

The Use of Future First Planning, the Triad, and Performance-Based Contracting to Accelerate Site Closure at Seymour Johnson AFB



Contract Overview



SITE NAME	SITE CLOSURE DEADLINE	CURRENT STATUS
F-15 Ramp	MAY 2010	SITE CLOSURE NOV 2008
Radar Tower Site	MAY 2010	REMEDIAL ACTION OPERATIONS
Bulk Fuel Storage Area (BFSA)	DEC 2010	REMEDIAL ACTION OPERATIONS
	DEC 2010	SITE CLOSURE MAY 2006
	DEC 2010	SITE CLOSURE MAY 2006
	DEC 2010	REMEDIAL ACTION OPERATIONS
KC-135 Ramp	DEC 2010	REMEDIAL ACTION OPERATIONS
BX Service Station	NOV 2011	SITE CLOSURE FEB 2007
Fire Training Area No. 3	NOV 2011	REMEDIAL ACTION OPERATIONS
Fire Training Area No. 1	NOV 2011	SITE CLOSURE JULY 2007
Fire Training Area No. 2	DEC 2010	SITE CLOSURE OCT 2006
Old Entomology Shop	DEC 2010	SITE CLOSURE NOV 2008
Landfill No. 4	DEC 2010	SITE CLOSURE NOV 2007
Landfill No. 1	DEC 2010	SITE CLOSURE NOV 2007
Landfill No. 2	NOV 2011	SITE CLOSURE NOV 2007
Landfill No. 3	NOV 2011	SITE CLOSURE NOV 2007

Regulatory Framework



 Regulatory oversight performed through three NCDENR regulatory programs:

- Underground Storage Tank (UST) Program:
*SS-04, SS-12, ST-14 and
BFSA (ST-01, SD-02, SD-03, ST-05)*
- Inactive Hazardous Sites Branch (IHSB) Program:
FT-07, FT-19, FT-20, OT-21, OT-29
- RCRA Program (Landfill) Sites:
LF-06, LF-08, LF-15, LF-16

Site Closure Strategy



Site Closure Strategy Based on a Marriage of:

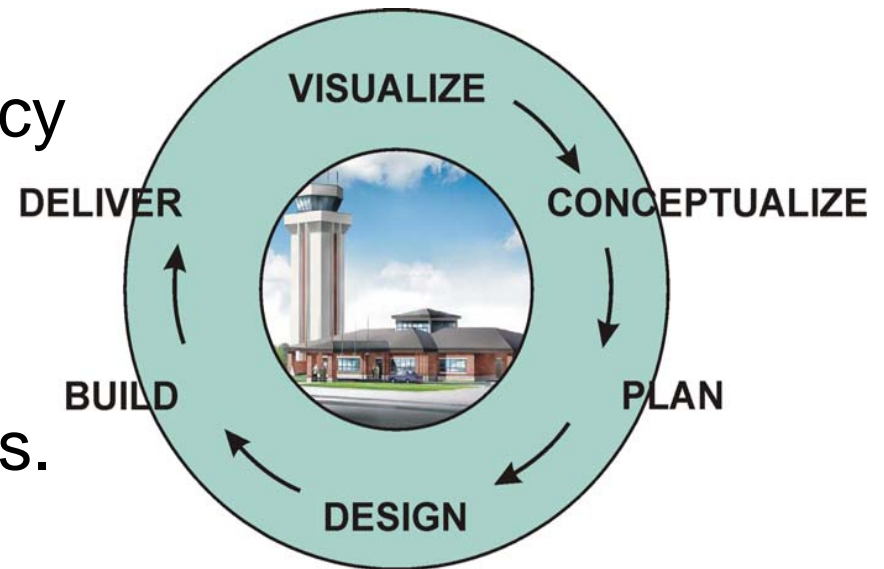
- Future First Planning
- Triad
- Innovative Technologies
- Remedial Process Optimization
- Decision-Based Partnering

Future First Planning



Future First Planning (F2P):

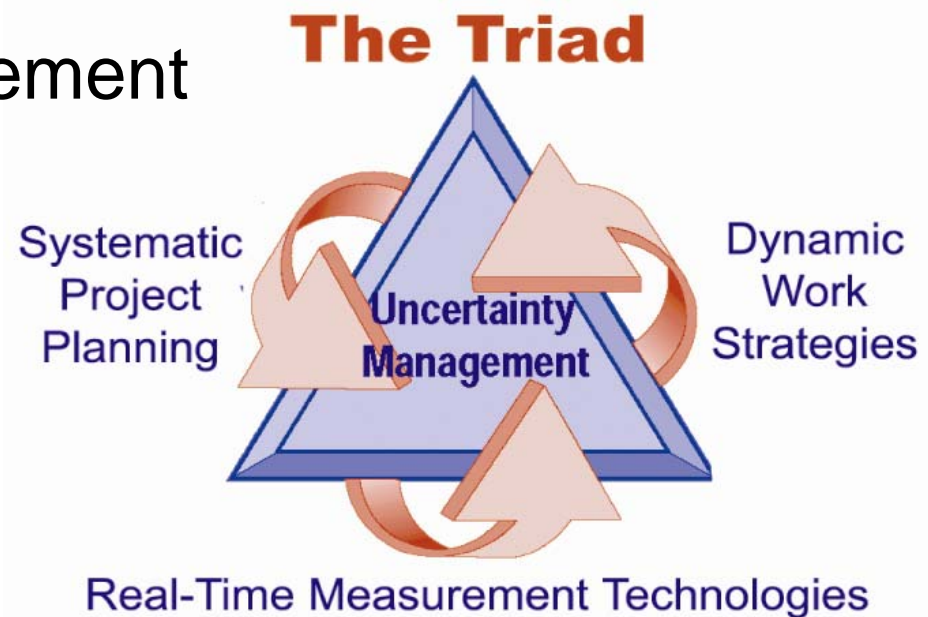
- A process that fuses Base development planning with environmental cleanup to optimize land use.
- Represents a shift in policy where environmental restoration sites are viewed as potential assets instead of liabilities.



The Triad

Uncertainty Management through the Triad:

- Systematic Project Planning
- Dynamic Work Strategies
- Real Time Measurement Technologies



SJAFB Triad Elements



Systematic Project Planning:

- Developed preliminary Conceptual Site Model (CSM) using data from past investigations
- Evaluated real time analytics and feasibility of use based on anticipated in-field decisions
- Incorporated potential remediation approaches into data collection techniques
- *Cost savings realized through reduced mobilizations*

SJAFB Triad Elements (cont.)



Dynamic Work Strategies:

- Decision Trees allowed in field decision-making, preventing equipment down-time and reducing fixed-lab costs
- Flexible work plan allowed changes to occur when the CSM changed
- *Iteratively updating the CSM and continuously adapting the investigative strategy helped to reduce uncertainty and allow for full characterization of the site*

SJAFB Triad Elements (cont.)



Real Time Measurement Technologies:

- Real time data used to update the CSM throughout the investigation for continuous use to direct additional data collection
- Electronic data (*CPT data, stratigraphic logs, LIF data*) produced/transmitted daily and posted to Bay West's web site for access/review by Client
- *Real Time Measurement allowed the Team and stakeholders to make informed, quantitative site decisions while in the field*

OT-29

Former Radar Tower Site

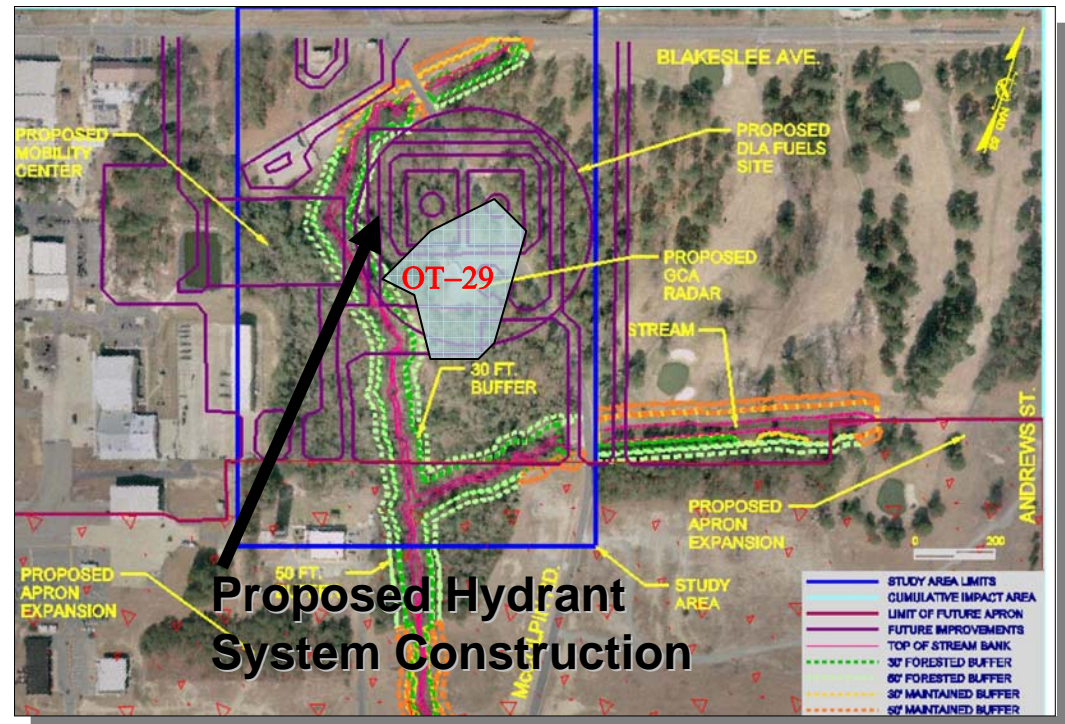


Overview

- Pending Mission Critical fuel hydrant system
- Mixed plume of petroleum hydrocarbons and chlorinated hydrocarbons
- Original system installed as Interim Remedial Action
- 1998 construction completed and system started

Original System

- Biosparge/biovent wells and groundwater extraction trench
- 2018 projected cleanup



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Cleanup Strategy

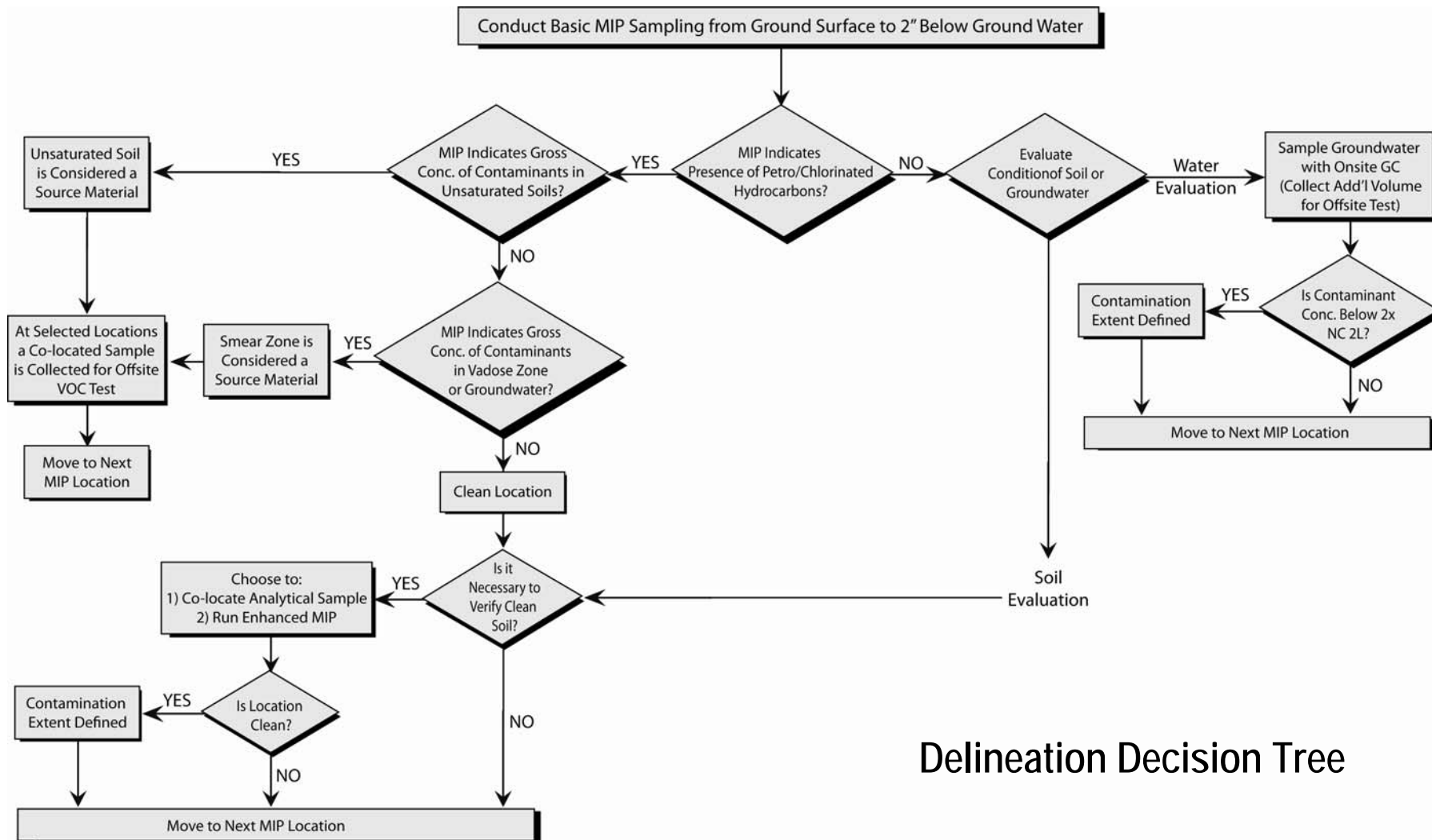


- ⑥ Site characterization utilizing the Triad
- ⑥ Removal of residual LNAPL using surfactant flush and recovery
- ⑥ Excavation of contaminated soils
- ⑥ Groundwater treatment through chemical oxidation events



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Dynamic Work Strategies



Delineation Decision Tree

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Characterization Actions Performed

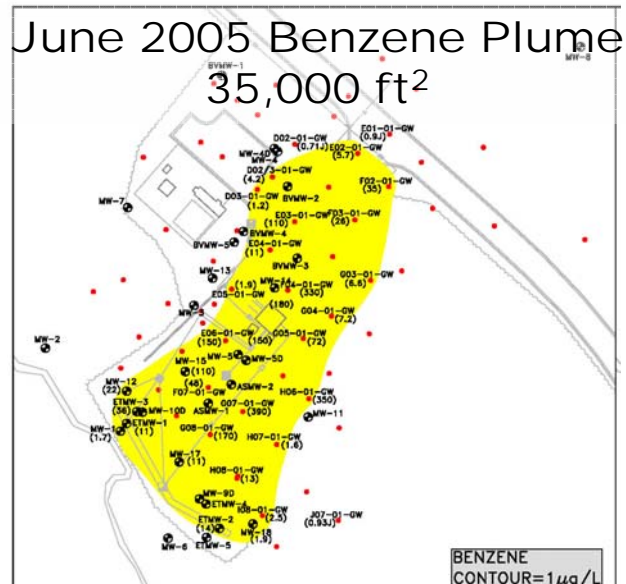


Membrane Interface Probe Characterization

- 55 points analyzed
- MIP enabled determination of source area and extents

Rapid Analysis

- Soil and groundwater samples used to correlate data with MIP
- PID headspace analysis performed on potentially contaminated soil



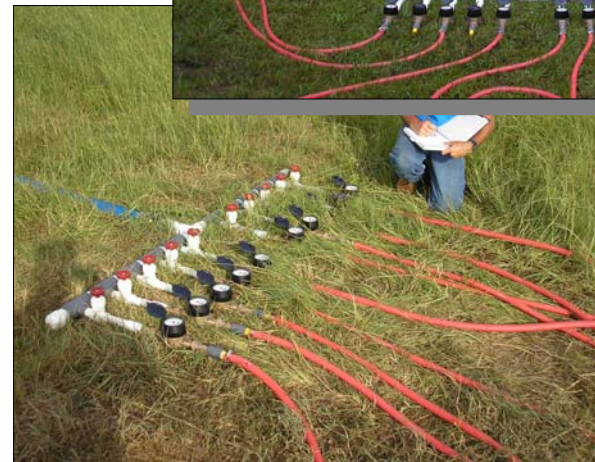
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Surfactant Injection



Field Activities:

- Installed temporary injection points within targeted LNAPL area based on Triad results
- Injected 10,000 gal of 1.6% non-ionic surfactant (1,250 gal/well)
- Used MMPE to recover surfactant and >700 gal of petroleum product
- Work completed in 2 weeks



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“Hot Spot” Excavation



TCE Source Removal adjacent to Radar Tower

- Source removal of 2,000 tons of impacted soil
- Excavation extents based on Triad delineation results – soil removed from 2 areas



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Biopile Construction



Actions Completed:

- Constructed biopile to treat petroleum/VOC-impacted soil on-site
- Biopile actively vented and moisture content managed
- Highly-impacted soil amended with approx 1,000 gal hydrogen peroxide (12 wt %) and tilled
- Beneficial reuse of cover material for local landfill following treatment



	NCDENR Unrestricted (mg/kg)	Jan. 2005 (mg/kg)	Oct. 2005 (mg/kg)
Benzene	0.006	0.003	ND
Toluene	7.3	0.5	ND
Ethylbenzene	0.24	5.14	0.002
Xylenes	5	31.9	0.03
Aliph. C5-C8	72	659	28
Aliph. C9-C18	3,260	484	910
Aliph. C19-C36	--	271	71
Arom. C9-C22	34	819	355

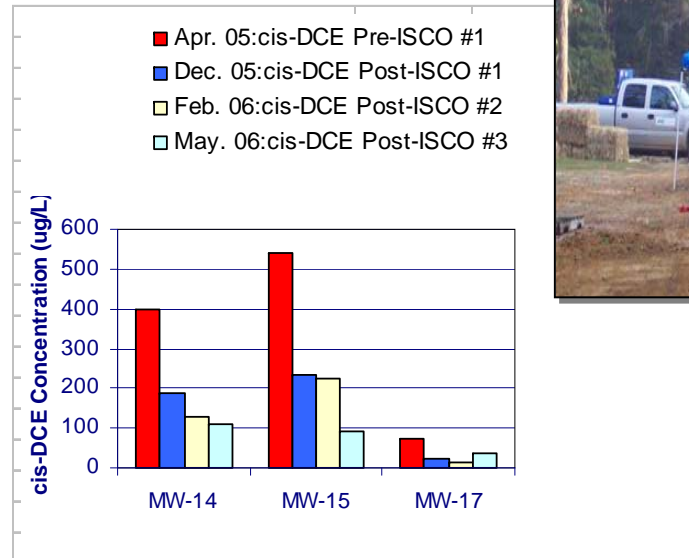
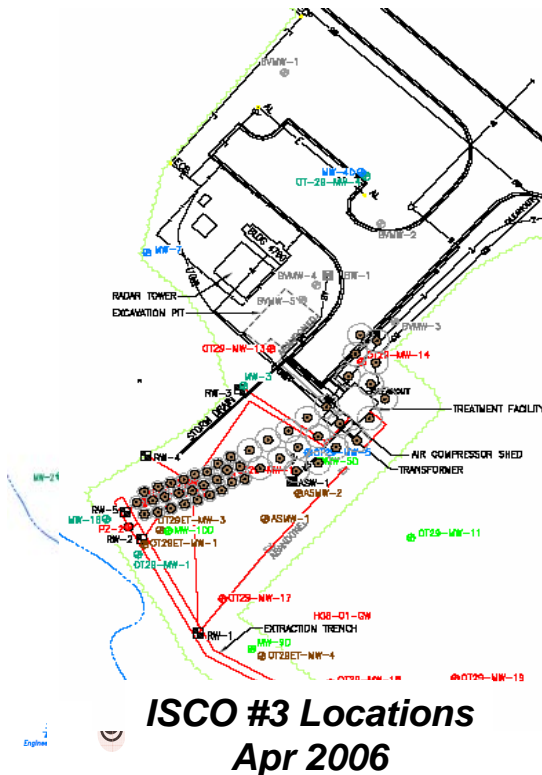
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In Situ Chemical Oxidation



Actions Completed:

- ISCO Bench Scale Tests (modified Fenton's)
- 3 ISCO events w/287 injection points and approx 75,000 gal oxidizer/catalyst over 50,000 ft² area



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Current Status



-
- Site remediation activities completed with no impact to the mission-critical fuel hydrant system construction
 - Awaiting NCDENR concurrence on No Further Active Remediation Status
 - Cleanup timeframe reduced from 20+ years to 4 years
 - Projected Savings to Government in excess of \$1.5M

Bulk Fuel Storage Area (BFSA)



Setting:

- 400,000-gal jet fuel (JP-4) release (>50,000 gal in subsurface requiring cleanup)
- Estimated 29,000 ft² LNAPL plume
- Estimated 395,000 ft² dissolved plume
- Legacy treatment system installed in 1998



BFSA

Cleanup Strategy



- Optimize legacy treatment system to maximize performance prior to design and installation of updated recovery system
- Perform Triad-based characterization to expedite plume definition
- Design, install, and operate enhanced recovery system

BFSA

Triad LIF/CPT ROST Investigation



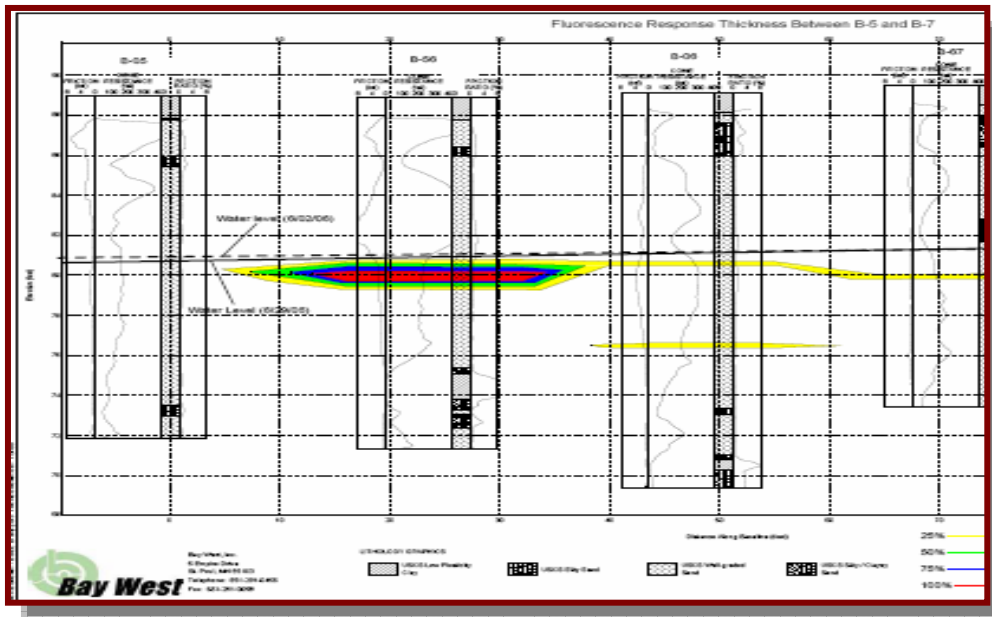
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- 🌀 Rapid Optical Screening Tool (ROST) used for simultaneous collection of LIF and CPT data
 - 🌀 Data collection provided integrated 3D investigation and mapping of LNAPL and smear-zone vadose soils
 - 🌀 9-day field effort with collection of 98 borings with minimal disturbance to AF mission
 - 🌀 Decision Tree utilized to direct field activities

BFSA

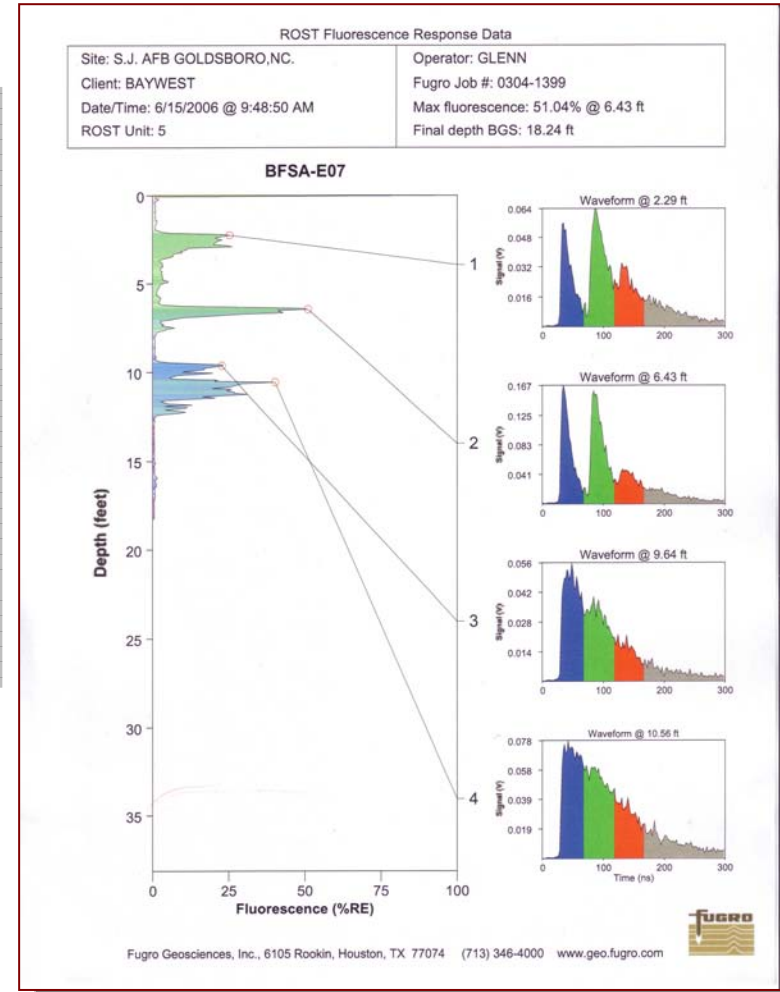
Real Time Data Collection



BFSA Data Rendering



CPT & LIF Data

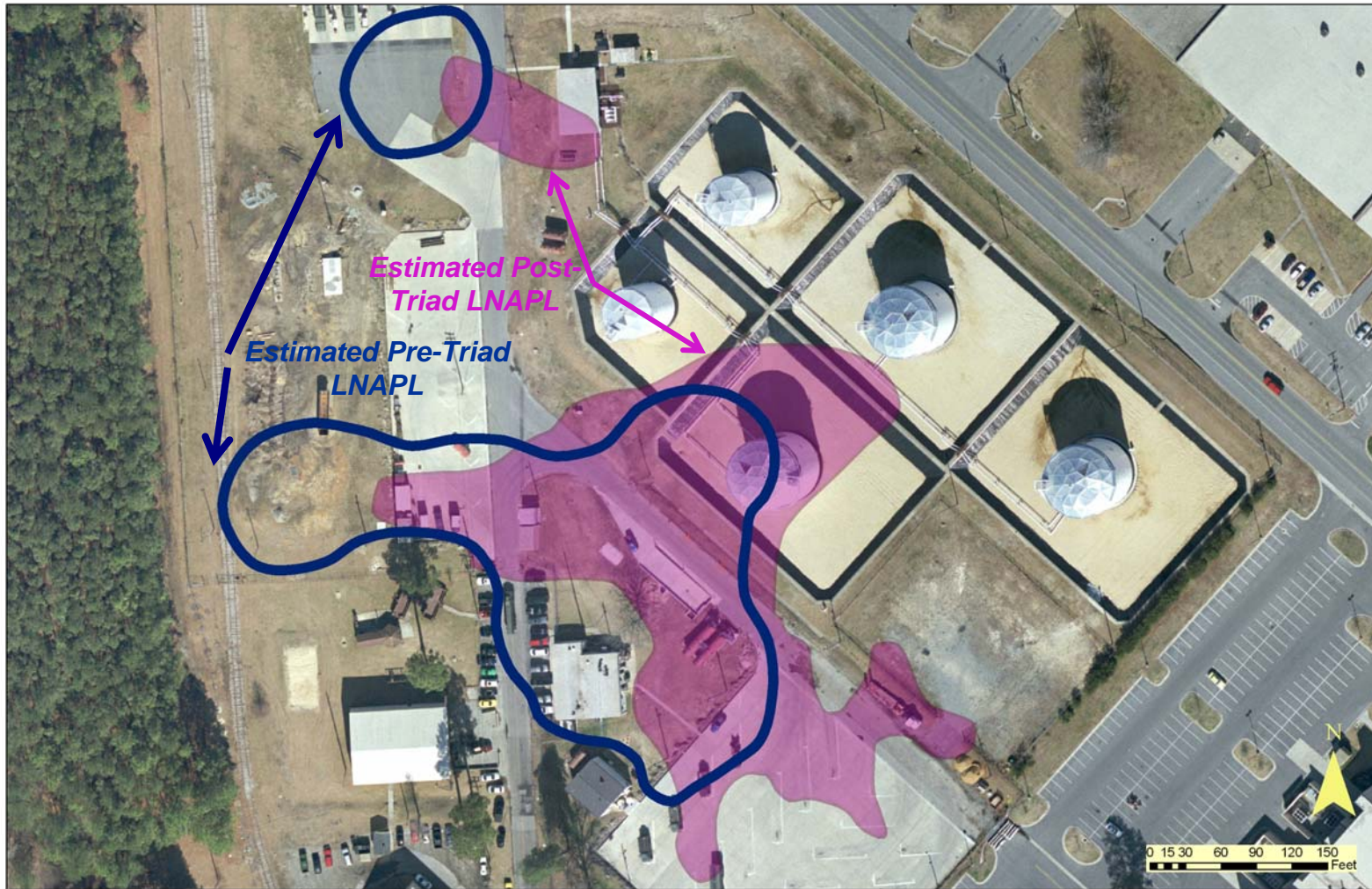


ROST Data

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Updating the Conceptual Site Model



BFSA

Treatment System Expansion



- ④ Installation of 65 MPE wells in target areas identified during the Triad investigation
- ④ Horizontal drilling and installation of system piping (~3,000 linear ft) to minimize impact to high-traffic, mission critical site area
- ④ Installation/Integration of 650-cfm extraction skid to increase recovery volume as estimated from the 3D site models

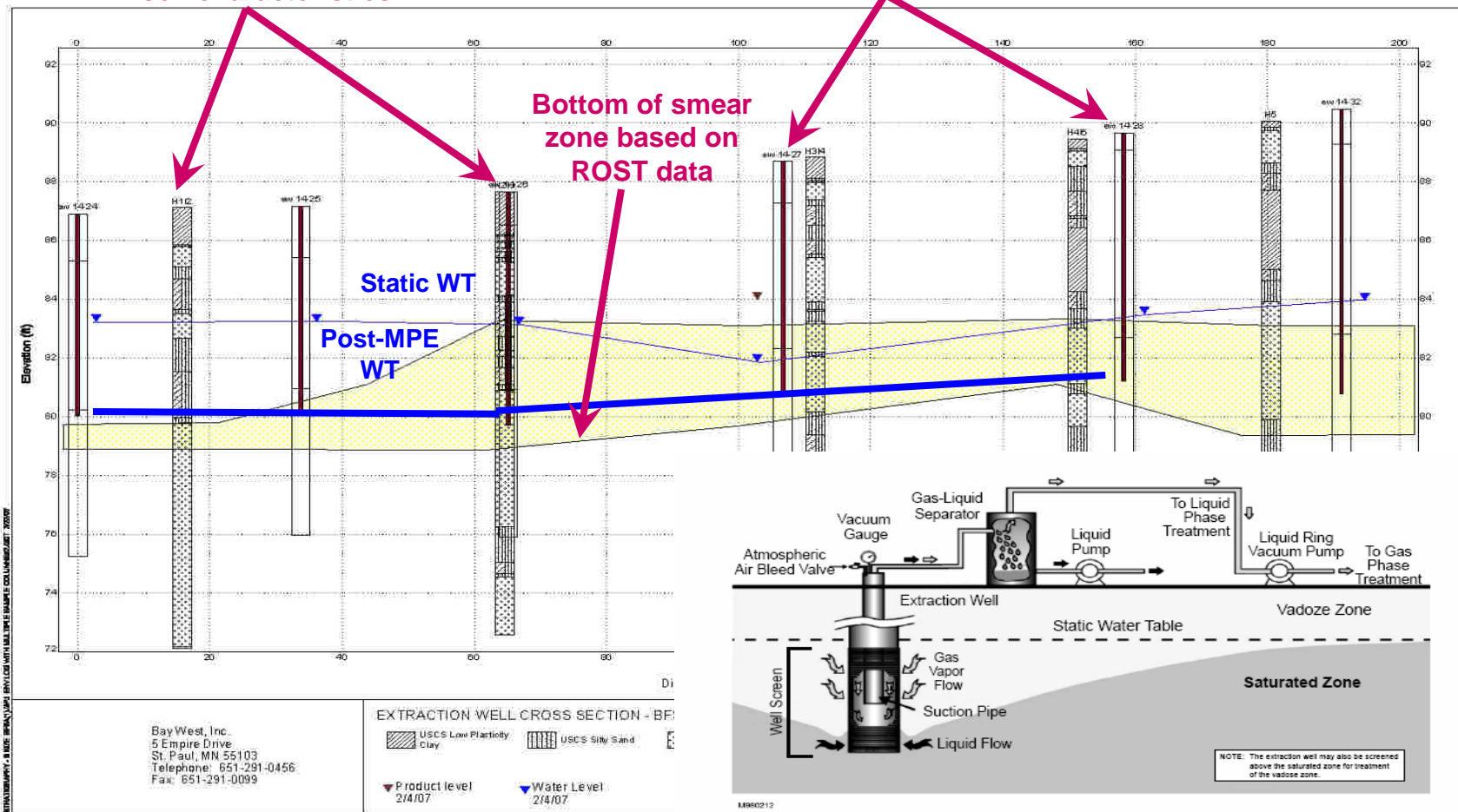
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System Enhancement



ROST Point, used to locate contamination and evaluate soil characteristics

Extraction well point installed based on ROST data



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Extraction Well and Manifold Pipe



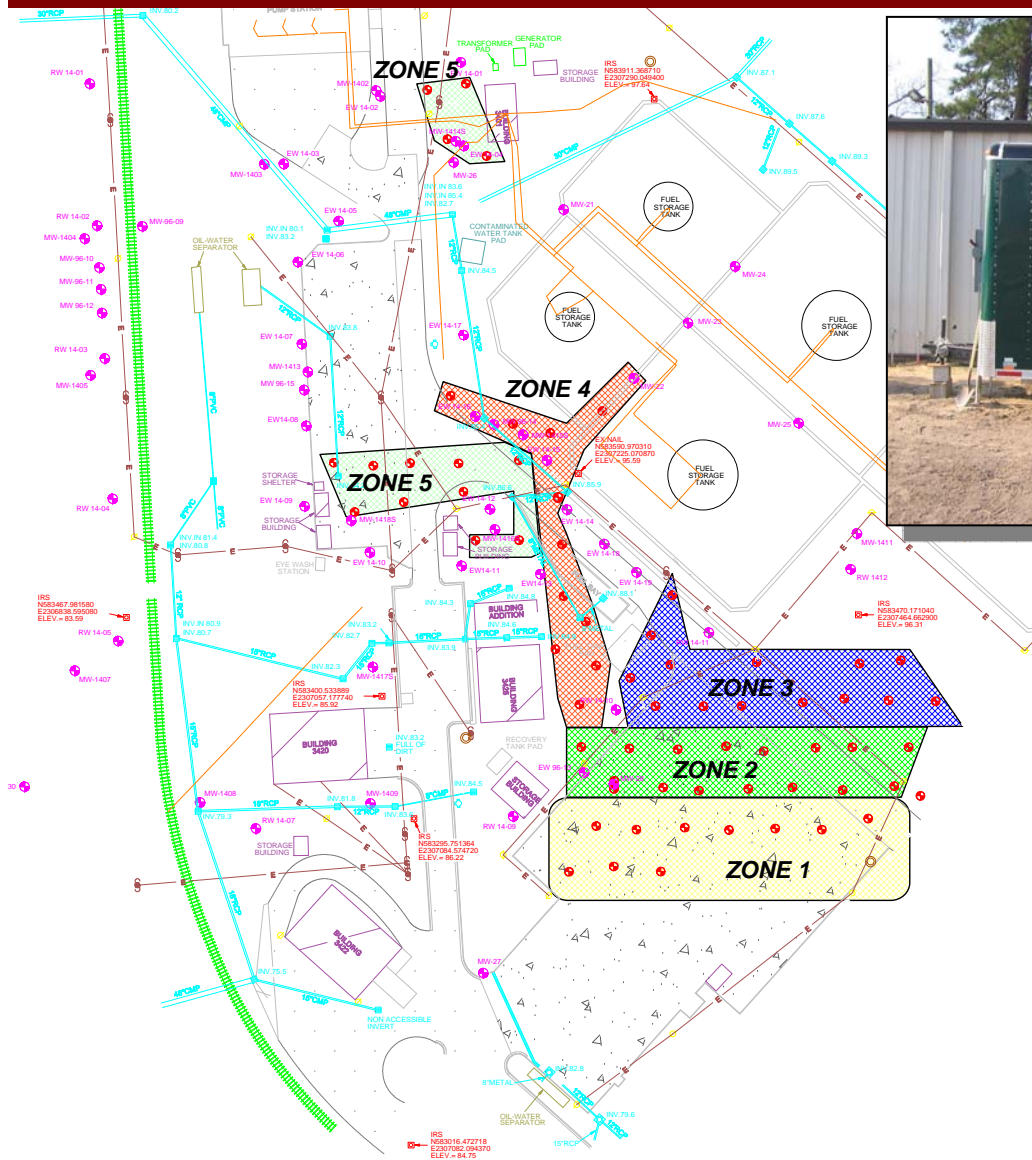
Isolation/
Bypass Valve

Air Velocity Site Tube

Well Field
Operation Valve

BFSA

Treatment Zone Configuration



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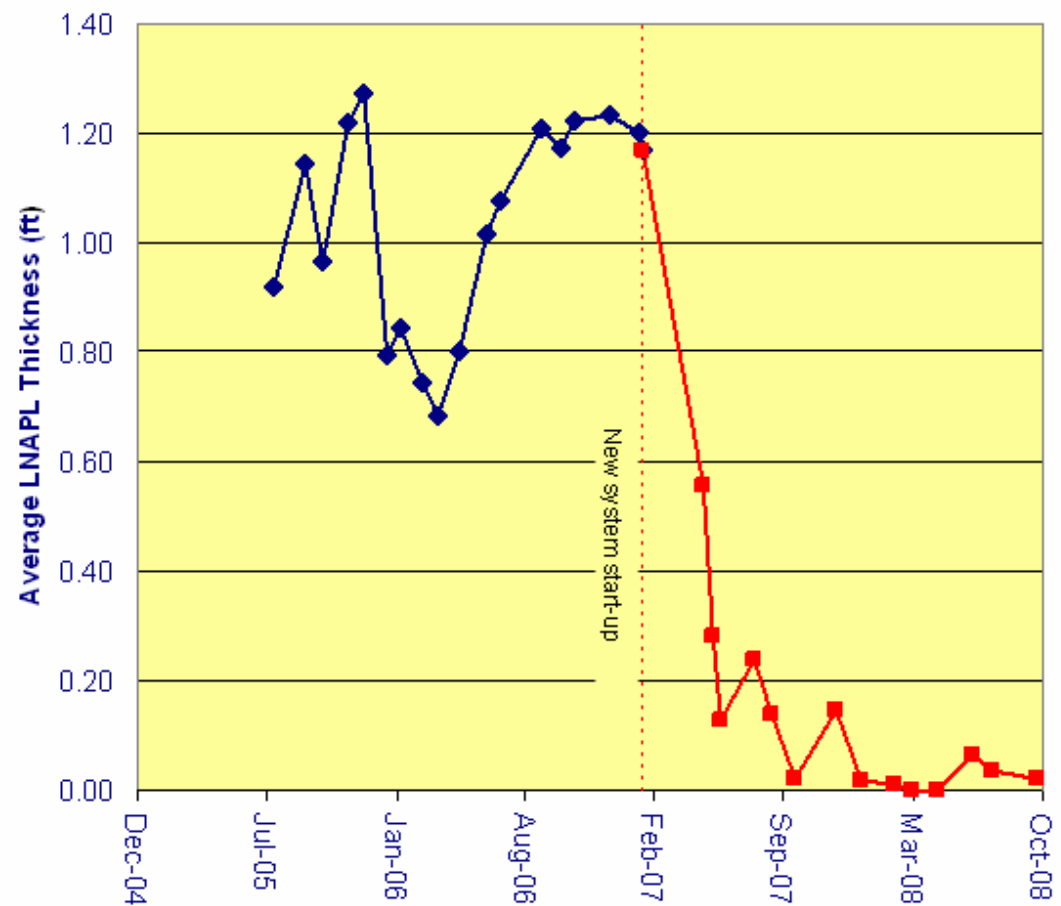
Current Status



- MPE targeting of Triad-defined LNAPL removed approx 50,000 gal of LNAPL in 12-month period
- Cleanup timeframe estimated to be reduced from 10+ years to 3.5 years

Average LNAPL Thickness

MW-1414S, MW-1415S, MW-1416S, MW-96-14, RW-14-10, MW-22, MW-28



Summary



TRIAD reduced:

- Number of mobilizations & fixed-base lab costs
- Field and reporting efforts
- Time to design and implement remedial action enhancements

Provided data to revise CSM reflecting:

- More accurate LNAPL distribution (vertical and horizontal)
- Soil impacts below regulatory criteria
- Role of stratigraphy in contaminant transport/recovery

Resulted in a design targeting source and “hot-spot” areas, reducing cleanup time