



# ***Stormwater Challenges & Treatment Solutions from Northwest Port Facilities***

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***Federal Way, WA***



**American Association  
of Port Authorities**



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# Discussion Topics

## ► First Session

### *Stormwater Treatment Drivers & Challenges*

- Regulations
- Pollutant Sources
- Physical Challenges Specific to Ports
- *Limitations of Traditional Methods*



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# Discussion Topics

## ▶ Second Session

### *Stormwater Treatment Case Studies*

- Gravity-Based Solutions
- Pumped Systems
- Advanced Treatment
- ▶ Summary & Recommendations



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# Stormwater Treatment Drivers Agency Pressure & Citizen Suits

- ▶ Regulatory Changes
- ▶ Permit Required Corrective Actions
- ▶ Agency Pressure
- ▶ 3rd Party Litigation



Issuance Date: October 21, 2009  
Effective Date: January 1, 2010  
Expiration Date: January 1, 2015

## INDUSTRIAL STORMWATER GENERAL PERMIT

A National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit for Stormwater Discharges Associated With Industrial Activities

State of Washington  
Department of Ecology  
Olympia, Washington 98504-7600

In compliance with the provisions of  
The State of Washington Water Pollution Control Law  
Chapter 90.48 Revised Code of Washington  
and  
The Federal Water Pollution Control Act  
(The Clean Water Act)  
Title 33 United States Code, Section 1251 et seq.

Until this permit expires, is modified or revoked, Permittees that have properly obtained coverage under this general permit are authorized to discharge in accordance with the special and general conditions which follow.

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Water Quality Program  
Washington State Department of Ecology



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**Puget Soundkeeper Alliance**  
Versus the Boatyards

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# Industrial Stormwater Permits

- ▶ Most states based on EPA MSGP
- ▶ Updated on a 5 year cycle
- ▶ **WA is NUTS!!**
- ▶ Other states less so **FOR THE TIME BEING**



**THE INDUSTRIAL STORMWATER GENERAL PERMIT**  
 A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM AND STATE WASTE DISCHARGE GENERAL PERMIT FOR STORMWATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITIES  
 State of Washington  
 DEPARTMENT OF ECOLOGY  
 Olympia, Washington 98504-7600  
 In compliance with the provisions of The State of Washington Water Pollution Control Law Chapter 90.48 Revised Code of Washington and The Federal Water Pollution Control Act (The Clean Water Act) Title 33 United States Code, Section 1251 et seq.  
 Until this permit expires, is modified or revoked, Permittees that have obtained coverage under this general permit are authorized to discharge under the general conditions which follow.



Permit Number: 1200-Z  
 Effective: July 1, 2012  
 Expiration: June 30, 2017  
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GENERAL PERMIT  
 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM  
 STORMWATER DISCHARGE PERMIT  
 Department of Environmental Quality

Proposed 2013 MSGP

United States Environmental Protection Agency (EPA)  
 National Pollutant Discharge Elimination System (NPDES)  
 MULTI-SECTOR GENERAL PERMIT FOR STORMWATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITY (MSGP)



Industrial General Permit Order  
 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)  
 GENERAL PERMIT FOR STORM WATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITIES

ORDER  
 NPDES NO. CAS000001



This Order was adopted by the State Water Resources Control Board on:	April 1, 2014
This Order shall become effective on:	July 1, 2015
This Order shall expire on:	June 30, 2020

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# Industrial Permit Requirements

- ▶ Most float similar requirements down from **MSGP**
- Minimize exposure
- **Good housekeeping**
- Spill prevention & response
- Erosion & sediment control
- **BMPs**
- **Facility inspections**
- ▶ All this stuff and much more needs to be in your **SWPPP**
- ▶ Most require **visual monitoring**
- ▶ More and more requiring **benchmark monitoring** (NALs)
- ▶ Some states for all permittees additional for specific sectors
- ▶ **Corrective actions**



*Hint - Don't do it this way!*



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# Permit Coverage at Transportation Facilities

## ▶ **Transportation SICs**

- **40XX – RR**
- **42XX – Motor Freight**
- **44XX – Water Transportation**
- **45XX – Air Transportation**
- ▶ **Who needs a permit and permit coverage areas are defined in 40 CFR 122.26**
- ▶ **Almost all states industrial permits retain this language**
- ▶ **WA does NOT**
- ▶ **What's the significance?**

## 8. Transportation Facilities:

Facilities with SICs 40XX through 45XX (except 4221-25) and 5171 **with vehicle maintenance shops, equipment cleaning operations, or airport deicing operations. Only those portions of the facility involved in vehicle maintenance (including vehicle rehabilitation, mechanical repairs, painting, fueling, and lubrication) or other operations identified under this Permit as associated with industrial activity.**



# Benchmarks (NALs) at Land & Water Transportation Facilities (40XX, 42XX, **44XX**)

Parameter	EPA – 2013 Draft MSGP		CA - 2015		OR - 1200-Z 2012		WA – ISGP 2014
	Q(44XX)	P(40XX, 42XX)	Q(44XX)	P(40XX, 42XX)	Q (44XX)	P(40XX, 42XX)	All
TSS (mg/L)			100	100	100	100	
Turbidity (NTU)							25
Total Copper (ug/L)					20	20	14 – WWA 32 – EWA
Total Zinc (ug/L)	40-260 HD, 90 SW		260		120	120	117
Total Lead (ug/L)	14 – 262 HD, 210 SW		262		40	40	
Total Aluminum (ug/L)	750		750		750		
Total Iron (ug/L)	1000		1000		1000		
Oil & Grease (mg/L)			15	15	10		No Visible Sheen

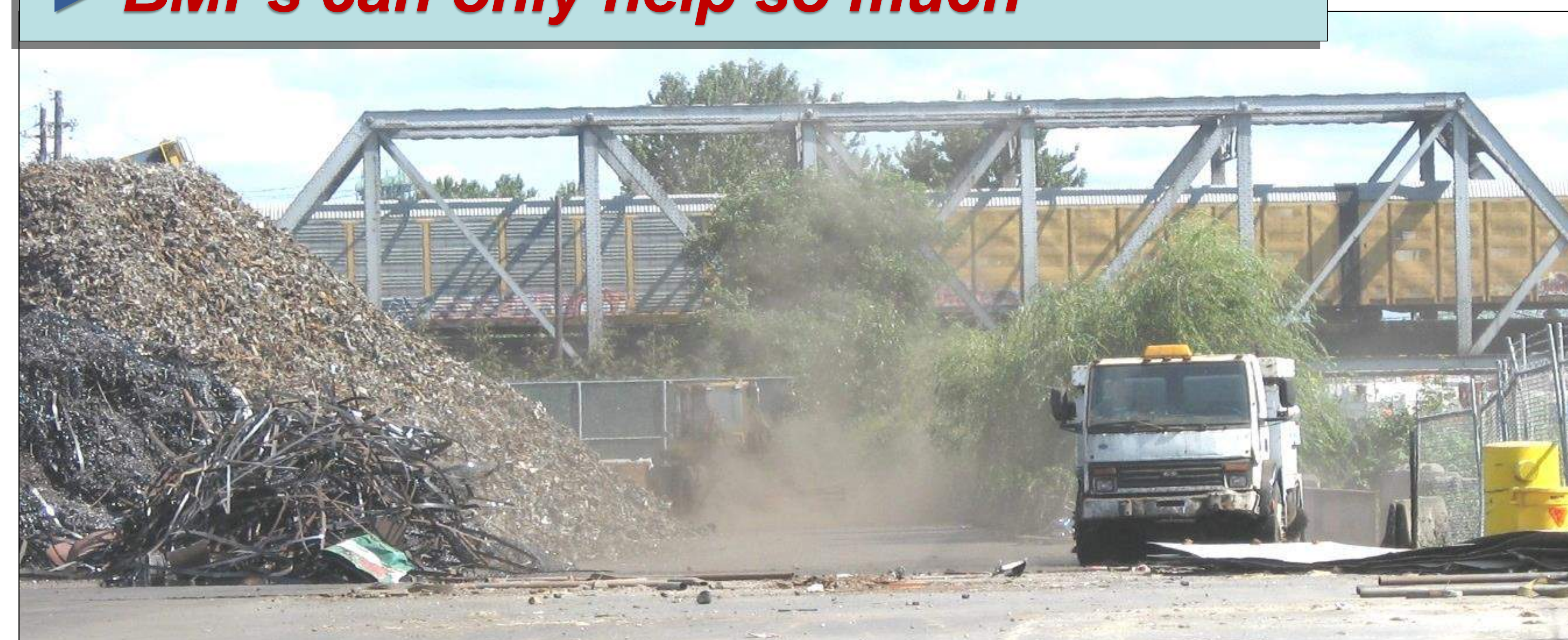
HD – Hardness Dependent  
SW - Saltwater

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# ***Pollutant Challenges***

- ▶ ***Sources are everywhere at Ports***
- ▶ ***TSS - Dirt, tires, worn asphalt***
- ▶ ***O&G - motor oil & hydraulic fluids***
- ▶ ***Zn - Dirt, anything galvanized, roofs, fences, tires, shipping containers***
- ▶ ***Cu – brake pads***
- ▶ ***All of these fall from the sky through atmospheric deposition***
- ▶ ***BMPs can only help so much***



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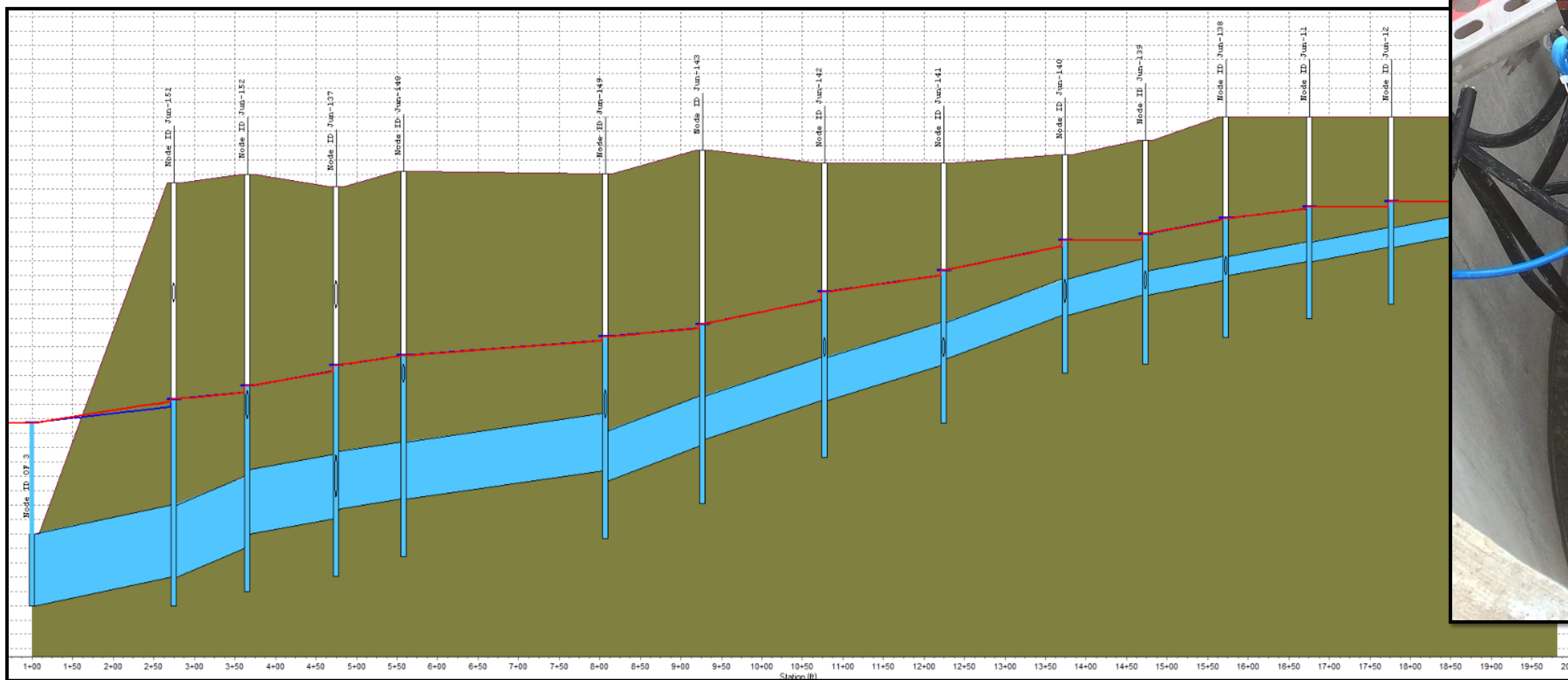
# ***Operational & Physical Challenges***

- ▶ Large impervious sites
- ▶ Heavy load requirements
- ▶ Contaminated sites
- ▶ Shallow groundwater
- ▶ Tight silty soils
- ▶ LID options often limited
- ▶ Industrial waterfront land is in limited supply



# Hydraulic Challenges

- ▶ Treatment requires grade
- ▶ There's little to be had
- ▶ Retrofitting existing drainage is disruptive and expensive



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# ***Limitations of Conventional (Municipal) Methods (Ponds, Vaults, Swales, Engineered Wetlands)***

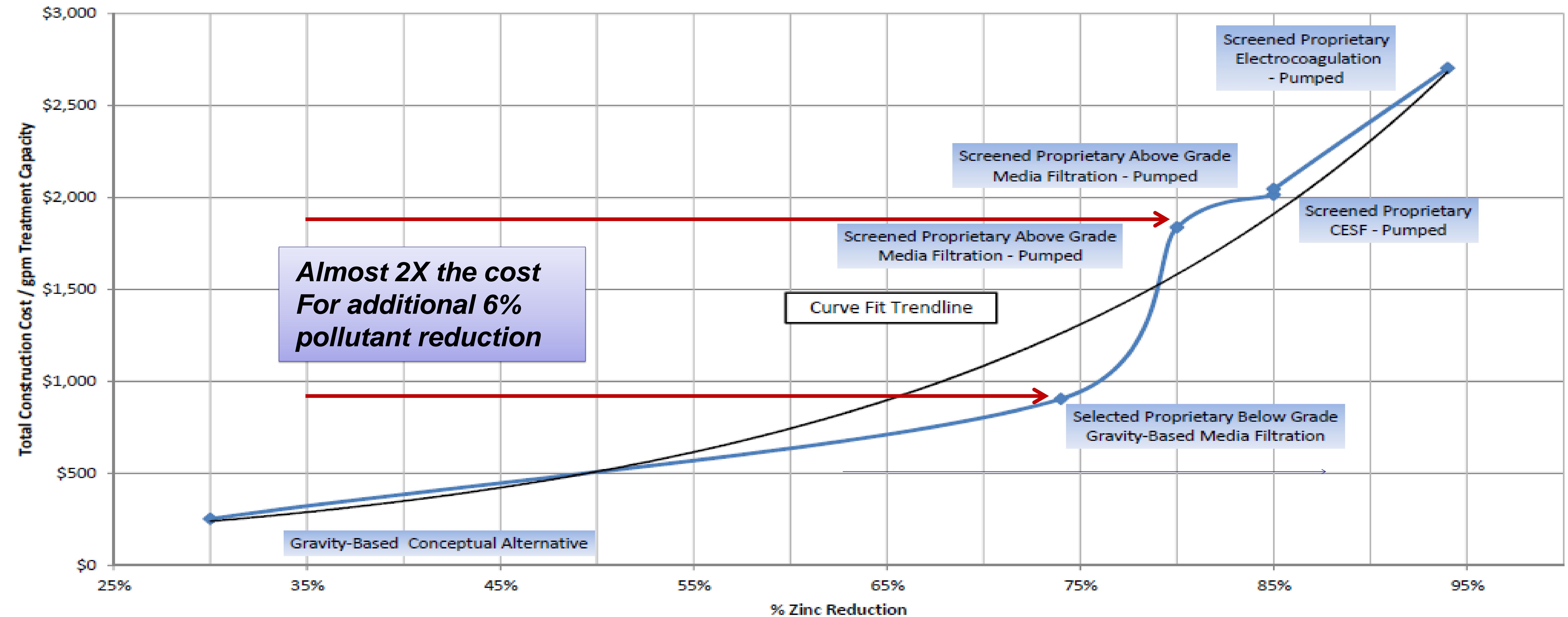
- ▶ Take a lot of space
- ▶ Focus on particle settling
- ▶ Ineffective for dissolved metals & colloids



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# Gravity vs. Pumped Treatment Alternatives

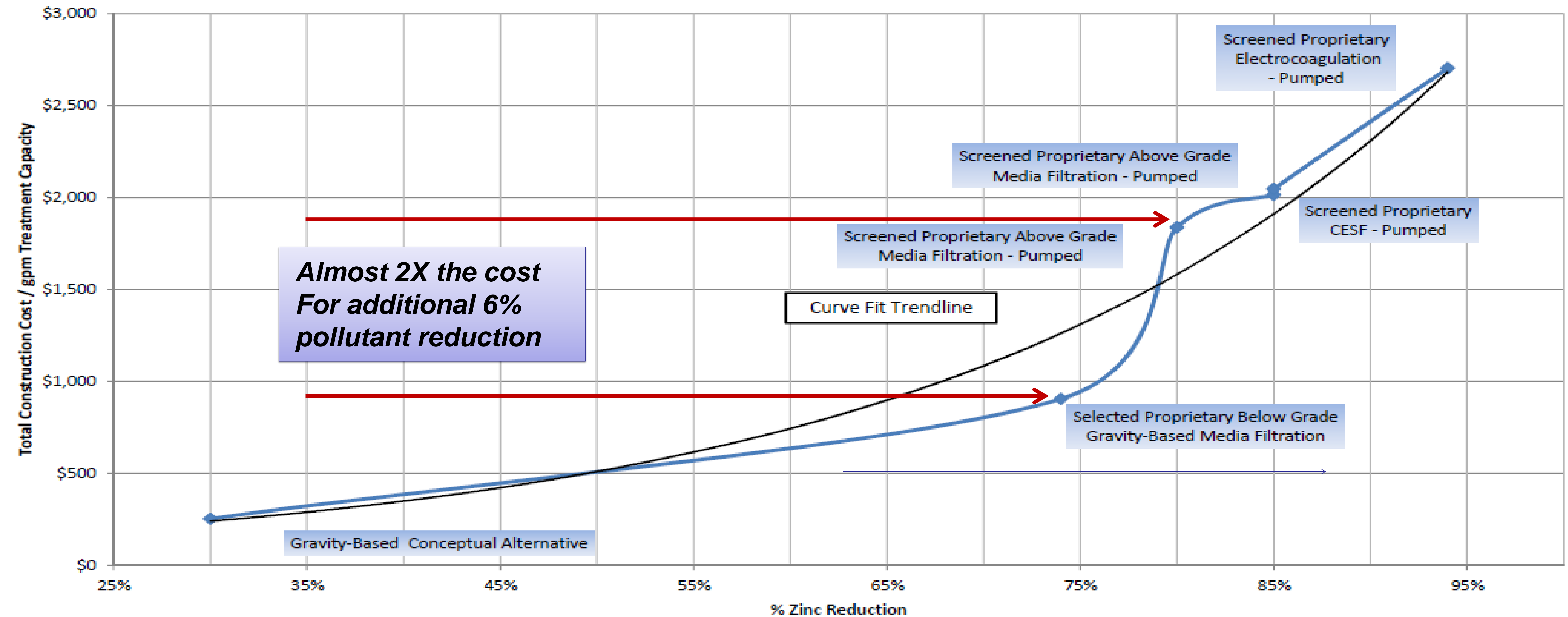
EXAMPLE WASHINGTON STATE MARINE TERMINAL  
STORMWATER TREATMENT COST/PERFORMANCE CURVE  
Alternative Cost vs. % Zinc Reduction



**Almost 2X the cost  
For additional 6%  
pollutant reduction**

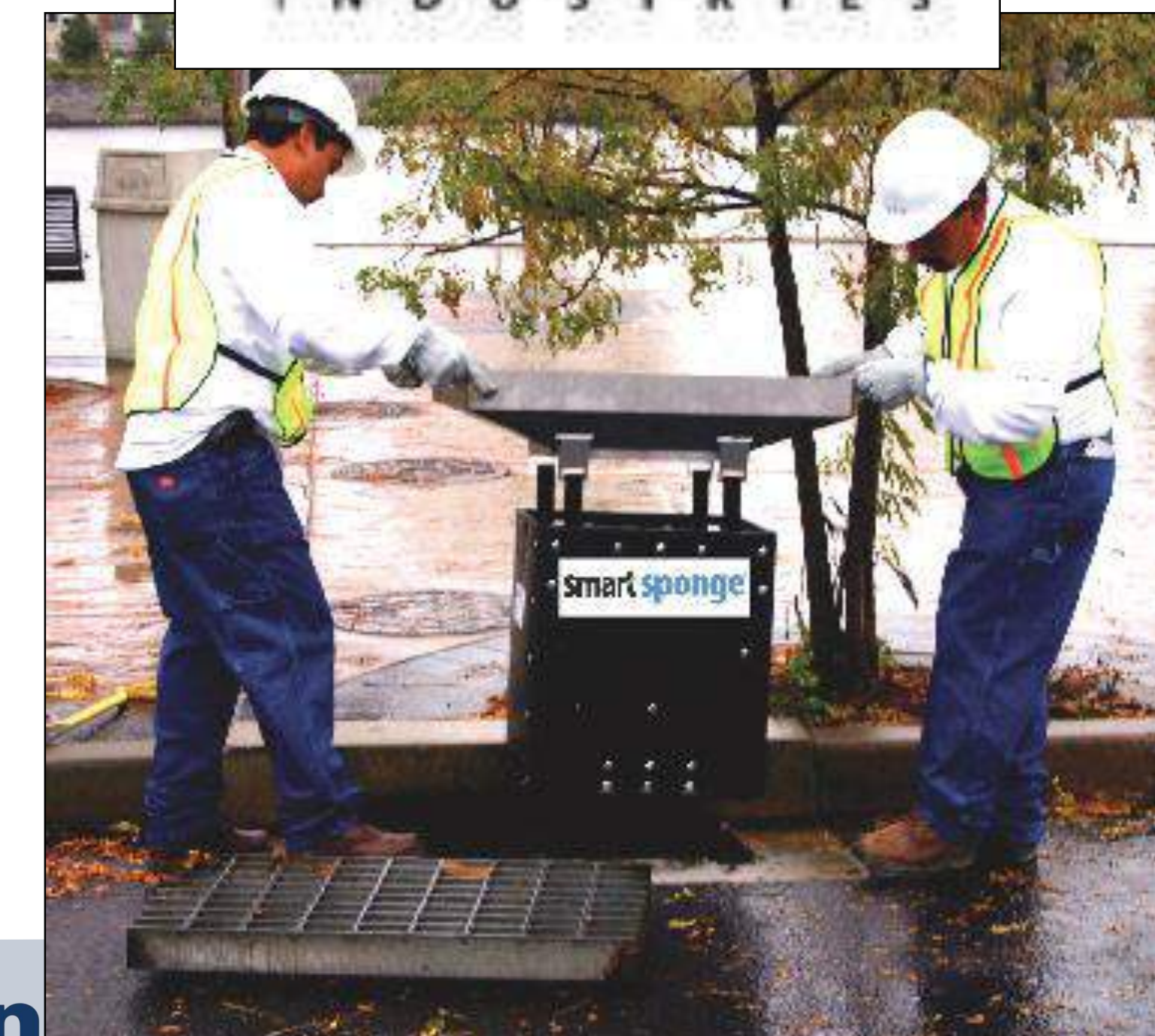
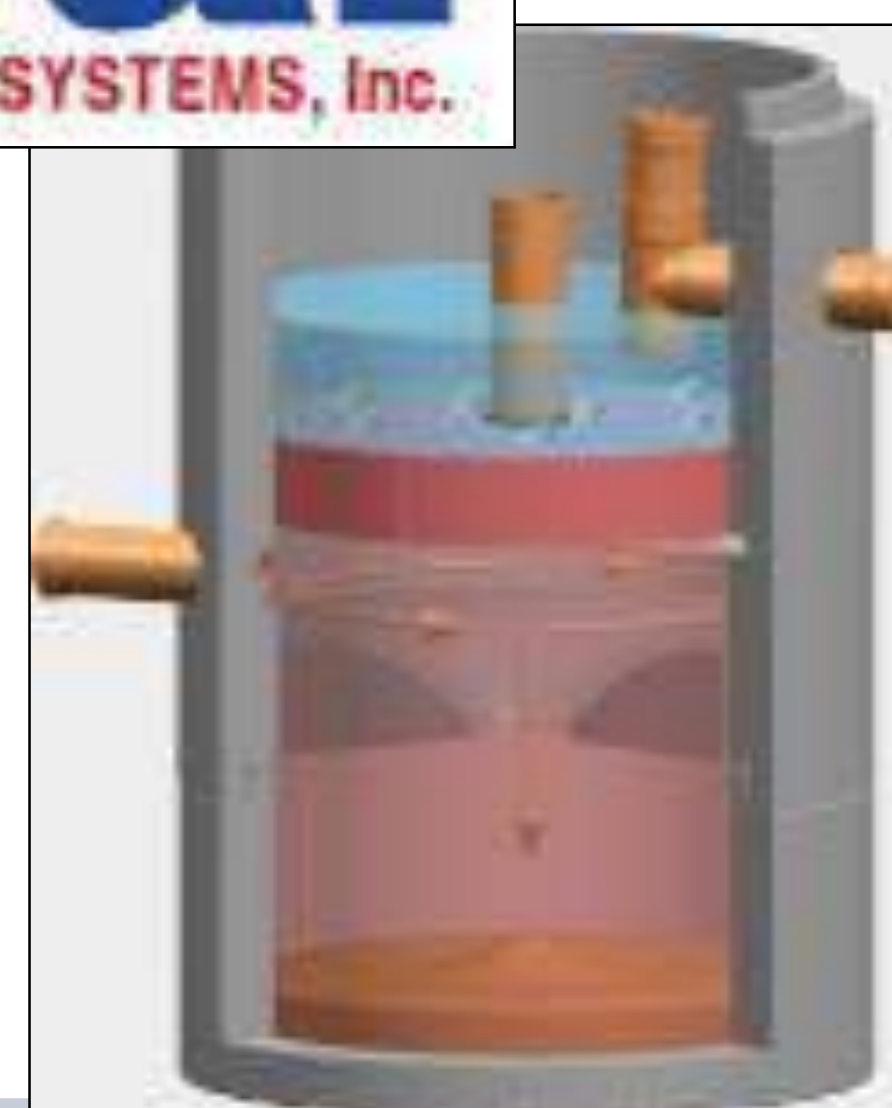
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# Gravity Based Proprietary Systems

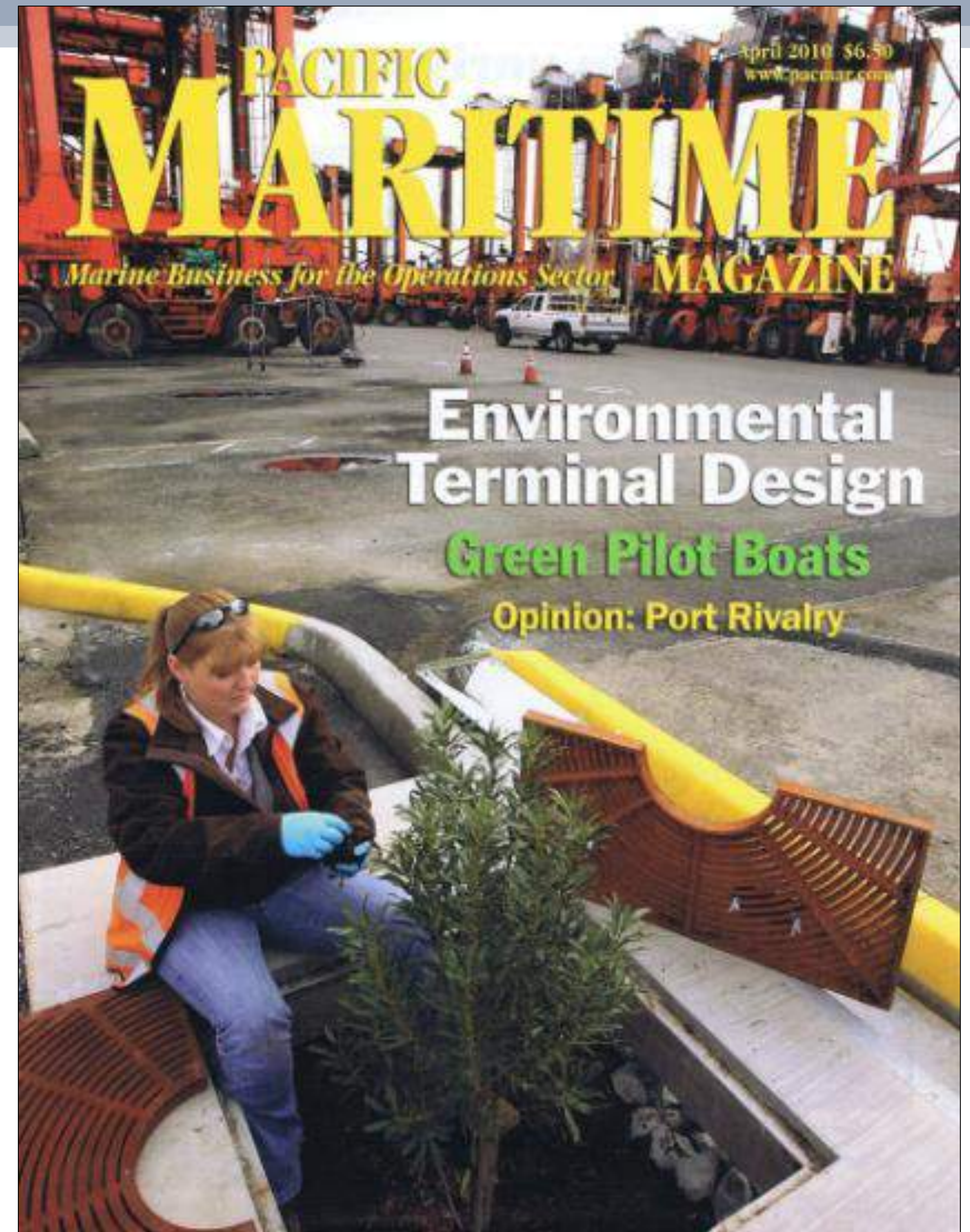
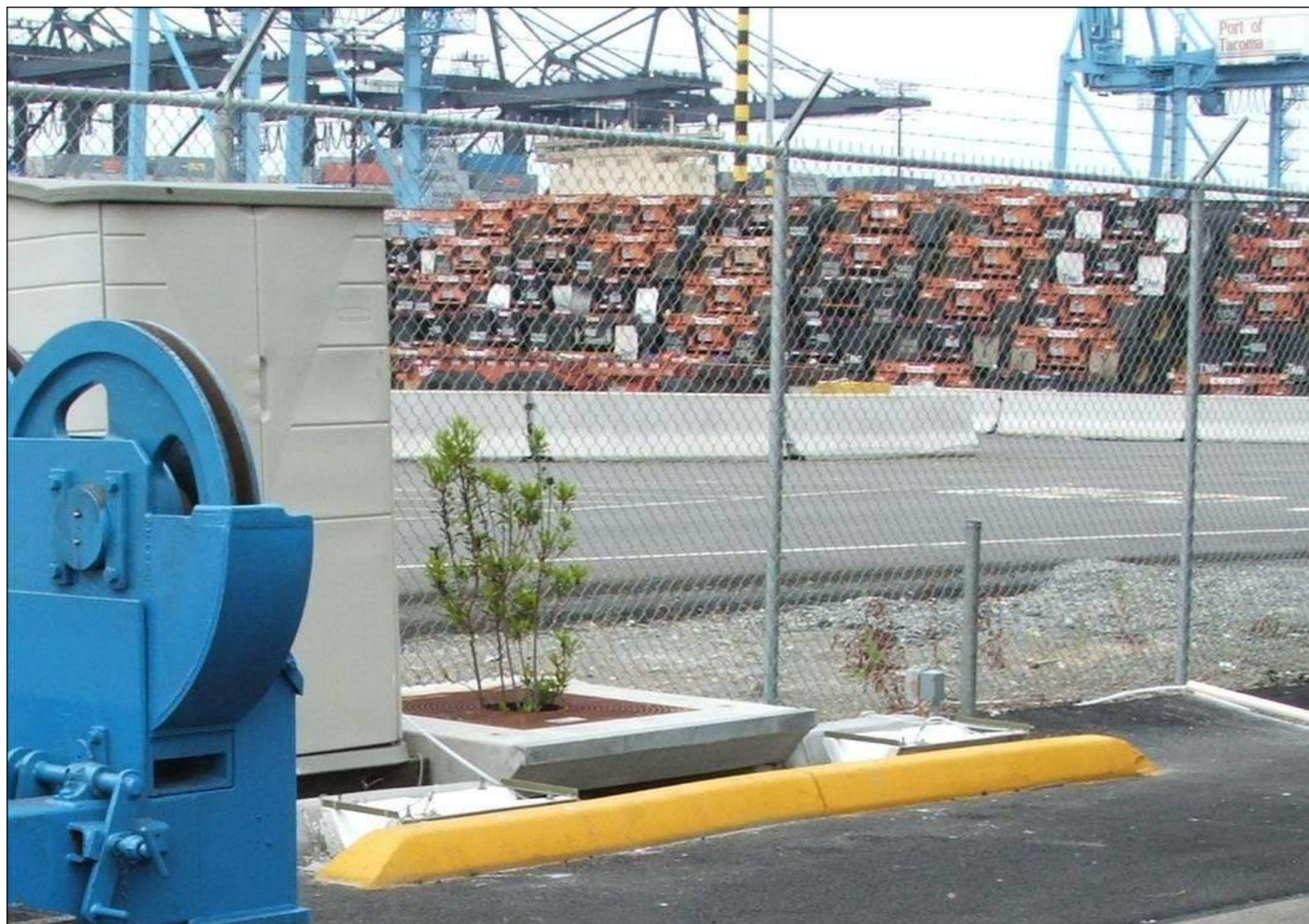


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# ***Gravity - Port of Tacoma, WA Maintenance Facility Biofiltration***

- ▶ ***First NW industrial biofiltration installation***
- ▶ ***Excellent removal of oil & grease, TSS, & total and dissolved metals***



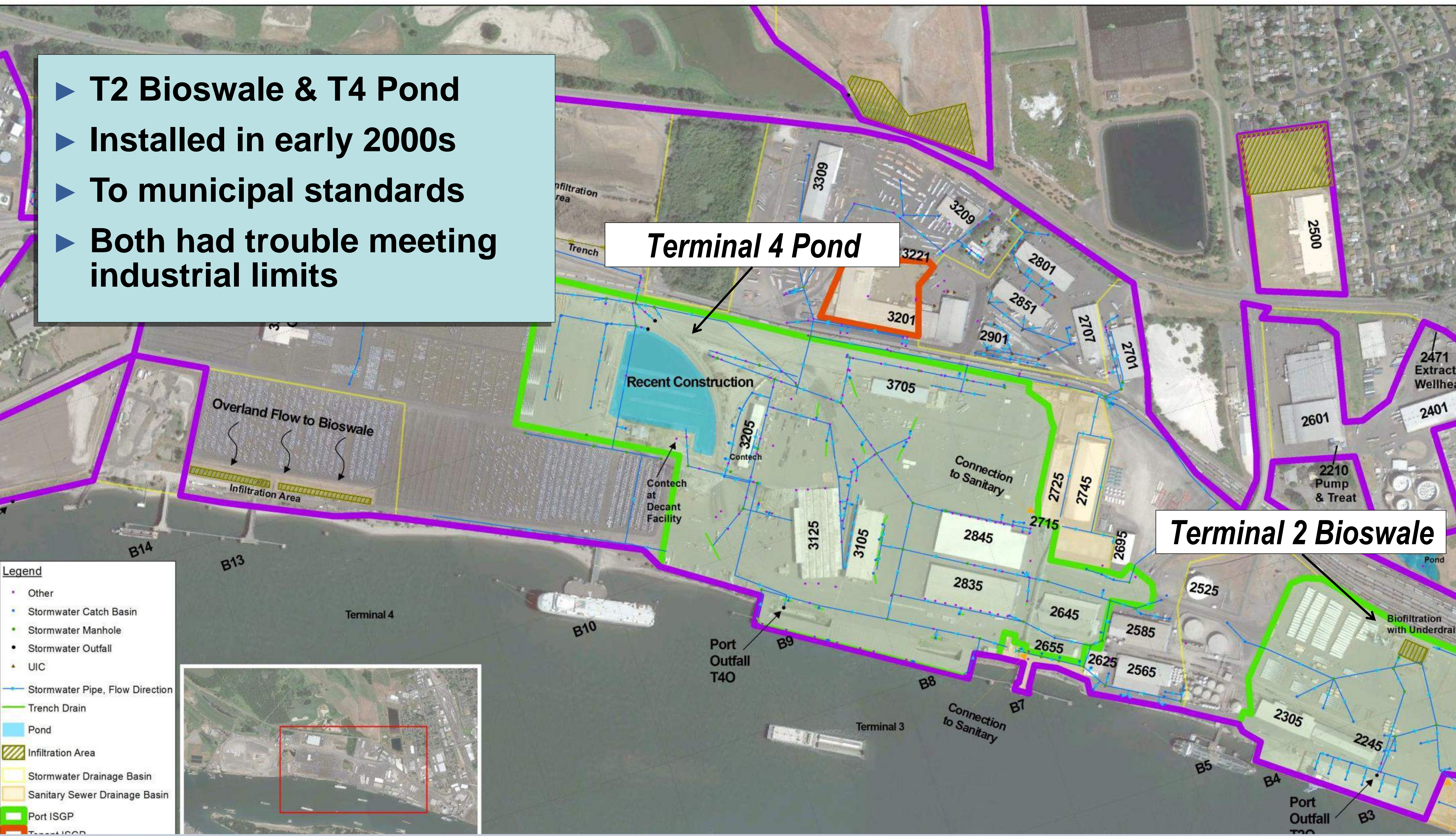
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# Port of Vancouver, WA Retrofits

- ▶ T2 Bioswale & T4 Pond
- ▶ Installed in early 2000s
- ▶ To municipal standards
- ▶ Both had trouble meeting industrial limits



**Legend**

- Other
- Stormwater Catch Basin
- Stormwater Manhole
- Stormwater Outfall
- UIC
- Stormwater Pipe, Flow Direction
- Trench Drain
- Pond
- ▨ Infiltration Area
- ▨ Stormwater Drainage Basin
- ▨ Sanitary Sewer Drainage Basin
- ▨ Port ISGP
- ▨ Trench ISGP



# ***Port of Vancouver, WA Terminal 2 Bioswale Retrofit***

- ▶ ***Terminal 2 - 50 acres***
- ▶ ***Former parallel flow bioswale***
- ▶ ***Level 3 for Zn, Cu, Turbidity***

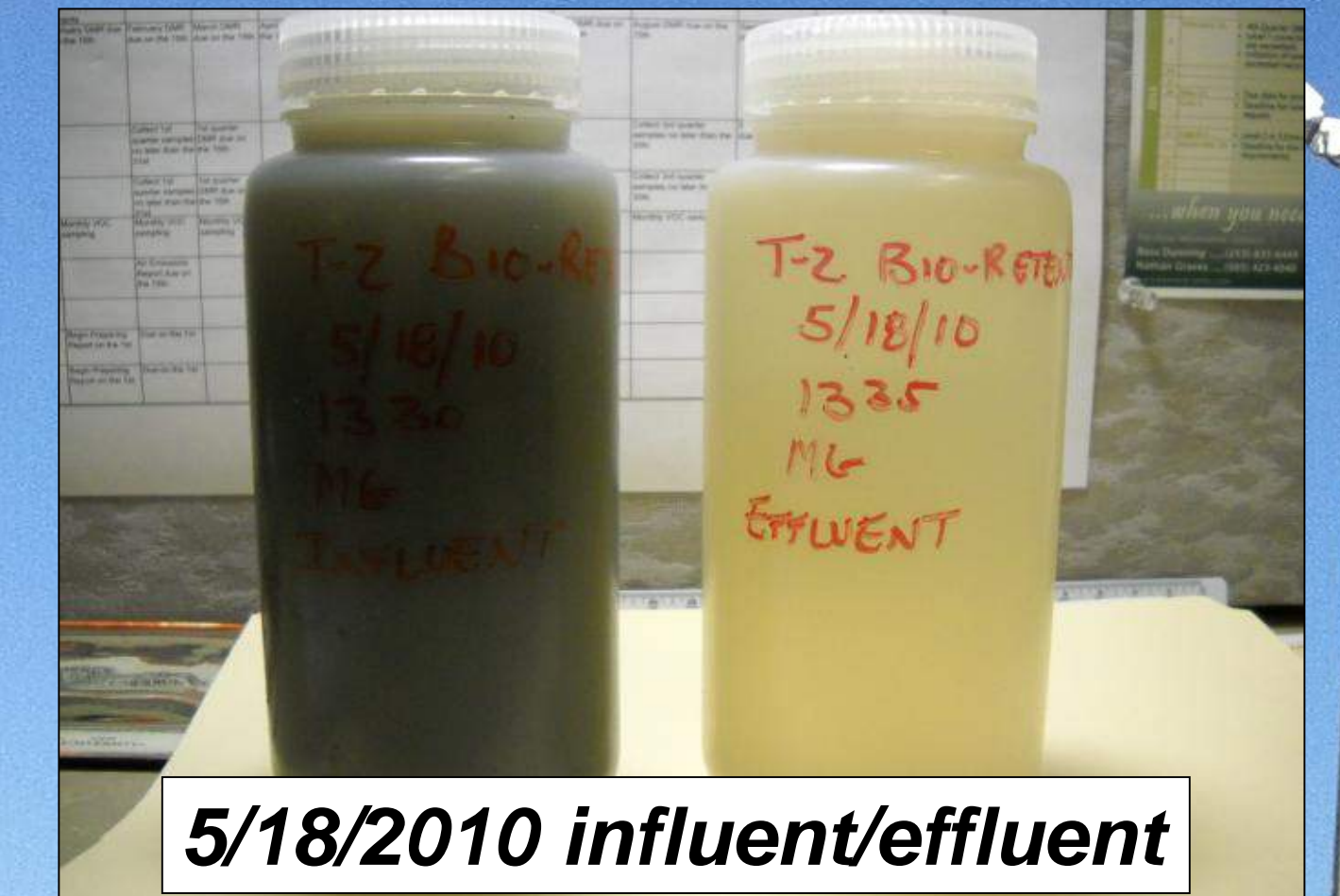
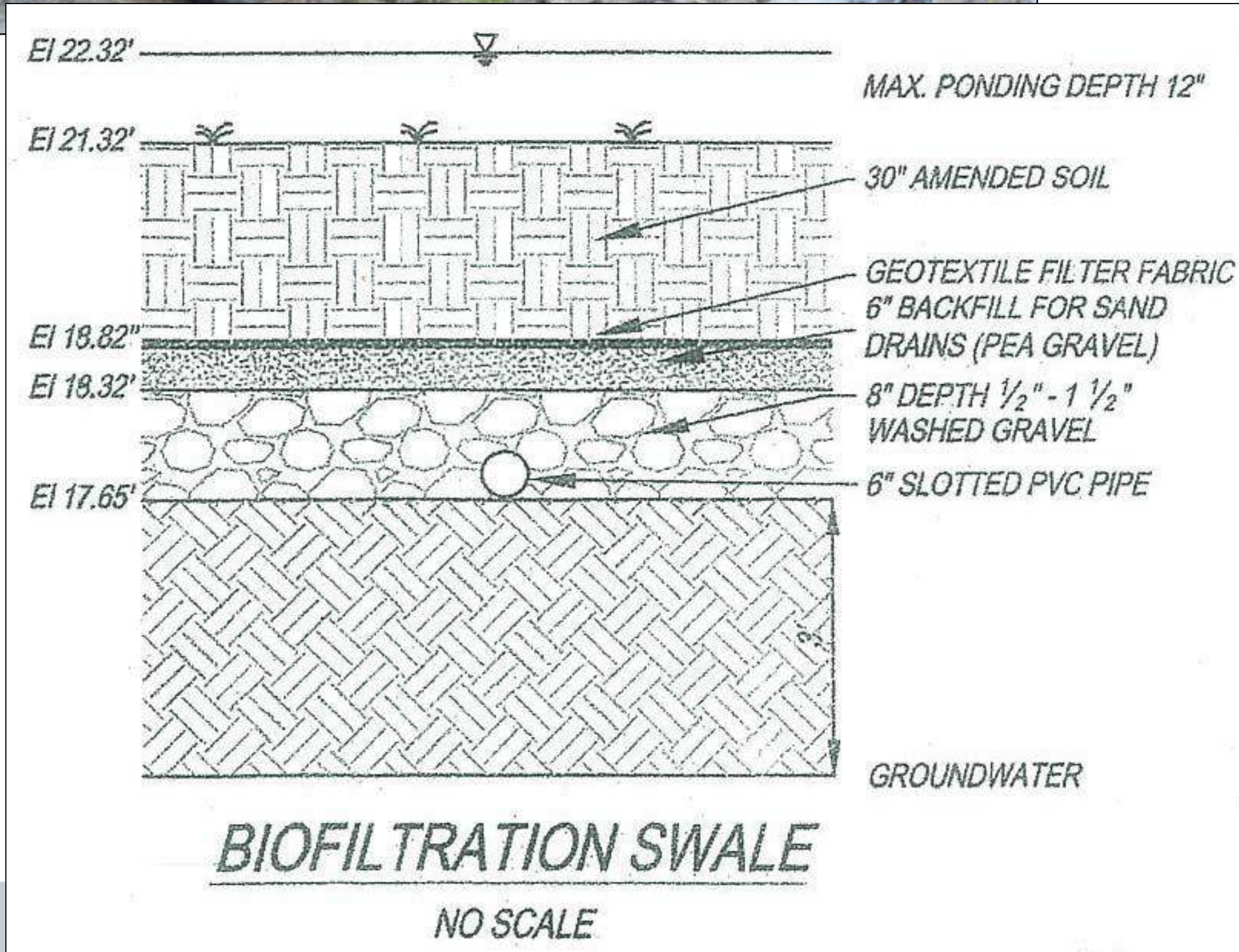


***Columbia River***

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# Gravity - Port of Vancouver, WA Terminal 2 Biofiltration

- ▶ Downflow biofiltration - compost/sand
- ▶ Sedges & rushes
- ▶ Below benchmarks for all parameters



# ***Gravity - Port of Vancouver, WA Centennial Industrial Park Biofiltration***

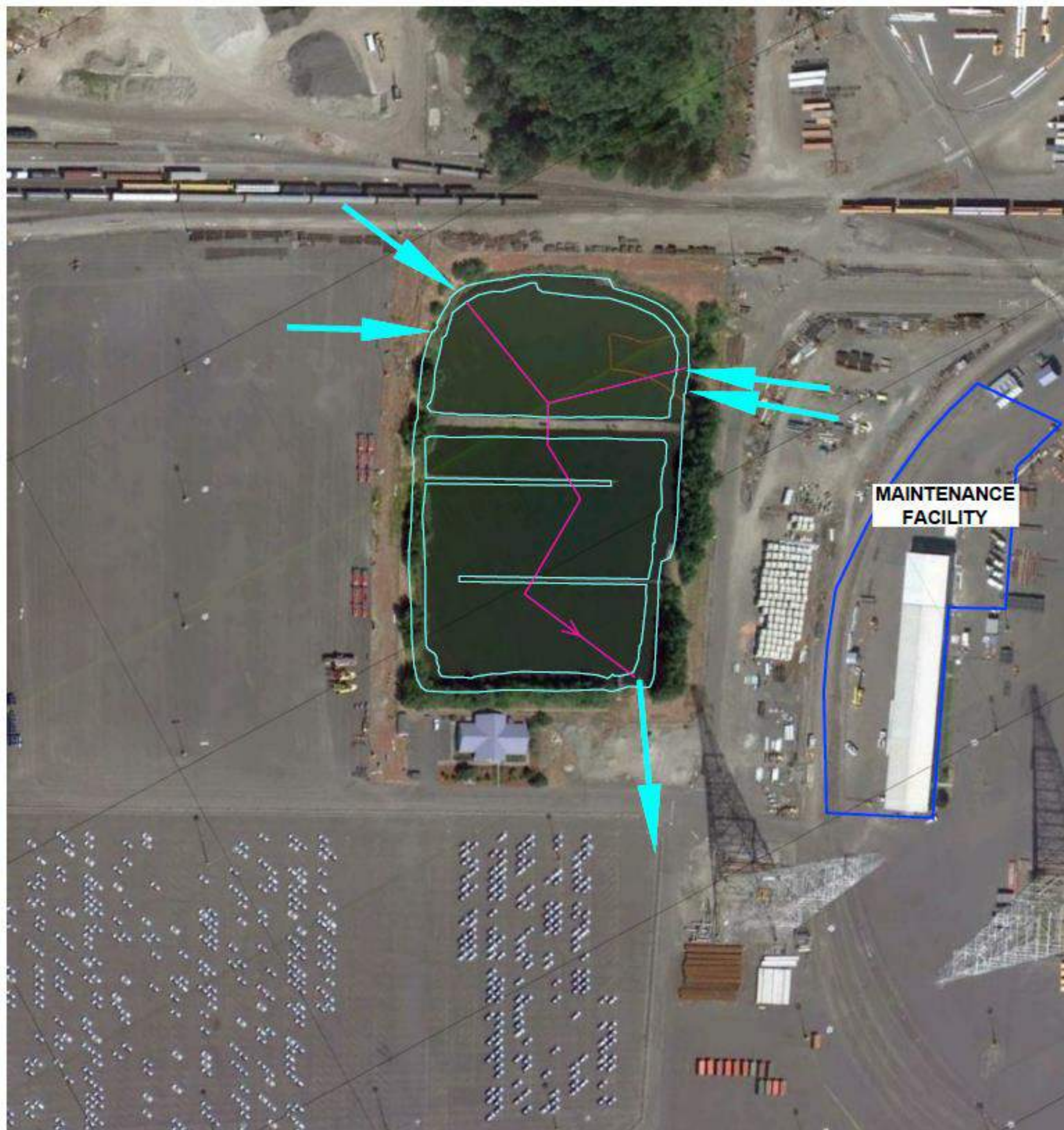
- ▶ ***100 acre Centennial Industrial Park***
- ▶ ***It works so stick with it***



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# Port of Vancouver, WA Terminal 4 Pond Retrofit

- ▶ Pond degraded and not meeting benchmarks
- ▶ Reconfigured in 2012
- ▶ Much better but not quite there



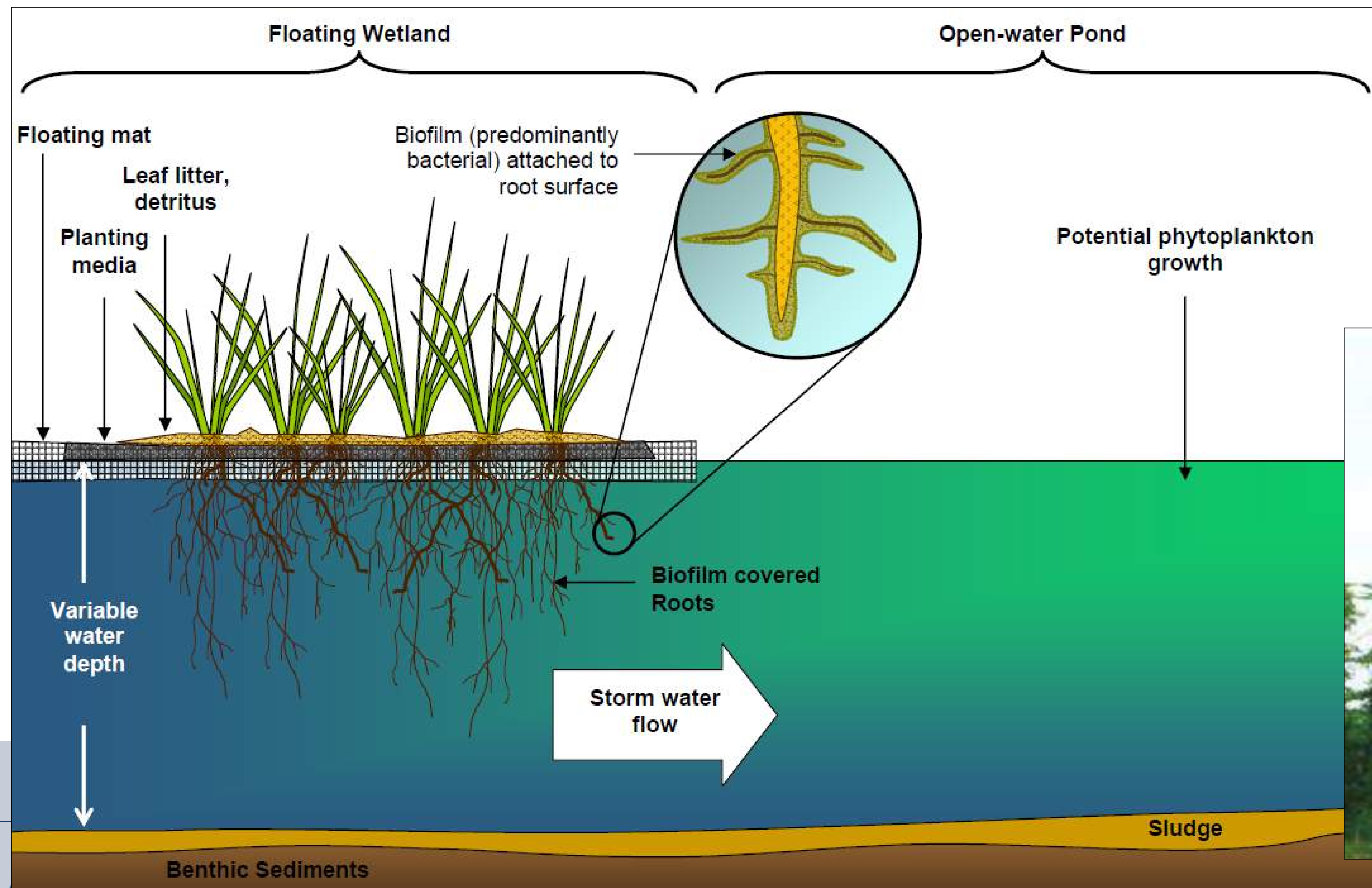
T4 POND 2010



T4 POND 2012

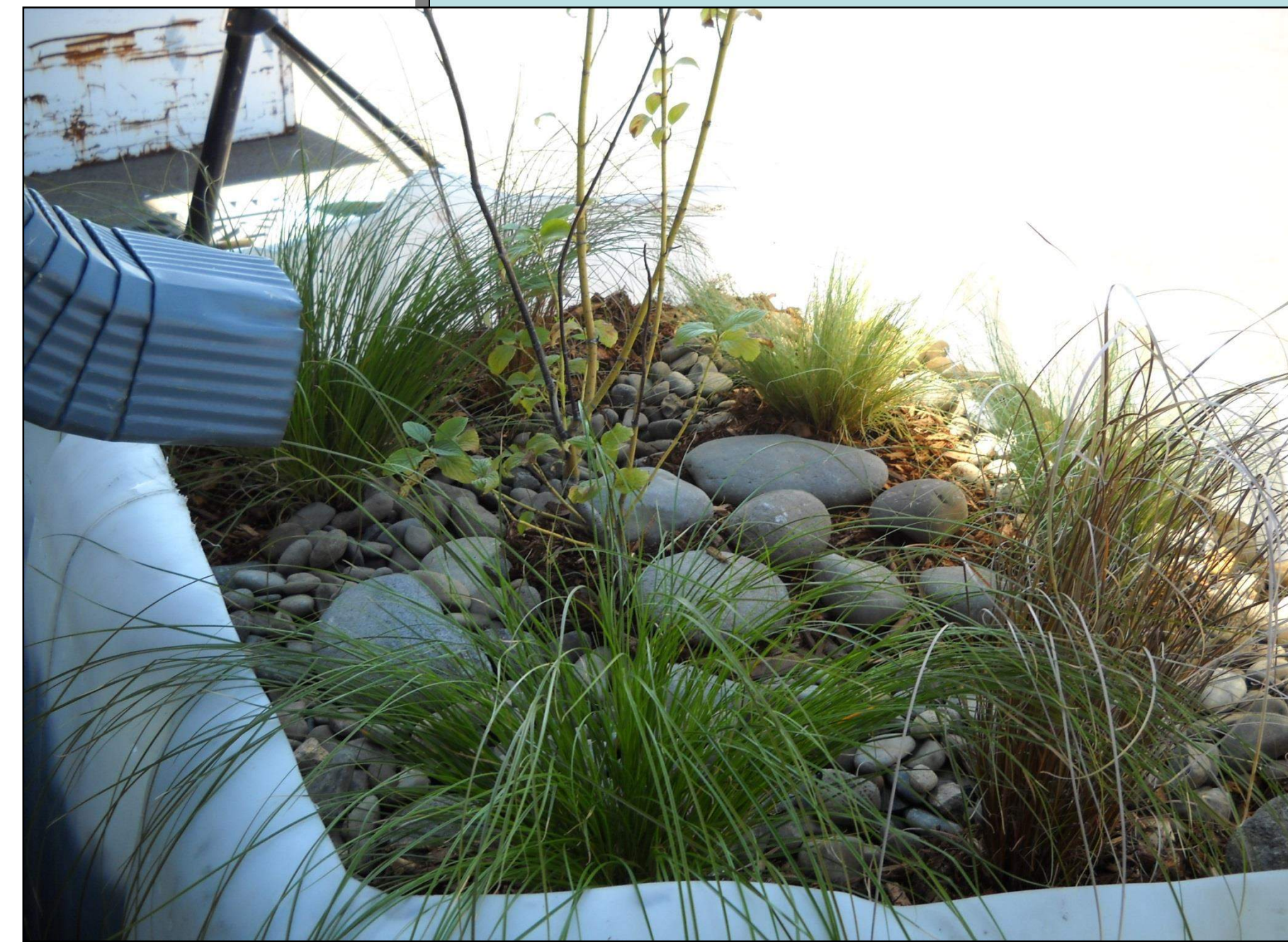
# PoV - T4 Pond Floating Treatment Wetlands

- ▶ Pilot treatment cell deployed May 2014.
- ▶ More cells planned.



# Port of Vancouver, WA The Grattix

- ▶ “Bioretention in a Box”
- ▶ Downspout Filtration System



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# ***Gravity Based Treatment Port of Tacoma, WA - Central Peninsula***

***North Intermodal Yard (NIM)***

***Olympic Container Terminal (OCT)***

***Blair Waterway***

***Sitcum WW***

***Puyallup River***

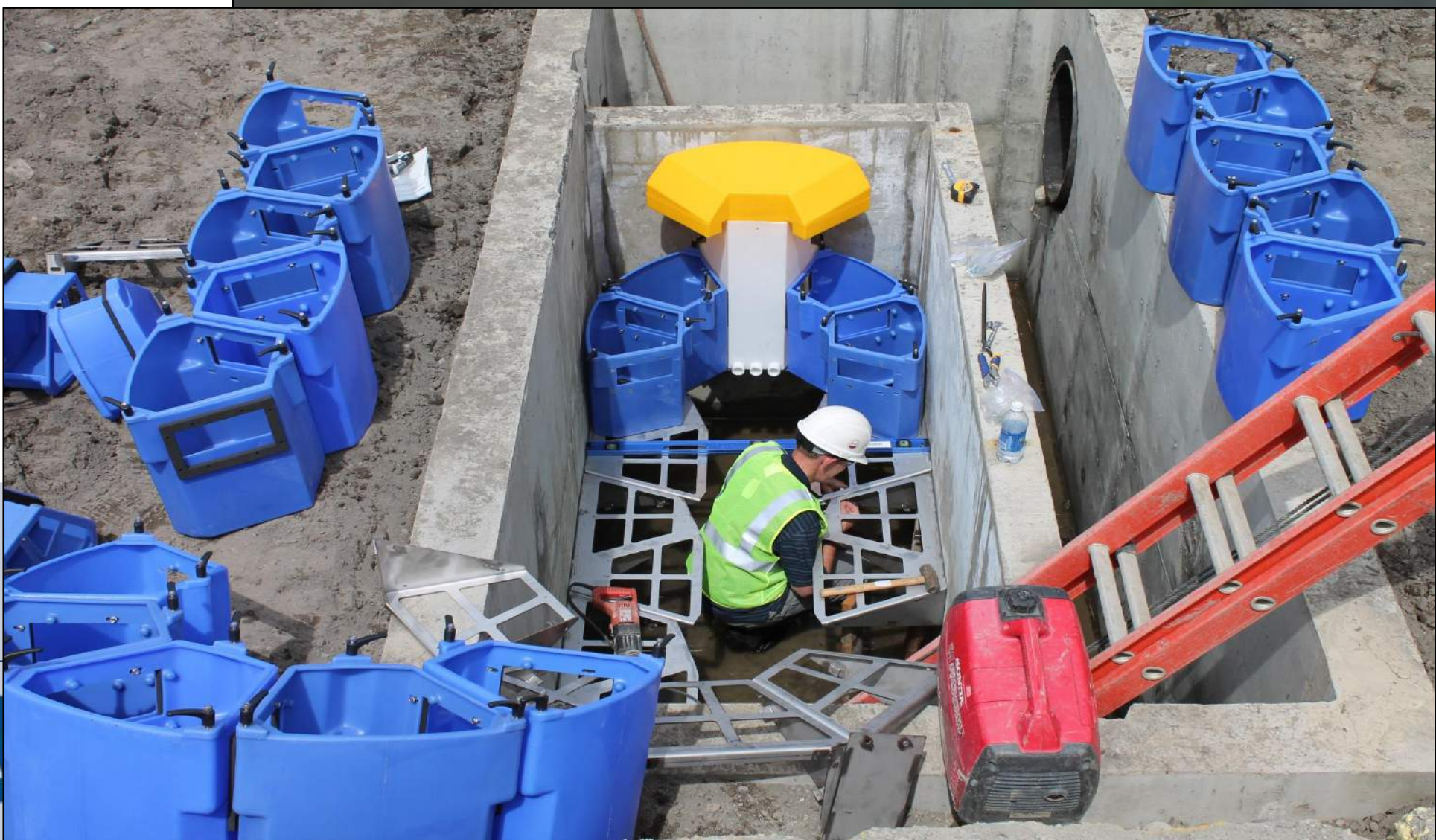
***South Intermodal Yard (SIM)***





# Port of Tacoma - Olympic Container Terminal Up-Flo Filter

- ▶ 45 acre container terminal
- ▶ *Gravity-based Up-flo filter*
- ▶ *If pumping required add ~ 200%*



OLYMPIC CONTAINER  
TERMINAL  
(OCT)

OCT I  
SEE SHEET C-1

OCT II  
SEE SHEET C-2

OCT III  
SEE SHEET C-3

OCT IV  
SEE SHEET C-4

OCT V  
SEE SHEET C-5

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# Port of Seattle - Terminal 46

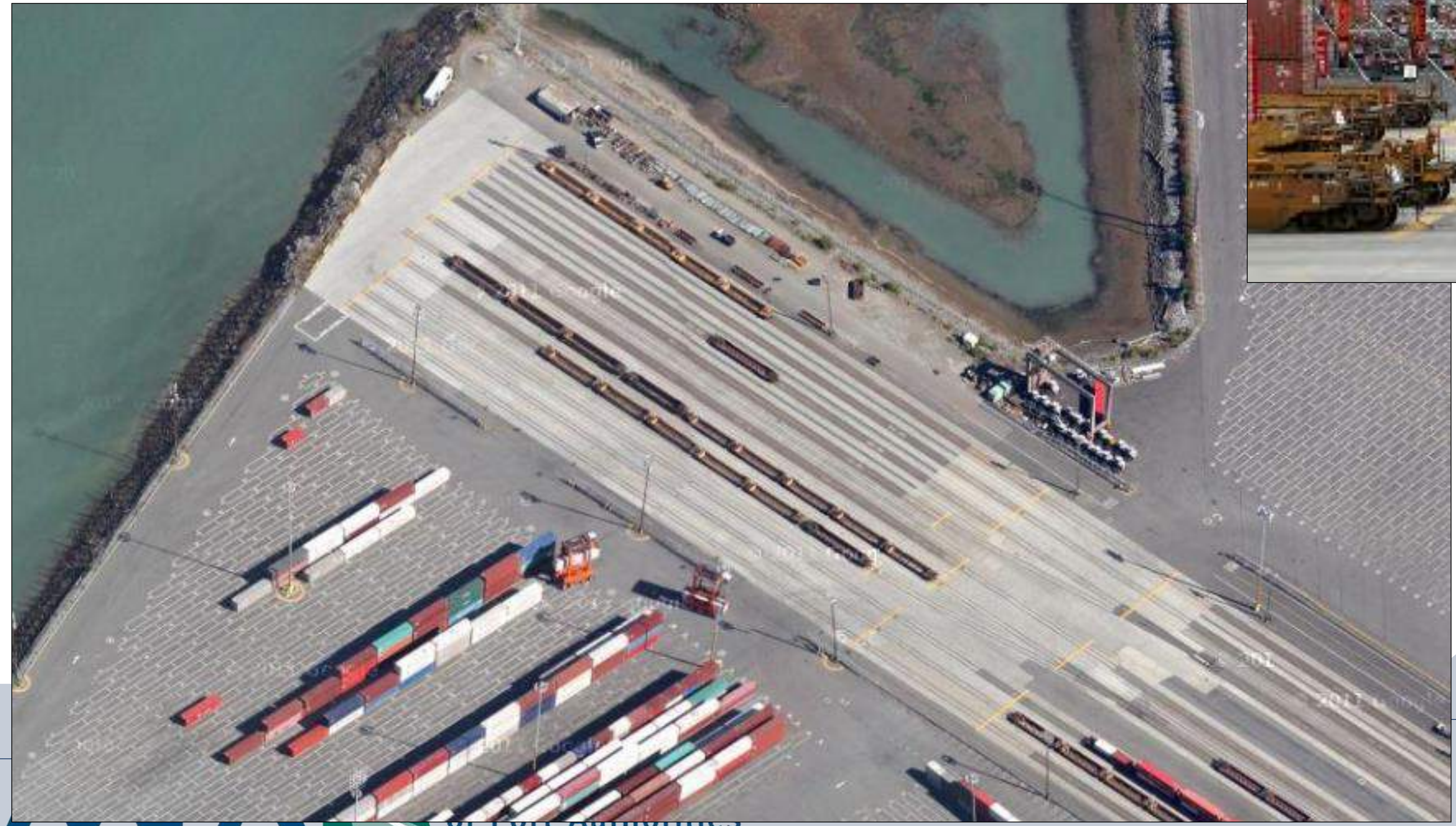


- ▶ 68 treated acres
- ▶ Gravity-based Up-flo filter
- ▶ If pumping required add ~ \$1,000,000

# ***Port of Tacoma - North Intermodal Yard***



- ▶ ***11.4 acre intermodal yard***
- ▶ ***Level 3 for Zn***

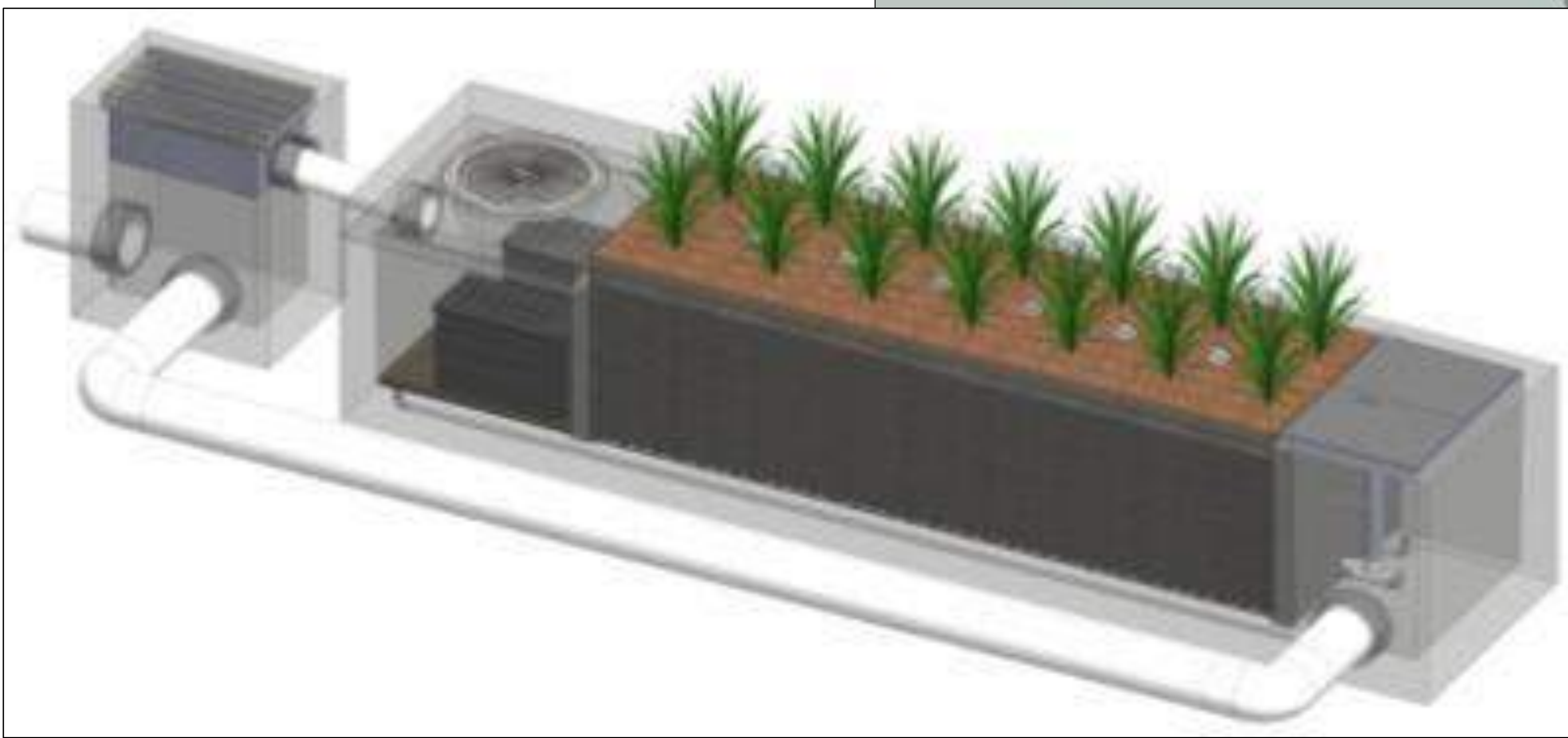
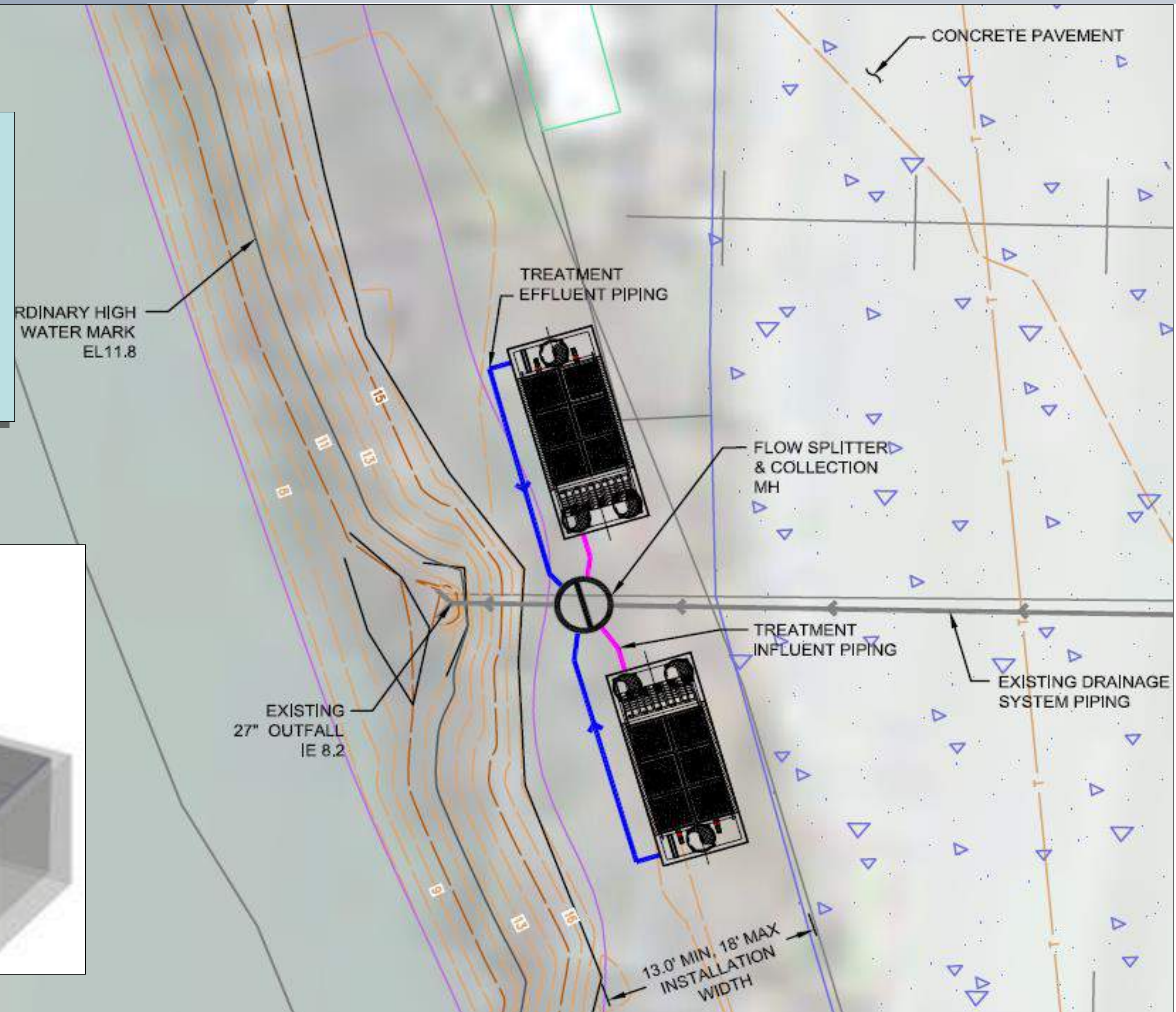


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# Port of Tacoma, WA North Intermodal Yard



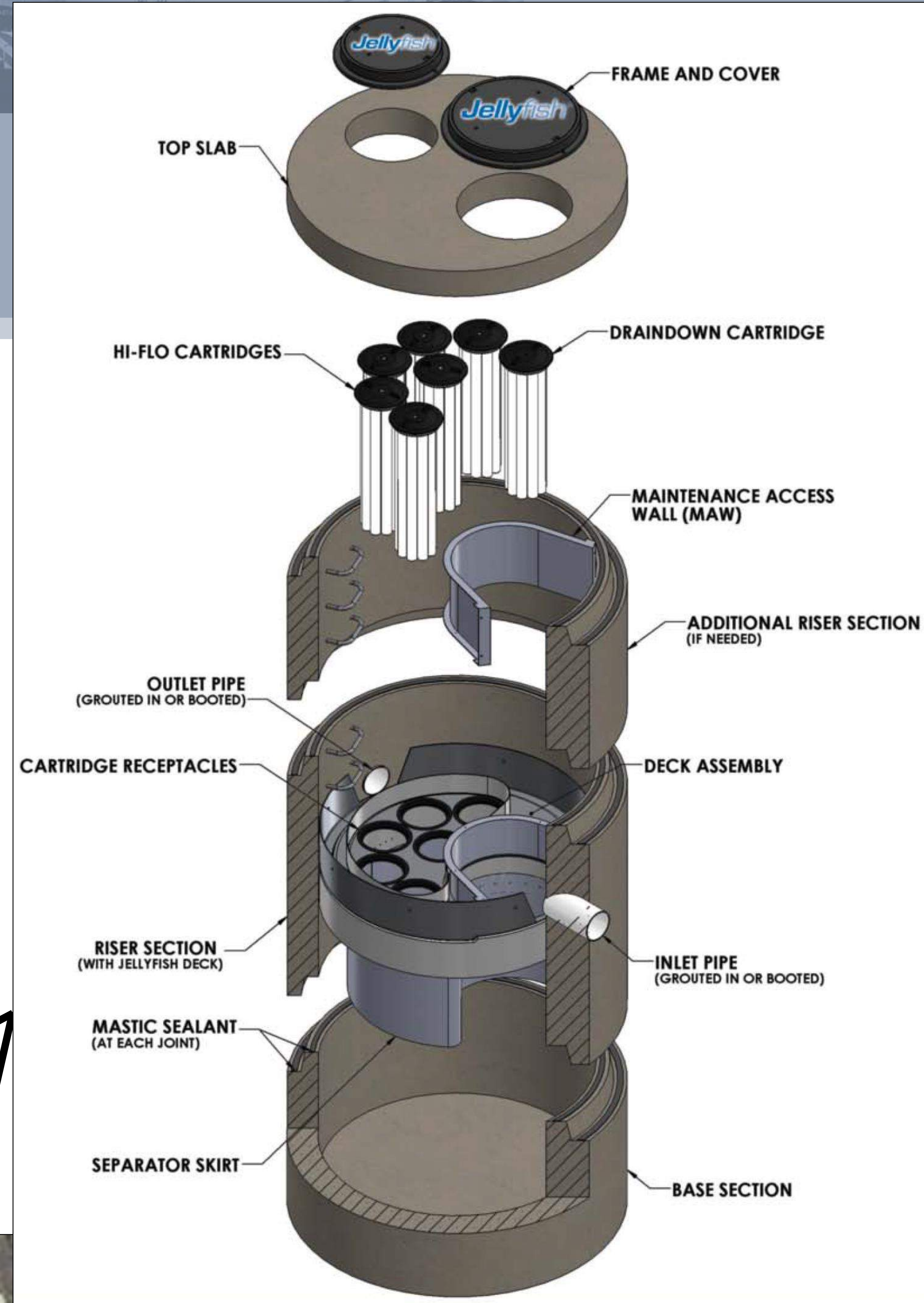
- ▶ **Modular Wetland gravity-based design – under construction**
- ▶ **11.4 acres treated cost - \$500,000**
- ▶ **If pumping required add ~ 100%**



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# South Intermodal Yard

- ▶ 16.5 acre intermodal yard – L3 for Zn
- ▶ Jellyfish gravity-based design under construction
- ▶ Treatment cost - \$523,000
- ▶ If pumping required add ~ 100%



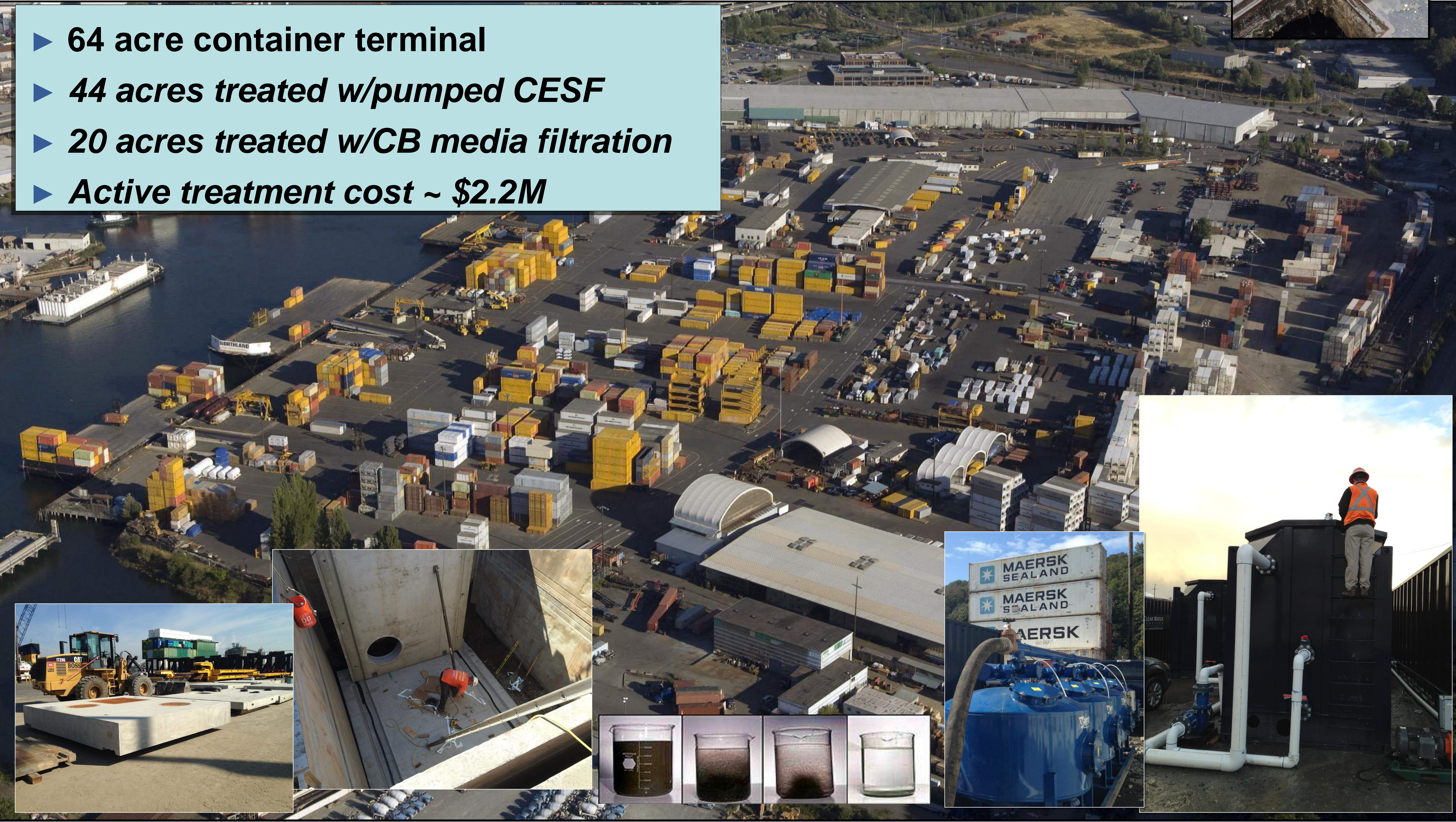
# ***Pumped Systems – Northland Services Port of Seattle T115 - CESF***

- ▶ 64 acre container terminal
- ▶ 44 acres treated w/pumped CESF
- ▶ 20 acres treated w/CB media filtration
- ▶ Active treatment cost ~ \$2.2M



# ***Pumped Systems – Northland Services Port of Seattle T115 - CESF***

- ▶ 64 acre container terminal
- ▶ 44 acres treated w/pumped CESF
- ▶ 20 acres treated w/CB media filtration
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# ***Pumped Systems - Port of Tacoma Logyard 4-Tiered Biofiltration***



- ▶ **25 acre logyard**
- ▶ **Level 3 for Zn, Cu, Turbidity, TSS**
- ▶ **Pumped biofiltration**
- ▶ **Bid cost ~ \$2.6M**



06 13 2014



# ***Pumped Systems - Port of Tacoma Logyard 4-Tiered Biofiltration***



- ▶ **25 acre logyard**
- ▶ **Level 3 for Zn, Cu, Turbidity, TSS**
- ▶ **Pumped biofiltration**
- ▶ **Bid cost ~ \$2.6M**



06 13 2014

# Advanced Treatment

- ▶ Treatment Trains

- ▶ Storage

- ▶ Separate Oil & Grease

- ▶ Settle/Filter TSS

- ▶ Remove Dissolved Metals

- ▶ Disinfection

- ▶ Sedimentation

- ▶ Coagulation

- ▶ Flocculation

- ▶ Electrocoagulation

- ▶ Media & Membrane Filtration

- ▶ Ion Exchange

- ▶ Oxidation

- ▶ Aeration

- ▶ UltraViolet



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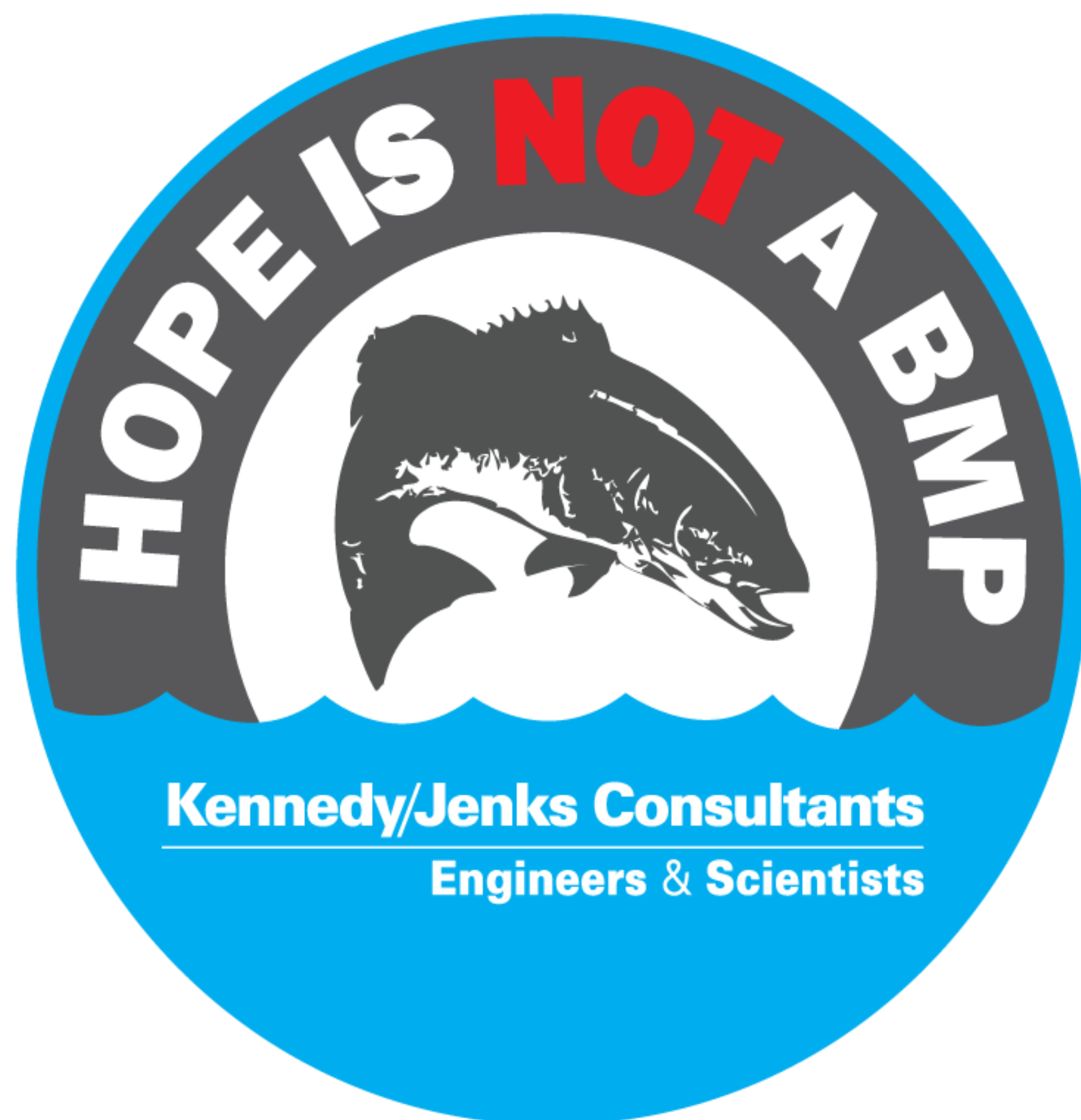
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# Proprietary Active Systems



# ***General Treatment Concept Summary***

- 1. GET THE OIL OUT***
- 2. GET THE DIRT & THE OTHER JUNK OUT***
- 3. GET THE OTHER STUFF OUT***



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# ***Take Home Message***

- ▶ Industrial stormwater permits are getting more stringent
- ▶ Multiple pathways to compliance
- ▶ Take the opportunity to figure it out what will be needed NOW!
- ▶ ***There was no book with the answers in it so the Ports are writing it!!***



## **Washington Public Ports Association Marine Terminal AKART and ISGP Corrective Action Guidance Manual**

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***Questions??***

***RossDunning@KennedyJenks.com***



***www.KennedyJenks.com/Blog***

