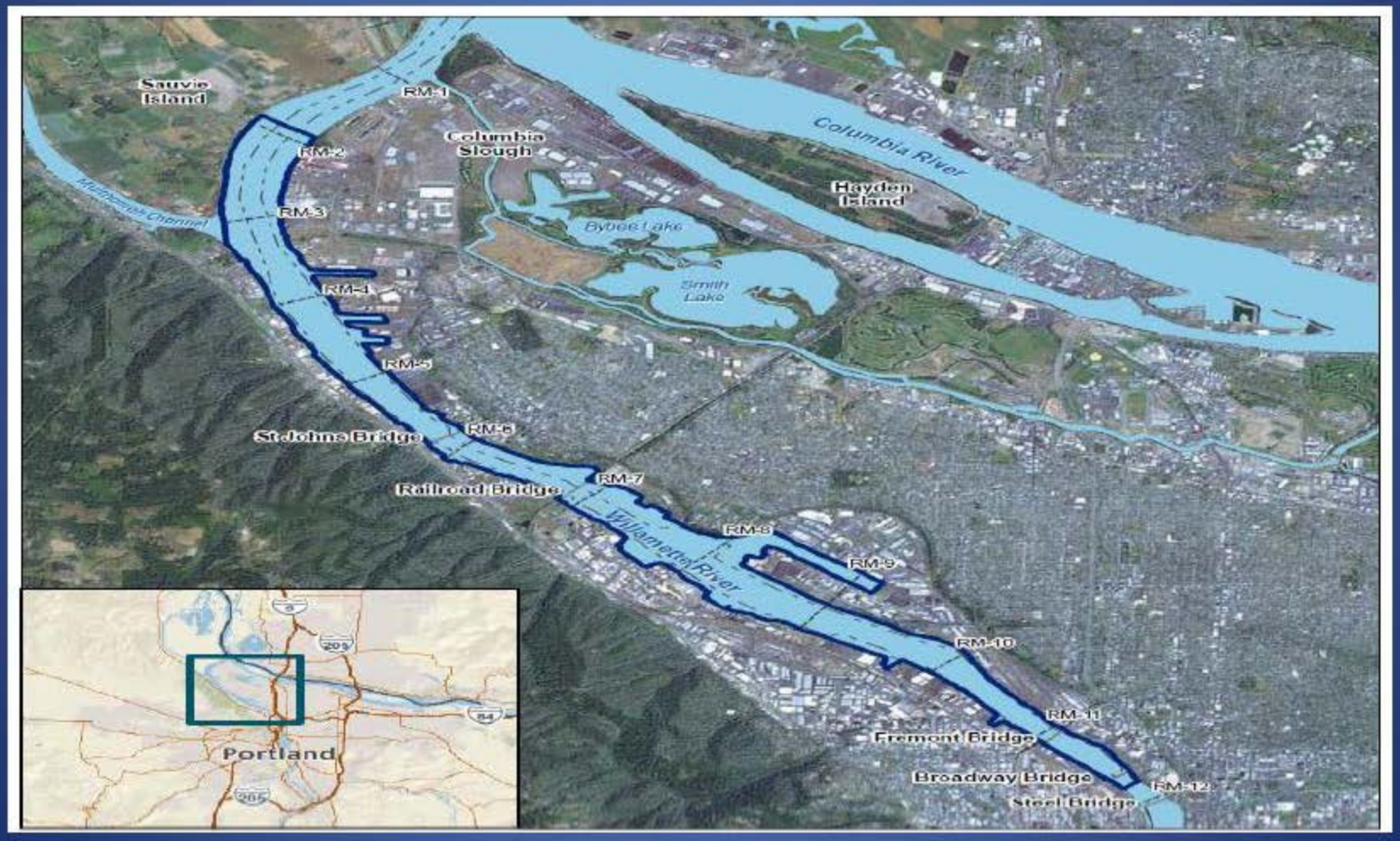
Portland Harbor

CSTAG Update
June 2013

Portland Harbor Superfund Site



Portland Harbor Superfund Site

- Listed in 2000 as Superfund Site
- U.S. EPA and Oregon DEQ oversight (with multiple federal and state agencies and Tribal governments)
- Lower Willamette Group – 12 companies and 2 public agencies funding cleanup studies. Ten parties signed the AOC

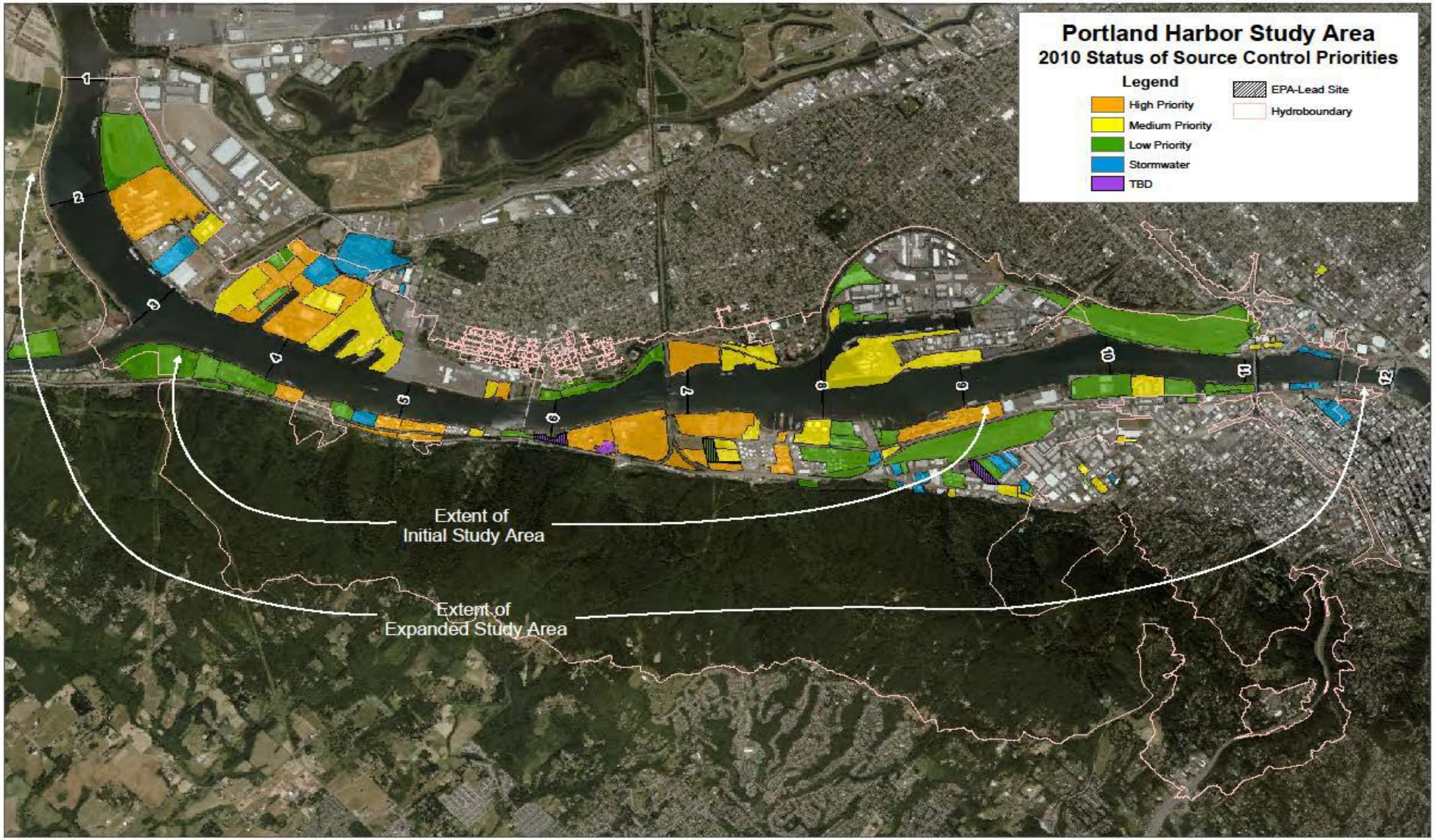
Site Background

- Over 100 years of industrial activity
- Many types of industries and contaminants:
  - Ship construction and maintenance (metals, TBT, PCBs)
  - Chemical manufacturing (pesticides, dioxins, perchlorate, Cr VI)
  - Wood treating (PAHs, PCP, metals)
  - Bulk petroleum storage (PAHs)
  - Manufactured Gas Plant (PAHs, Cyanide)
  - Rail Road Yards (PAHs)
  - Metals production, fabrication and recycling (metals, PCBs)
  - Industrial and urban Stormwater (metals, PCBs, phthalates, pesticides)

Portland Harbor Challenges

- Large site at bottom of large watershed
- Dynamic river system
- Large number of sources and source types
- Large number of PRPs and MOU partners
- Regulatory complexity - ESA listed receptors
- Integration of RI/FS with source control, early actions and NRDA, WQ authorities and USACE
- Background contamination may prevent achievement of some RAOs
- Managing uncertainty, political interest

Upland Source Control



DEQ Source Control program

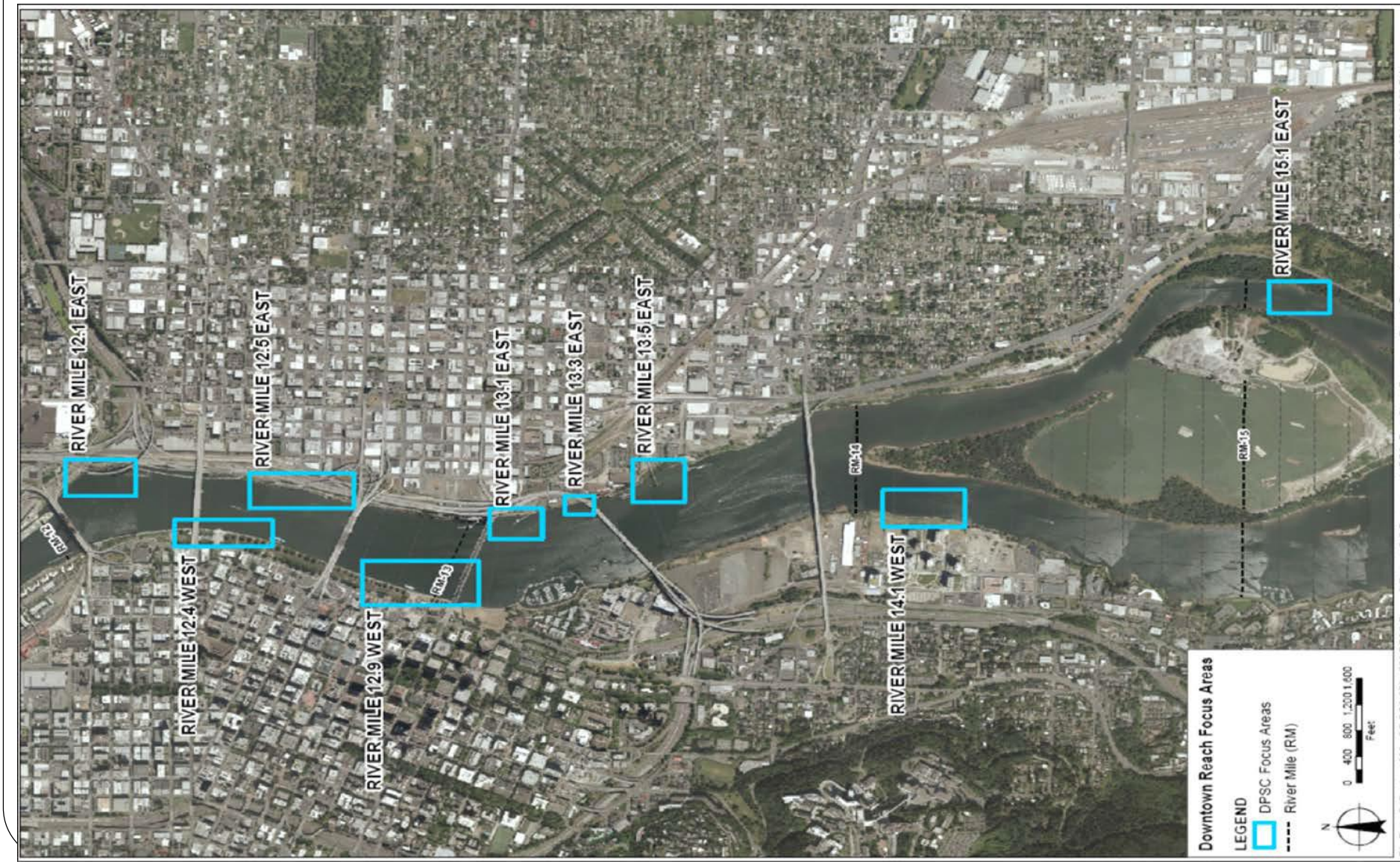
- Total Sites in Program = 100
- Closed Sites = 28
- Continuing Work = 72
  - High Priority = 14
  - Medium Priority = 29
  - Low Priority = 28
  - TBD = 1

Source Control Sites Status

- High Priority Sites
  - Interim or final SCMs have been selected and implemented at 12 of 13 sites
  - Six sites have effective ground-water SCMs operating
  - Ground-water SCMs being installed at Gasco and Arkema sites in 2012-13
- Medium Priority Sites
- Goal - SCEs completed by 12/13
  - 17 of 29 medium-priority sites have SCEs
  - 22 sites have interim SCMs in place
  - 11 sites to have SCEs completed in 2013
- SCEs completed 12/13
  - 10 of 28 low-priority sites have SCEs
  - 15 low-priority sites have interim SCMs in place
  - 15 low-priority sites to have SCEs completed in 2013

Arkema Slurry Wall

Upstream Source Control

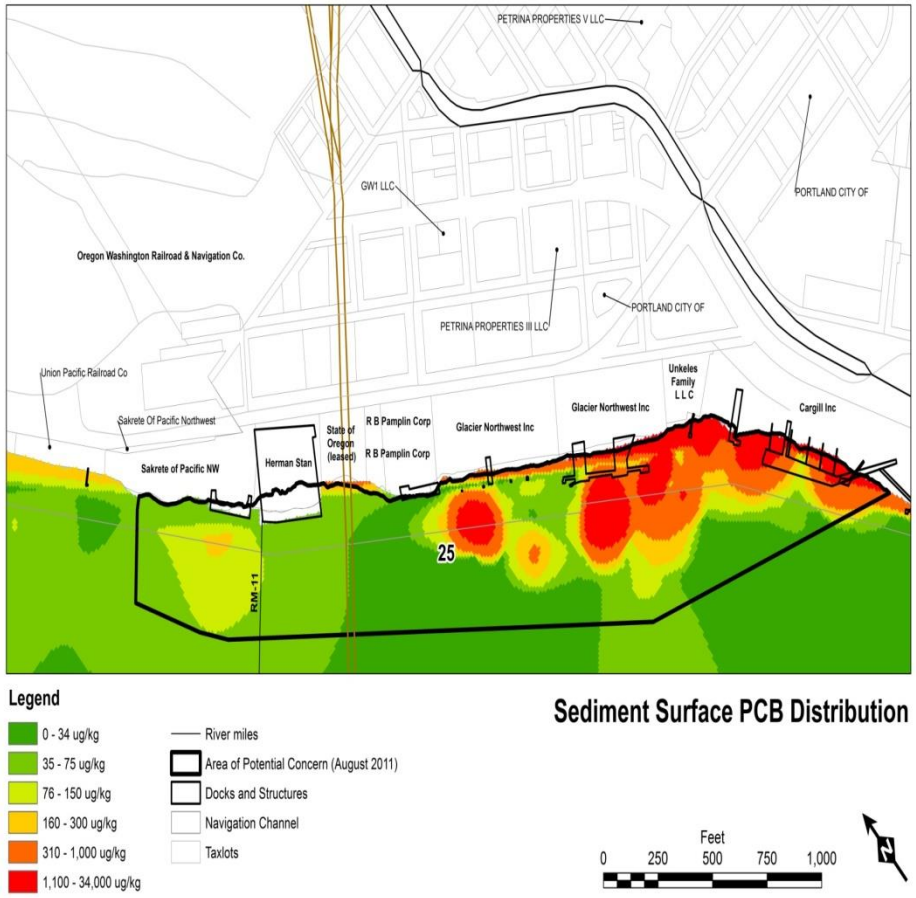


Zidell – upland cleanup, riverbank and sediment cap of PCB source area

Portland Harbor Area Early Actions

- Address hot spots and facilitate overall sequencing of harbor-wide work
- GASCO: PAHs
  - Phase 1 Early action completed in 2005
  - Phase II work to be integrated with in-water FS
  - Phase II work will likely be performed post-ROD
- Terminal 4: PAHs
  - Partial abatement completed at T4
  - Phase II of early action may be completed post-ROD
- Arkema: DDx
  - Disputes resolved sufficient to allow EECA sampling
  - Working to integrate in-water RI/FS with early actions
- RM 11E: PCB
  - Early Action Agreement 2012

RM 11E

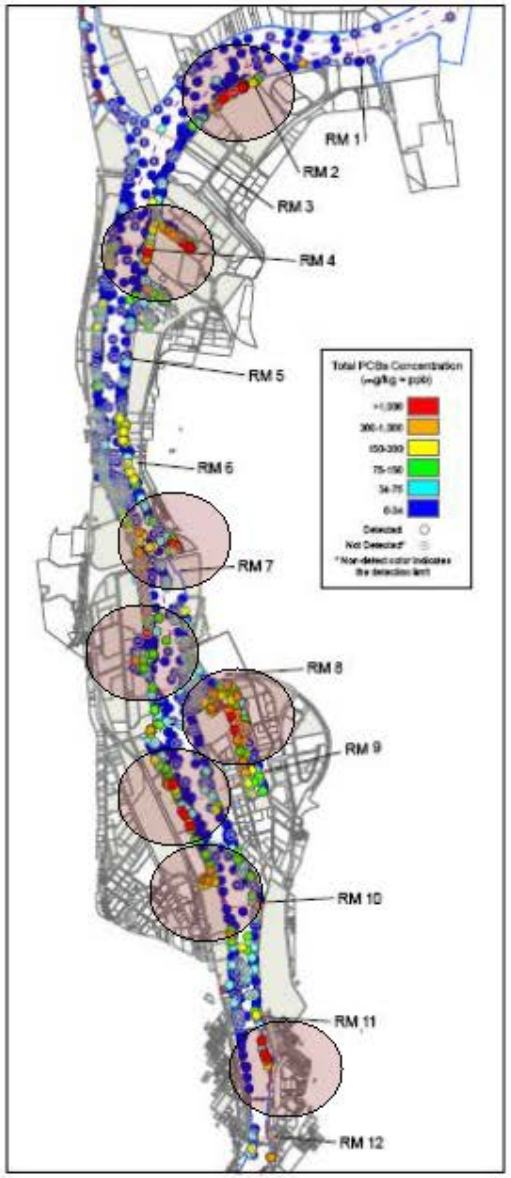

PETRINA PROPERTIES V LLC
GW1 LLC
PORTLAND CITY OF
Oregon Washington Railroad & Navigation Co.
PORTLAND CITY OF
PETRINA PROPERTIES III LLC
Union Pacific Railroad Co
Unkeles Family L L C
Cargill Inc
Glacier Northwest Inc
Glacier Northwest Inc
Sakrete Of Pacific Northwest
R B Pamplin Corp
State of Oregon (leased)
R B Pamplin Corp
Sakrete of Pacific NW
Herman Stan
25
RM-11
Legend
0 - 34 ug/kg
35 - 75 ug/kg
76 - 150 ug/kg
160 - 300 ug/kg
310 - 1,000 ug/kg
1,100 - 34,000 ug/kg
River miles
Area of Potential Concern (August 2011)
Docks and Structures
Navigation Channel
Taxlots
Sediment Surface PCB Distribution
Feet
0
250
500
750
1,000
N

RI/FS – Current Status

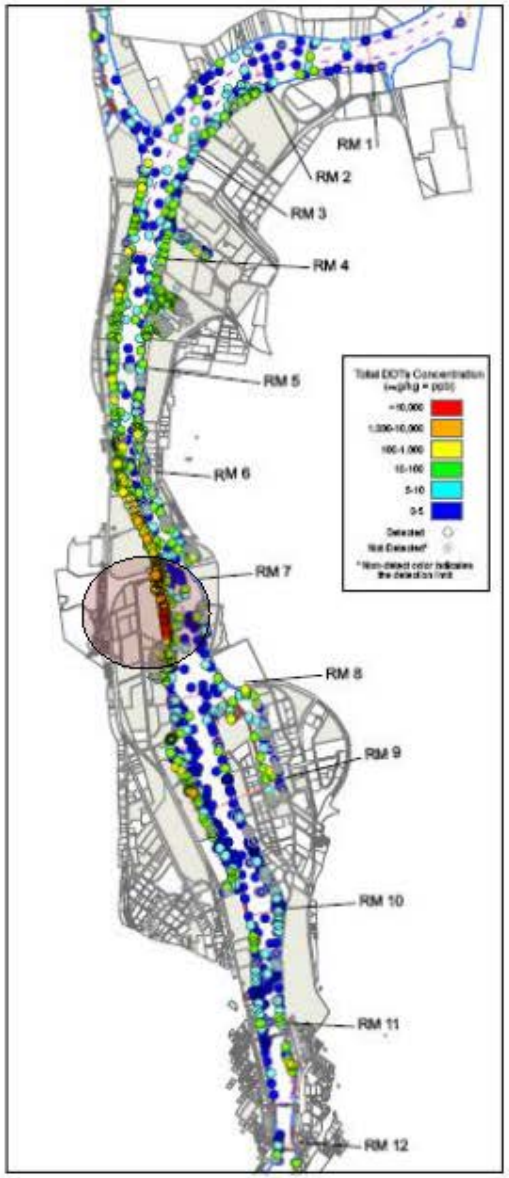
- Final baseline human health assessment approved April 2013 (formal dispute)
- Final baseline ecological risk assessment due June 20th, EPA expects to approve by end of June 2013
- Draft RI Report July 2011 – review completed Dec 2011- EPA modifying document, targeted for Oct 2013
- Draft FS Report submitted March 30, 2012 (15K pages) EPA initial comments December 2012

Draft RI Conclusions

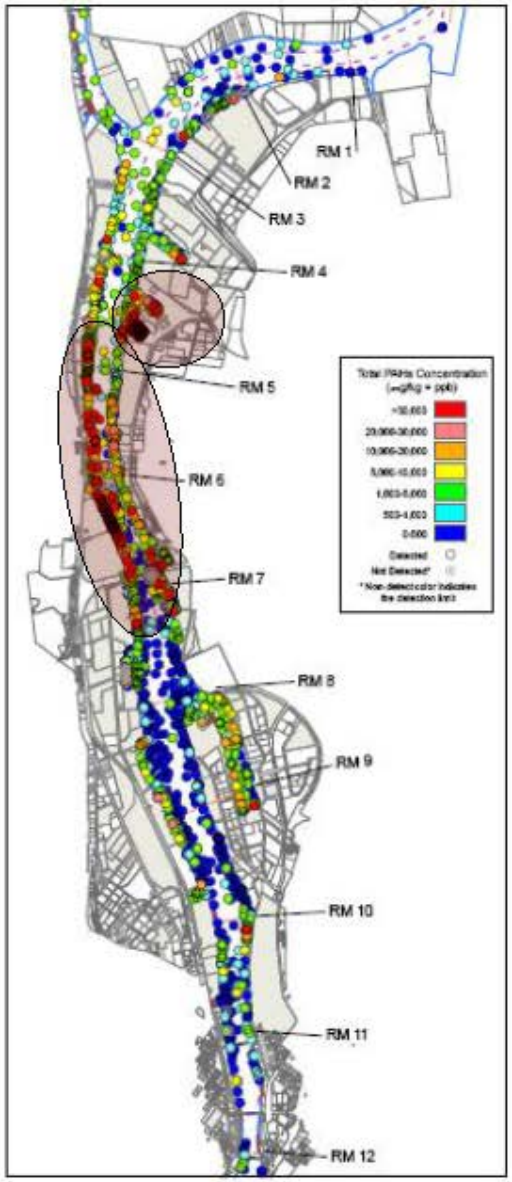
- RI data demonstrates relationship between sediment, surface water, tissue and upland sources
  - Chemical concentrations are higher in near shore areas and deeper sediments
  - Ongoing sources of contamination still exist throughout study area (e.g., stormwater, groundwater, bank erosion)
- Highest levels of contamination in 9 major areas
- RM 5-7
  - Significant ongoing sources
  - NAPL



Total PCBs

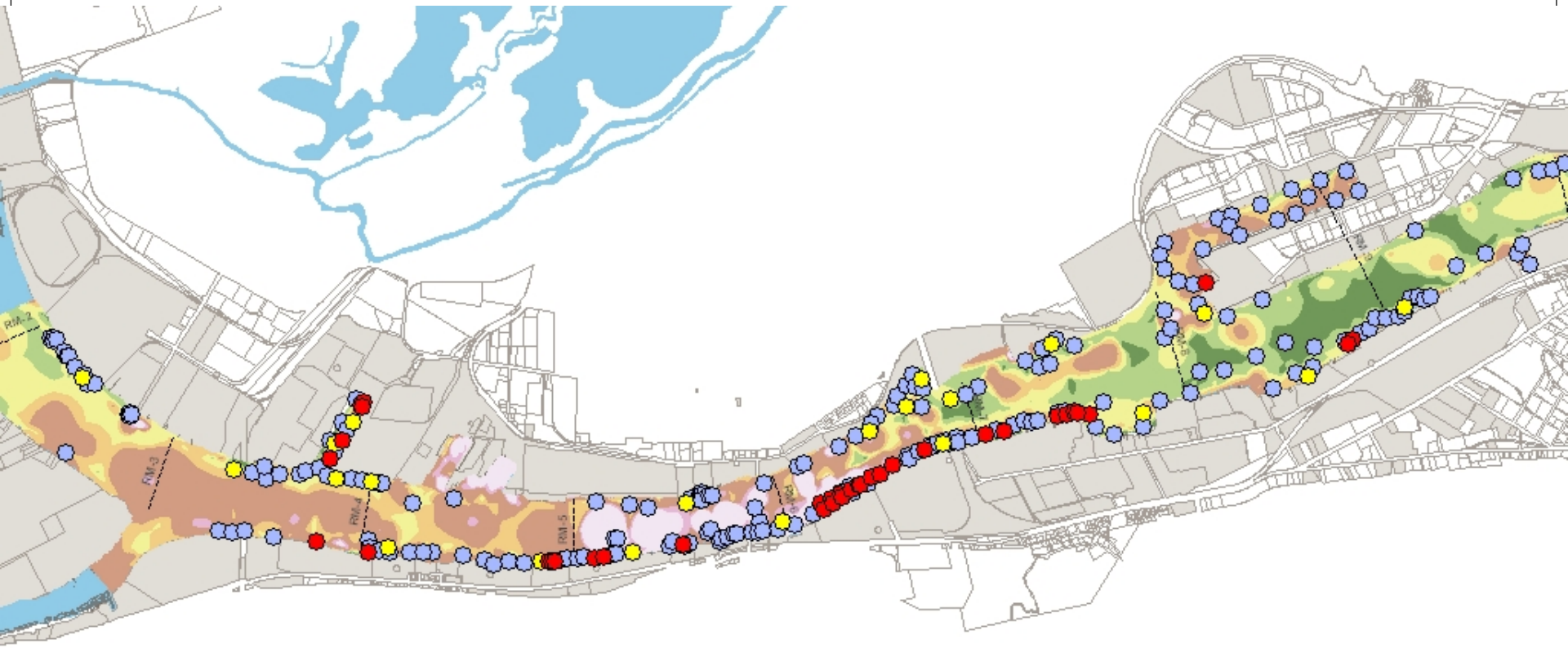


Total DDx

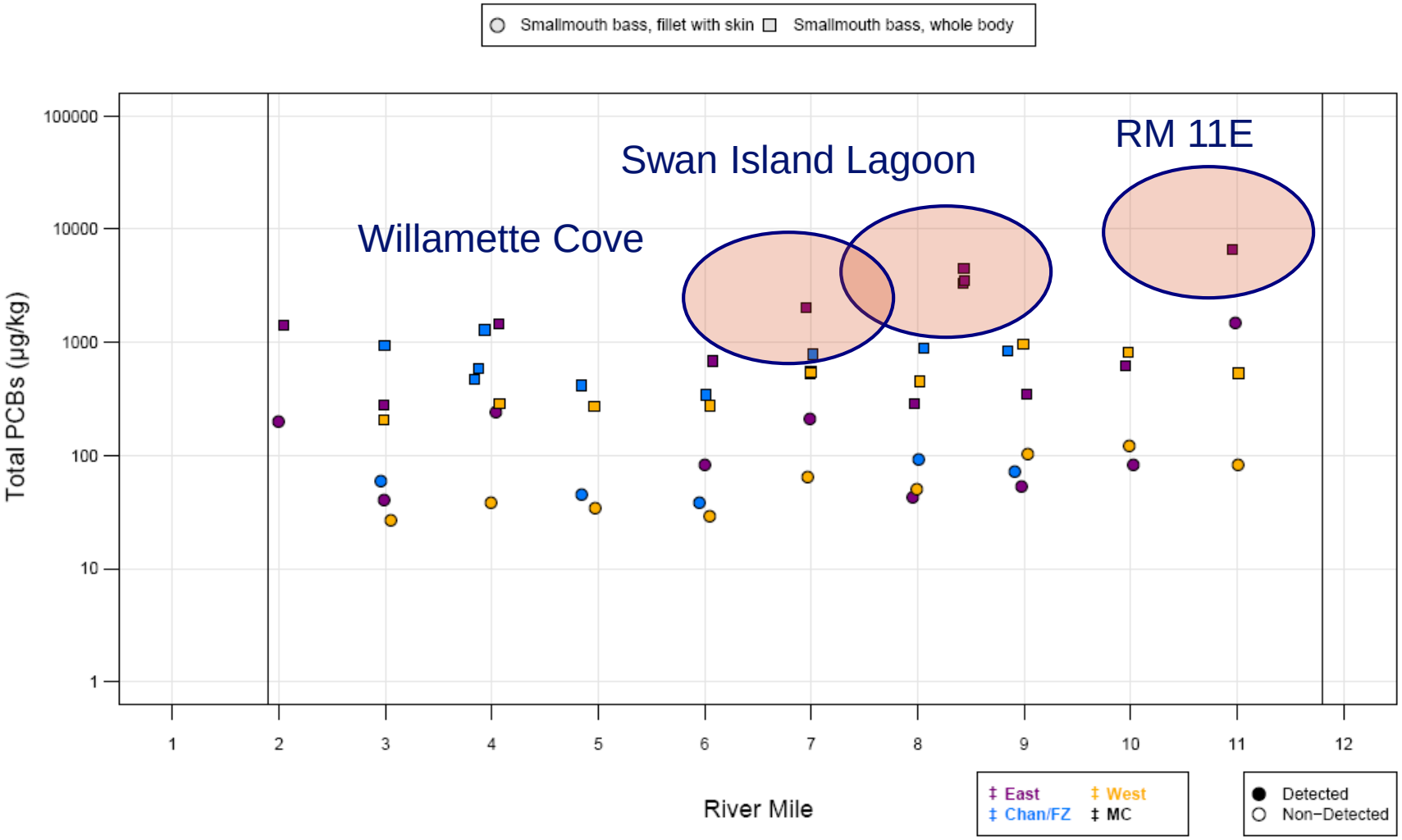


Total PAHs

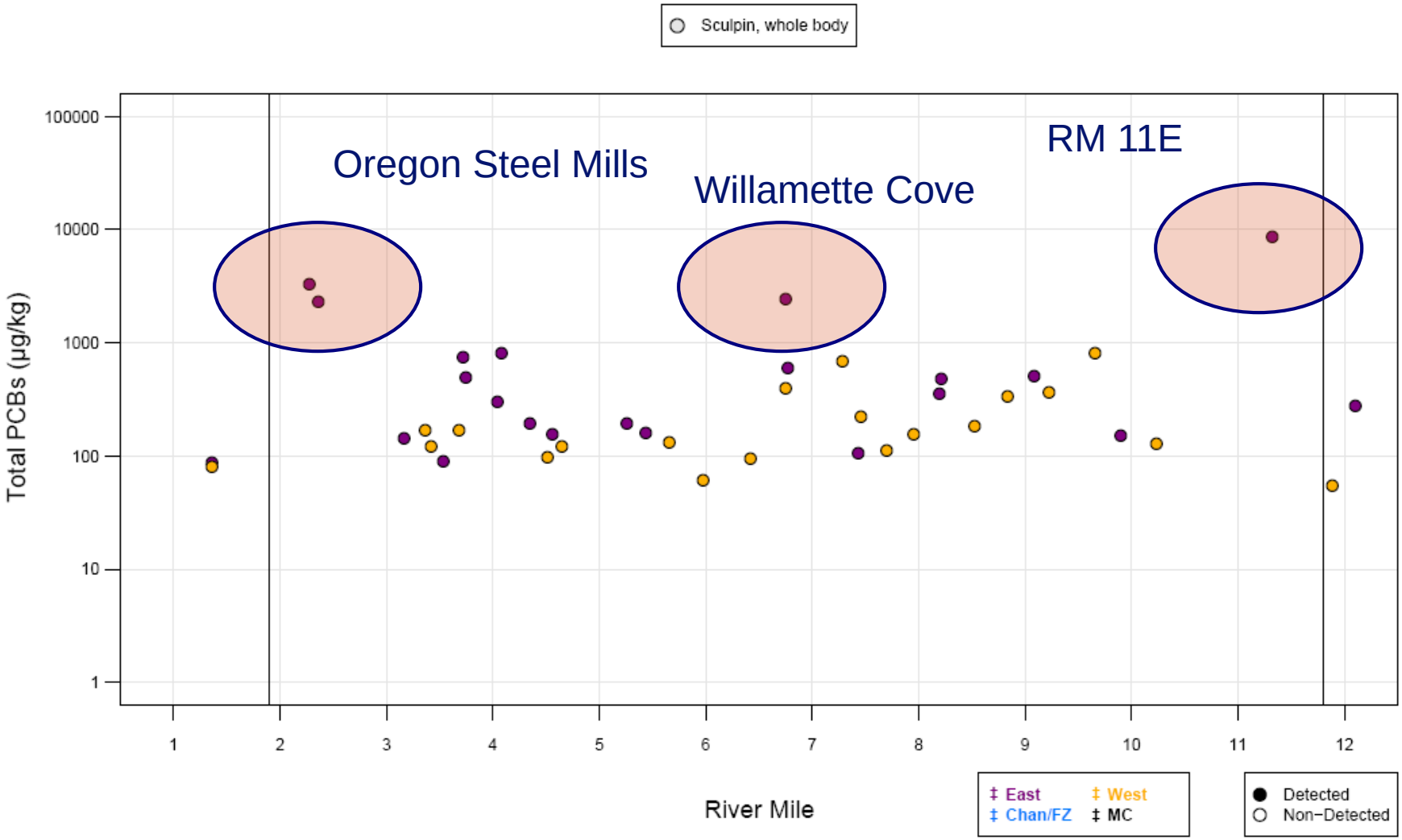
Areas of Benthic Risk



Total PCBs in Smallmouth Bass



Total PCBs in Sculpin



Human Health Risk Assessment Exposure Scenarios Evaluated

	Ingestion and Dermal Adsorption	**In-water Sediment** Ingestion and Dermal Adsorption	**Surface Water** Ingestion and Dermal Adsorption	**Groundwater Seeps** Ingestion and Dermal Adsorption	**Fish/ Shellfish** Ingestion	**Infant Consumption of Human Milk**
Workers	●	●				●
Transients	●		●	●		
Beach Users	●		●			
Fishers	●	●			●	●
Divers		●	●			●
Domestic Users			●			

Baseline Human Health Risk Assessment Results

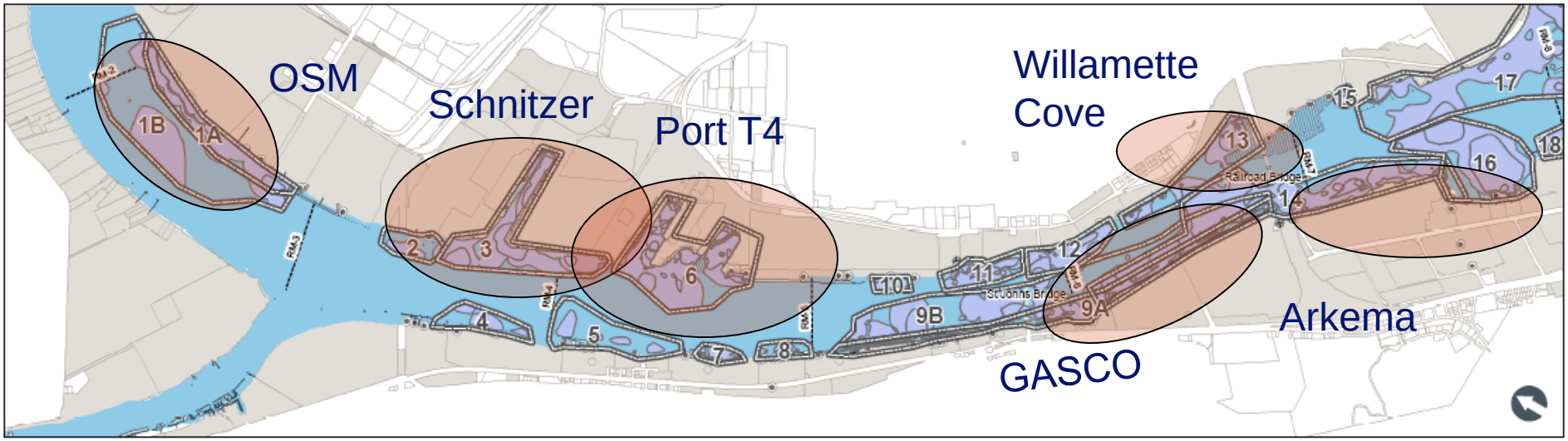
- Greatest risk from consumption of resident fish
- Lower risk through sediment direct contact
- Consumption risks and hazards > 1×10^{-4} and HI of >1 both harbor-wide and river mile scale
- Harbor-wide: PCBs are the primary contributor to risk from fish consumption.
- River Mile Scale: Dioxins/furans are a secondary contributor risk and hazard.
- PCBs are primary contributor to the noncancer hazard to nursing infants, primarily because of the bioaccumulative properties of PCBs and the susceptibility of infants to the developmental effects associated with exposure to PCBs.
- The largest source of uncertainty includes the lack of good site-specific information about consumption of resident fish from Portland Harbor prior to the initiation of fish consumption advisories.

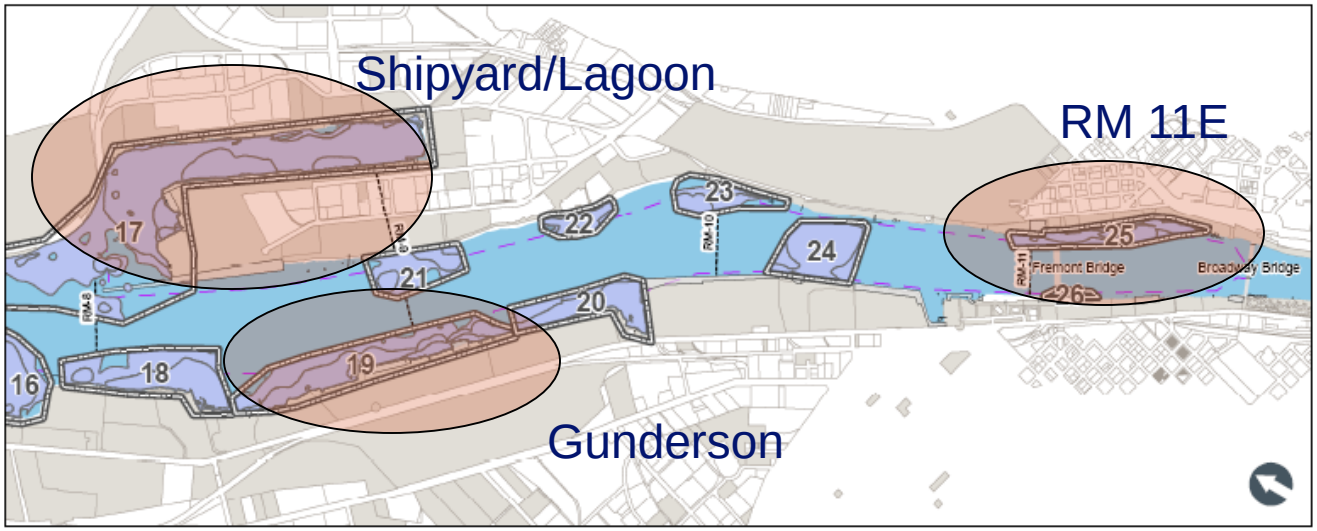
Baseline Ecological Risk Assessment Results

- PCBs, DDx, dioxin and PAHs are most ecologically significant
- Fish– PCBs, DDx, TBT and metals present highest risk to fish and shellfish (tissue residue and dietary)
- Wildlife – PCBs, DDE and dioxin present highest risk to birds and mammals (dietary)
- Benthic Community – toxicity, TBT, metals, PAHs, PCBs, DDX and VOCs (bioassays, generic and site specific SQGs, tissue residue and TZW)

AOPC Identification

- 26 Areas of Potential Concern
  - Fish consumption (PCBs) is the primary risk driver
  - Benthic Risk – Sediment toxicity
  - PAHs – Direct contact and shellfish consumption
  - Organic pesticide, PECD/TCDD
- Secondary COCs
  - BEHP, metals, TBT, TPH, PCP, hexachorobenzene
- Key sediment source areas:
  - OSM, Schnitzer Steel, Port T4, GASCO, Arkema, Shipyard and Swan Island, Willamette Cove, Gunderson, RM11E
  - Site-wide AOPC based on PCBs and fish consumption



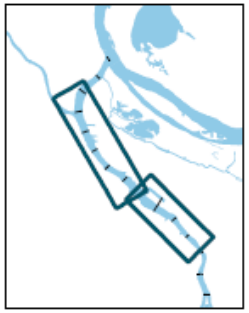


Draft AOPCs for Portland Harbor Site
June 2009
River Mile 1.9 to 11.8

LEGEND
LWG AOPCs_revised 060509
EPA AOPCs 051409

Feet
0 1,000 2,000 3,000 4,000

DRAFT



AOPC DEVELOPMENT NOTES
AOPCs are based on the mapping of surface sediment chemistry against the following lines of evidence:
1. Recreational small mouth bass fish consumption preliminary remediation goal (PRG) for total PCBs at a 10-4 cancer risk level using the by-river mile hill topping approach. The PRG equates to 29.54 ug/kg dry weight total PCBs achieved on a Surface-weighted Average Concentration (SWAC) basis by river mile. Use a replacement value equal to the PRG in the hill topping routine.
2. Site-wide hilltopping approach that results in a site-wide target SWAC of 17 ug/kg total PCBs, which represents one estimate of background. Use 17 ug/kg as the replacement value in the hill topping routine.
3. Tribal fisher direct contact PRG for benzo(a)pyrene at a 10-6 cancer risk; hill topping by direct contact sub areas. This PRG equates to a benzo(a)pyrene concentration of 423.25 ug/kg dry weight. Use a replacement value equal to the PRG in the hill topping routine.
4. "Common" Probable Benthic Risk Areas, which are the areas that both EPA and LWG currently agree have benthic risks.

It should be noted that areas outside of the individual AOPCs identified on this figure also pose an unacceptable, although generally lower, risk to human health and the environment throughout the current study area. These areas will be evaluated as part of a site-wide AOPC.

AOPCs were identified prior to completion of the baseline human health and ecological risk assessments and represent a starting point for the Portland Harbor Feasibility Study (FS). AOPCs may expand or contract based on the consideration of additional site information and the results of the baseline human health and ecological risk assessments.

Draft Feasibility Study

- Draft Feasibility Study submitted by LWG March 30, 2012
- EPA provided initial comments on December 18, 2012
  - EPA letter highlighted major comments
  - Letter and comments on EPA website

Draft Feasibility Study Options

- RALs distinguish alternatives through B thru G
- Eleven alternatives evaluated
  - No Action - A
  - 5 removal focused (dredging) B thru F
  - 5 integrated (still involve significant dredging) B thru F
  - Alternative G was Screened out early and not evaluated
- Removal and integrated include mixed technologies
- Assumes sources will be controlled

Cleanup Methods

Combinations of methods used in different areas of the Site

- Dredging
- Capping
- Treatment – in place or after dredging
- Innovative Technologies
- Monitored Natural Recovery
- Enhanced Monitored Natural Recovery

Remedial Action Levels

Alternative	Portland Harbor RALs (parts per billion)						
	PCB	PAH	DDD	DDE	DDT	Dioxin/ Furans	Benthic Toxicity
A	None	None	None	None	None	None	None
B	1,000	20,000	NA	1,000	NA	NA	No Toxicity in 10 Years
C	750	15,000	NA	1,000	NA	NA	No Toxicity at Year Zero*
D	500	8,000	NA	200	NA	NA	No Toxicity at Year Zero*
E	200	4,000	100	50	150	0.02	No Toxicity at Year Zero*
F	75	1,500	50	20	60	0.01	No Toxicity at Year Zero*
G	50	600	15	10	20	0.005	No Toxicity at Year Zero*

* No toxicity immediately after active remedy completion.

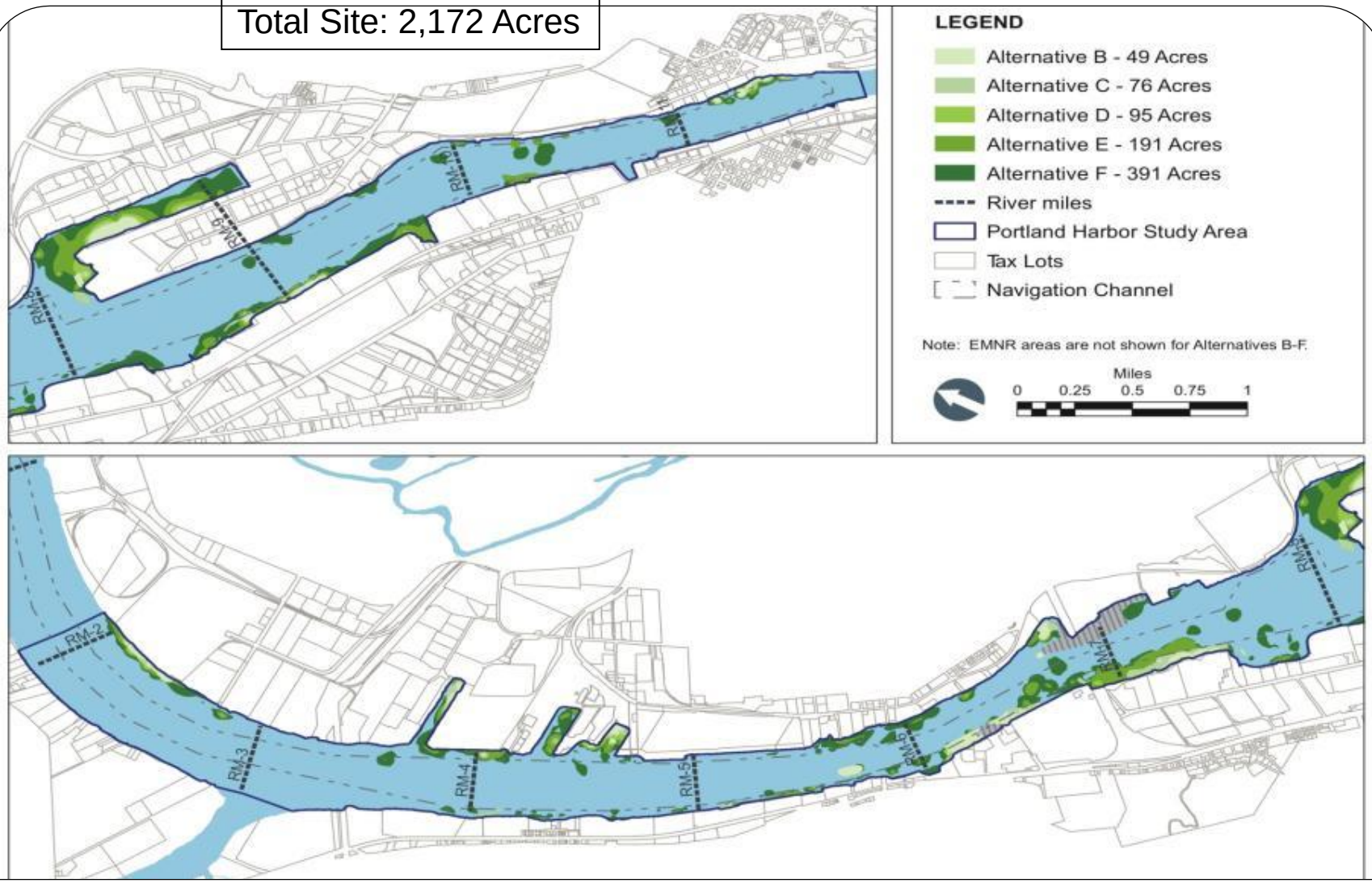
Draft FS Alternatives

Alternative	Total Dredge Volume Removed	Dredge Areas	In-situ Treatment Areas	Engineered Cap Area	Use of CADs or CDFs[1]	Enhanced Monitored Natural Recovery	Years to Construct	Estimated Net Present Value Cost ($Millions)	
	(Cubic Yards)	(Acres)	(Acres)	(Acres)				Low[2]	High[2]
B-i	198,000 to 293,000	23	19	7	None	75	2	$169	$250
B-r	541,000 to 783,000	42	0	13	CAD &CDF	41	6	$228	$330
C-i	314,000 to 459,000	34	29	13	CAD & CDF	40	3	$231	$345
C-r	777,000 to 1,127,000	63	0	10	CDF	73	7	$304	$449
D-i	387,000 to 565,000	43	34	15	CAD & CDF	37	3	$266	$398
D-r	914,000 to 1,321,000	78	0	13	CDF	68	8	$351	$520
E-i	936,000 to 1,362,000	91	58	25	CDF	15	7	$463	$709
E-r	1,775,000 to 2,596,000	145	0	21	CDF	15	12	$568	$884
F-i	2,129,000 to 3,151,000	176	117	49	CDF	3	15	$878	$1,389
F-r	4,196,000 to 6,182,000	304	0	38	CDF	3	28	$1,077	$1,762

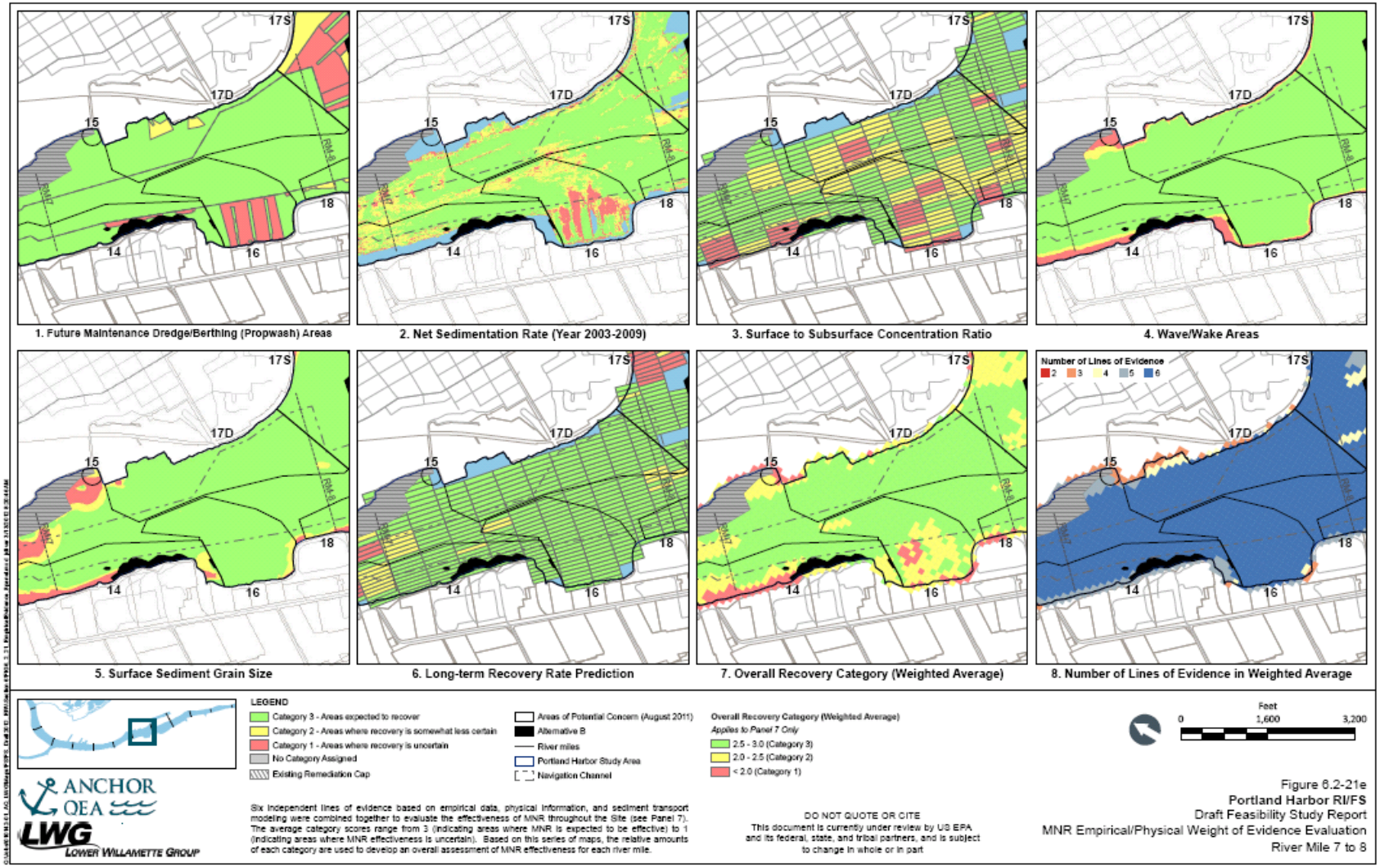
1 - Confined Aquatic Disposal (CAD), Confined Disposal Facility (CDF)
2 - The cost of the entire duration of the project in today's dollars.

Sediment Cleanup Areas

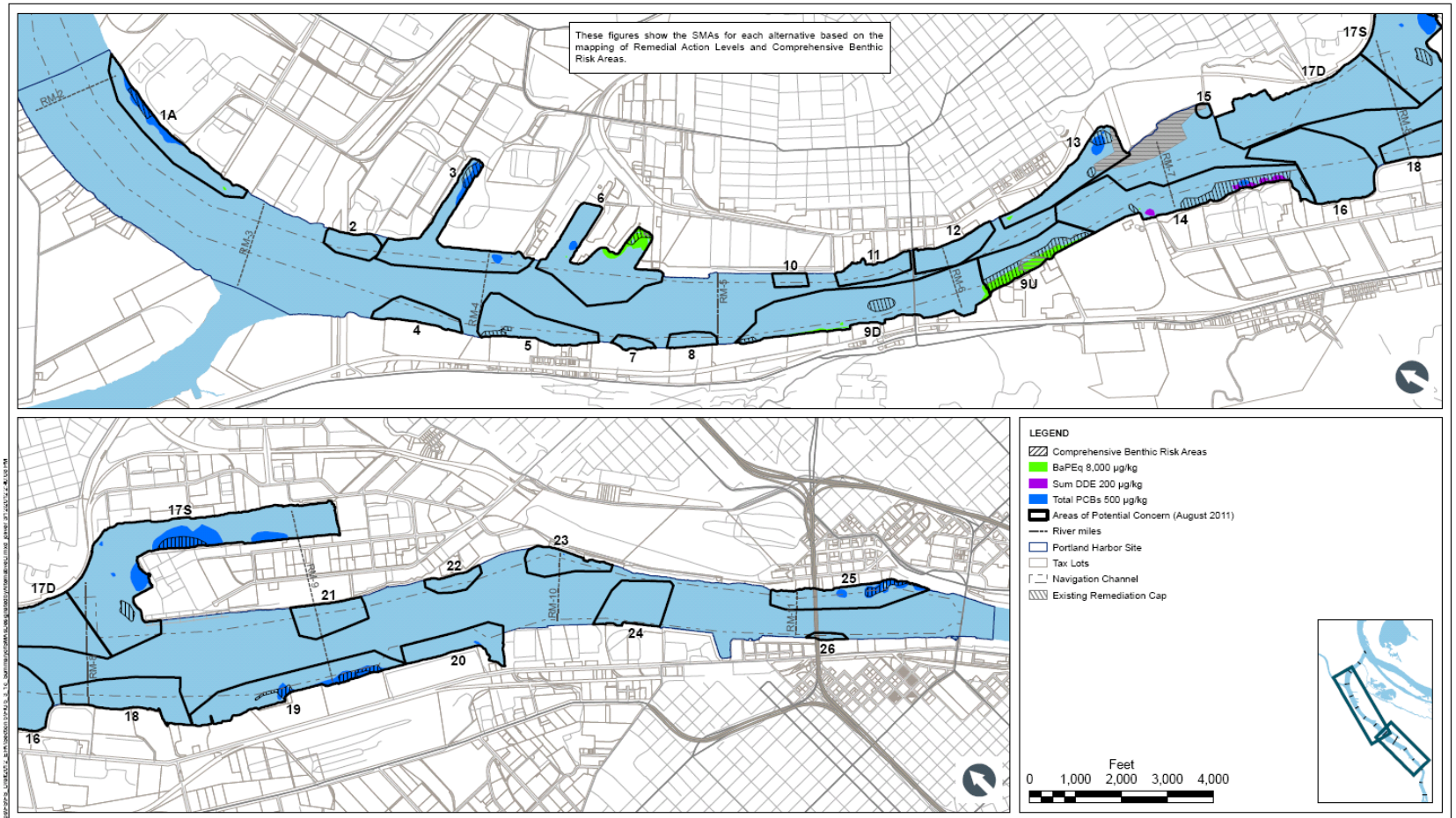
Total Site: 2,172 Acres



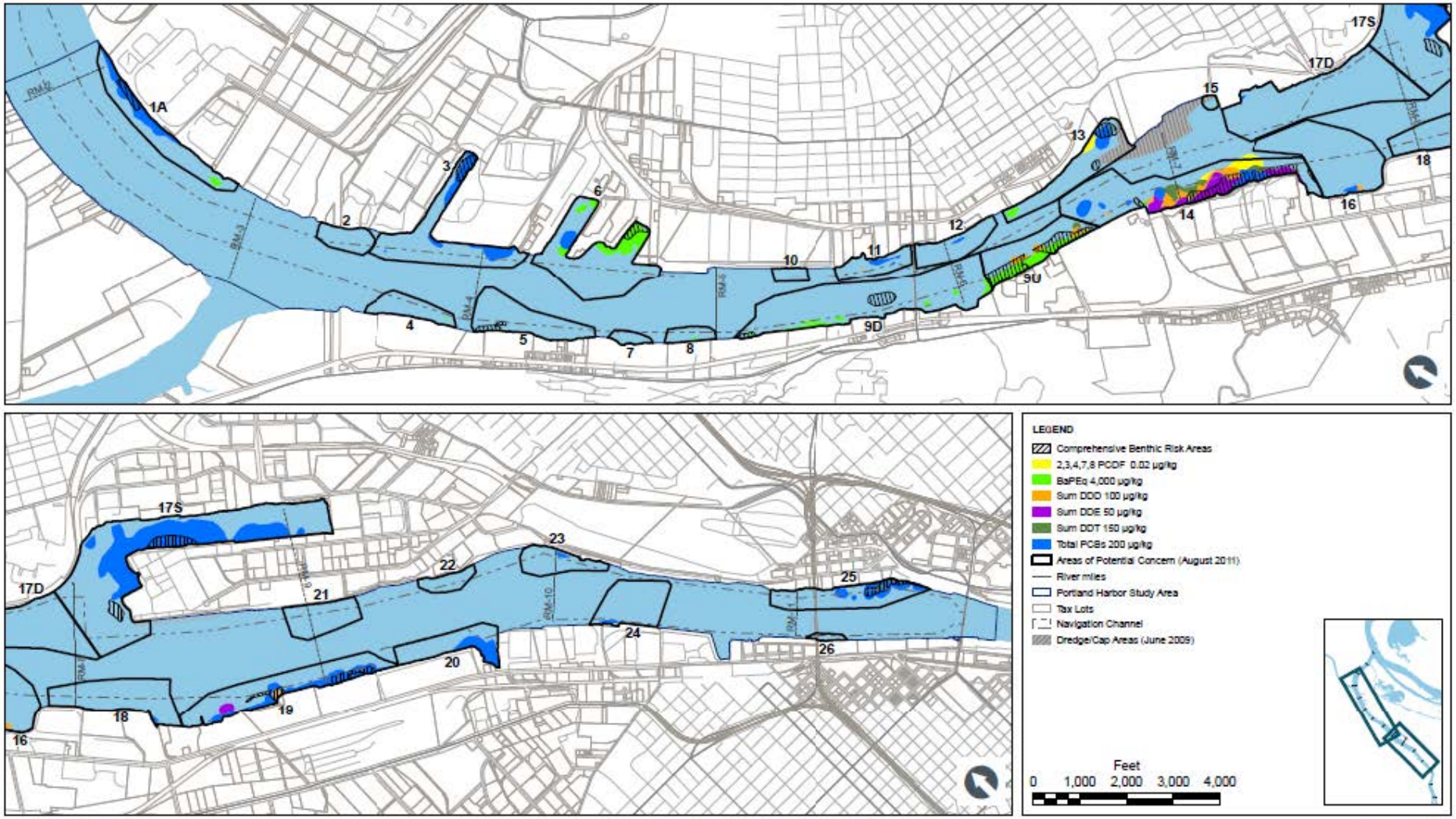
Alternatives Evaluation – Empirical Data



SMA Mapping- Alt D. Example



Alternative E



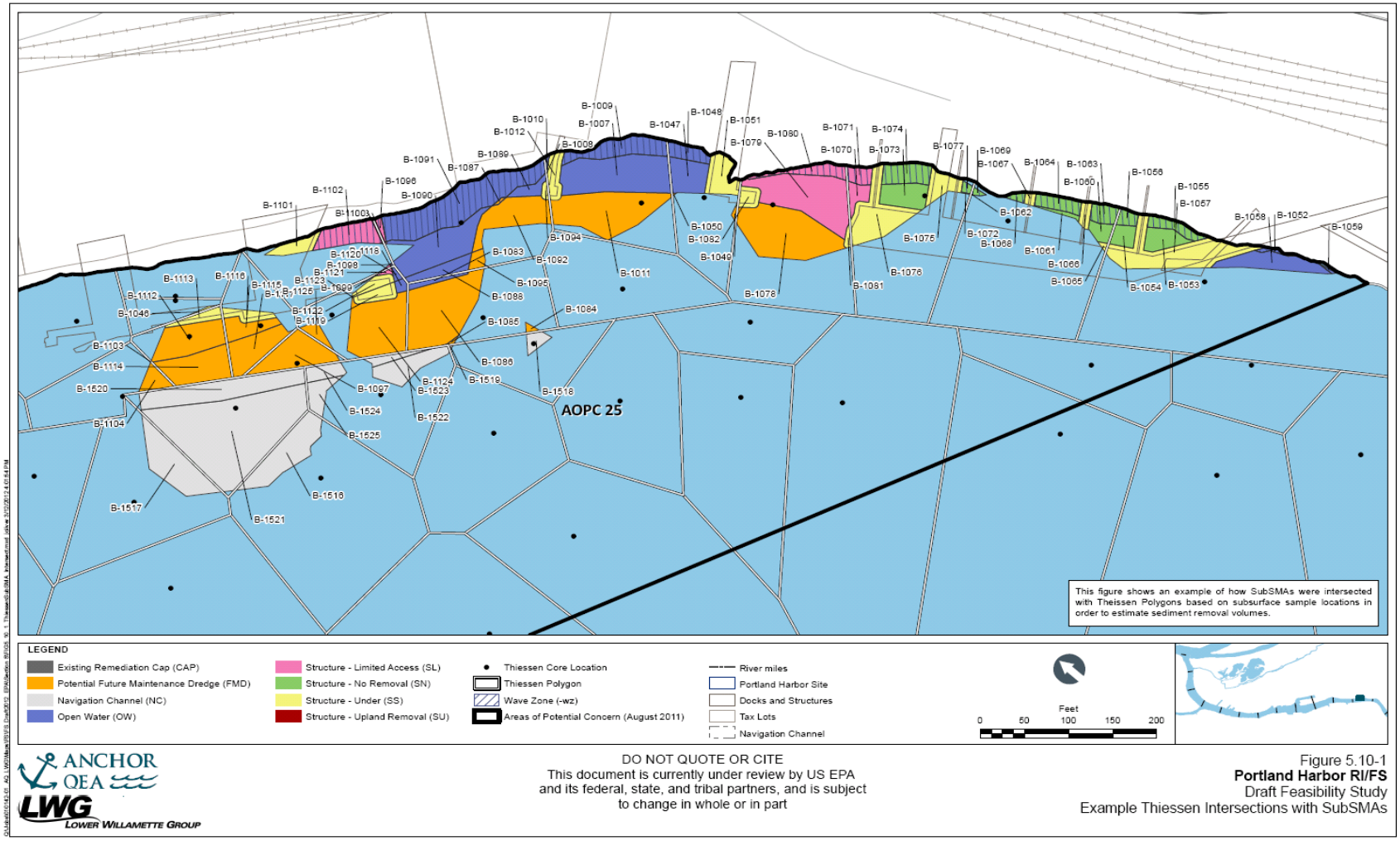
ANCHOR QEA

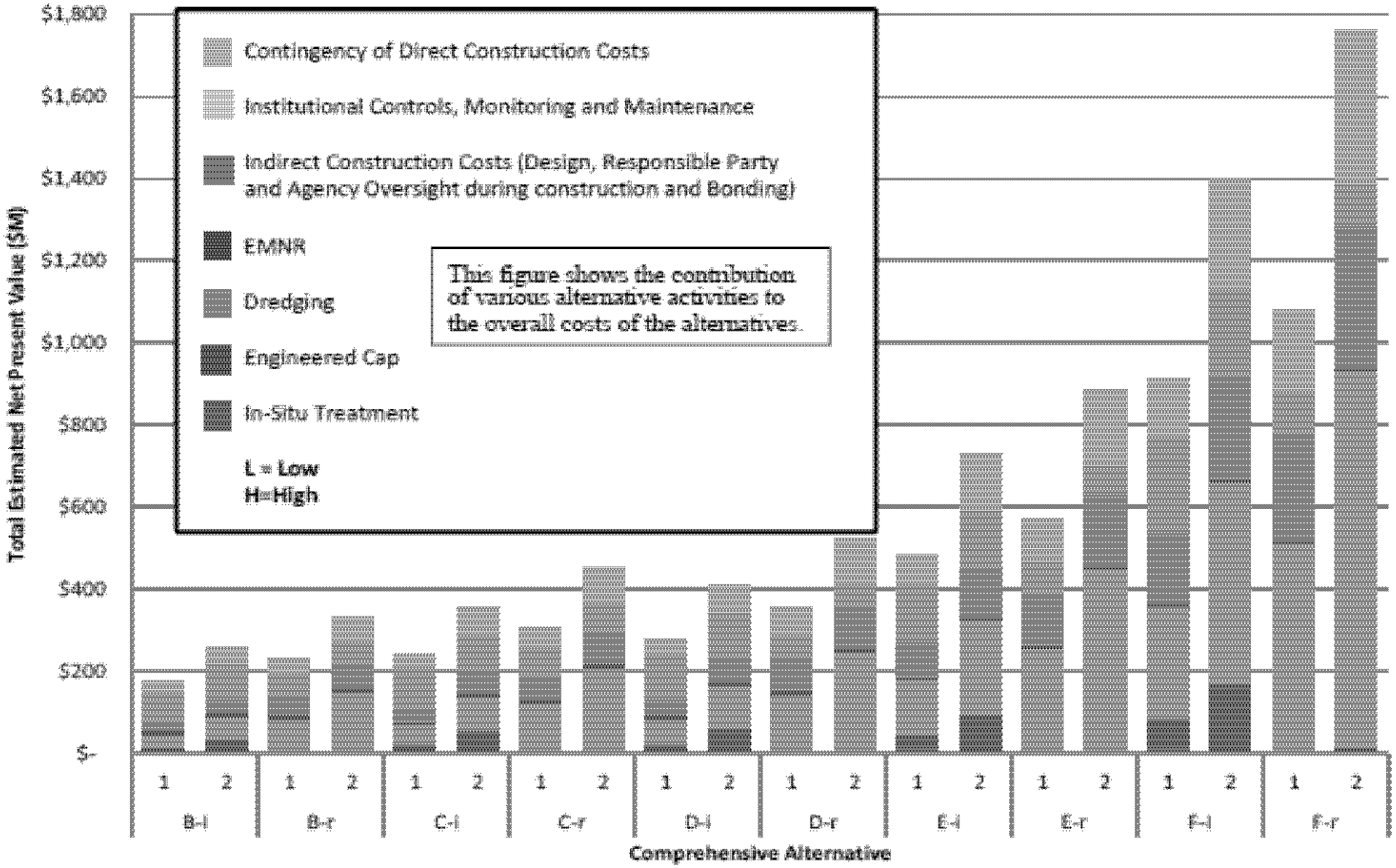
LWG Lower Willamette Group

Preliminary Draft Information: Distribution Restricted to EPA Project Team.
Contains Preliminary Analyses Subject to Change in Whole or in Part.

Figure 5.3-1d
Portland Harbor RI/FS
Draft Feasibility Study
Summary of SMAs Designated by Alternative E

Volume Development





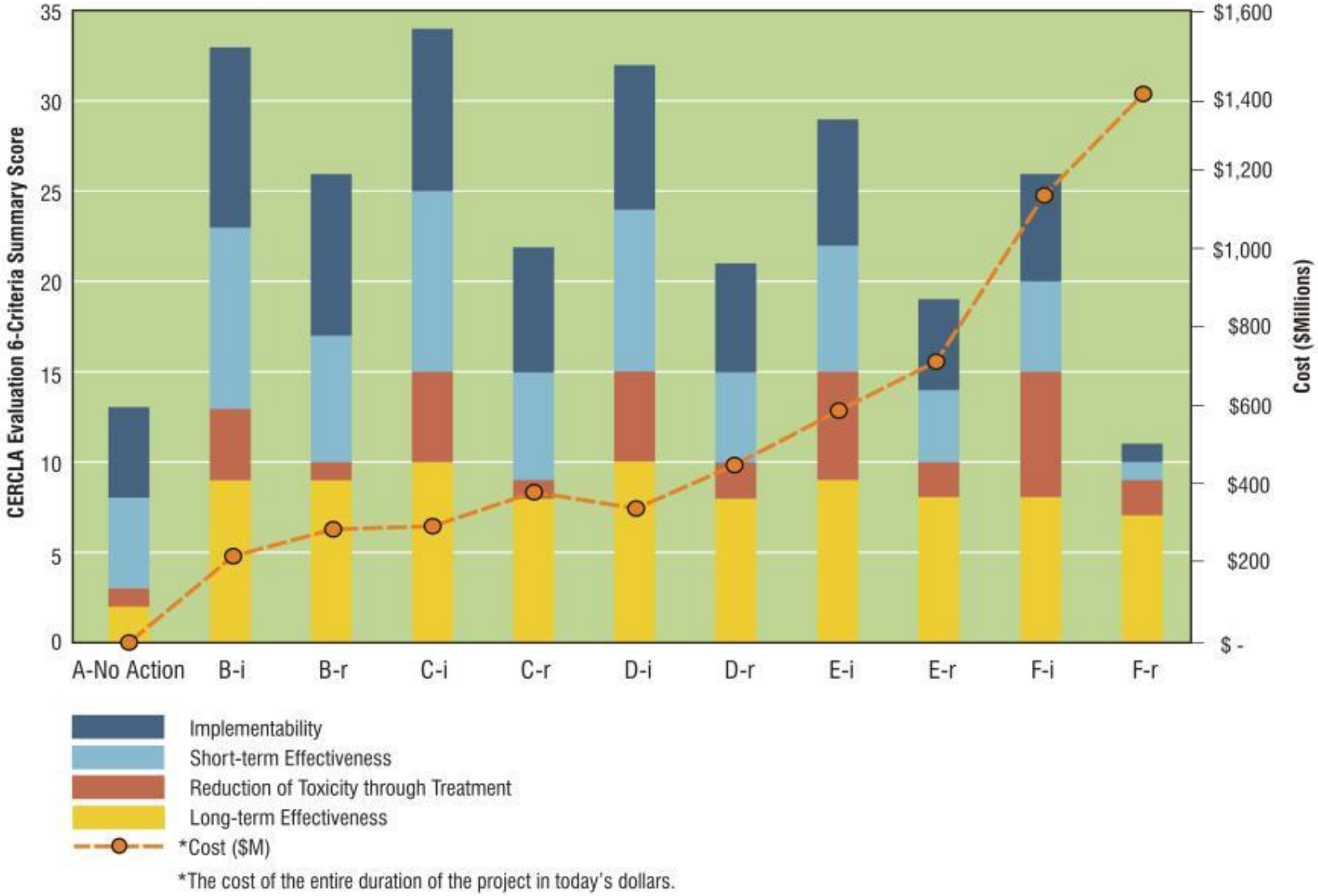
ANCHOR QEA

LWG
Lower Willamette Group

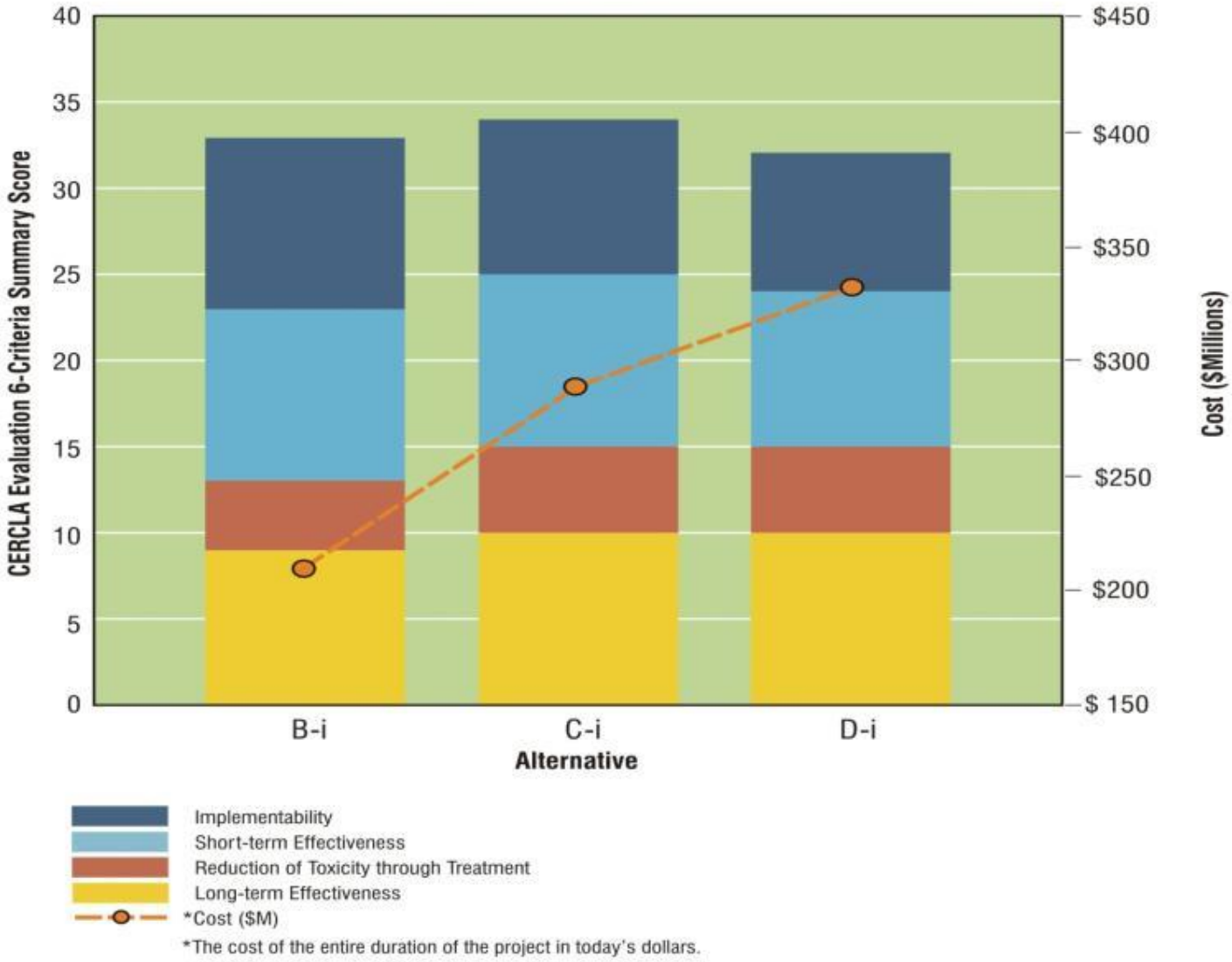
DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part

Figure 9.7-2
Portland Harbor RI/FS
Draft Feasibility Study
Breakout of Net Present Value Cost by Alternative

LWG Alternatives Comparison



LWG Best Scoring Alternatives



LWG Conclusions in Draft FS

- Site is depositional (supports MNA)
- All alternatives adequately reduce risks to human health and environment (except the No Action Alternative)
- Differences - cleanup action levels, active cleanup time, impacts, use of technology, and cost

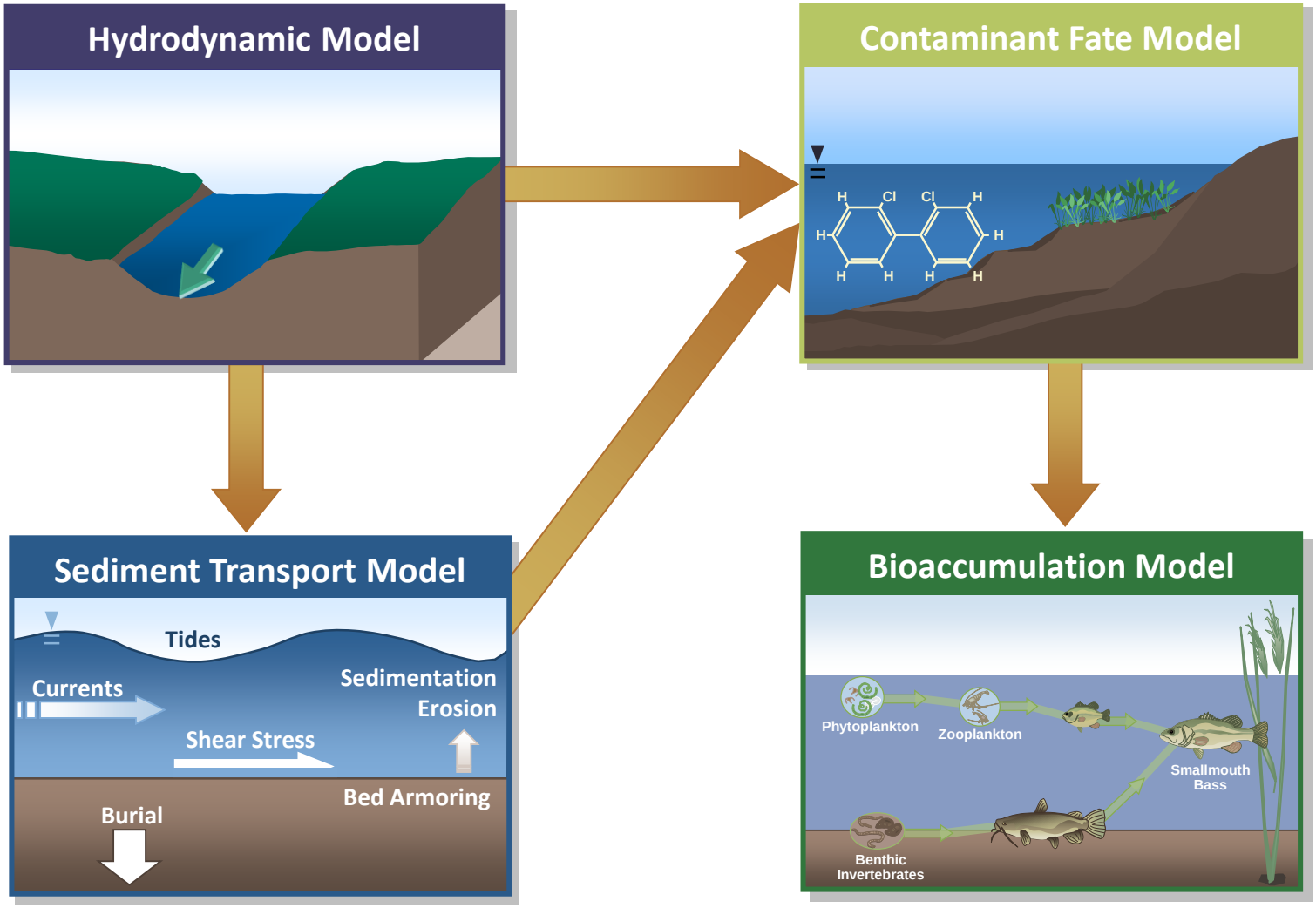
EPA Comments on Draft FS

- Document not approvable
- EPA is performing independent evaluation and comparison of alternatives
- EPA expects to redraft portions of the report with support from LWG
- Working with LWG on process and schedule targeting FS revision by Spring 2014

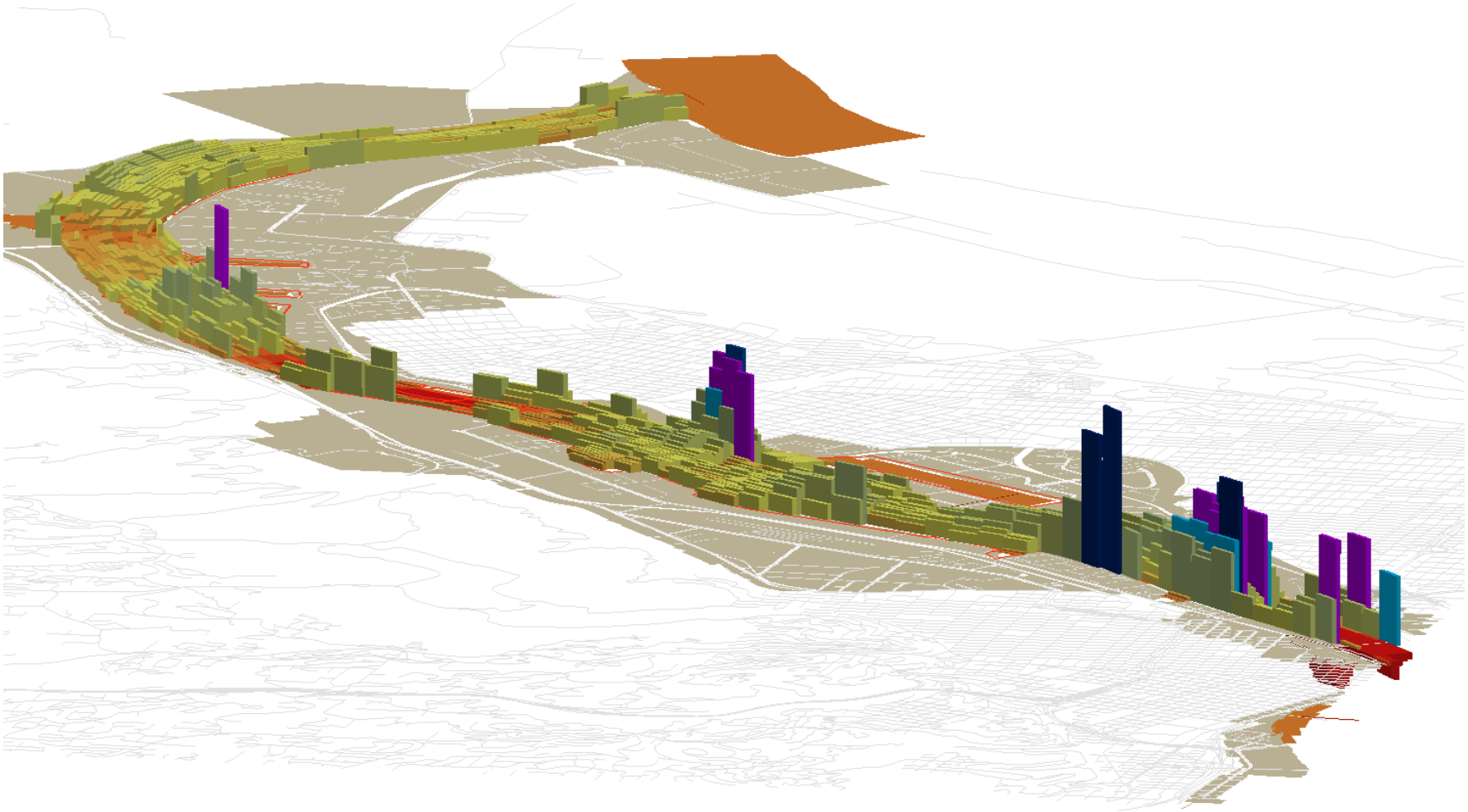
Major Issues – Draft FS

- Monitored Natural Recovery emphasis
  - Fate and transport model predictions of depositional rates for many areas
- Dredging effectiveness and impacts
- Site-wide vs localized focus evaluation
- Short term vs long term impacts
- Appendix E "Sensitivity Analysis"
- Comparative analysis of alternatives
- "packaging" of technologies/alternatives

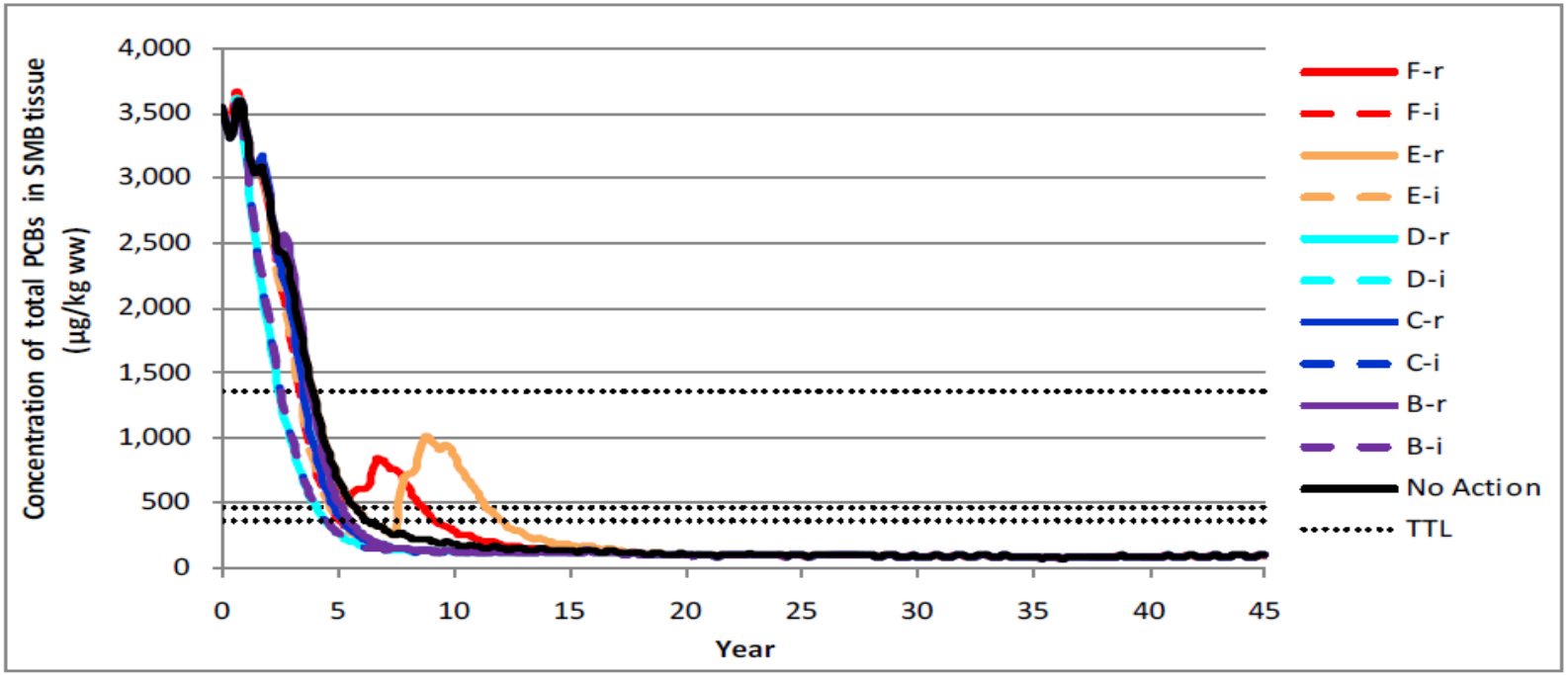
LWG Fate and Transport Model



LWG Model Predictions Deposition and Erosion



LWG Predicted SMB Tissue at RM 11E



Note: i – integrated, r – removal ased, SMB – smallmouth bass, TTL – target tissue level
Dotted horizontal lines indicate SMB TTLs for the 10^{-4} excess cancer risk level, corresponding to the 90th percentile (4,140 µg/kg ww), point estimate (1,356 µg/kg ww), 95th percentile (470 µg/kg ww), and 99th percentile (372 µg/kg ww). TTLs are only shown on the graph if they fit within the scale shown.

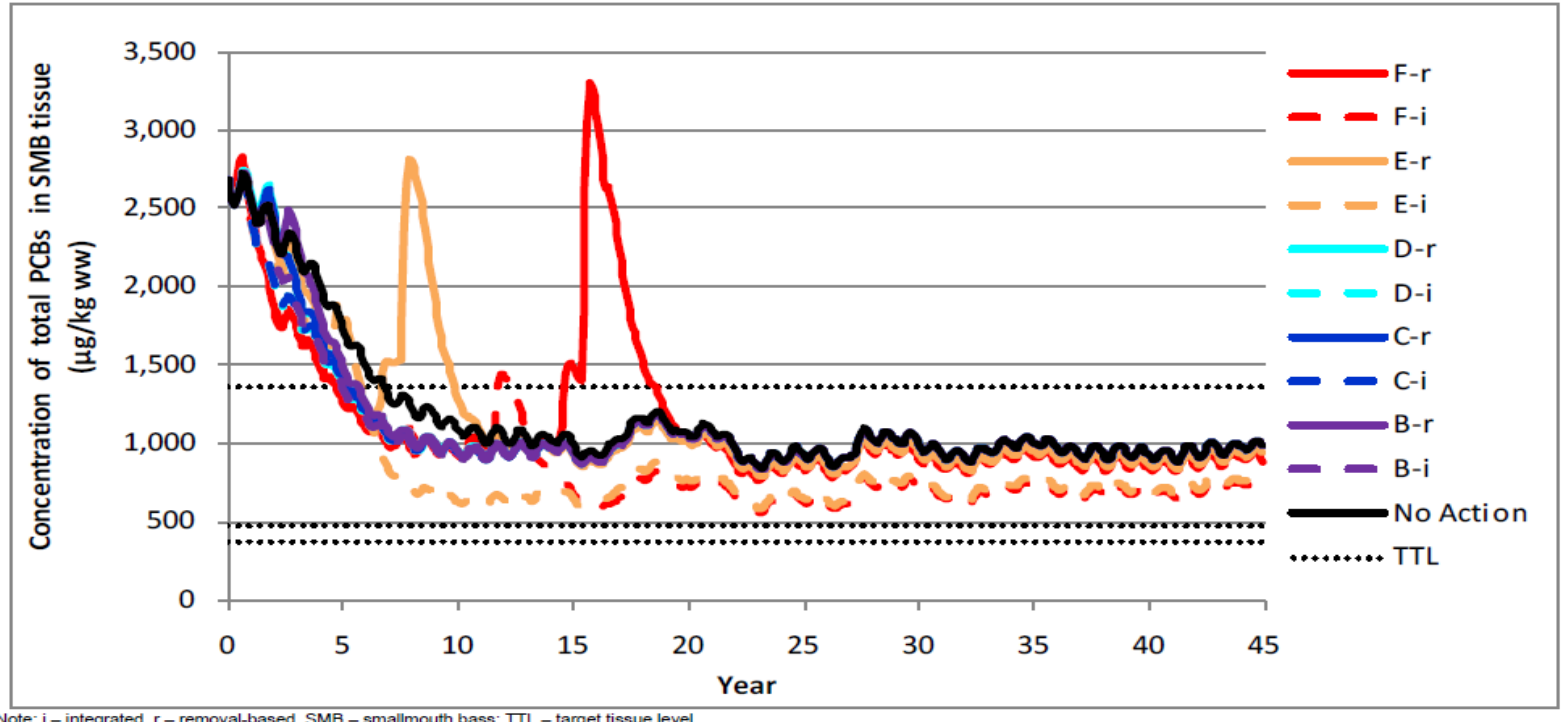
Windward environmental LLC

LWG
Lower Willamette Group

Preliminary Draft Information: Distribution Restricted to EPA Project Team. Contains Preliminary Analyses Subject To Change in Whole or In Part

Figure 3-1
Portland Harbor RI/FS
Draft Feasibility Study
Comparison of Alternatives for Smallmouth Bass for RM 11 to 11.8 E

LWG Predicted SMB Tissue RM9-10 (Gunderson)



Note: i – integrated, r – removal-based, SMB – smallmouth bass; TTL – target tissue level
Dotted horizontal lines indicate SMB TTLs for the 10^{-4} excess cancer risk level, corresponding to the 90th percentile (4,140 µg/kg ww), point estimate (1,356 µg/kg ww), 95th percentile (470 µg/kg ww), and 99th percentile (372 µg/kg ww). TTLs are only shown on the graph if they fit within the scale shown.

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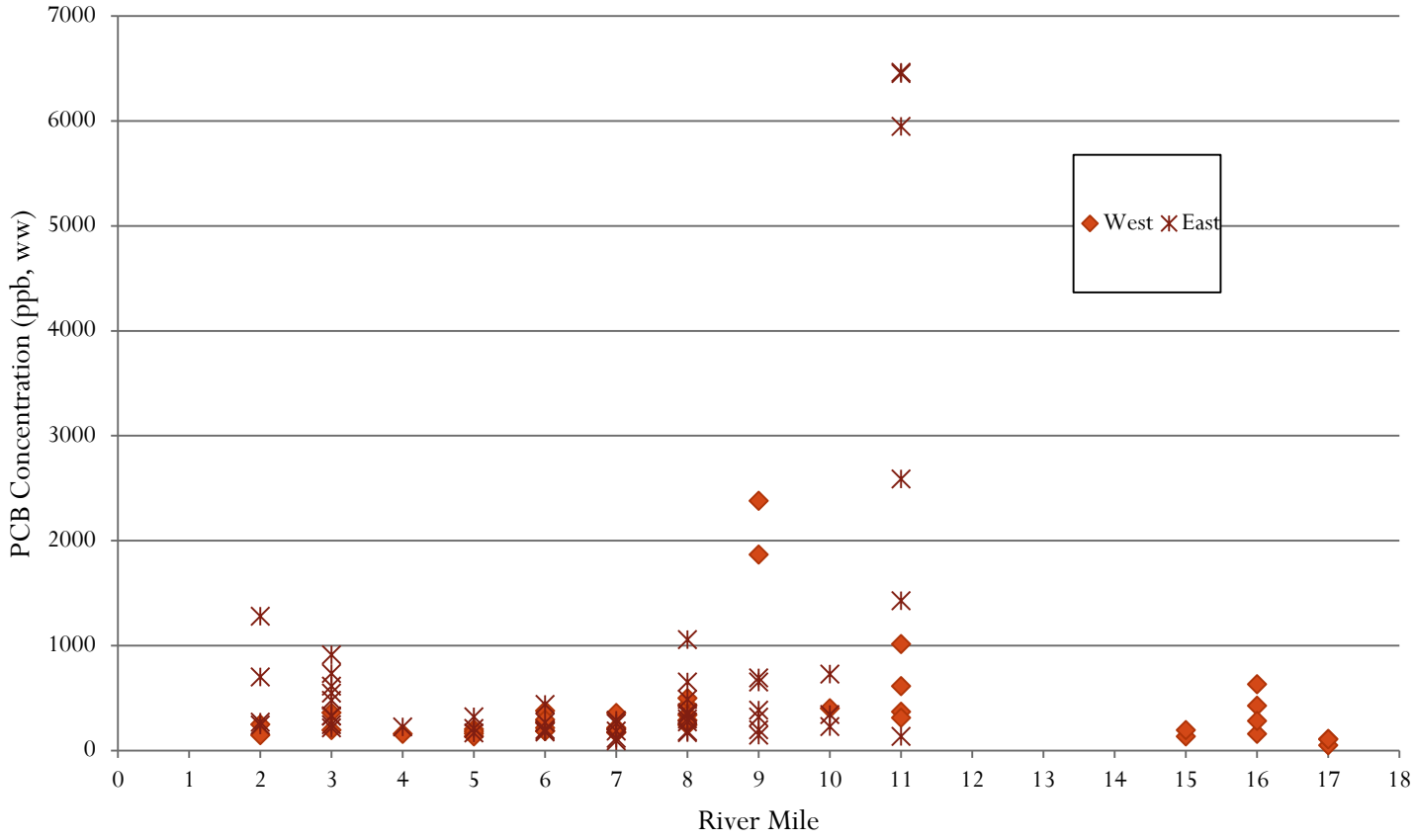
Figure 3-9
Portland Harbor RI/FS
Draft Feasibility Study
Comparison of Alternatives for Smallmouth Bass for RM 9 to 10 W

2012 Smallmouth Bass Whole Body PCBs



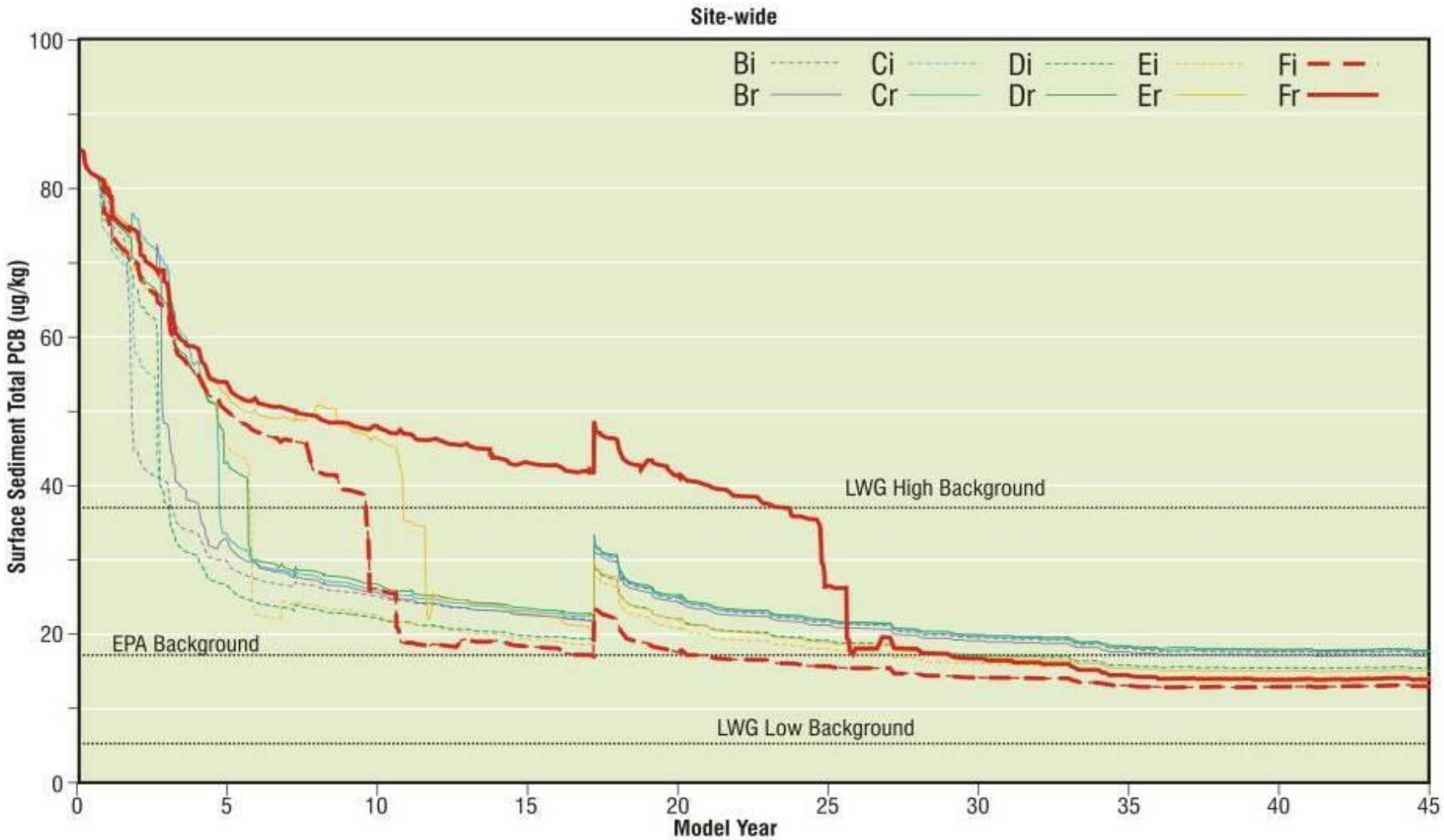
Site-wide vs. Localized Focus

- Many contaminants are in discrete areas, some localized sources in certain sections of the river. Sitewide focus dilutes sources
- Sitewide averaging not consistent with ecological relevance for key species (ie, small mouth bass home ranges)

Dredging Evaluation

- FS Dredging assumptions – releases, residuals, production, project duration and sequencing
- Releases and residuals feed into models
- Corps ERDC review & recommendations
  - Releases – LWG: 3% of contaminants mass (100% soluble); ERDC: 1% with current practices
  - Residuals – LWG 5% of mass in last cut w/ 6" cover
  - Production – LWG: 2100 cy/day (700 cu/day/plant, 3 plants @ 10 to 12 hrs day); ERDC: 5,600 to 6,000

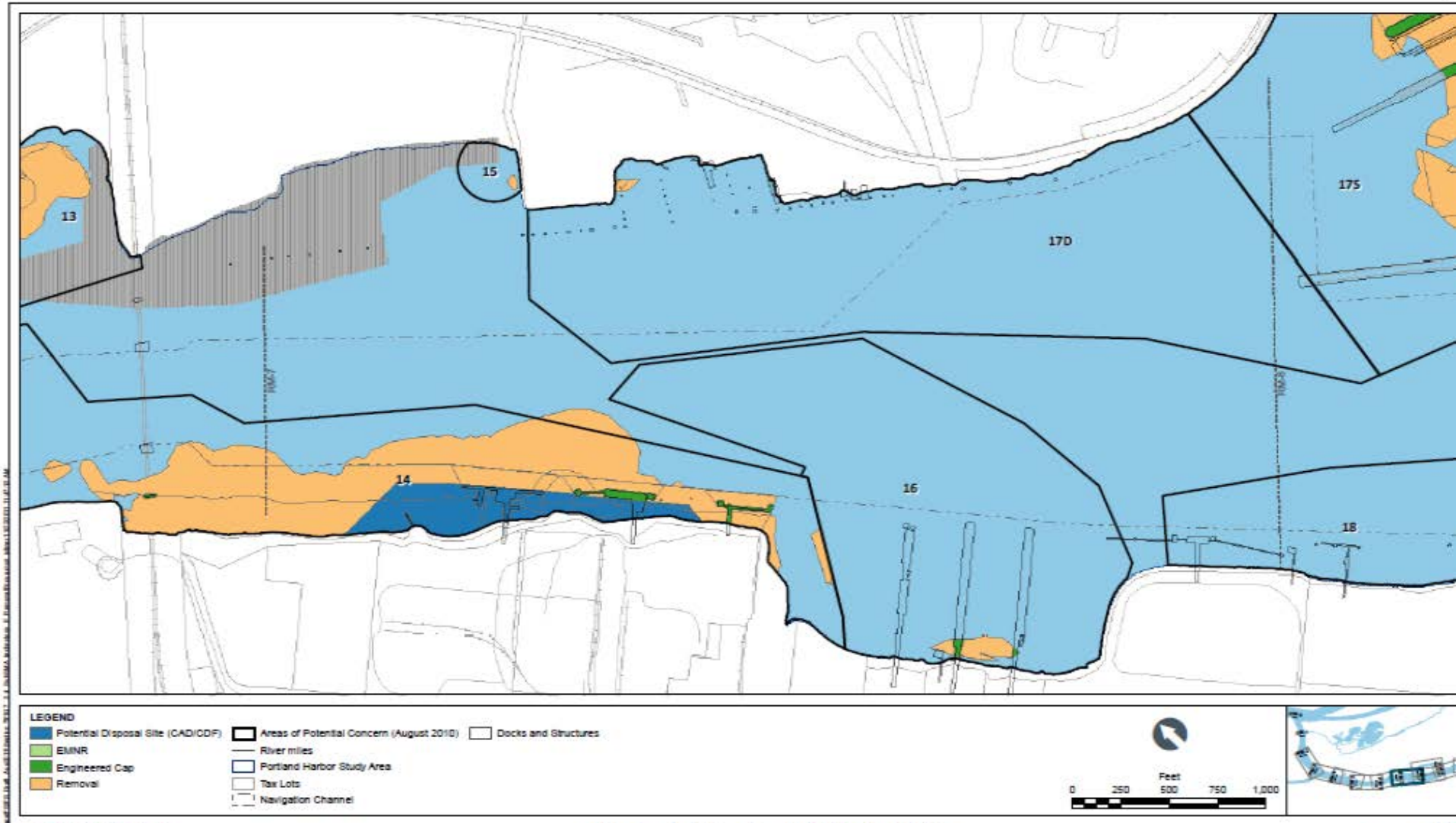
Predicted PCB concentrations



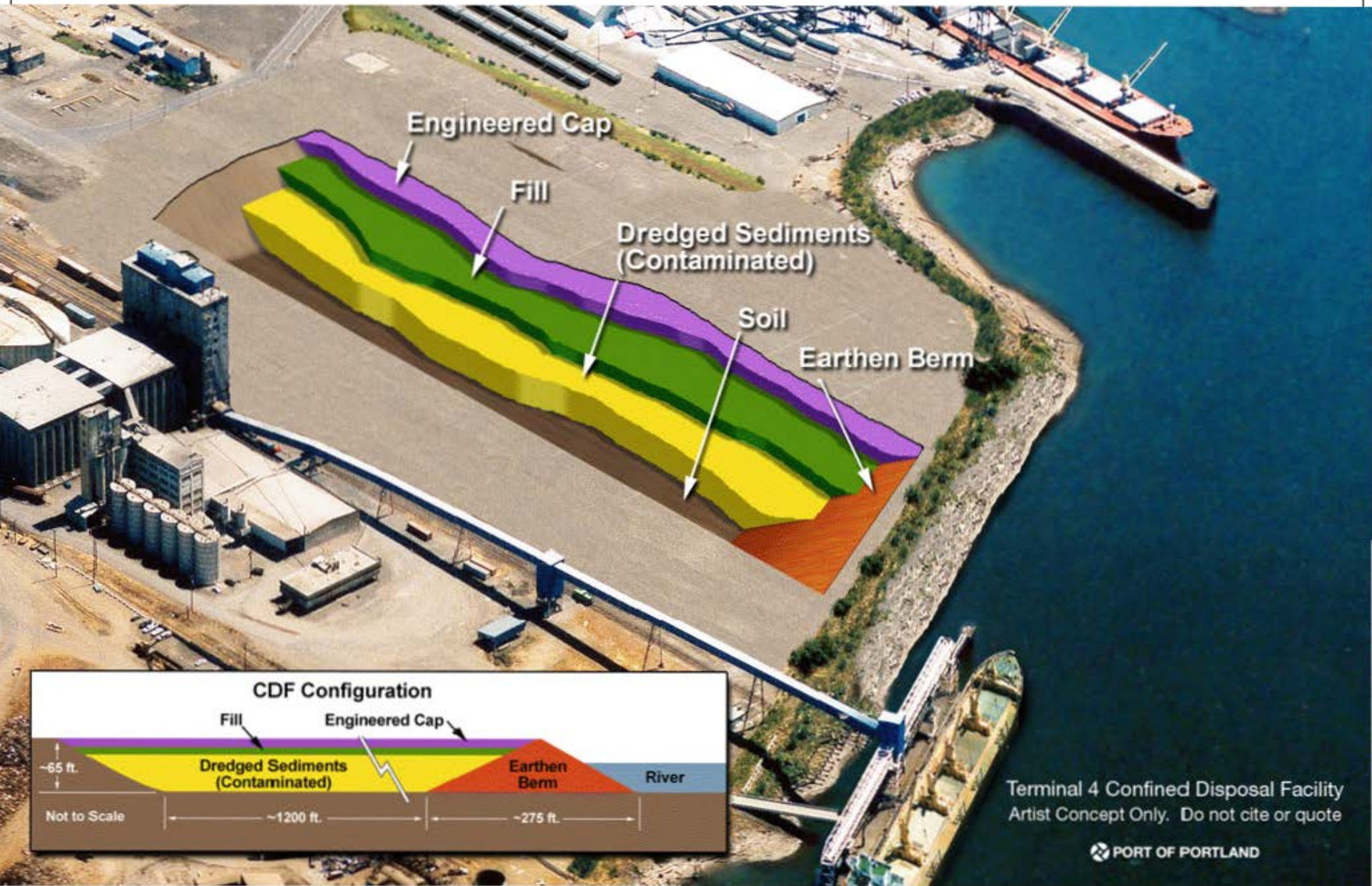
Disposal

- LWG assumed screening CADs and CDFs
- Draft FS includes various CDF combinations for alternatives C through F.
- CDF locations at Arkema, Swan Island Lagoon and T4
- Arkema and Swan Island CDFs conceptual
- T4 CDF – selected for T4 early action, at 60% design
- Local opposition to CDFs

Arkema CDF


13
15
17D
175
14
16
18
LEGEND
Potential Disposal Site (CAD/CDF)
EMNR
Engineered Cap
Removal
Areas of Potential Concern (August 2010)
River miles
Portland Harbor Study Area
Tax Lots
Navigation Channel
Docks and Structures
Feet
0
250
500
750
1,000
ANCHOR QEA
LWG
LOWER WILLAMETTE GROUP
Preliminary Draft Information: Distribution Restricted to
EPA Project Team. Contains Preliminary Analyses
Subject to Change in Whole or in Part.
Fig
Portland Harb
Draft Feasib
Alternative E - Removal
River M

T4 CDF


Engineered Cap
Fill
Dredged Sediments
(Contaminated)
Soil
Earthen Berm
CDF Configuration
Fill
Engineered Cap
~65 ft.
Dredged Sediments
(Contaminated)
Earthen
Berm
River
Not to Scale
~1200 ft.
~275 ft.
Terminal 4 Confined Disposal Facility
Artist Concept Only. Do not cite or quote
PORT OF PORTLAND

EPA review process

- Finalizing PRGs, RALs based on final RAs
- Tech checkpoints/work sessions
- Areas of focus – rolling river miles
- MNR model evaluation – ERDC (Earl Hayter)
- Dredge residuals, releases – ERDC
- Road to ROD

PH – Road to ROD

RAs

Human Health

Receptor Scenarios

- Complete Pathways
- Relevant Area for Exposure Point Concentration Calcs

Ecological

Receptor Scenarios

- Complete Pathways
- Relevant Area for Exposure Point Concentration Calcs
- Benthic Tox

- Predicted vs. Actual

RI

Characterization

Background Concentrations

Depositional Areas

Areal and vertical extent of COPCs

FS-Mtg 1

Path

Key Issues from RI/RAs

RAOs/PRGs/RALs

Hot Spots/PTMs

Workgroups with LWG

Plan Meeting 2

FS-Mtg 2

Technology Evaluation

- No action
- MNR
- EMNR
- Cap
- Dredging
- Disposal

Detailed Evals

- Dredging Production
- Dredging Effectiveness
- Cap Design
- MNR – suitable locations
- EMNR – effectiveness
- Disposal Options

Develop Decision Tree

FS-Mtg 3

Develop Remedial Action Alternatives

FS-Mtg 4

Detailed Alternative Analysis

- 9 Criteria
- Cost Effectiveness
- Time to Achieve RAOs

Residual Risk Analysis

Review Agency preferred alternative

Circle back for all key Stakeholder issues

Outline draft of proposed plan

Plan to resolve any outstanding stakeholder issues

Review TOC for Revised FS

Proposed Plan/ROD

Basis for action

Preferred remedy components

- No action
- MNR
- Cap
- Removal
- Restoration

Expected outcomes

- Time = 0
- Time = 30 yrs

Institutional Controls

Long Term Monitoring

Community Participation

Draft FS to ROD

- EPA review of Draft FS – 2013
  - Public outreach
  - Adequate basis for remedy selection
  - Comment/revisions/Final FS
- Proposed Plan development
  - Begin drafting based on draft FS
  - R10 peer review
  - NRRB/CSTAG reviews
- Proposed Plan – public comment – 2014
- Record of Decision - 2015

Community Involvement

- Four FS information sessions
- Portland Harbor Community Advisory Group meets monthly
- TAG Grant – Willamette Riverkeeper
- Regular e-mail updates to over 1000 people with information about the investigation and cleanup
- Project team members make presentations to a wide variety of stakeholders and audiences.

Portland Harbor
EPA Contacts/Additional Information

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http://www.epa.gov/Region10/PortlandHarbor