

Enhanced Decision Making in Complex Projects Using 3-D GIS Visual Analysis

A Service Provided by:

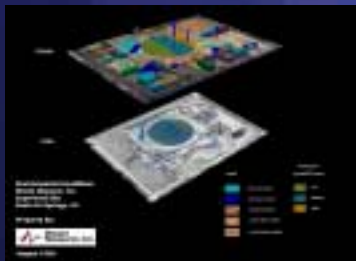
Project Navigator, Ltd.,

2600 East Nutwood Ave., Suite 830

Fullerton, CA 92831

714-449-8920

www.projectnavigator.com



Background

- Complex engineering and construction projects generate vast amounts of data
- Many “stakeholders” are involved in the review/understanding of the data
- Decisions are often made “by committee”
- Data is often presented in written reports or “canned presentations”



Making Maximal Use of Data

- Data utility is maximized with spatial orientation
- 3-D data base interactability is a powerful technique for answering "what-if?" questions in real time, thereby maintaining control of meetings
- *"Visible Decisions Inc. has been telling finance executives since 1993 that it is easier to make tough decisions based on pictures than on numbers", MSNBC, 5/11/99*



Project Navigator's GIS Tools Take Client Project Advocacy to a New Level

- All site data is loaded on one system, which is portable
- Never go to any client or regulator meeting without the project database
- Site 3-D data visuals help promote common understanding of project drivers
- Remedies can be formulated by interaction with 3-D visuals, in an attempt to bypass massive Agency project deliverables



Uses of 3D Data Visuals

- Litigation support
- Enhanced data understanding for non technical project stakeholders
- Internal presentations to management
 - AFE support
 - Executive decision making
- Remedy selection and cost analysis
- More powerful "owner oriented" project reports



GIS Project Examples by Project Navigator Ltd.

- 1. Waste Disposal Inc. Superfund Site
 - Santa Fe Springs, CA
- 2. PAB Oil & Chemical Site
 - Abbeville, LA
- 3. MAR Services Site
 - Cankton, LA
- 4. Tex Tin Superfund Site
 - Texas City, TX



1. Waste Disposal Inc. (WDI) Superfund Site Notes

- Approximately 500,000 cu.yds. of drilling muds were disposed within a containment structure
- EPA started data collection in 1988
- PRP group formed in 1994, and commenced supplemental data collection under UAO
- Two data bases existed until 1998, resulting in vast site characterization disagreement
- All data GIS'd & 3-D'd by ProNav in 1998/9
- Result has been the PRP controlled management of one data base, permitting the RI to be finally written
- GIS will be used in next stage of remedy selection feasibility study



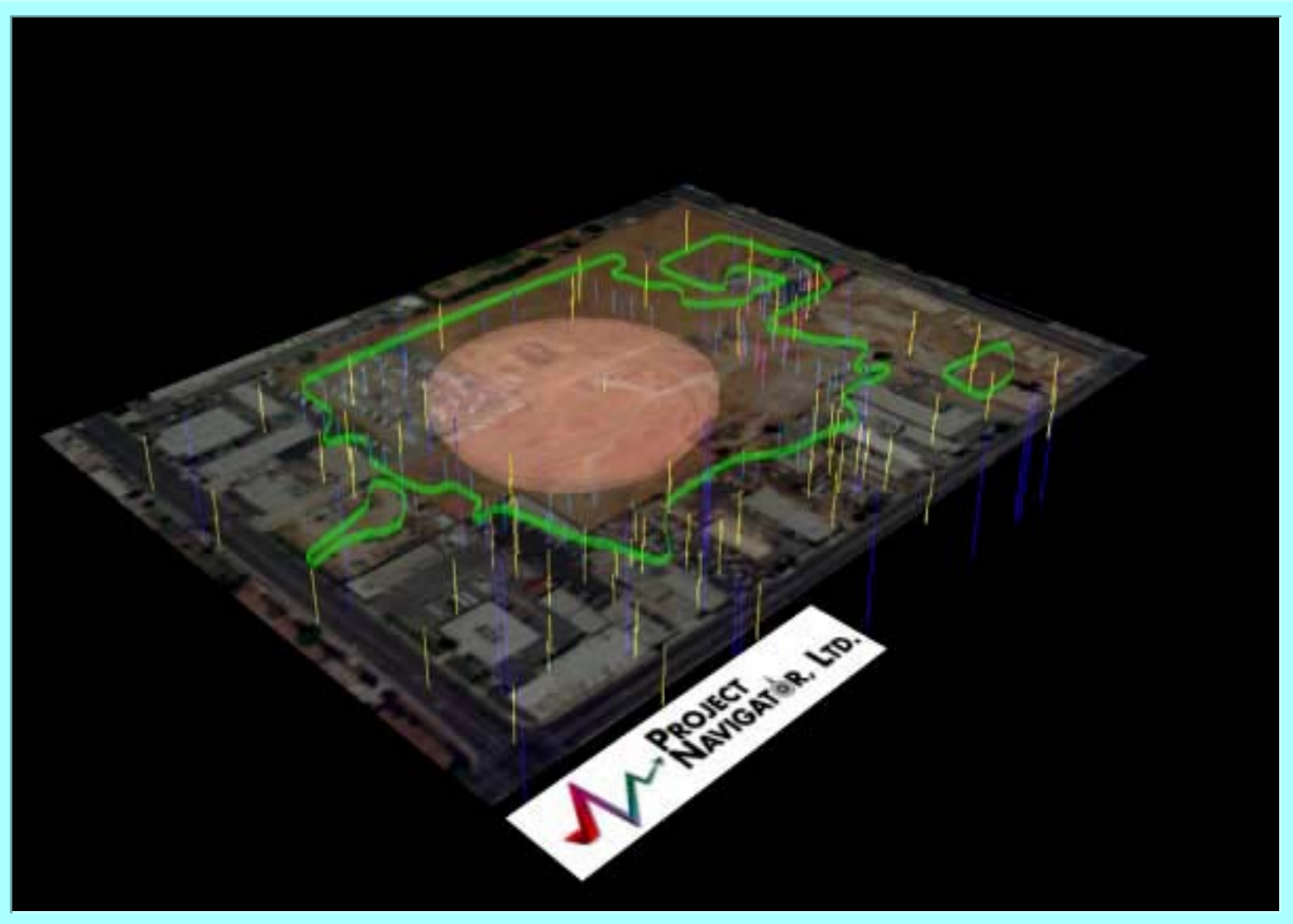
WDI
Superfund
Site

Site Conditions Showing Onsite Structures



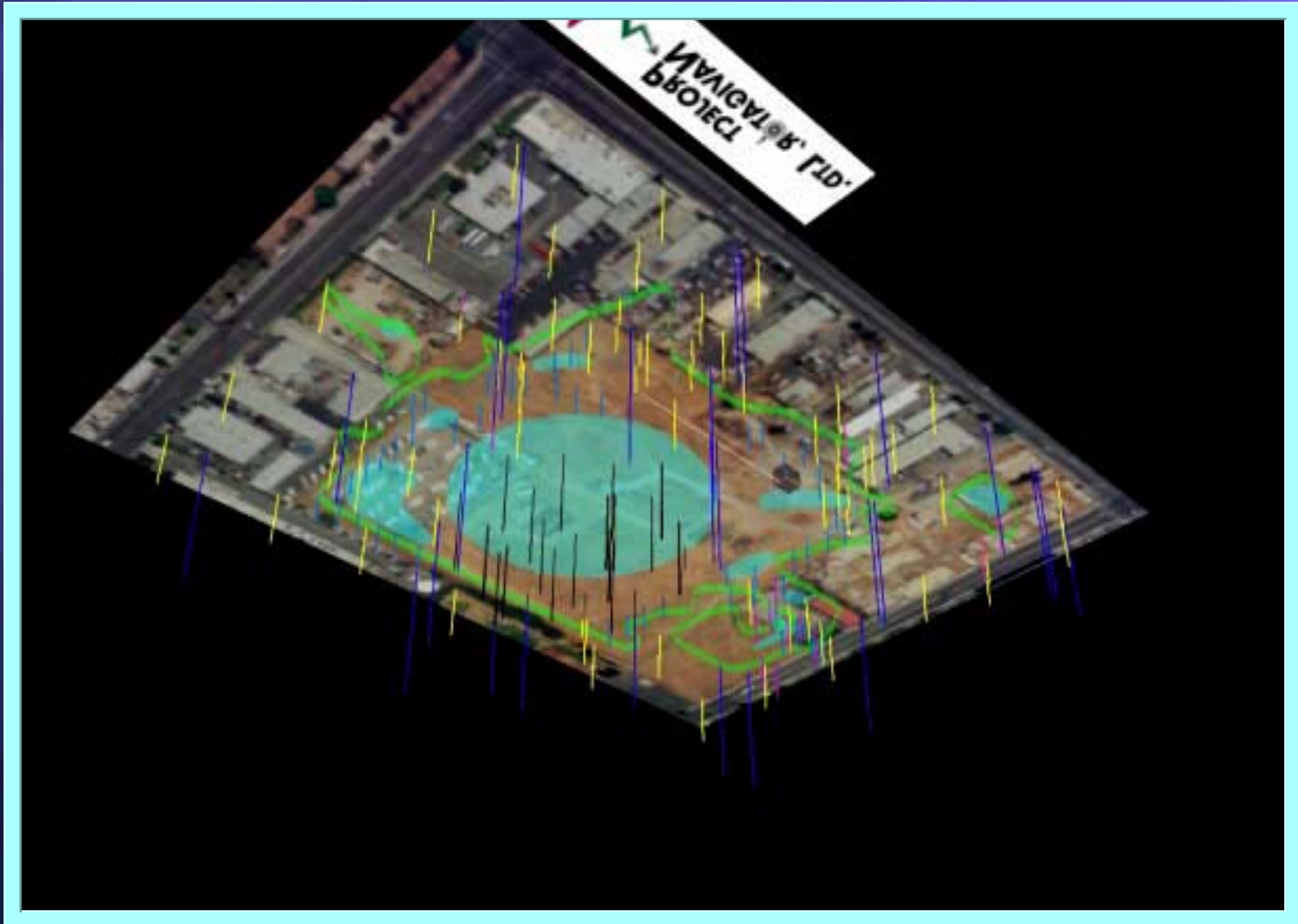
**WDI
Superfund
Site**

Environmental Monitoring Network



WDI
Superfund
Site

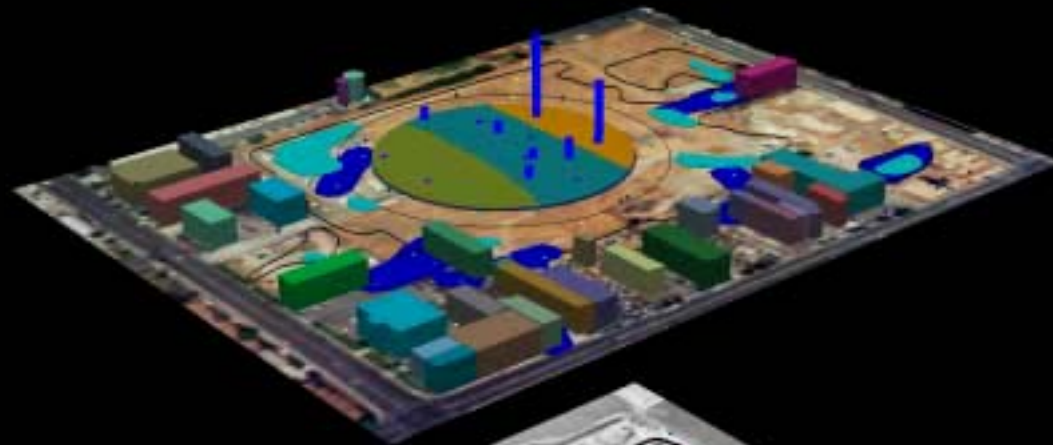
Environmental Monitoring Network from Underground



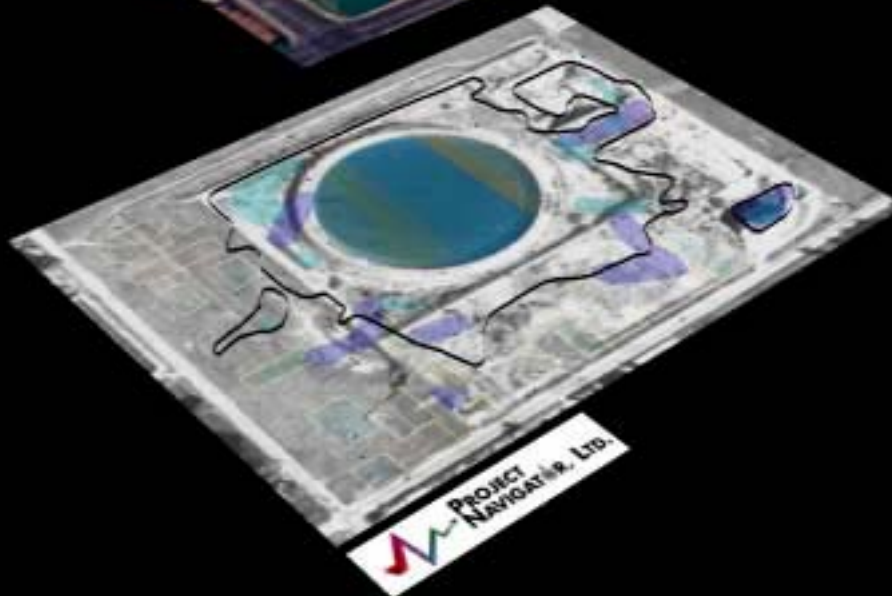
**WDI
Superfund
Site**

**Existing Environmental Conditions (top) and Today's
Conditions Superimposed on 1945 Aerial (bottom)**

Present

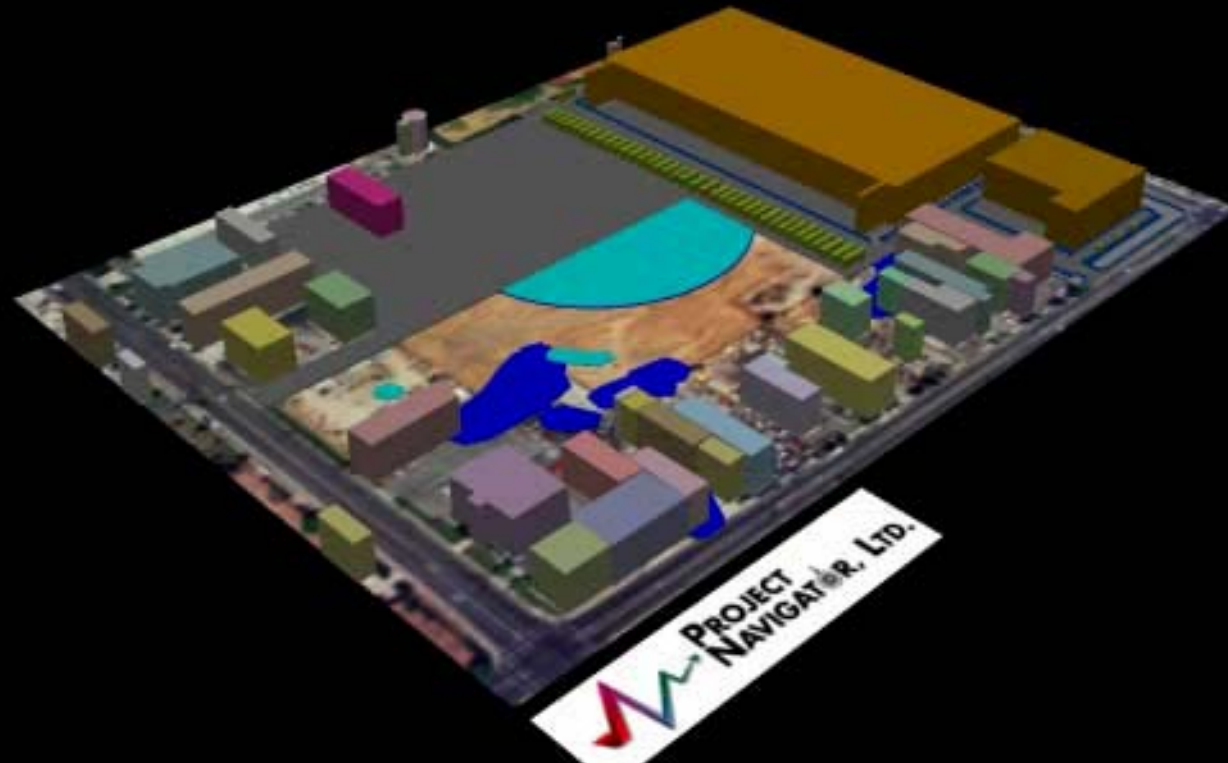


1945



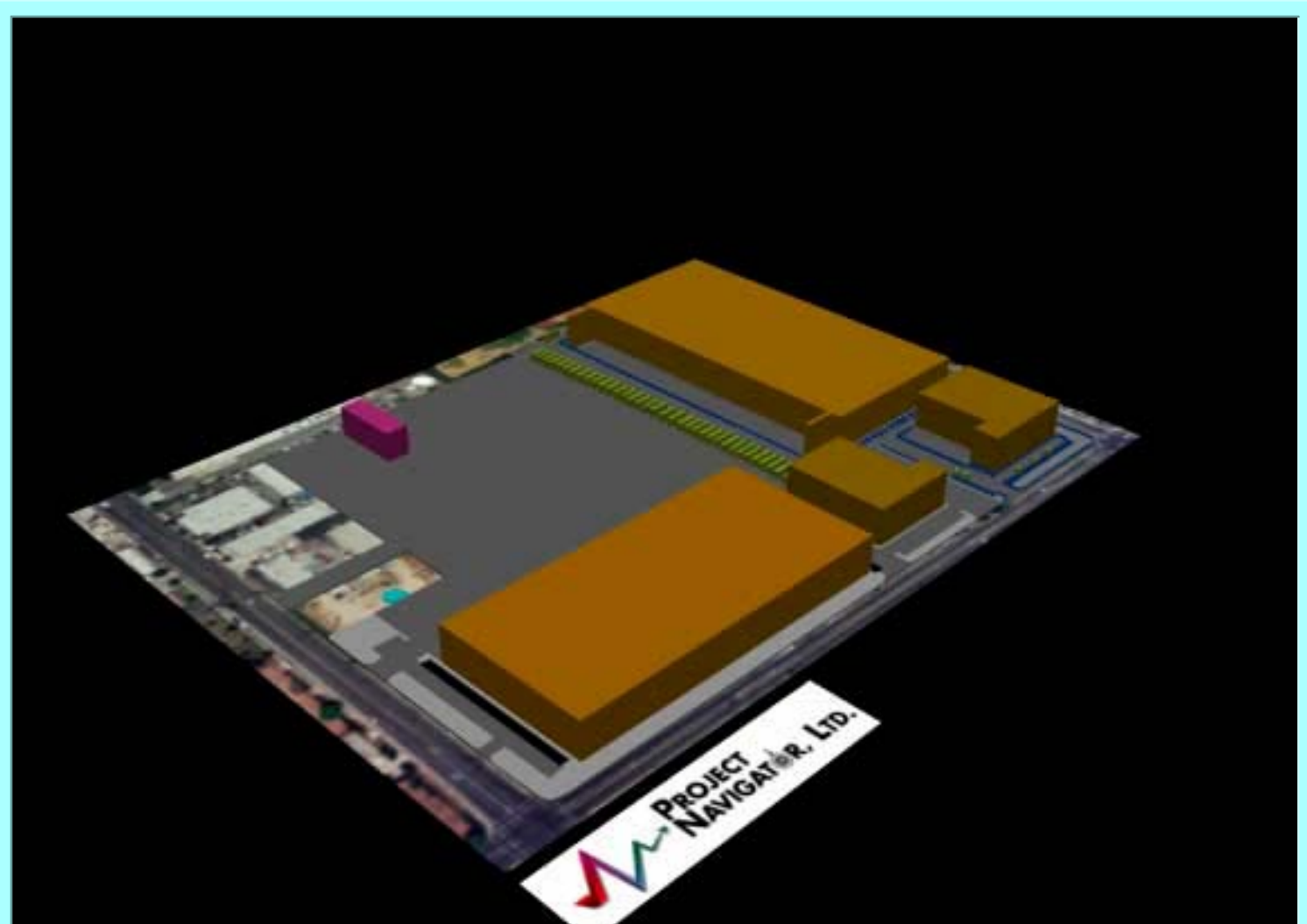
**WDI
Superfund
Site**

Development Initiative : Phase I



**WDI
Superfund
Site**

Development Initiative : Phase II



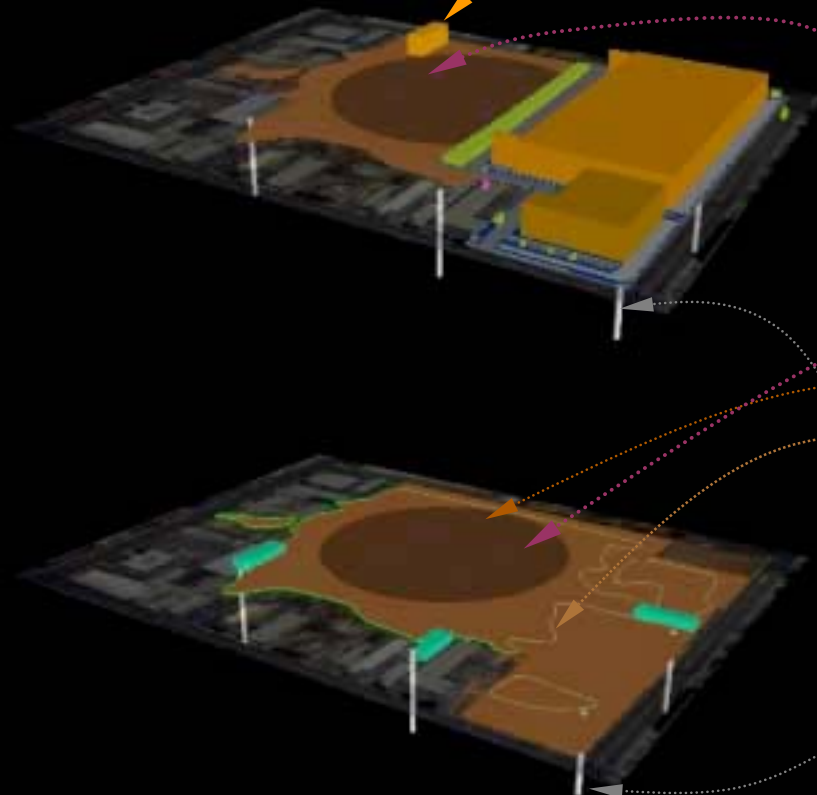
Future Development
(Phase I only)

WDI Site Remedy

Exceedances of:
Methane (>1.25 %)
Benzene (>10 ppb)
Vinyl Chloride (>1 ppb)
(Reservoir is not included)



Proposed Brothers New Location



WDI Superfund Site
Forecasted Remedy

Reservoir Leachate
Collection Points

RCRA Equivalent Cap

Monofill (soil cap)

Soil Gas Control System

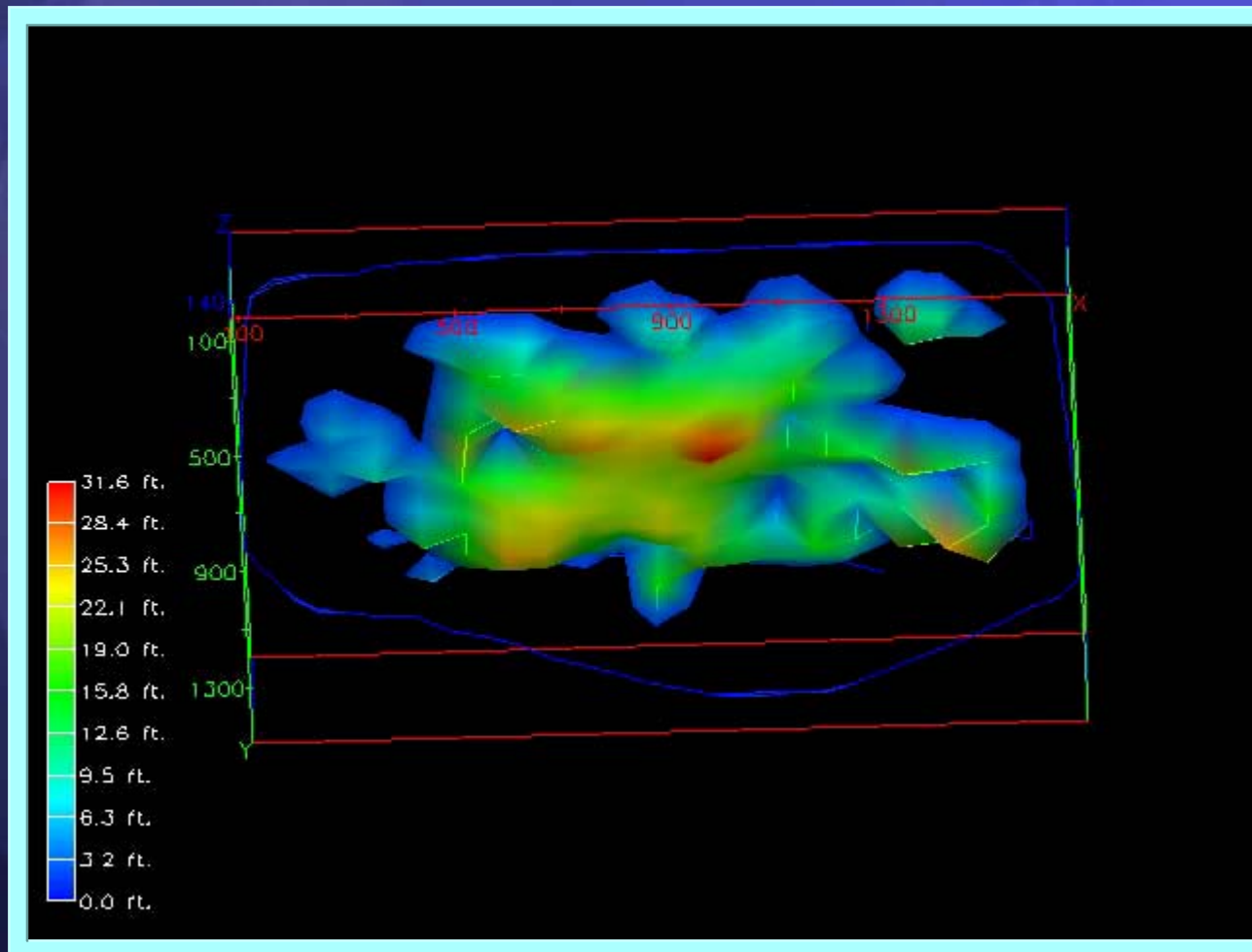
Waste Outline

Gas Impacted Zones

Vapor Wells

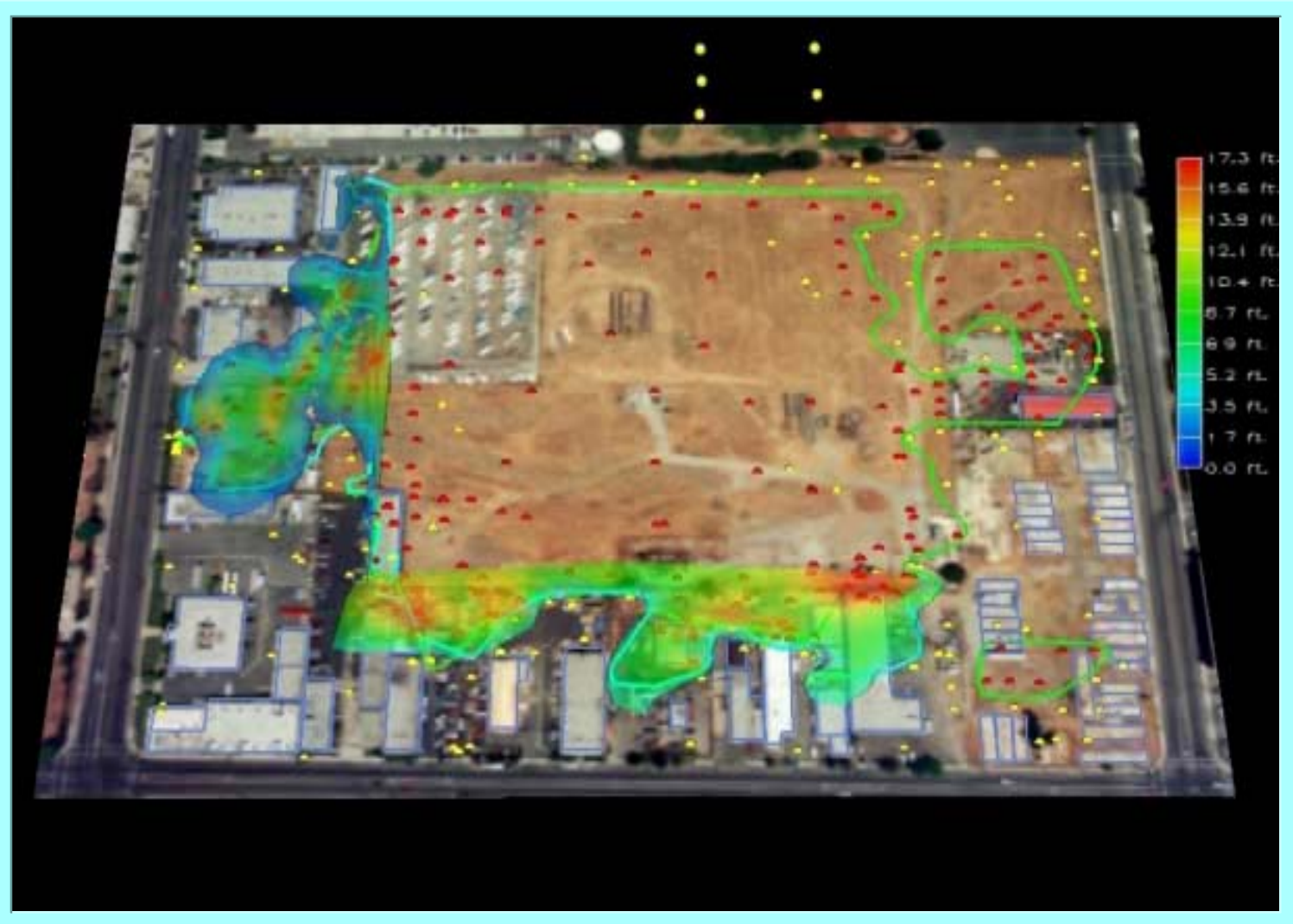
WDI
Superfund
Site

Waste Thickness



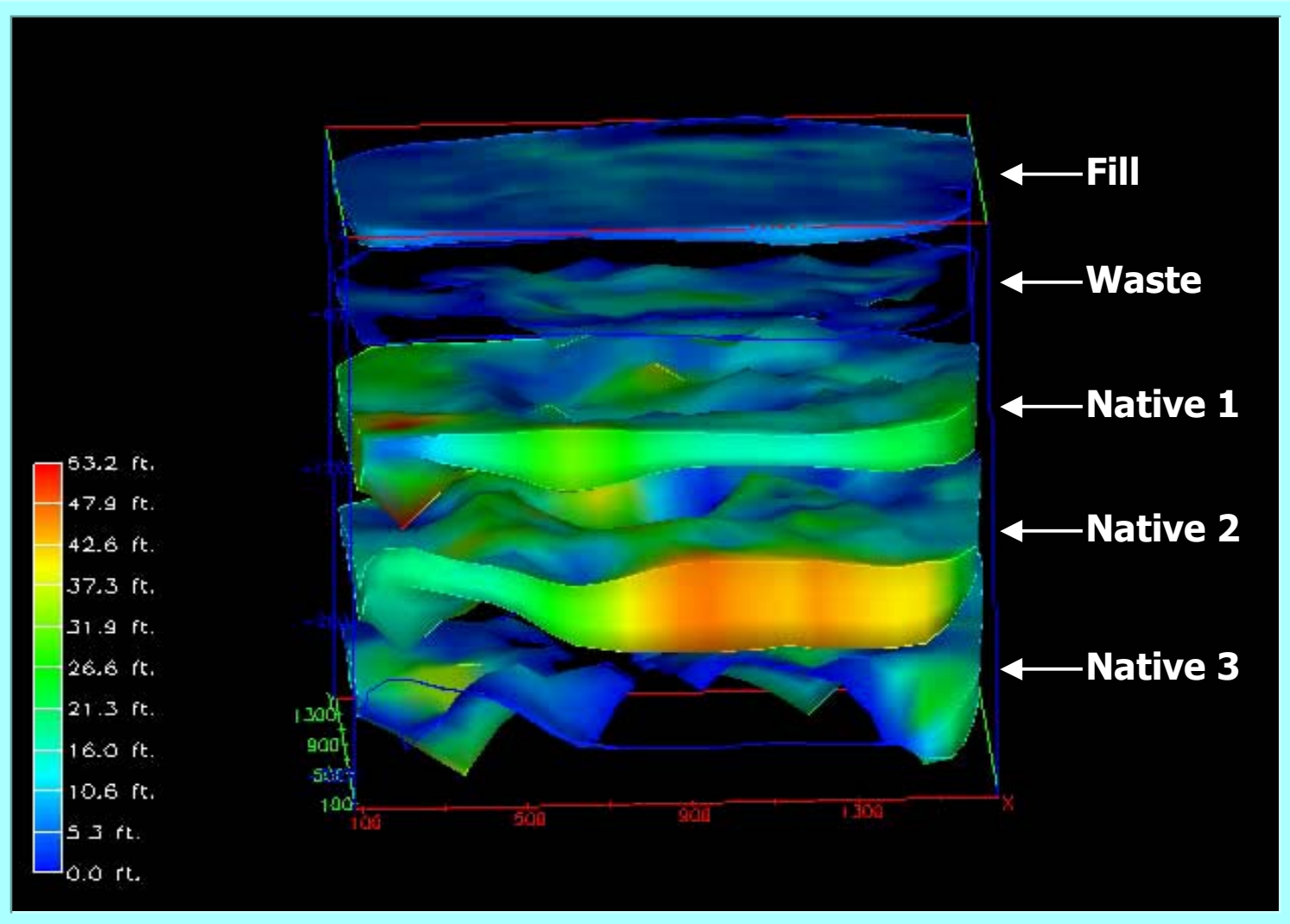
WDI
Superfund
Site

Waste Thickness in South and West



**WDI
Superfund
Site**

Geological Layer Thickness

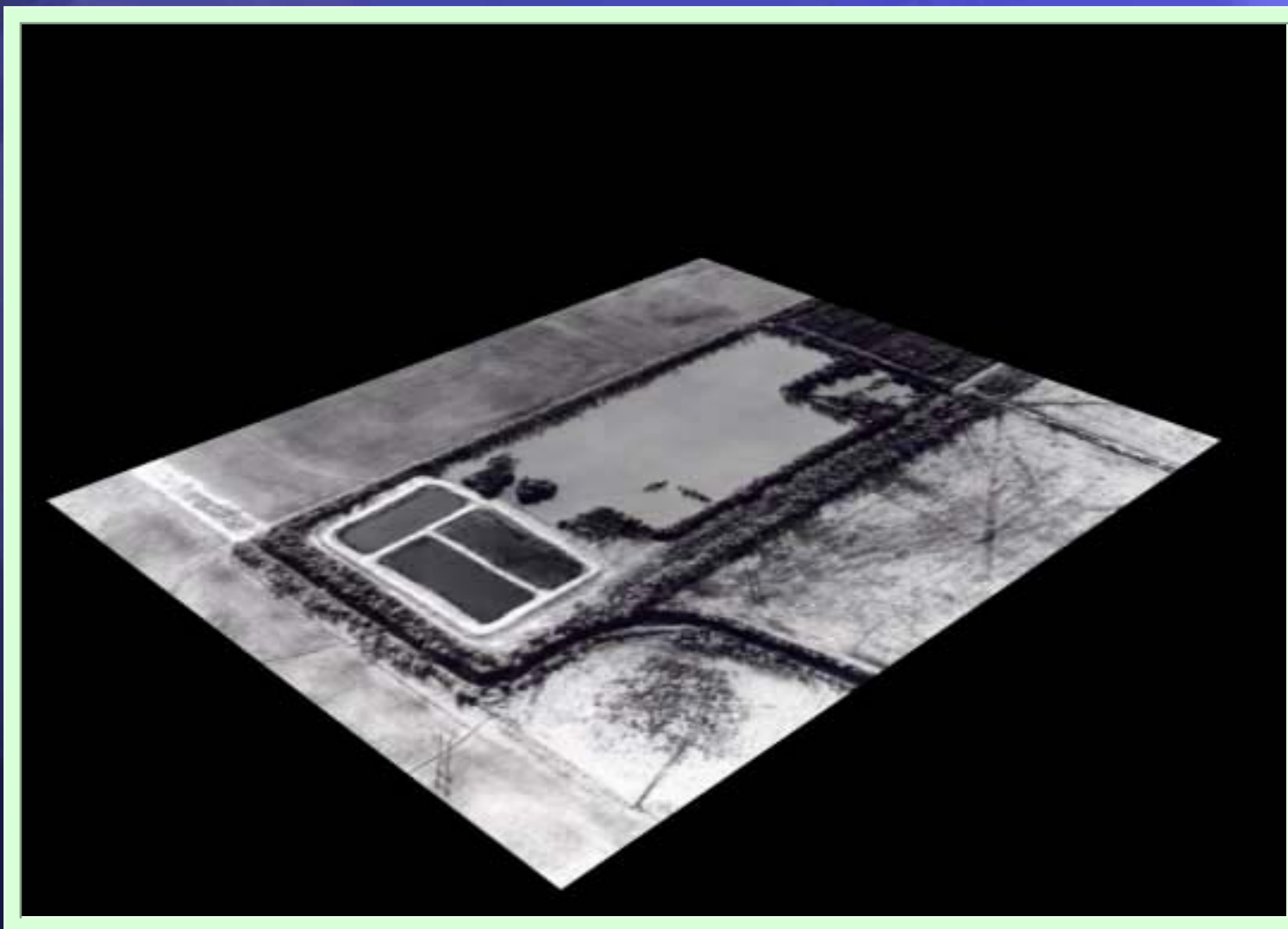


2. PAB Oil & Chemical Site Notes

- Site operated as drilling muds/produced fluids disposal site from 1978-1983
- PRPs closed site in 1998 with waste stabilization/capping remedy
- Further negotiations between PRP group and EPA have generated situation where:
 - EPA will give "good performance credit" for Past Costs, if,
 - PRPs turn site into recreational area, and donate.
 - This "swap" is financially beneficial to PRPs
- Project Navigator is using 3-D GIS to facilitate the acceptance of improvements over the underlying Superfund Site



Site Conditions 1997 (Pre-RA)

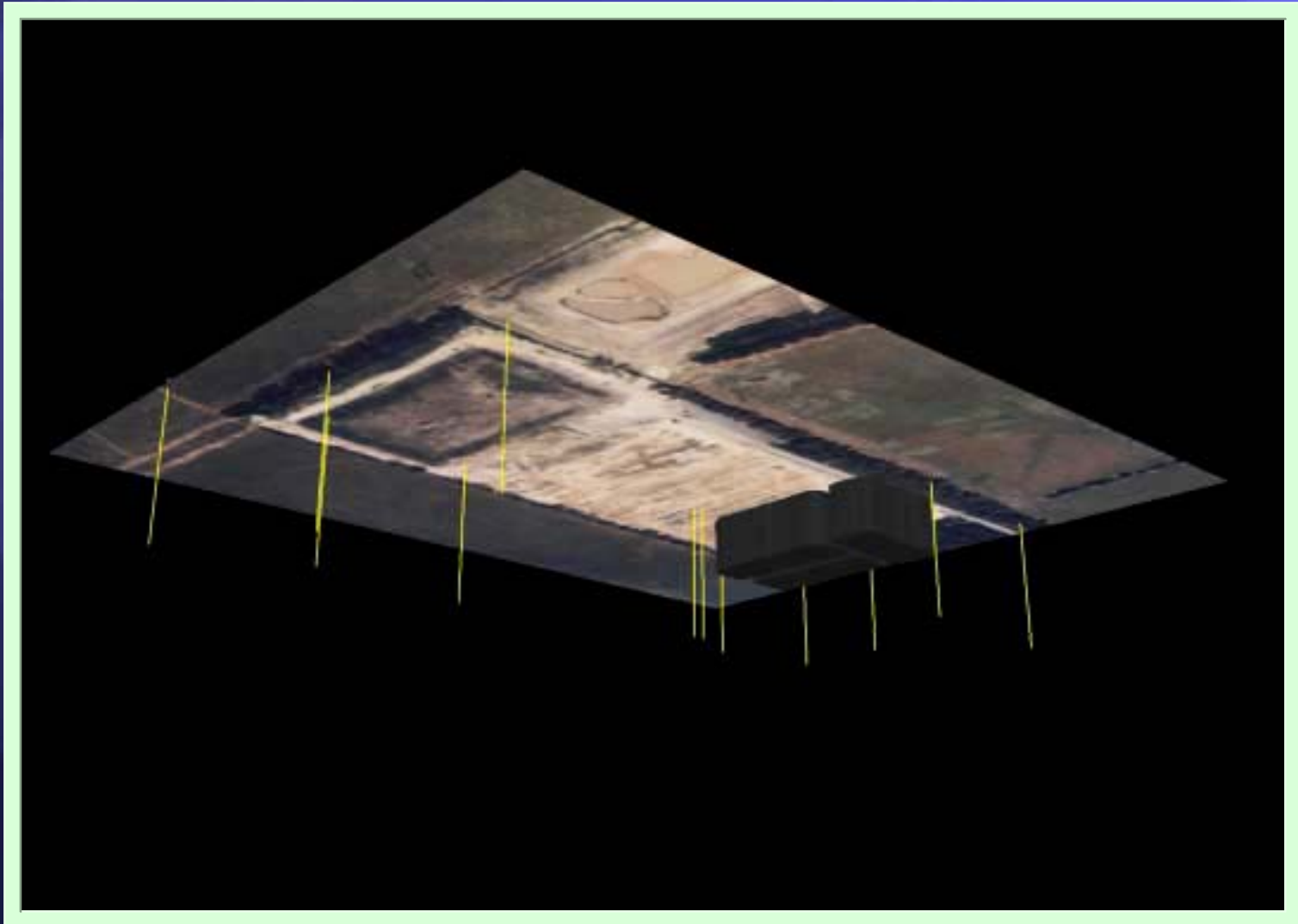


Site Conditions 1998 (Post RA)



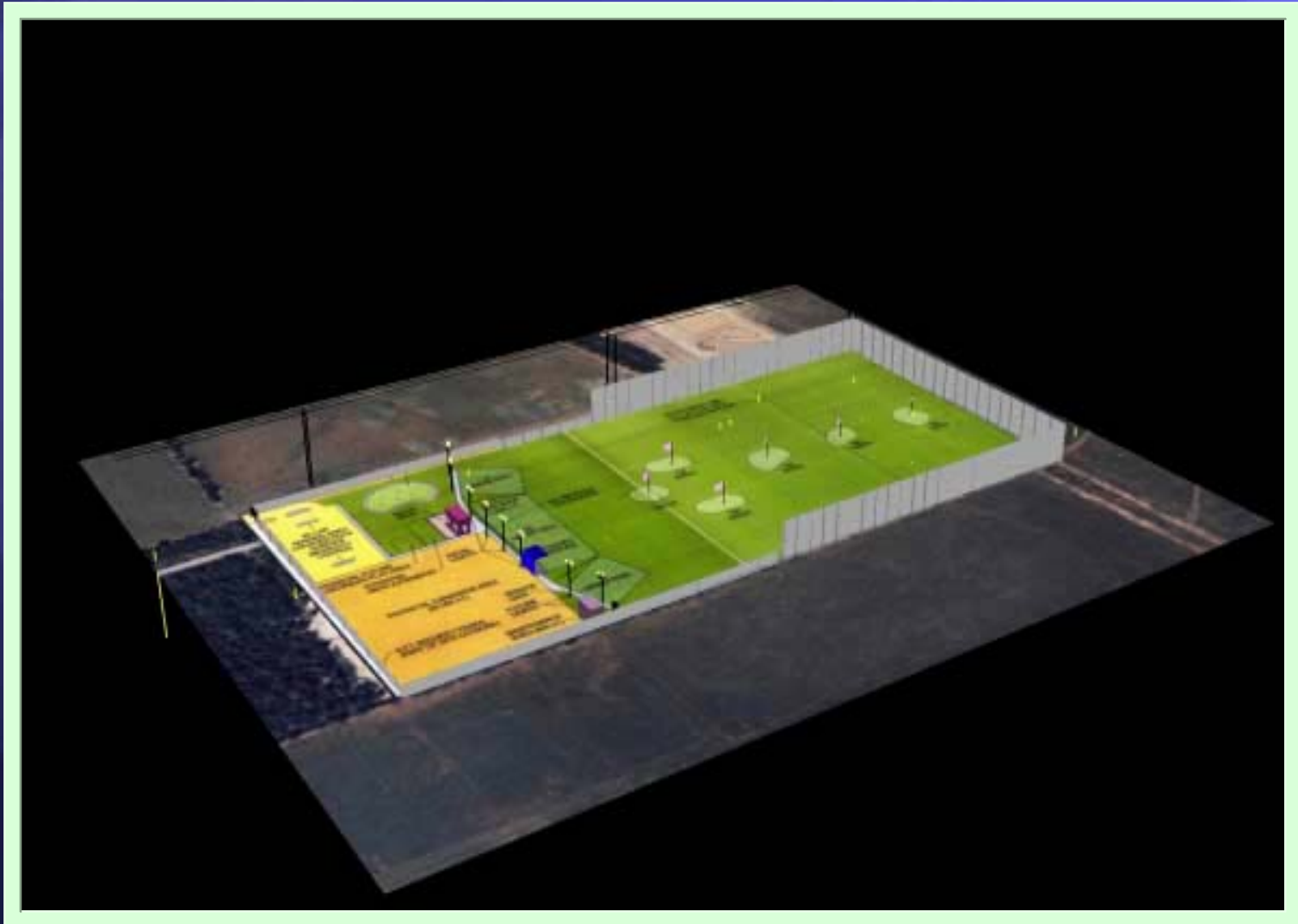
PAB
Oil &
Chemical
Site

Groundwater Monitoring Network



PAB
Oil &
Chemical
Site

PAB Driving Range Concept



PAB
Oil &
Chemical
Site

PAB Soccer Field Concept



3. MAR Services

- MAR operated 80 acre oilfield waste disposal site during 1980s
- Louisiana Department of Natural Resources(DNR) issued NOV's in 1990, closing the operation
- Site has Salt, Ba, Zn, Cd and O&G compliance exceedances
- Project Navigator is negotiating remedy on behalf of PRPs to "treat" upper 3 ft and "risk away" deeper zones
- Use of 3D GIS is key in these negotiations with LA DNR



**MAR
Services
Site**

Site Condition 1993



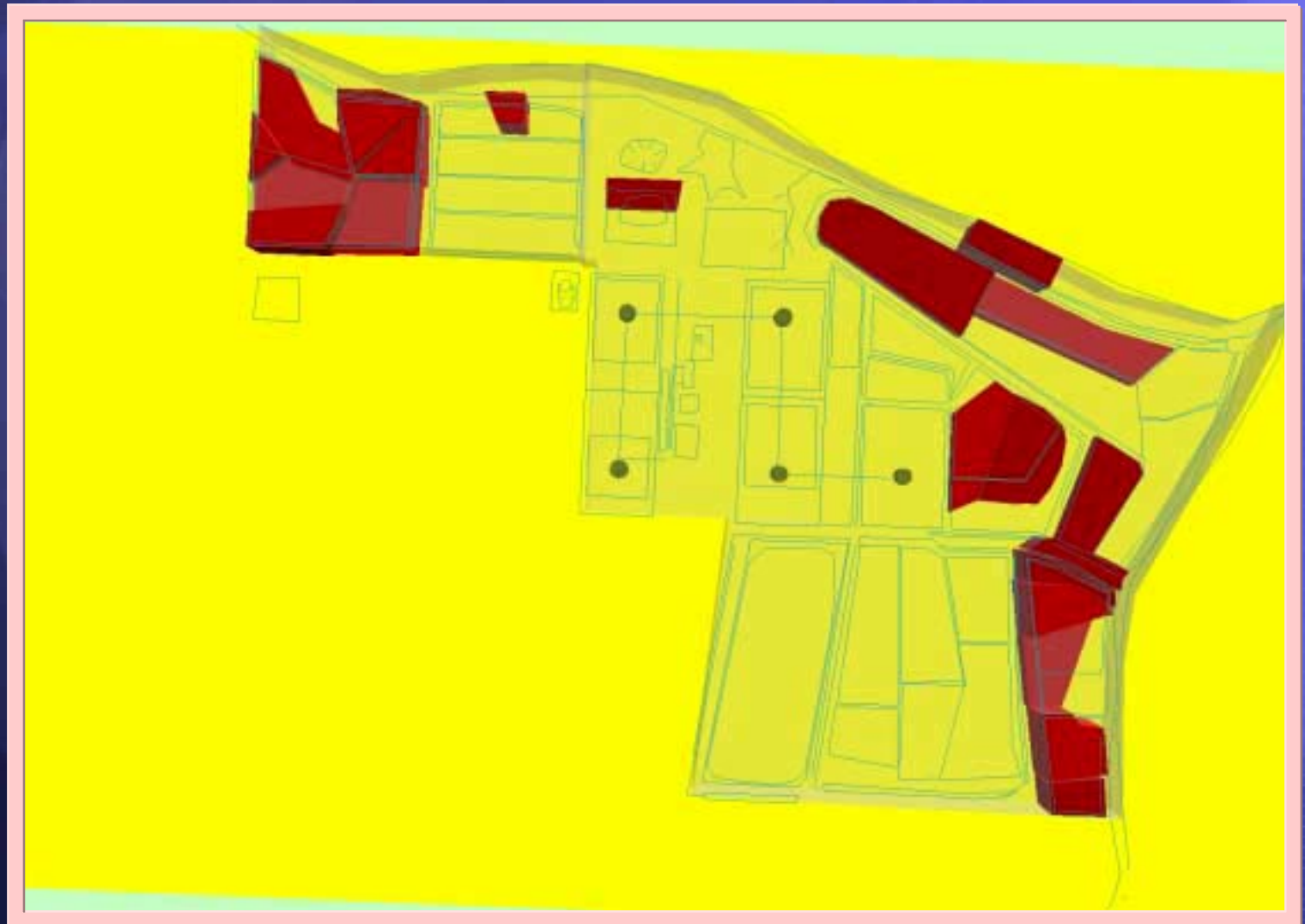
MAR
Services
Site

Site Salt Exceedances



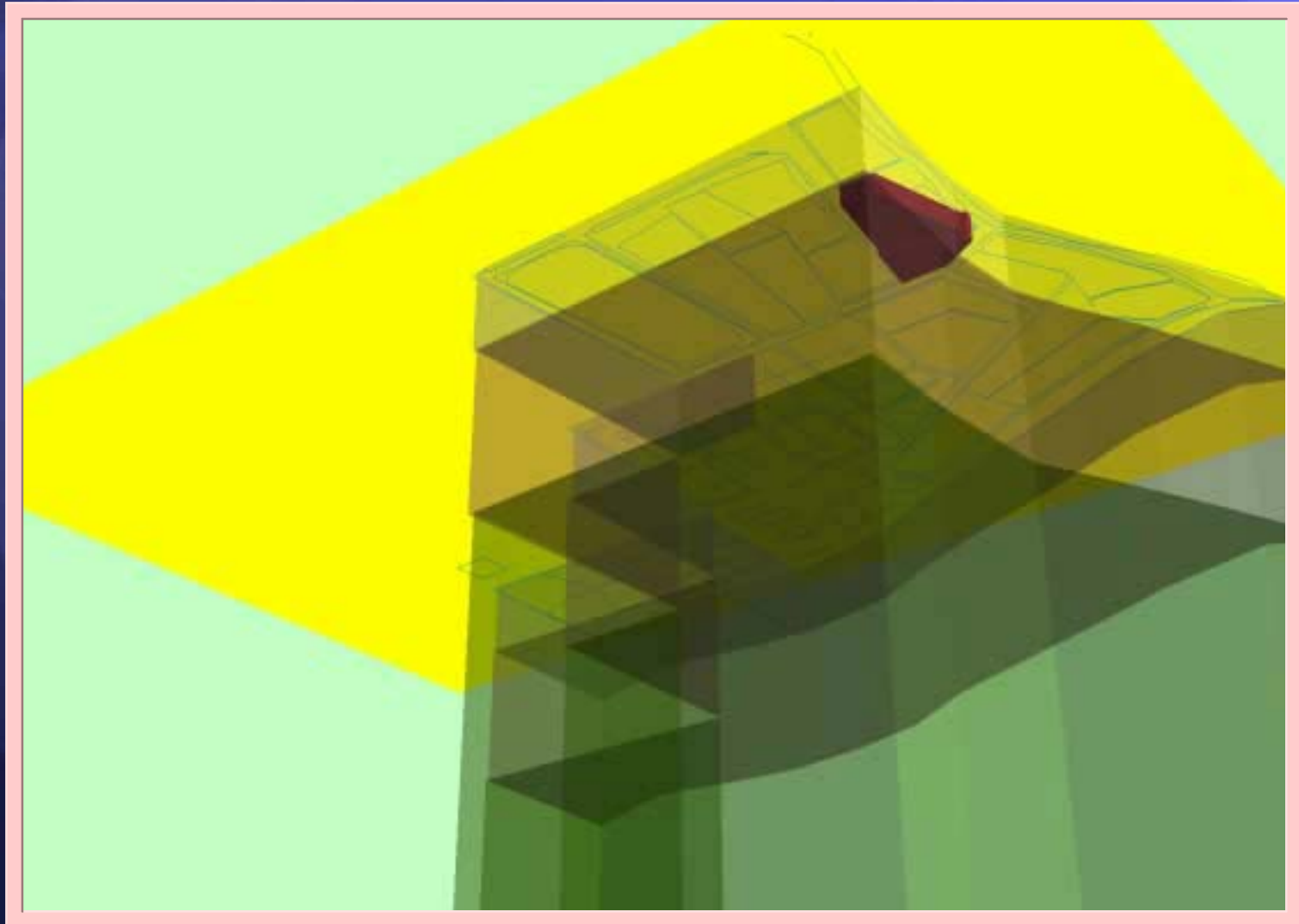
**MAR
Services
Site**

Site Barium(Ba) and Oil & Grease(O&G) Exceedances



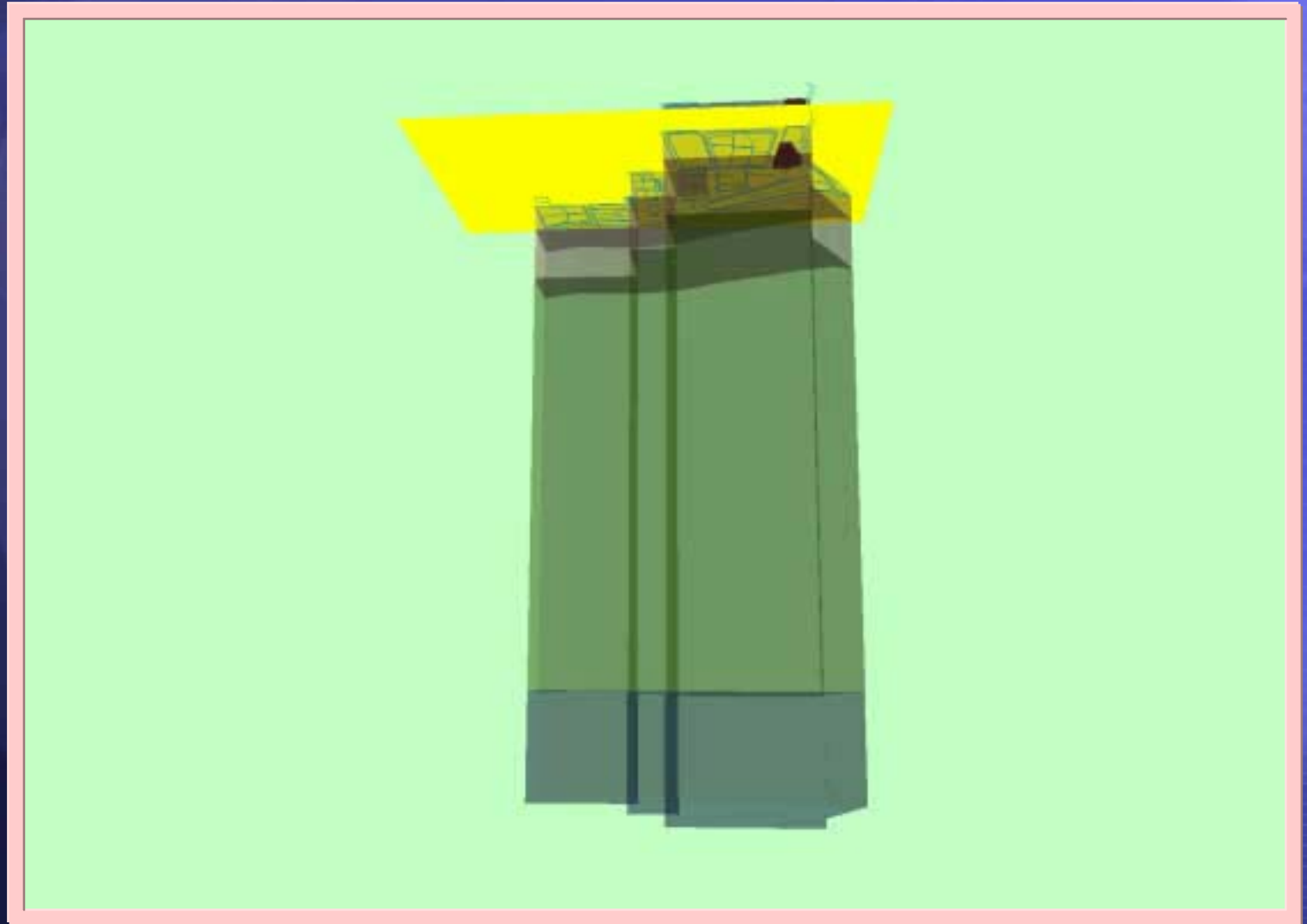
**MAR
Services
Site**

Site Ba and O&G Exceedances Below "3 ft" Proposed Remediation Cut-off Depth



**MAR
Services
Site**

Integrated View of Soil Impacts and Groundwater Bearing Zones



4. Tex Tin Superfund Site Notes

- The Tex Tin Superfund site is located in Texas City, Texas. Operable Unit No1 (OU1) is an old smelter facility situated on approximately 140 acres.
- OU1 includes process buildings, slag piles, and acid pond, drums of spent catalyst and other metal-bearing materials, above ground storage tanks of organic wastes, and assorted other materials.
- Project Navigator functions as the PRPs project coordinator.



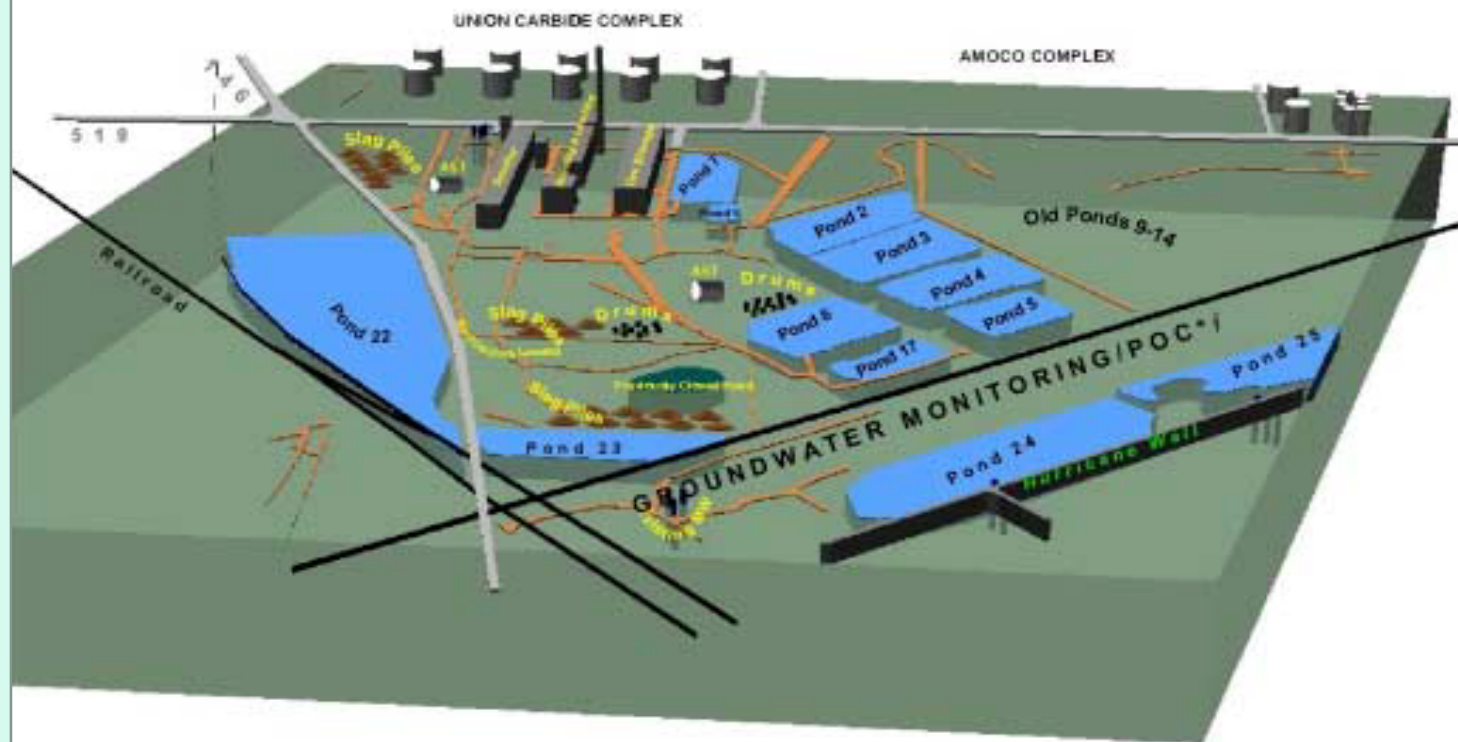
**Tex Tin
Superfund
Site**

Aerial View of the Site (Year 2000)



Tex Tin in 3D GIS

TEX TIN 3D GIS MATERIALS MANAGEMENT



ref: Tex-Tin ROD / May 1998

 PROJECT
NAVIGATOR, LTD.

 PROJECT
NAVIGATOR, LTD.

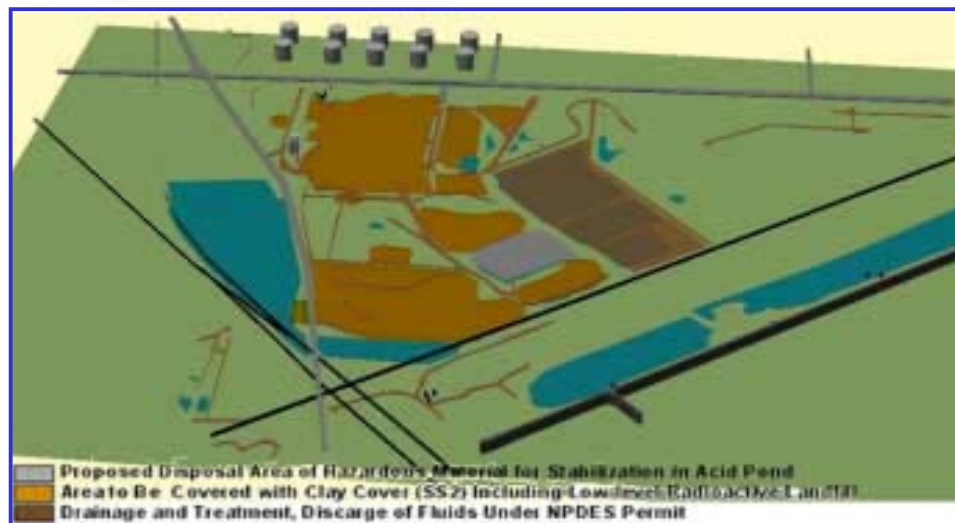


Conceptual Site Remedy

Before Remediation

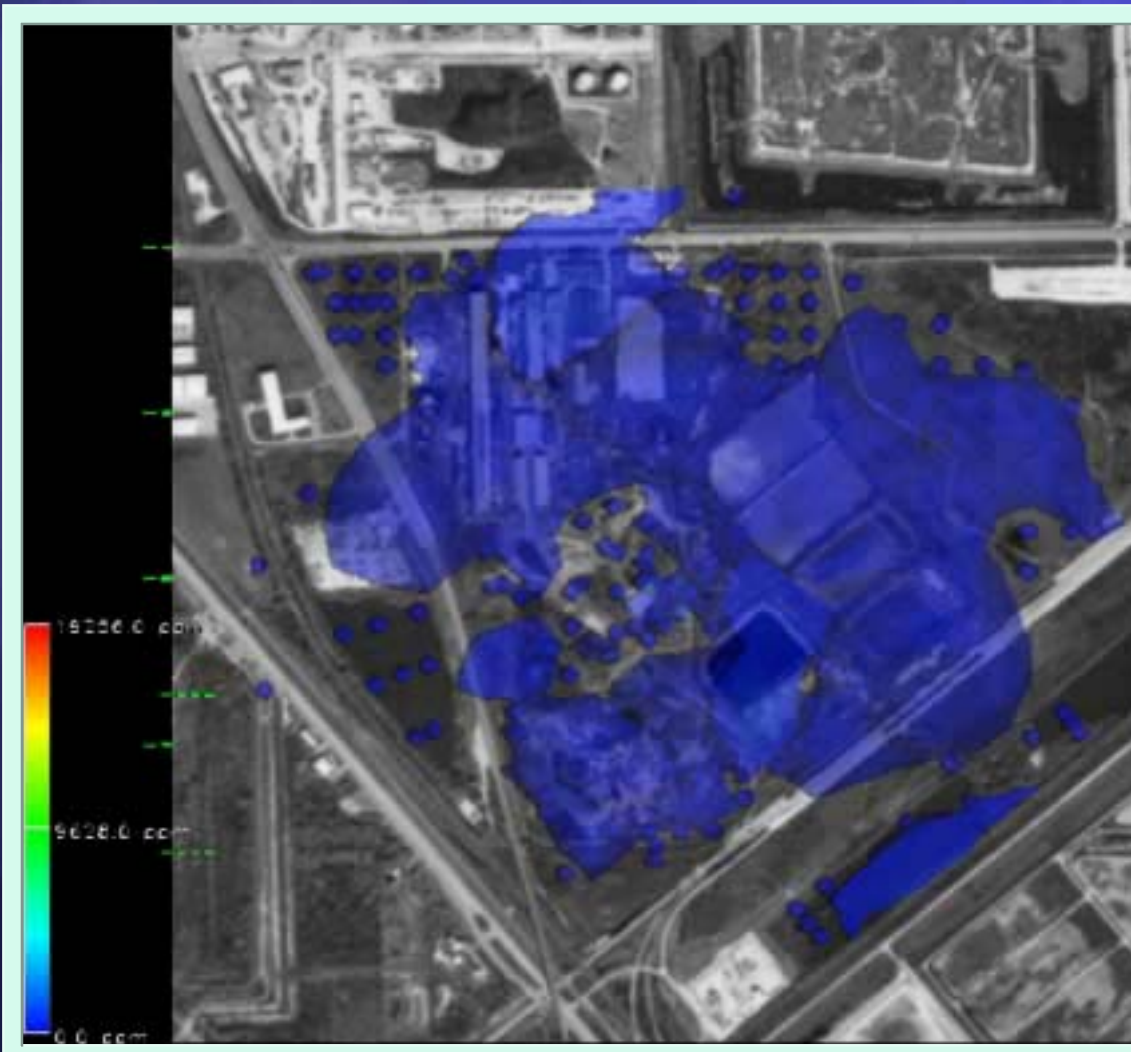


After Remediation



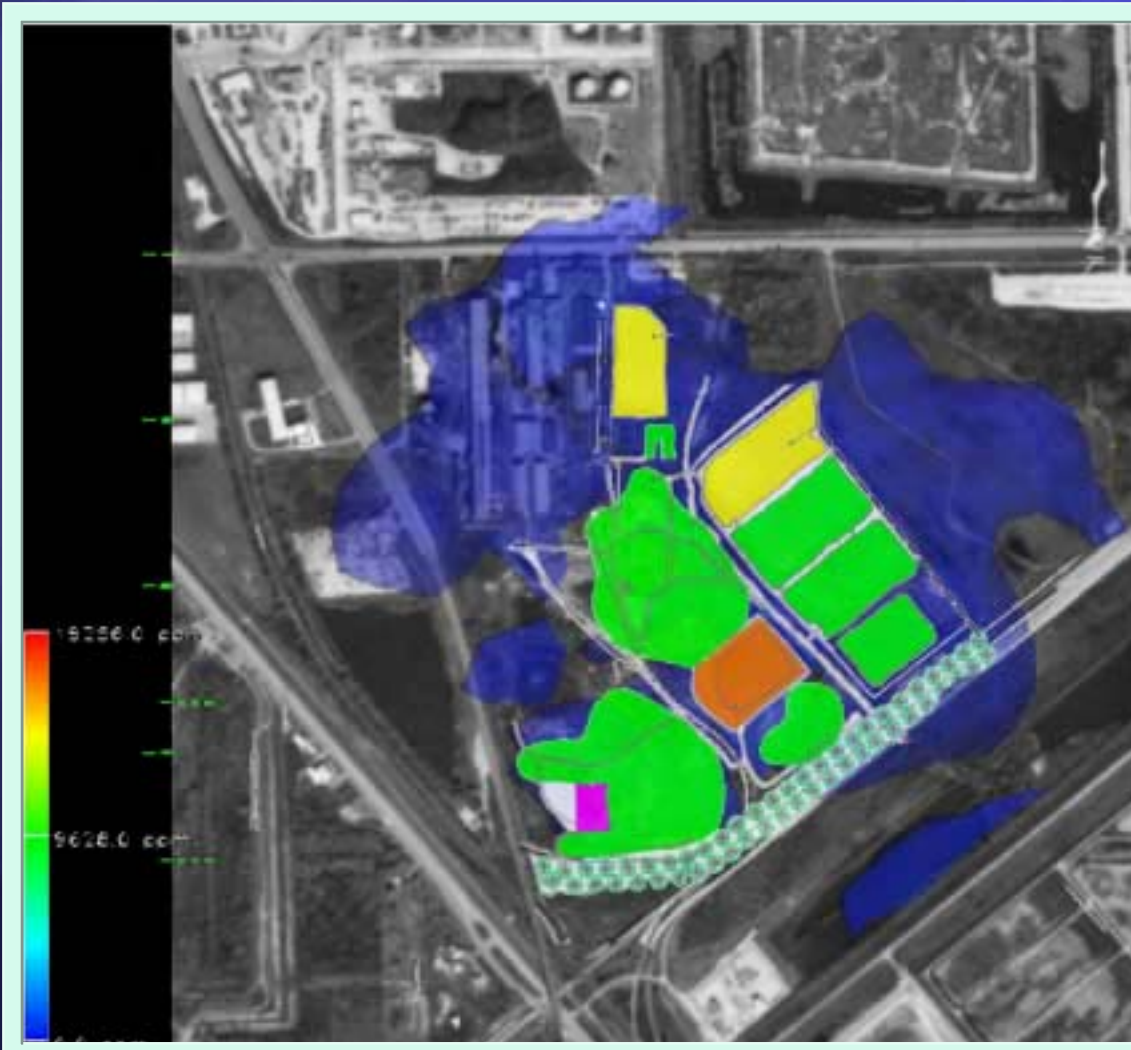
**Tex Tin
Superfund
Site**

GIS Shows Soil Arsenic Concentrations Above Remedial Action Cleanup Level of 194 mg/kg

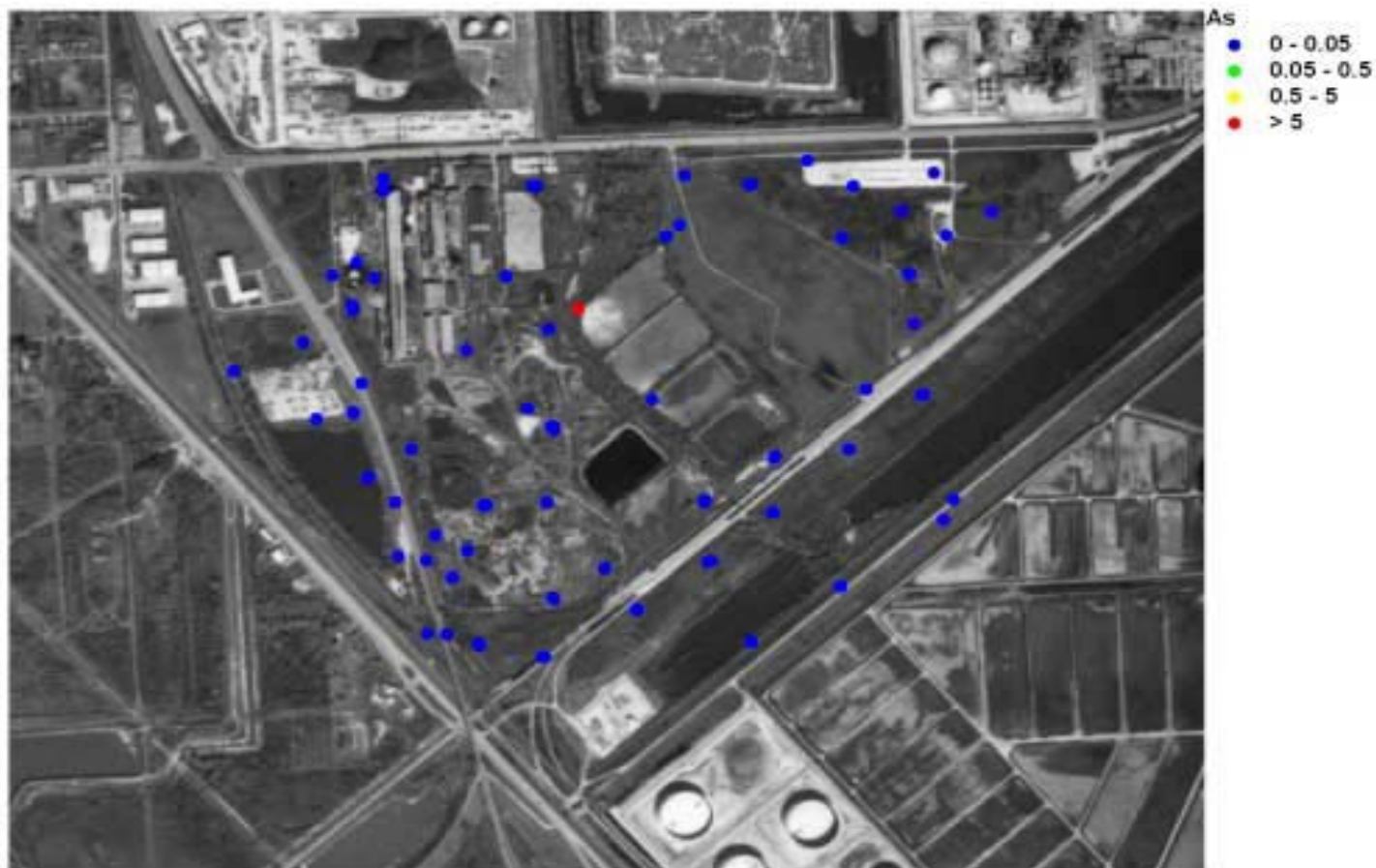


Tex Tin
Superfund
Site

ROD Remedy SW 7 Superimposed on Arsenic Soil Concentrations > PRG

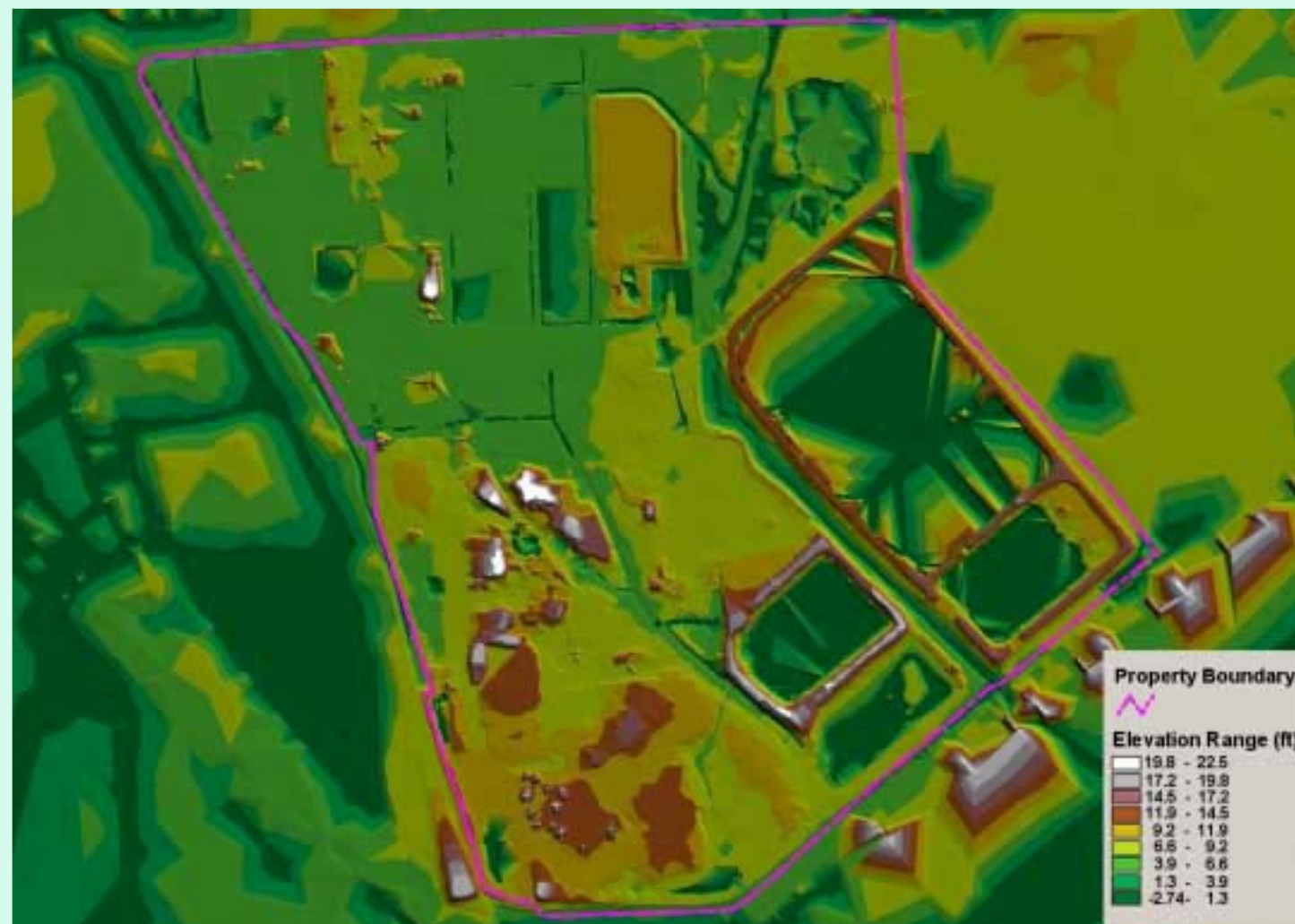


Tex Tin Leachable Arsenic



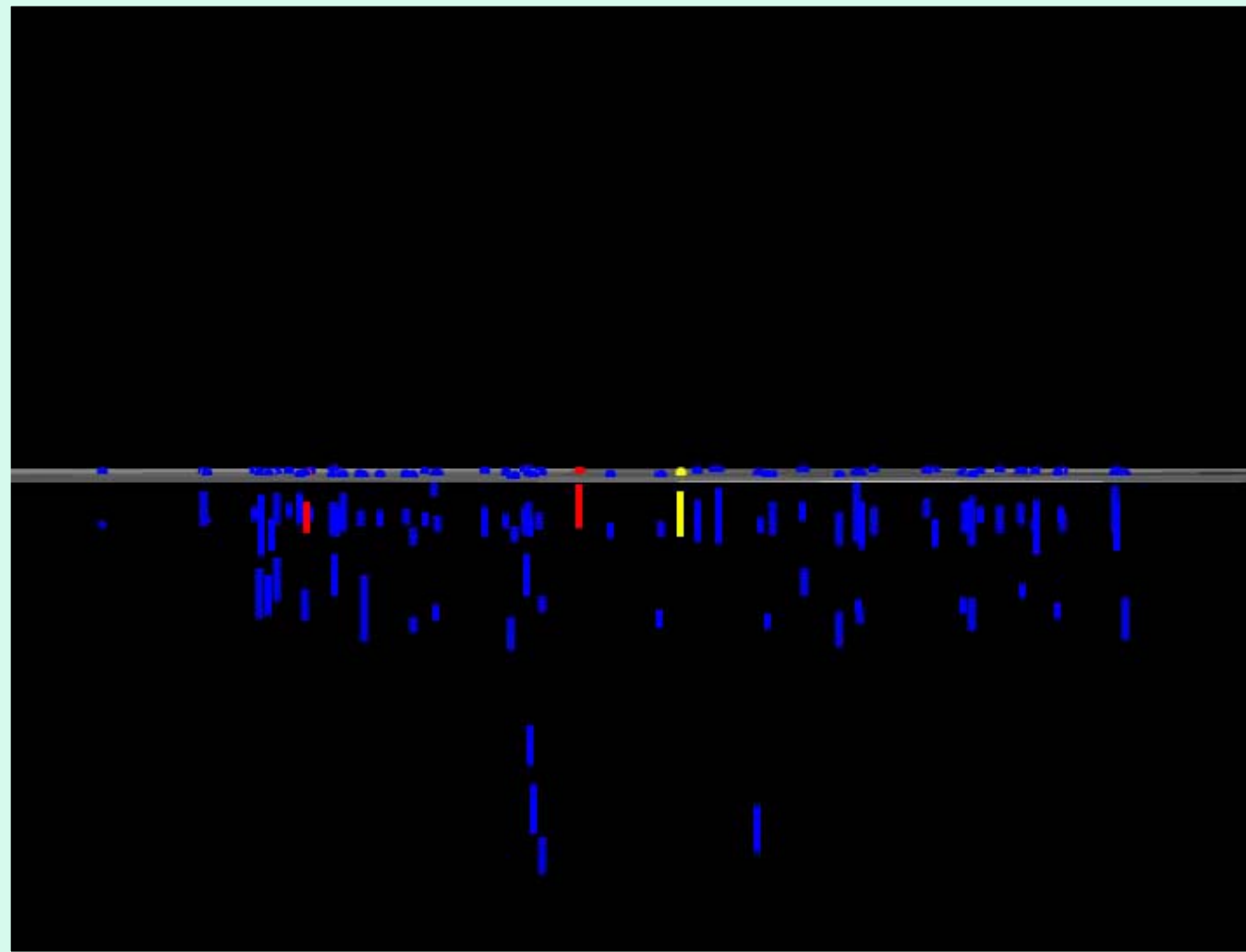
Tex Tin Superfund Site

Topographic Map (OU1)



**Tex Tin
Superfund
Site**

Leachable Arsenic in 3D

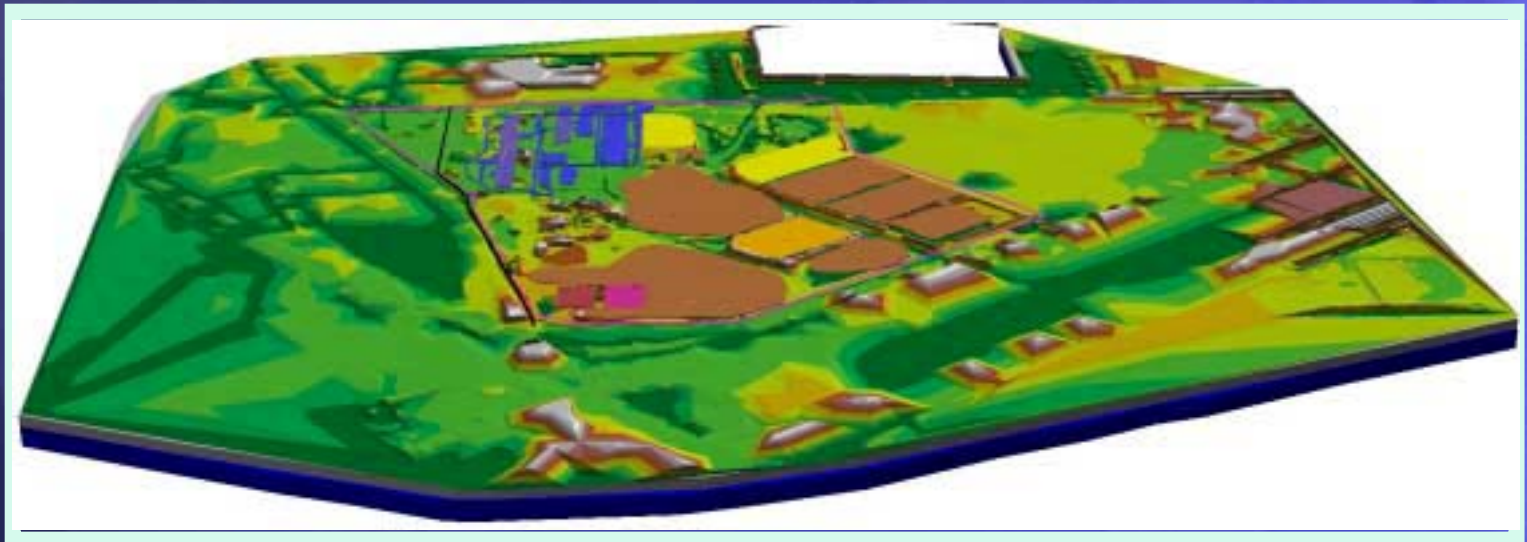


ROD Remedy Superimposed on Topographic Map



**Tex Tin
Superfund
Site**

ROD Remedy Superimposed on 3D Topographic Map



Conclusions

Use GIS if you want to:

- Present data with more power... "a picture says a 1000 words"
- Analyzed data quicker and cheaper
- More easily select a remedy
- Gain control of a project, by having ownership of the data base in understandable and easy to use format
- Enhance owner advocacy for dictating a cost effective project direction.
- Maintain attention in key meetings
- Minimize written project deliverables to regulatory bodies
- Accelerate project schedules and save on consulting fees



More Project Power...Tools Under Development by Project Navigator Ltd.

- Use of Environmental Visualization System (C Tech Development Corp., Huntington Beach, CA) software:
 - This system permits the following:
 - *Bitmap images and animations of project conditions*
 - *Enhanced site visualizations and site assessments from minimal data sets*
 - *Expedited project cost forecasting*
 - *Efficient project execution planning*
- Creation of a Project Navigator Project Virtual Reality System:
 - This tool will permit the following:
 - Online telecons visually assisted with 3D site renderings, where the client virtually "walks" the project and has instantaneous access to data
 - Online design changes and cost forecasting



Web-Enabled Project Management Tools

- GIS databasing of all data using ArcView Total
- immersion/interactive 3D capabilities
- Environmental Visualization System (EVS)
- E*meetings on WebEx
- Use of interactive 3D GIS
- Emailed mpg's for rapid audio/visual PRP updates
- Use of dedicated web domain, with secure access, for site updates
- Onsite webcam for PRP real-time assessment of progress



ProNav Staffing for E*Project and GIS Analysis

Ian A. Webster, Sc.D. (MIT)

- Raw project data to GIS rendition analysis
- Client oriented presentation of complex data sets
- Expert witness experience

Halil I. Kavak, Ph.D. (University of Southern California)

- GIS ArcView, Environmental Visualization System
- Spatial analysis of environmental data
- Project 3 dimensional graphical analysis
- Project management through animation

Jimmy Nguyen, B.F.A.(Cal State University, Fullerton)

- Graphic design, project construction animation and forecasting
- Data information management and analysis
- E-communication of information (data and graphics)

