Pacific Northwest Ballast Water Test Facility

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Today…….

- Introduction to ballast water treatment
  - Imperative
  - What's available
  - How treatments will be evaluated
- Testing and verification sites
- PNW test facility
- Process for moving to on-board treatment

Ballast Water Treatment – Why Bother?

- Economic losses
- Environmental losses
- Public health risk
- Synergy with climate change

Sea Grant

CRD Public Health

Greg Jensen

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Ballast Water Treatment – Why Bother?

- Legislative/Regulatory Imperative
  - IMO has regulations now
  - Coast Guard regulations coming soon
  - Standards to be set by USCG; differ from IMO, CA
- BW exchange versus treatment

Ballast Water Treatment Technologies

- Treatment technologies under development
  - Llyods of London says: 24-26 (2007)
  - CA State Lands Commission says: 28 (2008)
  - Lots not known about many technologies listed
- Technologies use active or inactive processes
  - Active processes: chlorination, peracetic acid, SeaKleen, ozonation
  - Inactive processes: UV, gas injection, deoxygenation, ultrasonic, cavitation, heating

Testing BW Treatment Technologies

- Initial protocols by ETV for US, IMO for rest of the world

ETV:

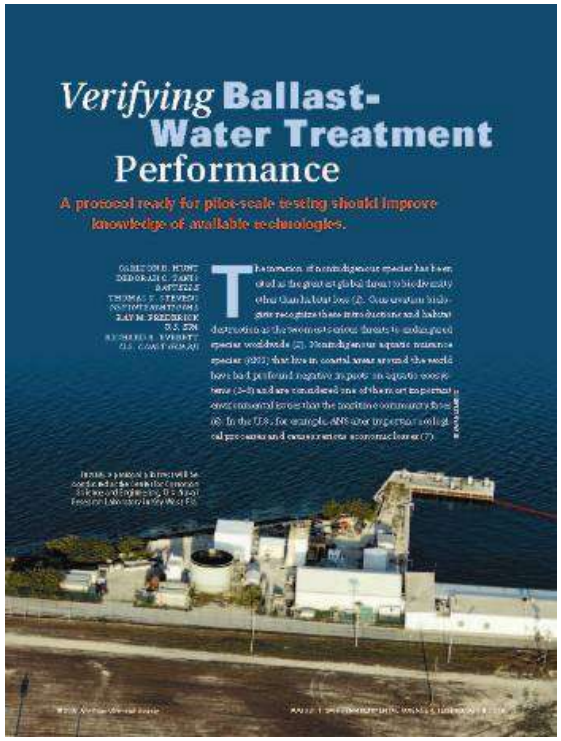
- Based on using ambient plankton and surrogates
- Three step verification process:
  - Bench-scale – proof of concept
  - Land-based – simulated shipboard, most rigorous
  - Shipboard – tests practicality
- USCG will certify treatment technologies, based on verification data (we think)

Evaluation of Treatment Technologies

ETV

Draft

Generic Protocol for the Verification of Ballast Water Treatment Technologies



IMO

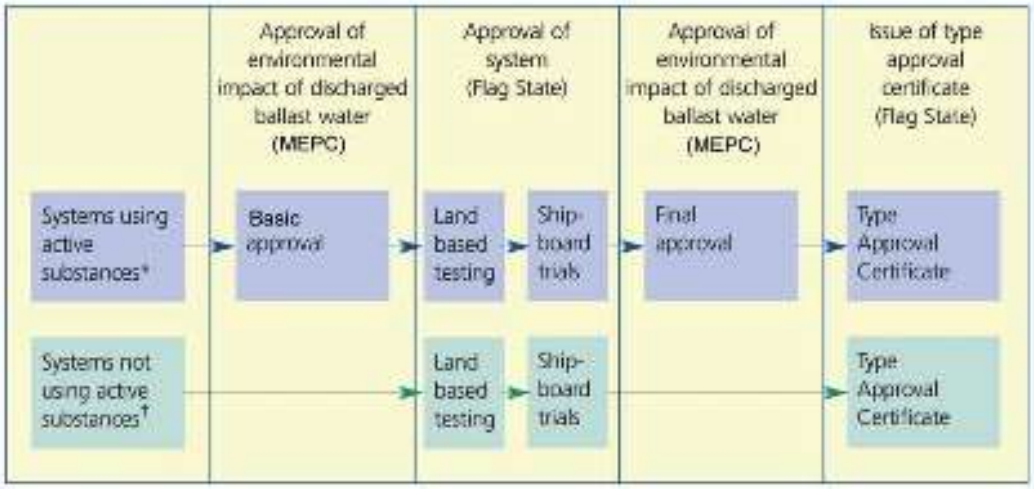
ANNEX 3

RESOLUTION MEPC.125(53)

Adopted on 22 July 2005

GUIDELINES FOR APPROVAL OF BALLAST WATER MANAGEMENT SYSTEMS (G8)

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,



Comparison of ETV, IMO Testing Protocols

Property	ETV	IMO
Salinity	Two (<1PSU, 28-33 PSU)	Two of three
Surrogates	Added at concentrations similar to ambient	Not required
Initial Organism Concentration	10^2 – 10^3 zooplnk/litre 10^5 phytoplank/litre 10^6 bacteria/litre	Organisms >50 μ 10^5 per m^3 Organisms 10-50 μ:10^5 per m^3
Tank Volume	200-300 m^3	200 m^3
Flow Rate	300m^3/hour	>200m^3/hour
No. Runs	3 per salinity	5
Hold Time	5 days	5 days
Shipboard	NA	3 tests

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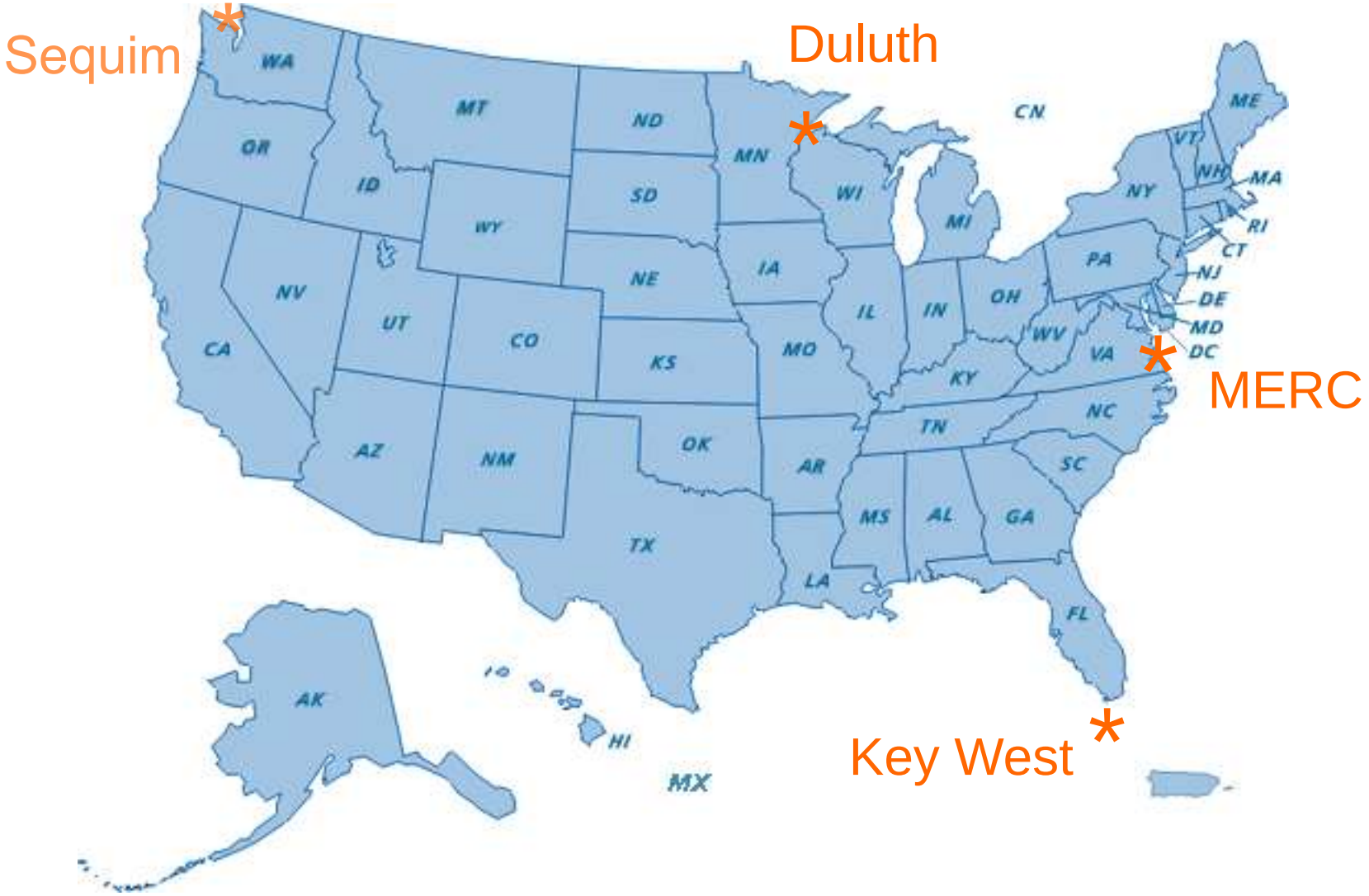
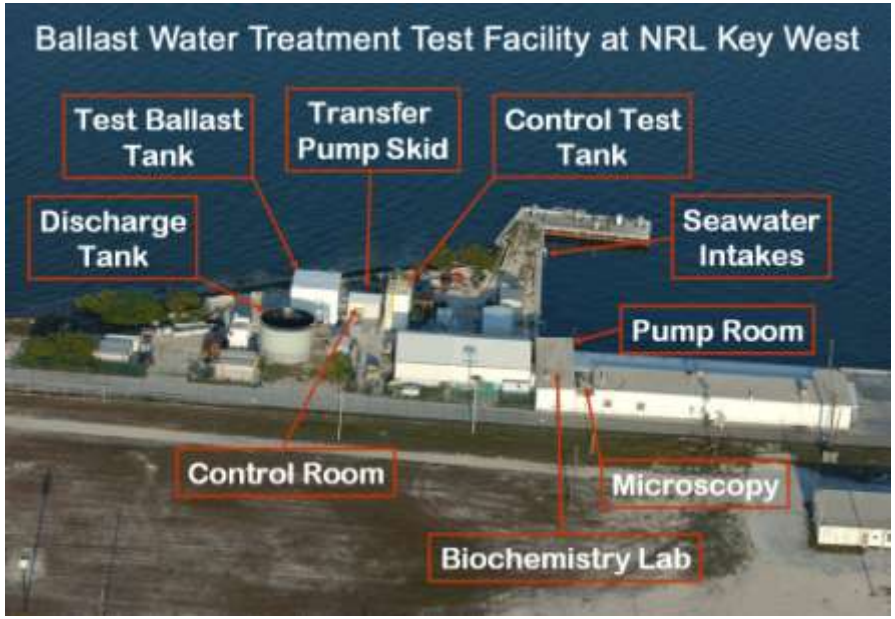
Cal Maritime Academy refit of *Golden Bear*



Land Based BW Test Facilities

Land-Based Test Facilities in the US



GSI Duluth MN

NRL Key West FL

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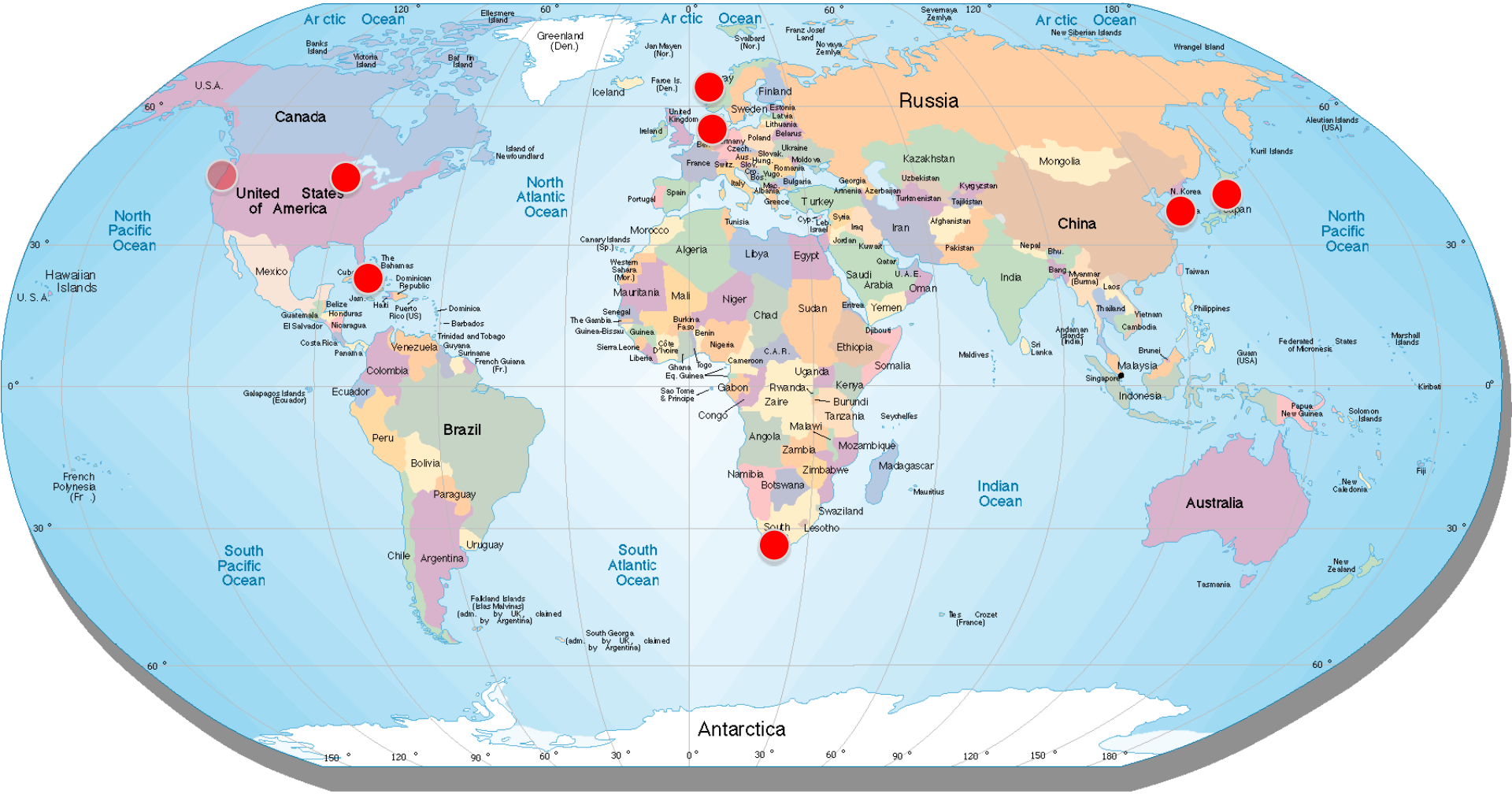


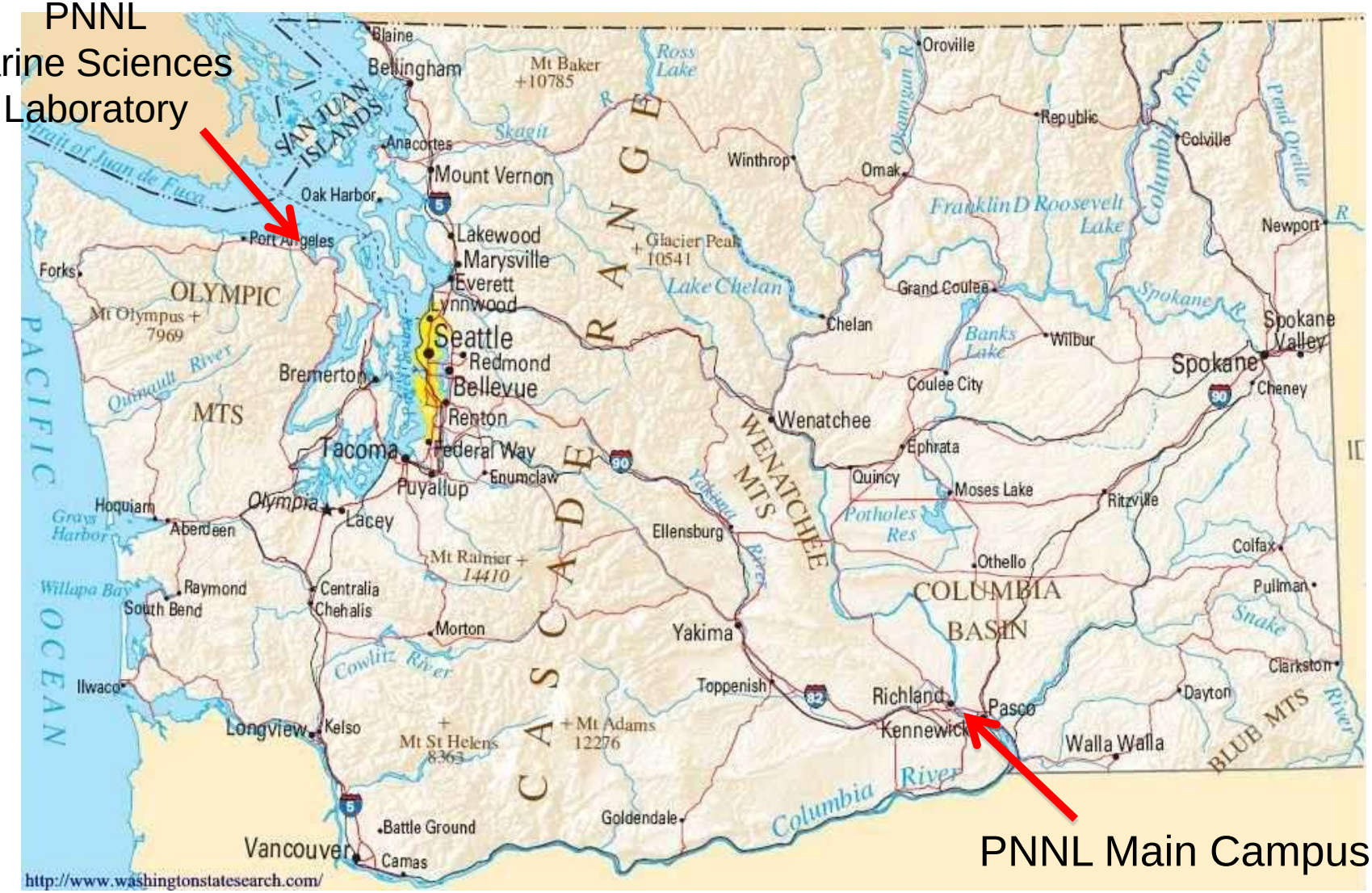
Major Land-Based BW Test Facilities

NIVA (Norway)

RDTE Facility
Pacific Northwest Ballast Water Treatment Facility

Pacific Northwest National Laboratory, Sequim WA

Sponsored by National Oceanic and Atmospheric Administration
and United States Fish and Wildlife Service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Enumclaw
Olympia
Lacey
Centralia
Chehalis
Morton
Cowlitz River
Longview
Kelso
Mt St Helens
8363
Mt Rainier +
14410
CASCADE RANGE
+ Mt Adams
12276
Battle Ground
Vancouver
Camas
Goldendale
Columbia River
Glacier Peak
10541
Lake Chelan
Winthrop
Omak
Okanogan R
Oroville
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Pend Oreille R
Newport
Grand Coulee
Chelan
Spokane R
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Moses Lake
Ritzville
Potholes
Res
Ellensburg
Yakima
River
Othello
COLUMBIA
BASIN
Colfax
Pullman
Snake
Clarkston
Dayton
Toppenish
Richland
Pasco
Kennewick
Walla Walla
BLUE MTS
River

Northwest RDTE at PNNL Sequim

- $1.25M Award by NOAA to build land-based test facility
- Design and construction: October ’07-summer ‘09
- Only commercial test bed on west coast; one of 2 in country (Duluth MN), only seawater one planned at the moment
- NRL Key West doing development work
- Capabilities for testing at Sequim (ecotox, species ecology, chemistry, etc.)

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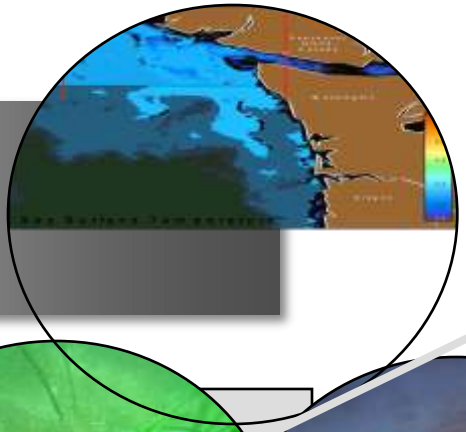
PNNL's MRO Focused in 3 Areas

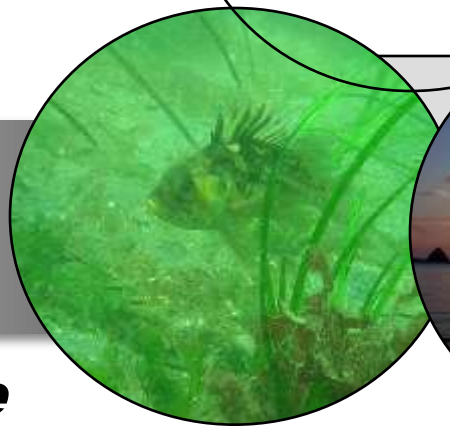
Coastal assessment & restoration

Protecting people & the environment



Bio Security
Ballast Water RDTE

Developing new products & energy sources



Securing our ports, coastlines & waterways

Marine biotechnology/ ecotoxicology

Coastal Security

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Rationale for Developing Ballast Water Test Facility at Sequim

- High quality abundant seawater and freshwater
- Reliable permitted wastewater treatment system
- Adequate land to add facilities
- Established facilities management and O&M
- Secure facility
- Scientific and engineering staff, experience in protocol development, testing, ballast water testing

Expert Staff to meet the needs of the RDTE

The MRO has a total of 85 scientists and engineers in:

- **biology**
- **chemistry**
- **physical oceanography**
- **biological oceanography**
- **ecological sciences**
- **environmental sciences**
- **ecotoxicology**
- **fisheries**
- **marine invertebrate**
- **carcinologist**
- **coastal engineering**
- **chemical engineering**
- **civil engineering**
- **marine engineering**
- **electrical engineering**

Team Partners

Elliott Bay Design Group
Architectural & Engineering Services for the Marine Industry

Aquatic Bioinvasions Research & Policy Institute
Portland State University
environmental sciences & resources

Smithsonian Environmental Research Center

UNIVERSITY OF WASHINGTON
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Virtual Tour of the Marine Sciences Lab

Marine Sciences Laboratory at Sequim

1965

1973

1982

1965 - Battelle purchased Bugge Clam cannery site

1973 - Beach wet laboratory & offices

1982 - Uplands analytical chemistry labs and offices

1992 - Twenty new offices at beach

2004 - New 44 office building completed

1965 - Battelle purchased Bugge Clam cannery site

2006 - New Biotechnology Laboratory

Today

Tomorrow

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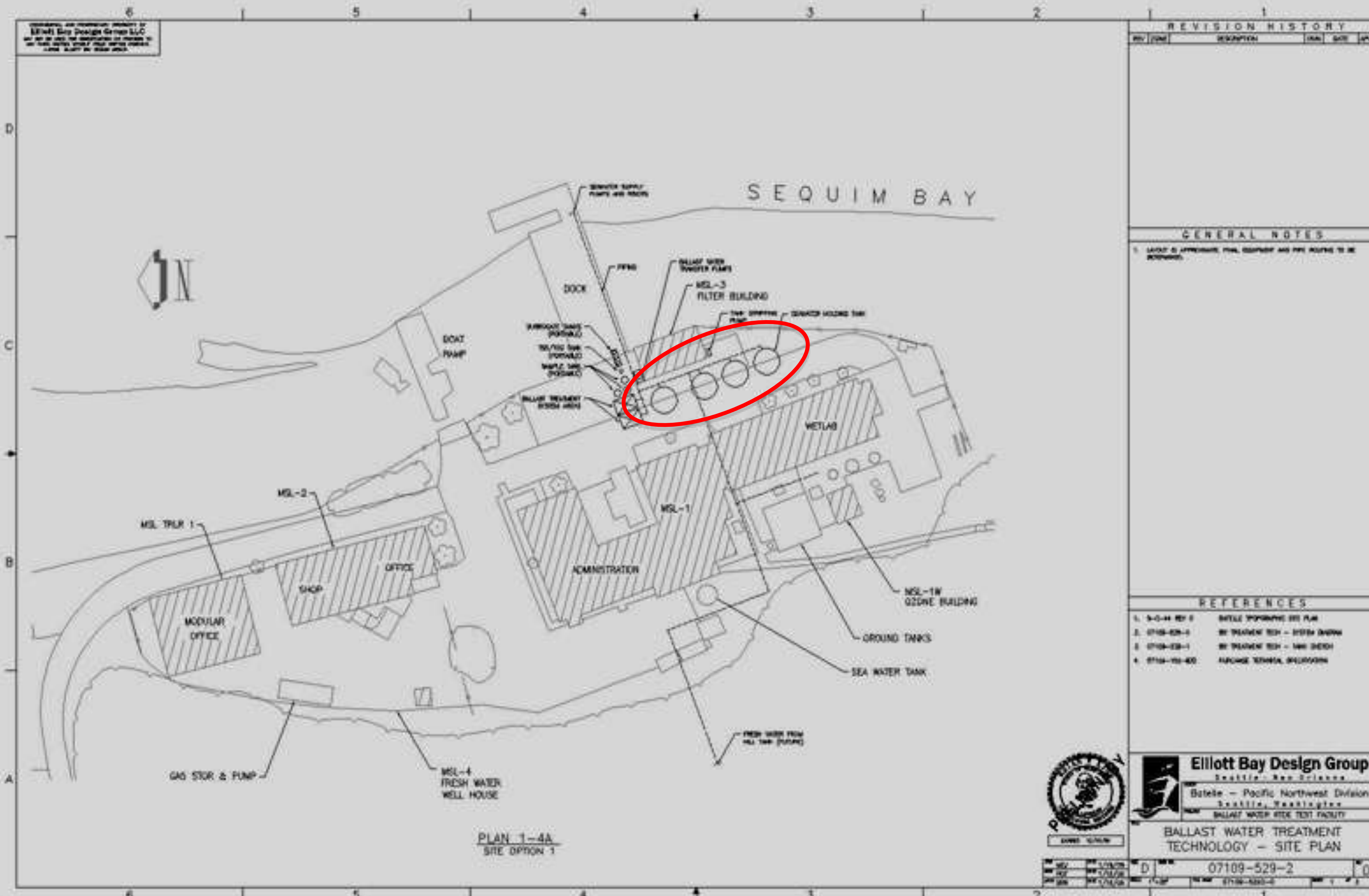
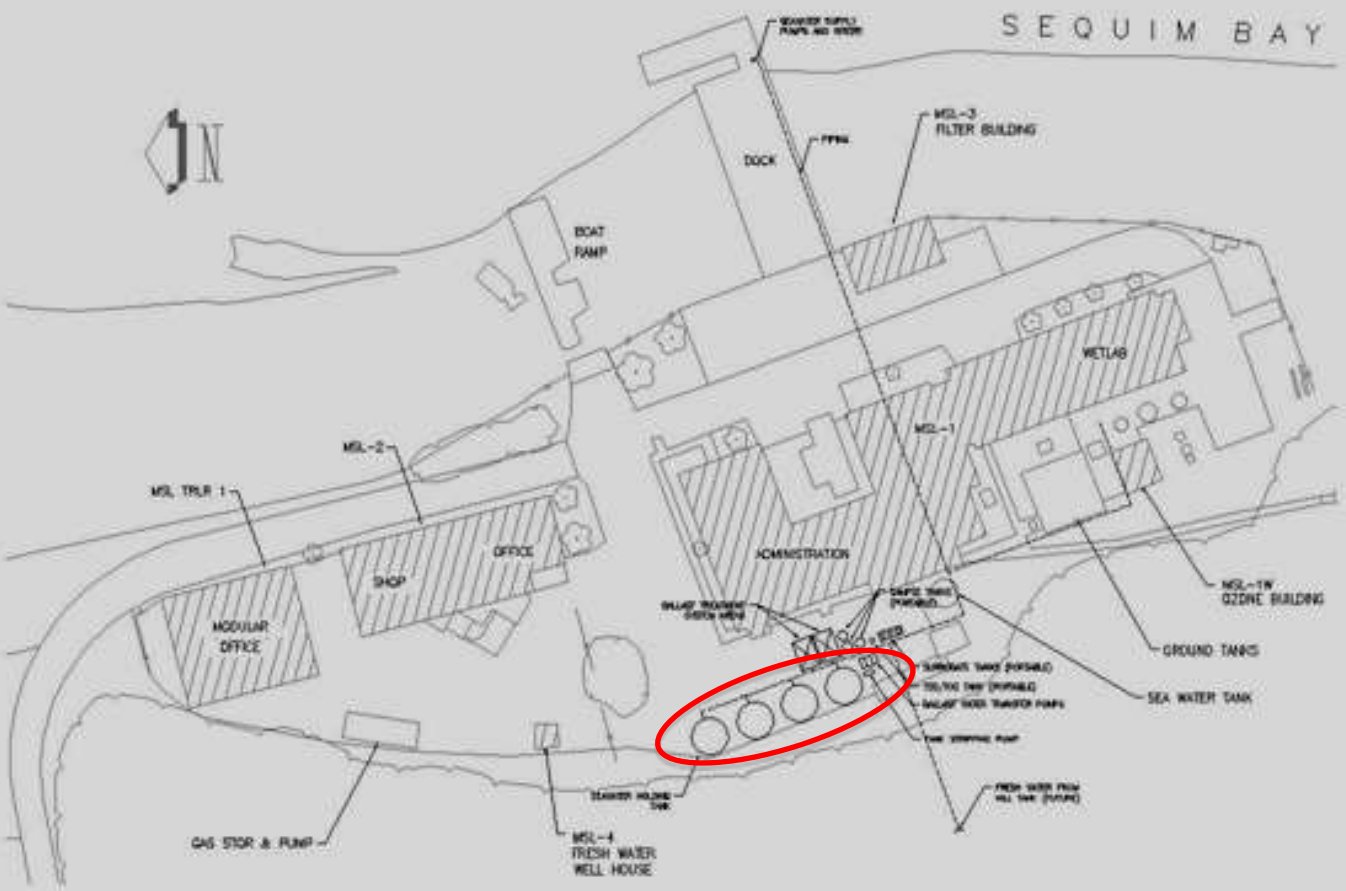

SEQUIM BAY
N
DOCK
PIPING
BOAT RAMP
MSL-3
FILTER BUILDING
WETLAB
MSL-1
ADMINISTRATION
MSL-2
MSL TRLR 1
SHOP
OFFICE
MODULAR OFFICE
MSL-1W
OZONE BUILDING
GROUND TANKS
SEA WATER TANK
GAS STOR & PUMP
MSL-4
FRESH WATER
WELL HOUSE
PLAN 1-4A
SITE OPTION 1
REVISION HISTORY
GENERAL NOTES
REFERENCES
Elliott Bay Design Group
Battelle – Pacific Northwest Division
BALLAST WATER TREATMENT TECHNOLOGY – SITE PLAN
07109-529-2



PLAN 2-4A
SITE OPTION 2

D 07109-529-2

- Facility construction to be completed in mid 2009
- We hope to be testing in late 2009

PNNL is looking for partners

- Funding to complete construction
- Serve on advisory panel
- Provide input on testing priorities, research

Moving a technology to shipboard

- Technology developer applies for verification testing
- Testing plan developed
- Land-based testing at PNNL (PNNL staff not developer)
- Verification results reviewed by USCG, certification
- Ship-based testing
- STEP program may be able to expedite the process

Important to think innovatively about BW treatment

Thank you

Questions…?

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