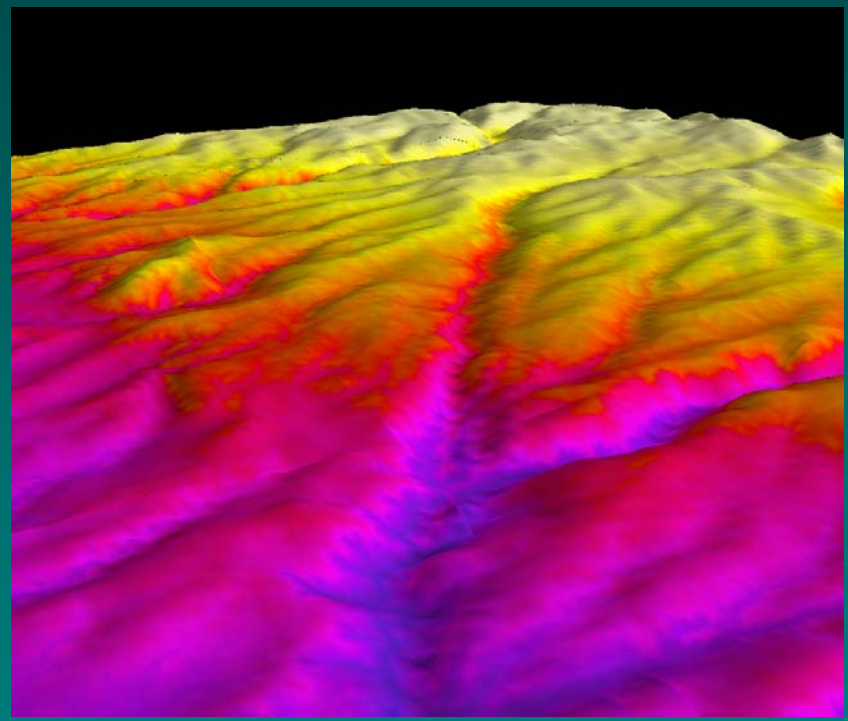
Introduction to Geographic Information Systems

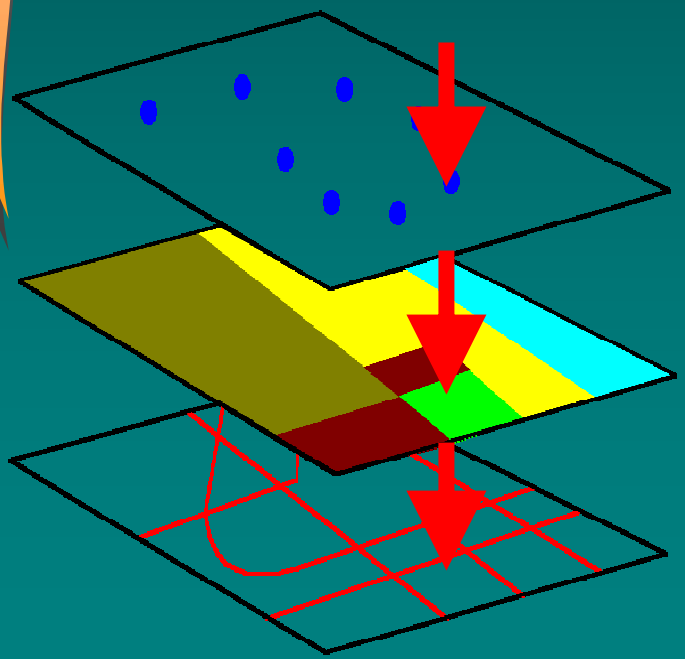


Henning Schreiber
Calaveras County Environmental Health
8th Annual LEA/CIWMB Conference, May 2005

Geographic Information System

- GIS -

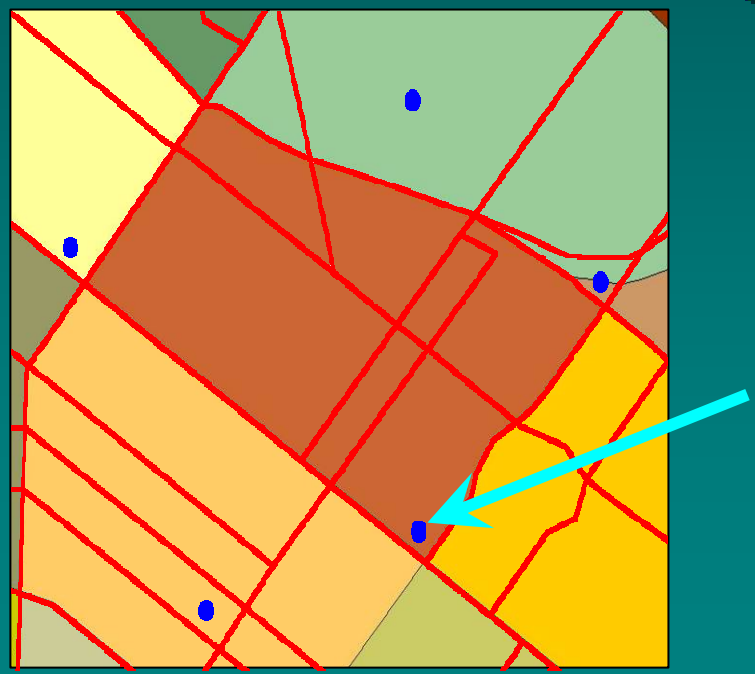
- GIS links spatial information (location) with descriptive information (attributes) and creates a map (layer)



- In GIS you can overlay these layers to create specific maps.
- For any point on these maps all information stored as attributes in the selected layers are available

Geographic Information System
What do we get?

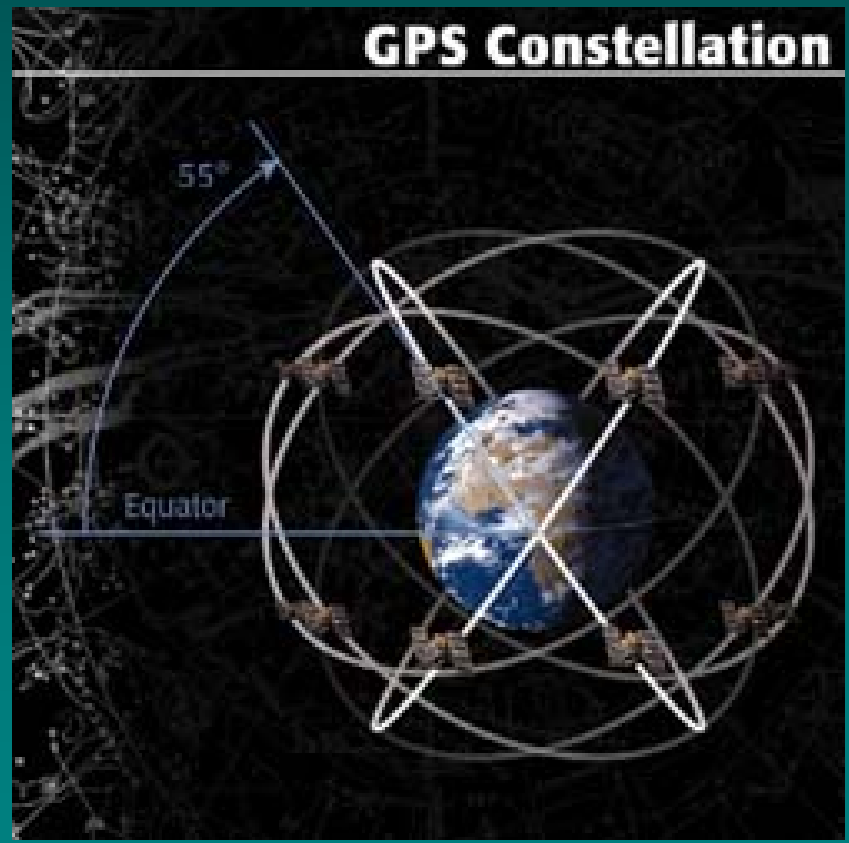
- GIS creates a map with the spatial information (location) in the selected layers.



- Using the "Information"-tool (i) the descriptive information (attributes) can be accessed.
  - Transfer Station #03 (1254 Main, 5 container capacity, Thu-Mon 9-5, incl. Haz.Mat.)
  - Main arteries within 500': S. Main St., Church St.
  - Medium density residential (R3, 2.5 persons/household, 7500 people)

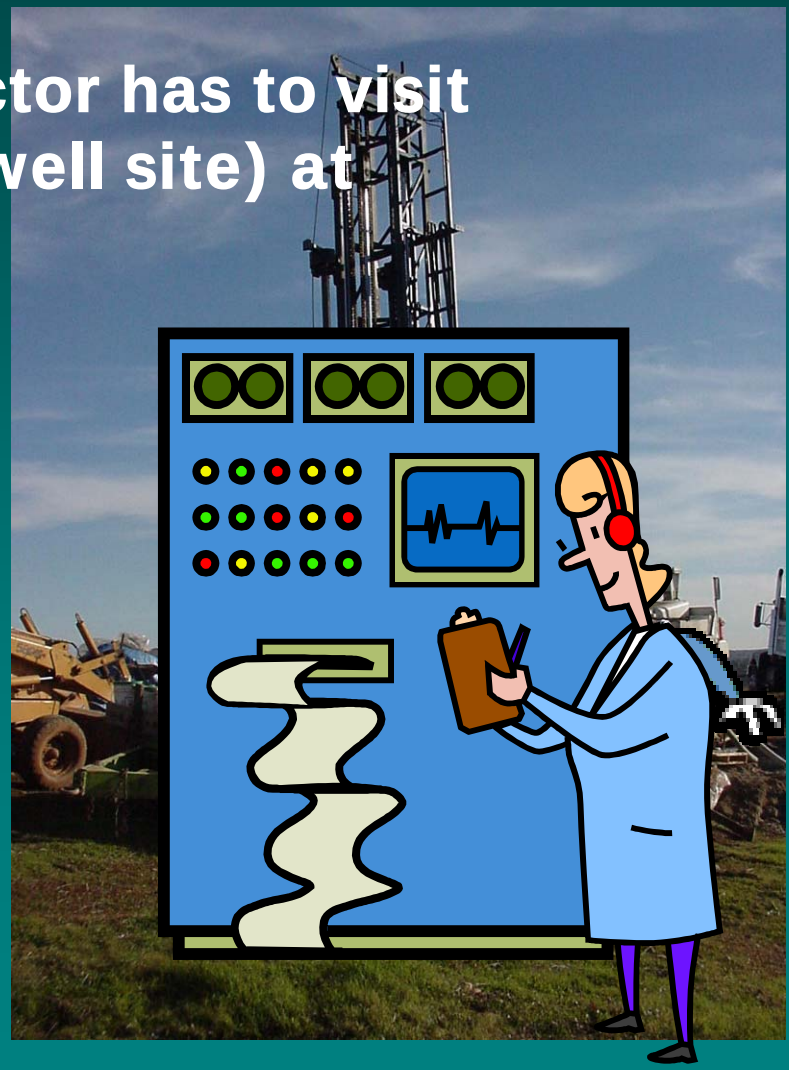
Global Positioning System
GPS

- 24 satellites constantly send signals to the earth.
- With a GPS receiver we can calculate our position according to the satellite signals.
- The accuracy of our position depends on (a) the type of receiver and (b) the quality of the signals received



Global Positioning System
Work Flow

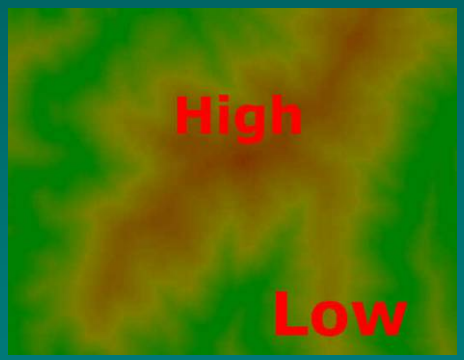
- In most cases an inspector has to visit a site (e.g. a proposed well site) at least once.
- While there he can take the GPS reading (2-3 min).
- In the office the GPS readings are being uploaded, differential corrected and added to the existing GIS layer (3-5 min)



What do we need GIS for?

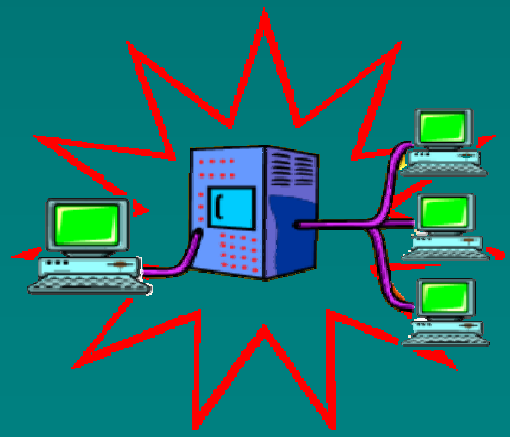
There are 3 major fields for GIS applications:

1. **Use of spatial data in the inter- and intra-departmental workflow**



2. **Spatial analysis and visualization of issues**

3. **Serving the public with information based on specific locations**

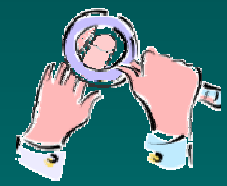


GIS

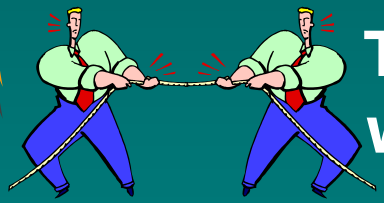
The Good, the Bad, and the Ugly

The Good

GIS provides a wealth of tools and it enhances the intra-departmental data flow. The right hand knows what the left hand is doing

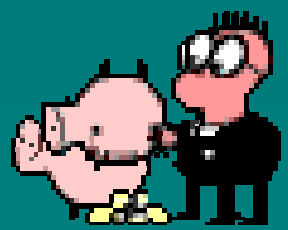


The Bad



The success of the GIS depends on the willingness of departments to collaborate.

The Ugly

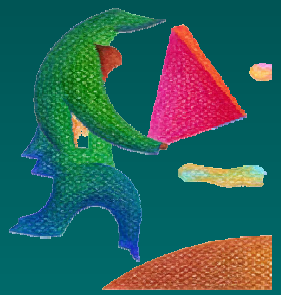


GIS costs money!

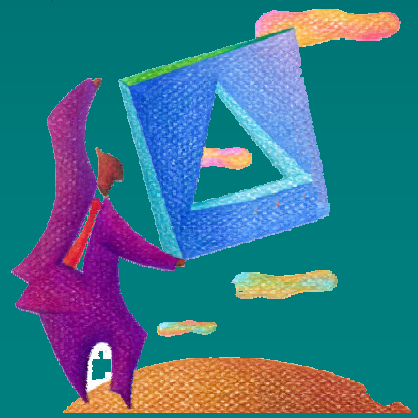
BUT think business: the investment in a GIS will save money on the long run.

GIS - Applications

The general problem:



- The GIS-guru knows what GIS can do, but very often is not familiar with the workflow and tasks within the department



- The professionals in the department know their work but are often not aware what GIS can do.

The Solution

TALK

GIS - Applications

GIS - Applications

Some examples

GIS - Applications

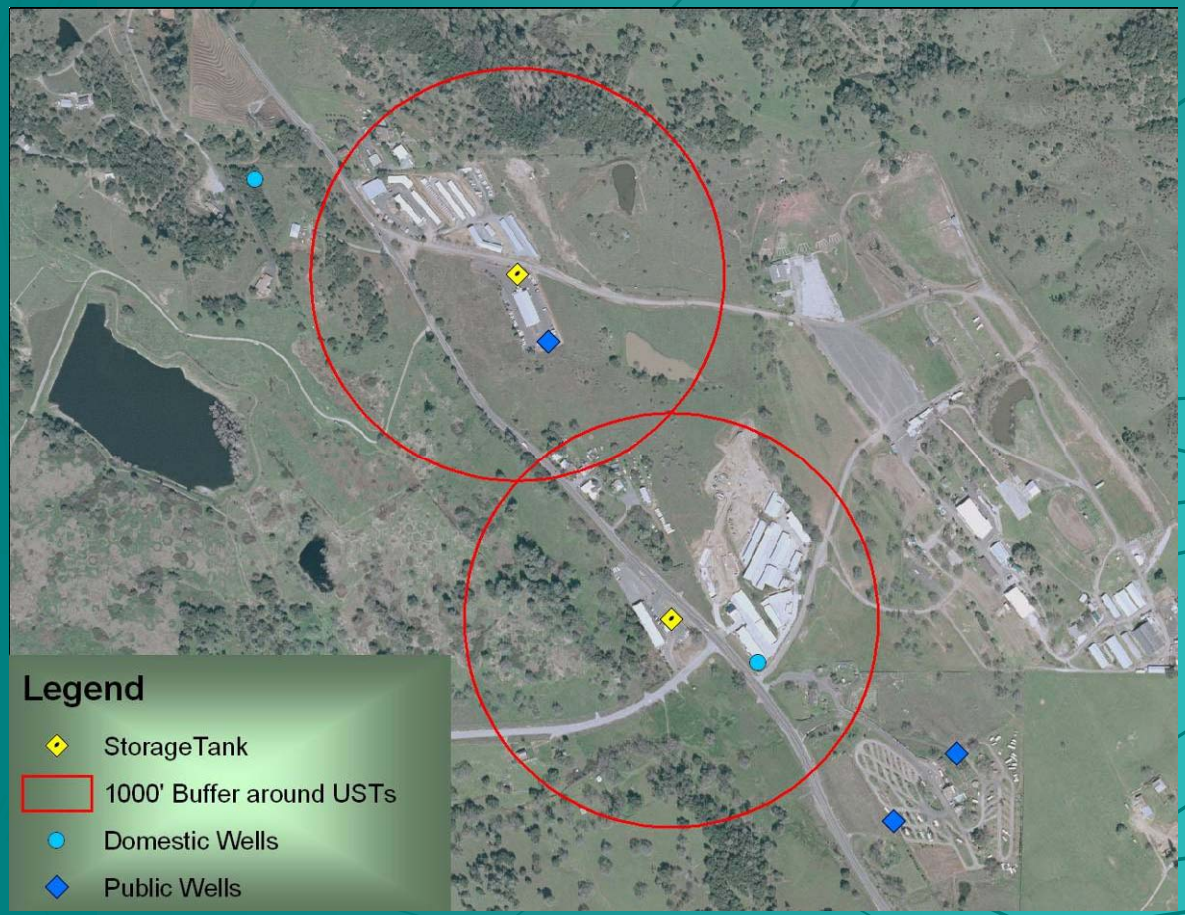
GIS and the intra-departmental dataflow:

The Code states:

All underground storage tanks within 1000’ of a public water well have to undergo an enhanced leak detection test.

GIS - Applications

GIS and the intra-departmental dataflow:



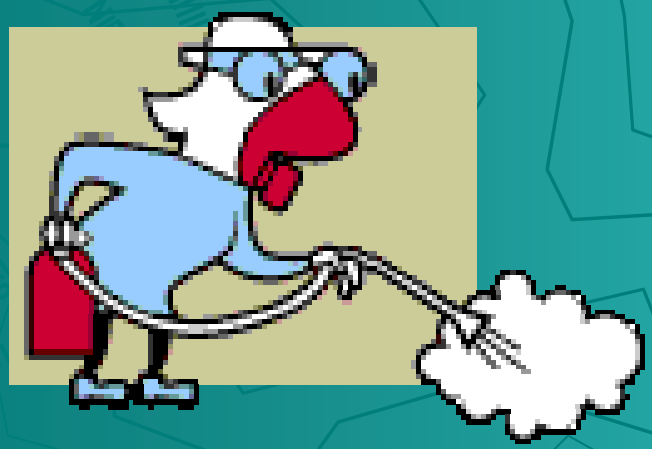
- Wilma Waterwell inspects and locates all public water systems and their wells.
- Greg Gasoline oversees the gas stations.
- GIS creates a buffer off 1000’ around all gas stations

GIS - Applications

GIS and the inter-departmental dataflow:

The Code states:

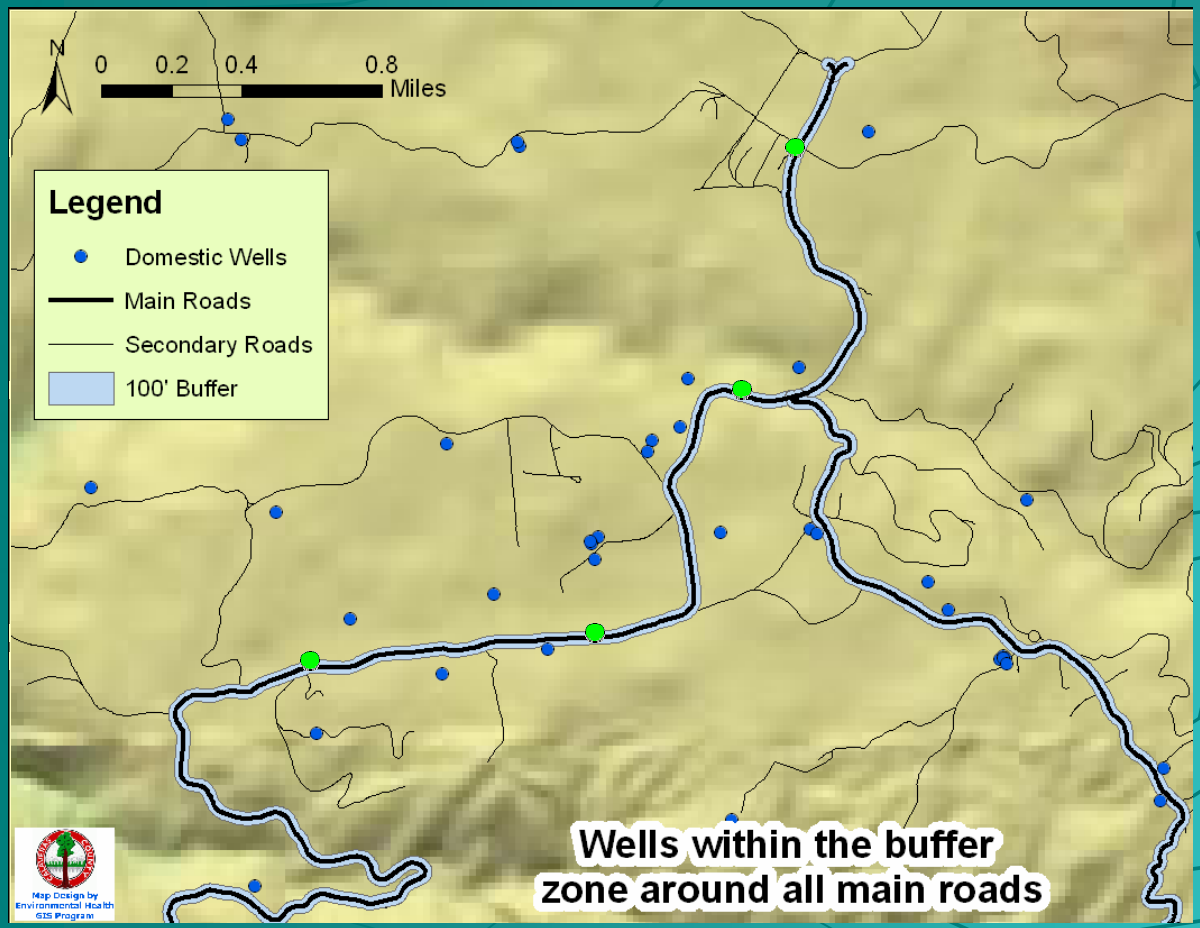
No pre-emergent herbicide shall be sprayed within 100’ of any well.



Every year Steve Sprayer from the Ag.-Department has to spray the roadsides of all main roads with pre-emergent herbicides.

GIS - Applications

GIS and the inter-departmental dataflow:



- Wilma Waterwell provides Steve with all well locations.
- GIS creates a buffer off 100’ around all main roads and selects all wells within the buffer

GIS - Applications

Presence of Hazardous Materials should be no surprise for First Responders

GIS and Solid Waste

Site assessment of illegal dump sites using GIS!

Site Assessment Form

The State asks for the following information:
(among other)

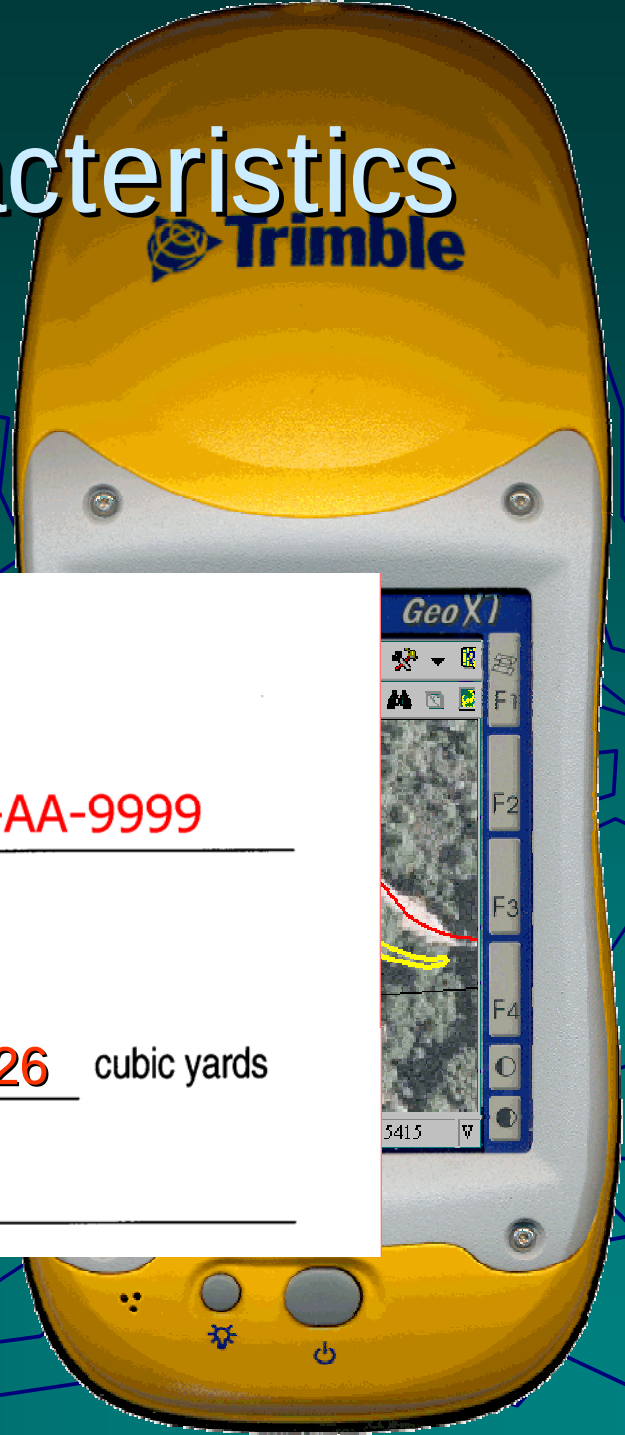
- Waste area(s) dimensions
- Soil Type
- Mean annual precipitation
- Is waste area within a flood plain? (Y/N)
- Slope pitch
- Show detailed site map(s)

Waste Area Dimensions

- GPS the outline of the dump.
- The GIS software calculates the surface area, perimeter etc.
- Estimate the depth of the dump and calculate the rough volume of trash to be removed.

Disposal Site Characteristics

GPS the outline of the dump.



SITE ASSESSMENT FORM

(Attach additional description or explanation as needed
or include in comment Section VIII.)

Site name: Gollum's Precious **SWIS No.** 05-AA-9999

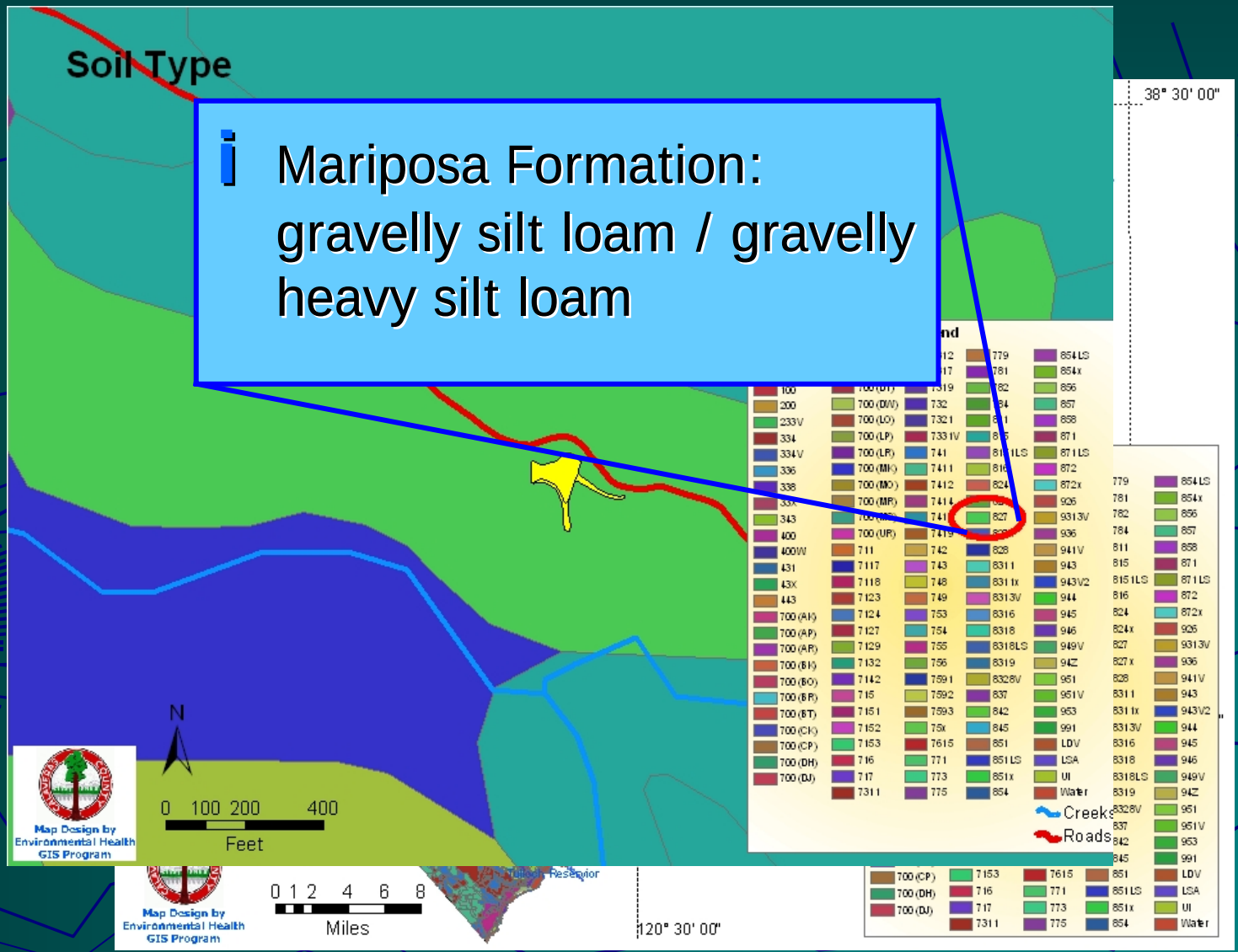
I. Disposal Site Characteristics

A. Waste Area(s) Dimensions

1. Area and volume:	0.11	acres	526	cubic yards
2. Estimate maximum depth of waste:	4.0	feet		
3. Estimate average depth of waste:	3.0	feet		

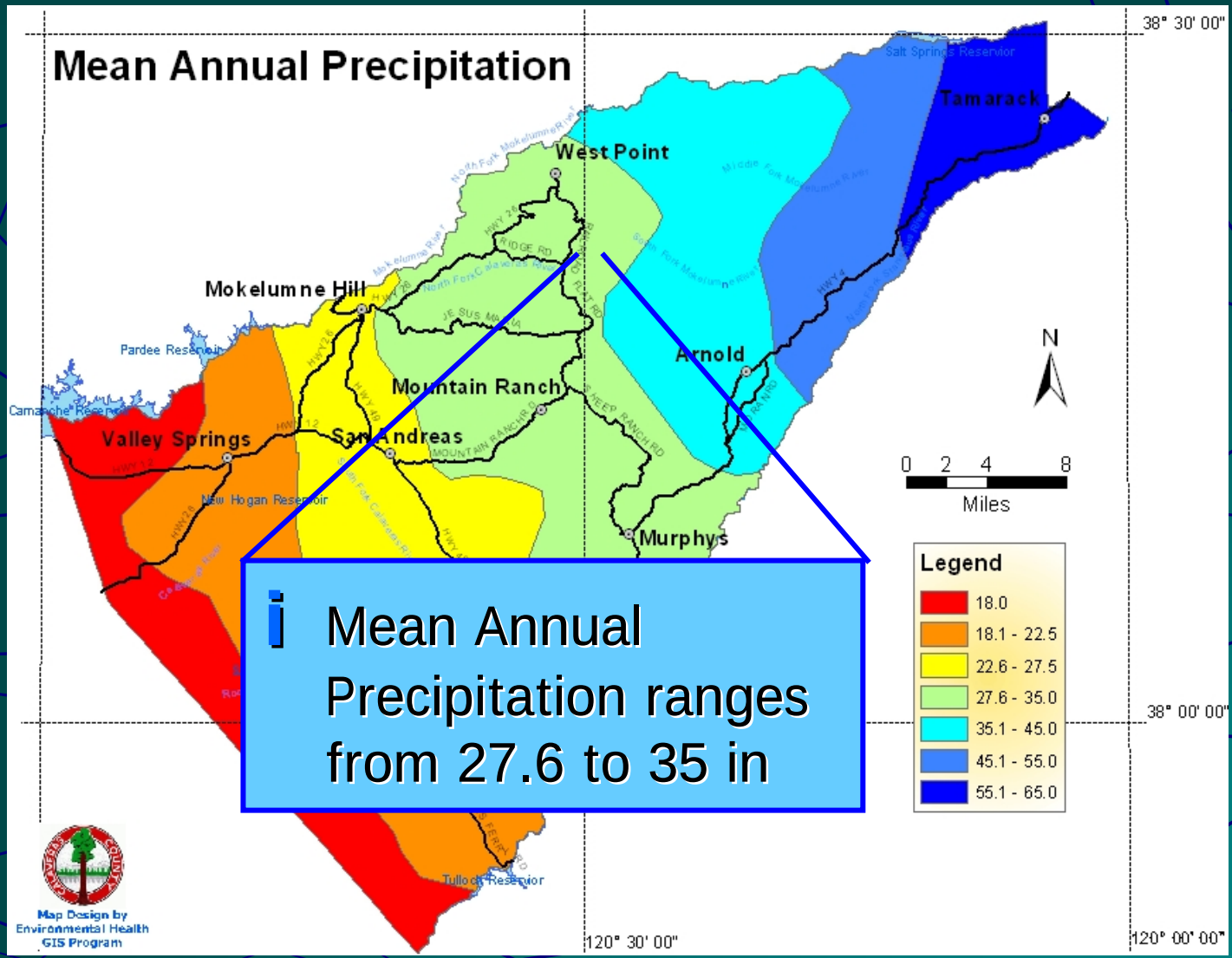
Soil Type

Display the GIS Layer with Soil Types and zoom to the dump site.



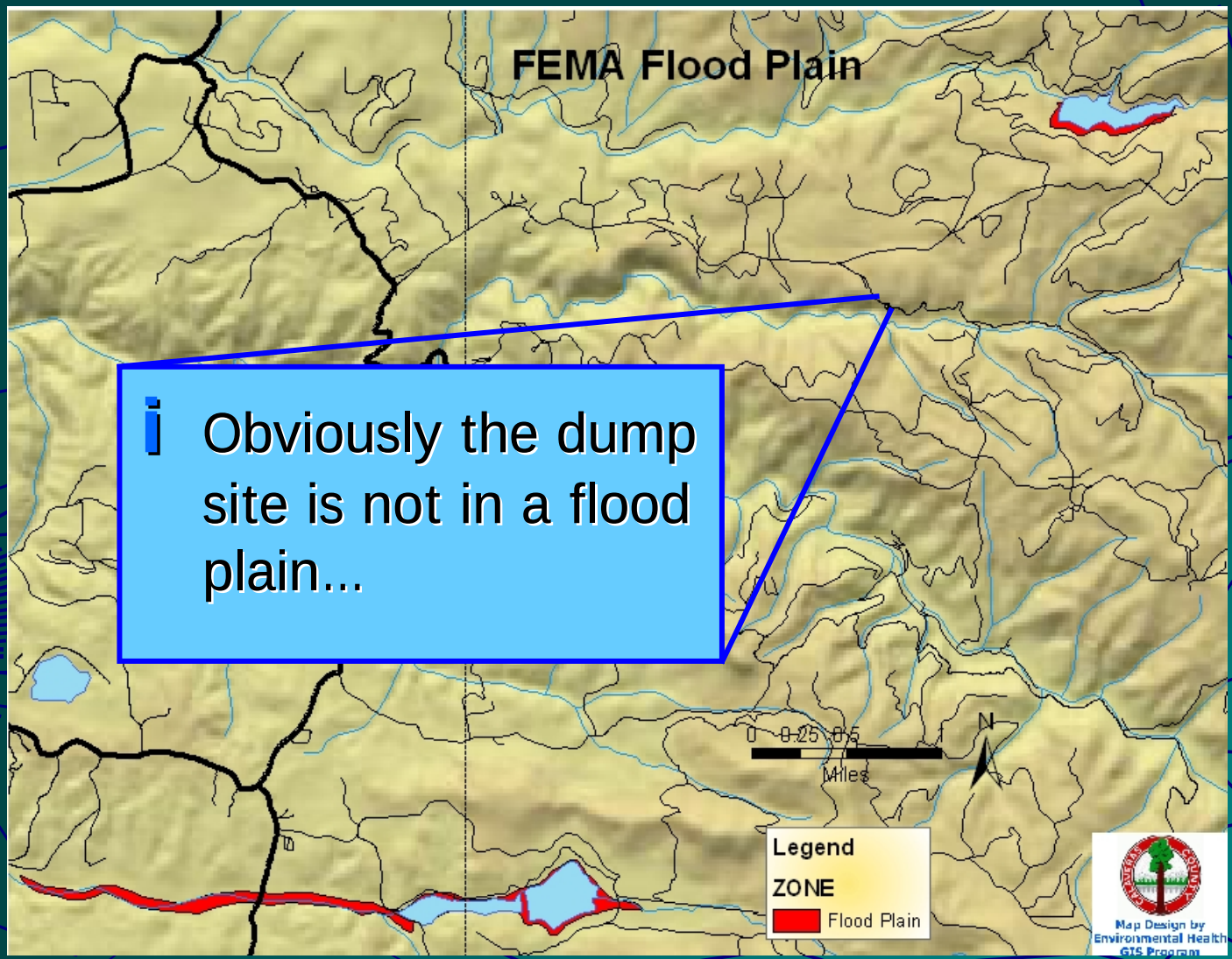
Mean Annual Precipitation

Display the GIS Layer with Mean Annual Precipitation and locate the dump site.

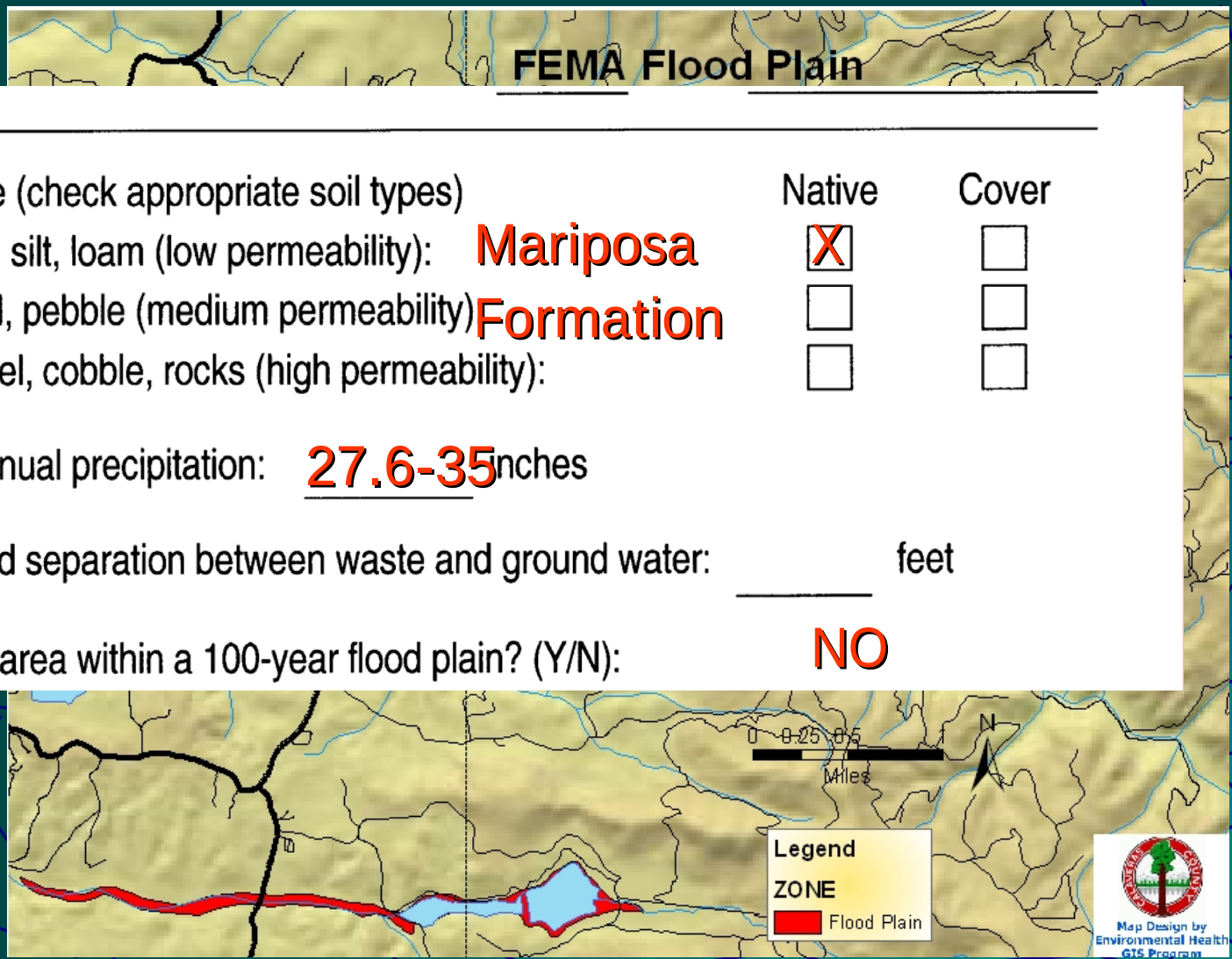


Within a Flood Plain ?

Display the GIS Layer with the FEMA Flood Plain data and locate the dump site.



Within a Flood Plain ?



B. Soil Type (check appropriate soil types)

		Native	Cover
1.	Clay, silt, loam (low permeability): Mariposa	X	
2.	Sand, pebble (medium permeability) Formation		
3.	Gravel, cobble, rocks (high permeability):		

C. Mean annual precipitation: 27.6-35 inches

D. Estimated separation between waste and ground water: _____ feet

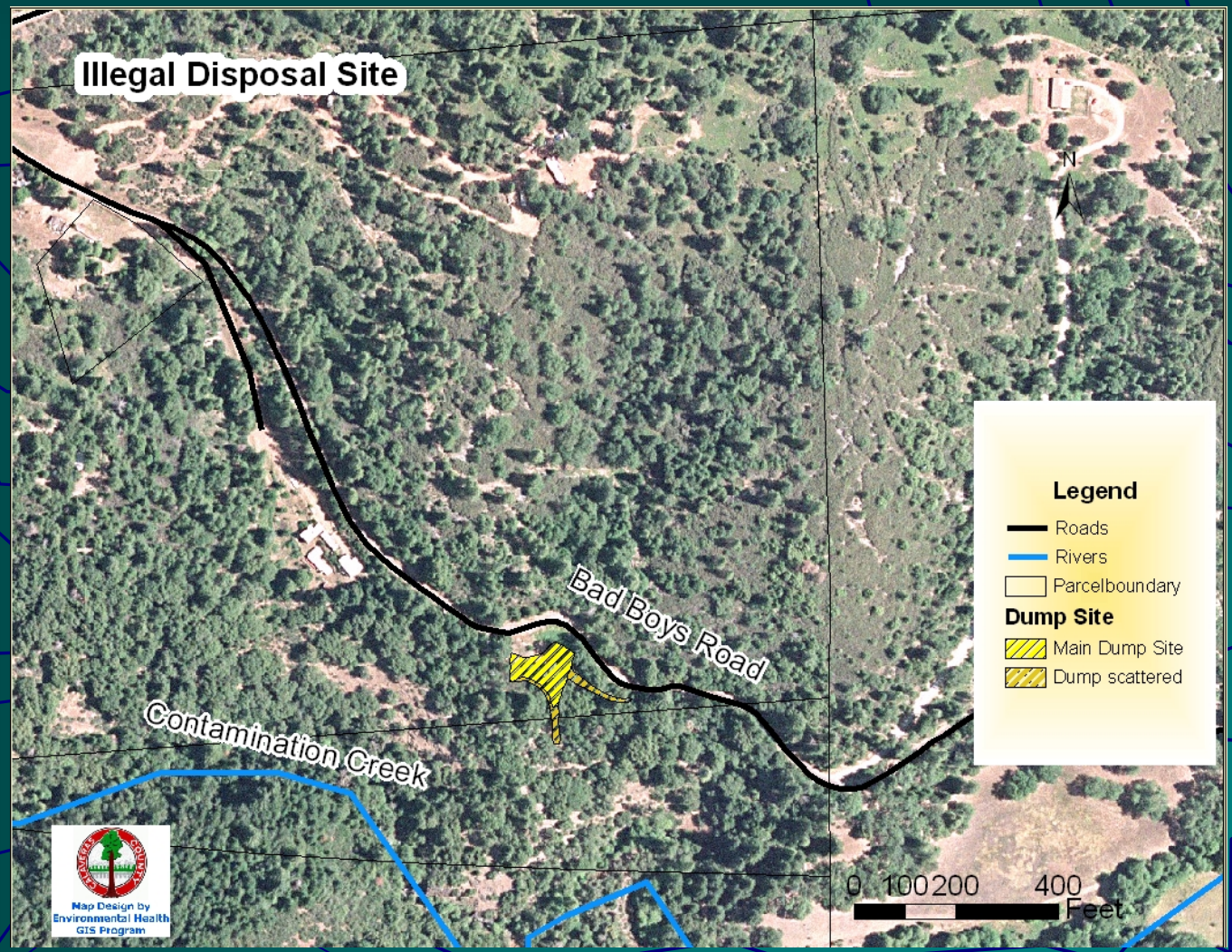
E. Is waste area within a 100-year flood plain? (Y/N): NO

Responsible Party

- Locate the site.
- Verify the property the site is located on.
- Identify the responsible party.

Risk Assessment

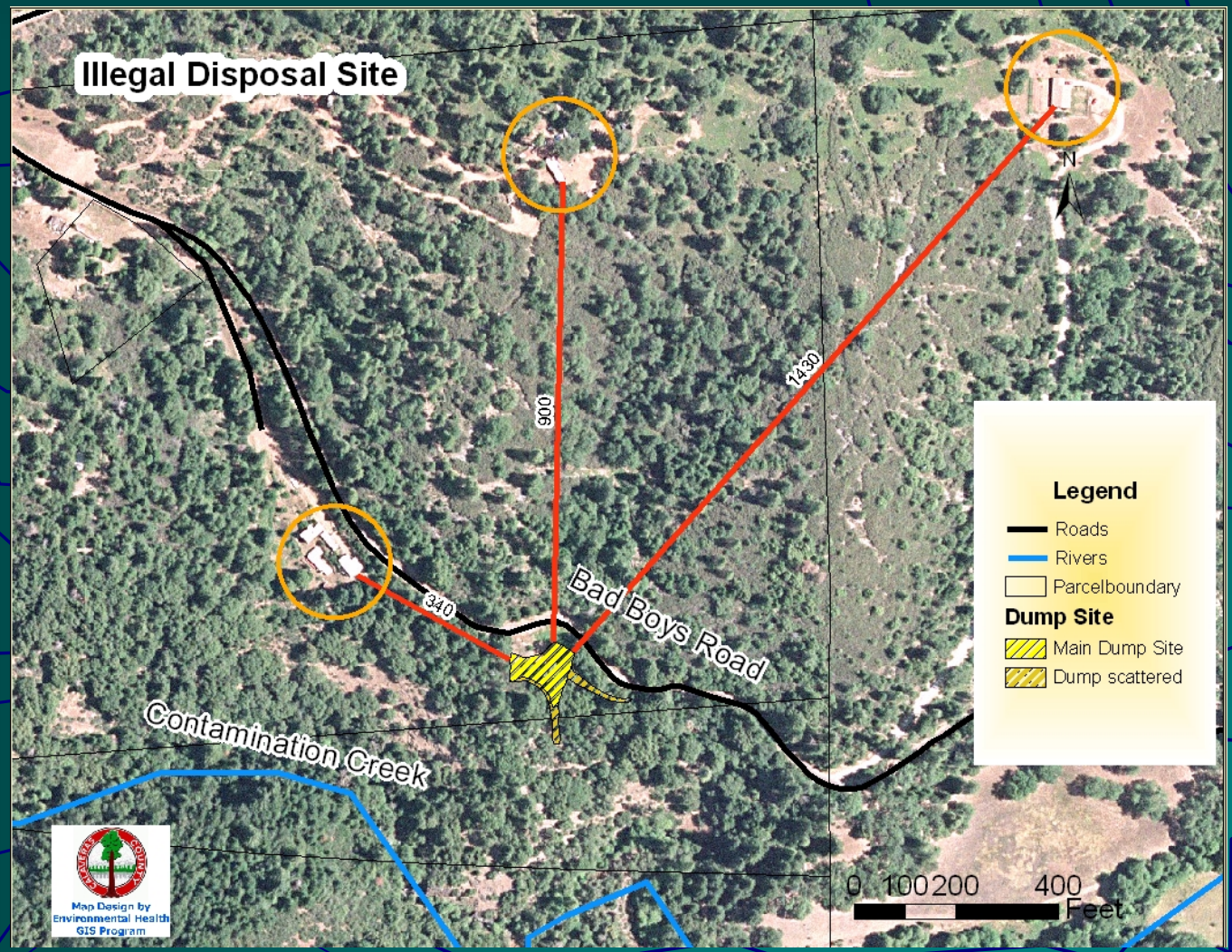
Put the dot on the map



Risk Assessment

Put the dot on the map

Measure to the dwellings

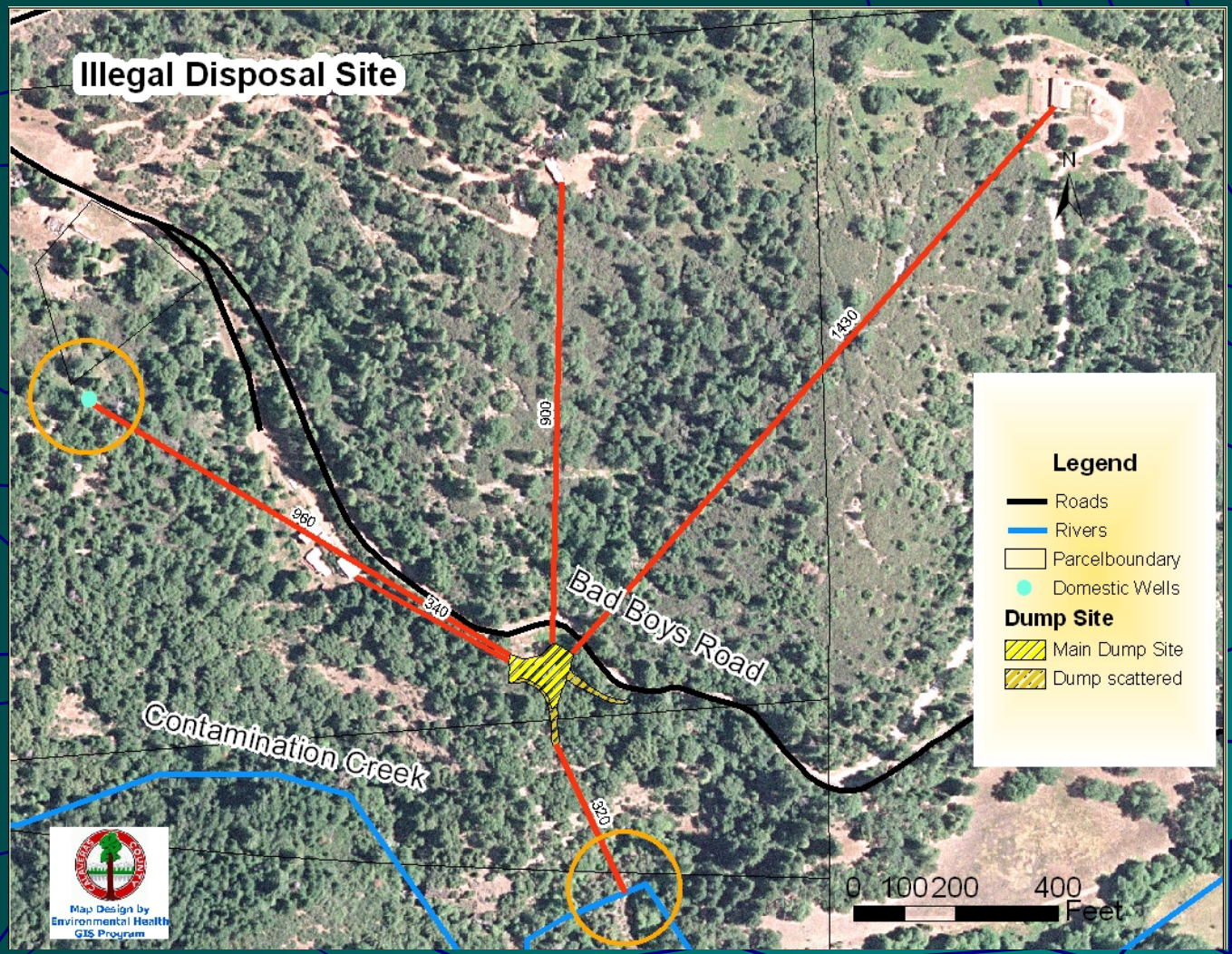


Risk Assessment

Put the dot on the map

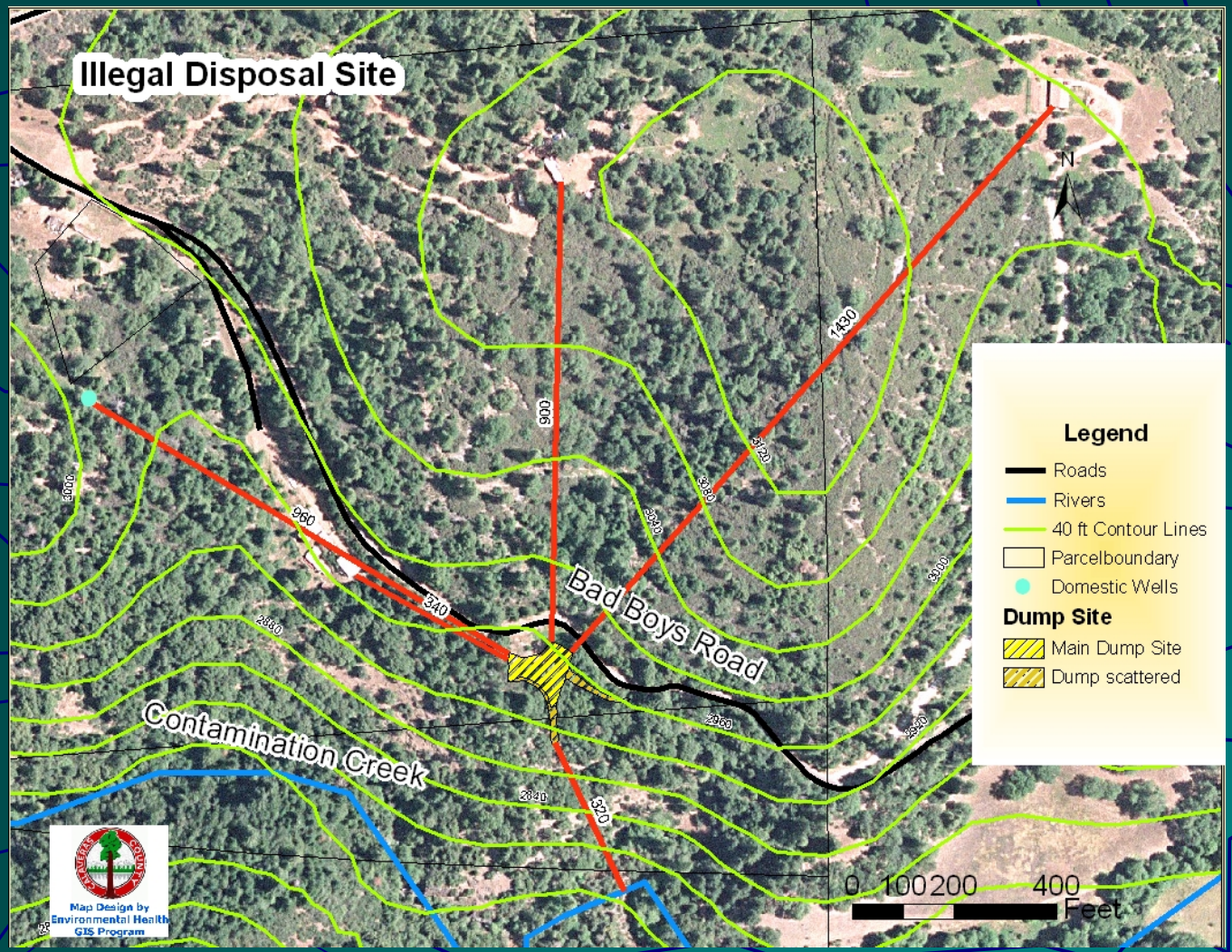
Measure to the dwellings

Measure to well and creek



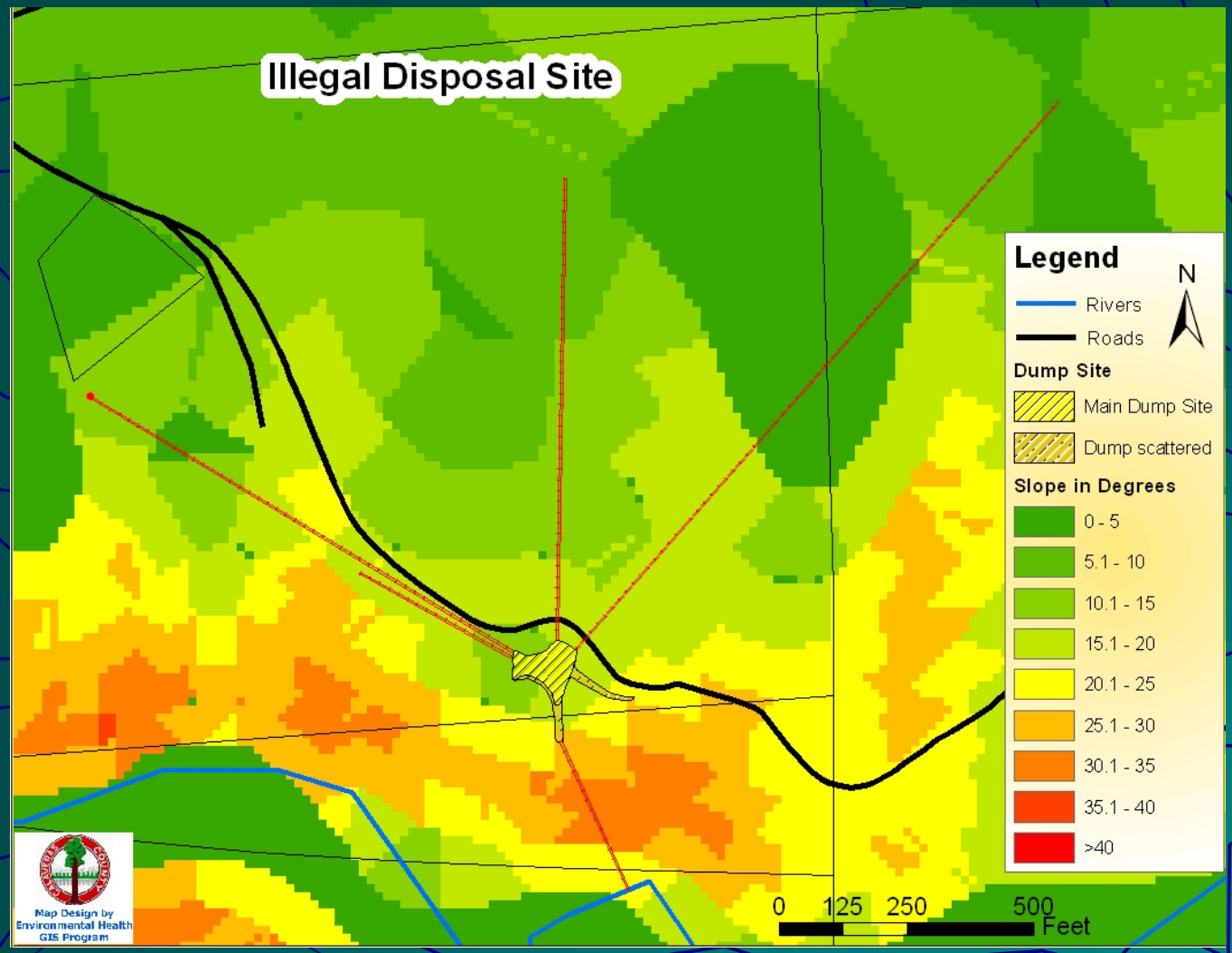
Risk Assessment

- Put the dot on the map
- Measure to the dwellings
- Measure to well and creek
- Add contour lines for the relief



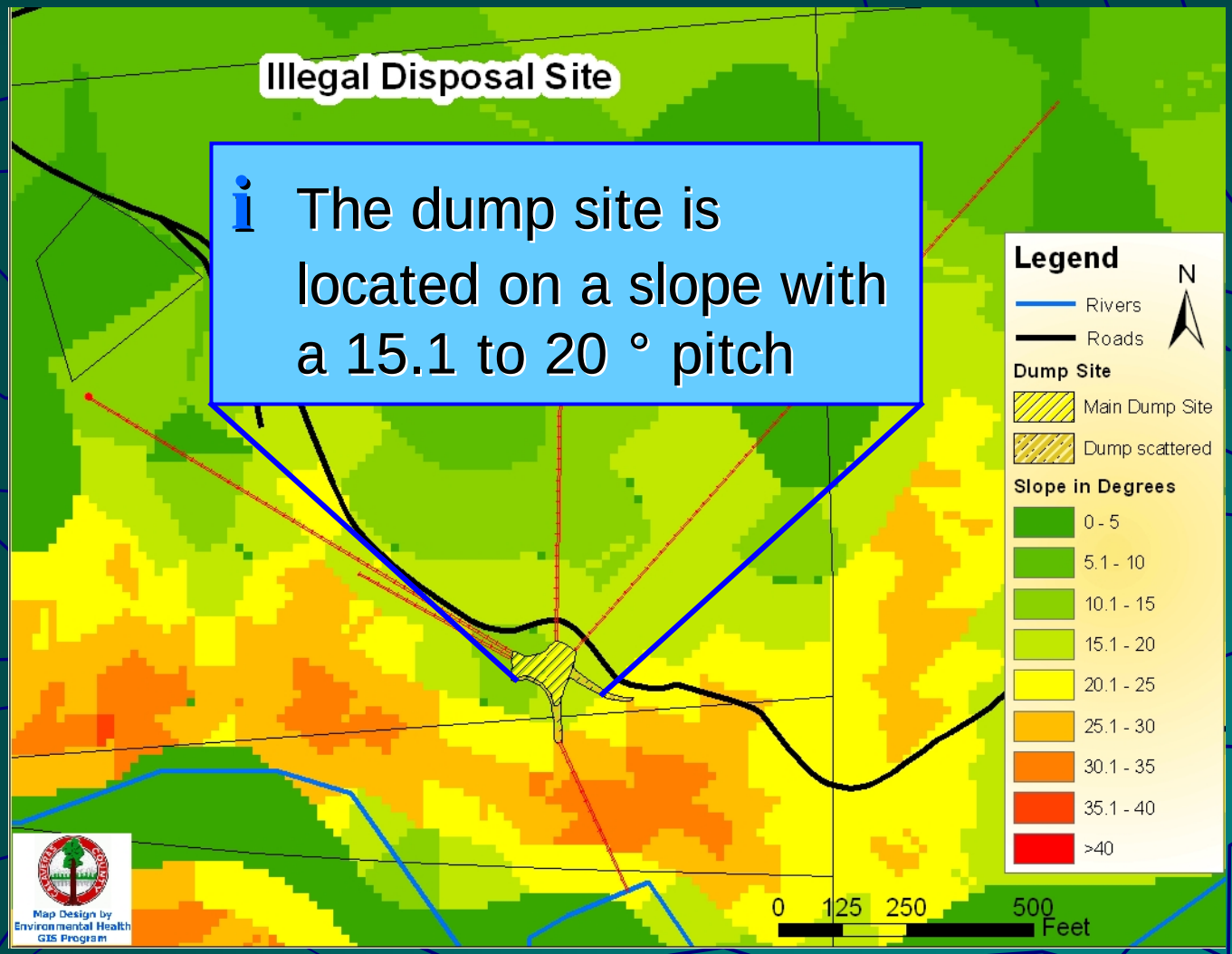
Slope

The GIS software calculates the pitch of the slope



Slope

The GIS software calculates the pitch of the slope



Risk Assessment

Put th
on the

Measu
the dv

Measu
well a

Add c
lines f
relief

E. Is waste area within a 100-year flood plain? (Y/N): NO

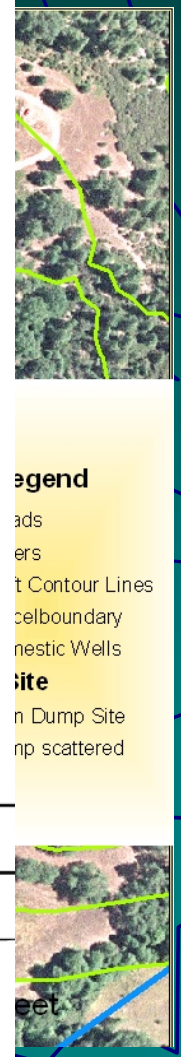
F. Show the following items on a site map(s):

1. Property boundaries ☑
2. Waste disposal area(s) boundary ☑
3. Structures on or within 1000 ft. of waste 340', 900' and 1430'
4. Topographical Contours ☑
5. Access points and roads ☑
6. Site security systems NO
7. Surface water bodies and drainage patterns ☑ (creek)

Maps are enclosed!

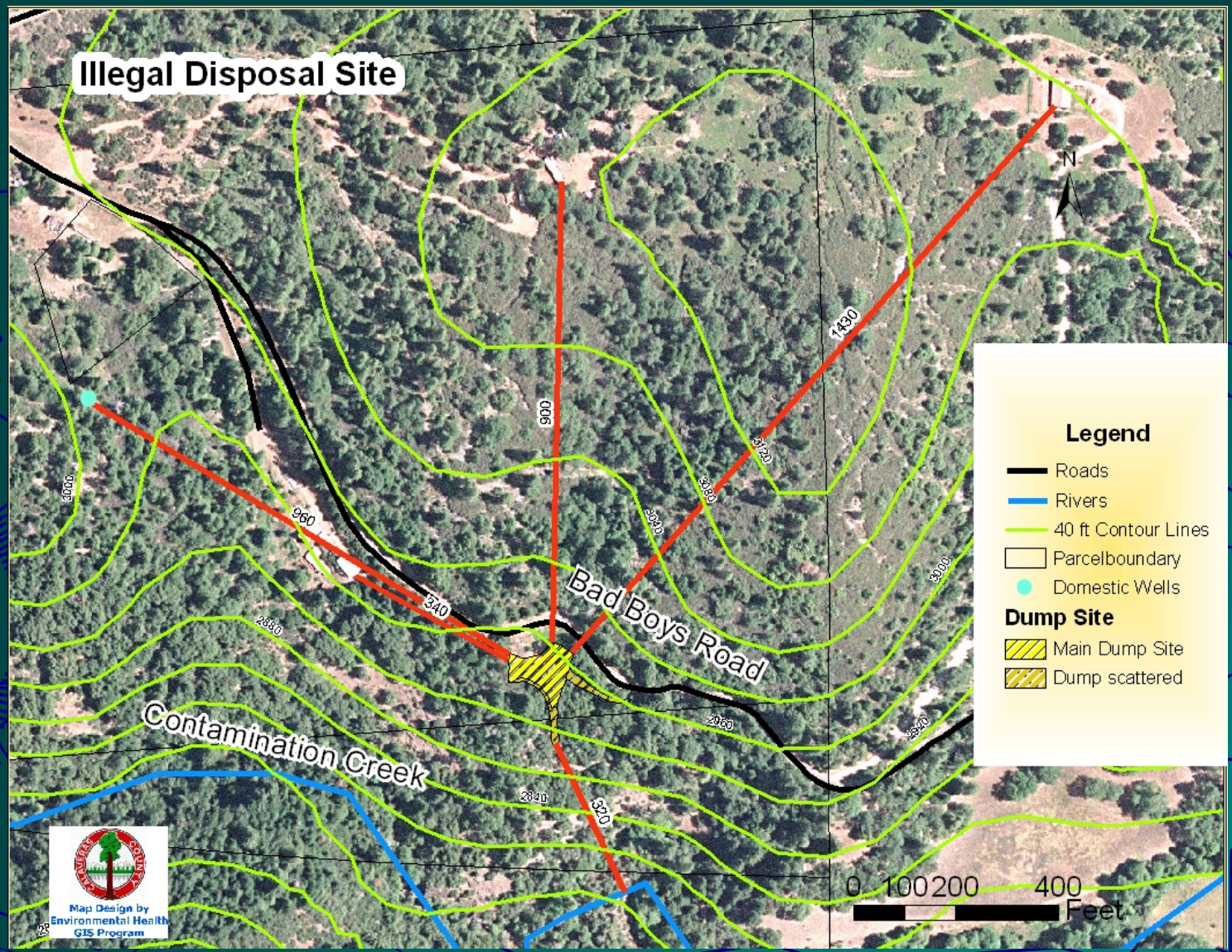
E. Are slopes greater than 3:1 (33% or 18 degrees)? (Y/N) YES

F. Are slopes greater than 1.75:1 (57% or 30 degrees)? (Y/N) NO



Visualization of Dump Sites

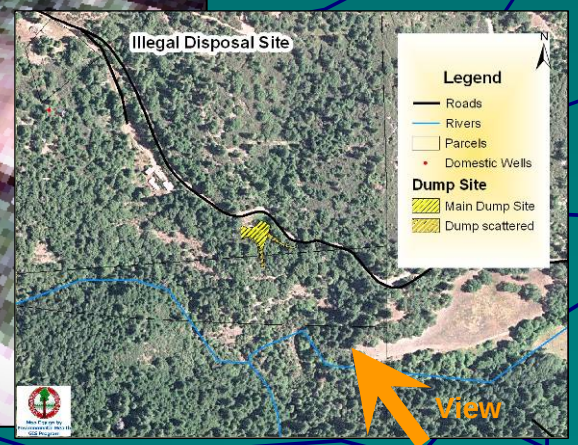
Include maps with the Site Assessment Form



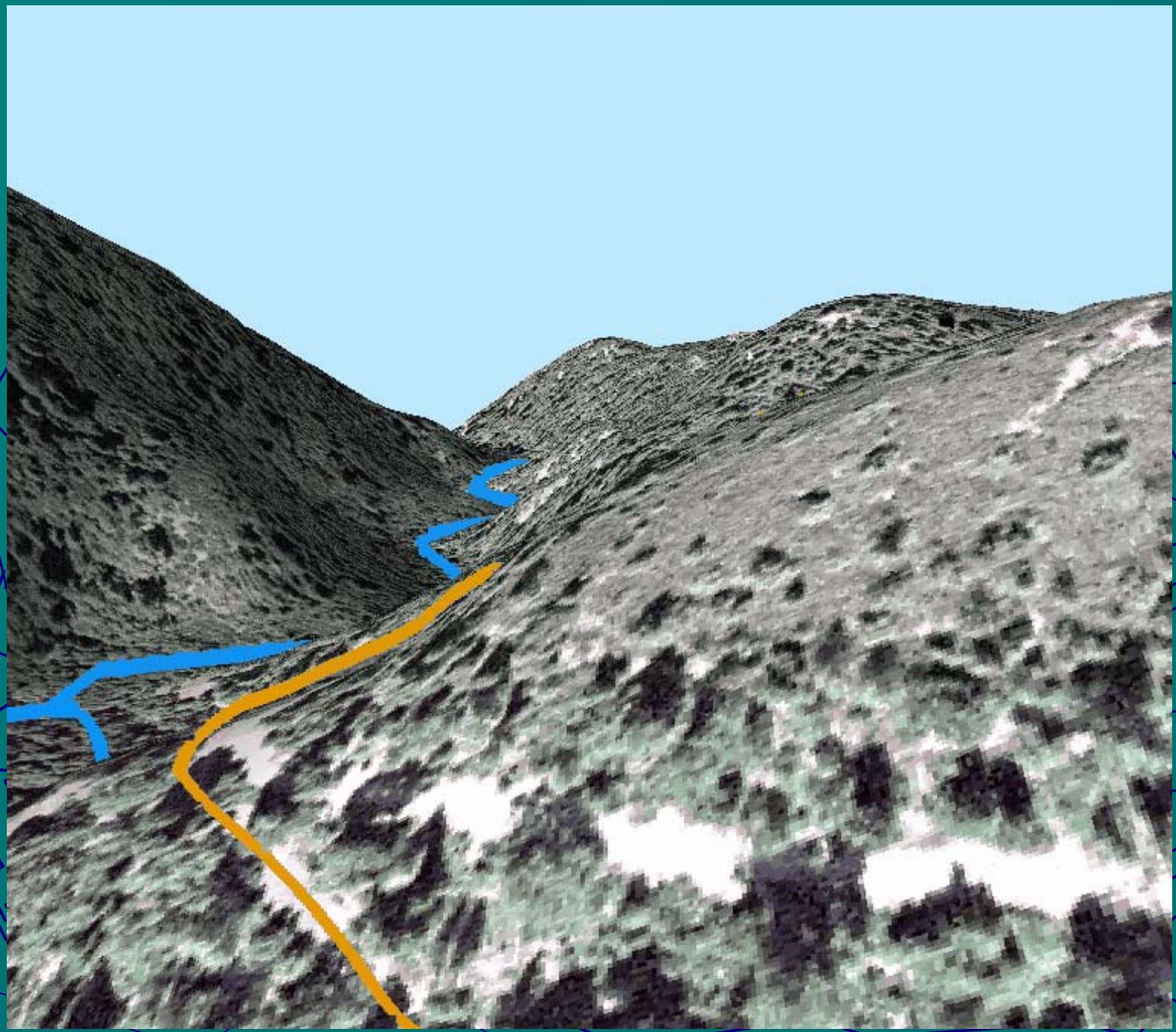
Visualization of Dump Sites

If appropriate include a 3D view of the dump site.

And be done!



Map Design by Environmental Health GIS Program



Map Design by
Environmental Health
GIS Program