Application of a Technology Assignment Process at the Hunters Point Naval Shipyard Site

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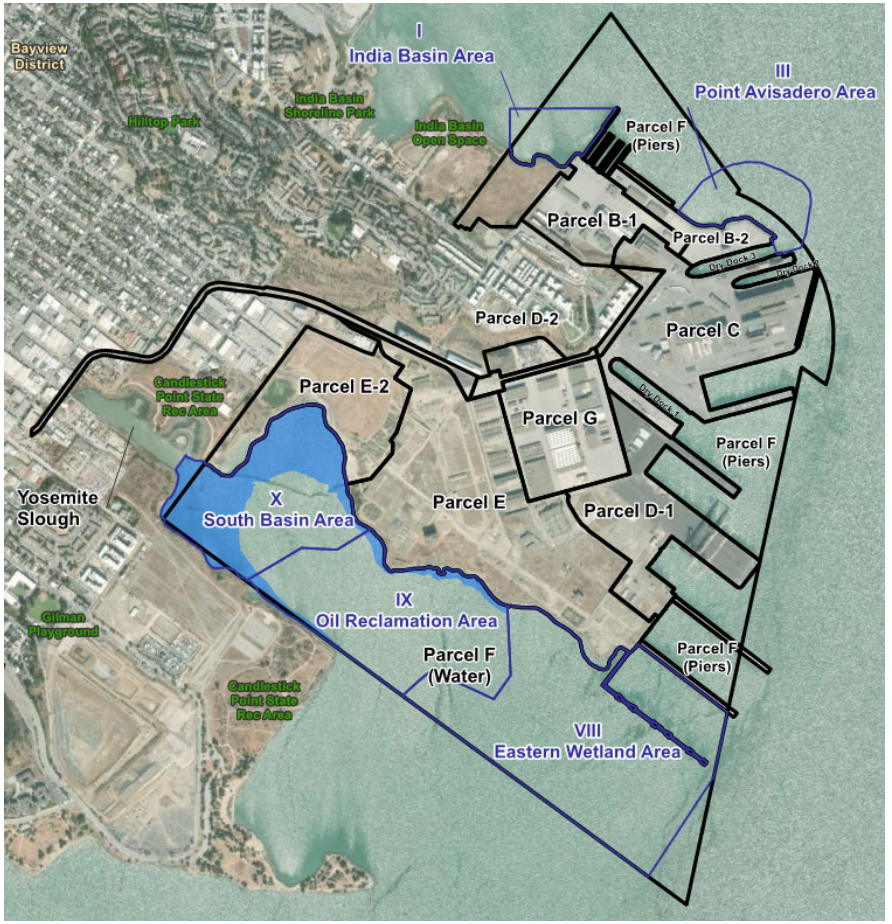
Site Background

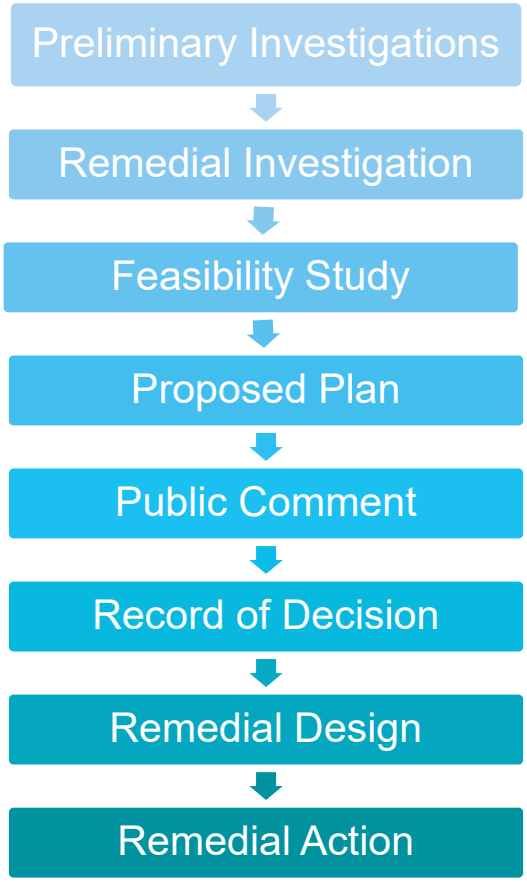
Site Background – Hunters Point Naval Shipyard

- Former naval shipyard in San Francisco
- Site operations resulted in releases of PCBs, copper, mercury, and lead to San Francisco Bay
- Site designated for closure by the Navy in 1991
- Sediment investigations and assessments were conducted between 1996 and 2013
- Feasibility Study completed in 2017
- Proposed plan issued in 2018

Site Location



Project Timeline



1991 – Environmental Sampling and Analysis

1996 – Ecological Risk Assessments

2002 – Shoreline Investigation
2003 – Feasibility Study Data Gap Investigation
2005 – Data Validation Study
2008 – *In Situ* Treatment Pilot Study
2008 – Feasibility Study
2013 – Radiological Investigations
2017 – Feasibility Study Addendum
2018 – *In Situ* Treatment Demonstration Project
2018 – Alternative Memo

2018 – Proposed Plan
2019 – Record of Decision
2019 – Remedial Design

Basis for Technology Assignment Approach

- EPA Contaminated Sediment Guidance (USEPA 2005)
  - No presumptive remedy for contaminated sediment sites
  - Site characteristics should be reviewed to ensure that the selected alternative will be effective
  - Alternatives that combine a variety of approaches are frequently the most promising
  - Guidance provides tables of site, sediment, and contaminant characteristics that should be considered when characterizing a sediment site
- ITRC Contaminated Sediments Remediation Guidance (ITRC 2014)
  - Provides guidance for selecting appropriate remedial technologies based on site-specific conditions
  - Chemical, sediment, biological, and land and water way use characteristics

Optimized Remedial Alternative

- Incorporates new information
  - Updated PRG for fish consumption exposure pathway
  - Advances in the application of *in situ* treatment to contaminated sediments
- Based on systematic method for assigning remedial technologies (dredging, capping, in situ treatment, and MNR)
  - Consider range of site-specific factors relevant to the effectiveness and implementability of remedial technologies
- Uses technology assignment process to develop optimized remedial alternative
- Optimized alternative evaluated against previously developed remedial alternatives

Technology Assignment Approach

Remedial Action Objectives

RAO	Description
RAO 1	Reduce the risk of benthic feeding and piscivorous birds, including surf scoters, to acceptable levels from exposure to copper, lead, mercury, and total PCBs through the consumption of contaminated prey and incidental ingestion of sediment
RAO 2	Limit or reduce the potential risk to human health from the consumption of shellfish from Parcel F
RAO 3	Limit or reduce the potential biomagnifications of total PCBs at higher trophic levels in the food chain to reduce the potential risk to human health from the consumption of sport fish

Preliminary Remediation Goals

RAO	Copper (mg/kg)	Lead (1) (mg/kg)	Mercury (mg/kg)	Total PCBs (µg/kg)	Basis
RAO 1	271	NA	1.87	1240	Not to exceed threshold
RAO 2	NA	NA	NA	1350	Area-weighted average
RAO 3	NA	NA	NA	(2)	Area-weighted average

1. A numerical PRG was not developed for lead due to uncertainty associated with the bioavailability and toxicity of this analyte
2. 200 µg/kg total PCBs represents a long-term goal based on background total PCB estimates for nearshore sediments within San Francisco Bay

Area III Alternative Summary

Alternative	Description	FS Effectiveness Ranking	Cost ($M)
1	No Action	Not Protective	$0
2	Removal/Backfill and Off-Site Disposal	Low-Medium	$12.2
3	Focused Removal/Backfill, Off-Site Disposal, Armored Cap, and ICs	Medium-High	$10.2
3A	Focused Removal/Backfill, Off-Site Disposal, AquaBlok® Cap, and ICs	Medium-High	$12.6
4	Focused Removal/Backfill, Off-Site Disposal, Modified Armored Cap, and ICs	Medium	$5.8
4A	Focused Removal/Backfill, Off-Site Disposal, Modified Aquablok® Cap, and ICs	Medium	$7.3

Areas IX and X Alternative Summary

Alternative	Description	FS Effectiveness Ranking	Cost ($M)
1	No Action	Not Protective	$0
2	Removal/Backfill and Off-Site Disposal	Medium	$31.6
3	*In-Situ* Stabilization (Treatment) and ICs	Low	$14.4
4	MNR and ICs	Low-Medium	$2.1
5	Focused Removal/Backfill, Off-Site Disposal, MNR, and ICs	High	$16.6
5A	Focused Removal/Activated Backfill, Off-Site Disposal, MNR, and ICs	High	$21.7
6	Focused Removal/Backfill, Modified Shoreline Removal/Backfill, Off-Site Disposal, MNR, and ICs	High	$16.9
6A	Focused Removal/Activated Backfill, Modified Shoreline Removal/Backfill, Off-Site Disposal, MNR, and ICs	High	$22.4

Technology Assignment Framework

- COC Sediment Concentrations
  - Active remediation will be required for all sediments exceeding the RAO 1 PRGs
- Water Depth and Hydrodynamics
  - Strong tidal currents offshore of Point Avisadero (Area III) may limit the effectiveness of in situ treatment
  - Hydrodynamic studies found wave action to be the most significant mode of sediment resuspension in the South Basin
  - *In situ* treatment may not be effective for intertidal sediments subject to wave induced erosion.
  - *In situ* treatment is expected to be effective in the more stable subtidal sediments within the South Basin

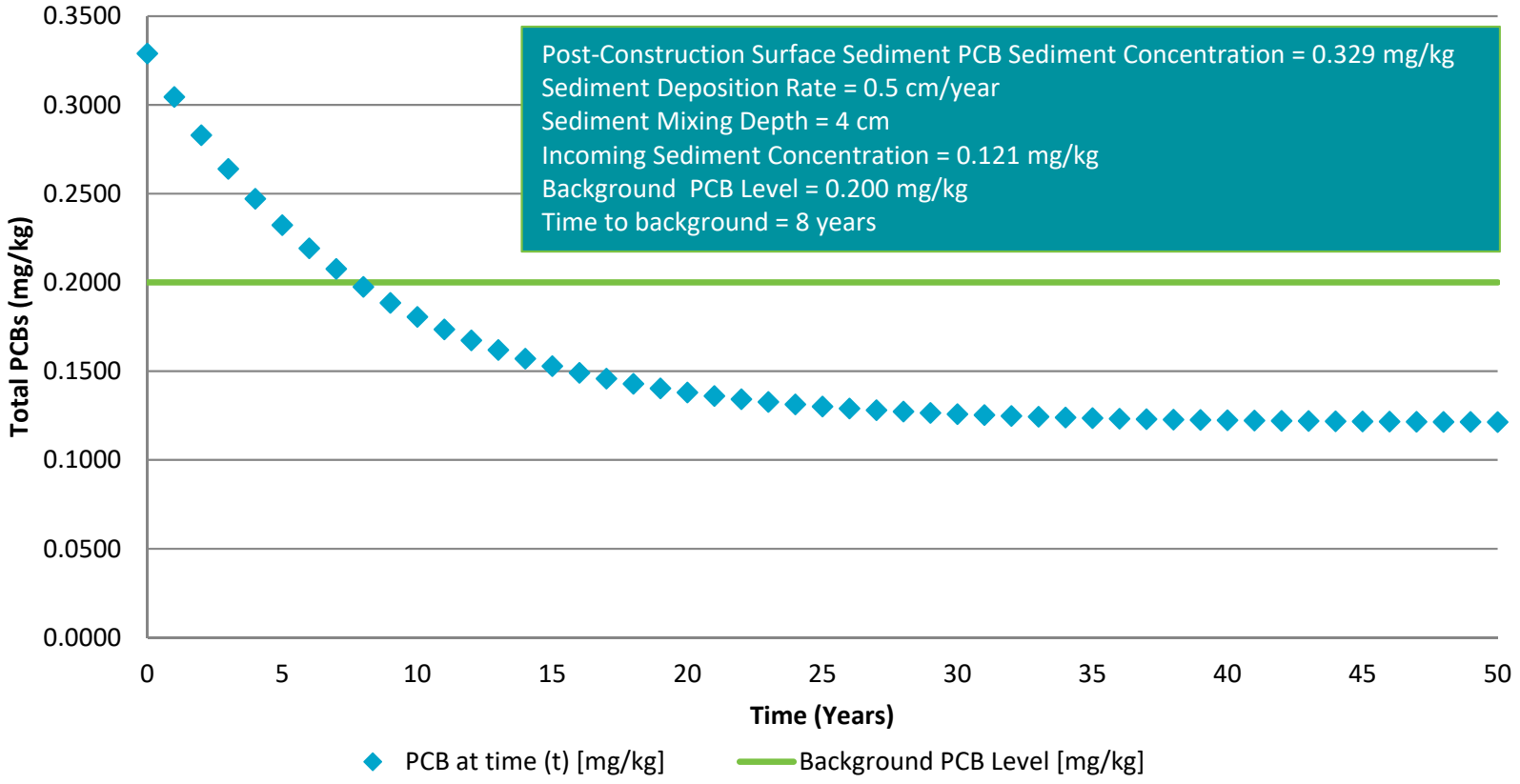
Technology Assignment Framework

- Natural Recovery Rate
  - Hydrodynamic evaluations determined that the South Basin is generally depositional – approximately 1 cm per year
  - Natural recovery was simulated using the SEDCAM model (Jacobs et al., 1988)
  - SEDCAM assumes that reductions in sediment concentrations are the result of deposition and mixing with the sediment bed

$$C(t) = C(p) \times (1 - e^{-t(ML/Rs)}) + C(0) \times e^{-t/(\frac{ML}{Rs})}$$

- Constructability
  - Shoreline considerations
  - Optimized alternative applies remedial technologies contiguously to increase efficiency during construction

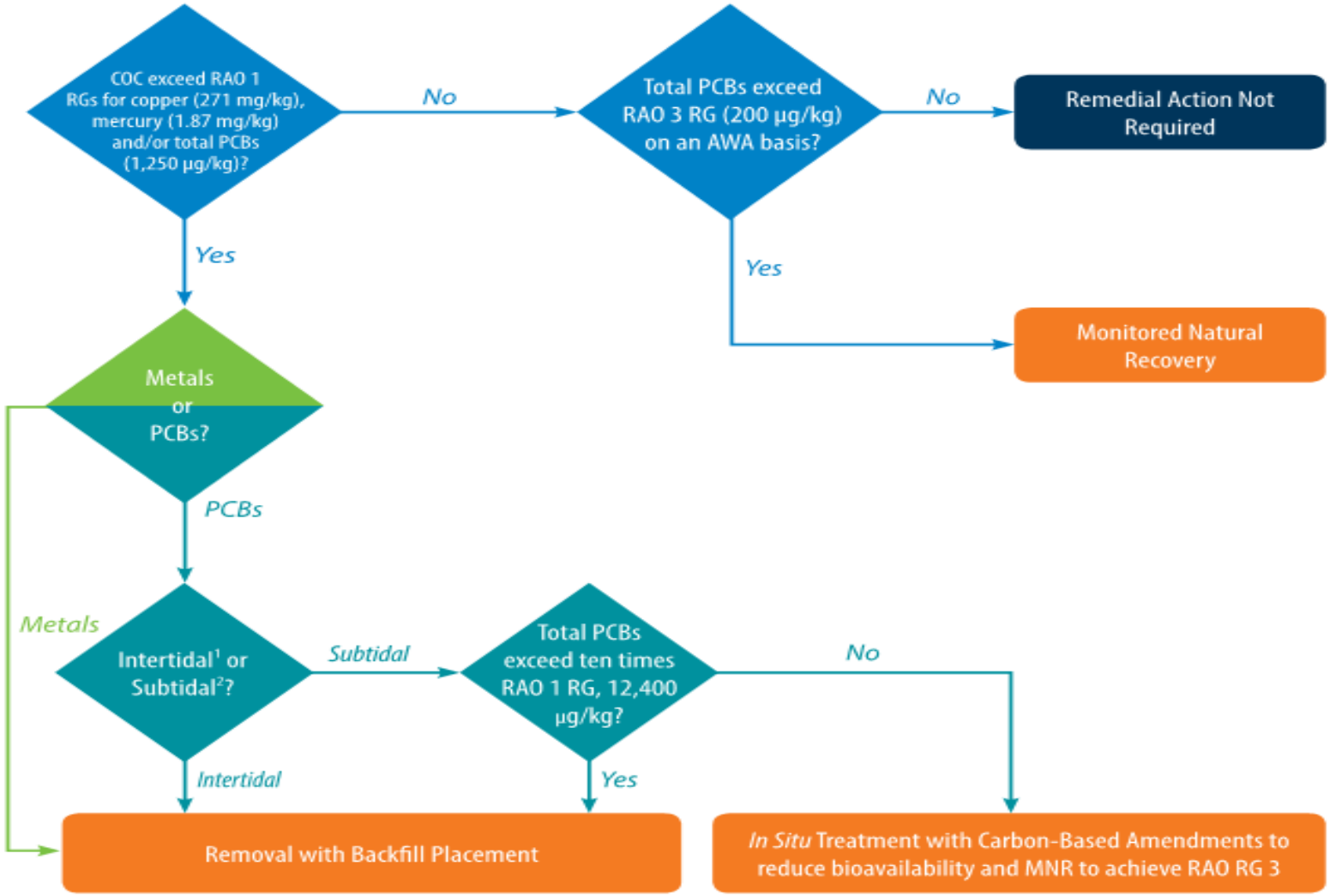
Reduction in HPNS Sediment PCBs – Area X

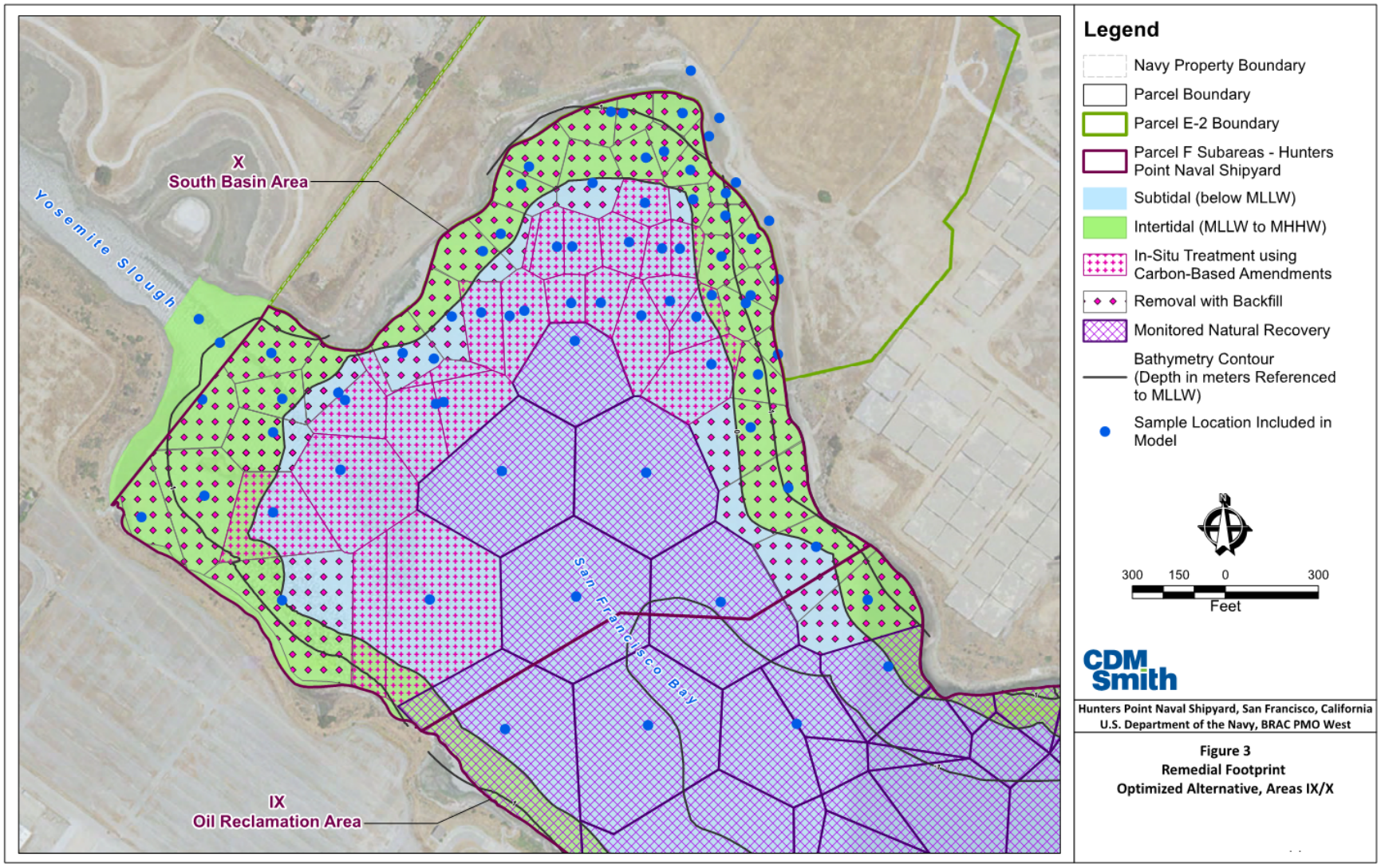


Technology Assignment Results

Technology Assignment Results

- Area III: Optimized alternative was not deemed necessary due to limited remedial footprint and concentration levels
- Intertidal Sediments within Area IX and X:
  - Removal and backfill of all intertidal sediments exceeding the RAO 1 PRGs
- Subtidal Sediments within Areas IX and X:
  - All subtidal sediments with metals exceeding the RAO 1 PRGs will be remediated through removal
  - Based on an assumed 90% reduction in bioavailability, subtidal sediment with PCBs exceeding 12,400 µg/kg (10X the RAO 1 PRG) will be remediated through removal and backfill
  - Subtidal sediments with PCBs between 1,240 µg/kg and 12,400 µg/kg will be remediated through *in situ* treatment
  - Subtidal sediments between 200 µg/kg and 1,240 µg/kg will be remediated through MNR


COC exceed RAO 1 RGs for copper (271 mg/kg), mercury (1.87 mg/kg) and/or total PCBs (1,250 µg/kg)?
No
Total PCBs exceed RAO 3 RG (200 µg/kg) on an AWA basis?
No
Remedial Action Not Required
Yes
Yes
Monitored Natural Recovery
Metals or PCBs?
PCBs
Metals
Intertidal[1] or Subtidal[2]?
Subtidal
Total PCBs exceed ten times RAO 1 RG, 12,400 µg/kg?
No
Intertidal
Yes
Removal with Backfill Placement
In Situ Treatment with Carbon-Based Amendments to reduce bioavailability and MNR to achieve RAO RG 3


X
South Basin Area
Yosemite Slough
San Francisco Bay
IX
Oil Reclamation Area
Legend
Navy Property Boundary
Parcel Boundary
Parcel E-2 Boundary
Parcel F Subareas - Hunters Point Naval Shipyard
Subtidal (below MLLW)
Intertidal (MLLW to MHHW)
In-Situ Treatment using Carbon-Based Amendments
Removal with Backfill
Monitored Natural Recovery
Bathymetry Contour (Depth in meters Referenced to MLLW)
Sample Location Included in Model
300 150 0 300
Feet
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Hunters Point Naval Shipyard, San Francisco, California
U.S. Department of the Navy, BRAC PMO West
Figure 3
Remedial Footprint
Optimized Alternative, Areas IX/X

Optimized Alternative Benefits

- The optimized remedial alternative incorporates the *in situ* treatment of contaminated sediments to a larger degree in conjunction with other remedial technologies
- The optimized alternative removes intertidal sediments above not-to exceed PRGs where *in situ* treatment may not be effective due to the presence of metals and the potential for wave-induced erosion
- The optimized alternative was evaluated against the NCP evaluation criteria and identified as the preferred remedial alternative in the Proposed Plan for Parcel F sediments at the HPNS Site
- This alternative is expected to effectively reduce site risks by removing significant amounts of COCs and safely contain or treat the remaining contaminants