Design Stage Conceptual Site Model

Wyckoff Eagle Harbor Superfund Site

Battelle Sediments Conference

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February 2019

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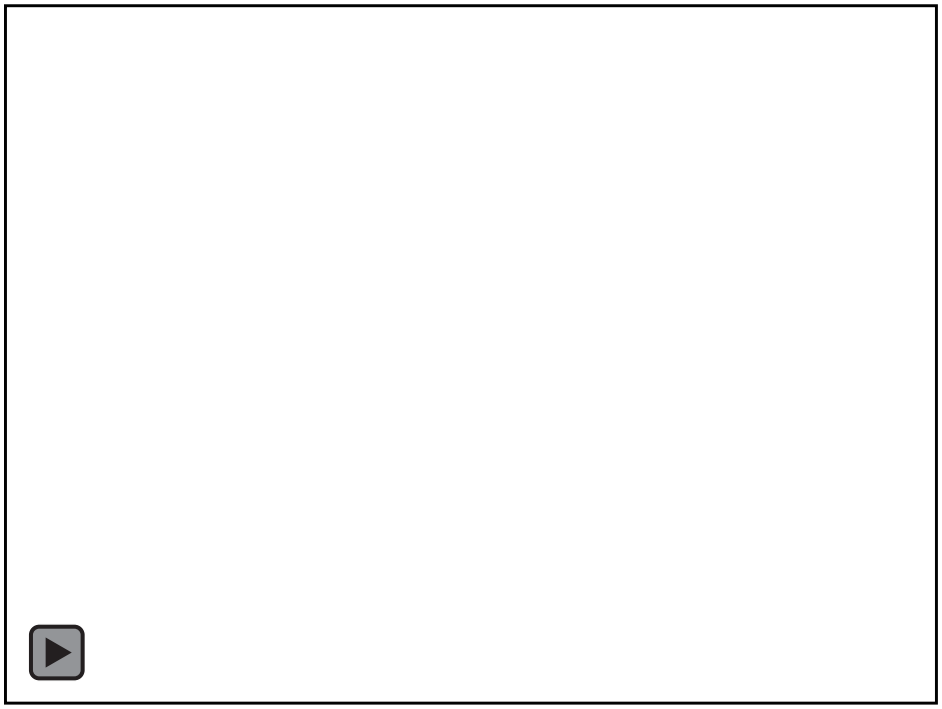
Agenda

1. Brief Site History
2. 2018 Intertidal Remedy ROD Amendment
3. 2018 Design Investigation Scope
4. Results
5. Path Forward

Site History of Wyckoff Facility



1986 EPA Video of Wyckoff Intertidal Area

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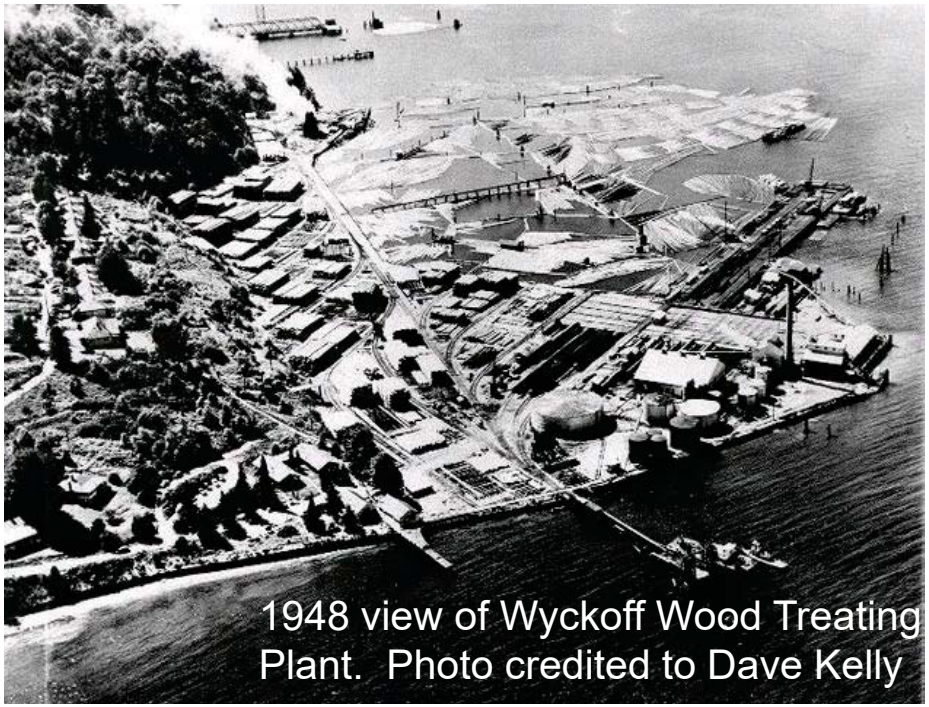

1948 view of Wyckoff Wood Treating Plant. Photo credited to Dave Kelly

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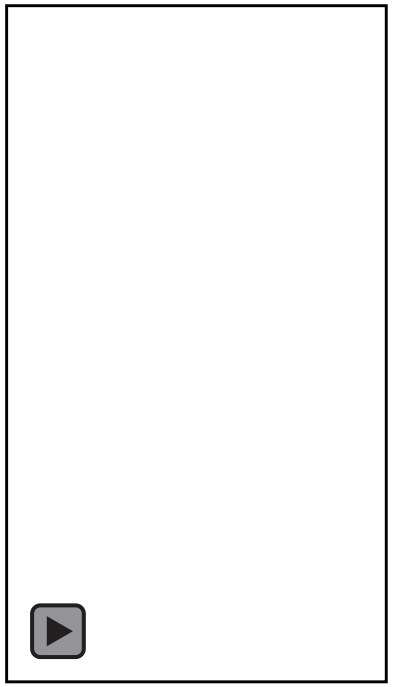
1994 ROD and MNR Monitoring

Intertidal Area Monitoring

- The 1994 ROD selected MNR for the intertidal beaches
- Cleanup goals were expected to met by 2011, 10 years after sheet pile wall construction
- EPA and USACE monitored beach conditions in 2001, 2002-2003, and 2011
- By 2011 there were fewer NAPL seeps but sill some areas of active discharge
  - Conclusion: additional remediation needed

2018 Intertidal Area Video



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May 2018 EPA Record of Decision Amendment

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May 2018 EPA Record of Decision Amendment

2018 ROD Amendment Actions

- Replace aging sheet pile wall
- Dredge ~6,600 cy
- Backfill dredged areas with a multilayer cap, including placing reactive materials at the base of the cap to retard upward nonaqueous phase liquid (NAPL) seepage
- Restore dredged areas to grade with clean, imported materials

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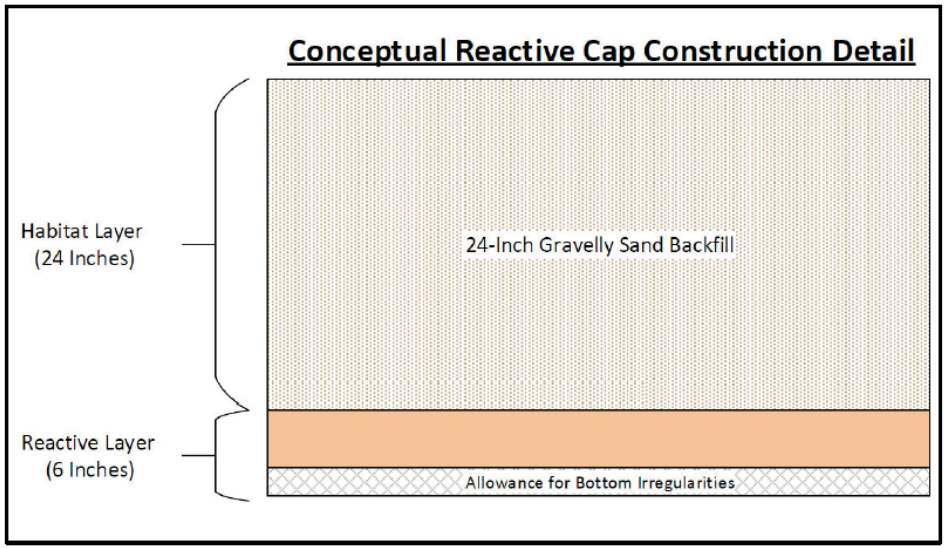

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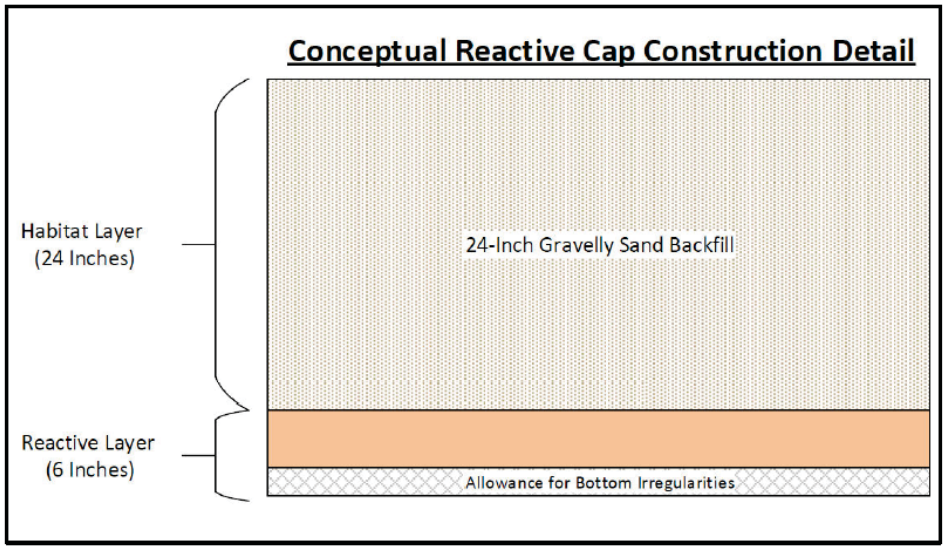

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2018 ROD Amendment: Remedial and Investigation Areas

- Distinct remedial target areas based on investigation stage CSM

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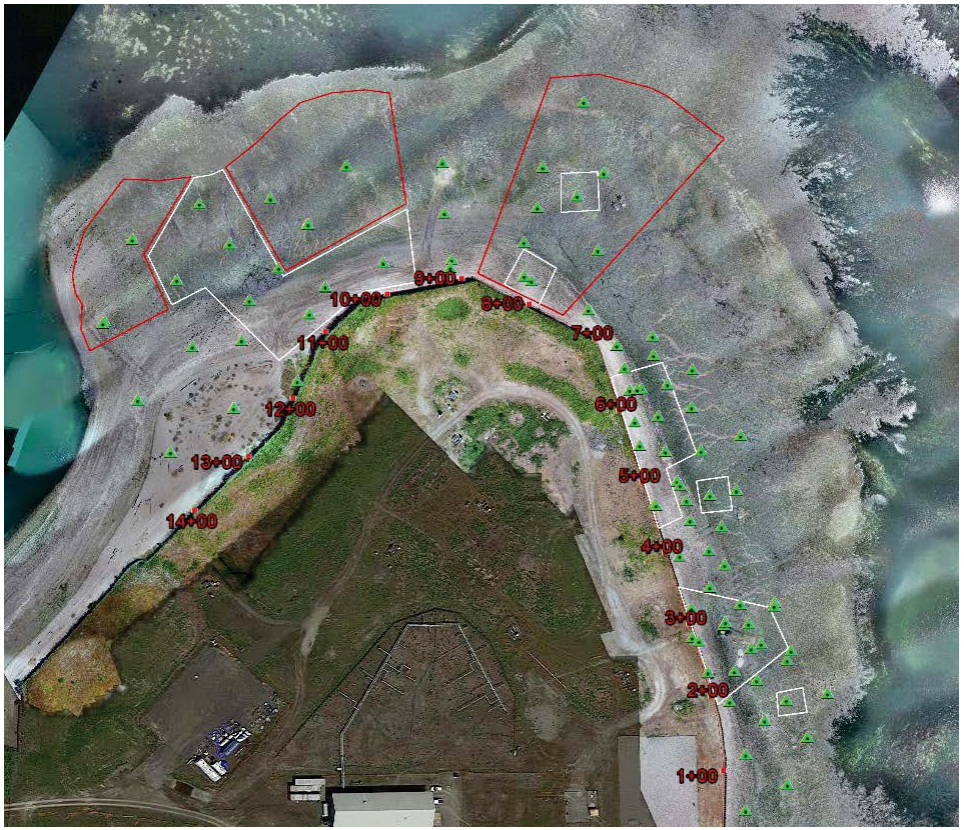
2018 ROD Amendment: Remedial and Investigation Areas



- Distinct remedial target areas based on investigation stage CSM
- Three areas identified for further investigation during remedial design

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2018 ROD Amendment: Remedial and Investigation Areas

- Distinct remedial target areas based on investigation stage CSM
- Three areas identified for further investigation during remedial design
- All areas inundated at high tides
  - Tidal range up to 15 feet

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Design Investigation Scope and Schedule

Scope

- Update Site Conceptual Model to Design Stage
- Work included:
  - **NAPL Nature and Extent Investigation**
  - **Topographic Photogramic Survey**
  - **NAPL Discharge Rate Tests**
  - **Treatment Media Tests**
  - Other tests including Groundwater discharge assessment, sediment excavation and dewatering

Schedule

- Lower intertidal areas accessible only during low tides of -2 feet MLLW or lower
- Work executed over two, four-day, low Spring tide events in July and August 2018
  - 5 acre total investigation area
  - 5 to 6 hours of beach time each day depending on elevation
- Rapid data analysis needed to focus August event based on July data

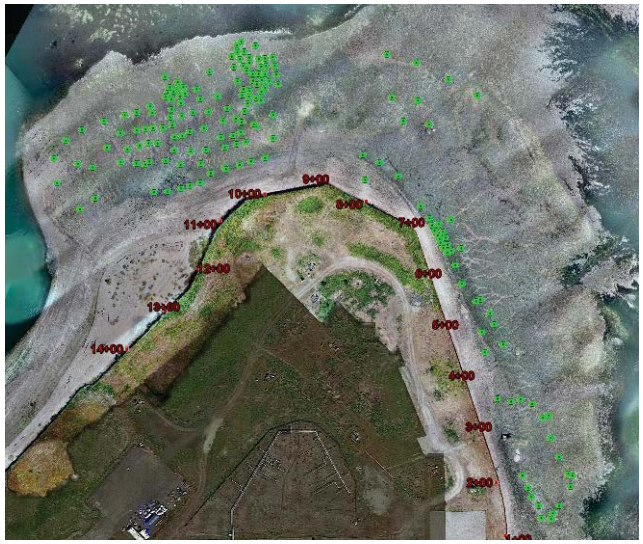
NAPL Nature and Extent Investigation

TarGOST

- 118 TarGOST borings over the eight day event

Shallow Test Pits

- 183 “clam holes” excavated and elutriate NAPL observations recorded



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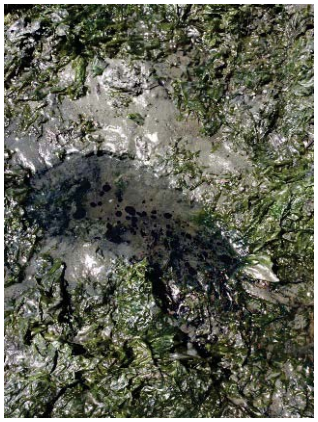

Blebs

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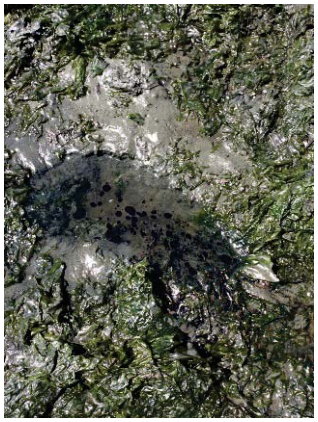

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Sheen

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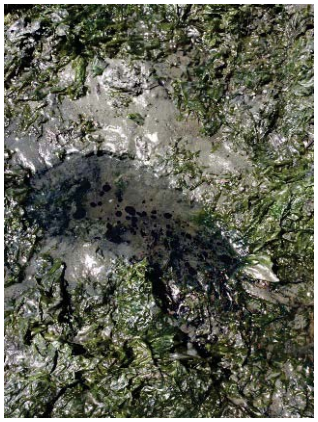

Blebs

Sheen

Clean

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Topographic Photogrammertry Survey

- Survey conducted on Day 1 in July

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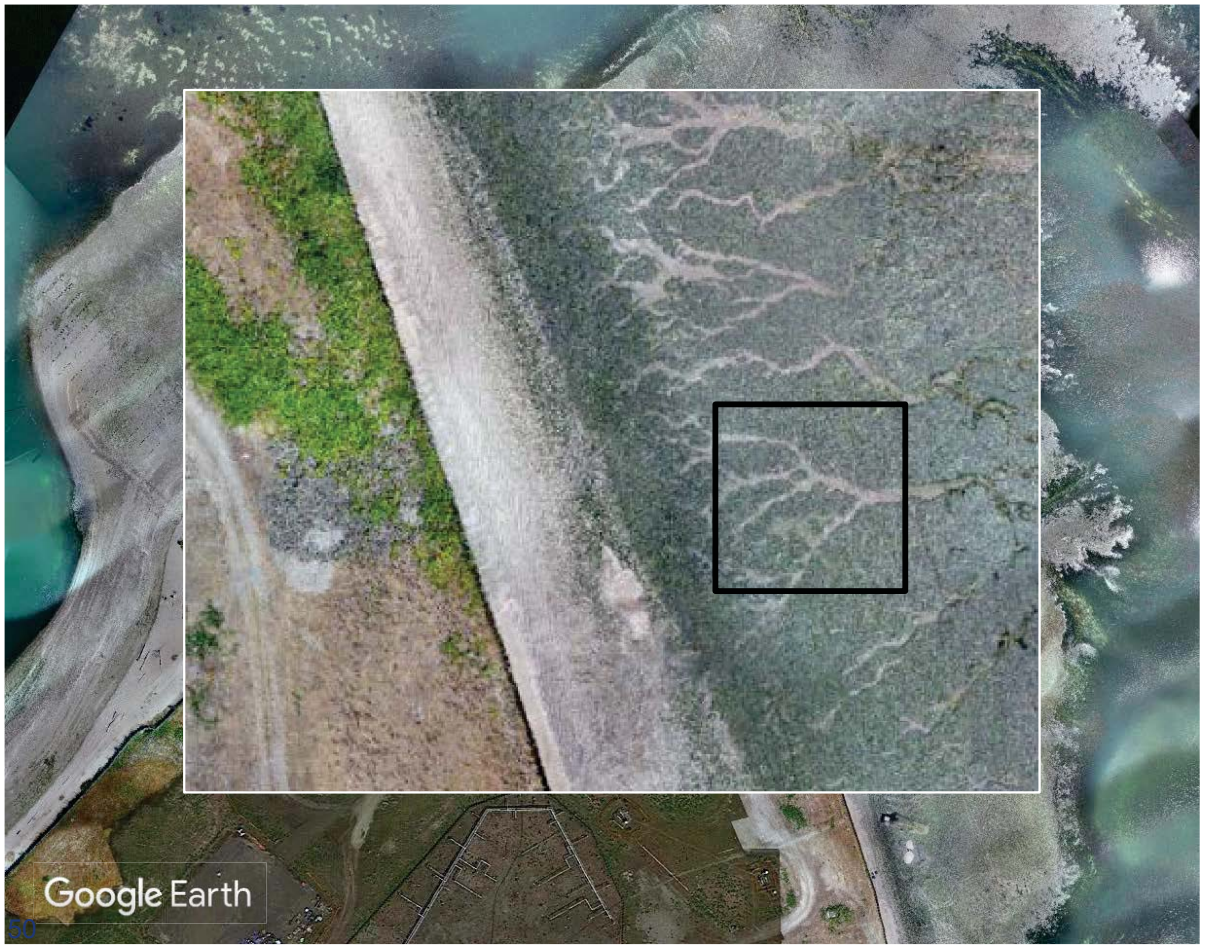
Topographic Photogrammertry Survey



- Survey conducted on Day 1 in July
- Detailed image used to identify visible tidal drainages

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Topographic Photogrammertry Survey

- Survey conducted on Day 1 in July
- Detailed image used to identify visible tidal drainages
- Survey data used to trace non-visible drainages

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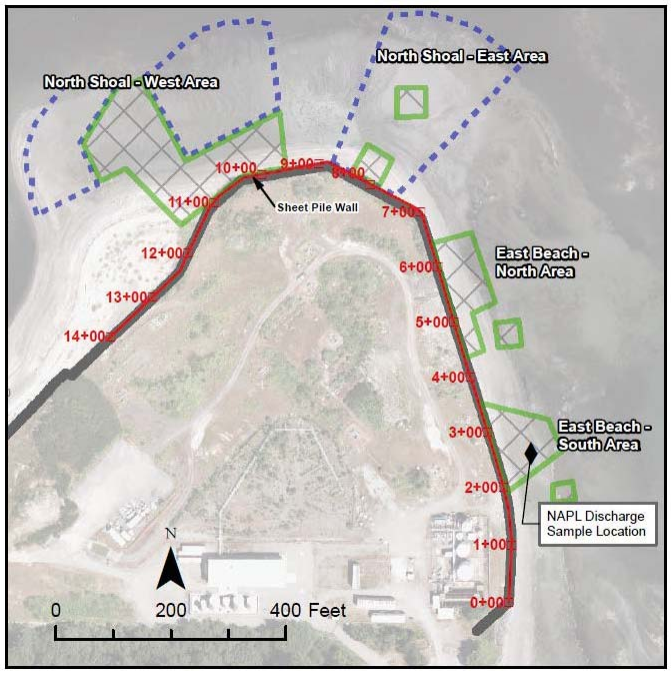
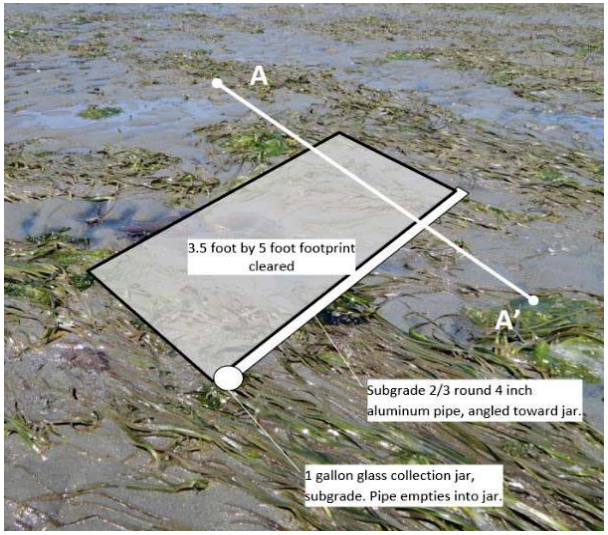
NAPL Discharge Rate Tests





- NAPL discharge locations identified prior to field event
- NAPL collected from seep area during low tide

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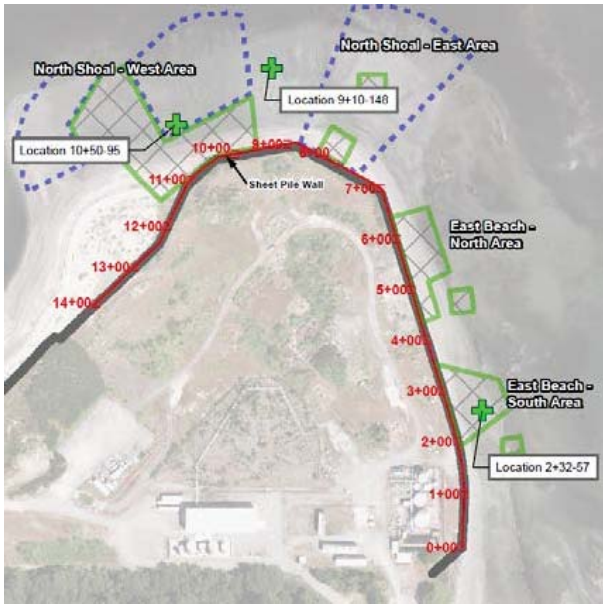
Treatment Media Tests

Test Locations



Absorptive Media Tests

- Oleophilic Bio Barriers placed in three locations
- Oleophilic Clay Mat placed at one location
- Clean backfill placed on excavation
- Media retrieved after two months deployment

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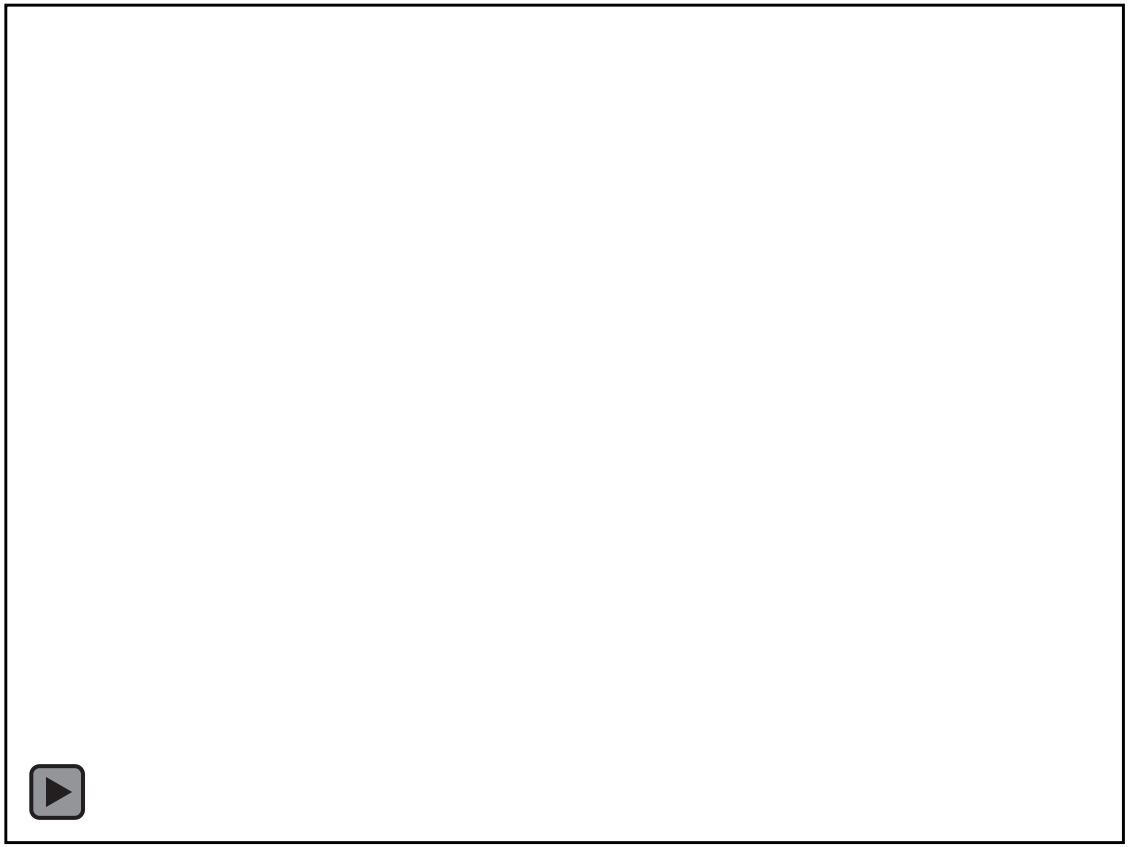
Key Results

Source Control and MNA has Vastly Improved the Intertidal Area NAPL condition



- 1986 Video shows low vegetation and high NAPL discharge

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- Currently, eel grass and clams present

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Source Control and MNA has Vastly Improved the Intertidal Area NAPL condition

- 1986 Video shows low vegetation and high NAPL discharge
- Currently, eel grass and clams present
- However, at low tides, NAPL surface discharge still occurs in select areas

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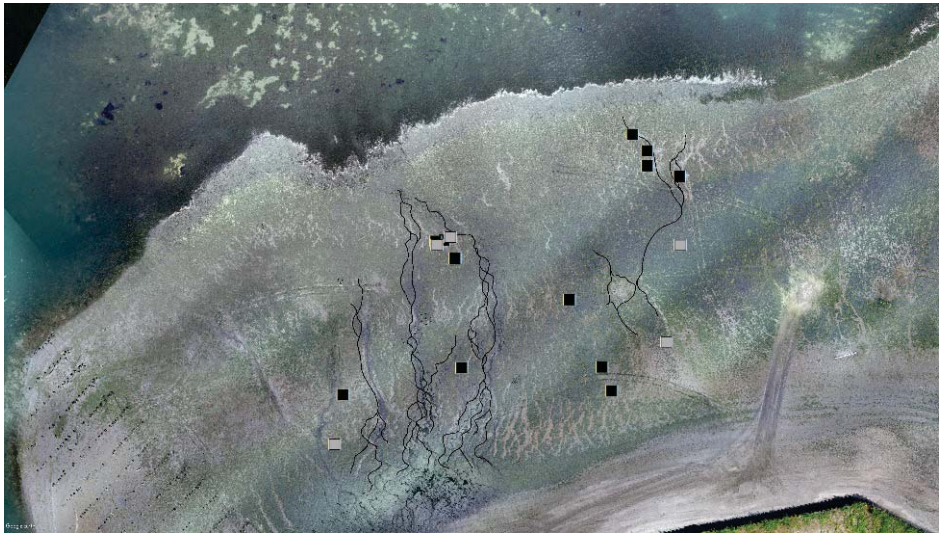
NAPL Impacts Align with Tidal Drainages



- NAPL blebs and sheen in shallow sediment followed tidal drainage

NAPL Impacts Align with Tidal Drainages

- NAPL blebs and sheen in shallow sediment followed tidal drainage
- Surface blebs observed 235 feet from sheet pile wall

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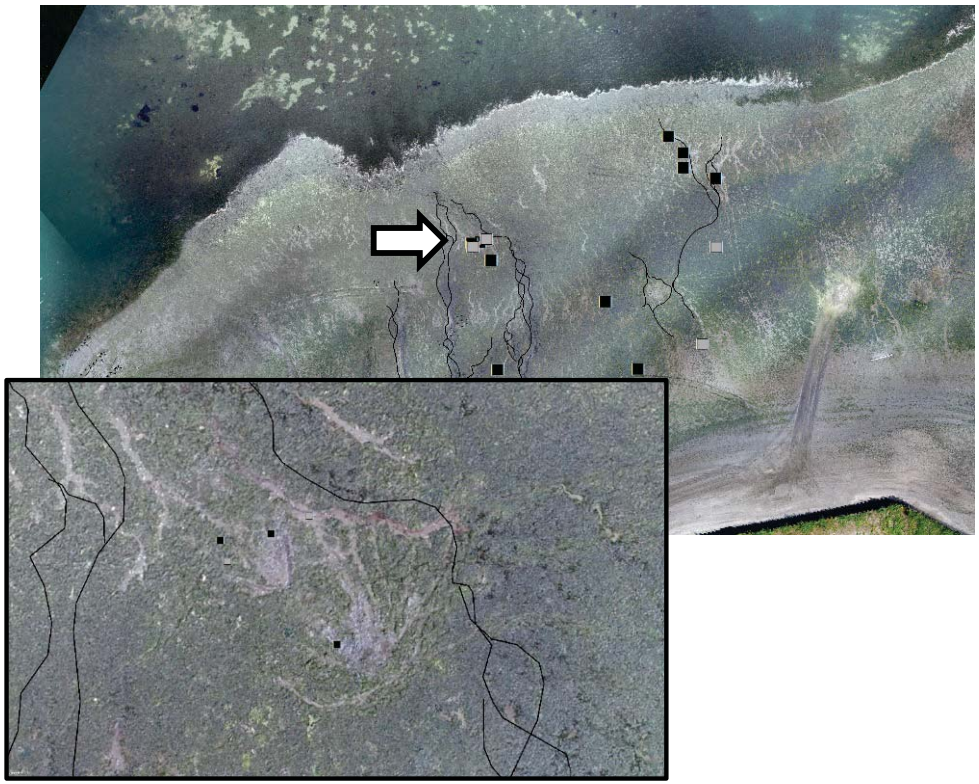

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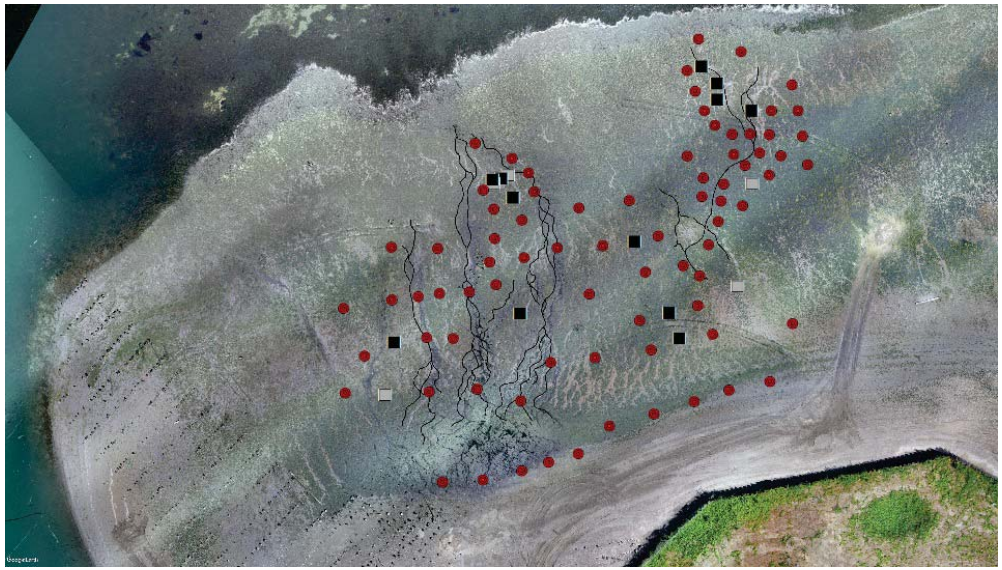
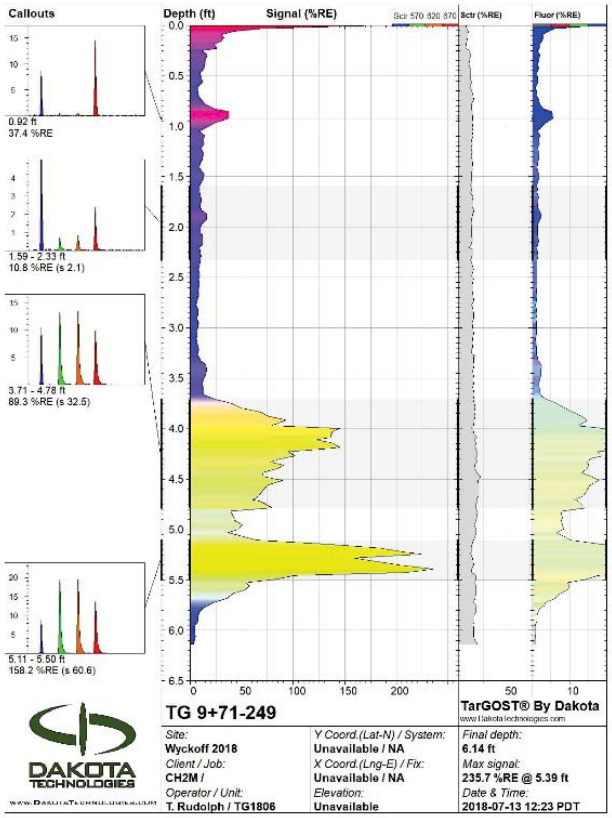


- NAPL blebs and sheen in shallow sediment followed tidal drainage
- Surface blebs observed 235 feet from sheet pile wall
- Detailed imagery allowed surface NAPL impacts to be identified
- August event planned for shallow test pits focused along tidal drainage

Deep NAPL Impacts Occur at Tidal Drainage Ends



- High TarGOST response up to 6 feet deep
  - 250 feet from wall
- Two step-out borings, same general response

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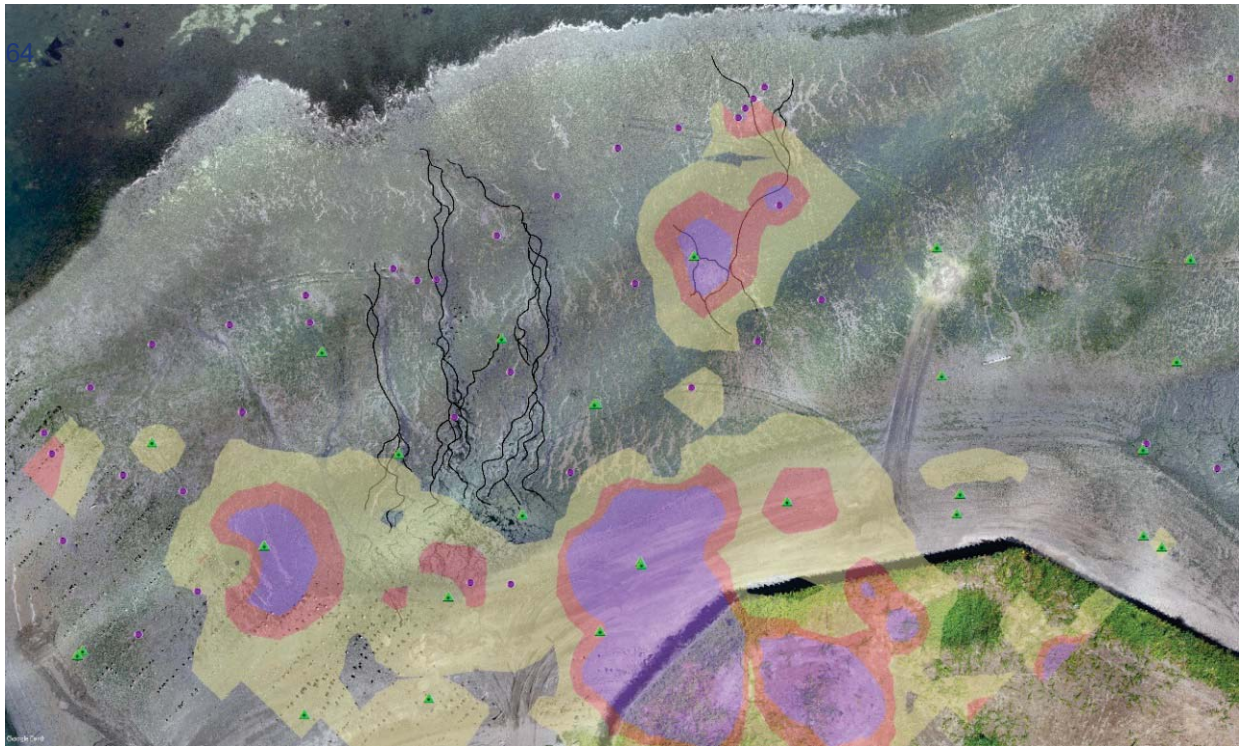

- High TarGOST response up to 6 feet deep
  - 250 feet from wall
- Two step-out borings, same general response
- NAPL observed in borehole
- TarGOST interpolation also follows tidal drainage

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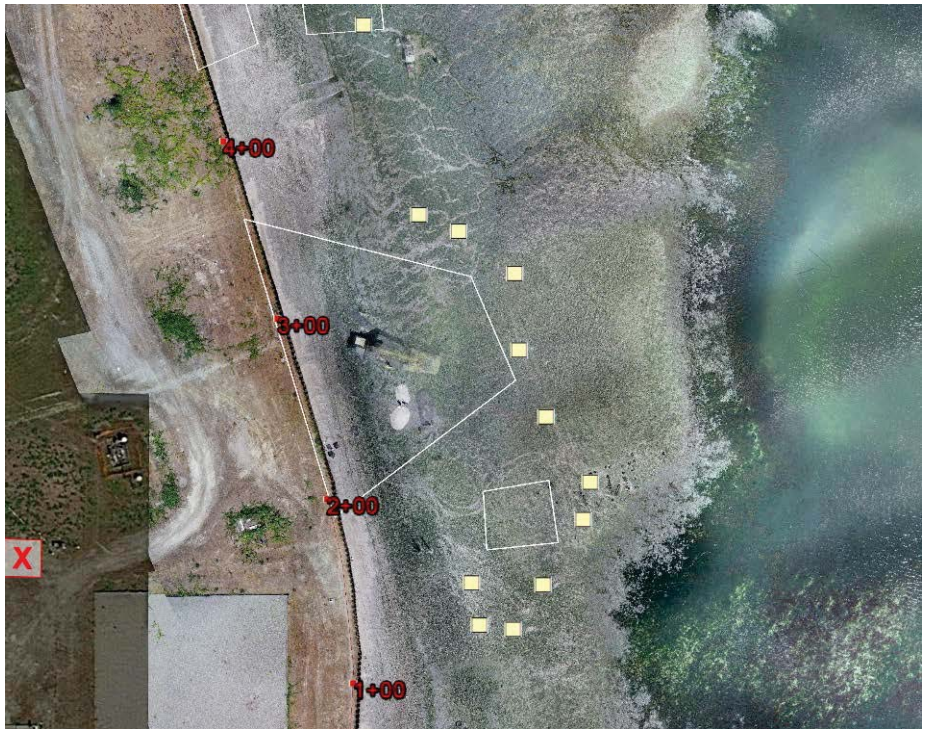
Shallow Test Pits Inform Final Cap Boundary



- “Clam Hole” elutriate observations were planned around previous defined target areas

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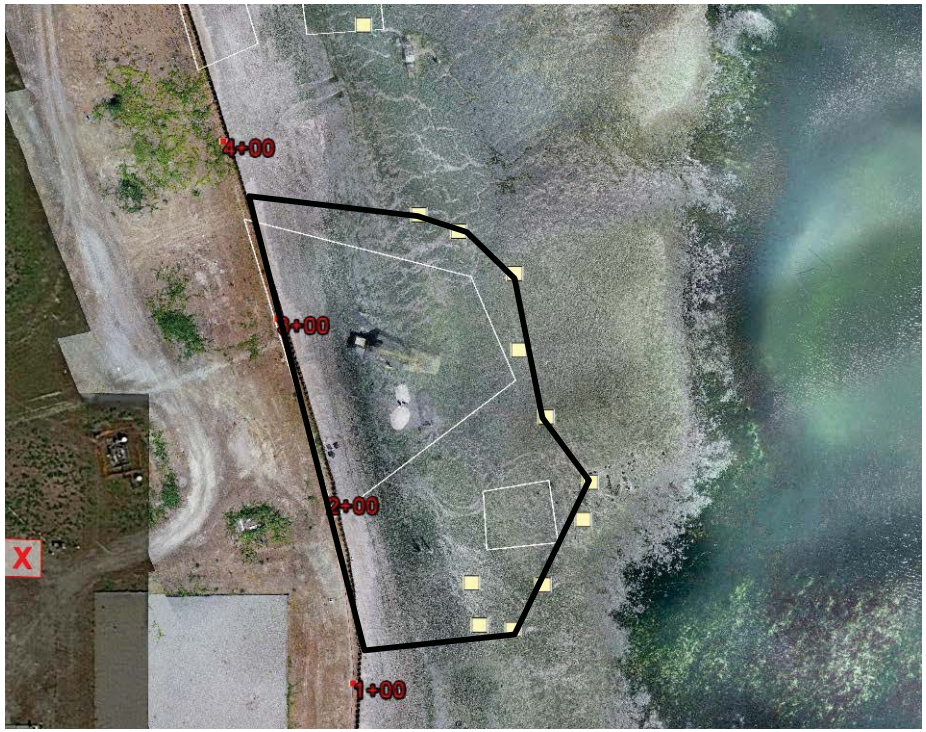

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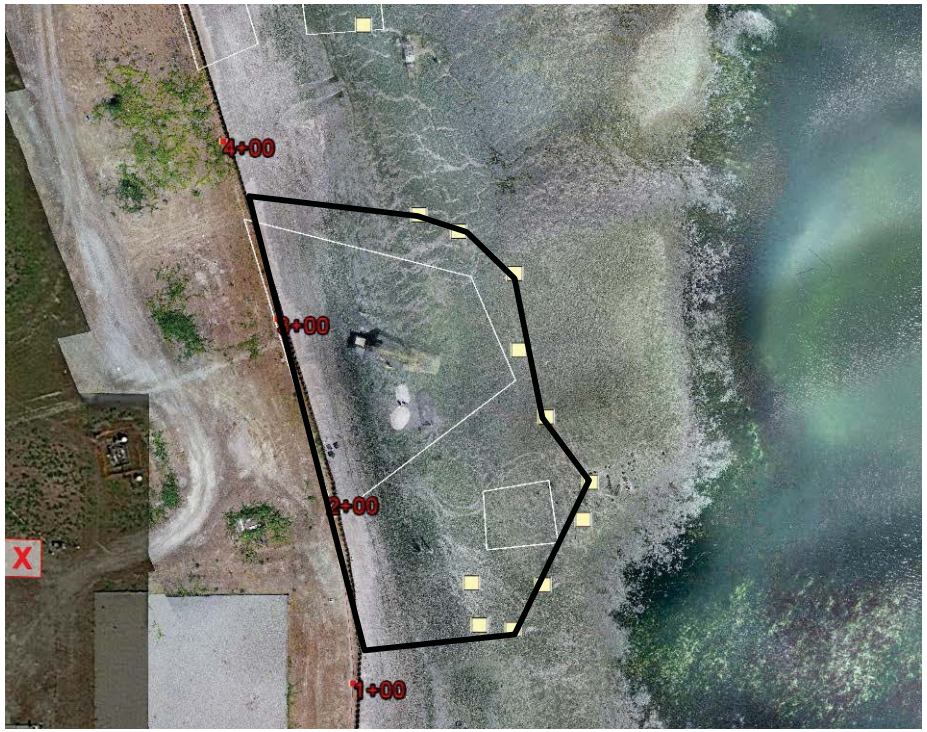

- "Clam Hole" elutriate observations were planned around previous defined target areas
- Stations with clean elutriate used to define outer cap boundaries
- Disturbed sediment elutriate tests do not represent NAPL mobility, but were used assess potential exposure during clam harvesting

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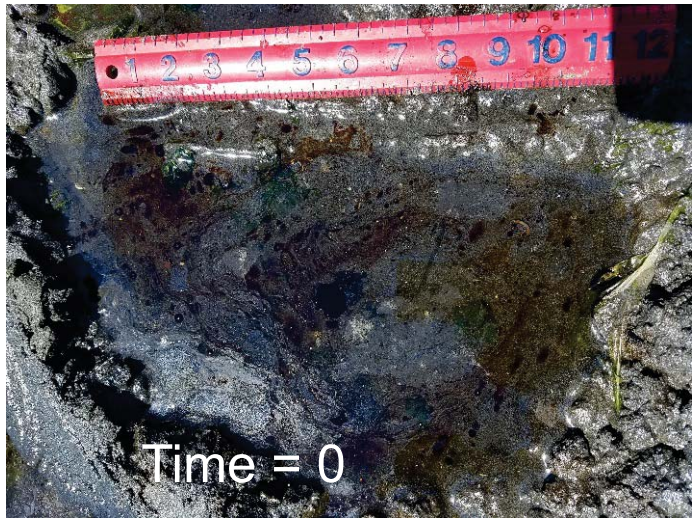
NAPL Discharge Rate



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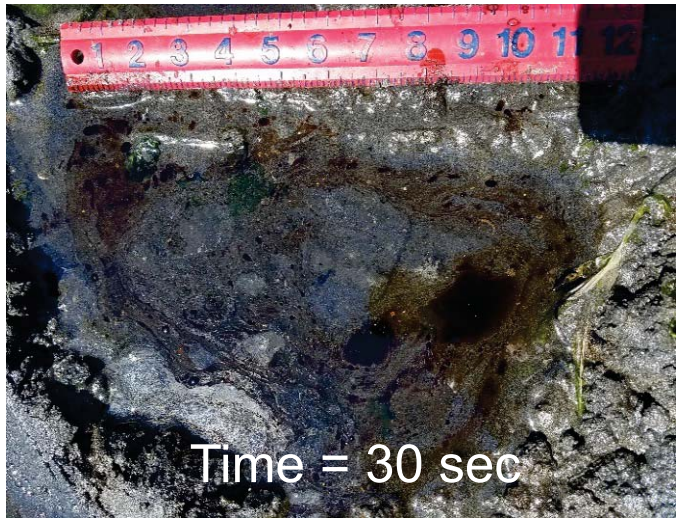

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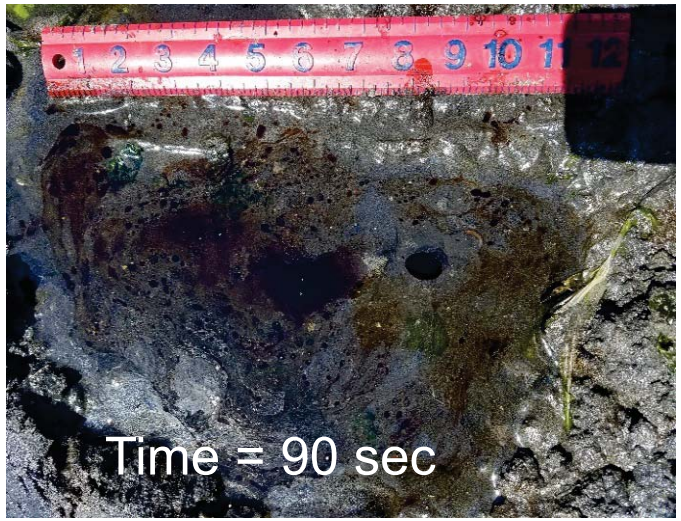

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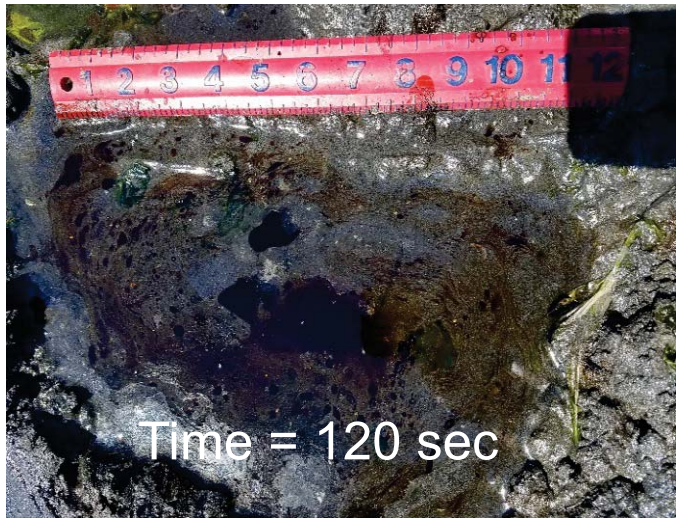

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NAPL Discharge Rate

- 200 mL of NAPL (or 196 grams) was collected over one tide cycle
  - 0.97 specific gravity – LNAPL!
  - Total collection area ~100 ft^2 (9.2 m^2)
  - majority of the discharge occurring from an area of 1 ft^2 (0.092 m^2)

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Assumed Seep Area	Volumetric Discharge (mL/m^2)	Mass Discharge (g/m^2)
1 ft^2 (0.092 m^2)	2,150	2,110
100 ft^2 (9.2 m^2)	21.5	21.1

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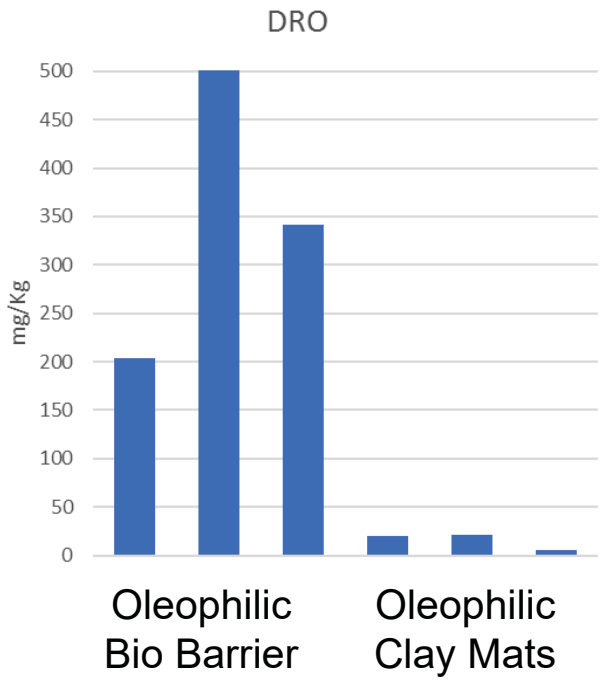
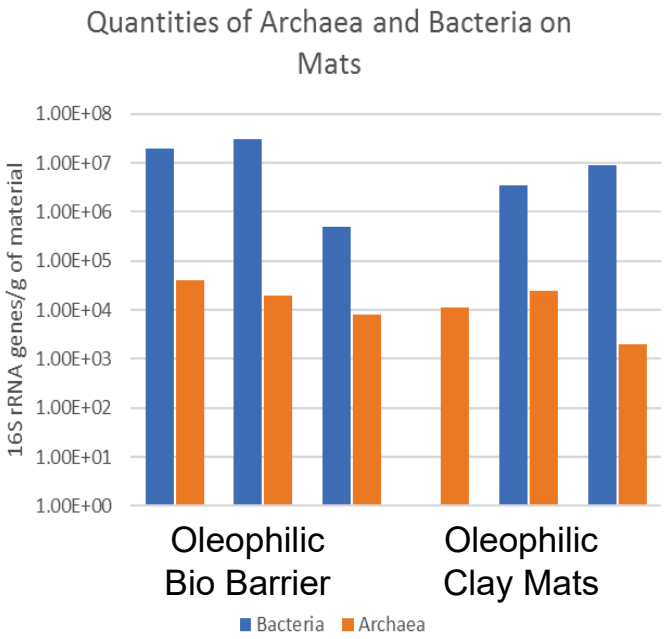
Absorptive Media Tests

Diesel Range Organics



Bacteria Counts



- North Shoal samples had inconclusive data
- DRO loading on OBB was higher than the oleophilic clay mat
- Both mats colonized by bacterial in 60 days
  - $1x10^7$ count considered high by CSU researchers

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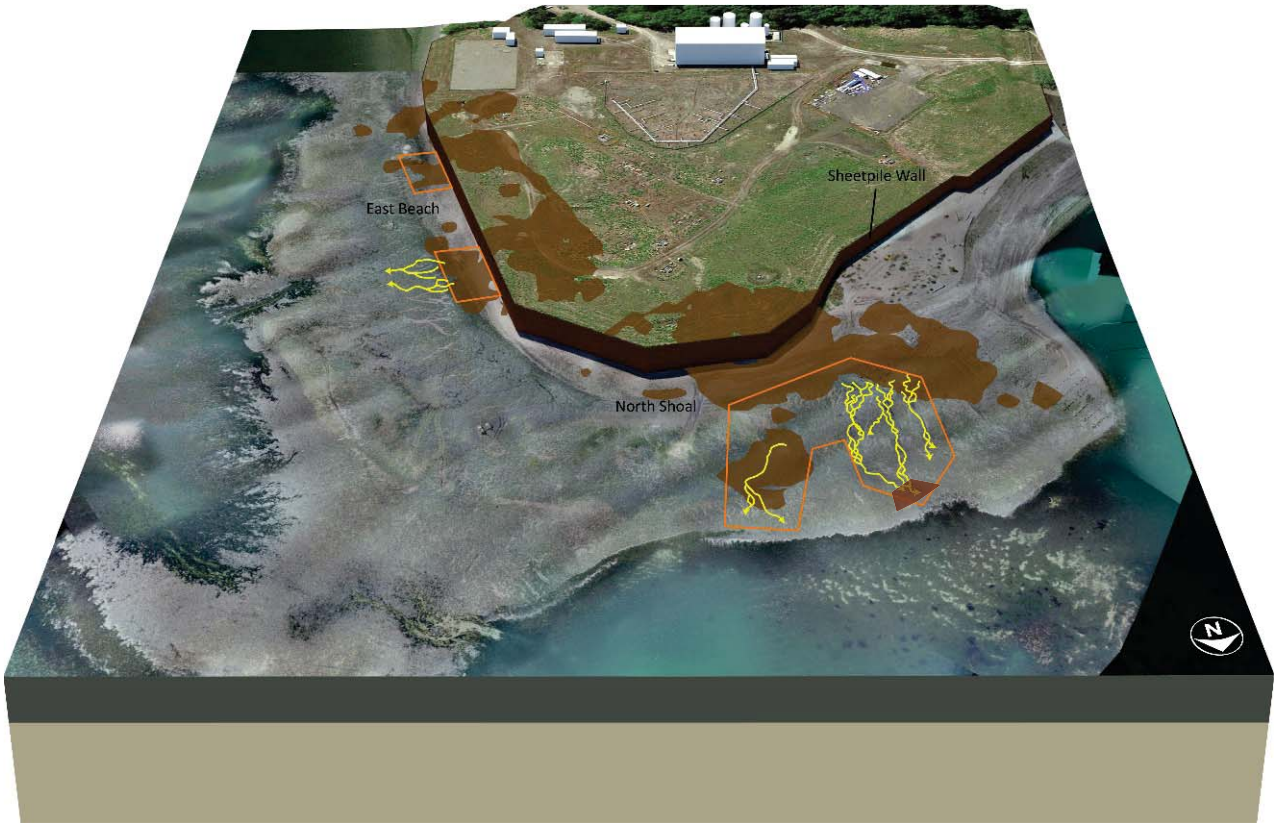
Surface NAPL Flow Informed Design Stage CSM



- NAPL surface discharge and transport explains the lateral NAPL distribution the site
- Tidal drainages are also accumulation areas for NAPL resulting in deeper NAPL impacts

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Revised Remedial Target Areas

- High NAPL discharge areas identified (1.3 acres)
  - Discharge too high for passive cap types
  - Improved source control and/or mass removal needed
- Total remedial target area identified (4.4 acres)
  - Low discharge or sheen areas, more cap types possible

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Key Take-Away Concepts

- Surface discharge of NAPL and overland transport:
  - can be a significant NAPL transport mechanism
  - should be evaluated whenever the NAPL plume intersects the surface sediment
- High resolution surveys should be used on intertidal sites
  - Plan ahead: the aerial survey required the lowest Spring tides during daylight hours
- Investigations in intertidal areas require significant planning
  - During the first four-day event, six co-current activities were needed

Project Path Forward

- Investigation results will inform the design of a new perimeter barrier wall
- Design of the remedy for intertidal beaches will continue during design and construction of the new perimeter wall

Thank you! Questions?

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