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Data and industrial stormwater general permit benchmarks; what we know

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THE NORTHWEST SEAPORT ALLIANCE
Gateway to Solutions

STORMWATER MANAGEMENT

Presentation to Salish Sea Ecosystem Conference
Policy and XXX Session

Deanna Seaman, Senior Manager Water Quality
The Northwest Seaport Alliance/Port of Tacoma

The Gateway History

Port of Seattle Established 1911

Port of Tacoma Established 1918

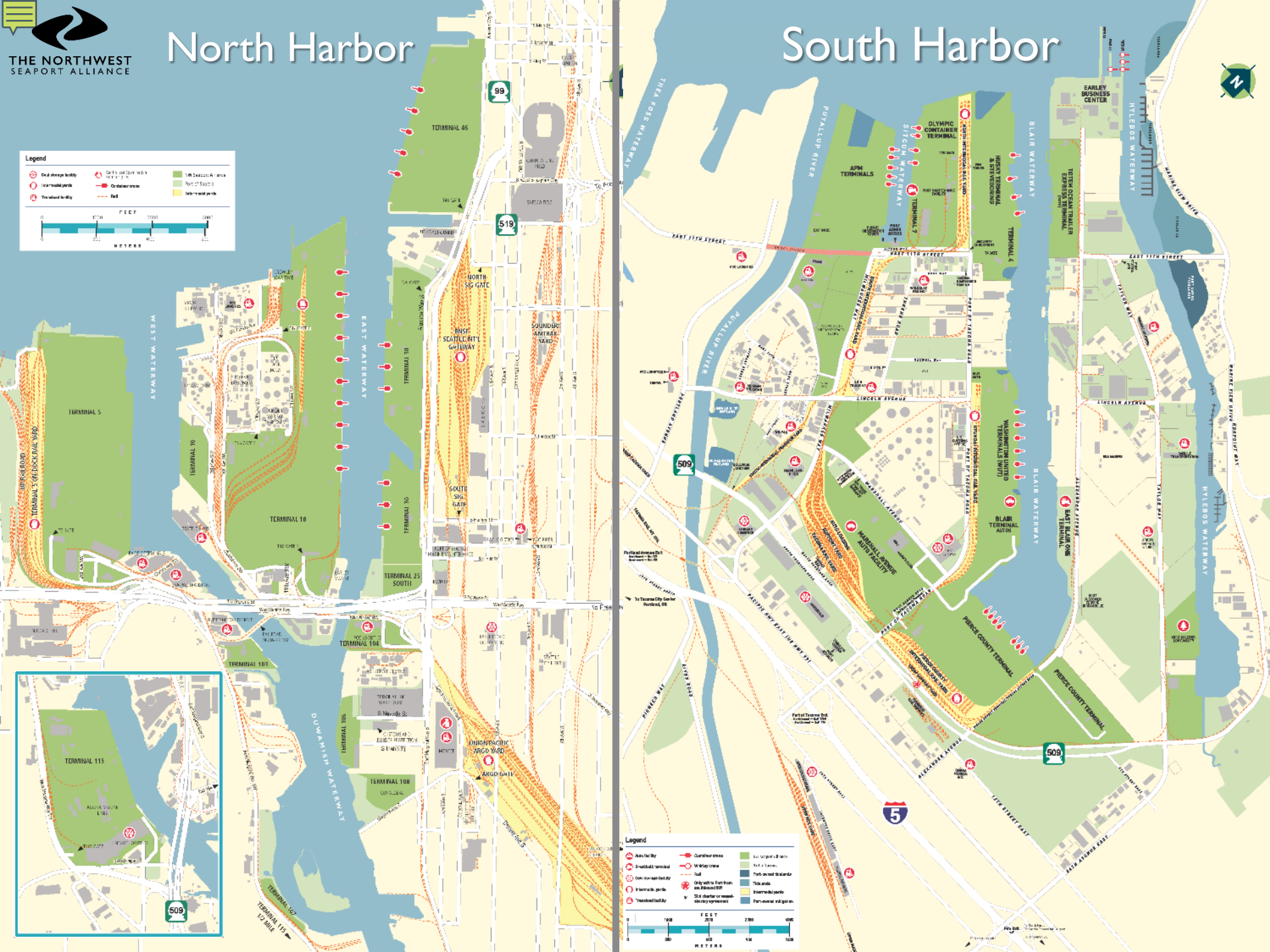
THE NORTHWEST SEAPORT ALLIANCE

Established 2015

THE NORTHWEST SEAPORT ALLIANCE

North Harbor

South Harbor



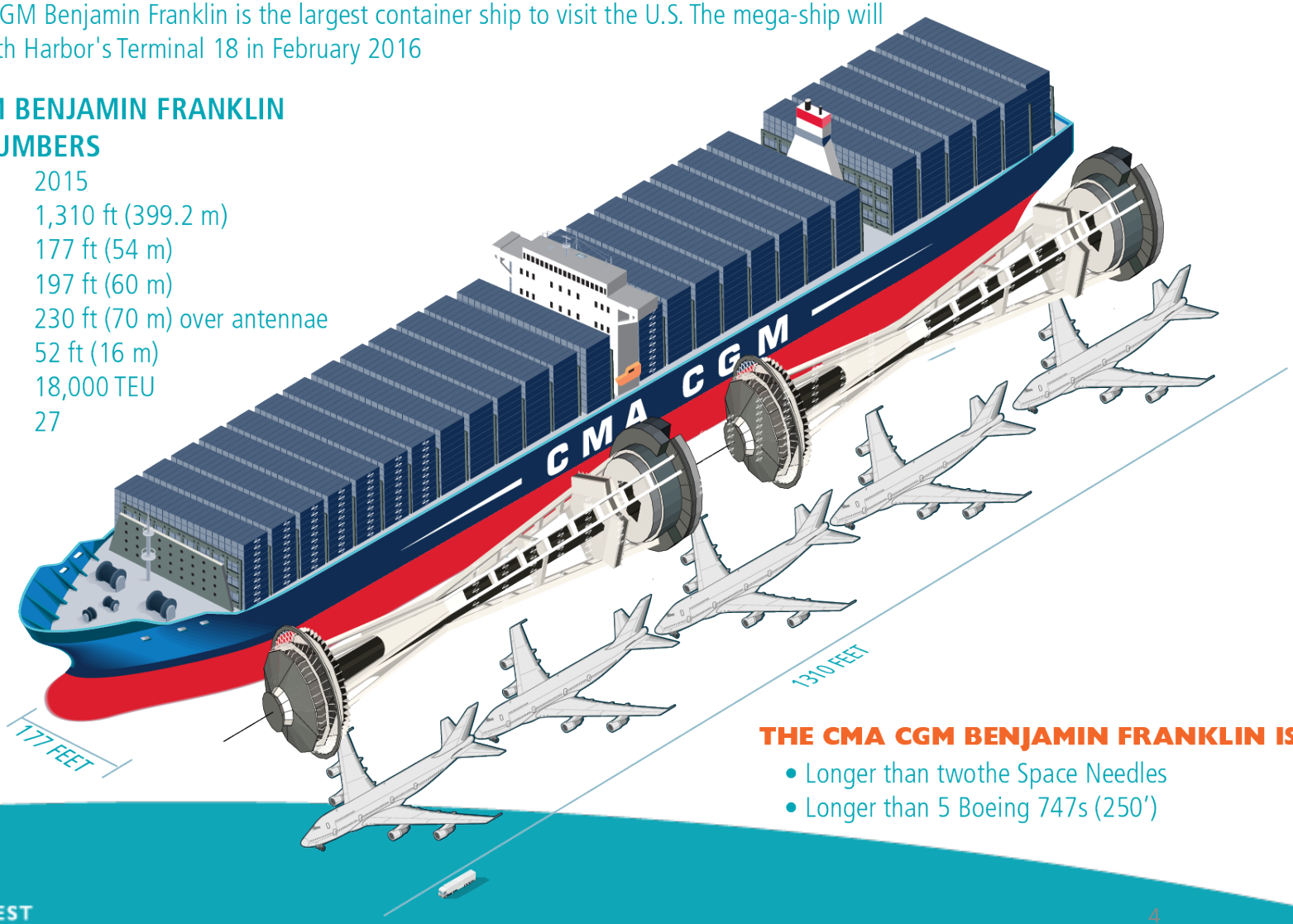
THE NORTHWEST SEAPORT ALLIANCE

IS BIG SHIP READY

The CMA CGM Benjamin Franklin is the largest container ship to visit the U.S. The mega-ship will call the North Harbor's Terminal 18 in February 2016

CMA CGM BENJAMIN FRANKLIN BY THE NUMBERS

Built	2015
Length	1,310 ft (399.2 m)
Width	177 ft (54 m)
Height	197 ft (60 m)
	230 ft (70 m) over antennae
Draft	52 ft (16 m)
Capacity	18,000 TEU
Crew	27

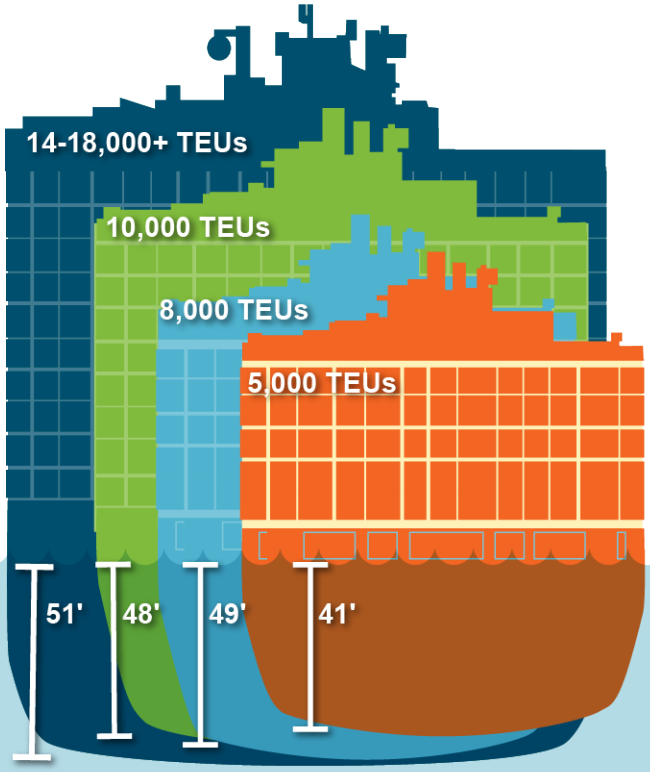


THE CMA CGM BENJAMIN FRANKLIN IS:

- Longer than twothe Space Needles
- Longer than 5 Boeing 747s (250')

THE NORTHWEST SEAPORT ALLIANCE

Big Ships and Their Impacts



2000 **5,000 TEU Vessels** Began calling PNW 2000

Length 935' Beam 131' Draft 43'

Containers high on deck 9
Containers below deck 5
Containers across 15

2009 **8,000 TEU Vessels** Began calling PNW 2009

984' 141' 48'

9
6
17

2009 **10,000 TEU Vessels** Began calling PNW 2009

1145' 150' 49'

10
8
18

20?? **15,000 TEU Vessels** Have yet to call

1230' 184' 51'

10
8
22

20?? **18,000 TEU Vessels** Have yet to call

1312' 194' 51'

10
8
23

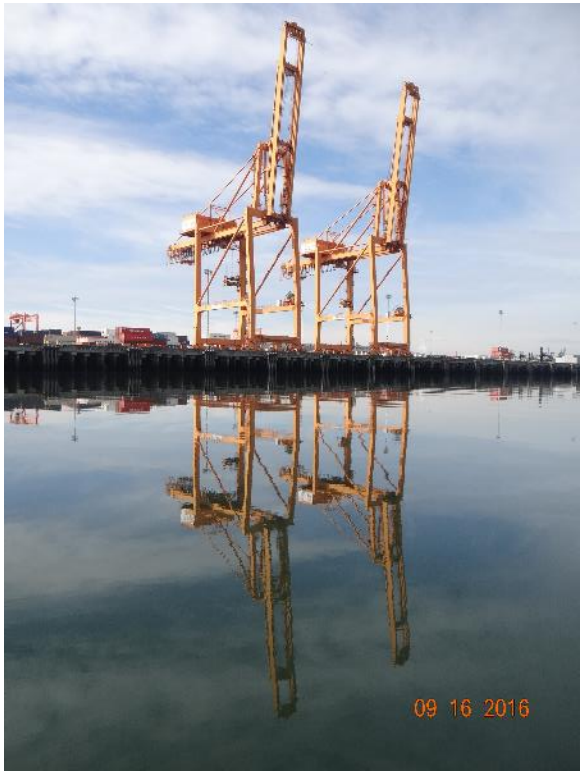
THE NORTHWEST SEAPORT ALLIANCE

Water Quality Team Goals

- **As Driven by Strategic Plan**
  - Increase number of acres under source control
  - Install and test two pilot projects at tenant sites
  - Implement Stormwater Working Group
  - Implement Web based documentation tool for IDDE program
- **As Driven by our Program Needs**
  - Develop Relationships with local jurisdictions
  - Work with tenants for spill procedures / business continuity

Permit Hierarchy

- **Municipal Stormwater Separate Sewer – MS4**
  - Runs with the land
  - Port administers as “secondary permittee” under Phase I Permit
  - Addresses conveyance infrastructure, outfalls, education
- **Industrial Stormwater General Permit**
  - Runs with Operational Activities
  - Permit holder, operator, responsible for compliance
  - Describes source control BMPs, house keeping, sampling, treatment
- **Construction Permit**
  - Active construction sites, BMPs, Housekeeping, sampling
- **Other Specialized Permits**
  - Individual, boat yard, sand and gravel



Types of Operations

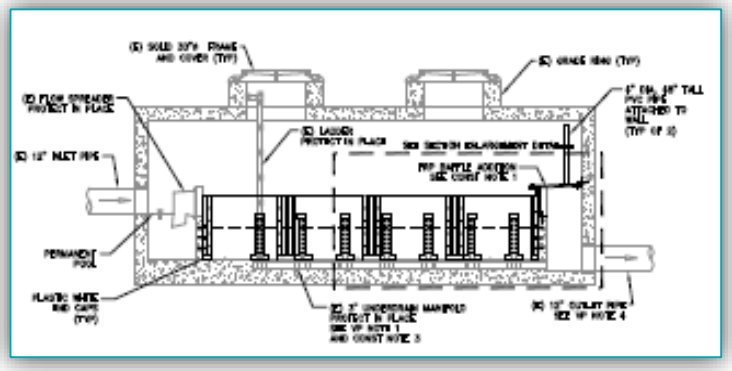
- **Terminals with Straddle Carriers and on-dock rail**
- **Terminals with RTGs**
- **Terminals with Chassis and trucks**
- **Log Yard (bulk products)**
- **Bulk Break Operations**

- **Typical Contaminants of Concern in the Permits:**
  - Varying levels of copper and zinc – total and dissolved
  - COD
  - Total suspended solids

Characterizing Stormwater

Water Quality Pilot Study Program

Treatment Media Pilot Study



Water Quality Vaults - Retrofit to treatment

Low Impact Development in-situ treatment

Chitosan Enhanced Sand Filtration Pilot Study

Filtration Media Studies

- **Basic Soil Retention Mix (BSM) – Dissolved Metals**
- **Expanded Shale – Solids**
- **Oyster Shells – Dissolved Metals, Solids**
- **Recycled Glass – Solids**
- **Bio-Char – More Aggressive with Dissolved Metals**
- **Water Treatment Residues (Alum) –Phosphorous, Fecal Coliform**
- **Chitosan (crushed crustacean shells) – Dissolved Metals, Solids**

Cost Benefit Analysis

- **Remove pollutants**
- **Characterize, choose wisely, no sunk costs (Over treat)**
- **Performance and Flexibility – easy to modify**
- **Smallest footprint or underground**
  - Not ponds when paying $6500 / acre for operational space
- **Performance, constructed cost, O&M costs**
  - Effluent curve – performance criteria a technology must meet prior install if not approved in manual
- **LID Feasibility Policy in SWMP**

Characteristics by Operations

Operation Type	Permit Benchmark Value	Straddle Carriers to Rail	Crane to Chassis	Bulk Products	Break Bulk / Roll on Roll Off
Copper	14 ug/ml	3.8 ug / ml	47.7 ug / ml	24.2 ug / ml	3.72 ug / ml
Zinc	117 ug/ml	142 ug / ml	222.2 ug / ml	189.1 ug / ml	38.9 ug / ml
Turbidity	25 ntu	55.98 ntu	36.8 ntu	759 ntu	38.6 ntu
COD	120 mg/l	Not Applicable	Not Applicable	2500 mg/l	Not Applicable
TSS Not a 2010 permit parameter	30 mg / L	N/A	18 mg / L	354 mg / L	

Results prior to treatment installations

Treatment Options By Operational Type

Treatment Type	Straddle Carriers to Rail	RTG to Chassis	Bulk Products	Break Bulk / Roll on Roll Off
Proprietary Media	X			
Non-Proprietary Filtration boxes	X		X	X
Chemical Treatment		X		
Downspout Boxes as source Control	X	X		
Membrane filters	X		X	
Chitosan / Sand Filtration			X	
Electro-coagulation		X		

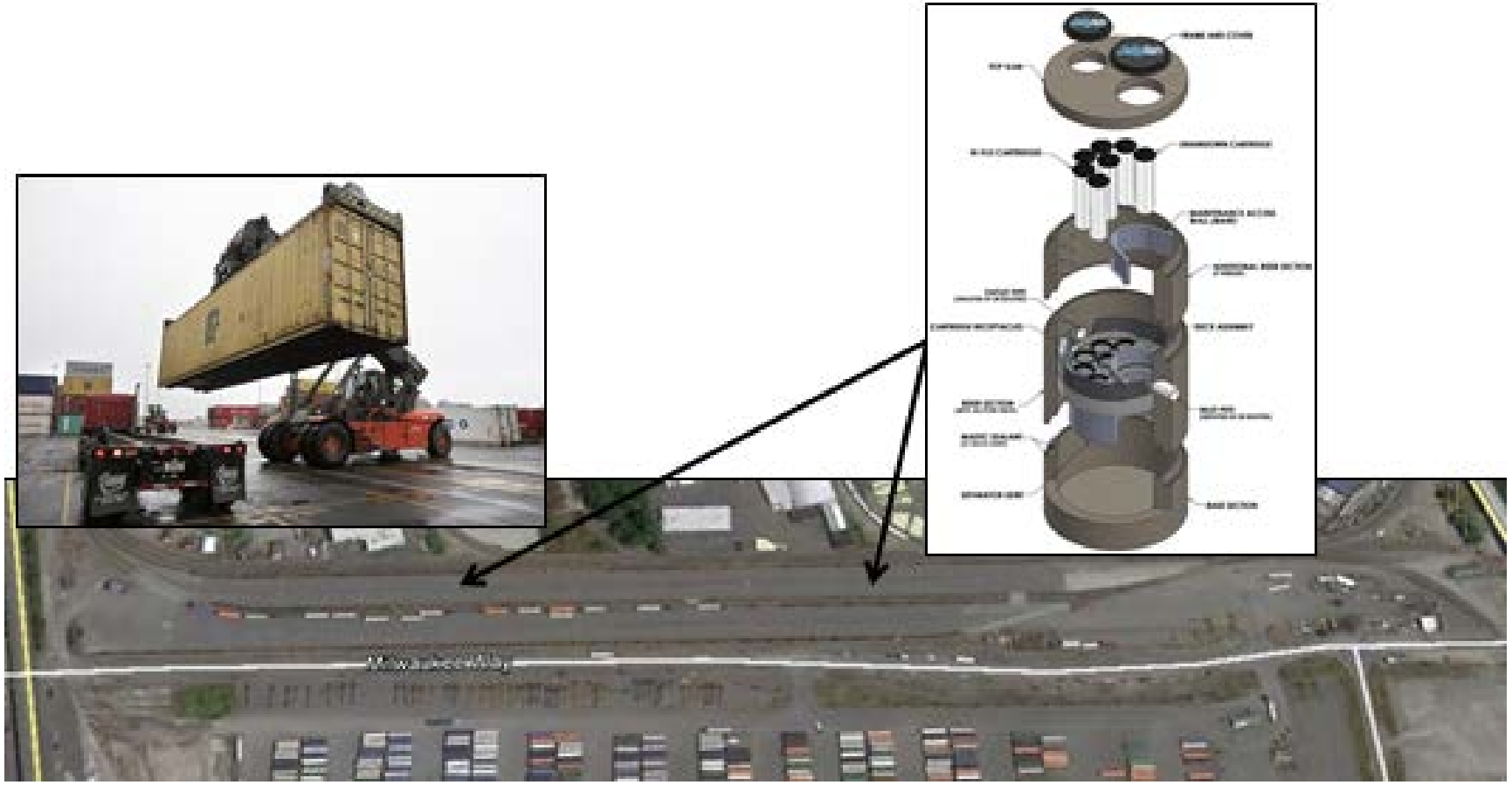
Cost of Treatment Per Acre

Site	Acres	System	Cost per Acre
Chassis Ops	138	Proprietary Media Filtration	$92,753
Top Pick	65	Chitosan / Sand Filtration	$150,000
Straddle Carrier	35	Proprietary Media Filtration with surge tank	$175,000
Top Picks	46	Up-flow Proprietary system, subsequently modified	$80,000
Intermodal	115	Up-flow plus proprietary membrane filtration	$65,000
Log Yard	25	Port blend of basic soil retention mix plus bio-char	$168,000
Container Support	27.5	Electro-Coagulation (waste water technology)	$90,910

Stormwater Characteristics after Treatment

Operation Type	Permit Benchmark Value	Straddle Carriers to Rail	Crane to Chassis	Bulk Products	Break Bulk / Roll on Roll Off
Copper	14 ug/ml	11.16 ug / ml		7.82 ul / ml	5.8 ug / ml
Zinc	117 ug/ml	240 ug / ml		15.02 ul / ml	44.56 ug / ml
TSS	30 mg / l	30.4 mg / l		N/A	N/A
COD	120 mg/l	N/A	N/A	76.0 mg / L	N/A
Turbidity	25 ntu	60.45 ntu		5.81 ntu	13.37 ntu

Membrane Filtration – Targets Solids Removal



Proprietary Media – Targets Dissolved Metals

Log Yard Visual – Before and after Treatment Bio-retention System (COD)

How the Alliance Helps our Tenants:

- **Stormwater Pollution Prevention Plans for all Port Properties**
- **Use lease review process to guide most protective BMPs**
- **Lower threshold for enhanced treatment**
- **Templates, site visits (upon request), technical review**

Thinking for the Future

- **Looking at Sea Level Rise**
  - Storm system sizing
  - Looking at current assets at end of designed life
  - Surge Capacity / Flood control
- **Working with other Ports in the Salish Sea and Puget Sound**
  - Underwater soundscape
  - Water quality regulations / best practices
- **Proactive solutions to ensure**
  - Puget Sound / Salish Sea useable by all
  - Focus on maritime jobs and the economics those support