



Remediation of the San Diego Shipyard Sediment Site – A Tale of Two Shipyards



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San Diego Shipyards



San Diego Shipyards



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General Dynamics NASSCO: The “South Shipyard”



BAE Systems San Diego Ship Repair : The "North Shipyard"



Sediment Investigation

- Shoreline investigation conducted in 2001 and 2002
- Limited number (30) of sediment samples collected and tested against reference samples
- Results indicated impairment to aquatic and human beneficial uses



Sediment Core Collected at San Diego Shipyard Sediment Site

Cleanup and Abatement Order

- Issued in 2012 for PCBs, copper, mercury, PAHs, and TBTs
- Economic and technical feasibility
- Numerous inputs and sources
- Shipyards led site cleanup
- Community outreach



Cleanup and Abatement Directives

- “...Dischargers shall take all corrective actions necessary to remediate the contaminated marine bay sediment...”
 - A. Dredging of identified sediments
 - B. Under-pier remediation
 - C. Post-remedial monitoring



Dredging of identified sediments

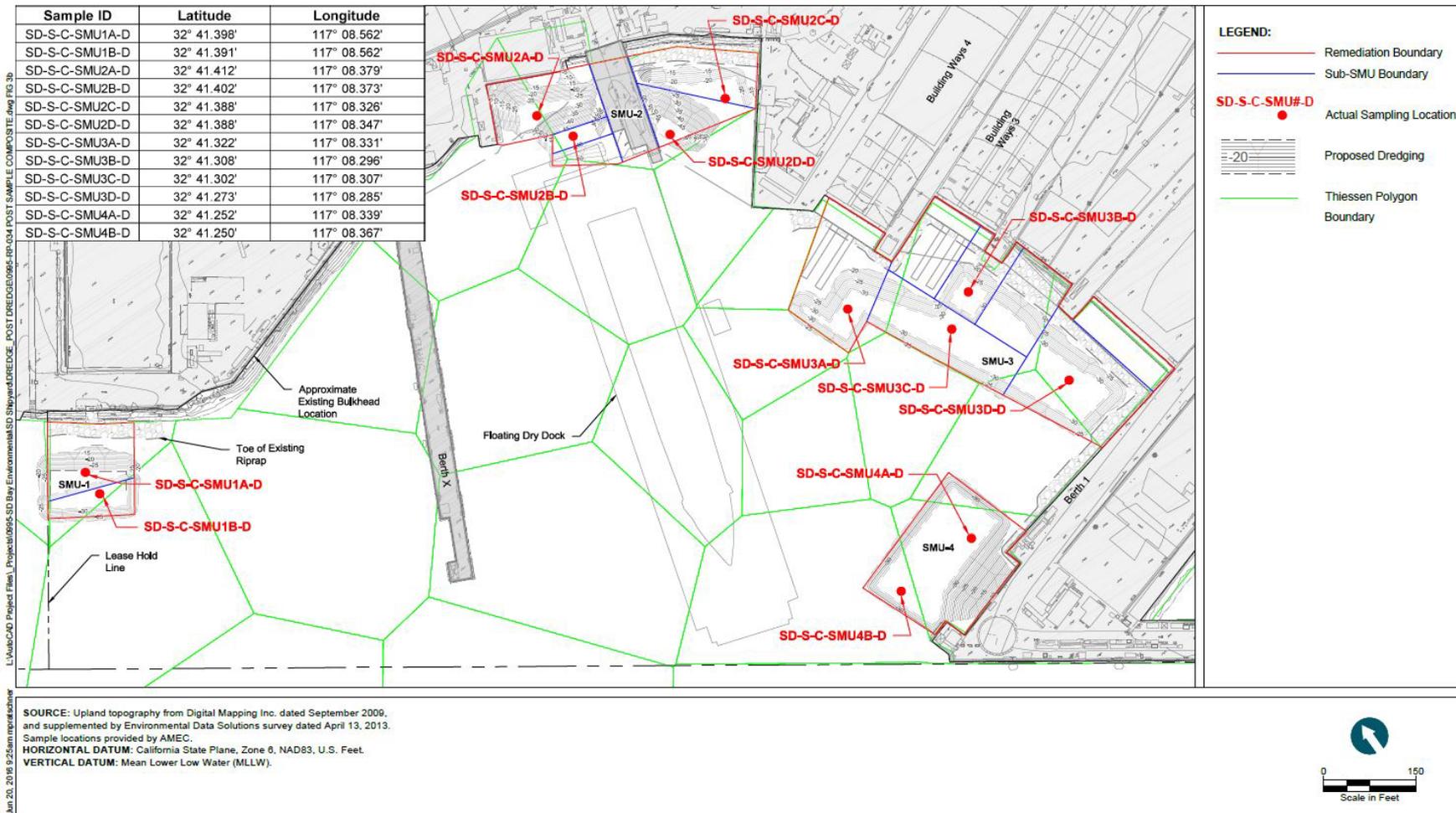


Under-pier remediation



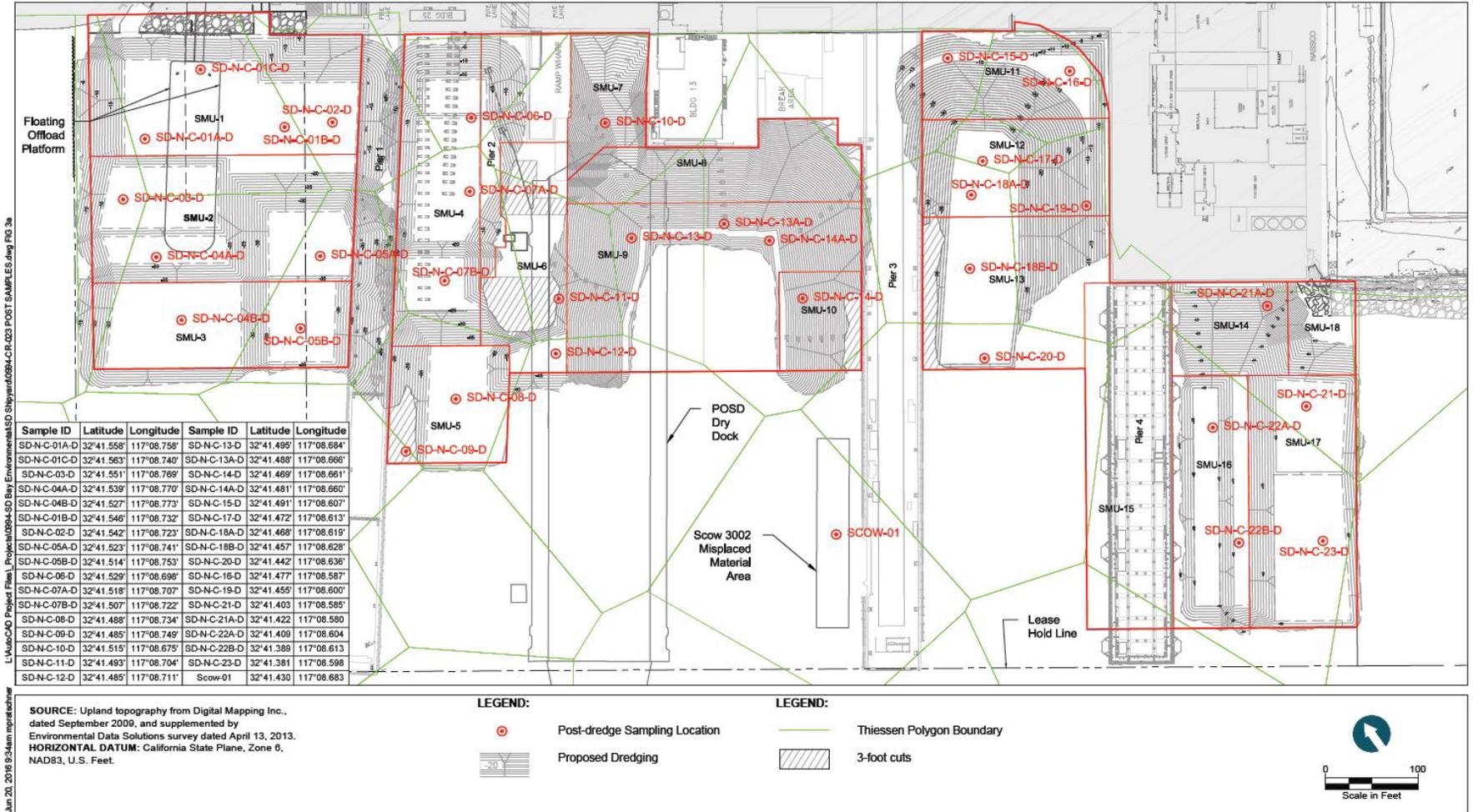
Post-remedial monitoring

Dredging Areas at South Shipyard



Jun 20, 2016 2:25pm mpr@anchor.com
 L:\Info\CAD Project Files\Project\1005-SD Bay Environmental\SD Shipyard\Dredge_Post Dredge\0905-PR-04 POST SAMPLE COMPOSITE.dwg FIG 3-B

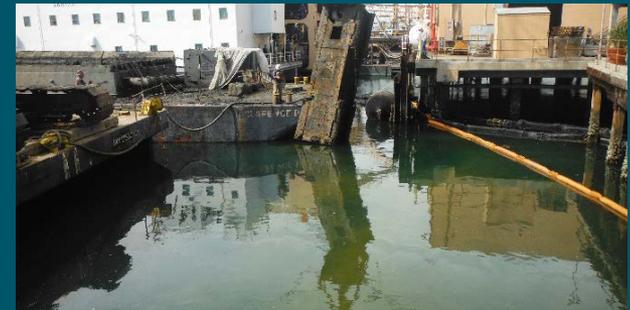
Dredging Areas at North Shipyard



L:\AutoCAD Project Files\1_Project\0904-SD Bay Environmental\SD Shipyard\0904-CR-023 POST SAMPLES.dwg FIG 3a
Jun 20, 2016 9:24am mprj@caltech

Demolition and Debris Removal

- Conducted to facilitate dredging
- Localized demolition
- Removal of debris
- Debris was recycled or disposed of at landfill



Pier demolition (South Shipyard)



Identified debris removal (North Shipyard)



Riprap removal during dredging
(North Shipyard)

Dredging



- Environmental bucket specified by CAO
 - Soft non-native material such as silt
- Mechanical bucket allowed when needed
 - Debris and native material such as sand and clay
- Double silt curtain for turbidity control

Sediment Management

- Available land space used as Sediment Management Areas (SMAs)
- Careful controls on material track-out
- Addition of cement
- Prevention of outflow to Bay waters
- Haul to local landfill via established routes



Stabilizing sediment with cement



Offloading to haul truck



Truck wash system

Post-dredge Confirmatory Sampling

- Required by CAO
- Vibracores obtained progressively after dredging
- Contingency measures for samples exceeding cleanup requirements
 - Additional dredging
 - Sand cover



Post-dredge confirmatory sampling vessel



Removing sample from vibrocore



Collected post-dredge confirmatory sample

Sand Cover Placement

- Gravelly sand on slopes
- Sand under piers and flat areas
- Conveyor use and controls on rate of placement
- Pneumatic sand pumping system used for difficult access area



Sand placement using slip box



Sand placement using telebelt



Sand placement using pneumatic pumping

Water Quality Monitoring

- WQC requirements
 - pH (+/- 1 pH)
 - Dissolved oxygen (10% below reference)
 - Turbidity (20% above reference)
- Automated monitoring buoys
- Manual monitoring and observation



Manual
water quality monitoring equipment

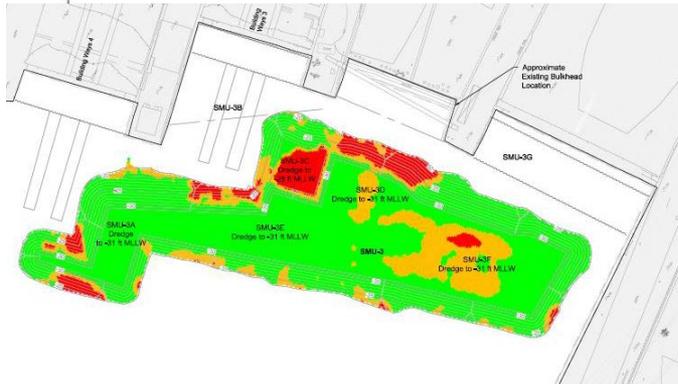
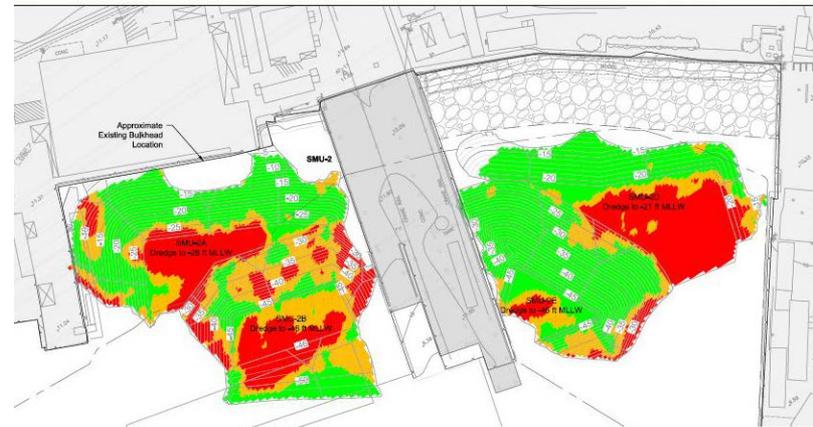
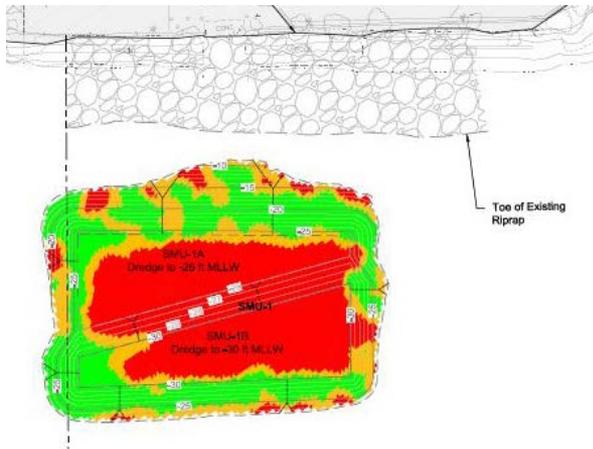


Automated
water quality monitoring equipment



Automated
water quality monitoring equipment

Sediment Removal at South Shipyard



Notes:

Green = above design elevation

Red = below allowable overdredge

Yellow = between design elevation and allowable overdredge

South Shipyard

- Shipyard activities had minimal effect on remedial operations
- Small remedial footprint
- 28,660 cy dredged
- Approximately 19,760 tons of cover placed
- Relatively minor demolition and debris removal

North Shipyard

- Shipyard activities had major effect on remedial operations
- Large remedial footprint
- 114,085 cy dredged
- Approximately 22,938 tons of cover placed
- Significantly more demolition and debris removal

Post-construction Remedial Monitoring

- Commence remedial monitoring 2 years (2018) and 5 years (2021) after completion of remediation
 - Chemistry analysis
 - Sediment toxicity testing
 - Bioaccumulation testing
 - Benthic community assessments

Keys to Successful Project Completion

- Up-front expectations with regulatory agencies (feasibility considerations)
- Use of post-dredge sampling to verify or adjust dredging completion
- Decision framework for post-dredge contingency actions
- Flexibility to accommodate shipyard operations
- Importance of manual water quality monitoring

Thank You



BAE Systems
North Shipyard

NASSCO
South
Shipyard



San Diego

Pacific Ocean

Project Location



Not to Scale