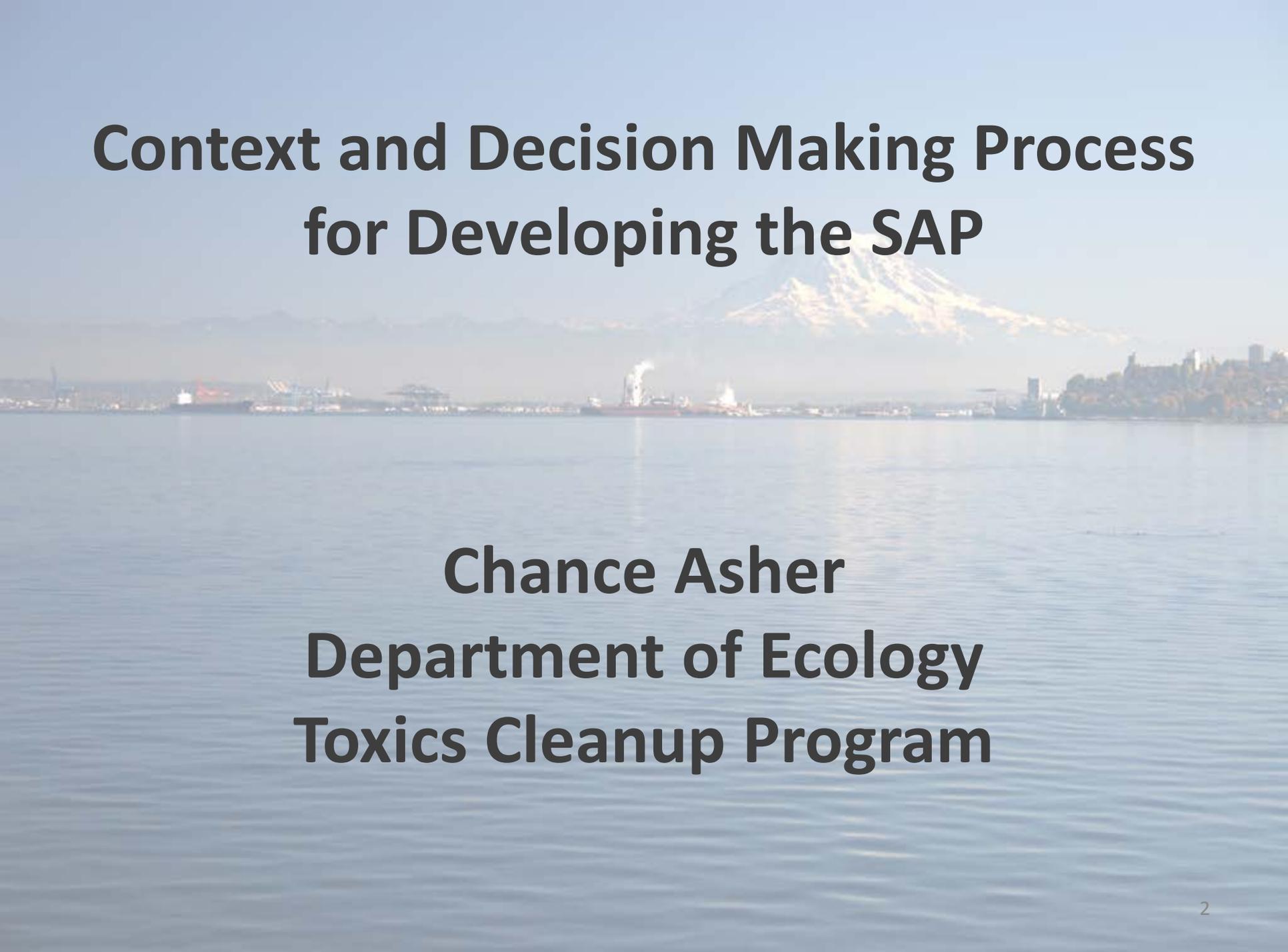


A scenic view of Bellingham Bay, Washington, with Mount Baker in the background. The water is a deep blue, and the sky is a clear, light blue. In the distance, the city of Bellingham is visible, along with industrial facilities and a large ship. The text is overlaid on the image in a white, sans-serif font.

**Bellingham Bay**  
**Regional Background**  
**Draft Sampling and Analysis Plan**

**August 19, 2014**



# **Context and Decision Making Process for Developing the SAP**

**Chance Asher  
Department of Ecology  
Toxics Cleanup Program**

# Goals For Today



- Describe the regional background concept.
- Provide context on the regional background approach based on stakeholder and tribal feedback in other areas.
- Provide an overview of the Bellingham Bay SAP.
- Communicate next steps and our timeline for completing the Bellingham Bay regional background work.
- Discuss remaining questions and issues.

# Acknowledgments

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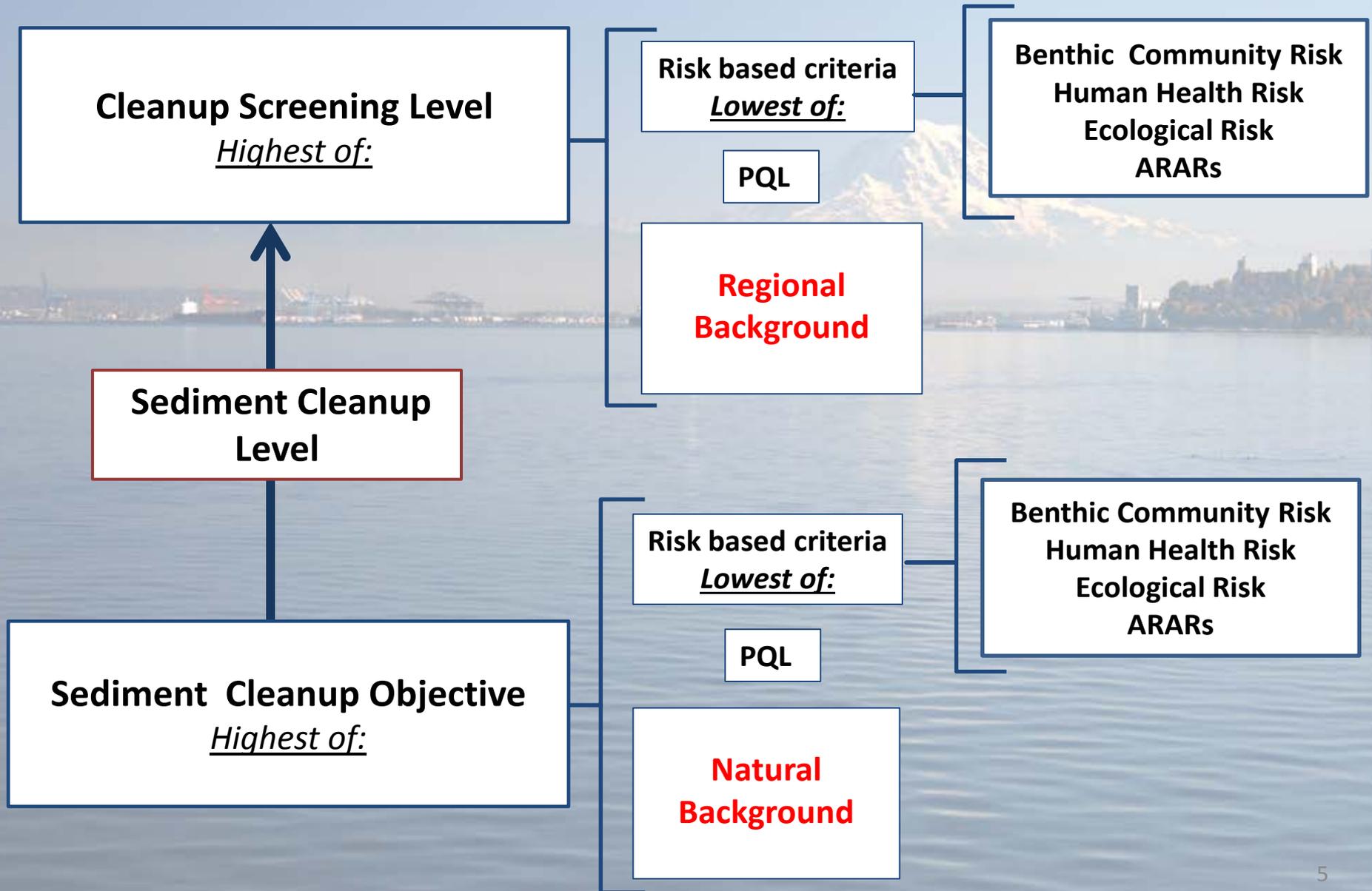
## **Avocet Consulting:**

Teresa Michelsen

## **TerraStat Consulting Group:**

Lorraine Read

# Background & SMS rule - Establishing Cleanup Levels



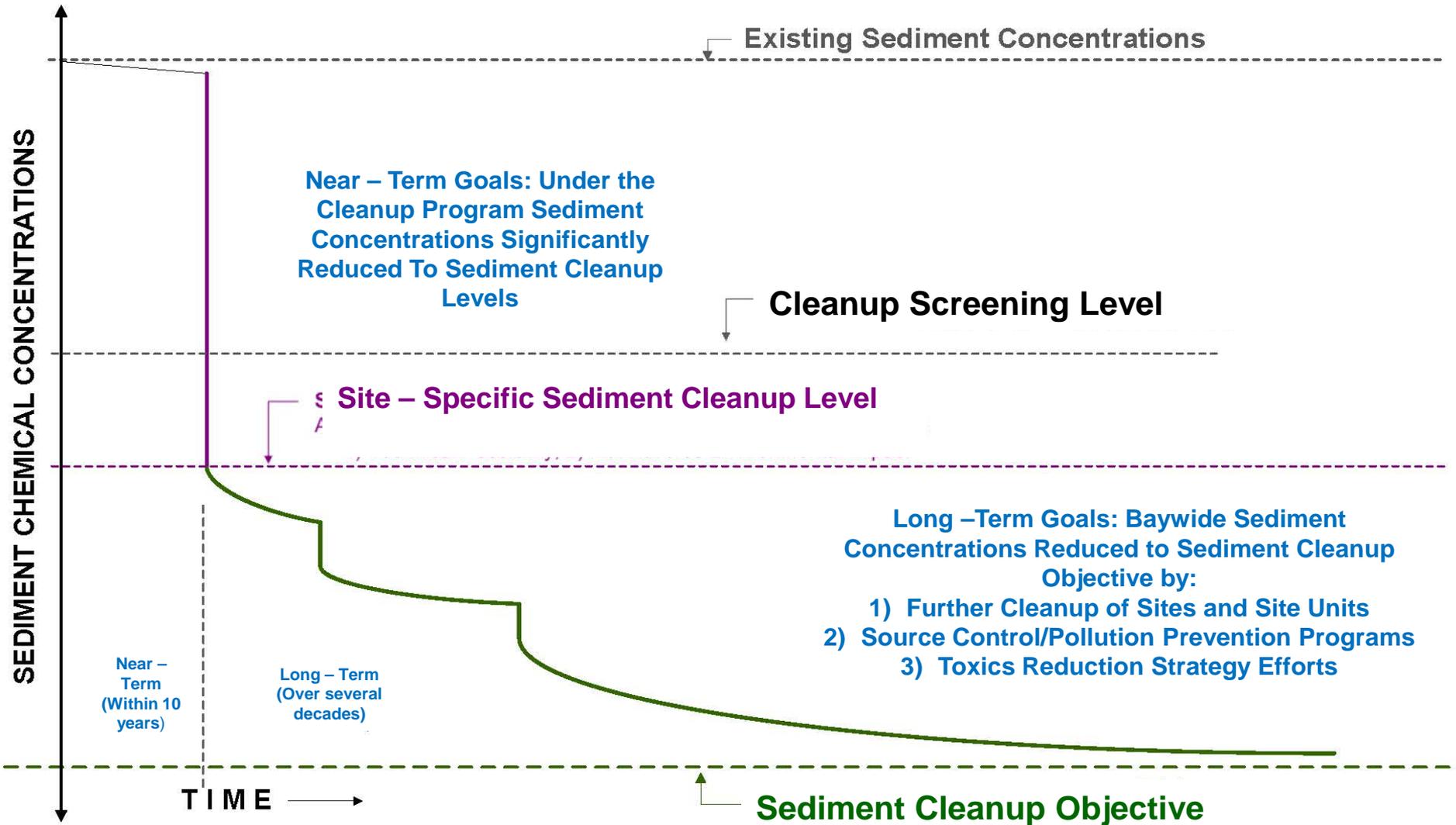
# Regional Background

## How can it be used under the SMS rule?

To establish the **Cleanup Screening Level (CSL)** which can be used:

- To identify a cleanup site
- As the upper bound for establishing a sediment cleanup level
- To identify the areas of a cleanup site requiring active cleanup
- To identify areas for interim actions

# How Cleanup Fits with Long Term SMS Goals



# SMS Background Definitions

- **Natural Background WAC 173-204-505(11):**
  - ...the concentration of a hazardous substance consistently present in the environment that has not been influenced by localized human activities.
- **Regional Background WAC 173-204-505(16):**
  - ...the concentration of a contaminant within a department defined geographic area that is primarily attributable to diffuse sources, such as atmospheric deposition or storm water, not attributable to a specific source or release.

**The difference:** Globally distributed contaminants from global sources versus locally distributed contaminants primarily from diffuse sources such as storm water, atmospheric deposition, etc.

# Some Background on Regional Background

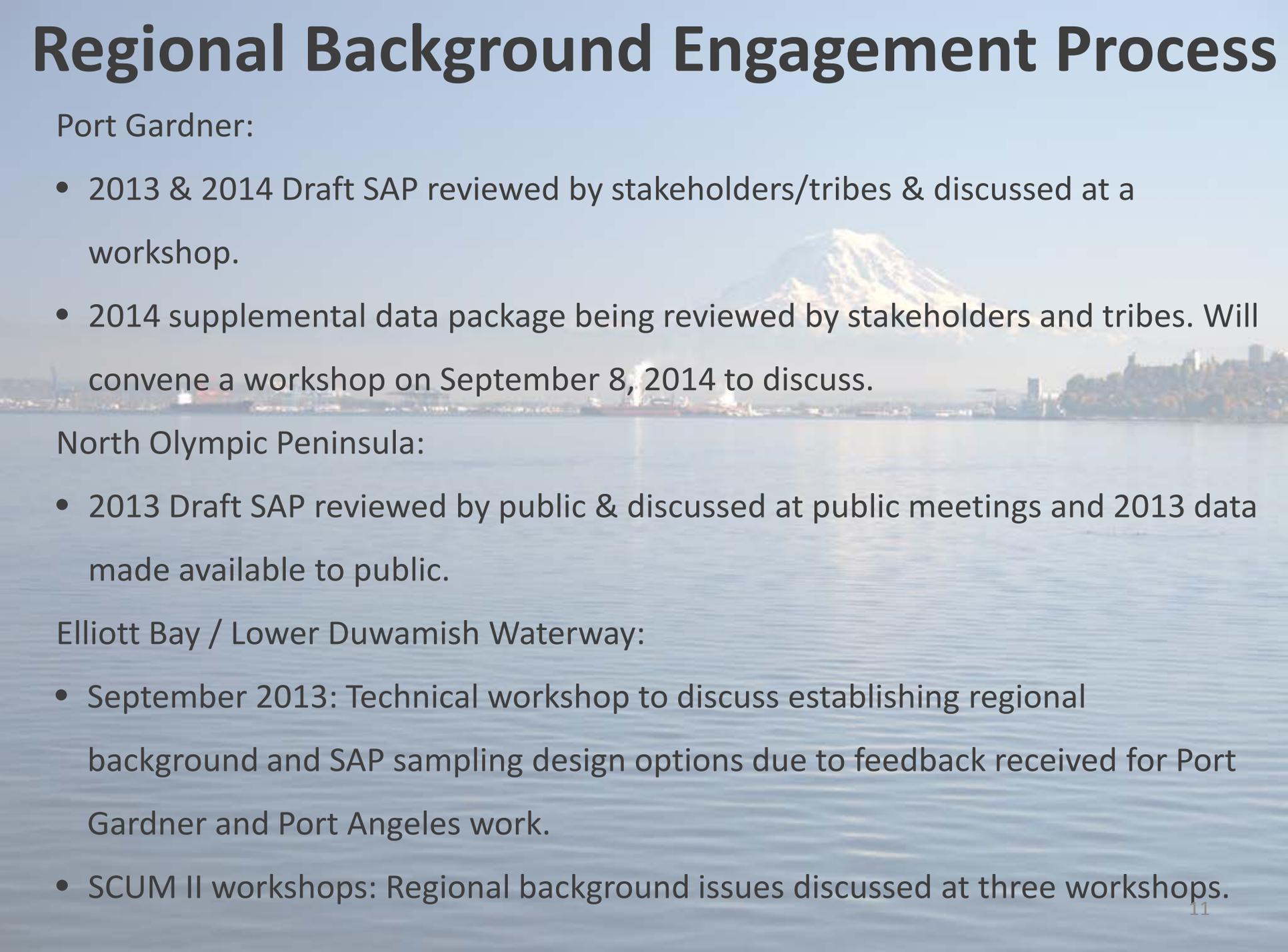
Regional background is one tool amongst several in the SMS rule, intended to help:

- Address the reality of ubiquitous contaminants continuously entering the environment that are not able to be physically or technically controlled in any practicable or timely manner.
- Provide a technically implementable structure to meet and maintain cleanup standards given the potential for recontamination from diffuse sources.
- Can include some influence from definable sources such as piped stormwater, but not the direct influence (that is, the primary contributor).

# Regional Background - What it is NOT

- Not primarily influenced by definable sources (e.g. a cleanup site or immediate depositional zone of an outfall).
- Cannot sample within an area of relatively elevated concentrations due to the direct impact of a definable source. For example:
  - Within the immediate depositional zone of an outfall, if a clear depositional zone exists.
  - Within an established and un-remediated cleanup site for that chemical of concern.
- Not natural background – regional background must exceed natural background, otherwise local values default to natural .

# Regional Background Engagement Process



## Port Gardner:

- 2013 & 2014 Draft SAP reviewed by stakeholders/tribes & discussed at a workshop.
- 2014 supplemental data package being reviewed by stakeholders and tribes. Will convene a workshop on September 8, 2014 to discuss.

## North Olympic Peninsula:

- 2013 Draft SAP reviewed by public & discussed at public meetings and 2013 data made available to public.

## Elliott Bay / Lower Duwamish Waterway:

- September 2013: Technical workshop to discuss establishing regional background and SAP sampling design options due to feedback received for Port Gardner and Port Angeles work.
- SCUM II workshops: Regional background issues discussed at three workshops.

# Establishing Regional Background

## What We Have Heard

- Ecology needs to improve on regional background implementation and ensure that sampling reflects the appropriate influence of stormwater consistent with the intent of the SMS rule.
- It should be more clear that establishing regional background does not result in a default cleanup level. It is one provision amongst others to establish the CSL.
- Regional and natural background areas should be clearly delineated when establishing either type of background.

# Refinements to the Regional Background Sampling Approach

- Developed a Conceptual Bay Model to guide development of the Area of Interest (AOI) for regional background sampling
- Analyzed existing data to:
  - Exclude areas from sampling due to natural features, sediment transport and recovery
  - Identify natural background areas
  - Identify potential sources and direct areas of influence
- Focused more on areas expected to be representative of regional background near the urbanized shoreline



The background of the slide is a scenic view of a coastal city, likely Vancouver, with a large, snow-capped mountain (Mount Rainier) in the distance. The city skyline is visible across a body of water, with various buildings and structures. The sky is clear and blue.

# **Technical Overview of the Sampling and Analysis Plan**

**Teresa Michelsen, Avocet Consulting**

# Conceptual Bay Model

The Conceptual Bay Model was used to guide the appropriate selection of sampling stations representative of regional background. Key features include:

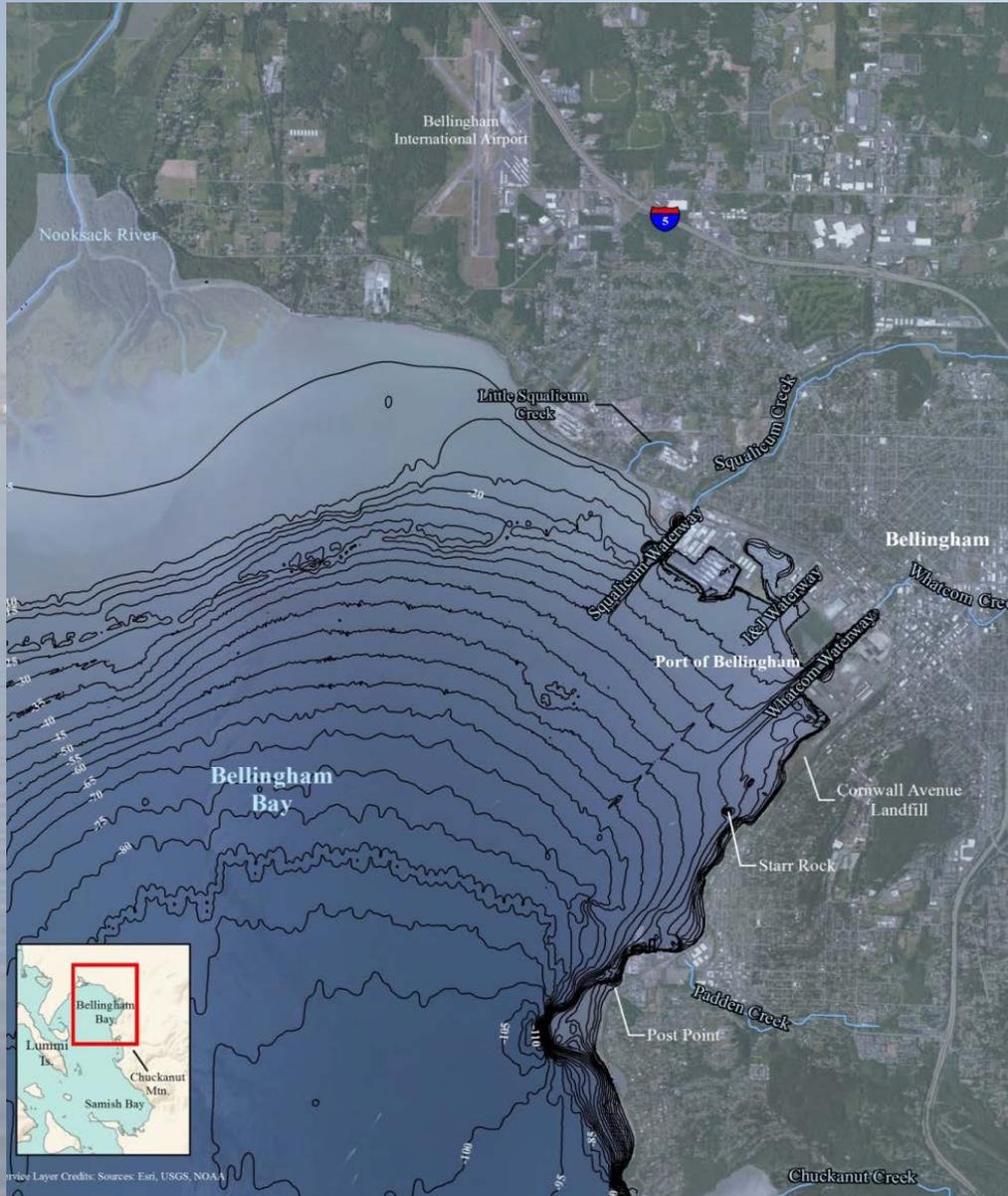
- Hydrology
- Bathymetry
- Sedimentation and natural recovery
- Known sites
- Known sources
- All existing chemistry data

# Conceptual Bay Model

## Hydrology and Bathymetry

- Nooksack River discharge dominates the northern and eastern sediments of the bay; low chemical concentrations with a high rate of sedimentation throughout the bay
- The Nooksack River delta is very shallow over large areas, with the bay deepening gradually to the south
- Several smaller creeks and discharges from residential and industrial areas discharge into the bay along north/northeast shoreline and may contribute contaminants locally

# Bathymetry, Watersheds

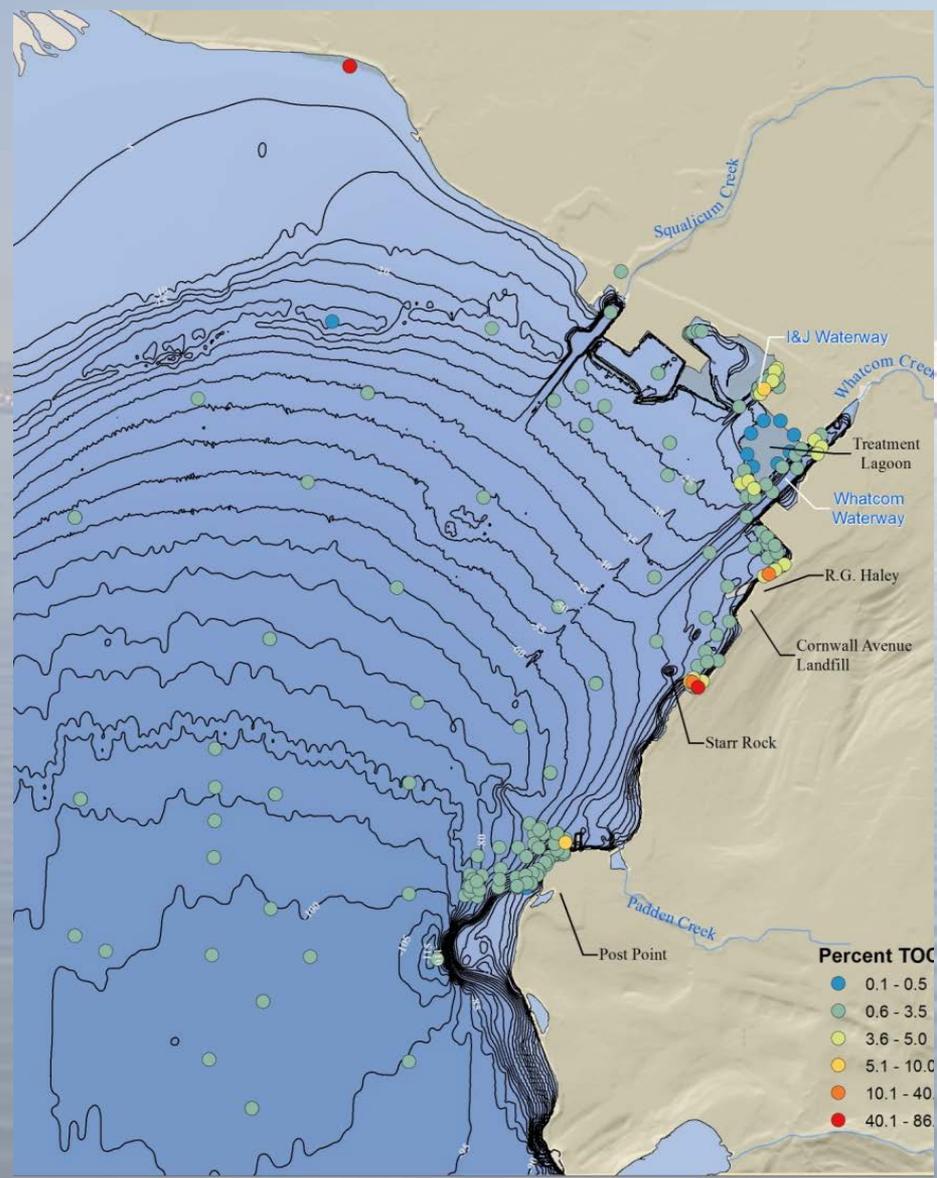


Focusing on the northeast quadrant of the bay, down to Post Point.

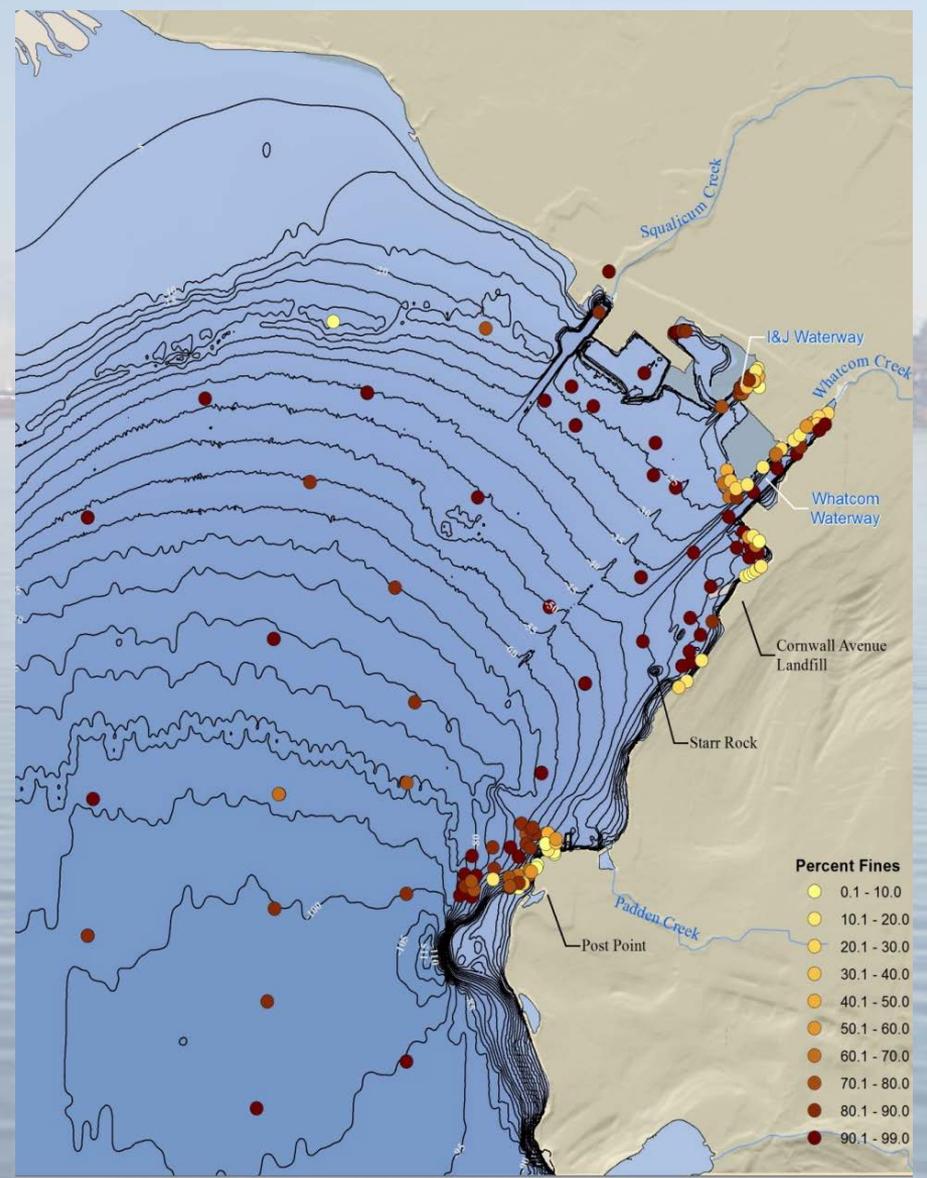
Excluding deeper areas to the south as unrepresentative of the nearshore regional background areas.

Excluding shallow areas of the Nooksack River Delta – lack of diffuse sources and contaminants, too shallow to sample, overwhelmed by low-concentration discharges.

# Total Organic Carbon



# Grain Size



# Conceptual Bay Model

## Evaluation of Sites

- Ecology is currently focusing on cleaning up 12 identified contaminated sites near the bay, including 8 sediment sites.
- Existing chemistry data, RI/FS reports, and Ecology staff expertise were used to identify areas of influence.
- High sedimentation rates have resulted in substantial and ongoing natural recovery in many areas where sources/sites have been controlled. This process was also considered in setting boundaries around sites.

# Conceptual Bay Model Evaluation of Sources

Additional sources with potential areas of influence were evaluated:

- Post Point Outfall and large CSOs (excluded; generally within existing sites)
- Former Georgia-Pacific deepwater outfall (excluded)
- Dredged Material Management disposal site, recently unused (outside the AOI)
- Several older dredged material disposal sites, including Starr Rock, receiving more contaminated material (most excluded)
- Urban watersheds (case by case, based on data)

# Conceptual Bay Model

## Evaluation of Natural Background

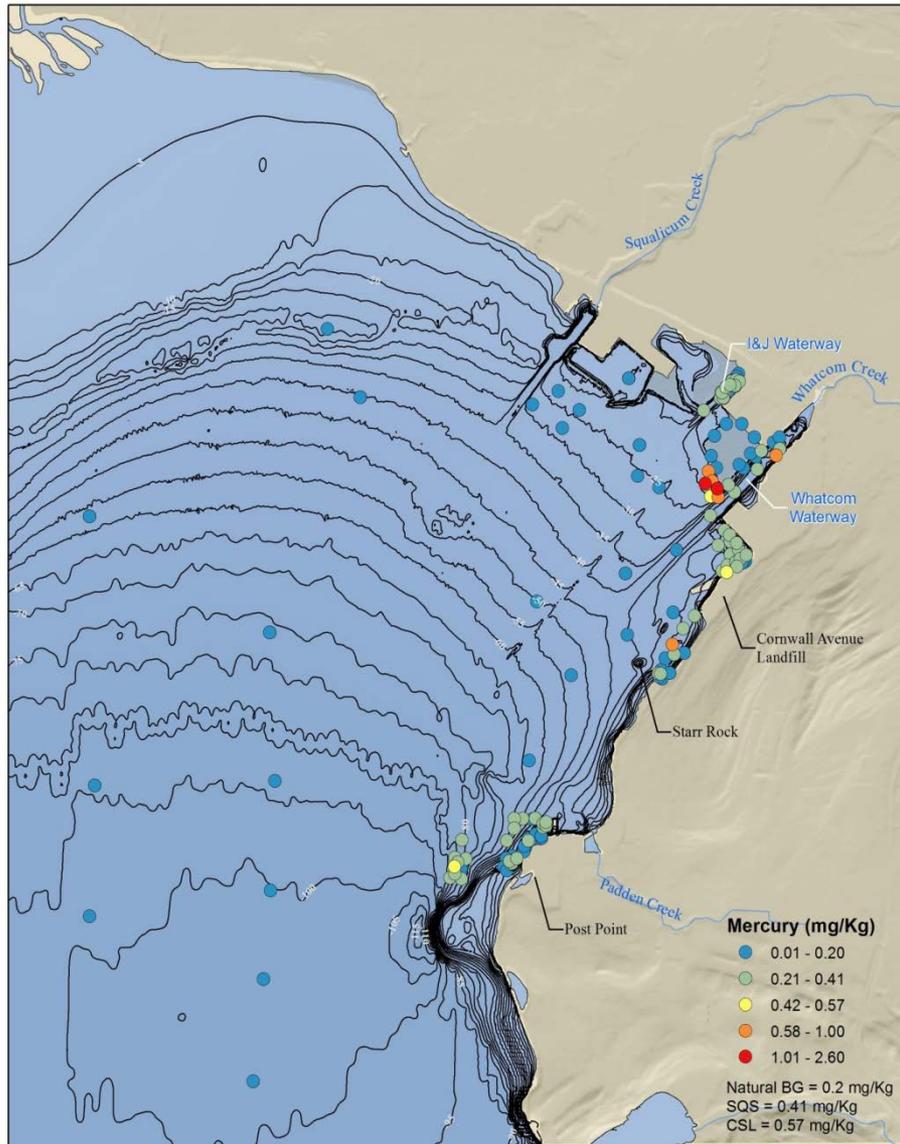
- Areas of the bay representative of natural background were evaluated based on existing data and excluded from the AOI.
- This is a new evaluation procedure for the AOI.
- The 90/90 UTL of the Bold Plus data set was used to identify stations within the natural background distribution.
- The AOI may still include some areas that have recovered to natural background since the existing data were collected due to the high rate of natural recovery.
- The AOI was established roughly halfway in between stations above and below these concentrations on the bay ward side.

# Conceptual Bay Model

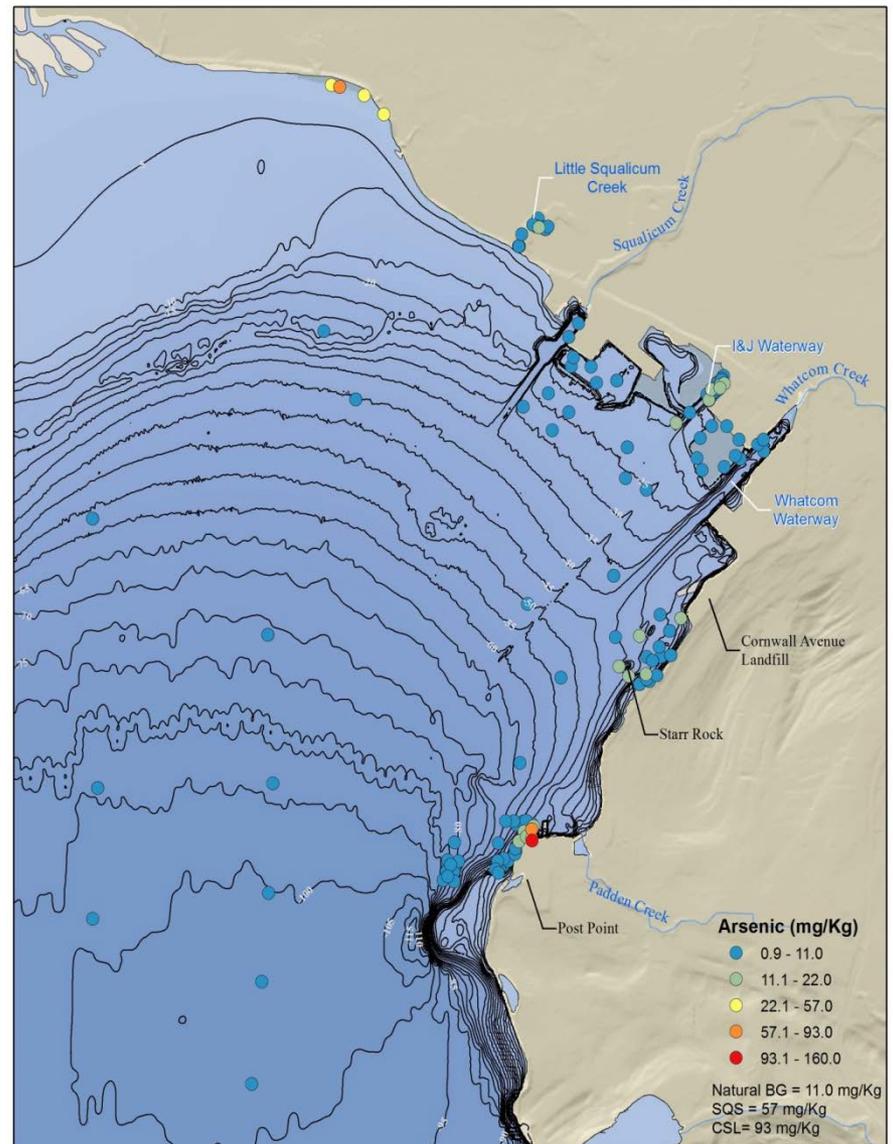
## Evaluation of Existing Chemistry

- Supports all exclusion decisions – natural background as well as the influence of sites and sources
- Apparent elevations of cPAHs and dioxins/furans – not in all the same areas
- Phthalates elevated, but not above SCO/CSL levels
- No real data for PCB congeners (non-detected at high PQLs)
- Mercury concentrations have rapidly recovered
- No apparent elevations of arsenic or cadmium except at a few locations

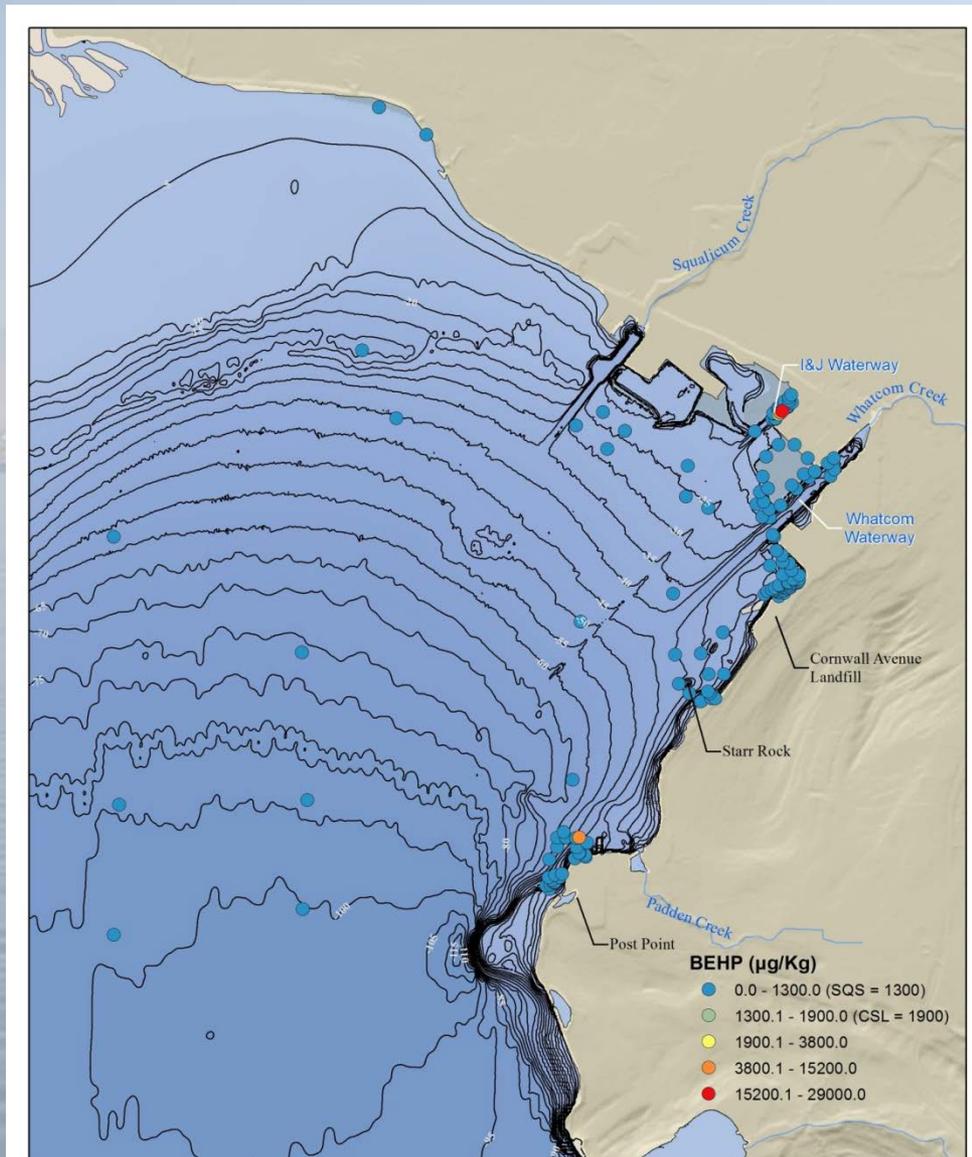
# Mercury



# Arsenic

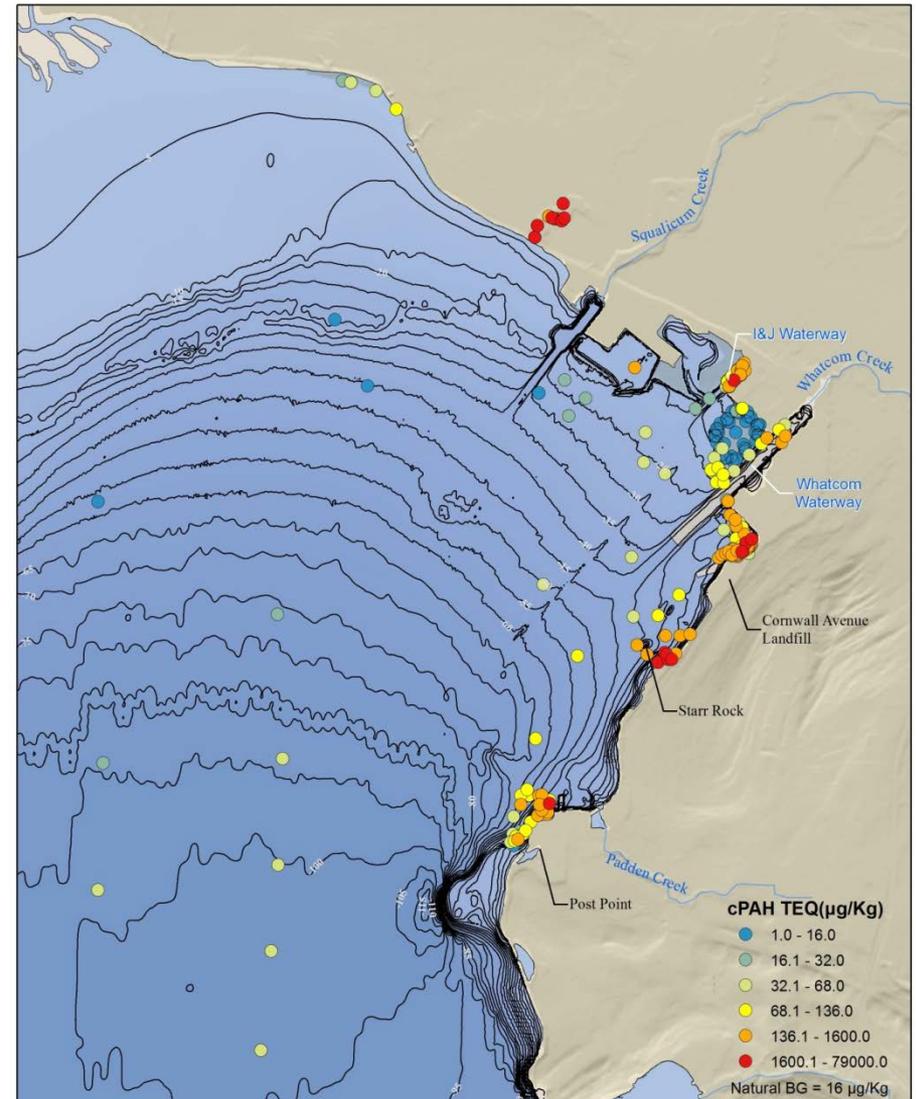
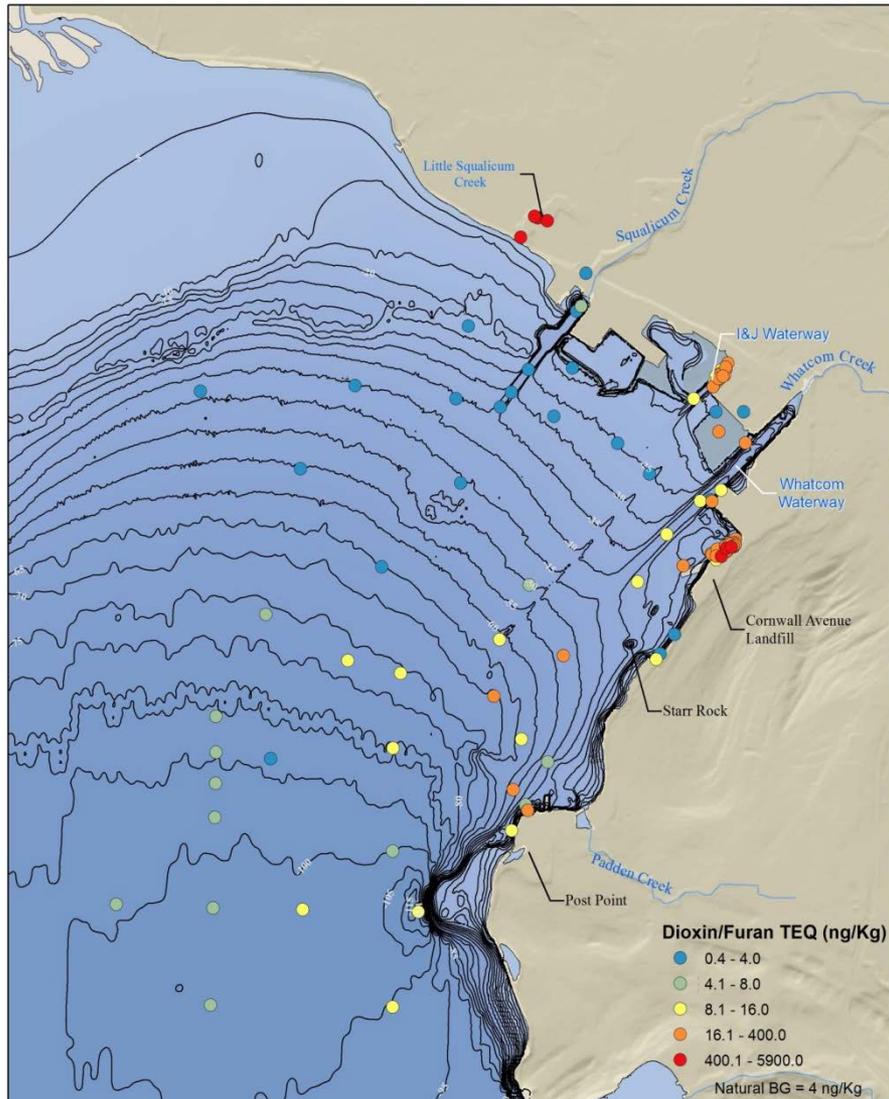


# Phthalates

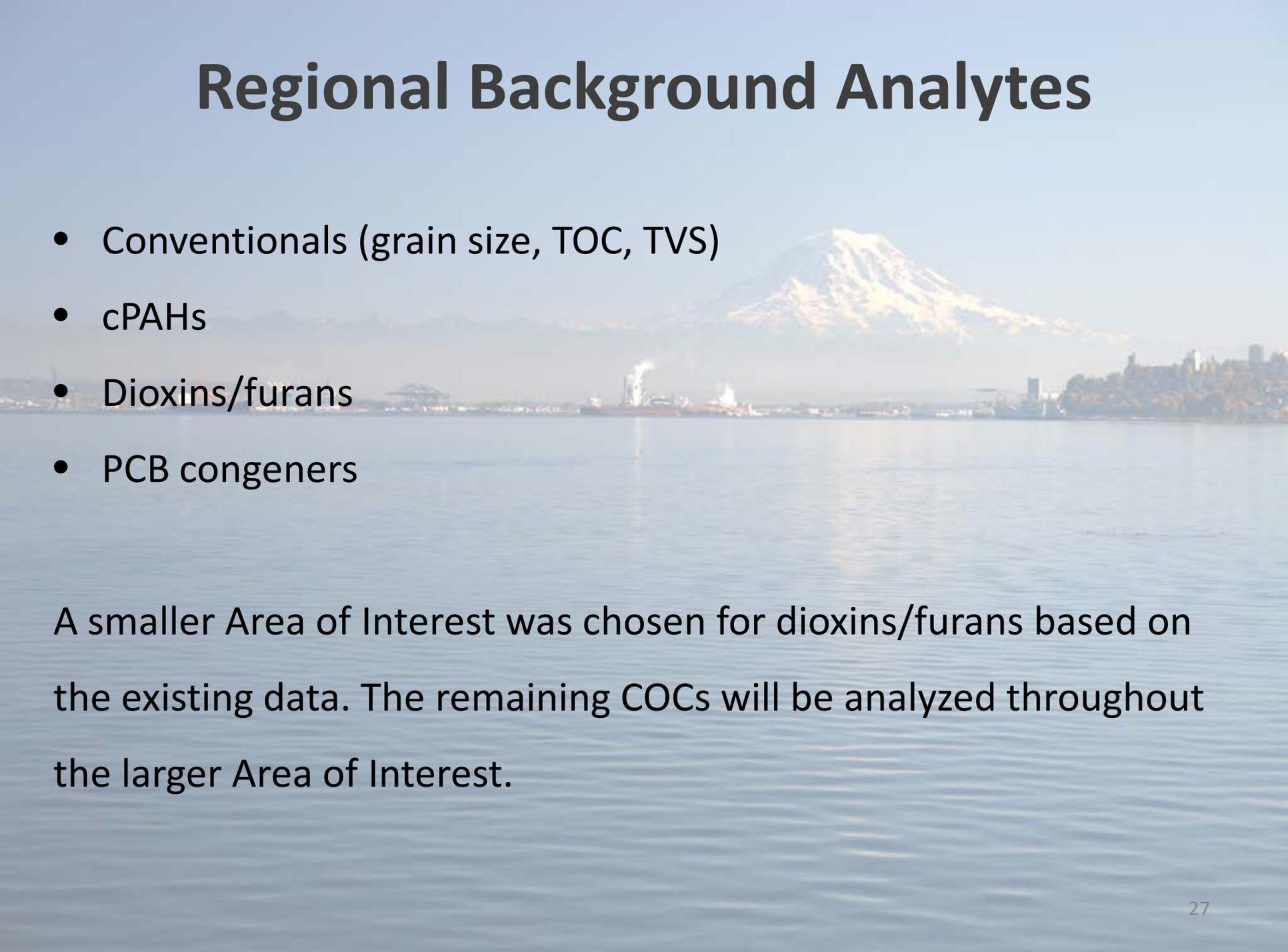


# Dioxins/Furans

# cPAHs



# Regional Background Analytes



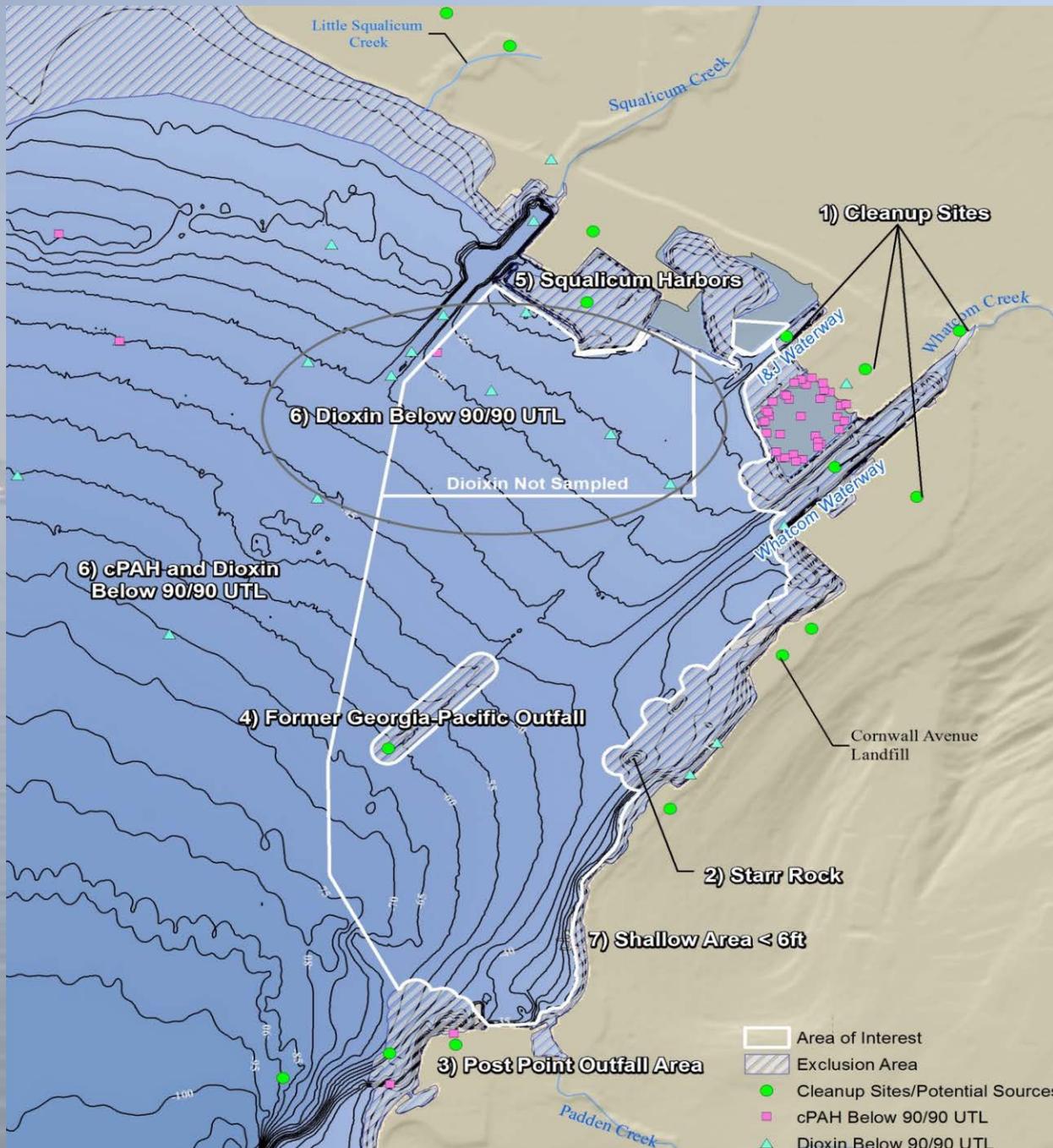
- Conventionals (grain size, TOC, TVS)
- cPAHs
- Dioxins/furans
- PCB congeners

A smaller Area of Interest was chosen for dioxins/furans based on the existing data. The remaining COCs will be analyzed throughout the larger Area of Interest.

# Areas Excluded from the AOI

- Course-grained, shallow areas in the delta of the Nooksack River
- Deeper areas south of Post Point
- Areas in the western half of the bay within the natural background 90/90 UTL
- All cleanup sites (other than areas that have naturally recovered)
- Starr Rock
- Post Point outfall and areas within its immediate depositional zone
- Former Georgia-Pacific outfall

# Bellingham Bay Areas of Interest



1) Full area for  
conventionals, cPAHs,  
PCB congeners

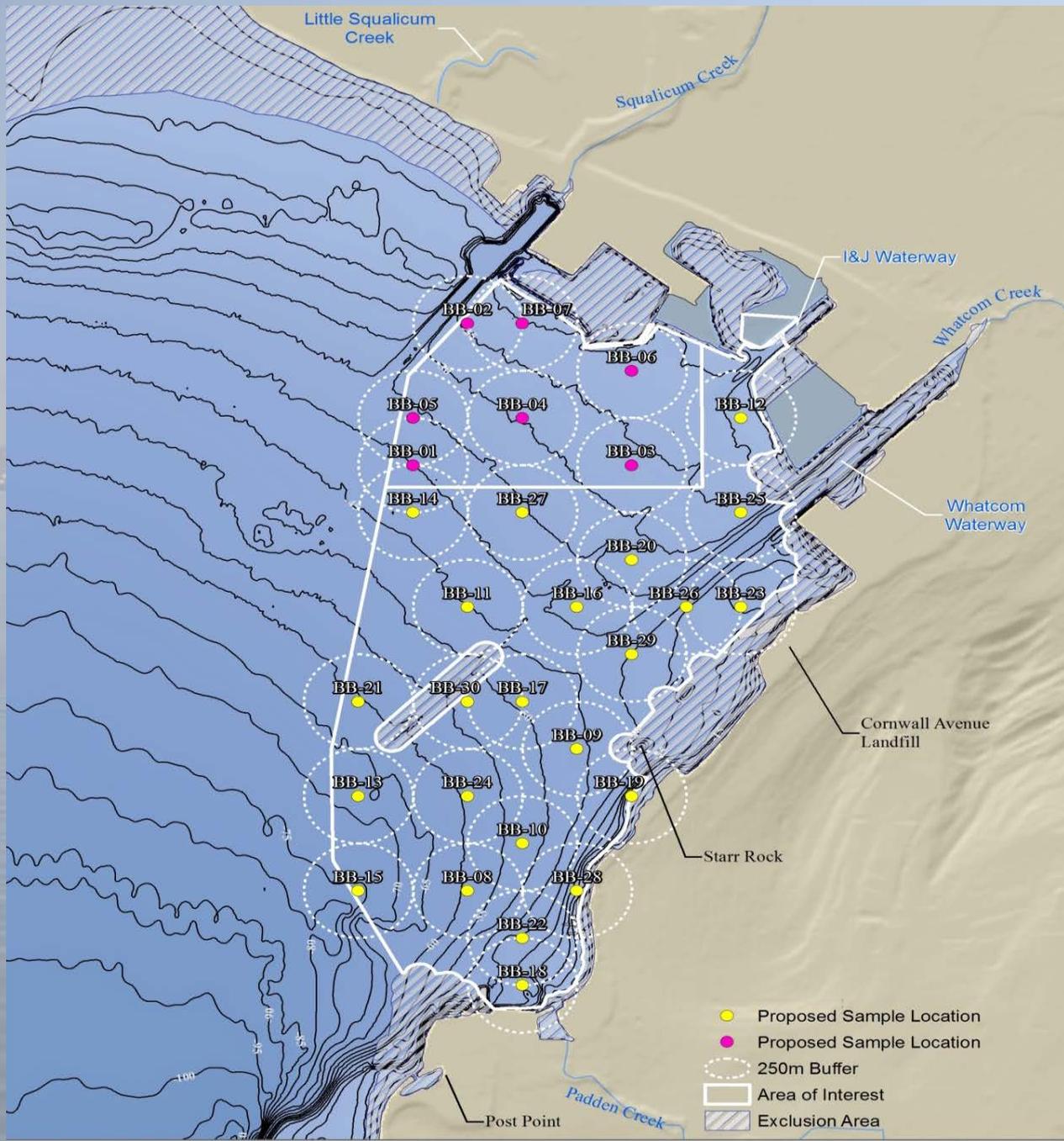
2) Smaller area for  
dioxins/furans

# Selection of Sampling Stations

We used a spatially balanced random sampling design:

- GIS algorithm was used to randomly distribute samples with minimum 250 m separation for the desired spatial balance.
- Samples were distributed proportionately to the sizes of the two AOIs:
  - 23 for dioxins/furans and
  - An additional 7 (total of 30) for the remaining analytes.
- All samples will be analyzed in the first round.
- Sample sizes exceed precision targets calculated from recent data.

# Sampling Locations



**Dioxin/Furan AOI:**  
**23 Samples**  
**(yellow)**

**cPAH/PCB AOI:**  
**30 samples**  
**(yellow + pink)**



A scenic view of a large body of water, likely a bay or harbor, with a snow-capped mountain in the background and a city skyline on the right. The text "Timeline and Next Steps" is overlaid in the center.

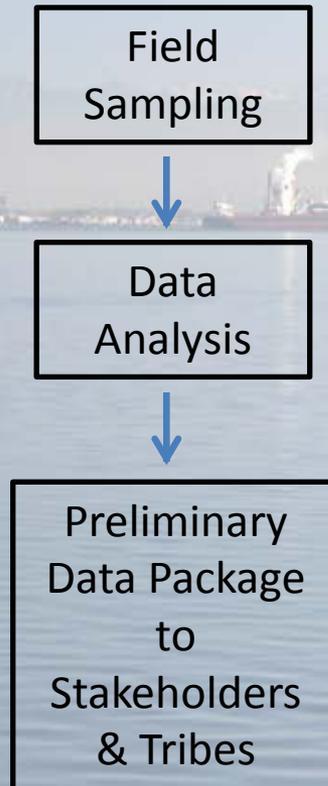
# Timeline and Next Steps

# Bellingham Bay Regional Background Timeline & Next Steps

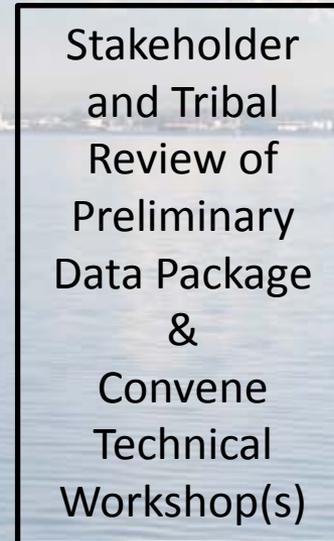
July - August 2014



Fall 2014



Fall/Winter 2014



Early 2015

