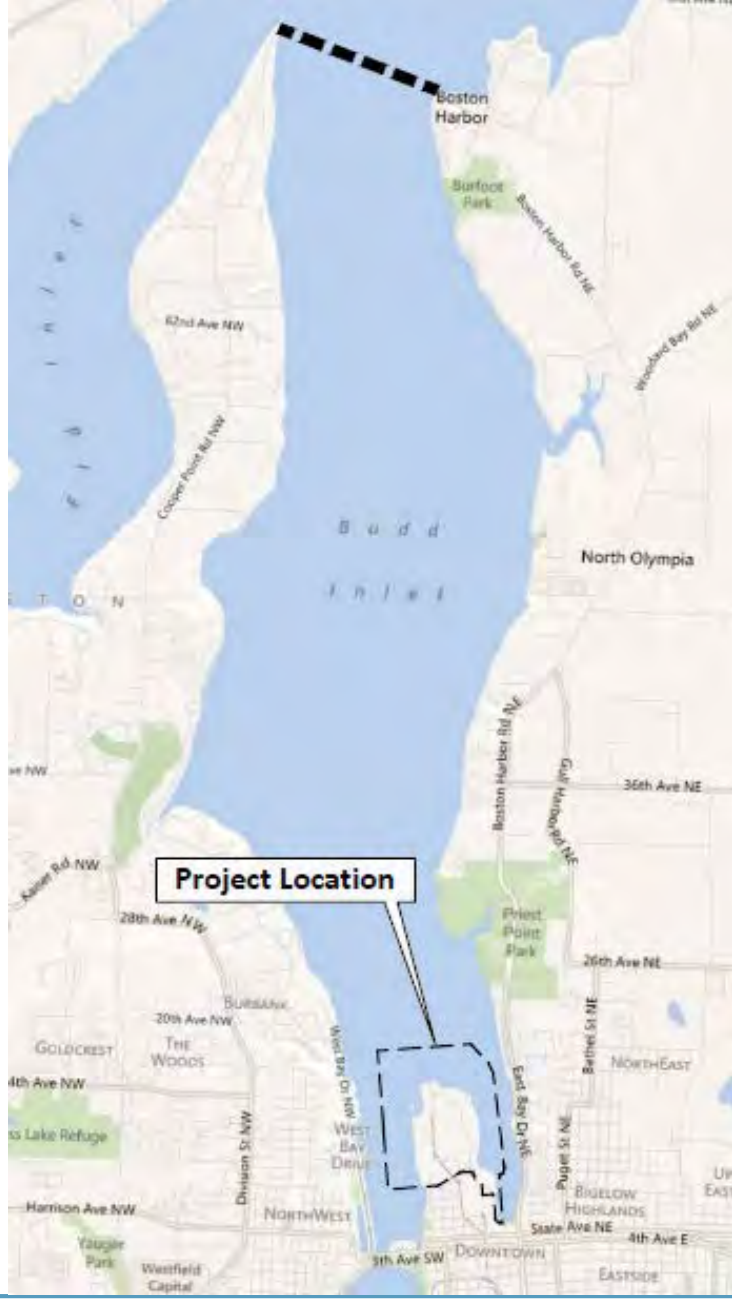
February 23, 2017

Presentation Overview

- Budd Inlet Project History
- Site Investigation
- Investigation Report Summary
- Alternatives Memorandum
- Next Steps

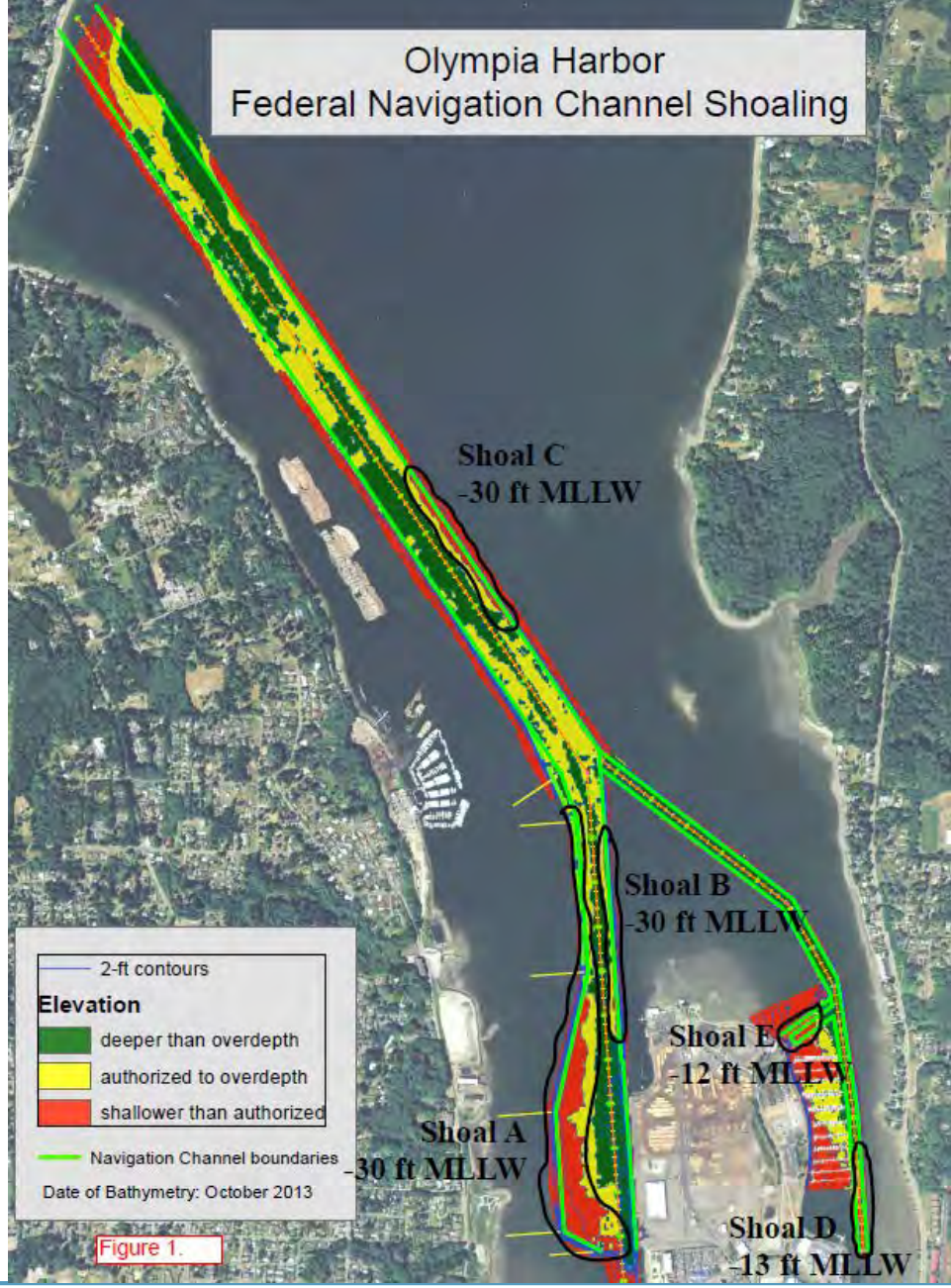


Project History

- 1990s to 2000s – Several shoreline cleanup sites identified by Ecology

Project History

- 2005 to 2007 – Elevated dioxin/furan discovered in sediment planned for maintenance dredging
- 2007 – Budd Inlet added to the Puget Sound Initiative by Ecology

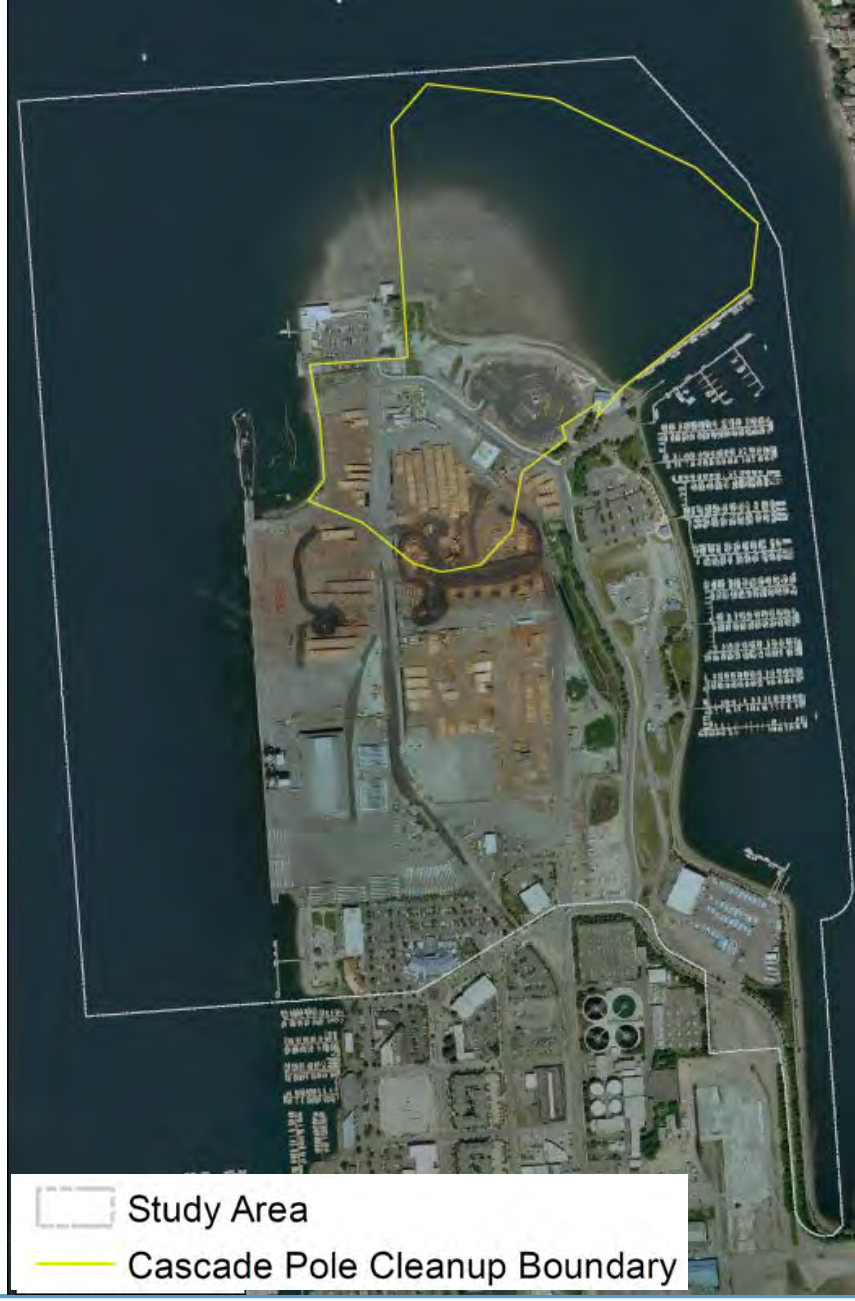


Project History

- 2008 – Port and Ecology developed Agreed Order for Interim Action cleanup
  - Additional characterization in berth and underpier area
  - Removal of berth area contaminated sediments
  - Sediment monitoring in the berth and underpier for 21 months

Project History

- 2012 – Agreed Order Amendment
  - "Study Area" defined
  - Cascade Pole cleanup boundary within Study Area

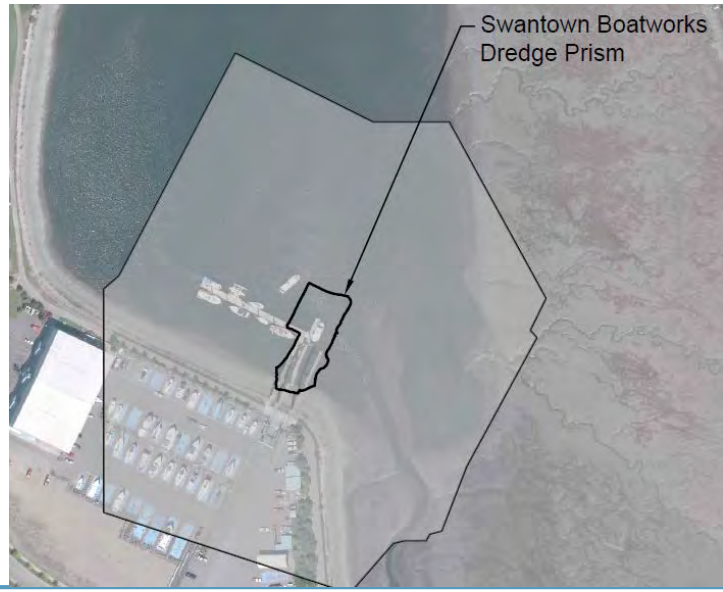


Project History

- 2012 – Agreed Order Amendment
  - Work Plan (completed in October 2012)
  - Existing Information Summary and Data Gaps Memorandum (completed in October 2012)
  - Sampling and Analysis Plan (completed in February 2013)
  - Investigation Report (completed in August 2016)
  - Interim Action Alternatives Memorandum
    - Draft submitted in November 2016
  - Draft Interim Action Plan – final deliverable under the AO

Project History

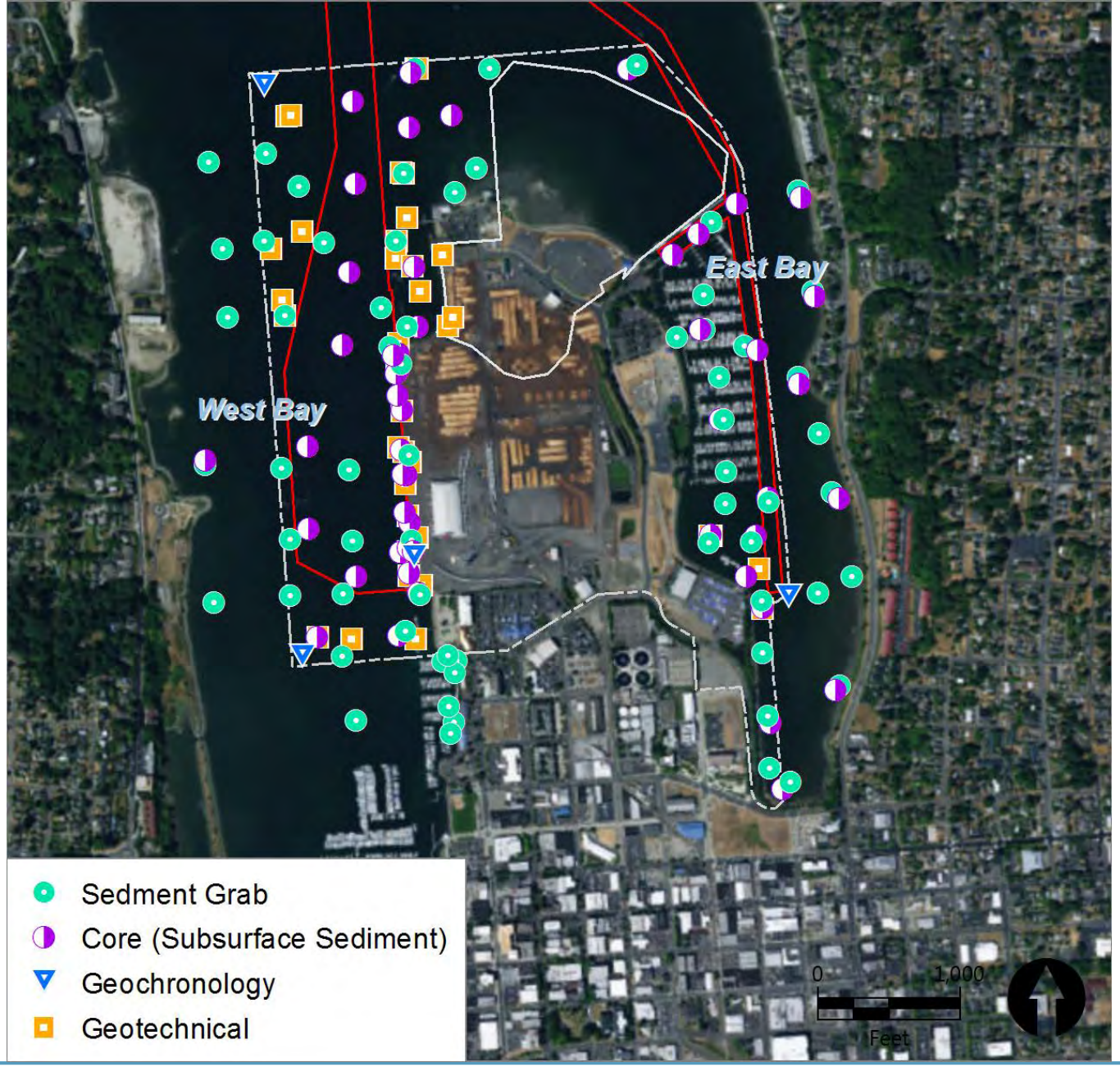
- Maintenance Dredging
  - Marine Terminal
    - 2013 – Berth stations 740 to 1,540 feet
    - 2014 – Second season dredging to remove sloughing and place cover
  - Swantown Boatworks and Haulout
    - 2013 – Dredging to clean

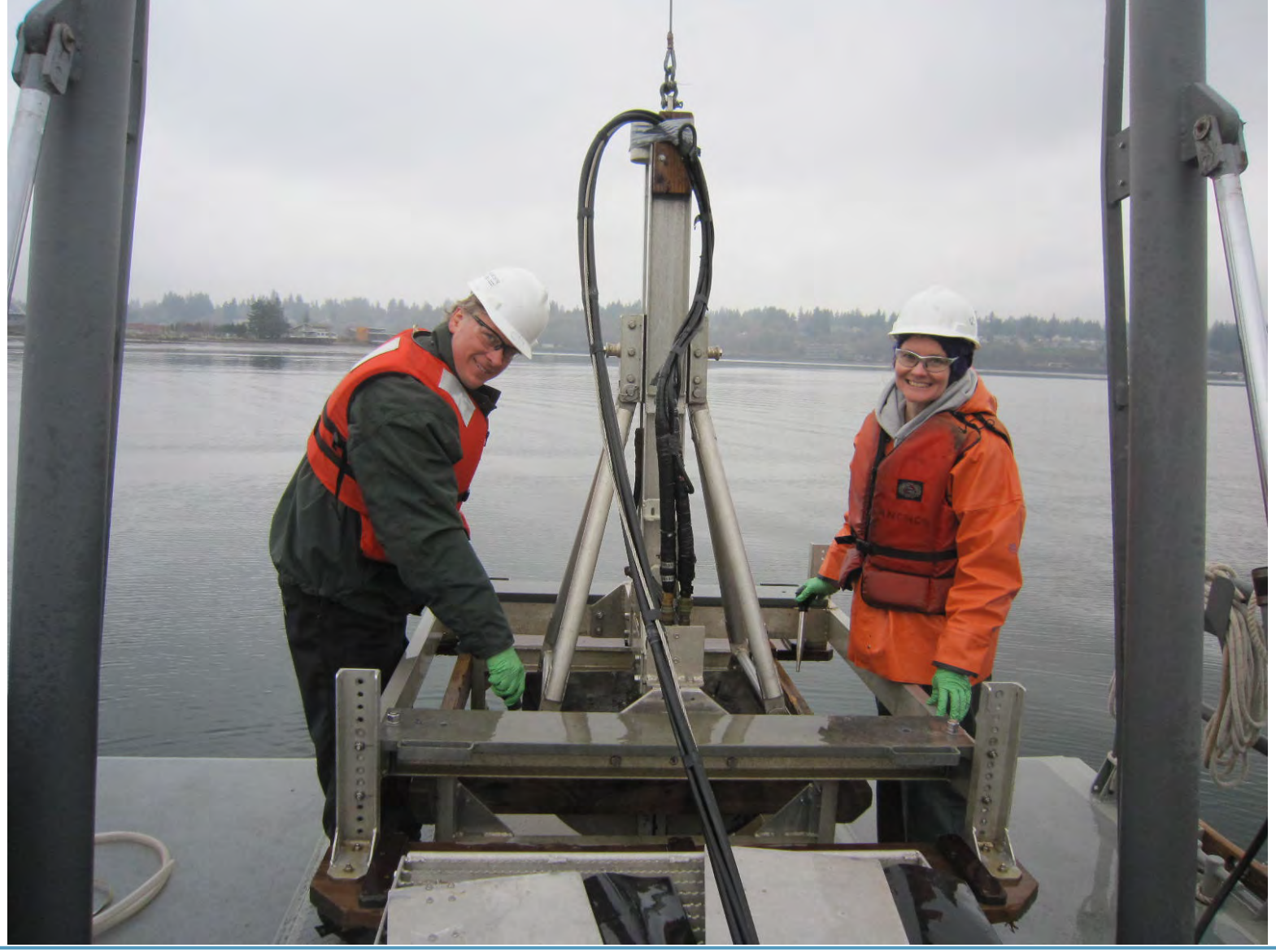


Site Investigation

Sampling and Analysis

- 2013 to 2015
  - Nature and extent of contamination
  - Source evaluation
  - Natural recovery trends
- Large sampling event
  - 65 surface samples (0-10 cm)
  - 50 cores (up to 15 feet)
  - Port and City catch basins
  - Chemical testing
  - Geochronology cores
  - Geotechnical testing


West Bay
East Bay
Sedment Grab
Core (Subsurface Sediment)
Geochronology
Geotechnical
0
1,000
Feet



Surface Sediment Sampling

Core Sampling

Catch Basin Sampling

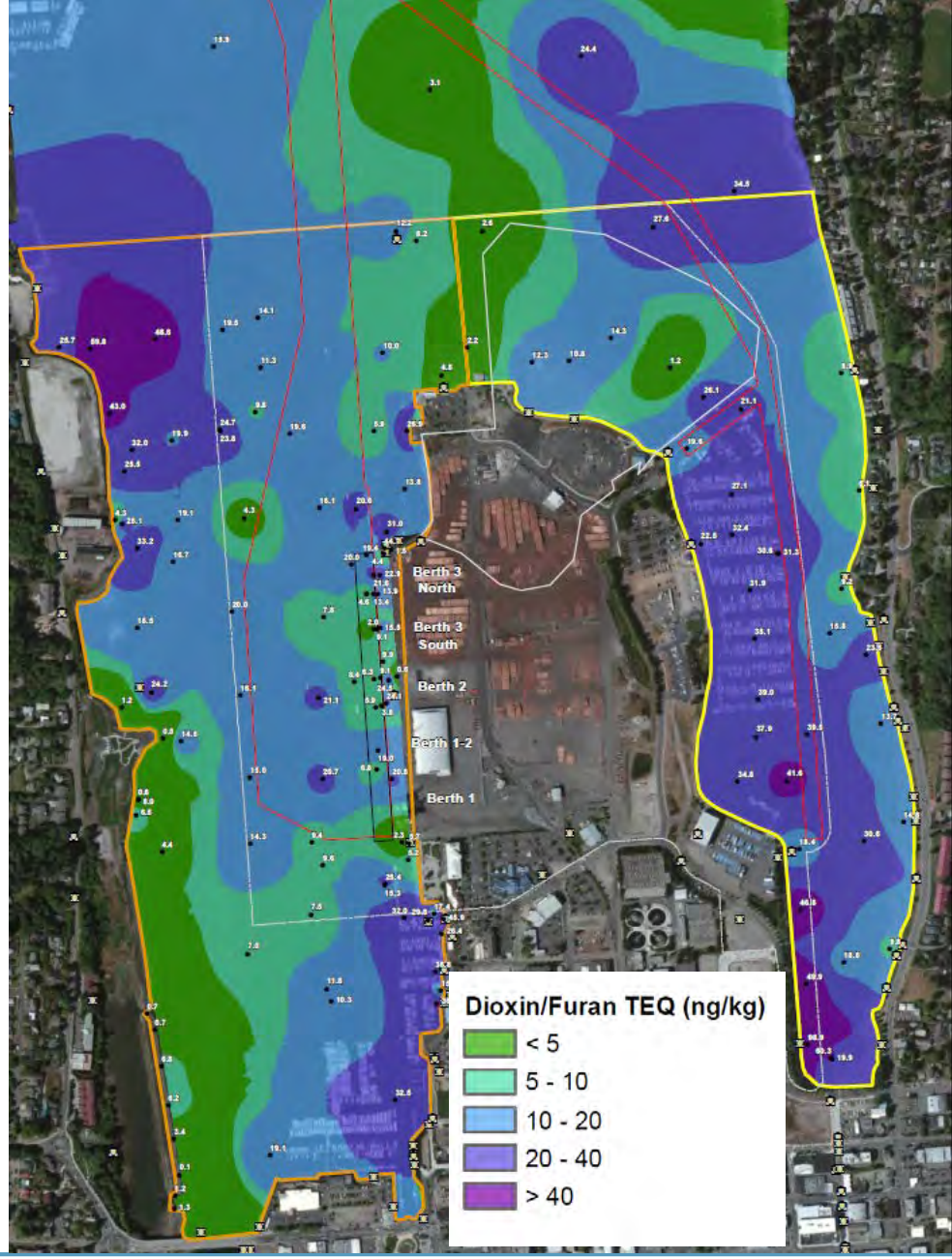
Investigation Report Summary

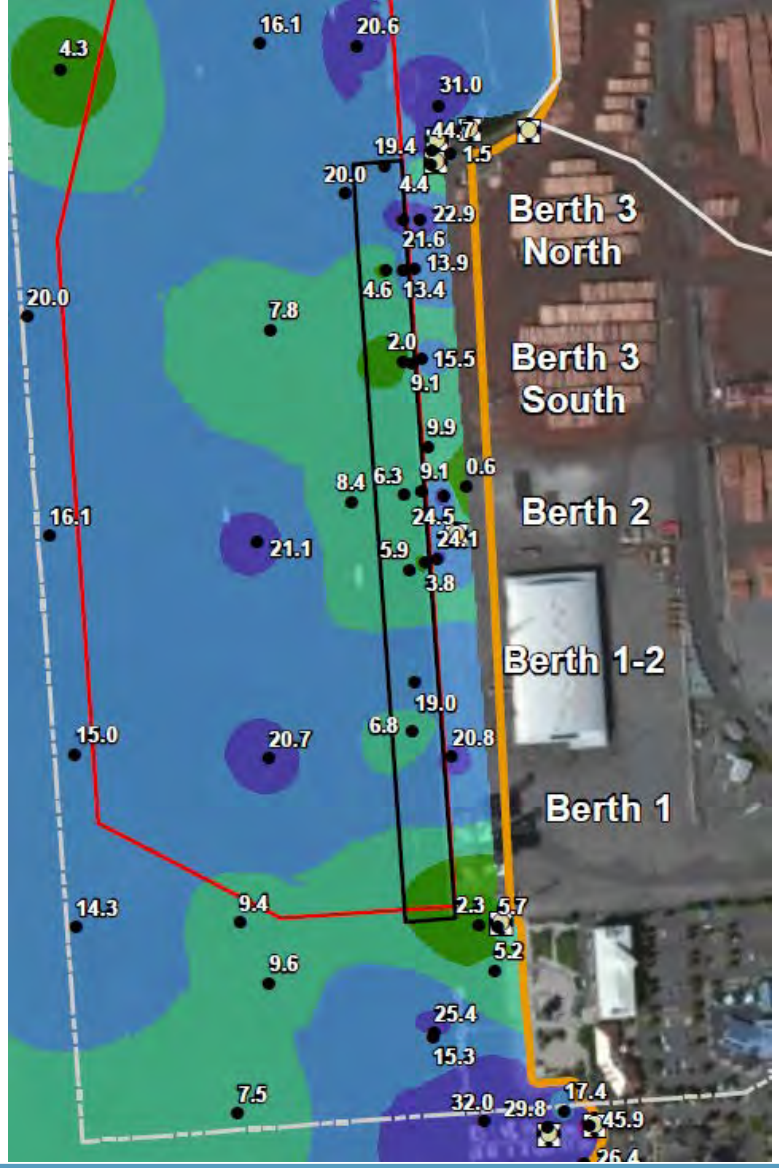
Surface Sediment Key Findings

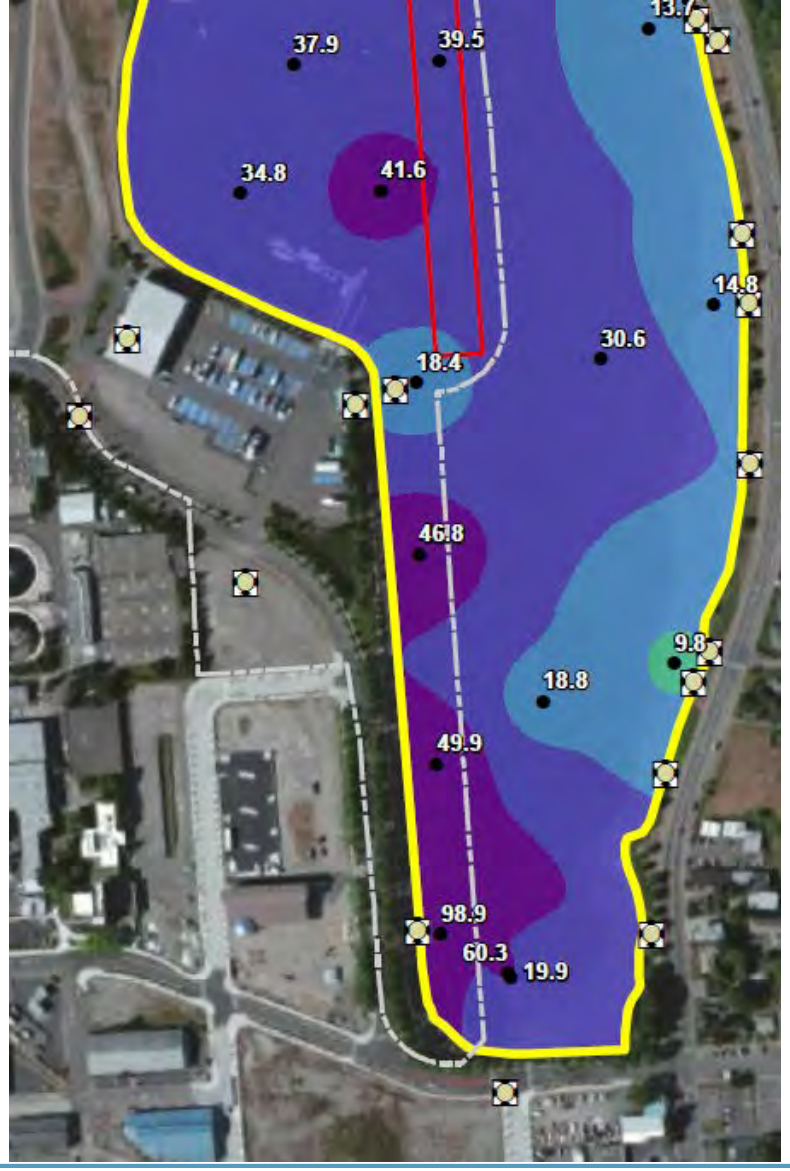
- Primary Contaminants of Concern
  - Dioxin/furans (D/Fs)
  - Carcinogenic polycyclic aromatic hydrocarbons (cPAHs)
- Other Localized Elevated Concentrations
  - Mercury
  - Benzyl alcohol
  - Butylbenzyl phthalate and acenaphthene

Surface D/Fs

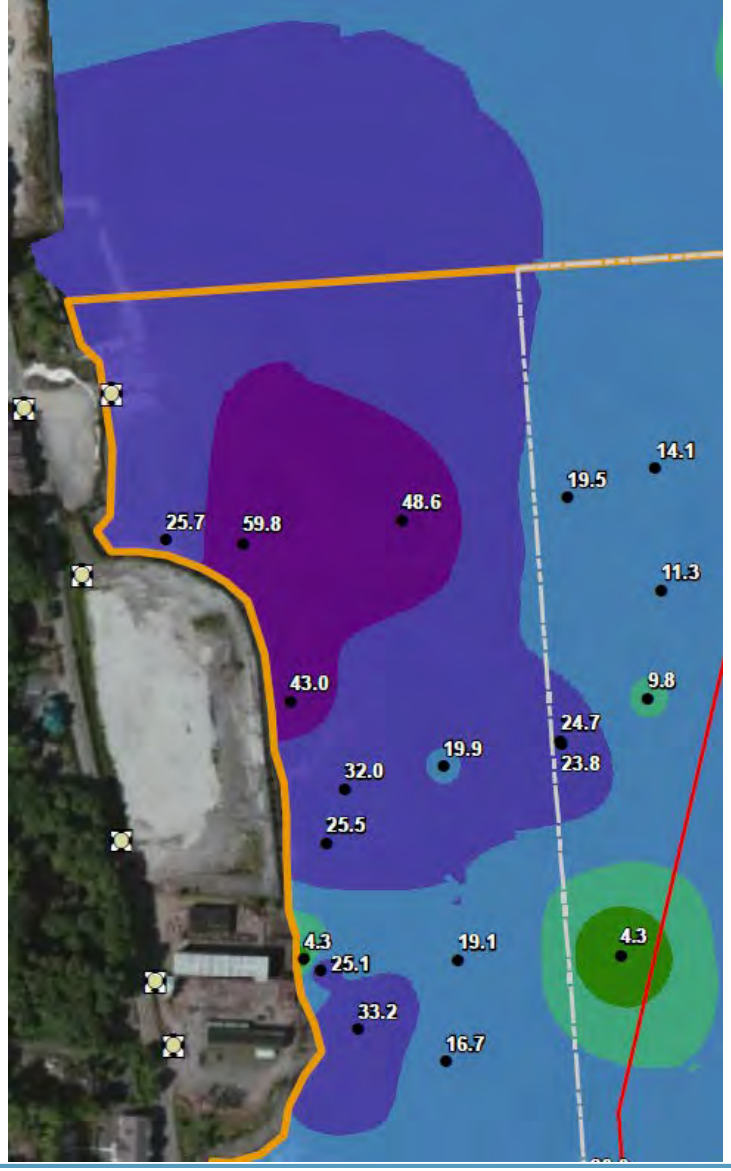
- Budd Inlet
  - Range from 0.65 to 98.9 ng/kg-TEQ (pptr)
  - Average 19.5 pptr
- Study Area
  - Average = 19 pptr
  - East Bay = 36 pptr
  - West Bay = 14 pptr
  - Intertidal = 41 pptr
- Outside Study Area
  - Localized areas in West Bay and East Bay



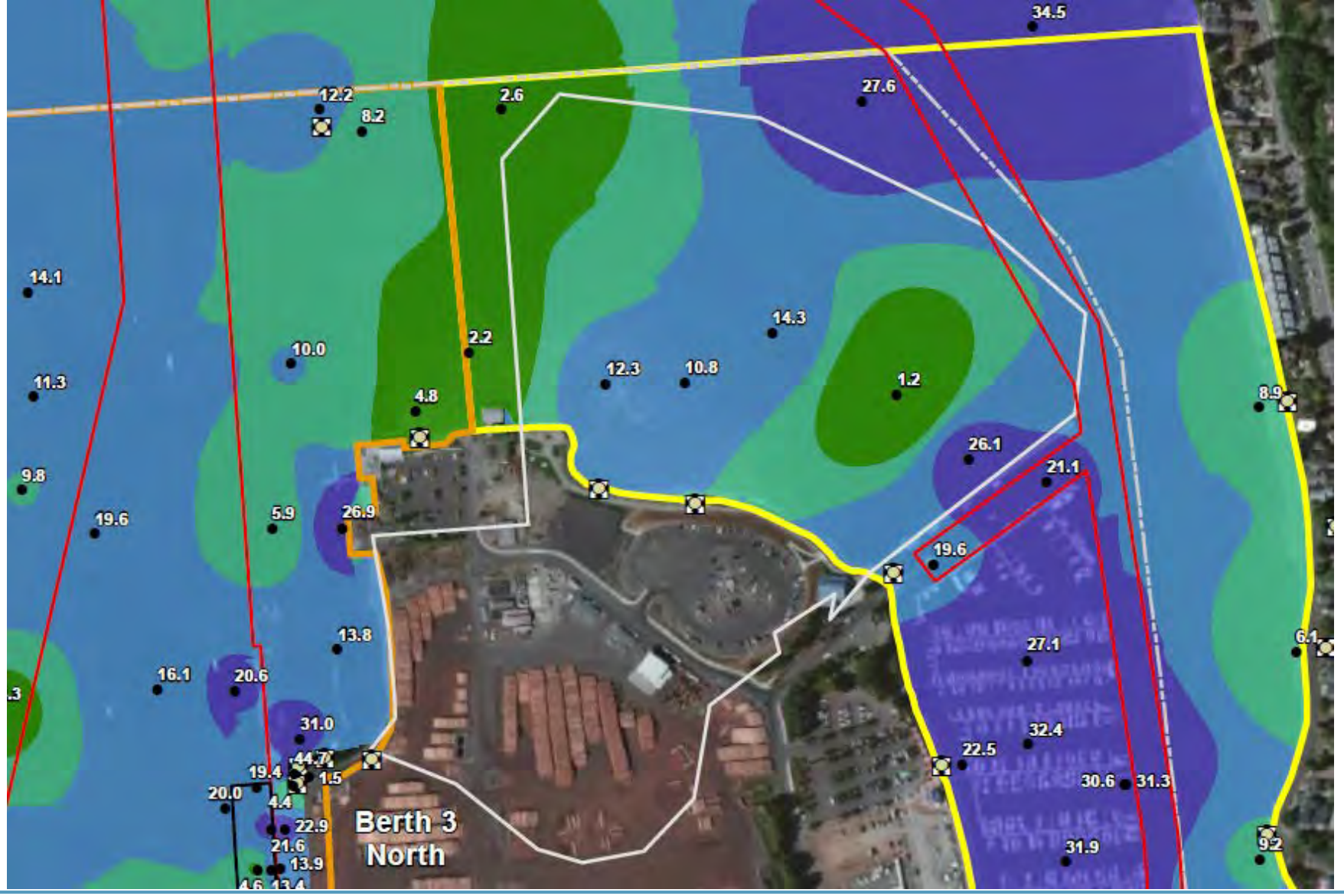




Study Area D/Fs



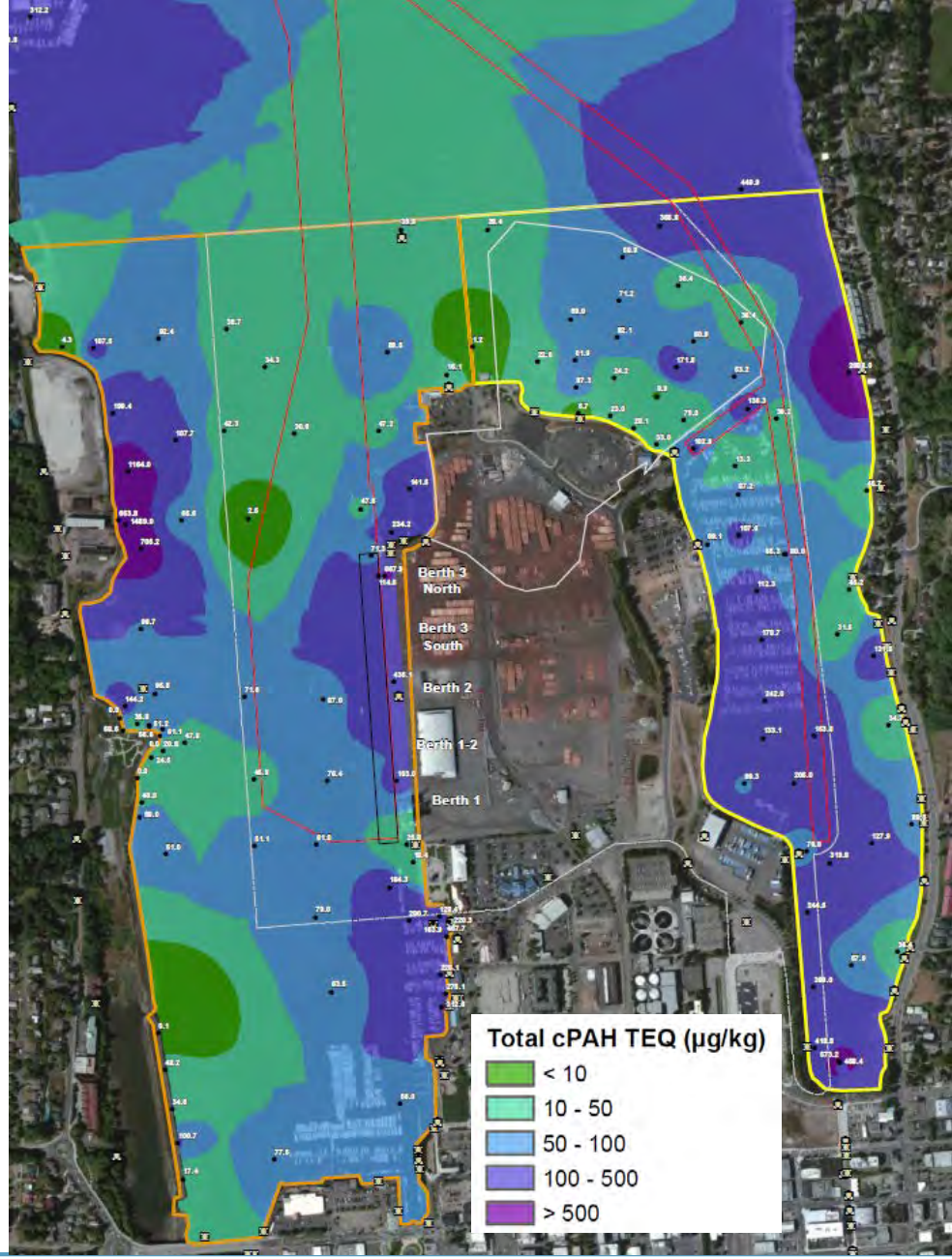
Outside Study Area D/Fs

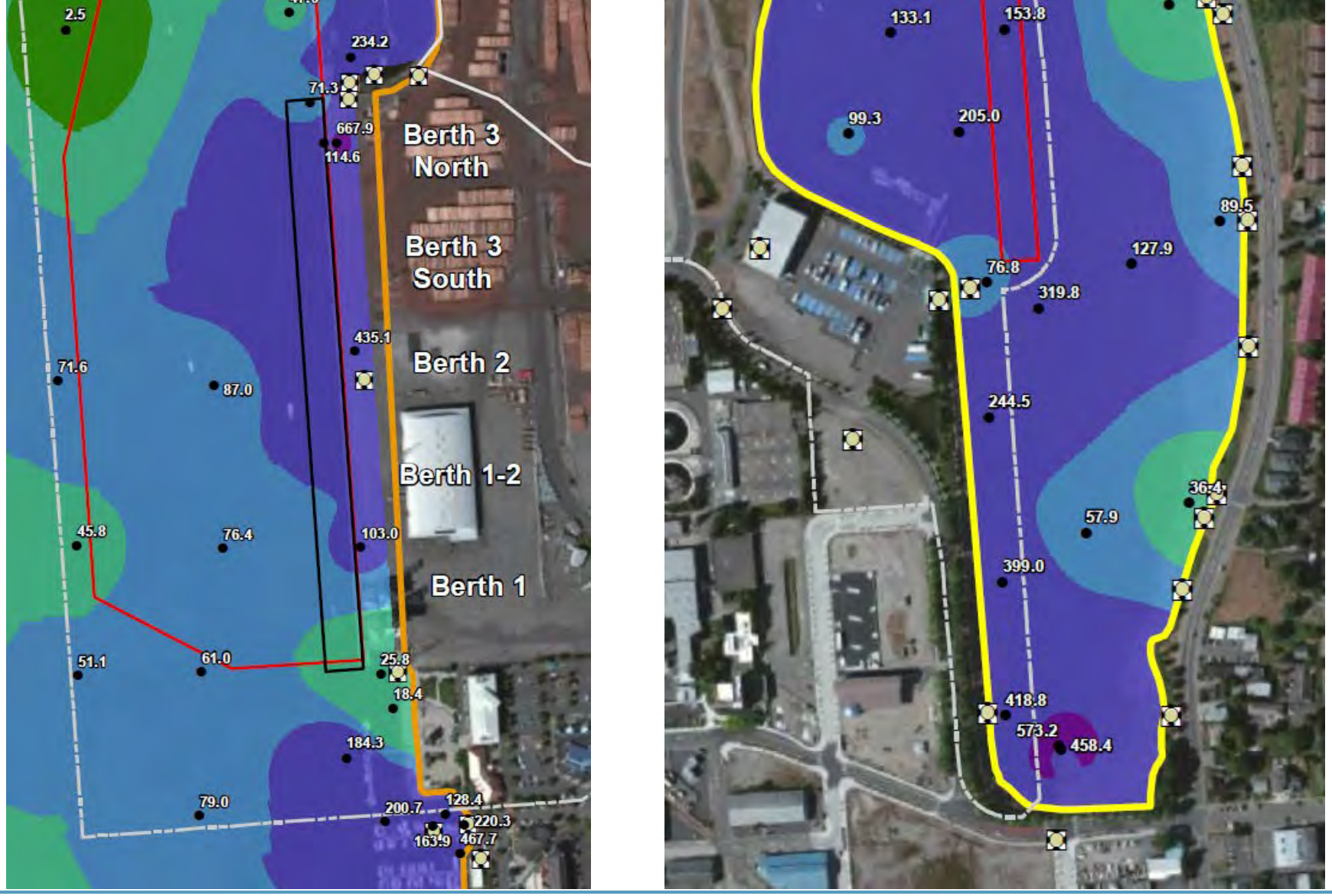


Cascade Pole Area D/Fs

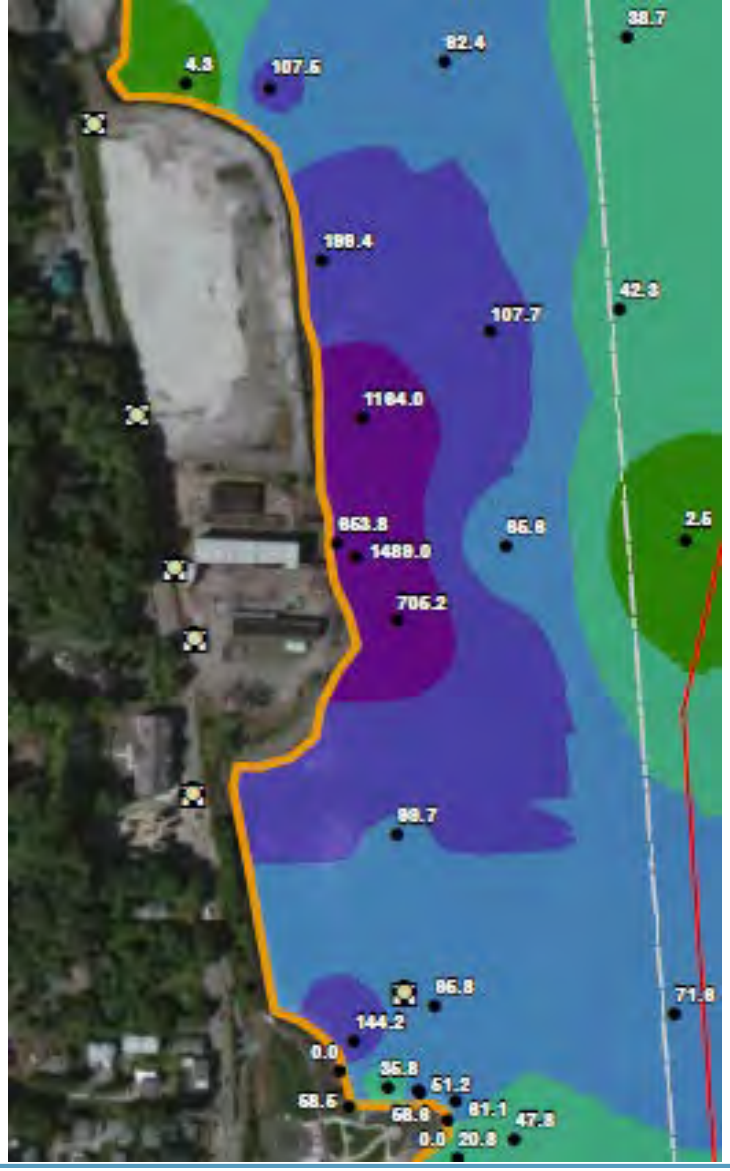
Surface cPAHs

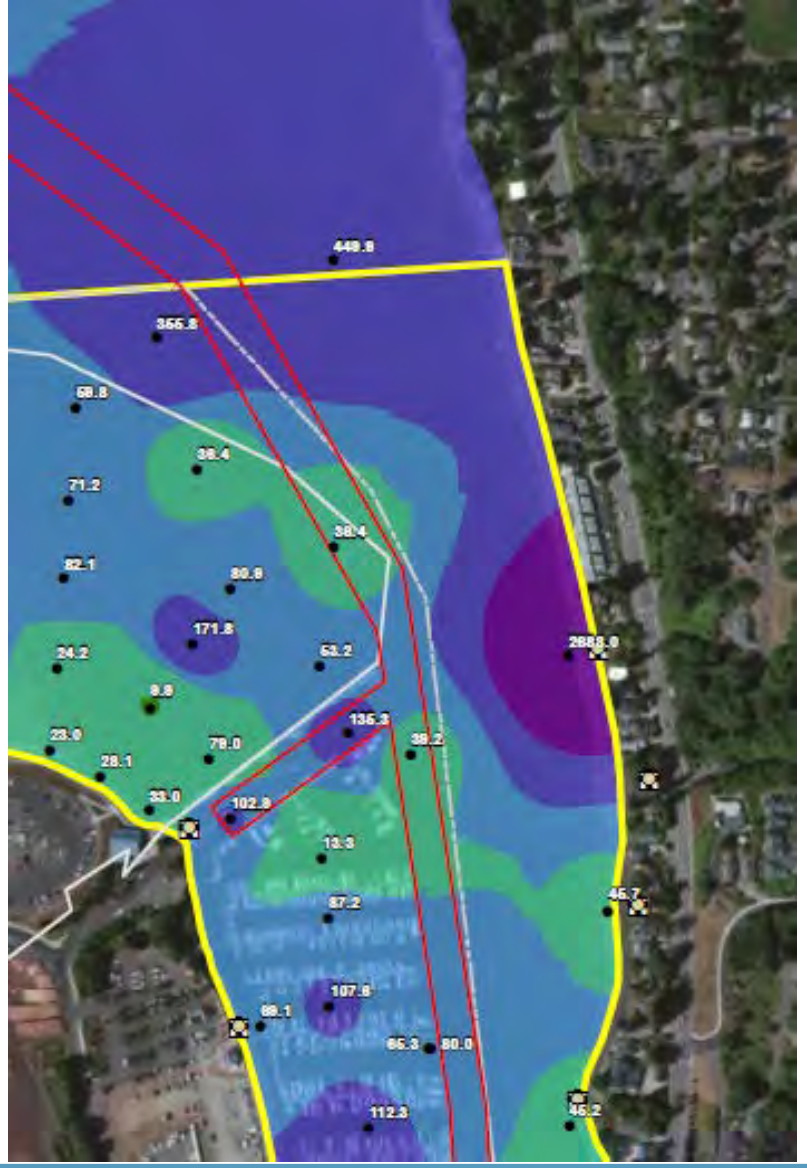
- Budd Inlet
  - Range from 13.6 to 2,690 µg/kg TEQ (ppb)
  - Average 170 ppb
- Study Area
  - Average = 140 ppb
  - East Bay = 192 ppb
  - West Bay = 97 ppb
  - Intertidal = 102 ppb
- Outside Study Area
  - Localized areas





Study Area cPAHs

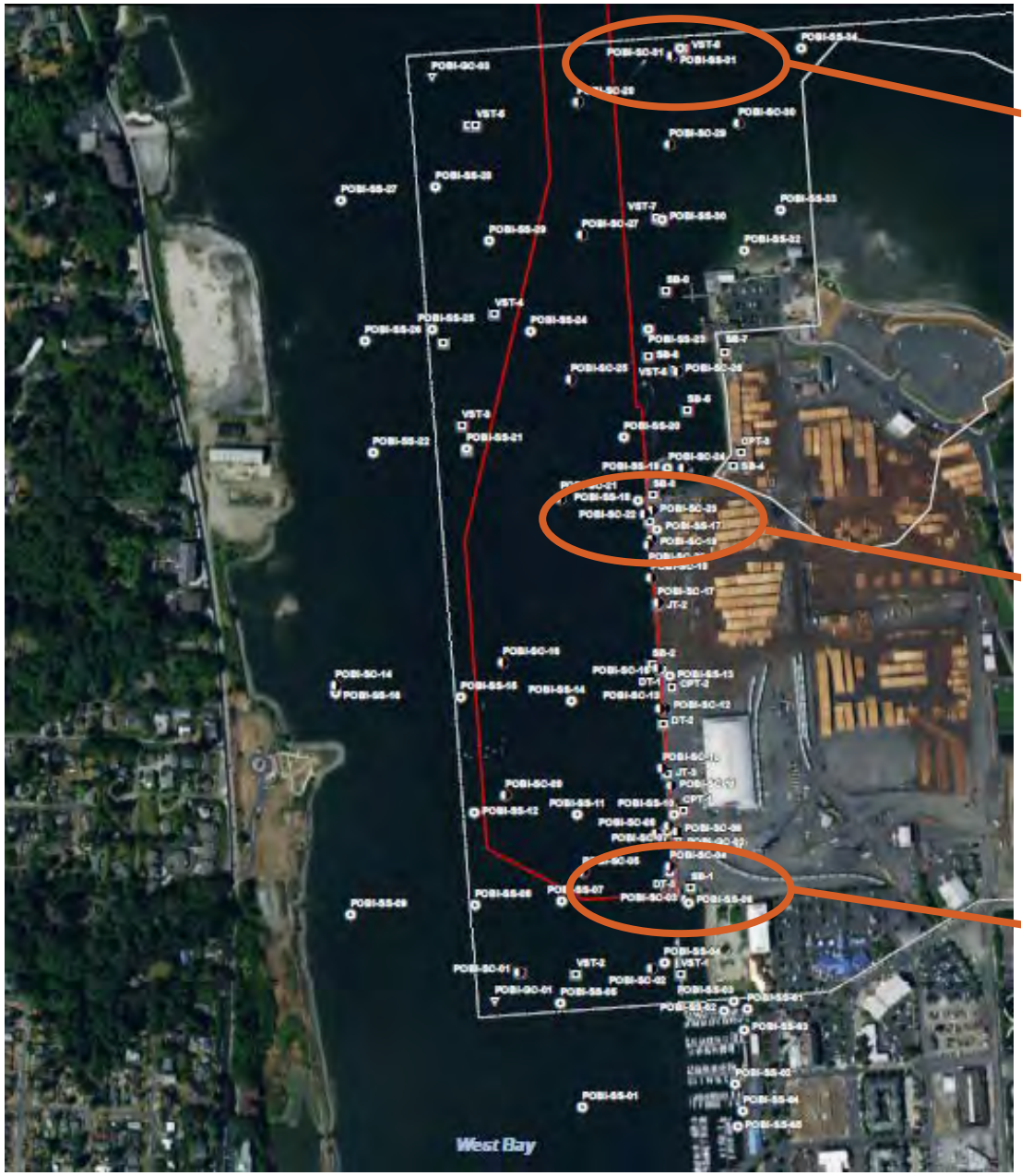




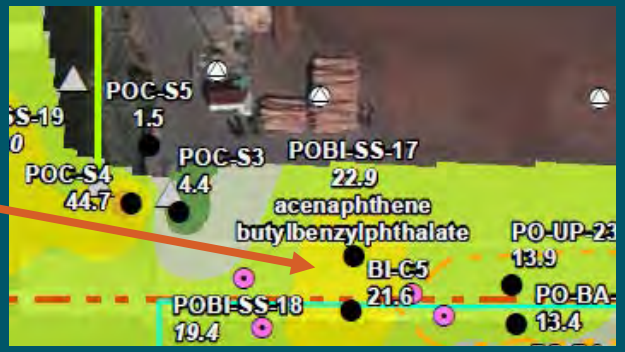
Outside Study Area cPAHs

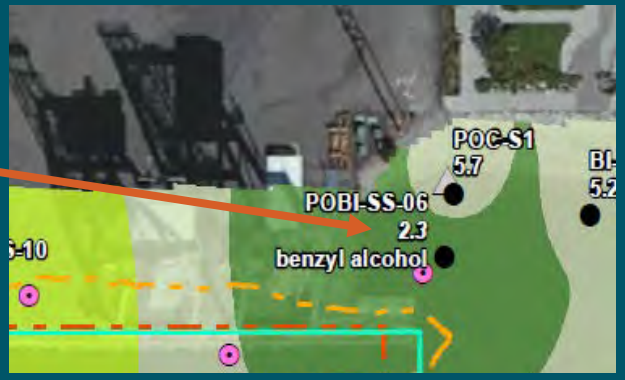
Other Contaminants

- Mercury near LOTT outfall
- Butylbenzyl phthalate and acenaphthene near outfall C
- Benzyl alcohol near outfall A


West Bay

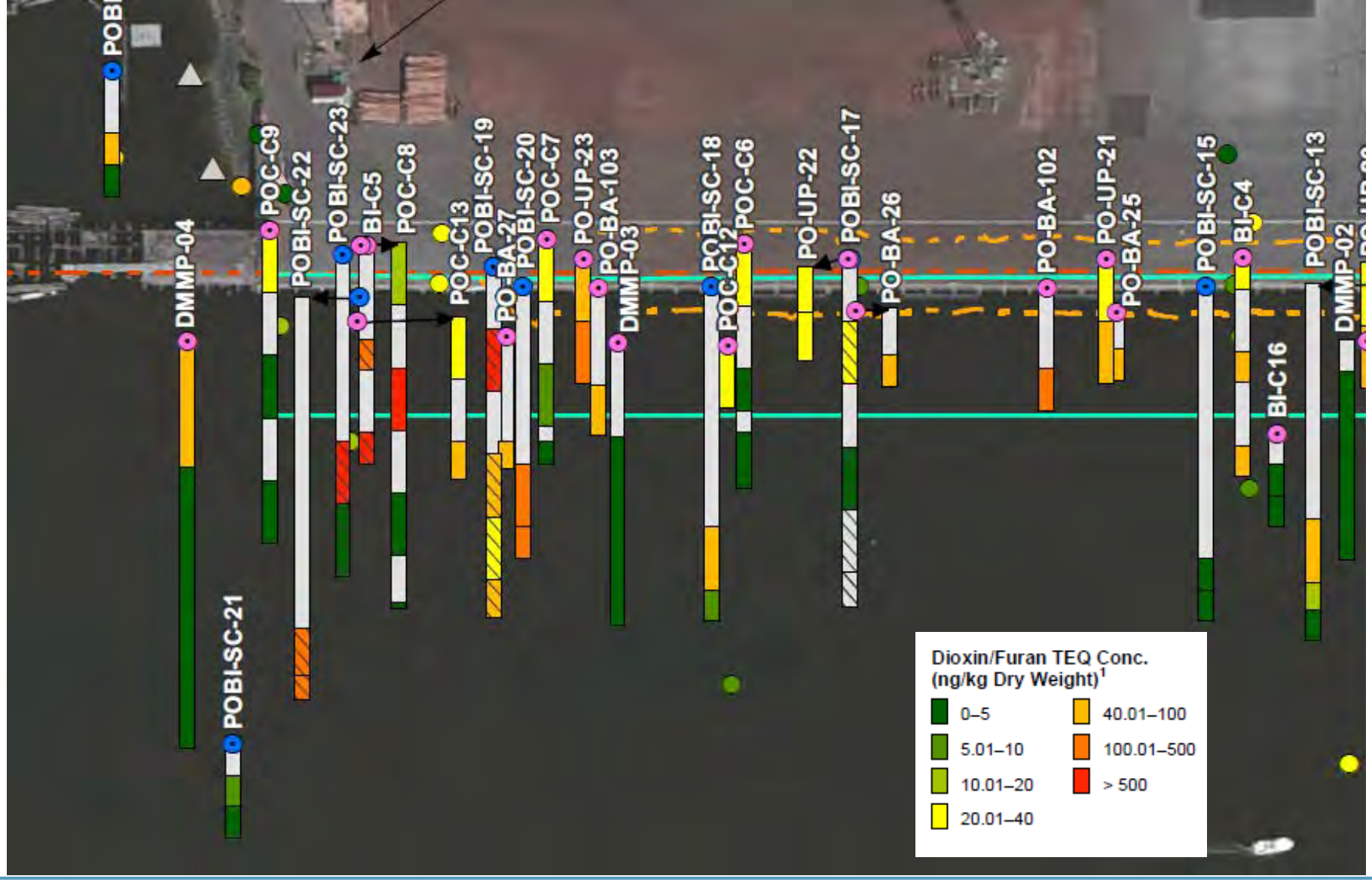

POBI-SS-31
12.2
mercury
BI-C7
8.2


POC-S5
1.5
POC-S3
4.4
POBI-SS-17
22.9
acenaphthene
butylbenzylphthalate
POC-S4
44.7
BI-C5
21.6
POBI-SS-18
19.4
PO-UP-23
13.9
PO-BA-
13.4


POC-S1
5.7
POBI-SS-06
2.3
benzyl alcohol

Suburface Sediment Key Findings

- Primary Buried Contaminants of Concern
  - Dioxin/furans
  - cPAHs
- Localized Buried Contaminants
  - SVOCs
    - Methylphenols, phthalates, 1,2,4,-trichlorobenzene, 1,2-trichlorobenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, n-nitrosodiphenylamine, benzoic acid, and dibenzofuran
  - Metals - cadmium, mercury, silver, and zinc
  - PCBs



Northern Berth Area

Southern East Bay

Dioxin/furan Sources

- Common Historical Sources
  - Hog fuel burners
  - Chemical manufacturing (i.e., pentachlorophenol, wood pulp bleaching)
  - Burning/combustion (i.e., residential, backyard barrel, forest fire, waste incineration, vehicle emissions)
- Potential Ongoing Sources
  - Stormwater runoff
  - Vehicle emissions
  - Sediment resuspension

Hog Fuel Burners

Dioxin/furan Sources

- Elevated concentrations in northern Budd Inlet
  - Mean 14 pptr, up to 36 pptr
- Elevated in urban areas
  - Ecology studies
    - Seattle sediment mean = 15 pptr
    - Seattle soil mean = 19 pptr
    - Bellingham Bay regional background = 15 pptr

PAH Sources

- Common Historical Sources
  - Treated timbers (i.e., creosote)
  - Atmospheric deposition (i.e., from combustion)
  - Manufacturing operations (i.e., fueling station, truck wash)
  - Spills
- Potential Ongoing Sources
  - Stormwater runoff
  - Atmospheric deposition
  - Leaching of treated timbers

PAH Sources

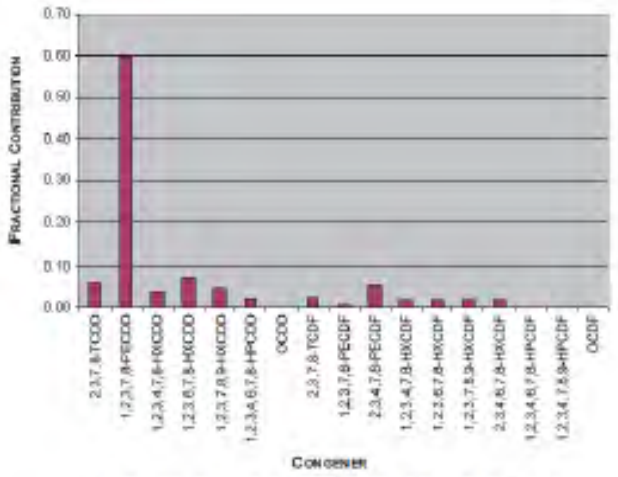
- Elevated concentrations in northern Budd Inlet
  - Mean 63 ppb, up to 238 ppb
- Elevated in urban areas
  - Ecology studies
    - Seattle sediment mean = 440 ppb
    - Seattle soil mean = 260 ppb
    - Bellingham Bay regional background = 86 ppb

Other Surface Sediment Contaminant Sources

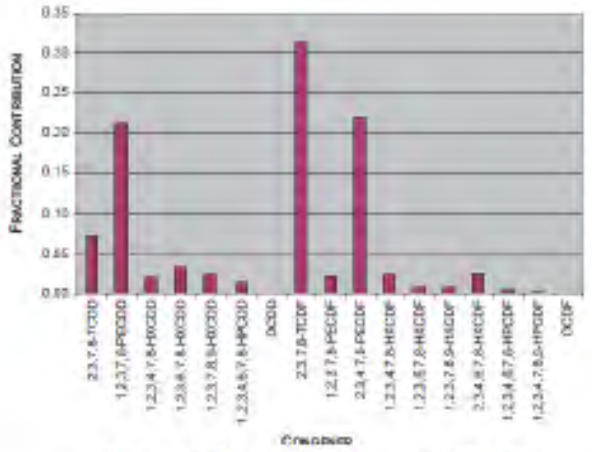
- Mercury
  - Likely associated with LOTT outfall
- Phthalates
  - Plasticizers found in PVC pipes, vinyl siding, vehicles, etc.
- Benzyl alcohol
  - Organic material decomposition (i.e., plants), dyes

Source Control Evaluation – Data Analysis

- Dioxin/furan fingerprinting
  - 17 congeners
  - Visual trends compared to source profiles
  - Sediment often looks similar
  - Slight variations in profiles



Rayonier Hog Fuel Boiler – 1995(a)



Rayonier Hog Fuel Boiler – 1995(b)

Source Control Evaluation – Data Analysis

- Multivariate statistical analysis, or chemometrics
  - Statistical analysis to identify underlying patterns
  - Comparisons to known source profiles
  - Port and Ecology conducted studies
    - Similar factor profiles found
    - Both studies summarized in Investigation Report
    - Ecology findings will be used for decision-making

Other Source Evaluations

- Port catch basins
  - Legacy contamination in old system
  - Port best management practices implemented
    - Catch basin filter socks in industrial area
    - Jet clean lines
    - Regularly clean out accumulated sediment
      - Solids sampled multiple times to monitor effectiveness
      - Overall downward trend in D/F concentration
    - Installed state-of-the-art treatment system in 2015 (C basin)
  - Surface sediment by Port outfalls has low concentrations of dioxins/furans

Other Source Evaluations

- City catch basins
  - Sampled storm lines adjacent to elevated surface concentrations
  - Further evaluation anticipated
- Sediment traps installed

Sediment Traps

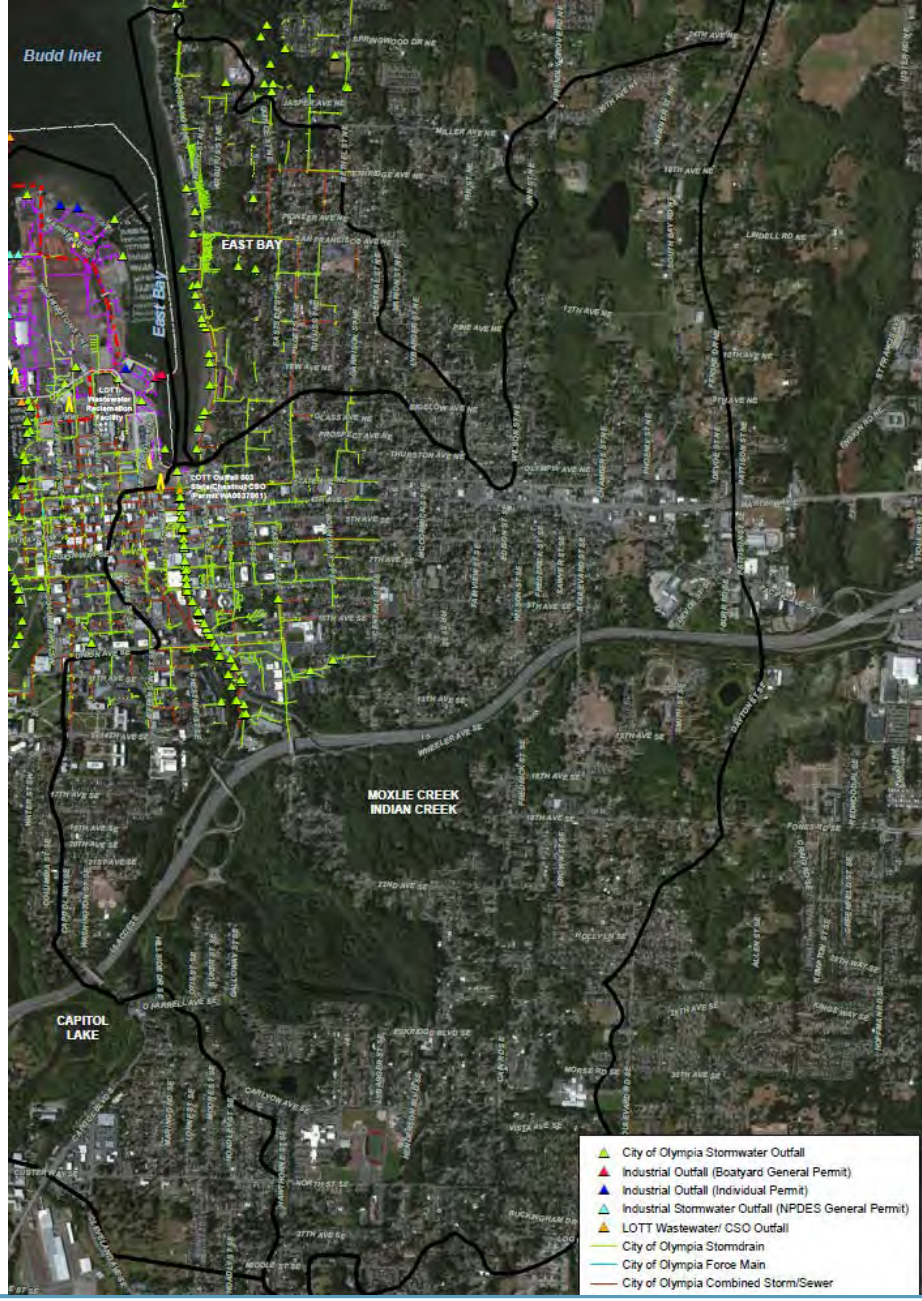
Sediment Traps

Location #1

Location #2

Further Source Evaluation

- To be conducted in coordination with Ecology
- May include
  - Other municipal or private lateral inputs
  - Loading evaluation
  - Further source testing
- EBRS cleanup site not ongoing source



Sedimentation Rate

- Geochronology summary
  - Highest deposition
    - Marine Terminal Berth Area – 1 to 4 cm/yr
    - Swantown Boatworks – 1 to 2 cm/yr
  - Lowest deposition
    - North Budd Inlet and Cascade Pole area
- LOTT sediment trap study (1996-1997)
  - Central Budd Inlet – 0.2 to 0.8 cm/yr
  - West Bay – 2 cm/yr

Surface Sediment Temporal Trends

- Evaluated Available Data
  - 2007 and 2013 concentrations
  - Monitoring following Interim Action Pilot Study
- West Bay
  - Concentrations relatively stable
  - Capitol Lake flushing events can influence concentrations
- East Bay
  - Northern portion concentrations relatively stable
  - Southern portion concentrations remain elevated, with some decreases

Alternatives Memorandum

Draft Interim Action Alternatives Memorandum

- Used to select Interim Action
- Develops cleanup requirements
- Establishes Site Units
- Evaluates remedial technologies
- Develops remedial alternatives
- Evaluates alternatives against Ecology criteria
- Identifies preferred Interim Action alternative

Draft Interim Action Alternatives Memorandum

- Current alternatives
  - West Bay alternatives focused at Marine Terminal
  - East Bay alternatives focused along southern portion
  - Costs range from $1M to $21M
- Based on 2013 Sediment Management Standards rule revision
- Further work with Ecology to formalize cleanup requirements and alternatives

Next Steps

- Finalize Alternatives Memorandum
- Analyze sediment trap data
- Coordinate with Ecology and other relevant parties on future source investigations
- Develop Draft Interim Action Plan

Questions/Discussion