



Improving "Ground Truth" Measurement & Stimulation for Unmanned Maritime Vehicle T&E

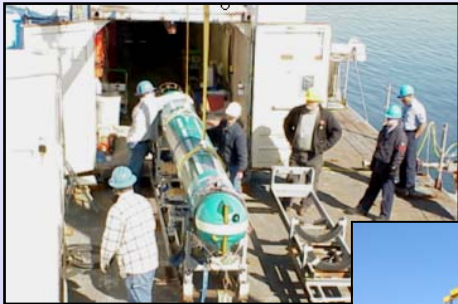
**NDIA Unmanned Maritime Vehicle T&E Conference
Naval Undersea Museum, Keyport, WA**

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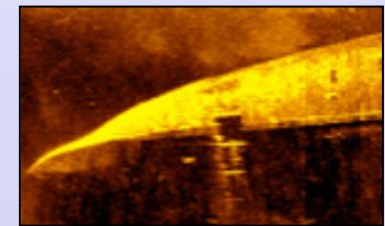
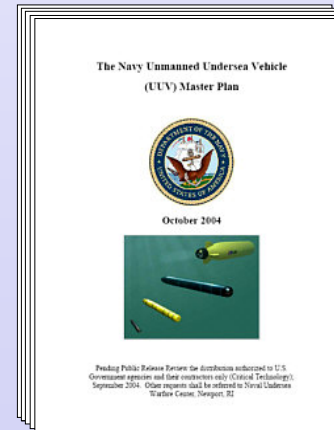
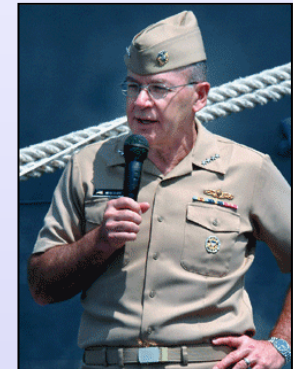
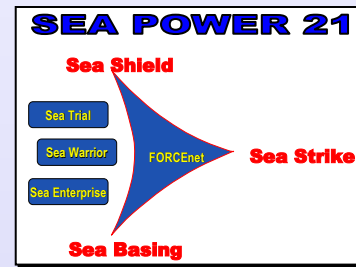
UMV TECHNOLOGIES ARE RAPIDLY ADVANCING & NAVY UMV PROGRAMS ARE MATURING



**Maturing UMVs & Payloads are Driving Development of
New UUV Testing & Training Support Capabilities**

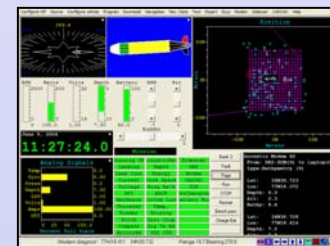
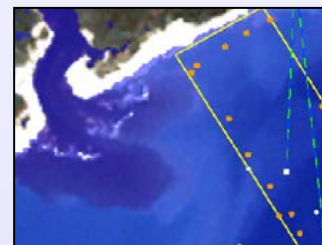
ADDITIONAL DRIVERS FOR DEVELOPMENT OF NEW UMV TEST & EVALUATION CAPABILITIES

- New UMV Technologies
- Sea Power 21 / Sea Trial Experimentation Focus
- U.S. Chief of Naval Operations Leadership Guidance: *“Reduce T&E Costs”*
- Updated UUV Master Plan Guidance -- Nine Mission Areas & Four Vehicle Classes
- Acquisition Reform & Spiral Development Emphasis
- War on Terror; Homeland & Maritime Security Needs
- New Types of Fleet Platforms & Modular Approaches
- Fleet Experience -- UUV Employment in Iraq



EXAMPLES OF SHORTFALLS IN “GROUND-TRUTH” UMV T&E AND EXERCISE SUPPORT CAPABILITIES

- Ground-Truth Information for the Undersea Environment at Test Sites
- Ground-Truth Information About Targets for Mine Countermeasrure Testing & Other Test Site Objects
- Ground-Truth Information for UUV Sensor Stimulation Sources
- Measurement of UUV Radiated Signatures
- Independent UUV Tracking
- Capturing UUV Exercise Communications (Voice & Data)
- Gathering All Important Exercise Data in One Place for Analysis



FULL-SPECTRUM T&E AND EXERCISE SUPPORT IS NEEDED FOR ALL PHASES OF UUV DEVELOPMENT & APPLICATION

S&T and R&D:

- Few Formal Specifications
- Need Test System Flexibility
- Objective / "Ground Truth"

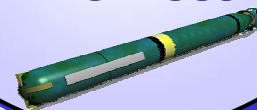


Shared, Standardized Resources Can Serve Multiple Program Requirements

Acquisition:

- Testing To Specifications
- "Requirements Compliance" T&E
- "User Operational Evaluation"
- DT / TECHEVAL / OPEVAL
- Production Acceptance Tests

Reliable UUV Systems Available To The Fleet



New Types Of Testing & Training Support Resources Are Required

In-Service:

- Verify Performance
- Check Repairs & Upgrades
- Mission Work-Ups
- Support UUV Cadre Training



A National Focus For Shared UUV T&E Solutions – *Across Programs; For All Levels Of Maturity; & For Training As Well As Testing* – Will Avoid Costs & Improve Results

NUTEC "ROADMAP" FOR UUV TEST & TRAINING CAPABILITY UPGRADES

Key Initiatives Required

UUV Measurements & Sensor Stimulation Upgrades

- *UUV Signature Vulnerability Measurements*
- *Specialized UUV Targets & Sensor Stimulation Sources*
- *Environmental Monitoring & Stimulation*
- *Wide-Area UUV Tracking*

UUV Test Data Management Upgrades

- *Distributed Testing and Modeling & Simulation Tools / Support*
- *Information Technology & Connectivity Upgrades*
- *High-Bandwidth Underwater Range Backbone*
- *UUV Analysis & Evaluation Tools*

UUV Test Support Systems

- *UUV Launch, Recovery, & Handling Support*
- *Test-Bed Vehicle(s) For UUV Sensor T&E*

UUV Testing In Mission-Specific Environments

- *Test Area Expansion & Environmental Documentation*
- *Oceanographic Data Collection For UUV Test Sites*

Four Key Initiatives

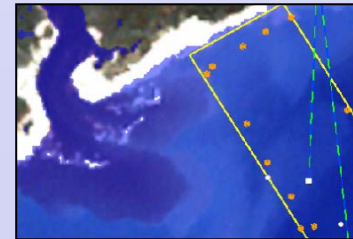
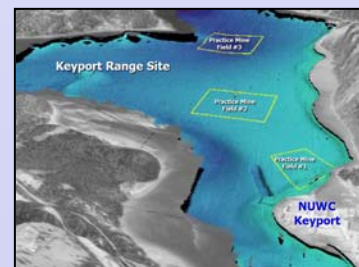
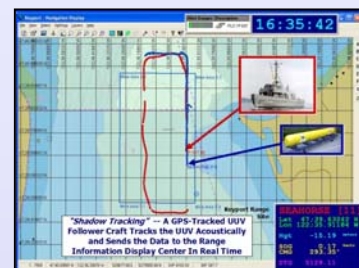
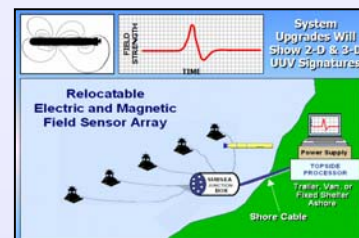
IMPROVED NAVY UUV T&E AND SUPPORT CAPABILITIES

- SUPPORT NAVY UUV MASTER PLAN OBJECTIVES
- ANYPLACE, ANYTIME TESTING & TRAINING
- ACCELERATE UUV DELIVERY TO THE FLEET
- REDUCE OPERATIONAL RISK
- ENHANCE FLEET READINESS TRAINING

8 of the 12 Requirements-Driven Thrust Areas for NUTEC's T&E Capability Upgrades
Are Related To *Ground-Truth Measurement, Stimulation, & Display Capabilities*

EXAMPLES OF NEW GROUND-TRUTH MEASUREMENT, STIMULATION, & DISPLAY CAPABILITIES

- **UMV Electric & Magnetic Field Vulnerability Measurement (EMFVM) System**
- **In-Situ Characterization of Practice Mine Shapes & No-Mine Bottom Targets**
- **UMV “Shadow Tracking”** – Providing a Virtual Range Anywhere
- **UUV Environmental Test Chamber (ETC)** – Endurance Testing Under Operational Temperature & Depth Conditions
- **Test Environments Assessment Lab (TEAL)** – Aids Understanding, Evaluating, & Selecting UMV Test Sites; Includes 3-D Environmental Visualization Tools
- **Common Operational USW Picture (COUP)** – A Viewing Portal for Real-Time UMV Exercise Observation, Decision Making, & Rapid Assessment
- **Portable Oceanographic & Environmental Measurement (POEM) System** – Real-Time Characterization of UMV Test Sites



AUV FEST 2005 LOCATION NUTEC / NORTHWEST RANGE SITES

*Hood Canal
Range Site*

Dabob Bay Range Site

SUBASE BANGOR

NAVAL UNDESEA MUSEUM

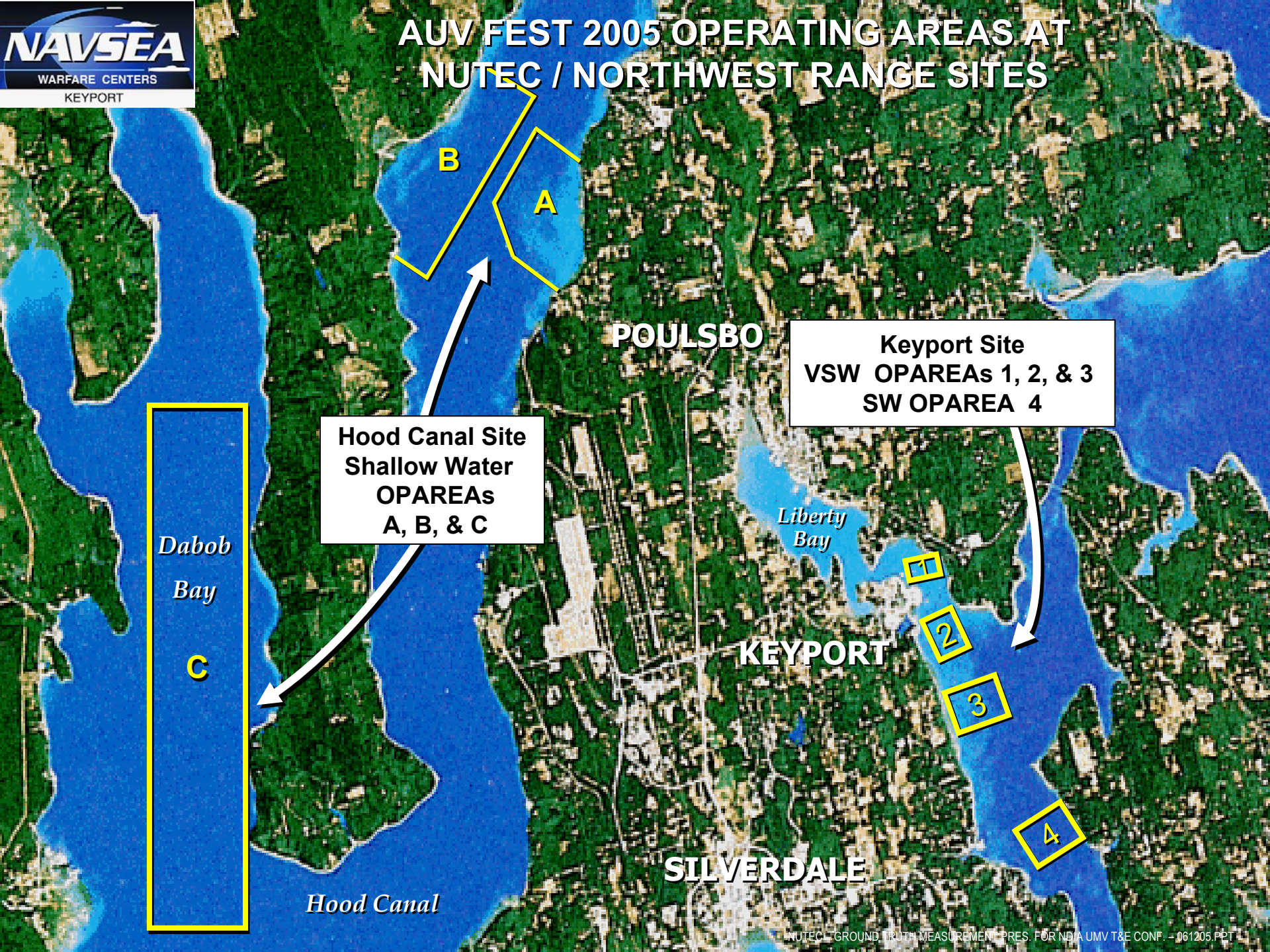


**NUWC
KEYPORT**

Keyport VSW Range Site



AUV FEST 2005 OPERATING AREAS AT NUTEC / NORTHWEST RANGE SITES



**Hood Canal Site
Shallow Water
OPAREAs
A, B, & C**

**Keyport Site
VSW OPAREAs 1, 2, & 3
SW OPAREA 4**

**Dabob Bay
C**

Liberty Bay

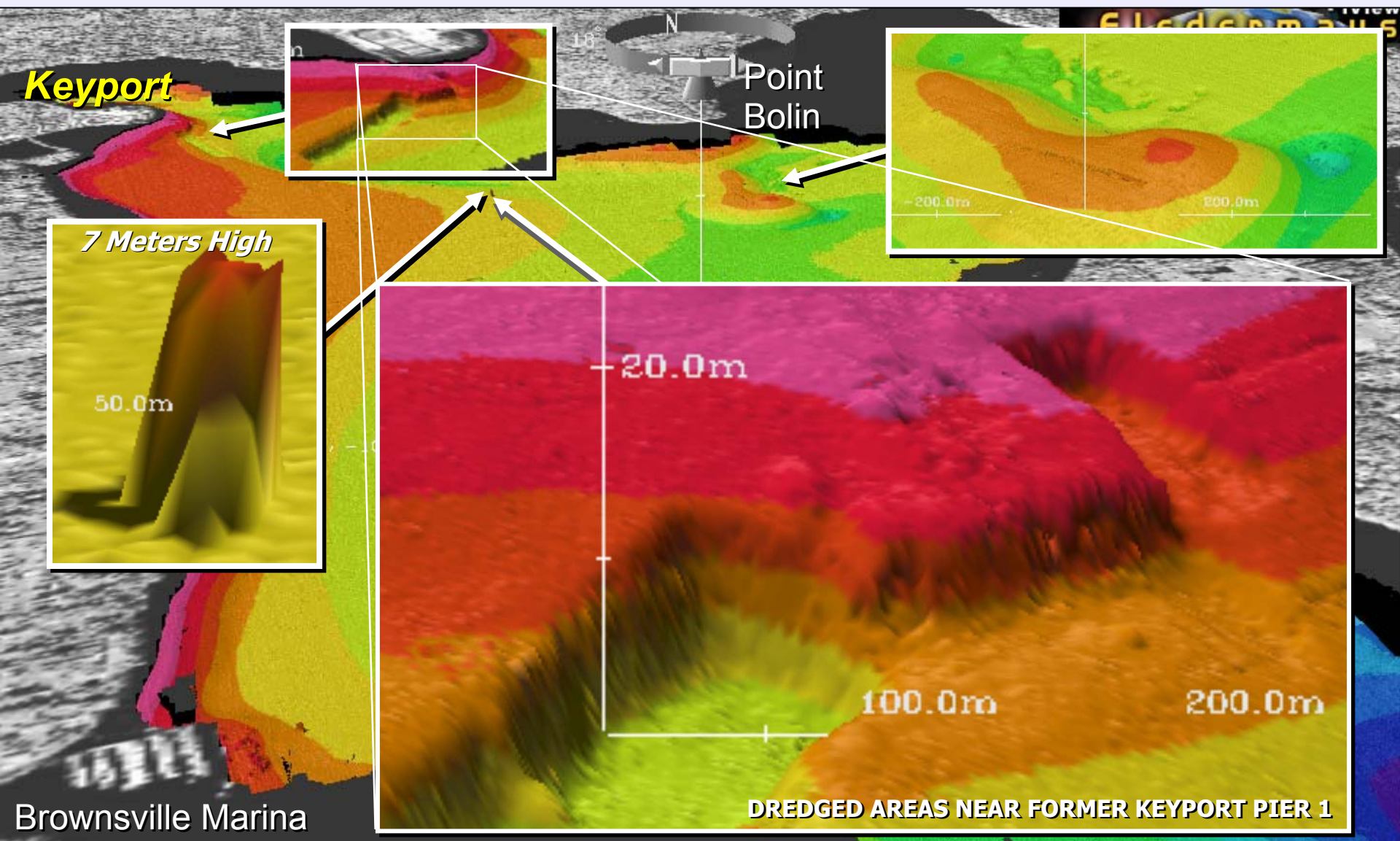
KEYPORT

SILVERDALE

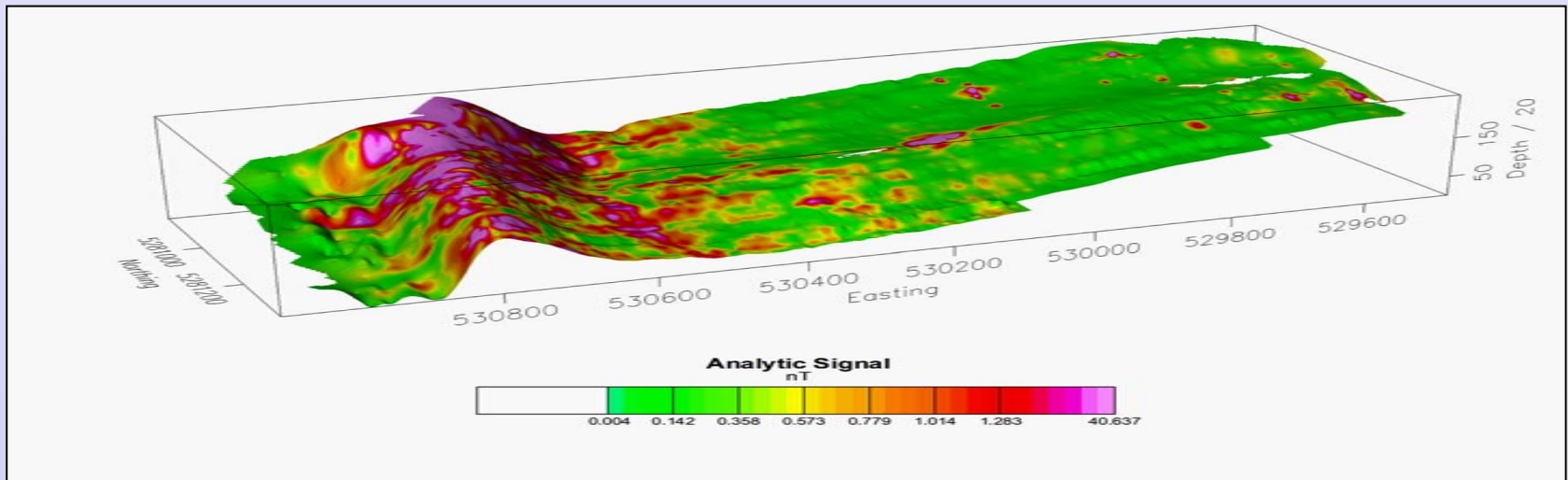
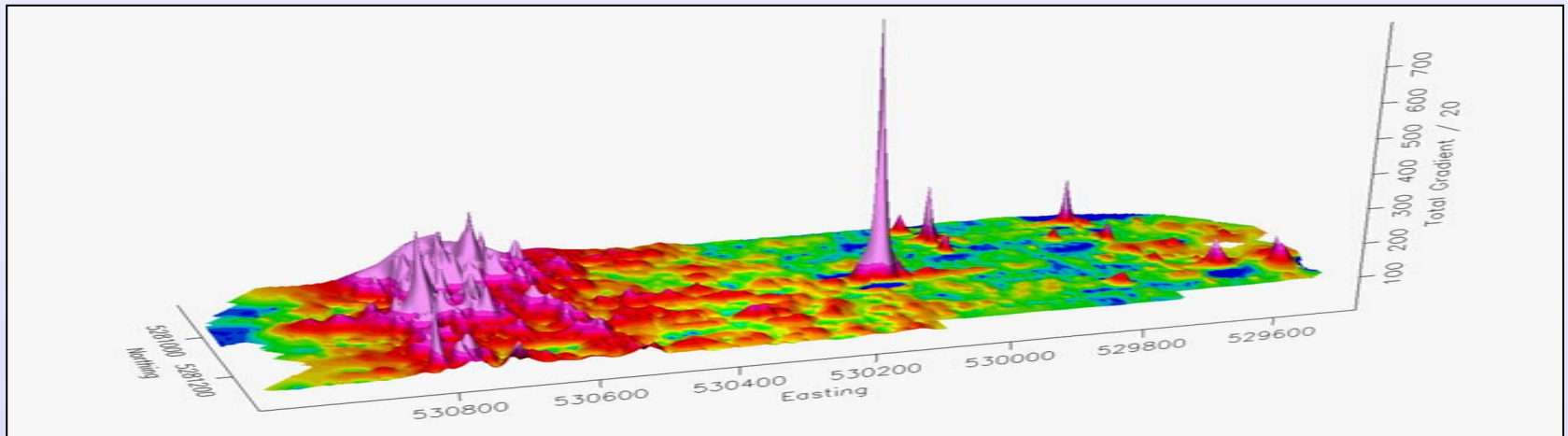
Hood Canal

UMV TEST SITE CHARACTERIZATION

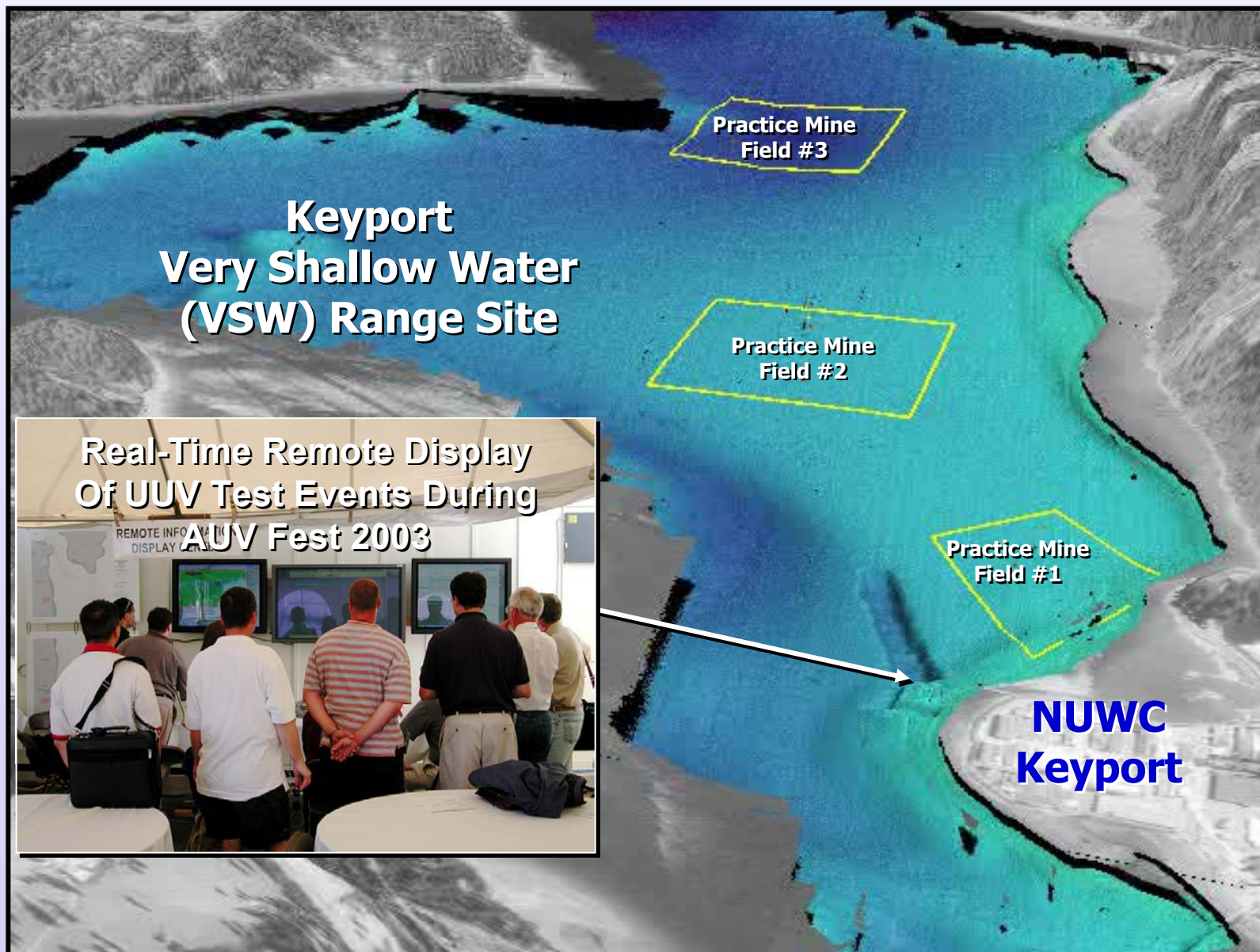
- EXAMPLE: GROUND-TRUTH BATHYMETRIC DATA SETS -



Magnetic Area Survey Results at the Keyport VSW Range Site



VISUALIZATION TOOLS FOR UUV TEST SITES - EXAMPLE: KEYPORT VSW RANGE SITE -



DEVELOPMENT OF SHARED UMV TEST CAPABILITIES CONTINUES IN SUPPORT OF NAVY PROGRAMS

NUTEC's Focus: Full-Spectrum UUV Testing & Training Support -- Anyplace, Anytime

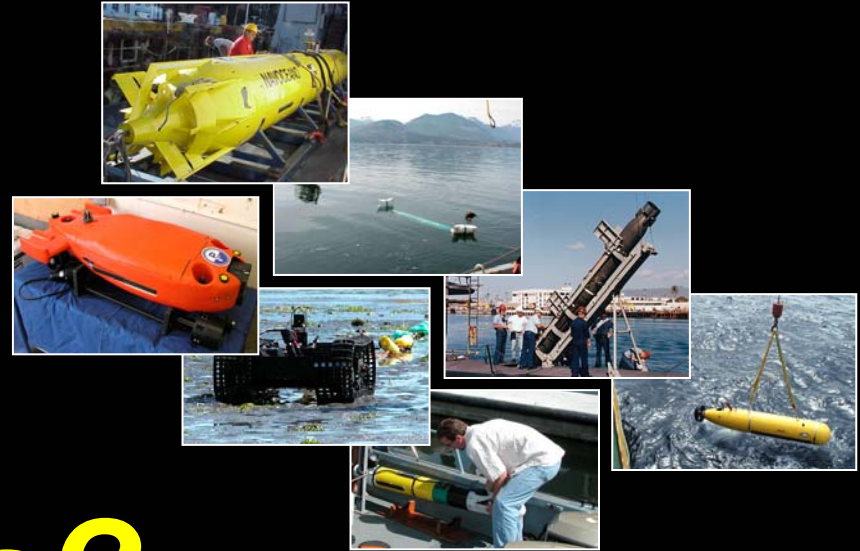


Current Projects:

- *Improved "Ground Truth" for UMV Tests & Fleet Exercises*
- *Expanded UUV Signature Measurements*
- *UMV Test Support / More Portable Capabilities*
- *Remote & Distributed Testing & Rapid Exercise Analysis Tools*
- *Capabilities to Enhance UMV Testing in Mission-Specific Environments*



- **Technology Advances & Sea Trial Experiments are Bringing T&E Challenges & New UMV-Specific Requirements**
- **New UMV T&E Capabilities -- Designed to be Shared Across Programs & Used for All Phases of Vehicle Development -- are Being Provided to Help Meet These Challenges**
- **Navy UMV Programs are Encouraged to Participate in Addressing UMV-Community-Wide Issues Such as Ground-Truth Measurement Improvements & Standardized T&E Processes**
- **NUTEK is Meeting the Sea Trial and T&E Goals Set by the Chief of Naval Operations to:**
 - *Accelerate Experimentation of Distributed and Off-Board Systems*
 - *Streamline T&E Processes Through Collaborative Efforts to Reduce the Navy's Cost for T&E*



Questions?

