Underwater Oil Detection and Recovery Operations

Prevention First 2016

Michael Popa
T&T Marine Salvage

Overview

- U.S. Regulatory Requirements
- Updated OSRO Classification Guidelines
- American Petroleum Institute (API) Submerged Oil Response Guide
- Historical Case Studies
- Advances in Technology

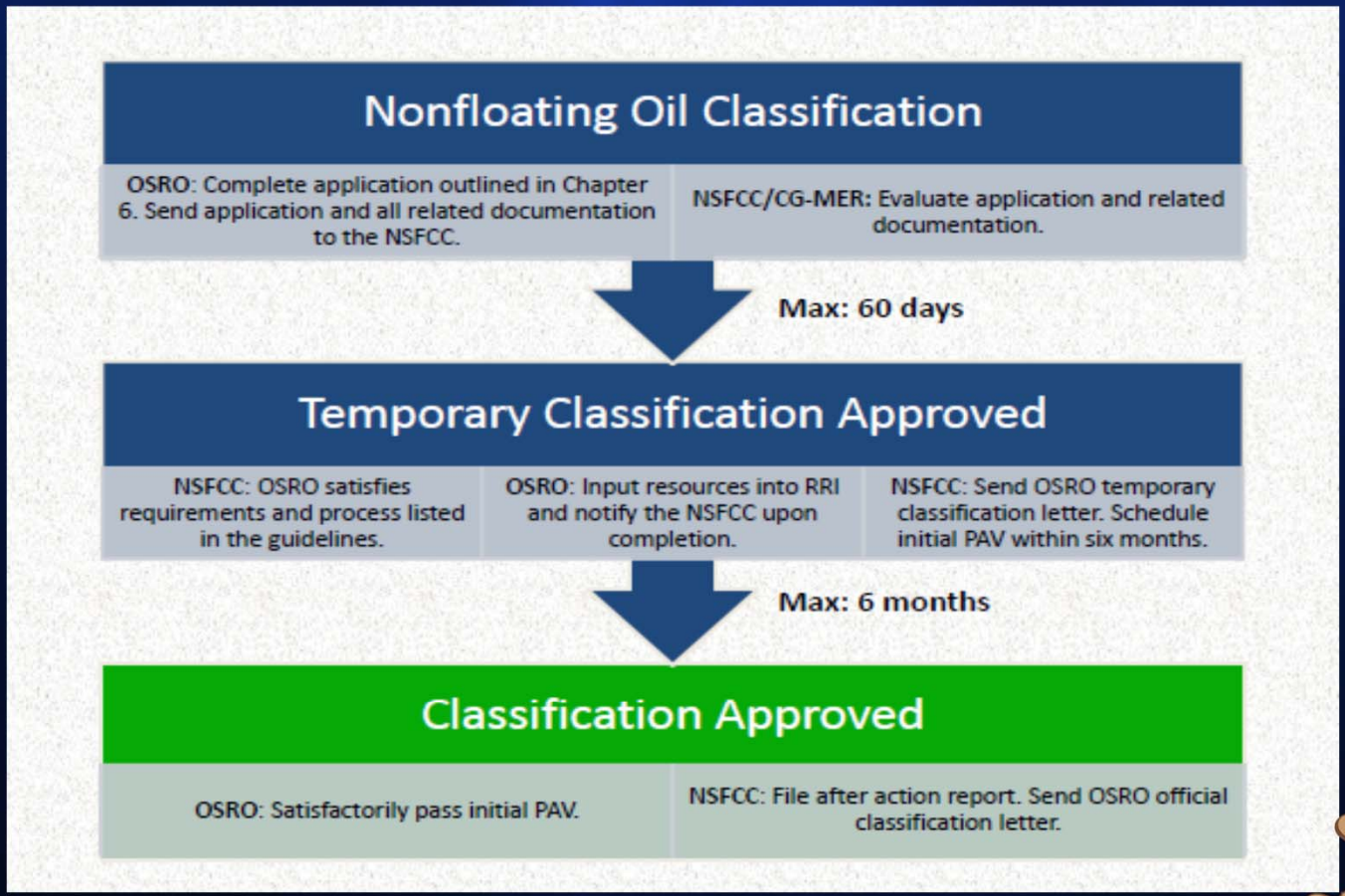
Nonfloating oils provide response challenges significantly different than for floating oils. Technology for tracking and predicting the behavior of submerged oil remains in its infancy. Currently, there does not exist robust and effective ways to remotely detect sunken oils under realistic field conditions nor sufficiently understand its ultimate fate.

National Oceanic and Atmospheric Administration (2008)

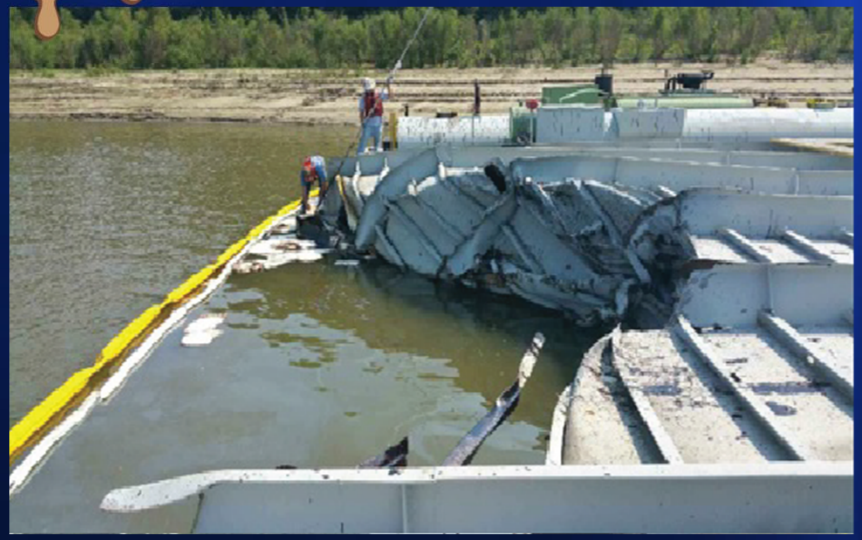
Salvage Planning Timelines

Service	Inland Waters Great Lakes Rivers & Canals < or = 12 miles	Ocean Environment 50 mile point
Salvage		
Assessment & Survey		
Remote assessment & consultation	1	1
Begin assessment of structural stability	3	3
On-site salvage assessment	6	12
Assessment of structural stability	12	18
Hull and bottom survey	12	18
Stabilization		
Emergency towingSalvage plan	12	18
External emergency transfer operations	16	22
Emergency lightering	18	24
Other refloating methods	18	24
Making temporary repairs	18	24
Diving services support	18	24
	18	24
Specialized Salvage Operations		
Special Salvage Operations Plan	18	24
Heavy lift	72	84
Subsurface product removal	72	84

Guidelines for the U.S. Coast Guard Oil Spill Removal Organization Classification Program PAV – Preparedness Assessment Verification



Upper Mississippi River 2015
#3 Starboard Tank Total Loss



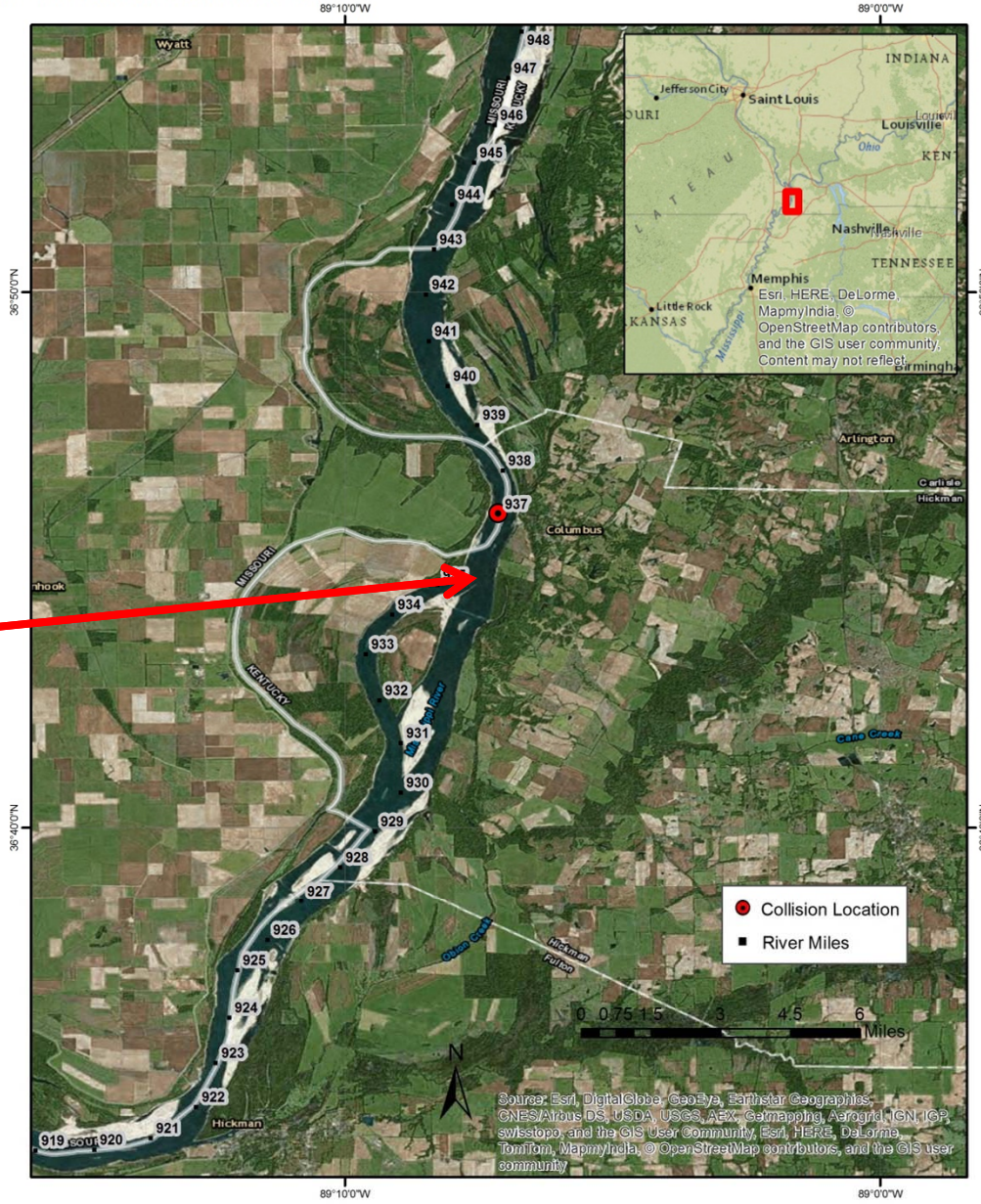
T/B APEX 3508

T&T MARINE SALVAGE INC.

UTV Dewey Collision, Incident Map 3-Sept-2015

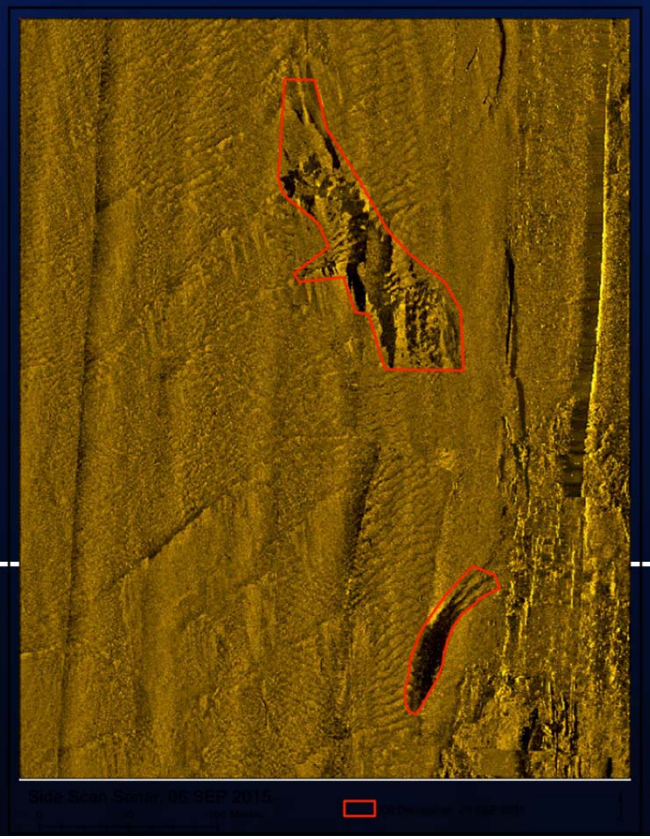
Type of Map: Incident Location
Prepared by: NOAA
USE ONLY AS A GENERAL REFERENCE

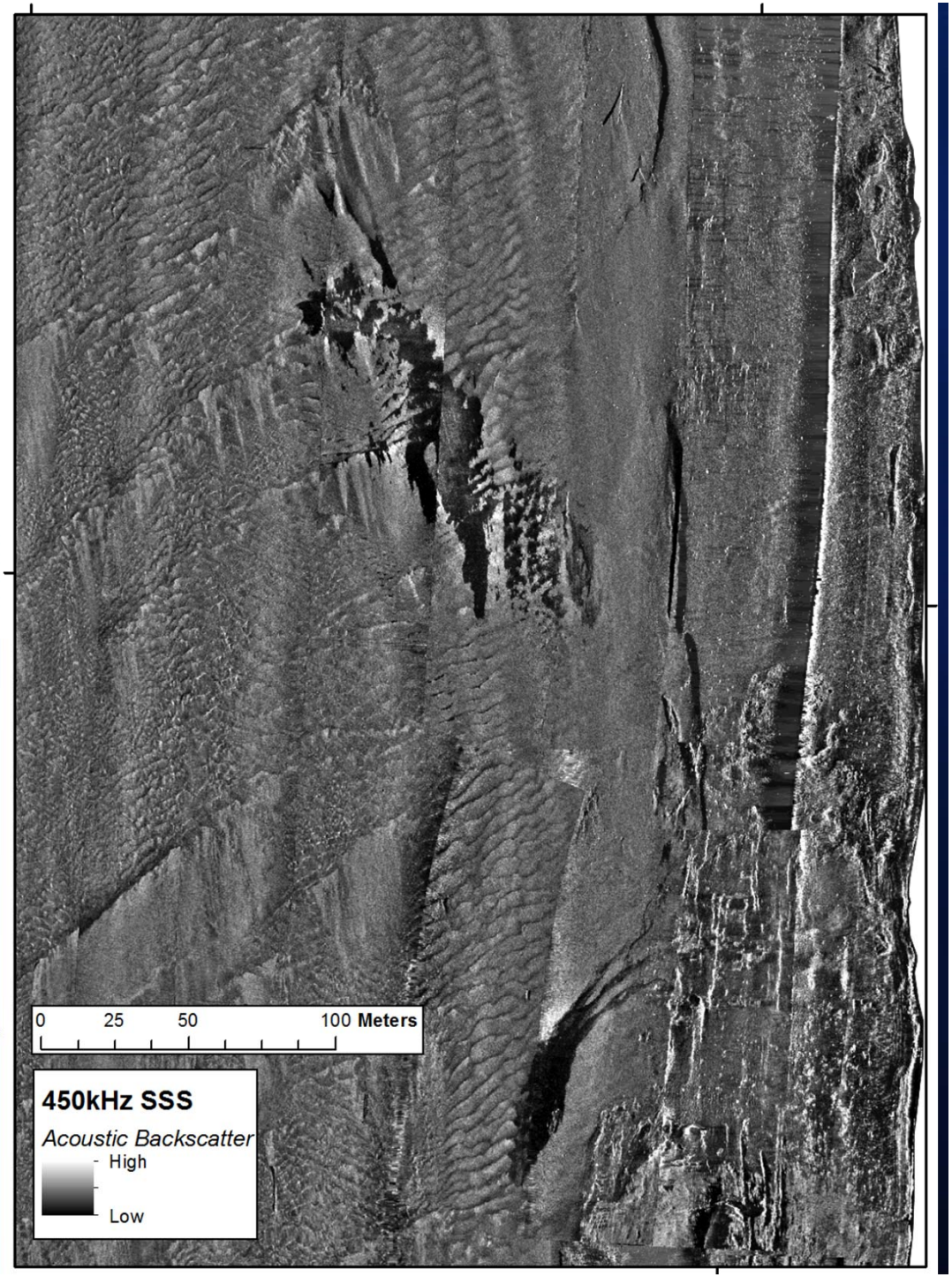
Date/Time: 09-03-2015 / 0900



High-resolution side scan sonar; two targets identified
- Collision site
- Current barge site

Processed near real time





Red = not likely effective; **yellow** = may be effective; **green** = most likely effective

	Suction Dredge	Diver Vacuum	Diver Pump	Excavator	Grab Dredge	Environmental Clamshell	Sorbents/V-SORS	Trawls and Nets	Manual Removal Shallow Water	Manual Removal by Divers	Agitation/ Refloat
Water Depth (ft)											
- < 5 ft											
- 5-40 ft											
- 40-80 ft											
- > 80 ft											
Water Visibility											
- > 5 ft											
- < 5 ft											
Water Current											
< 1 (kt)											
-1-2 kt											
- >2 kt											

ENVIRONMENTAL CLAMSHELL DREDGING

ACHIEVING CUSTOMER SATISFACTION BY REDUCING PROJECT OWNER COSTS AND INCREASING DREDGER PROFIT THROUGH INCREASED SEDIMENT REMOVAL EFFICIENCY.

RESUSPENSION ⇨ RELEASE ⇨ RESIDUAL = RISK

Sloping Profile

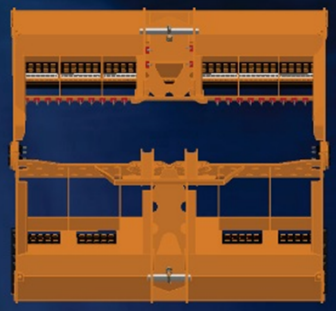
Allows for angled, lateral movement along an inclined bottom. Previously, over dredging in "steps" were required. These steps are then often filled in with capping material.

Lightweight

Eliminates the processing of hard, uncontaminated sediment.

Venting System with Open Center

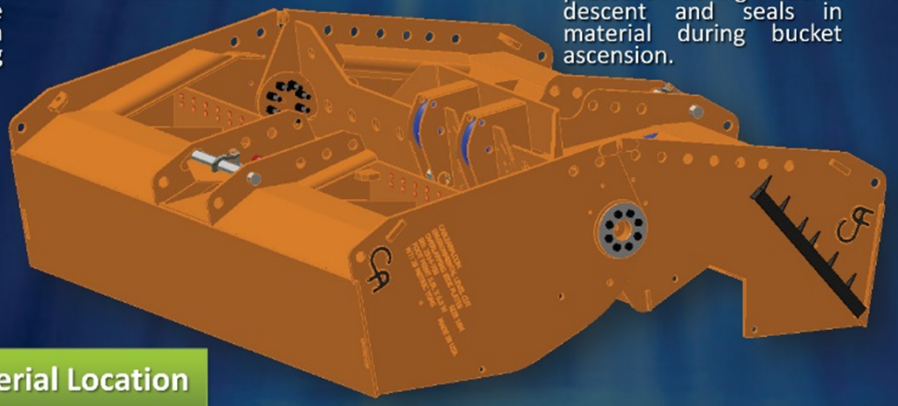
Decreases downward pressure during bucket descent and seals in material during bucket ascension.



Over-Square Footprint

Width greater than opened length minimizes outward flow of material during bucket closure.

(up to 100 m^2)



Overlapping Side Plates

Minimize outward flow (windrowing) of material during bucket closure and seals in material during bucket ascension.

Material Location

Center of Mass of material is located below the center of the bucket's containment area minimizing material washout during bucket closing and ascension.

Level-Cut

Produces a near flat surface opposed to the pothole effect which can create a pool of contamination.

Low Water Content

Squeezes and drains water to minimize transportation/disposal costs.

150° Cutting Edge

Allows the bucket to "scoop" material which lowers the materials center of mass within the containment area.

CLAMVISION®

PRECISE XYZ DREDGE POSTIONING SOFTWARE

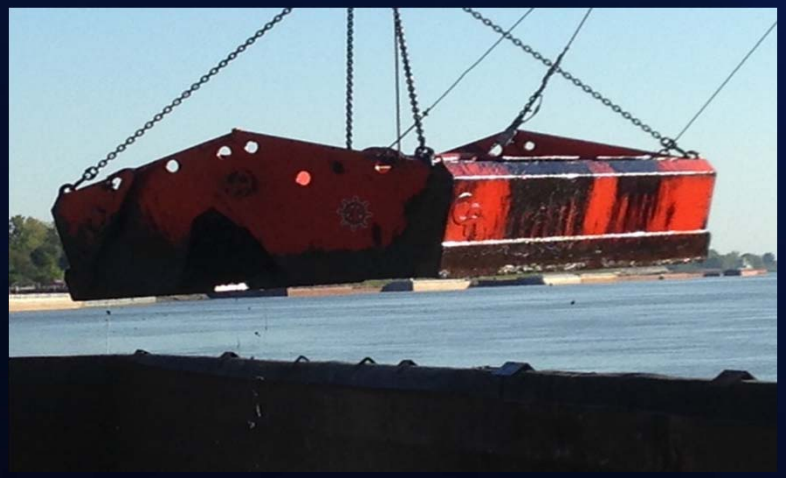
Cable Arm

info@cablearm.com

CAP

CABLE ARM POSITIONING


2870 Barrels of Heavy Clarified
Slurry Oil (CSO) spilled and sank
to 90 ft. on Mississippi River

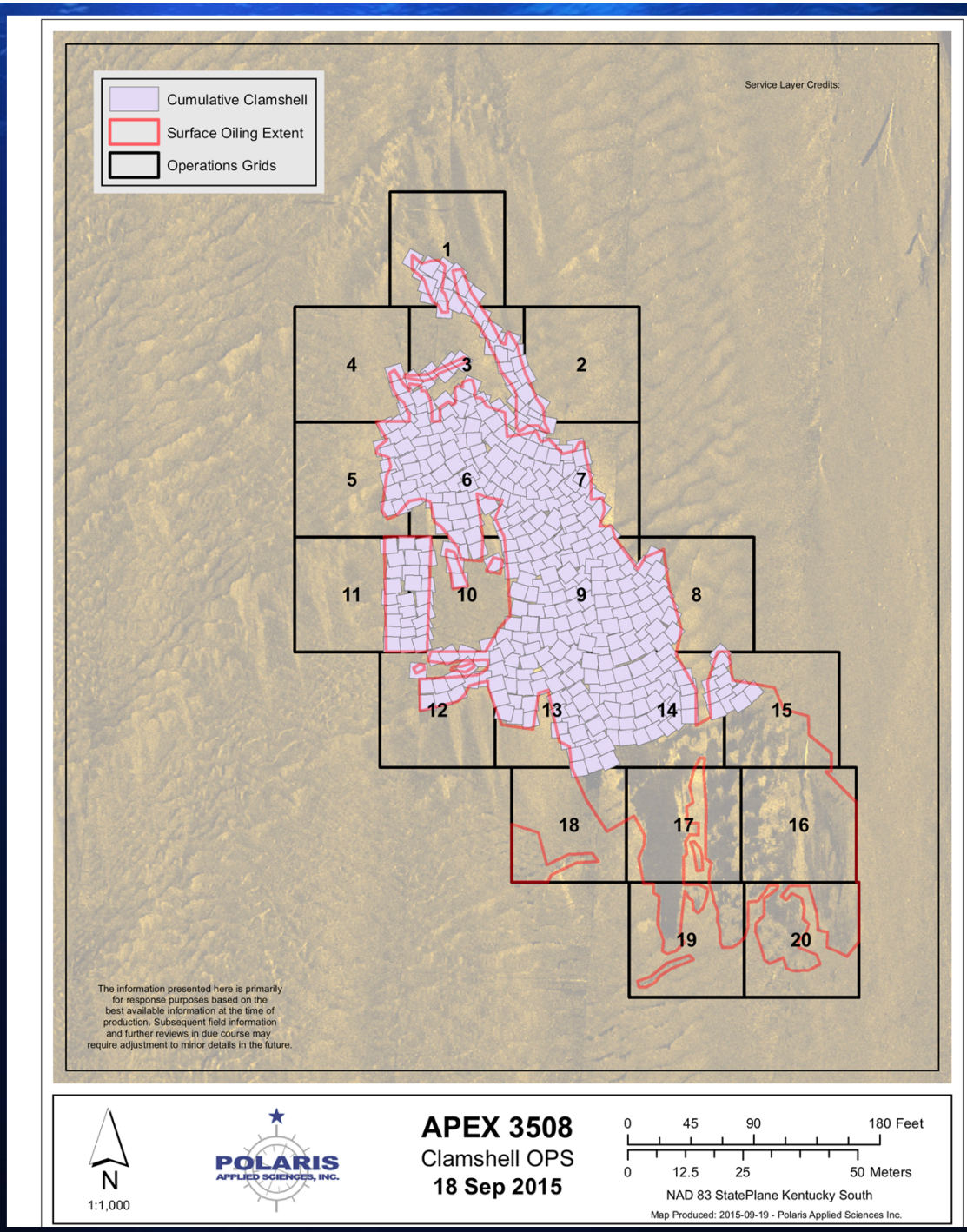


Solids Removed: 2,260 yd^3

Recovery Of Contaminated Material Observed By All Involved Stake Holders & Recorded

Stakeholders Provide Timely Operational Recovery Decisions On Site

Tracking the progress of the oil removal with the Environmental Clamshell



T/B *Apex 3508* Summary

Spill Details

- 2,870 bbl Clarified Slurry
- API = -7.4 (SG = 1.14)
- Viscosity = 160,000 cSt
- Sank straight to the bottom

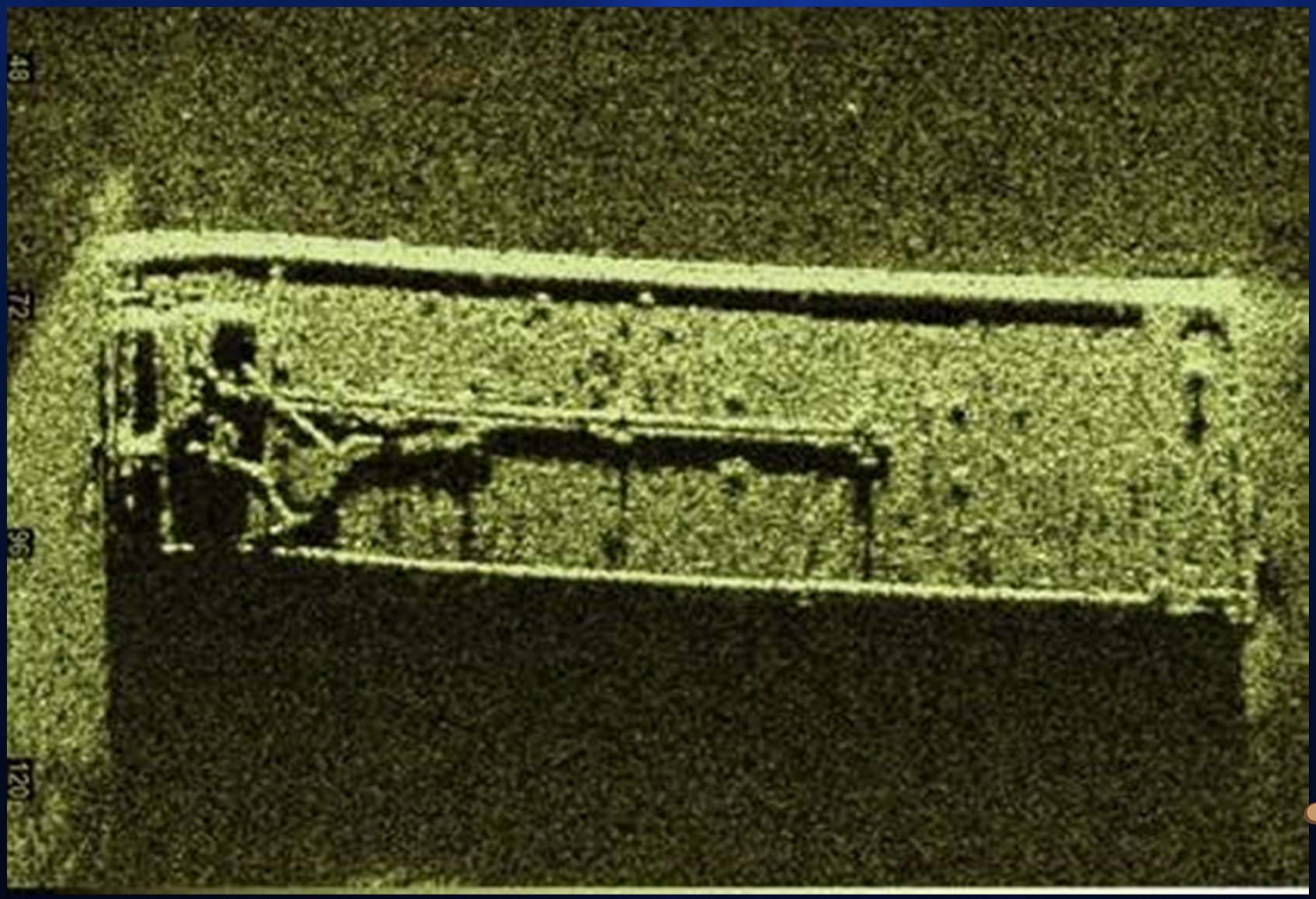
Detection Techniques

- Side scan sonar, MBES
- V-SORs, stationary sorbents
- Sediment coring
- Diver observations

Recovery Technique

- Environmental Clamshell Dredge
- 2,260 yd^3 over 10 days

T/B ARGO Sunken Barge Lake Erie- August 2015
Cleveland Underwater Explorers (CLUE) Divers Discovered Sunken Tank Barge
Reported Findings to United States Coast Guard, Sector Detroit



USCG Requested T&T Marine Salvage, Inc. Provide Dive Survey. Confirmed Barge Dimensions Matched T/B ARGO.

Port Clinton, OH- Lake Erie

Findings

- Barge approximately 120-ft by 35-ft with 4 to 5-ft visible above the mudline.
- Barge covered in marine growth; 4 to 6-in in some locations.
- Discovered holes on bow rake and four open hatches forward; eight closed cargo hatches
- Due to low visibility and heavy marine growth, hand-over-hand assessment was required

Diver places finger in top deck of rake

- T/B ARGO Sank in Storm October 20, 1937
- Single Steel Skin
- Riveted Hull Design with Eight Cargo Tanks
- Constructed in 1911
- Total Oil Cargo Carried reported 4,762 BBLS.
- Benzoyl Crude Oil
- Cargo included Benzene, Toluene, Xylene
- Listed on NOAA RULET Sunken Ship Program, ARGO is one of 87 wrecks that pose potential threat of pollution in the USA
- RULET – Remediation of Underwater Legacy Environmental Threats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T

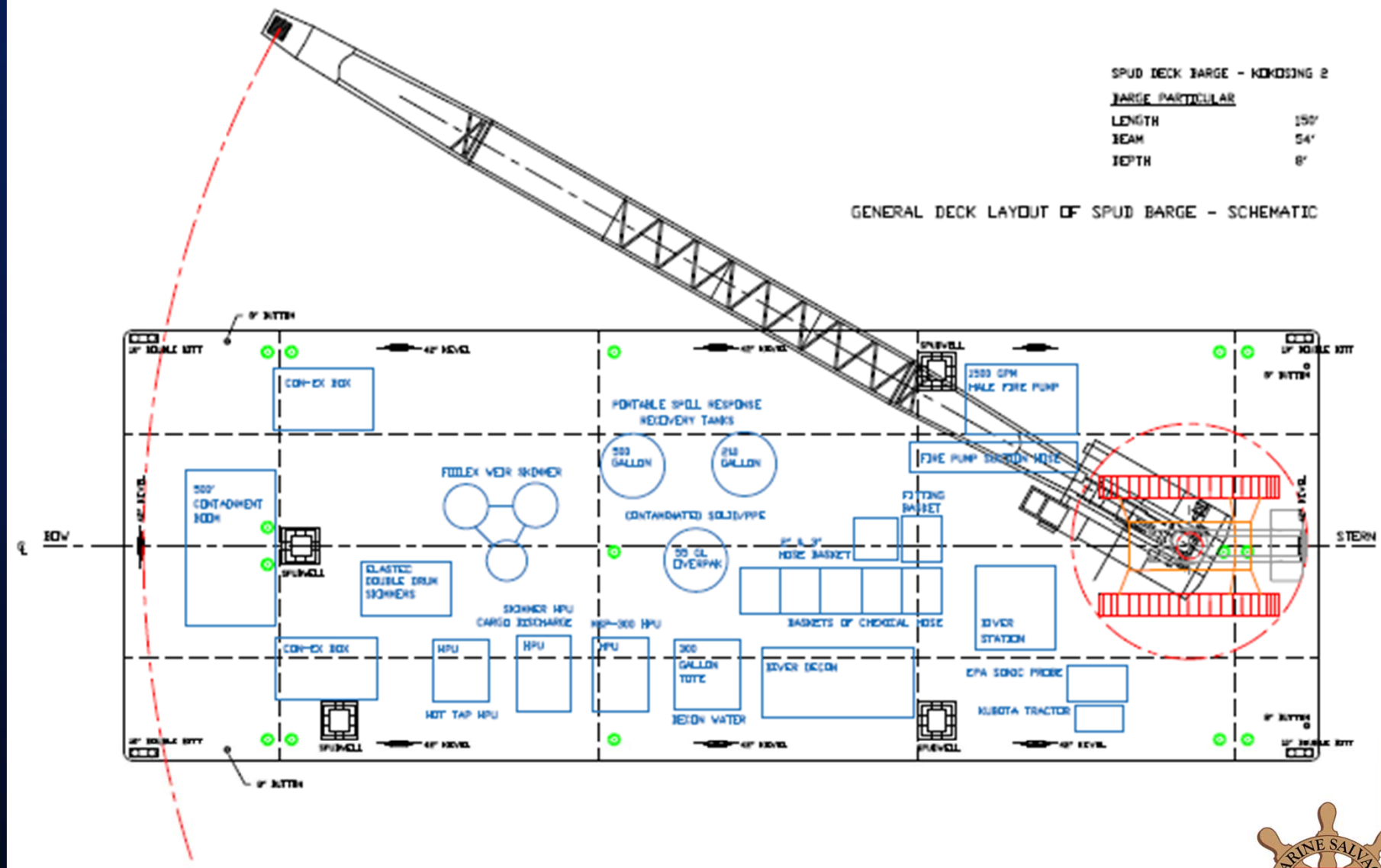
Positive Pressure DESCO Helmet and HAZMAT Viking Dry Suit

Salvage Plan Developed

Plan Included:

- Initial Survey
- Load out Plan/Calculations
- Lightering Plan
- Cargo Offloading Plan
- Dive Plan
- Safety Plan
- Air Monitoring Plan
- Pollution Response Plan

All Plans submitted to Unified Command for Approval


SPUD DECK BARGE - KOKOSING 2
BARGE PARTICULAR
LENGTH 150'
BEAM 54'
DEPTH 8'
GENERAL DECK LAYOUT OF SPUD BARGE - SCHEMATIC
CON-EX BOX
PORTABLE SPILL RESPONSE RECOVERY TANKS
500 GALLON
210 GALLON
2500 GPM MAIN FIRE PUMP
FIRE PUMP SUCTION HOSE
FITTING BASKET
500' CONTAINMENT BOOM
FOILEX VEER SKIMMER
CONTAMINATED SOLIDS/PPE
55 GL OVERPAK
HOSE BASKET
ELASTEC DOUBLE DRUM SKIMMERS
SKIMMER HPU
CARGO DISCHARGE
HPU-300 HPU
BASKETS OF CHEMICAL HOSE
DIVER STATION
CON-EX BOX
HPU
HPU
HPU
300 GALLON TOTE
DEION WATER
DIVER DECON
EPA SONIC PROBE
KUBOTA TRACTOR
HOT TAP HPU
STERN


T&T MARINE SALVAGE, INC.
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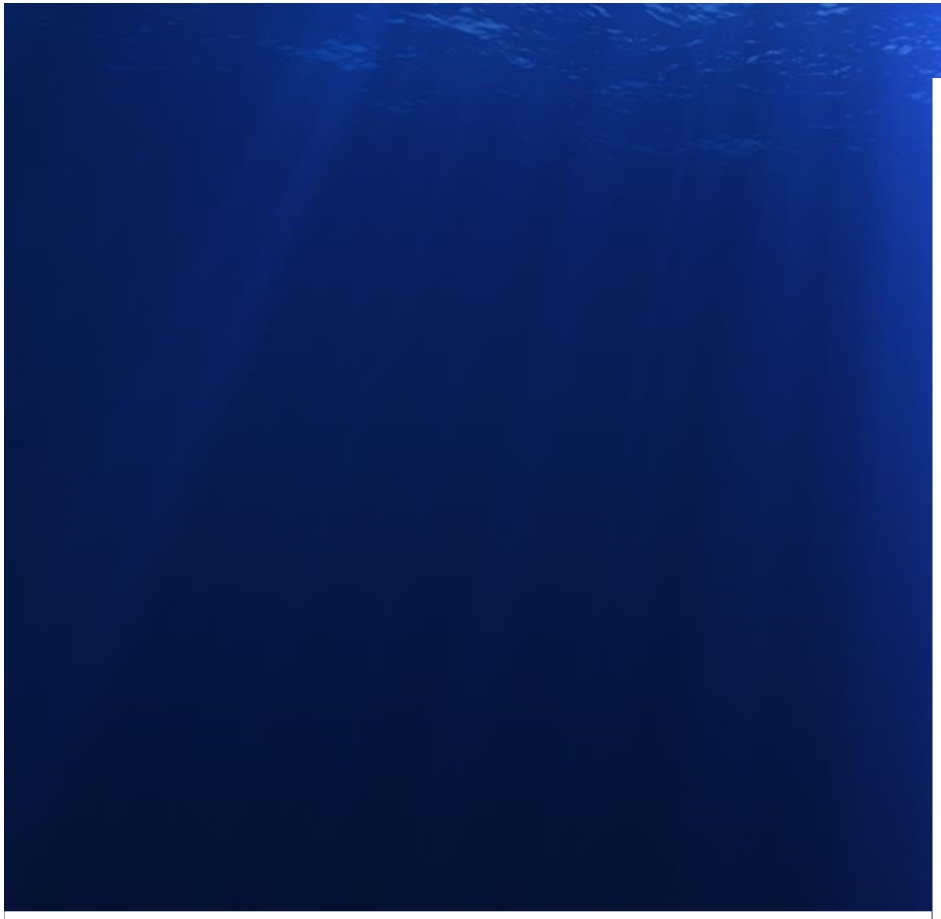
20,000 Gallon Portable Frac Tank

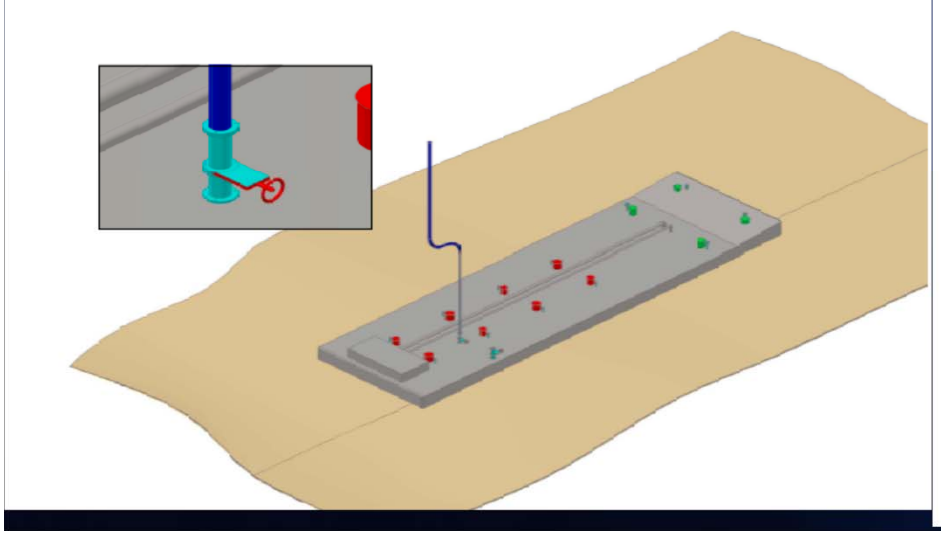
Loading And Offloading Manifold
Included Sample Valve

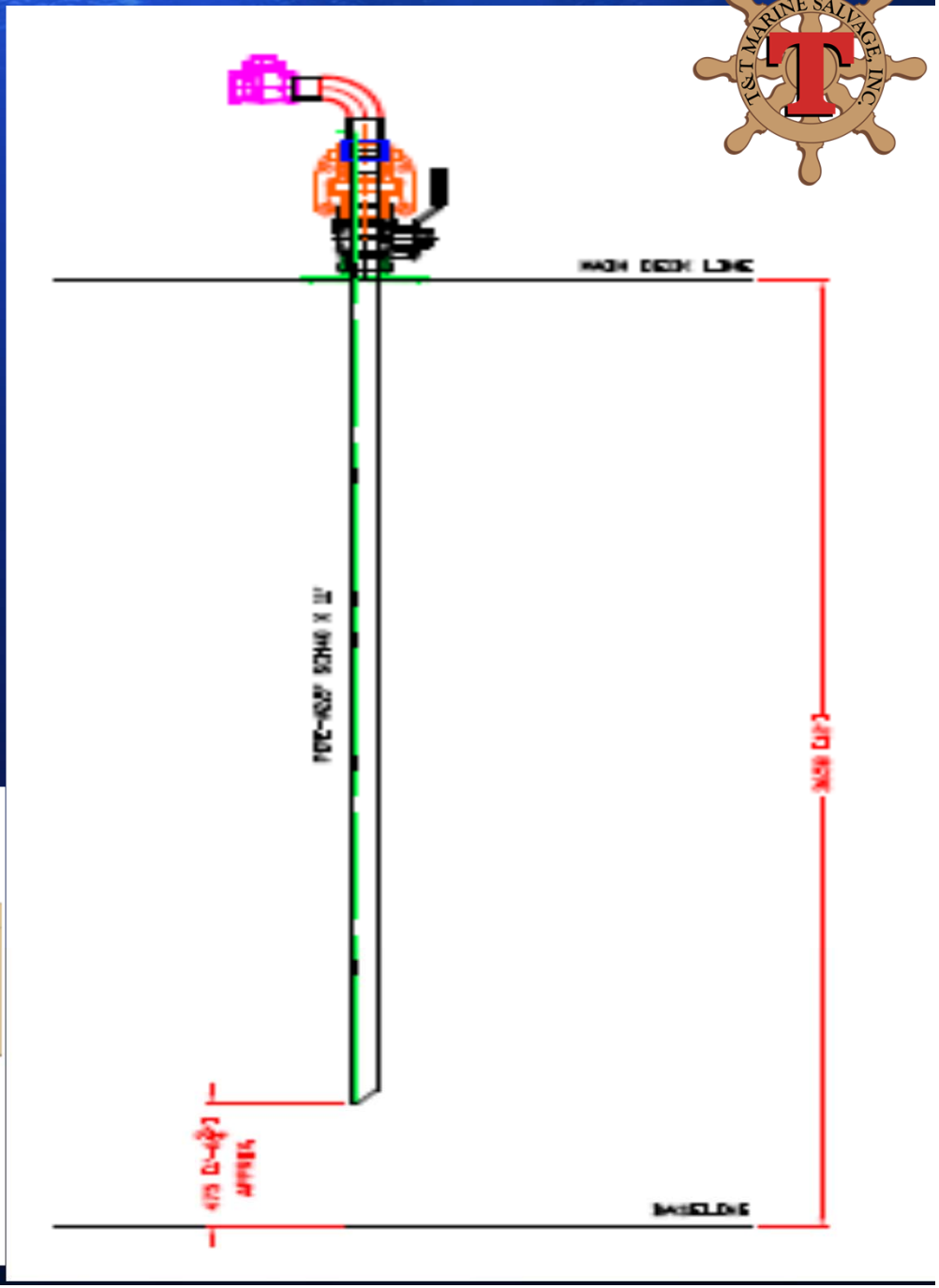
Nitrogen and Carbon Units

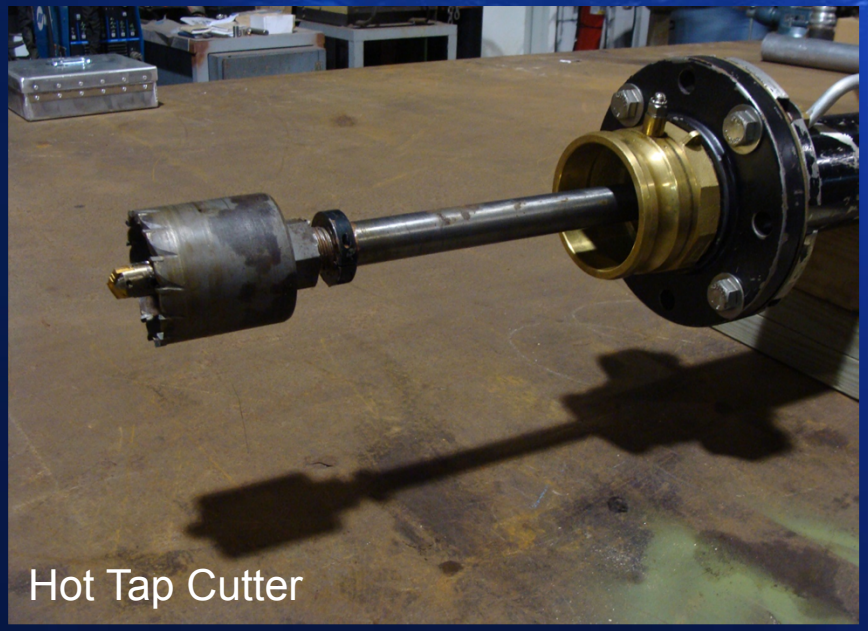
Portable Tank Farm Outfitted On VoO

Portable Tanks Utilized On Vessel Of Opportunity (VoO)

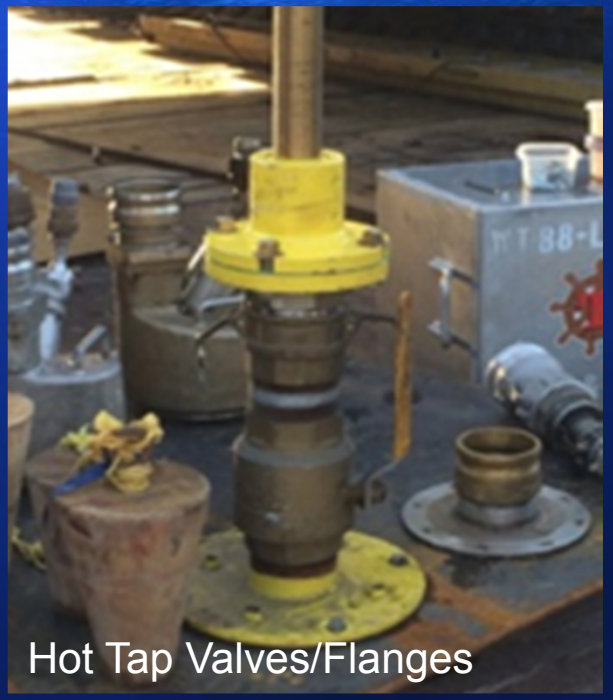








Hot Tap Cutter



Hot Tap Valves/Flanges

Coupon

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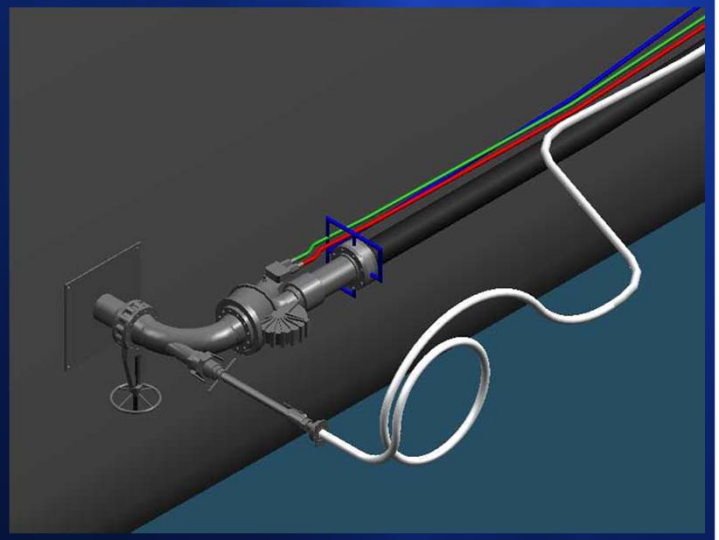
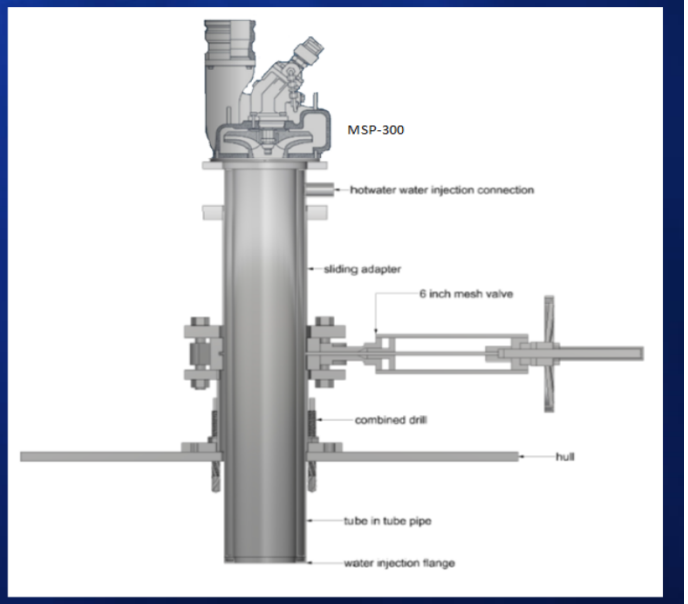
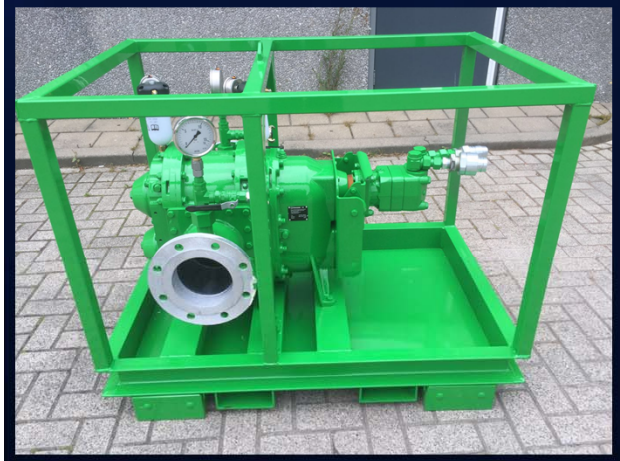
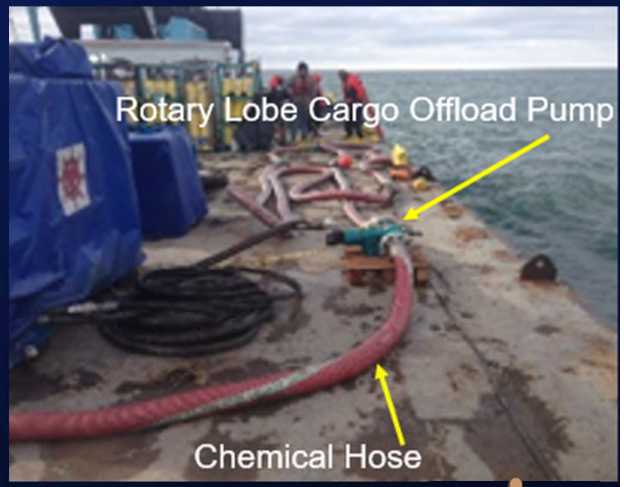
Submersible Hydraulic Pump









Rotary Lobe Pump

RECONSTRUCTED GENERAL ARRANGEMENT PLAN – ILLUSTRATION PURPOSE

T&T MARINE SALVAGE, INC.

TANK BARGE 'ARGO'

BARGE PARTICULARS

OFFICIAL NAME:	ARGO
OFFICIAL NUMBER:	164617
YEAR BUILT:	1911
FLAG:	U.S.
LENGTH:	120FT
BEAM:	35FT
DEPTH	12FT

UNDERWATER – SURVEY/WORK STATUS

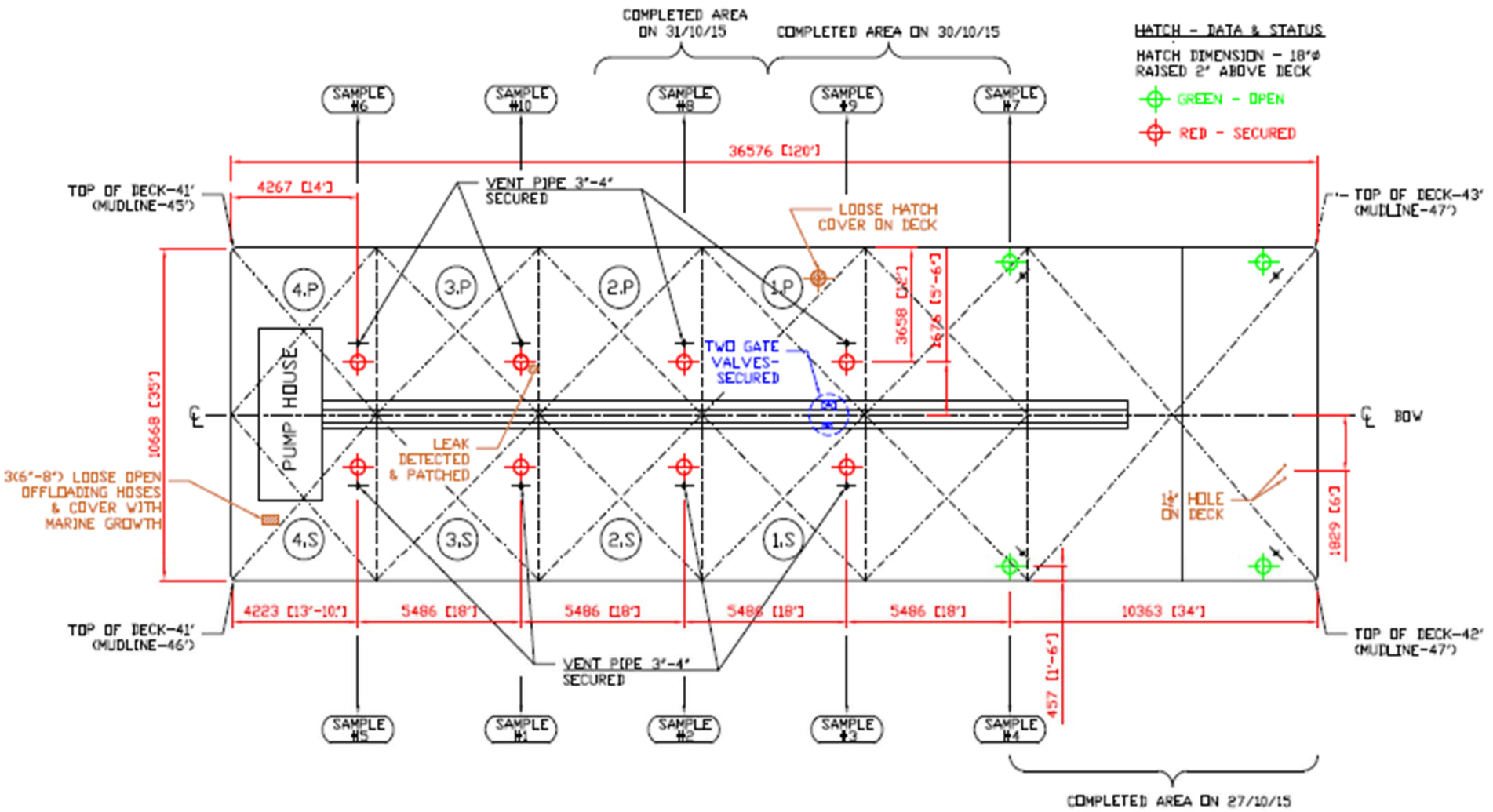
AREA WITHOUT BRACE PARENTHESES WAS COMPLETED – 01/11/15

HATCH – DATA & STATUS

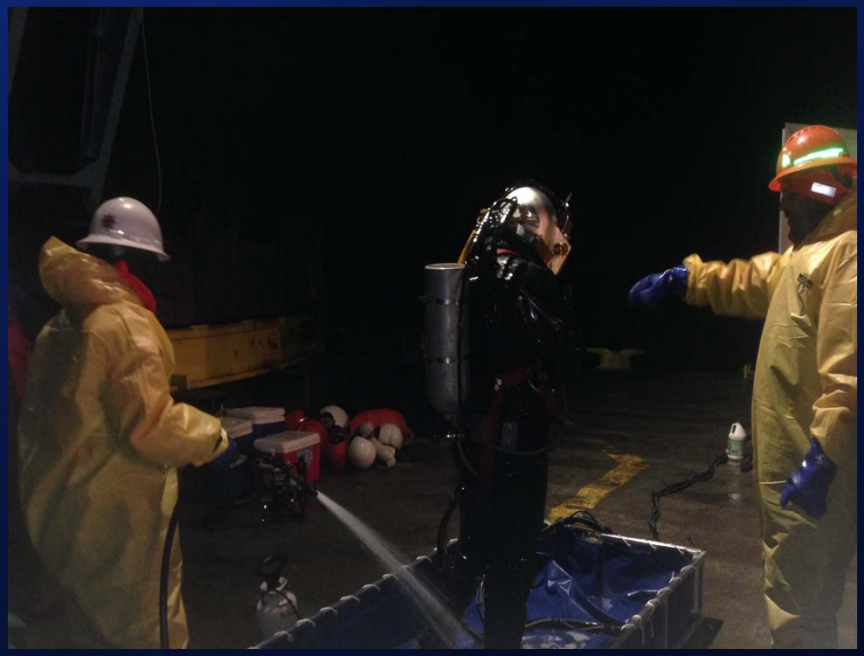
HATCH DIMENSION – 18"ø
RAISED 2" ABOVE DECK

GREEN – OPEN

RED – SECURED



Difficult sea conditions made it necessary to adjust operations.
Switch from Spud Barge to Barge with 4 Point Anchoring System
Night Operations included capitalize on Weather Windows



T&T MARINE SALVAGE, INC.

Fire pump staged for fire watch during cargo removal

.

Spill Response Plan developed including response equipment staged on location. Plan developed based on Geographic Response Plans (GRP)

Summary

- Liquids removed from ARGO Tanks - 48,821 gallons
- Carbon used for Vapor Recovery System - 10,000 lbs. transported in 2 - 20 yard roll off boxes.

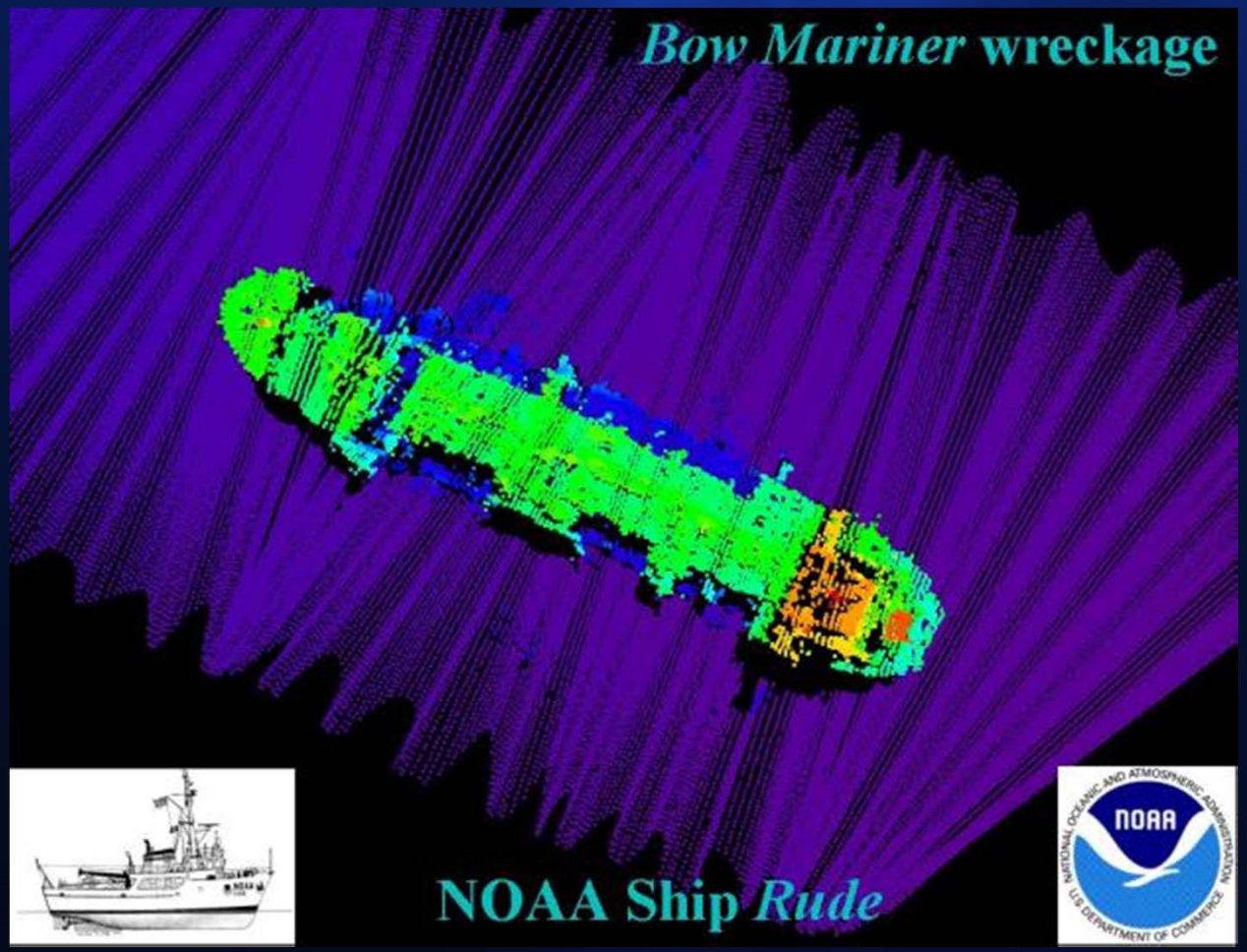
Detection Options

- Visual
- Divers
- VSORS
- Net Trawls
- Snare Sentinels
- Sorbent Drops
- Bottom Sampling
- Fluorometer
- Side-Scan Sonar
- Multi-Beam Sonar
- Bottom Classification System
- Real-Time Mass Spectrometry
- Echoscope
- Laser

Submerged Oil Assessment

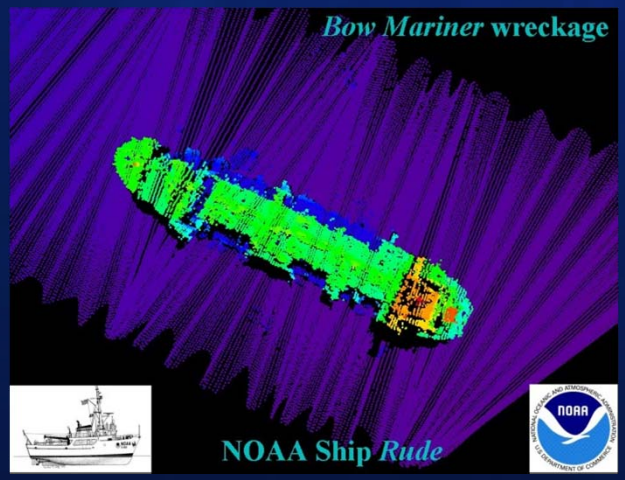
- In-Situ Visual (Divers)
- Remote Visual (VSORS/Sentinels)
- Side-Scan Sonar
- RoxAnn Bottom Classification System
- Remote Video (ROV/Towed Video)

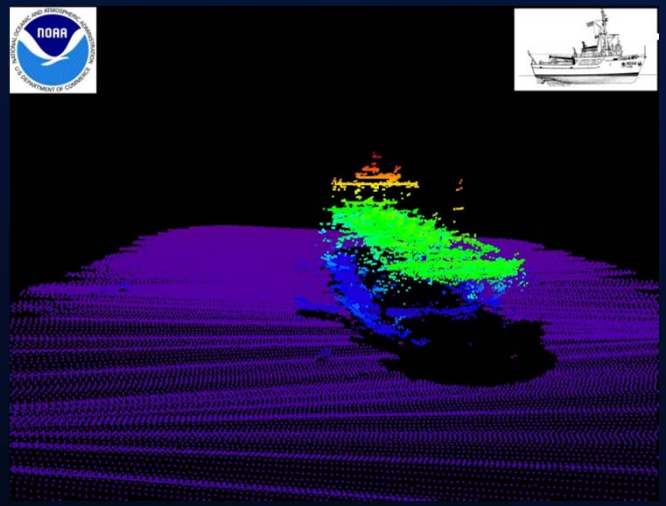
On February 28, 2004, T/V BOW MARINER, a Singapore-flagged chemical tanker, left Linden, New Jersey, for Texas City, Texas, carrying a partial cargo of 3.2 million gallons of ethanol when it exploded and sank 50 miles off the coast of Virginia. Sunk 250 ft. water.



T/V BOW MARINER

BOW MARINER





Side Scan and Multi Beam Sonar Images

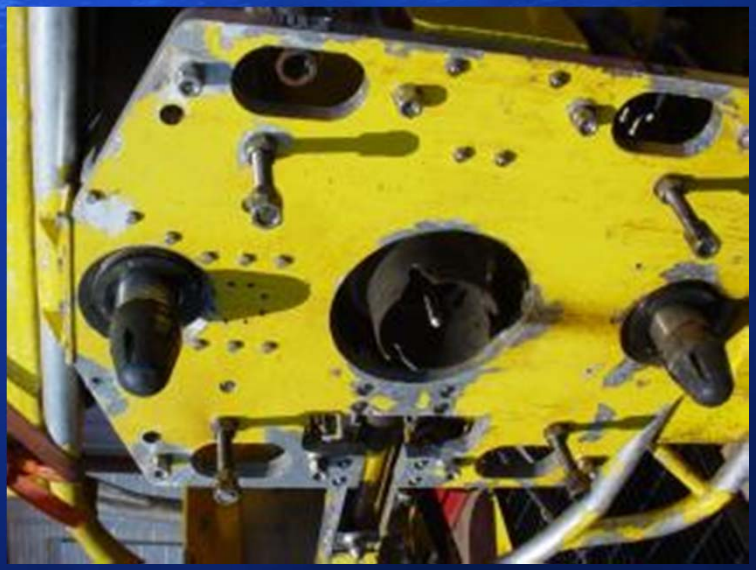
The NOAA vessel “RUDE” was deployed in the first days after the sinking to obtain sonar images of the wreck. These images showed the wreck to be in an upright position and confirmed damage consistent with massive explosions.

Oil Recovery Operations (FRAMO ROLS) designed for recovering oil from sunken wrecks. The ROLS unit in conjunction with ROV’s performed all sub-sea operations.

Due to the viscosity of the fuel oil carried aboard the BOW MARINER a steam heating system was required. Steam plants were installed.

ROV friendly plugs were on hand. These can be inserted by ROV into the holes milled into the fuel tanks

ROLS

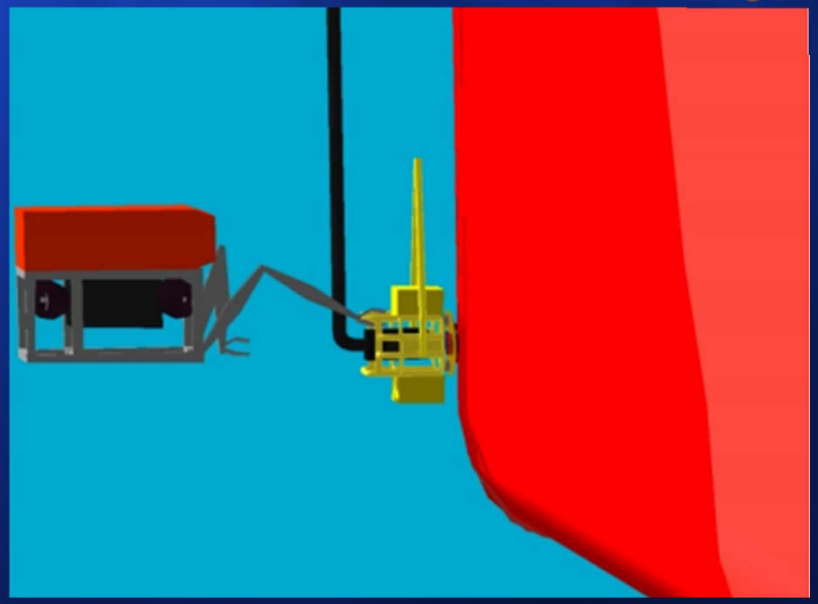


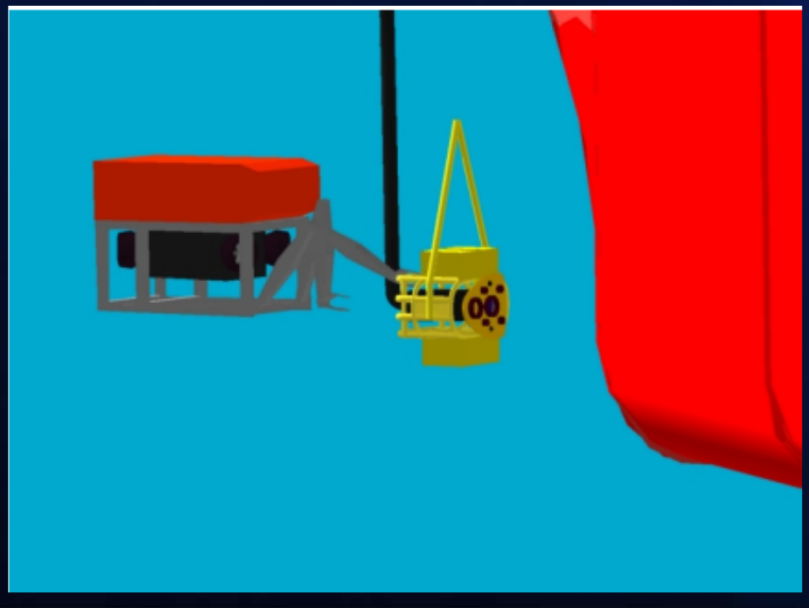
Milling Unit

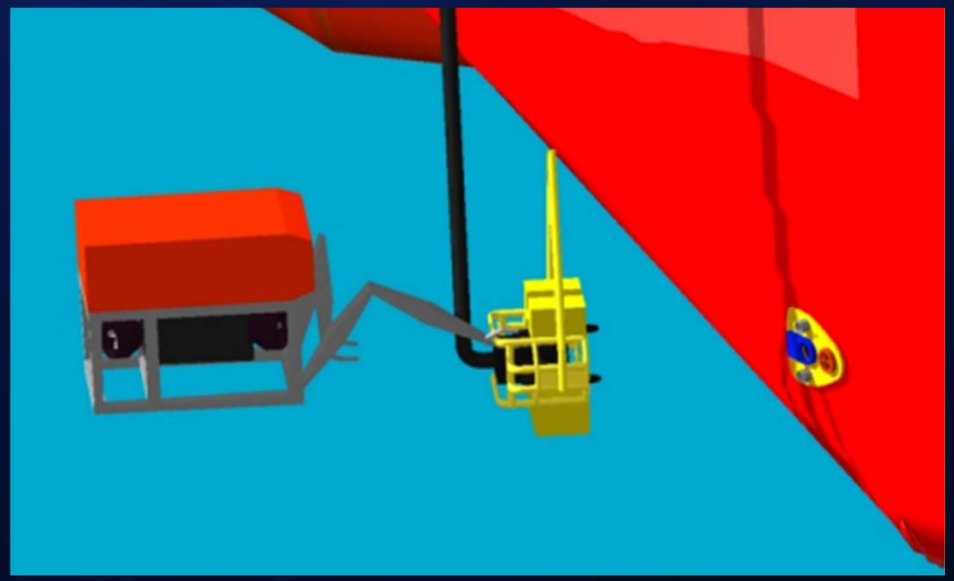
Base Plate Connection

Frank Mohn AS Oil and Gas
Remote Offloading System (ROLS)

ROLS







Looking Forward / Issues

Submerged Oil Plume Modeling
In-Situ Monitoring Capabilities
Decision-Making Tools
Submerged/Sunken Oil Response Capabilities