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Salish Sea Ecosystem Conference

2018 Salish Sea Ecosystem Conference  
(Seattle, Wash.)

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Apr 6th, 2:45 PM - 3:00 PM

## Wood waste assessment, characterization, and remediation in Esquimalt Harbour

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Davis, Mikaela and Northrup, Scott, "Wood waste assessment, characterization, and remediation in Esquimalt Harbour" (2018). *Salish Sea Ecosystem Conference*. 589.  
<https://cedar.wwu.edu/ssec/2018ssec/allsessions/589>

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# Wood Waste Assessment, Characterization and Remediation in Esquimalt Harbour

Mikaela Davis, Hemmera

Scott Northrup, Hemmera

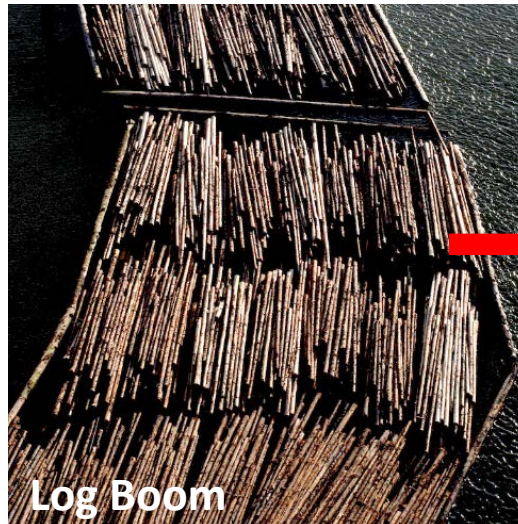
Shannon Bard, Hemmera

Mike Waters, DND

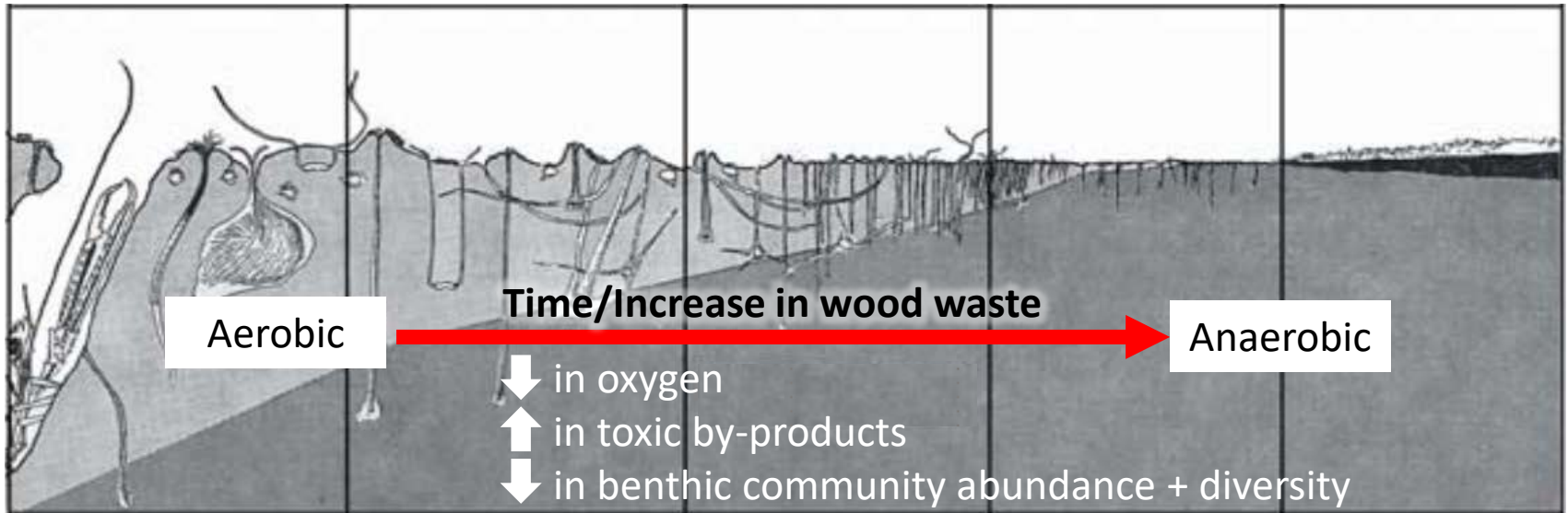
 **Hemmera**  
An Ausenco Company

# Wood Waste Effects

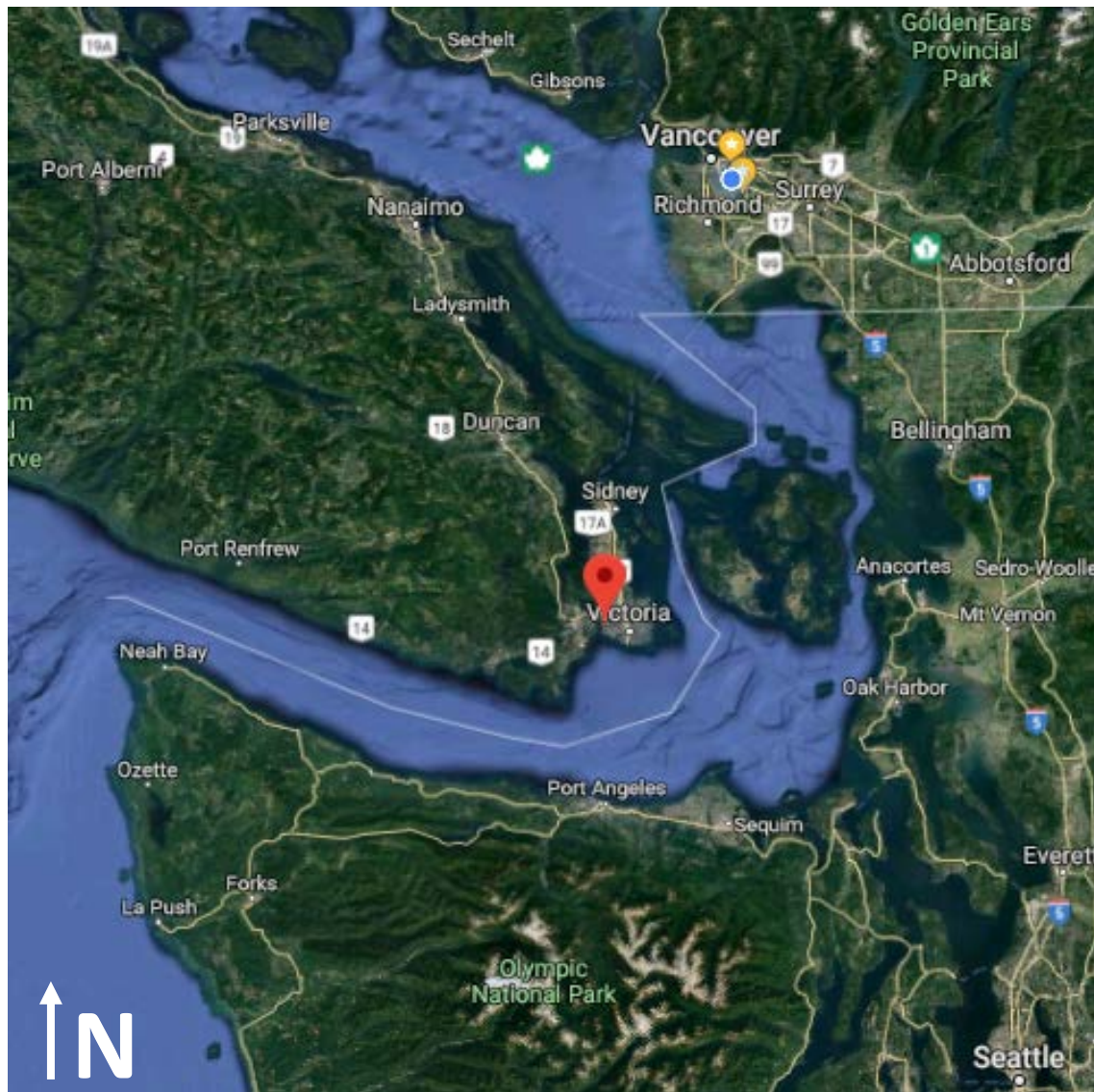
- Wood waste
  - Any wood by-product of the wood processing industry
- Impacts = ***negative***:
  1. Physical
  2. Leachate Production
  3. O<sub>2</sub> Depletion and toxic by-products of anaerobic breakdown
    - » H<sub>2</sub>S
    - » Ammonia
    - » Methane



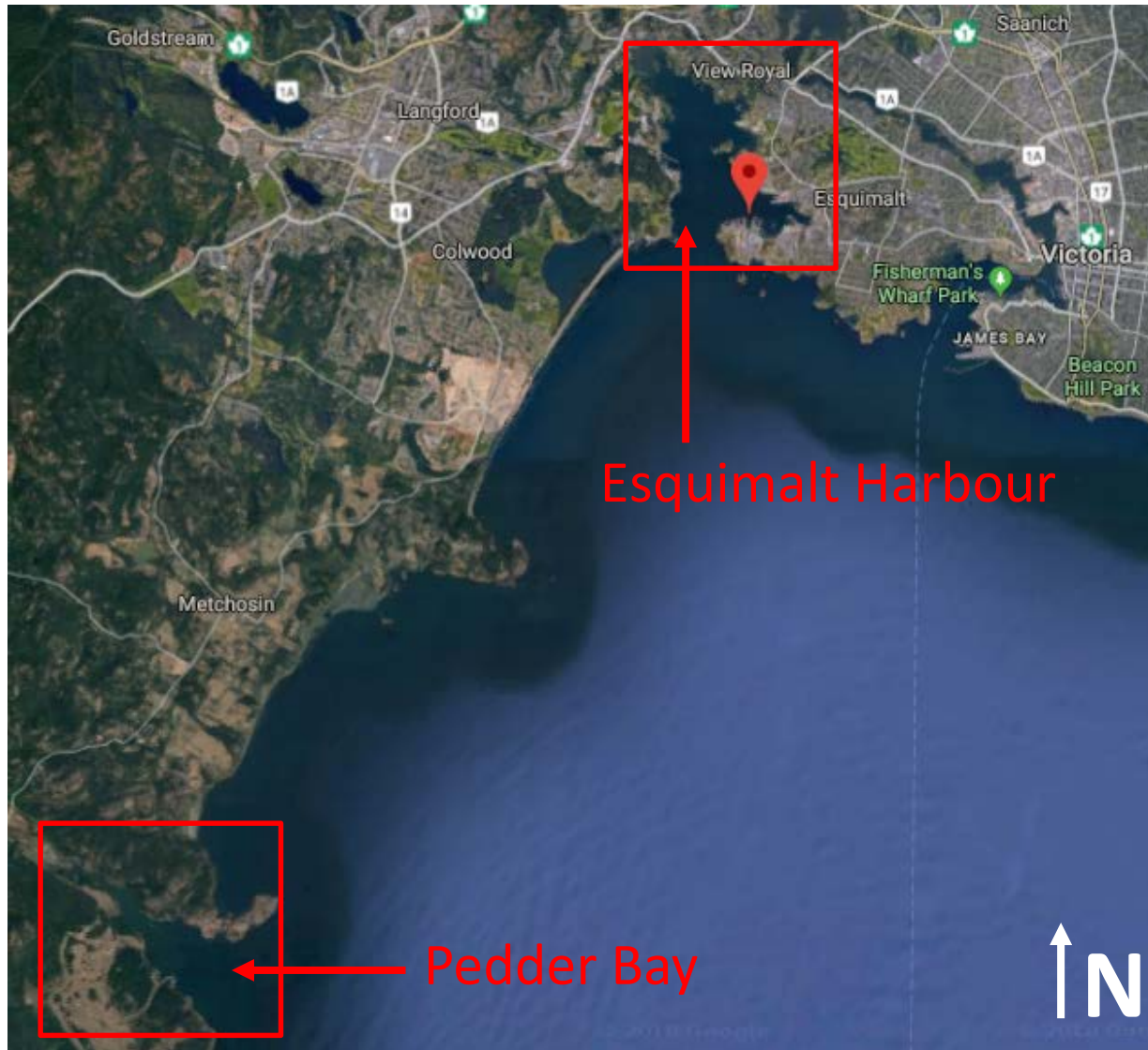
# Wood Waste Effects



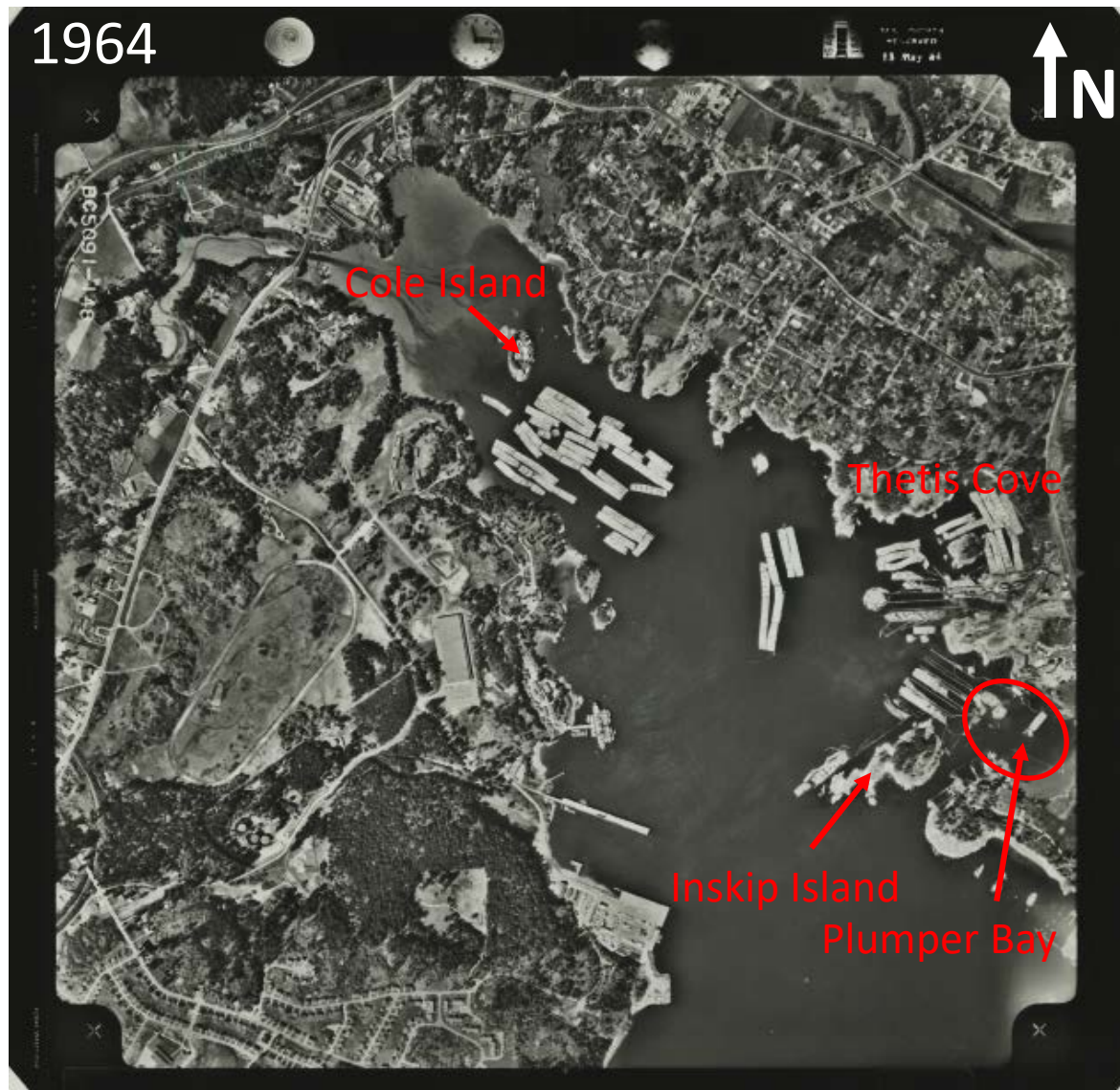
# Study Area



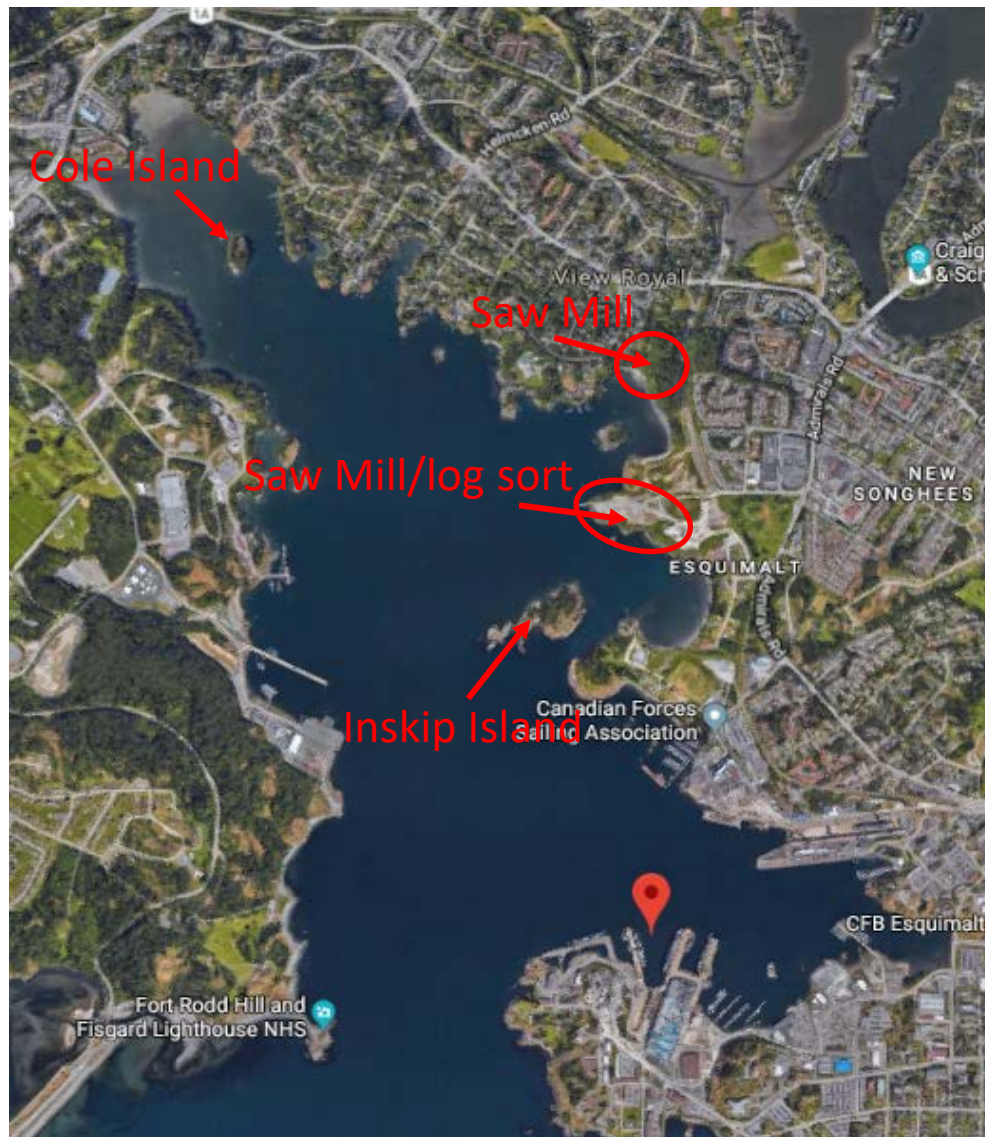
# Study Area



# Background



# Background







# General Harbour Conditions

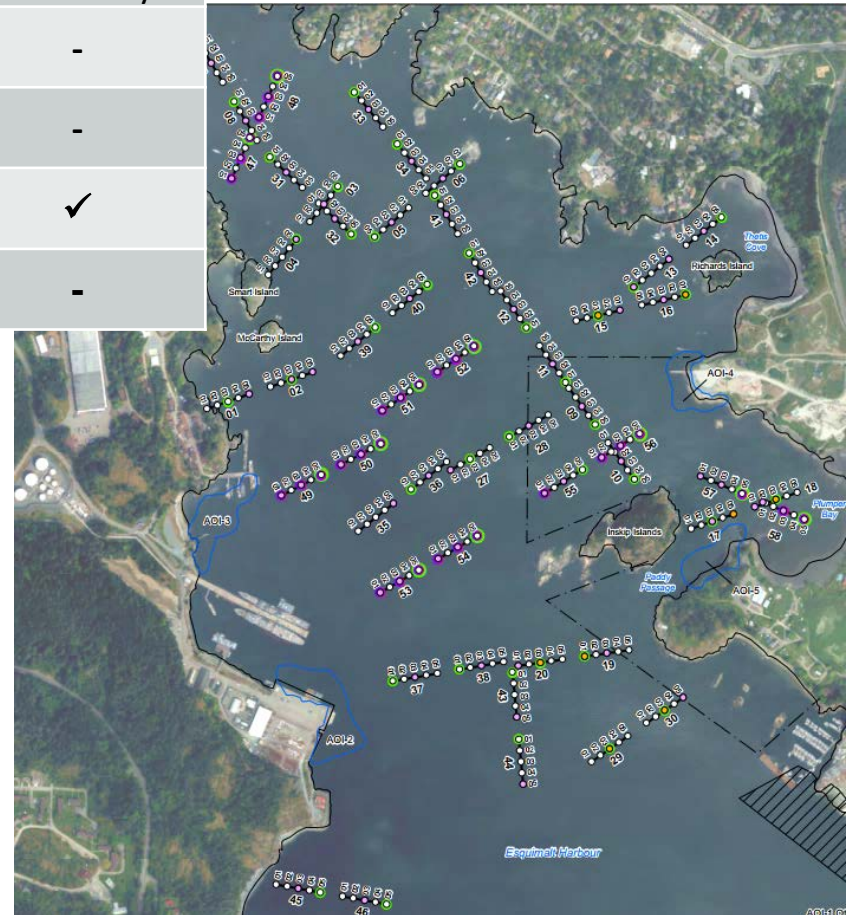
- Protected/low wave exposure
- Low tidal current velocity
- Low rate of natural sediment deposition
- Unconsolidated fine sediments in subtidal
- High disturbance
  - Prop wash from DND activities
  - Active dredging and remediation

# Methods

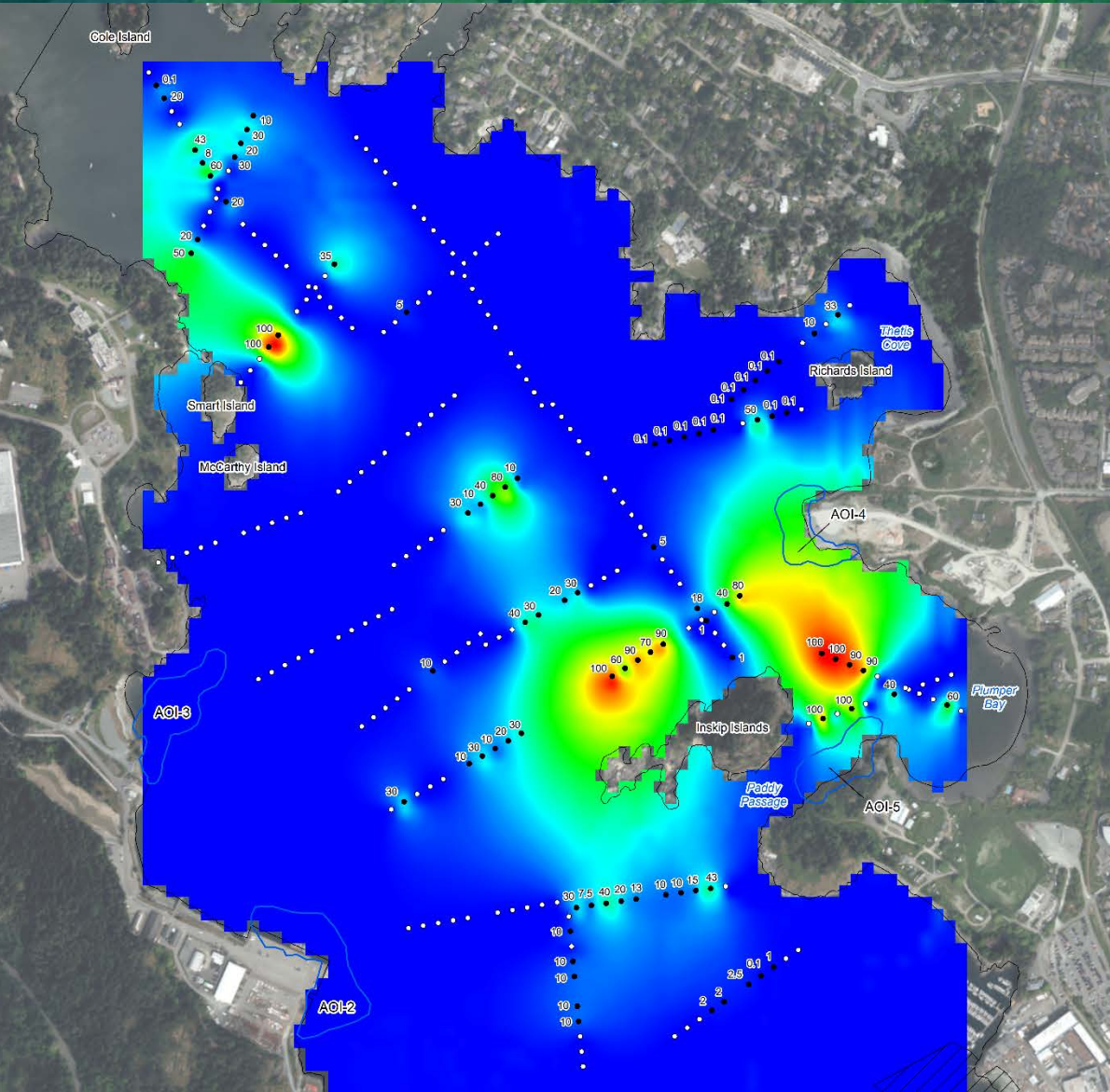
Survey Method	Objective		
	Wood Waste Delineation	Biophysical Assessment	Sediment Chemistry
Side scan sonar	✓	✓	-
SCUBA surveys	✓	✓	-
Sediment Collection	✓	-	✓
Benthic Infauna sampling	-	✓	-

Covered Areas of:

- Known wood waste
- Transition zones
- Reference area



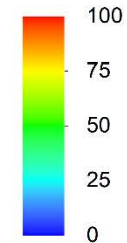
# Wood Waste Delineation - % Coverage



## Legend

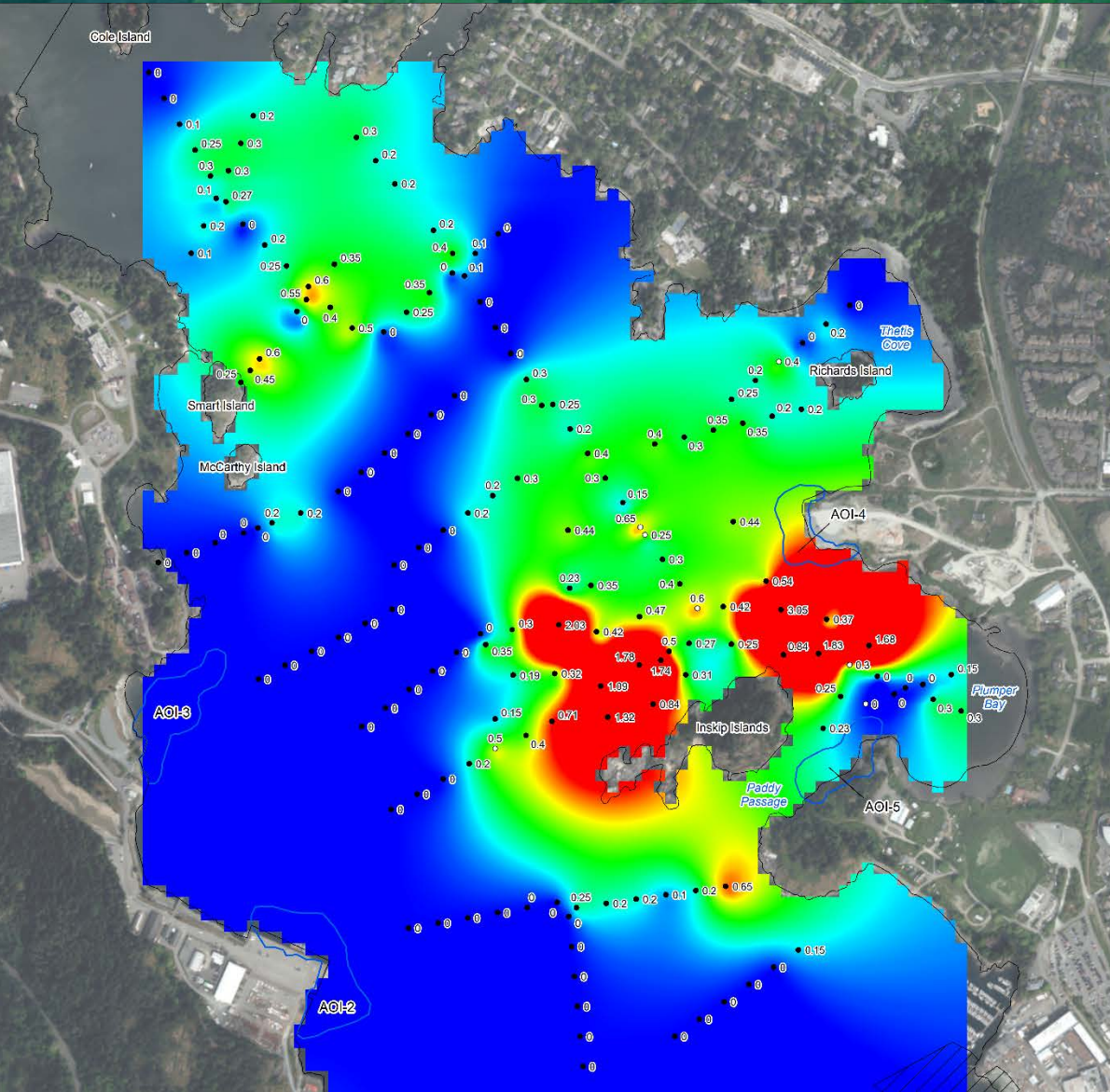
- Sampling Location (Surficial Wood Waste Coverage = 0%)
  - Sampling Location (Surficial Wood Waste Coverage >0%)
- 0.65 Surficial Wood Waste Coverage (%)

## Wood Waste Coverage (%)



\* No wood waste in  
Pedder Bay \*

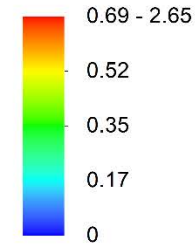
# Wood Waste Delineation - Depth



## Legend

- Sampling Location (Bottom depth of wood waste was reached during sampling)
- Sampling Location (Bottom depth of wood waste was not reached during sampling)
- 0.65 Sampled Wood Waste Depth (m)

## Wood Waste Depth (m)

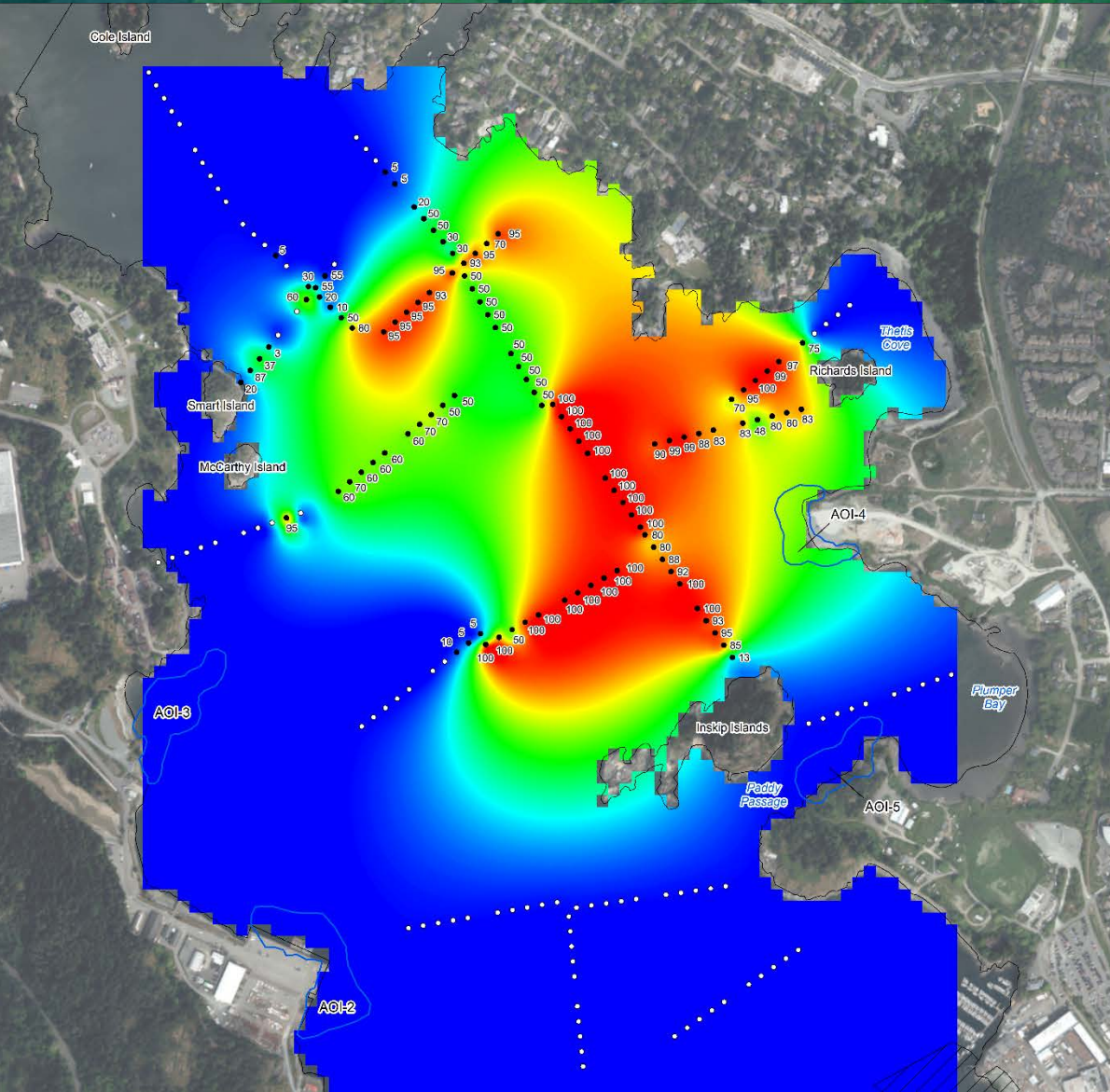


\* No wood waste in Pedder Bay \*

# Wood Waste Delineation - Nature



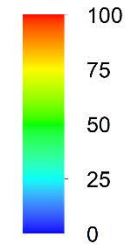
# Biophysical - Epifauna



## Legend

- Sampling Location (Beggatoea Coverage = 0%)
- Sampling Location (Beggatoea Coverage >0%)
- 75 Sampled Beggatoea Coverage (%)

## Beggatoea Coverage (%)



\* No *Beggatoea* in  
Pedder Bay \*

# Biophysical - Epifauna

**A** Cut logs = Habitat Islands



**B** Rocky habitat



**C** Silty/sand



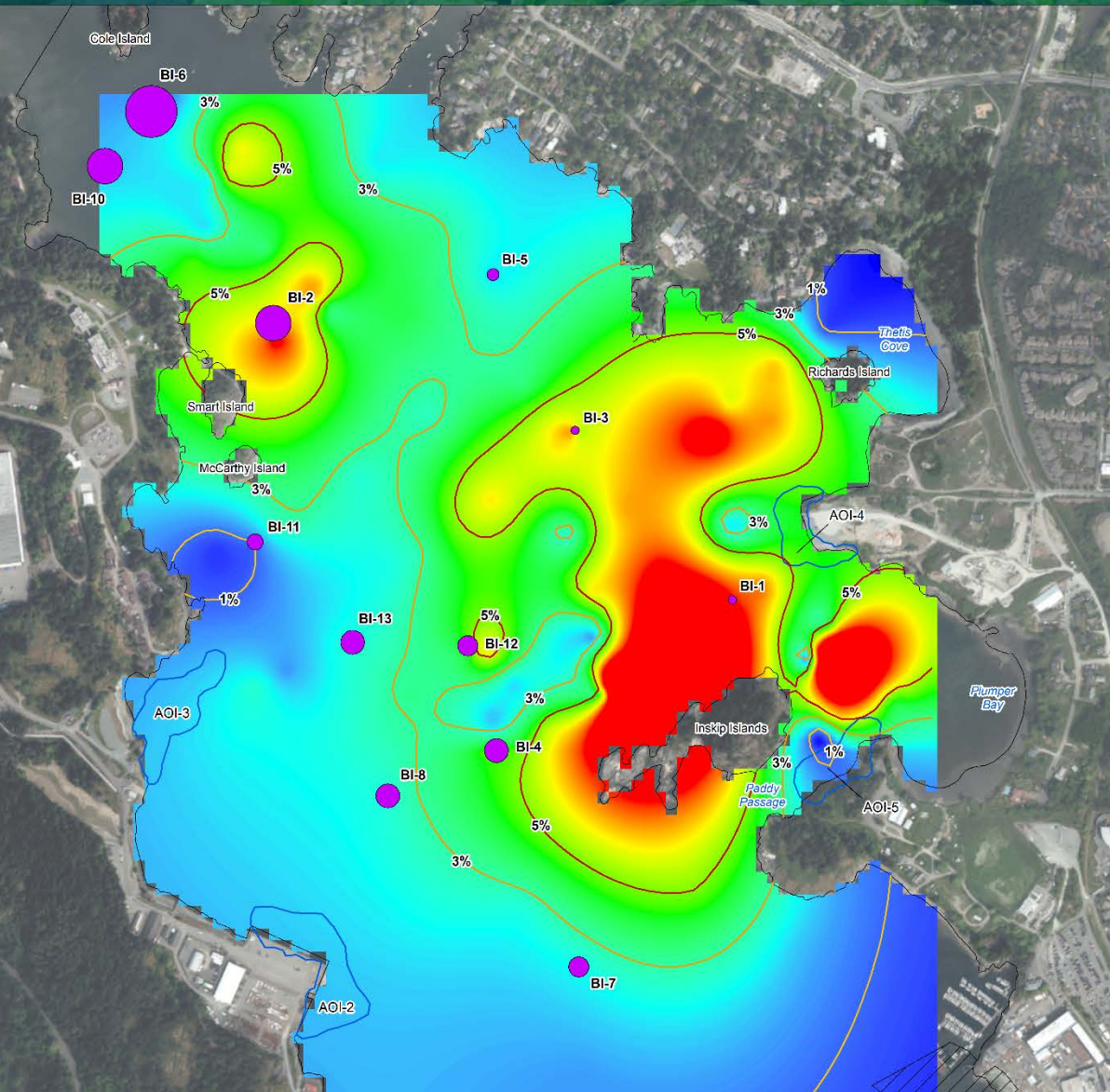
**D** Pedder Bay





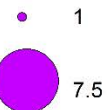


# Biophysical – Infauna



## Legend

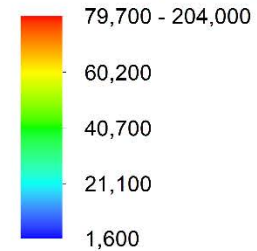
### Swartz's Dominance



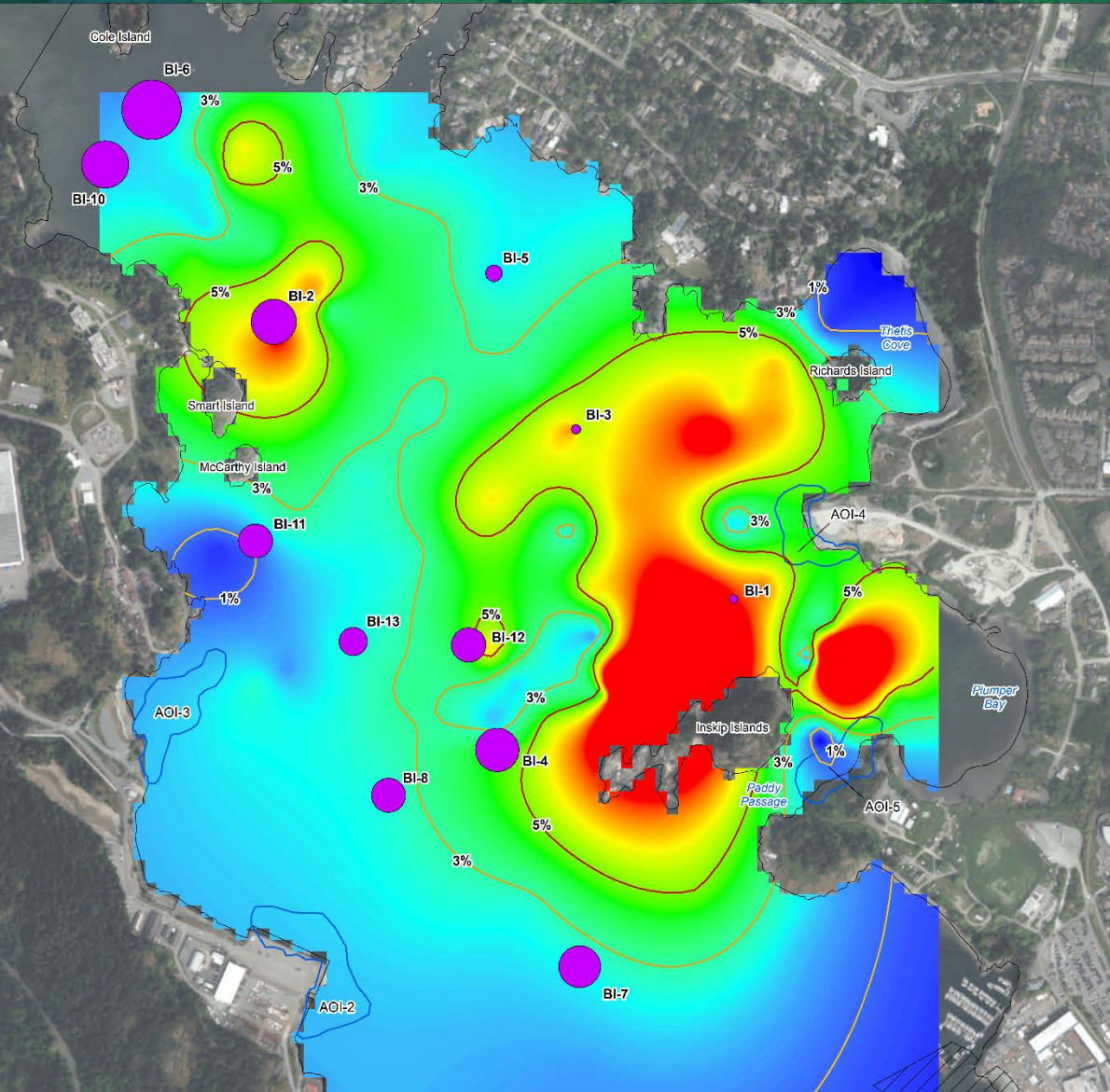
### Total Organic Carbon Threshold Contours



### TOC Concentration (mg/L)



# Biophysical – Infauna



## Legend

### Shannon Diversity Index

● 0.47

● 2.48

### Total Organic Carbon Threshold Contours

— < 1

— > 3

— > 5

### TOC Concentration (mg/L)

79,700 - 204,000

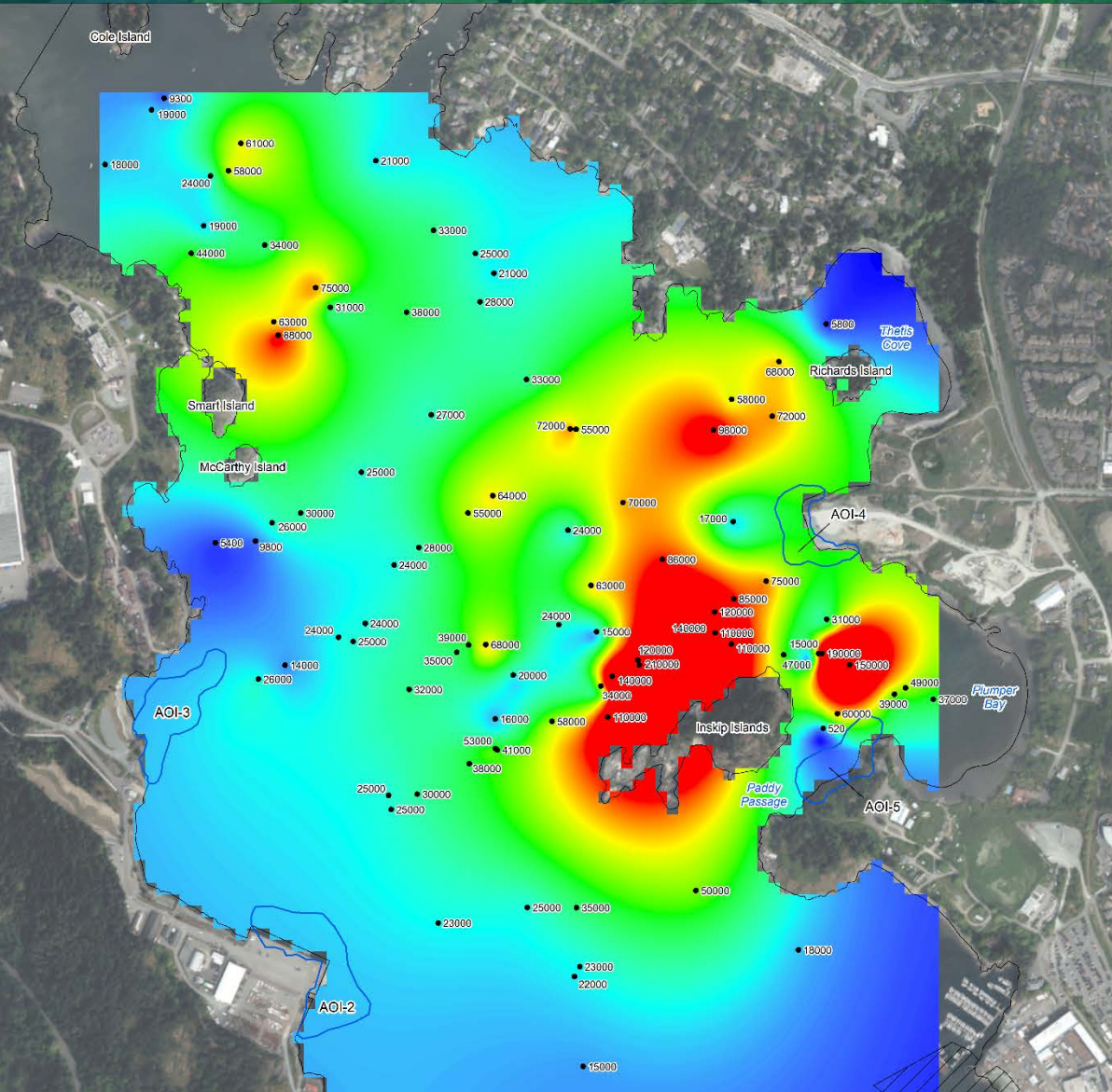
60,200

40,700

21,100

1,600

# Sediment Chemistry - TOC



## Legend

- Sampling Location
- 5400 Sampled Total Organic Carbon (mg/L)

## TOC Concentration (mg/L)

79,700 - 204,000

60,200

40,700

21,100

1,600

\* TOC = <1% in  
Pedder Bay \*



# Impact Assessment Summary

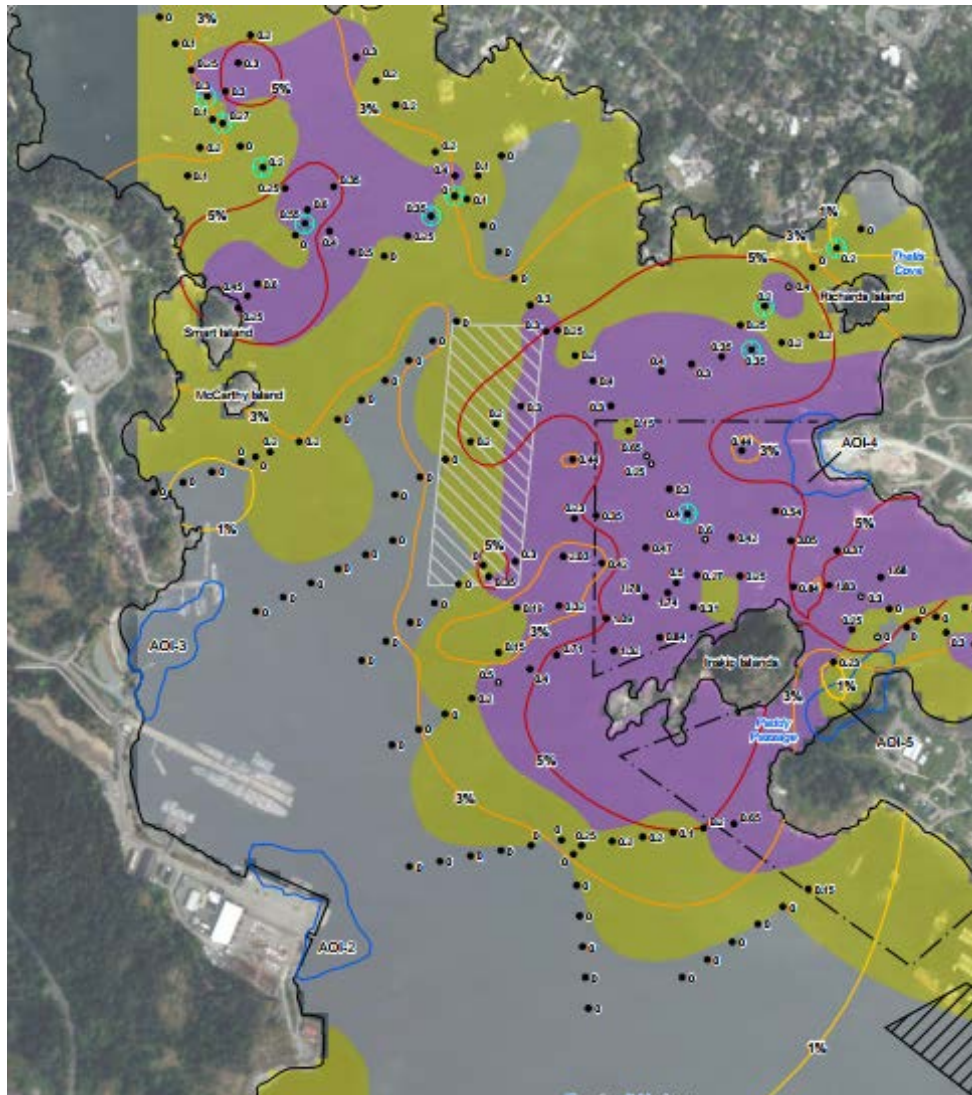
- Delineation
  - Very little sediment deposition over 20 years
  - Depth → stratification varies → two deeper areas >0.20m
- Biological
  - Epifauna are sparse
  - *Beggiatoa* mats → associated with wood waste areas
  - Infauna dominated by opportunists
- Sediment Chemistry
  - TOC → linked with wood waste areas
- Impacts to benthic infauna community apparent at 3% TOC

# Remedial Options

- Monitored Natural Recovery
- Enhanced Natural Recovery
- Dredging
- In-situ Engineered Capping
- In-situ Treatment



# Remedial Options



## Legend

- Sampling Location (Bottom depth of wood waste was reached during sampling)
  - Shallow surficial wood waste deposit (0 - 0.25m)
  - Deep surficial wood waste deposit (>0.25m)
  - ⊕ Surficial sediment overlying wood waste deposit
  - No wood waste
- Total Organic Carbon Threshold Contours**
- < 1
  - > 3
  - > 5

North Deposit  
31,182m<sup>3</sup>


South Deposit  
227,819m<sup>3</sup>



# Thank you!

## Contact Us

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Burnaby, BC V5H 0C6

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