"Visualizing Subsurface Soil Contamination"

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Project Overview

• Ongoing project with MFA Inc.

- site name and chemical name withheld

• Source of contamination: underground storage tanks

• Currently still tracking the chemical plume

- geoprobe sampling above known Basalt layer

• Chemical has 4 additional breakdown products

• Goal: 3D kriging of chemical plume

- visual analysis, predict plume movement, support decision making

Methods

- Clip DEM to site area
- Create TIN model
- Add site surface features; extrude buildings
- Add Basalt x,y,z coordinates, create TIN surface
- Add Chemical x,y,z,m coordinates, extrude points
- Create chemical plume; 3D Kriging
- Visual analysis and interpretation
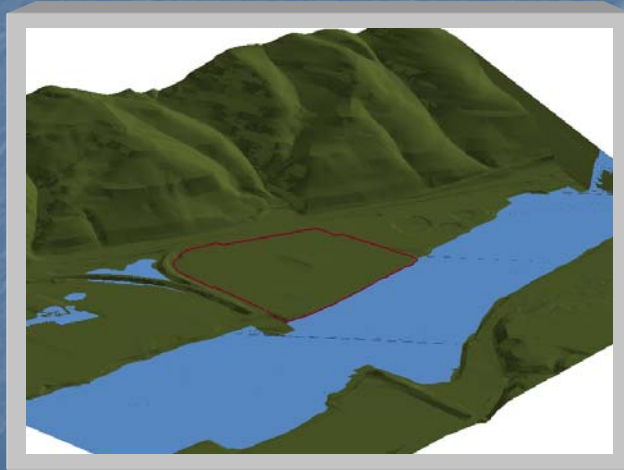
Data Sets Used

- RLIS — 5ft DEM, Taxlots, River Fill

- MFA Inc. — Chemical Data (x,y,z,m) (ug/L)
  - Basalt layer (x,y,z)
  - Bathymetry
  - AutoCAD drawings

- USGS — Aerial photo

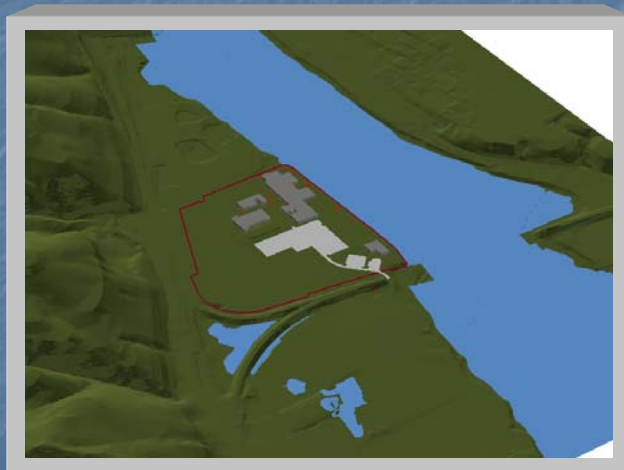- Created — buildings, parking lots

- Aerial overview
- 2D Site Overview
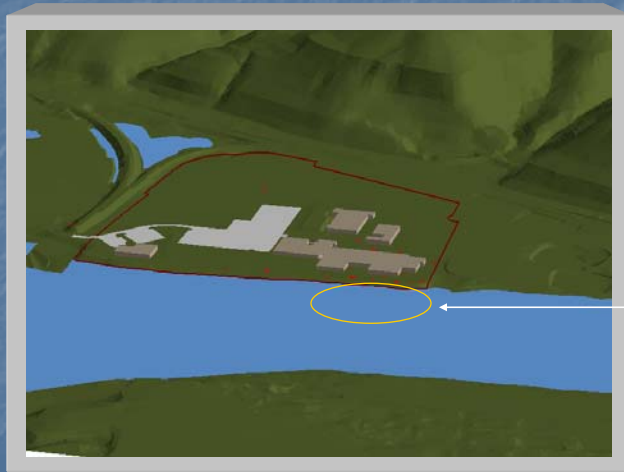

Clipped DEM and Bathymetry
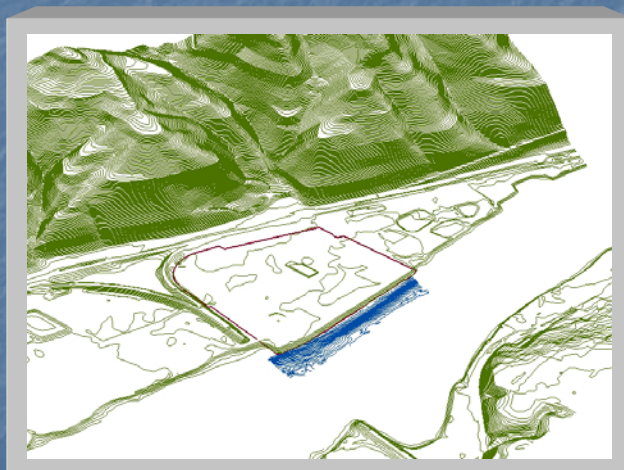
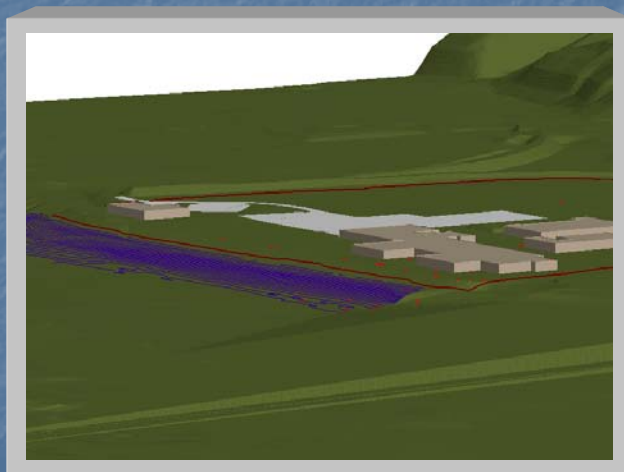TIN Surface w/ River & Site Boundary
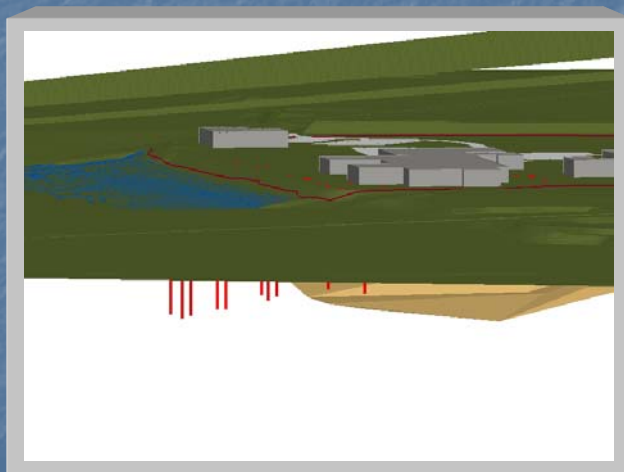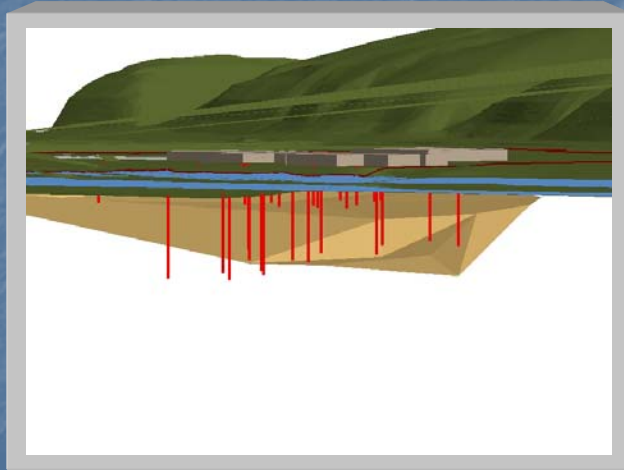

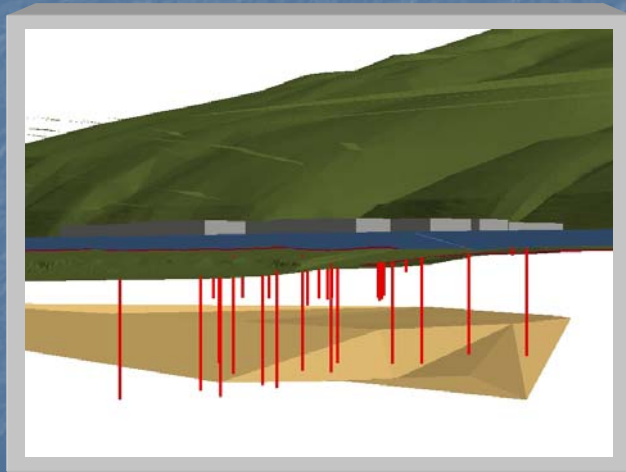Site Features & Geoprobe Locations Added

Offshore Geoprobe Locations

Offshore Barge Drilling Locations

Basalt Layer w/ Chemical x,y,z Extruded

Oops!!

- No 3D Kriging capabilities with Geostatistical/3D analyst

    - Limitation of ArcGIS

    - Doesn't know what to do with multiple values
   at a single x,y coordinate

2D Kriging Methods

- Selected 60 to 120 ft depth range

    - eliminates outliers & allows for most points

    - 160 x,y,z,m values ⟶ 61 x,y,z,m values

- If existed, averaged multiple values at single locations

    - 61 x,y,z,m ⟶ 27 x,y averages

- Hydrological assumption

    - subsurface flow directions

- Apply a model to wide ranging values

    - .02 to 575000 ug/L (difficult!)

- Prediction Map

• Prediction Map w/ Graduated Chemical Averages
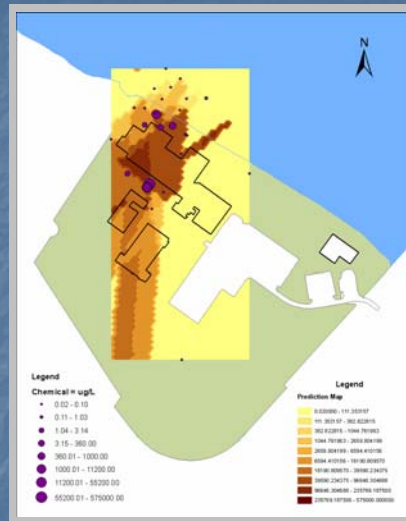
Conclusions

• Kriging Model: Too Simplistic

• Value of Model:

   - Not much...

• 3D software

   - EVS or gislib