



“Getting Out of the Pits”

Investigating Ohio’s Coal Mine Hazards

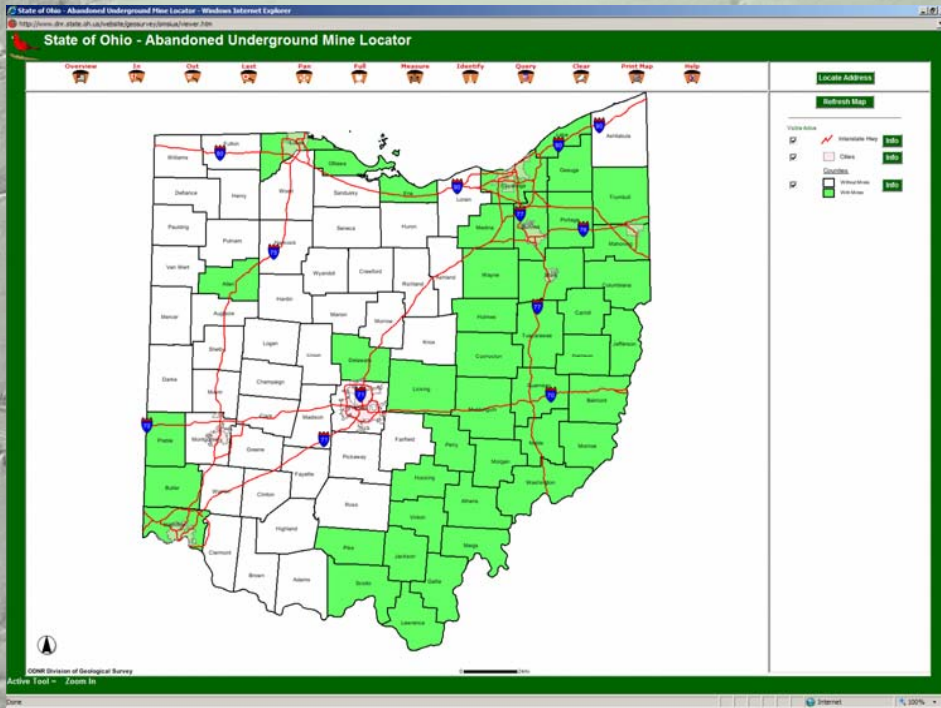
Ohio Department of Natural Resources

Chris Gordon - Ohio Geological Survey

Tim Jackson - Mineral Resources Mgmt.



Ohio Geological Survey



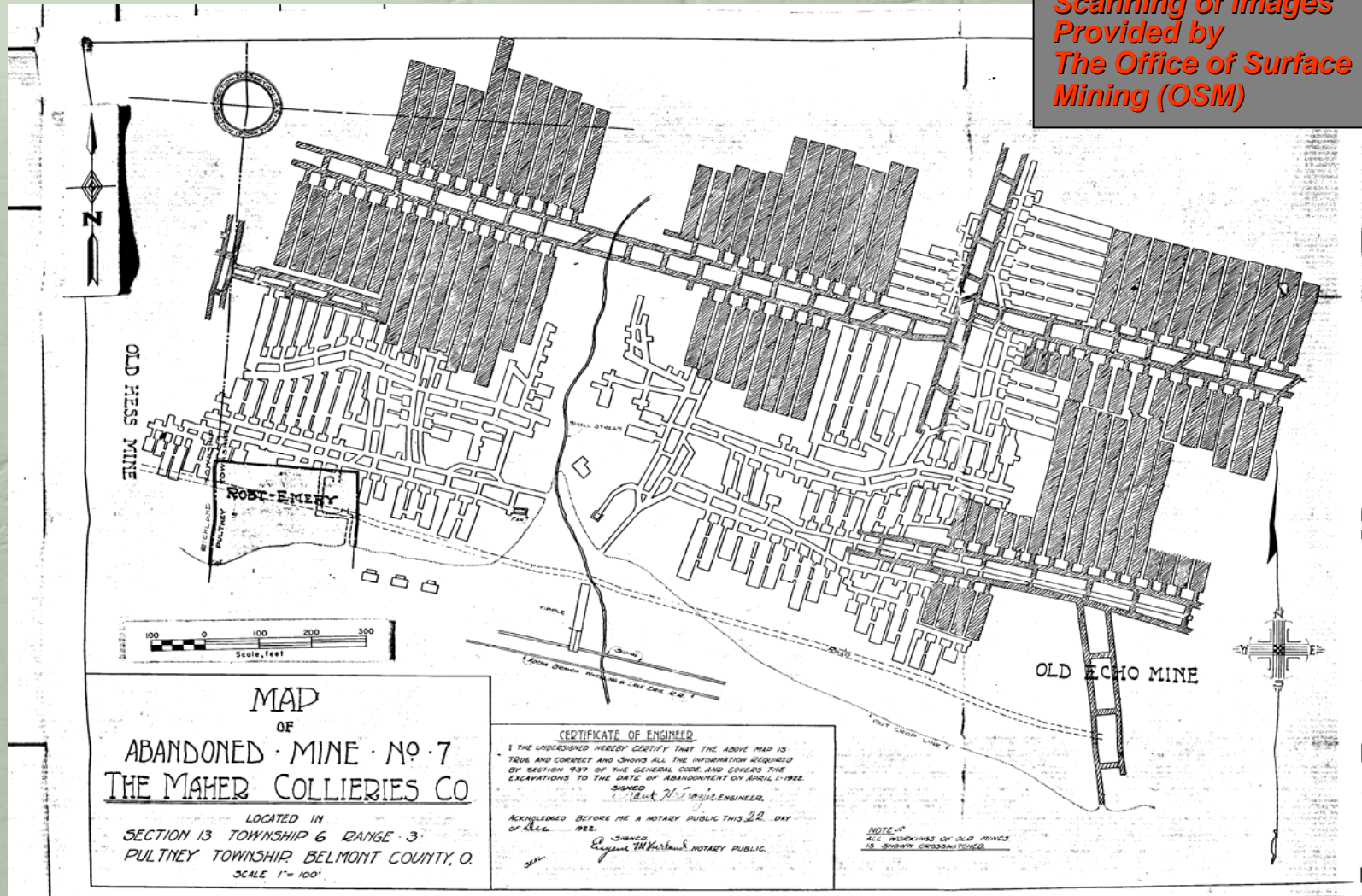
- Houses almost 5,000 mine maps
- Manages underground mine data
- AUMIRA project; ODOT
- IMS Update

Abandoned Mine Locator website



Scanned Image of Abandoned Underground Detailed Mine Map

Scanning of Images
Provided by
The Office of Surface
Mining (OSM)



Ohio Department of Transportation

- AUMIRA project
- Mile-marker GIS points
- Field application
- Overburden Application Tool

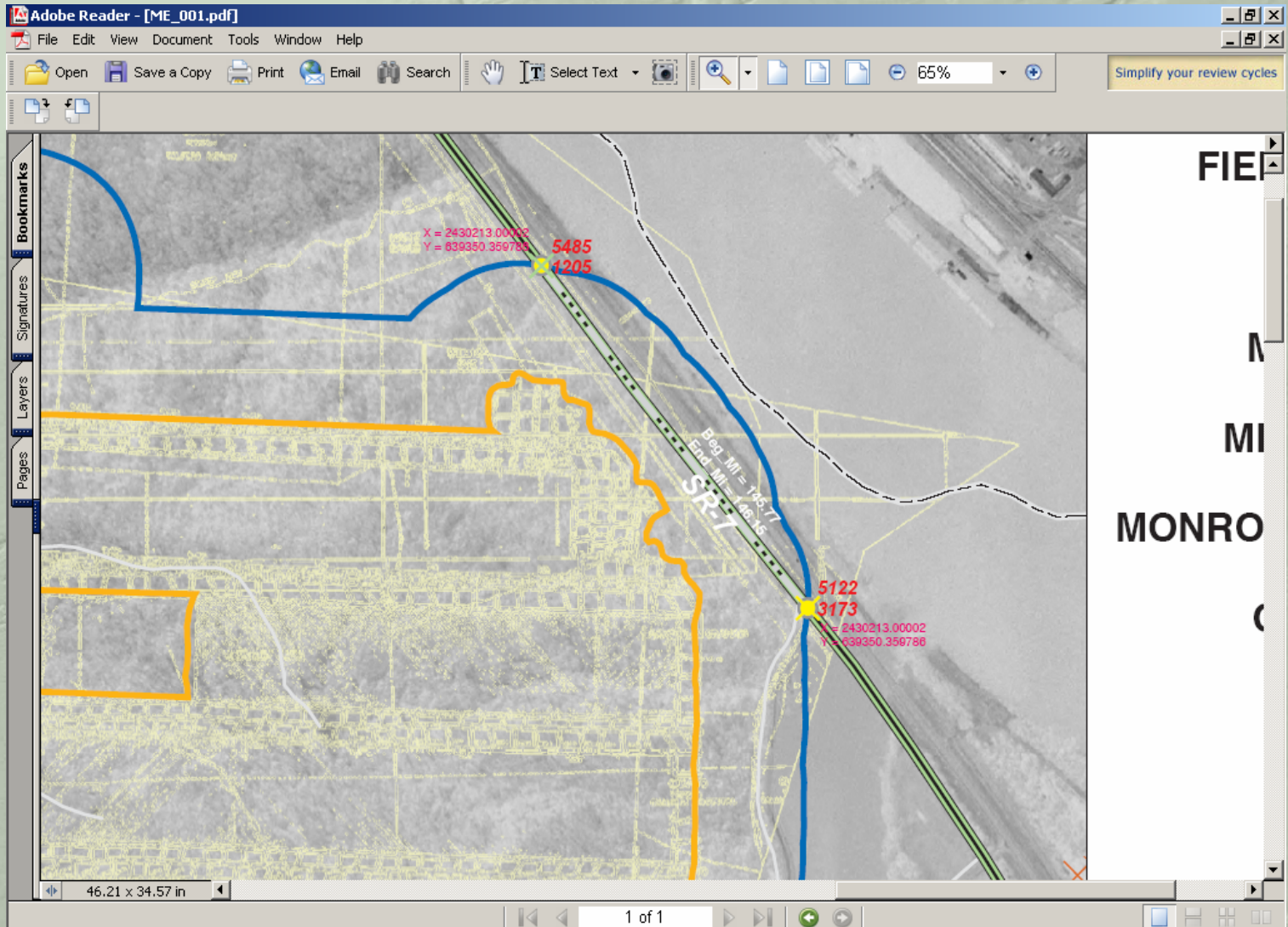


ABANDONED-UNDERGROUND MINE INVENTORY and RISK ASSESSMENT (AUMIRA)

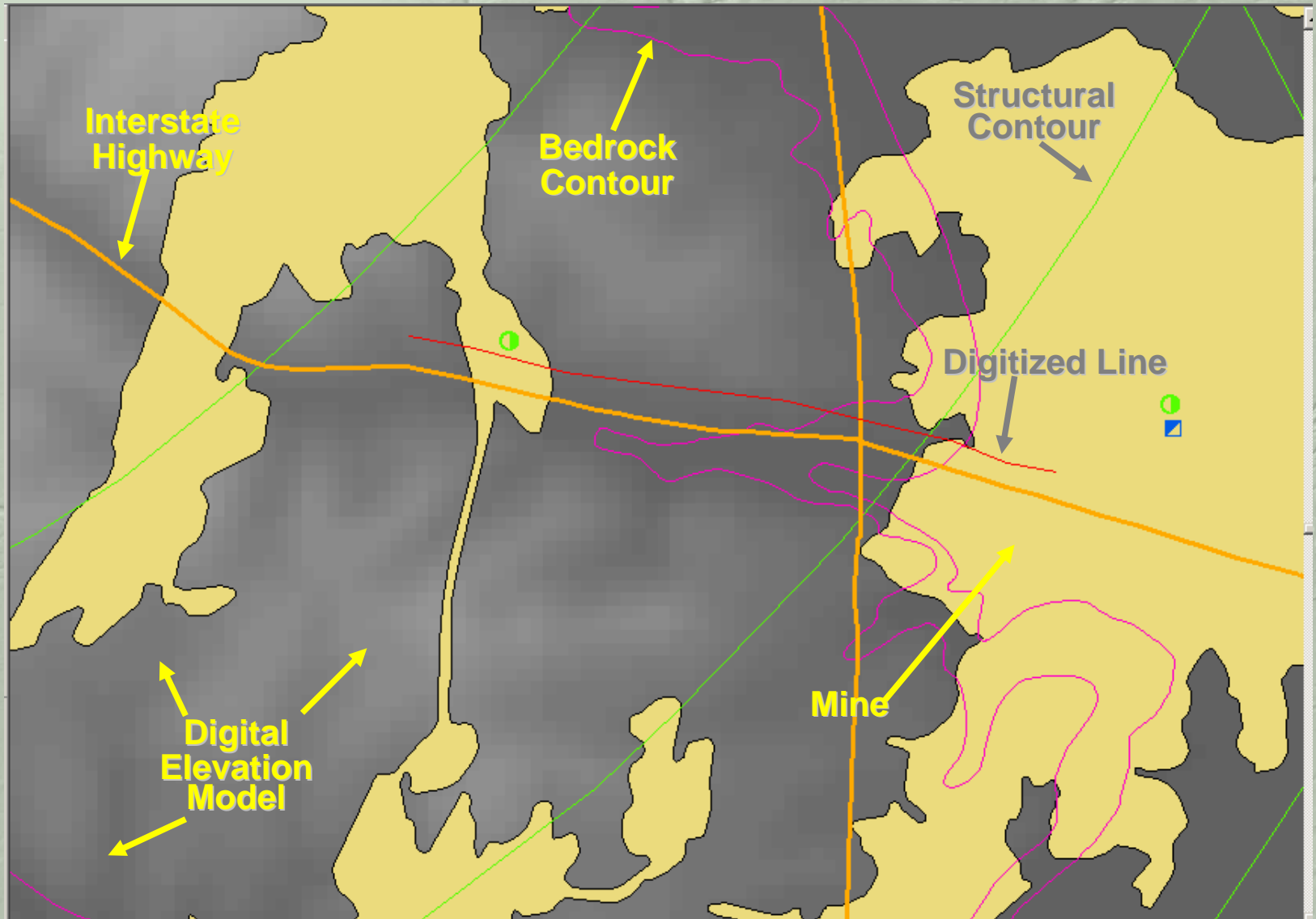
ODOT requirements:

- Field maps for ODOT's twelve districts depicting the location of AUM's, mined-out areas, entry points, and mine point locations that underlie all state routes, federal routes, and interstate highways within a 500 foot buffer of AUM's and mined-out areas.
- To indicate points of intersection and coordinates of such points where all roadways intersected buffer areas, mine polygons, and mine-out areas.
- To provide geo-referenced images of mine workings on maps.

GIS Analysis



Overburden Application

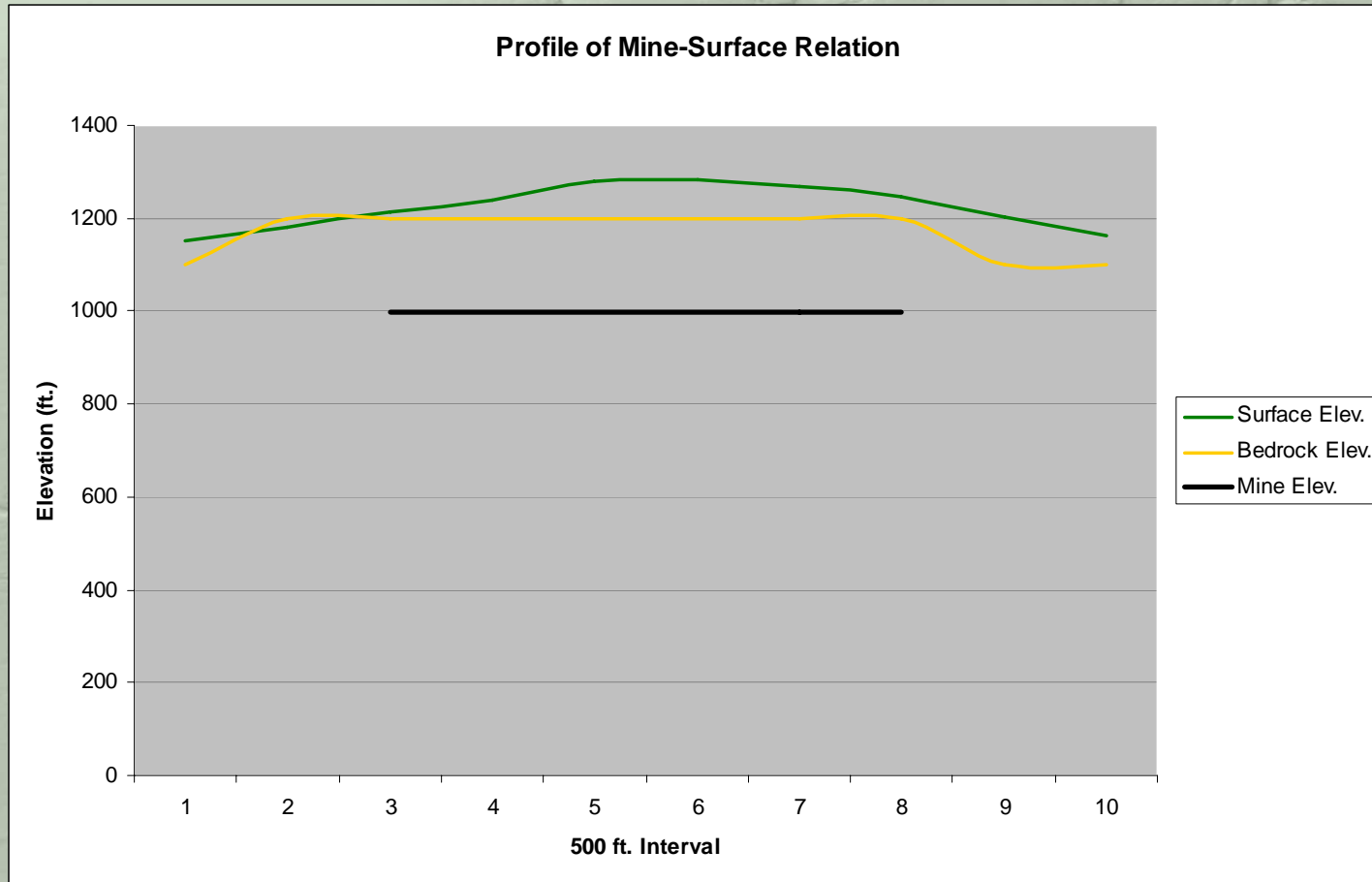


Captured Data Output

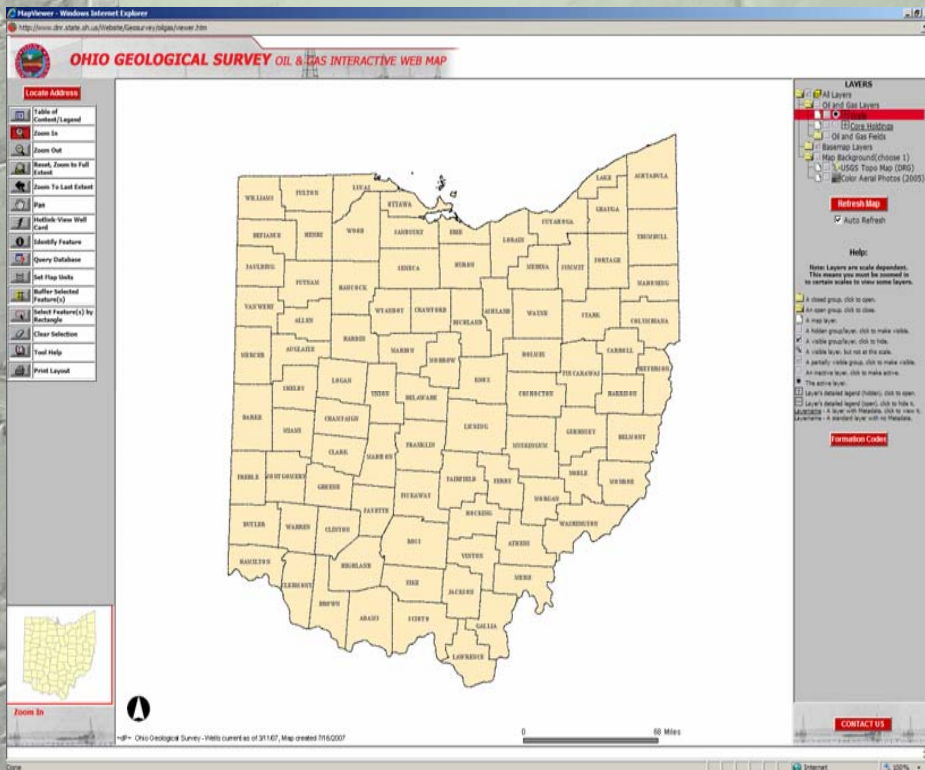
Interval # (500 ft.)	DEM Elev.	Bedrock Elev.	Mine Elev.	Ratio of Unconsolidated to Bedrock	Overburden (OVB) Thickness	Mine-to- Bedrock	Ratio of Thickness	Mine Exists?
0.0	1150	1100	0.0	0.0	1150	N/A	1.0	N
1.0	1179	1200	0.0	0.0	1179	N/A	1.0	N
2.0	1212	1200	999.0	0.1	213	201	1.1	Y
3.0	1240	1200	999.0	0.2	241	201	1.2	Y
4.0	1278	1200	999.0	0.4	279	201	1.4	Y
5.0	1284	1200	999.0	0.4	285	201	1.4	Y
6.0	1267	1200	999.0	0.3	268	201	1.3	Y
7.0	1248	1200	999.0	0.2	249	201	1.2	Y
8.0	1204	1100	0.0	0.1	1204	N/A	1.1	N
9.0	1163	1100	0.0	0.1	1163	N/A	1.1	N



Overburden Application



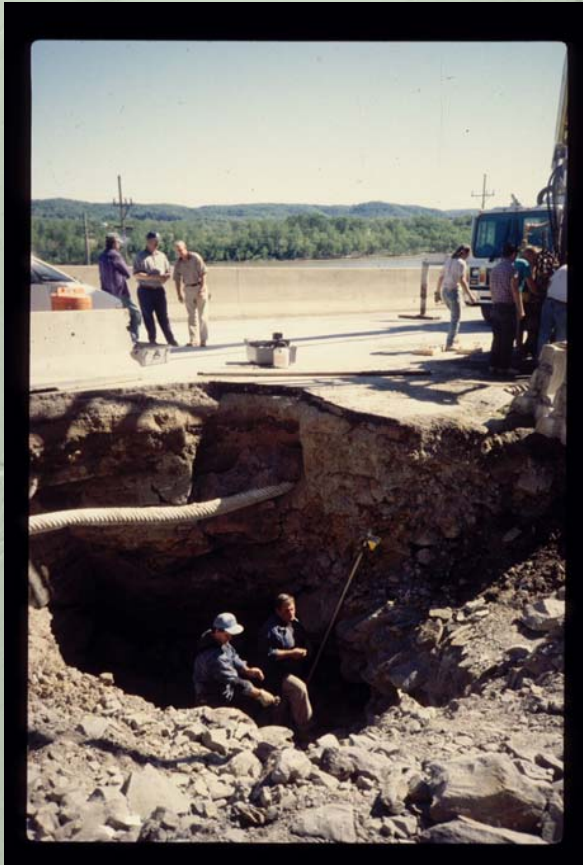
IMS Update



- Improve interface
- Georeferenced mine images
- Orthophotography
- Coalbed-specific identification



Mineral Resources Management



- Abandoned Mine Lands program
- On-site Investigations
- Emergency Program

I-70 subsidence, 1995

Ohio's Underground Mine Hazards

Case Studies



Ohio's Underground Mine Hazards

Case Study #1
Tunnel Hill Road



Ohio's Underground Mine Hazards

- Tunnel Hill Road
- Two lane county highway
- Connects New Lexington & Crooksville



Ohio's Underground Mine Hazards



Ohio's Underground Mine Hazards

- Tunnel Hill Road
- Connects New Lexington & Crooksville
- Road patched at 3:00 p.m.
- Road collapsed at 5:00 p.m.

Ohio's Underground Mine Hazards



Ohio's Underground Mine Hazards

- Tunnel Hill Road
- Connects New Lexington & Crooksville
- Road patched at 3:00
- Road collapsed at 5:00
- **Road temporarily closed**

Ohio's Underground Mine Hazards



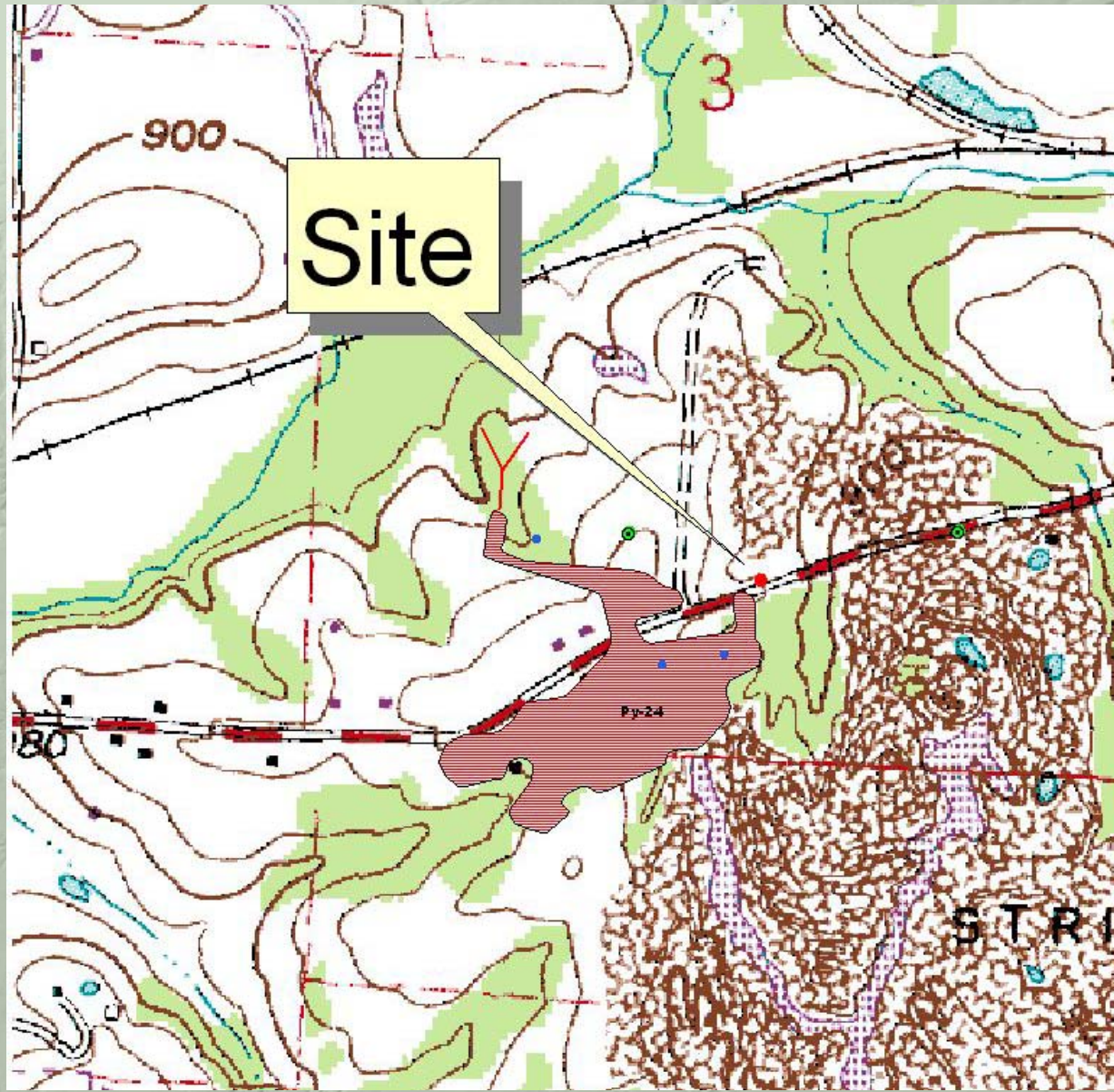
Ohio's Underground Mine Hazards

- Tunnel Hill Road
- Connects New Lexington & Crooksville
- Road patched at 3:00
- Road collapsed at 5:00
- Road temporarily closed

- Office research - mines in the vicinity
- And two past projects



Ohio's Underground Mine Hazards



Ohio's Underground Mine Hazards

- Tunnel Hill Road
- Connects New Lexington & Crooksville
- Road patched at 3:00
- Road collapsed at 5:00
- Road temporarily closed
- Office research - mines in the vicinity
 - And two past projects
- **Exploratory drilling needed**

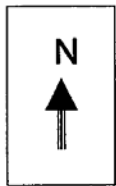


Ohio's Underground Mine Hazards



Ohio's Underground Mine Hazards

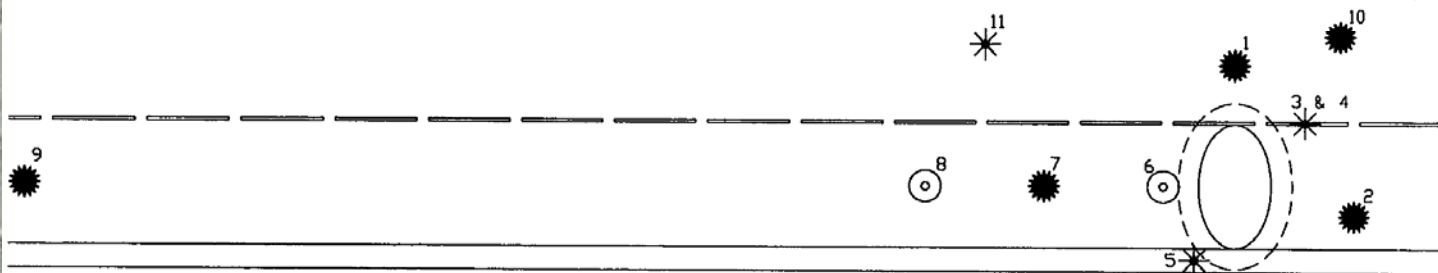
Pr-Pk-33-E
Tunnel Mill Rd
Subsidence




- ☼ - Coal
- * - Collapsed Void
- ⊙ - Open Void

PHONE LINE


DITCH




Ohio's Underground Mine Hazards


1855 FOUNTAIN SQUARE BUILDING H-3 COLUMBUS, OHIO 43224 Phone: 614-265-6633		ODNR Mineral Resources Management							
PROJECT NAME: Tunnel Hill Road - 6558		PROJECT TYPE: Emergency		S/P NUMBER: C-1					
COMPLAINT NUMBER: 6558		PROJECT OFFICER: Bill Jonard		SHEET: 1 of 2					
STREET ADDRESS: Tunnel Hill Road		WELL TYPE: D-W <input type="checkbox"/> P-W <input type="checkbox"/> C-W <input type="checkbox"/>		ELEVATION: 34.0					
COUNTY: Perry		DRILLED BY: Watts		TOTAL DEPTH: 34.0					
TOWNSHIP: Pike		LOGGED BY: Dawson		STATUS WATER LEVEL:					
COORDINATES:		EQUIPMENT: CME-805		START DATE: 4/7/03					
FINISH DATE: 4/7/03									
SUBSURFACE PROFILE			SAMPLE			GRAPHIC WELL	REMARKS		
DEPTH	ELEVATION	DESCRIPTION	NUMBER	TYPE	SAMPLE DEPTH			BLOWS PER 6 INCHES	% RECOVERY
					FROM TO				
		asphalt to road bed	1		0.0 2.0	100-37-27-17	2'		
		brown silty clay damp at the bottom	2		2.0 4.0	3-3-3-4	-4'		
			3		4.0 6.0	4-4-5-7	-8'		
			4		6.0 8.0	6-9-10-10	-16'		
			5		8.0 9.0				
		brown clay down to 9' brown and gray mix	6		9.0 11.0	2-3-5-6	2'		
			7		11.0 13.0	8-8-8-8	2'		
		silty clay with some sand mixed in brown to gray	8		13.0 14.0				
			9		14.0 16.0	2-4-4-5	-4'		
			10		16.0 18.0	5-7-12-16	2'		
			11		18.0 19.0				
		gray soft shale	12		19.0 21.0	10-17-16-25	2'		
			13		21.0 23.0	51-71-76-77	2'		
			14		23.0 24.0				
		coal							

25.5-30.7 coal

1855 FOUNTAIN SQUARE BUILDING H-3 COLUMBUS, OHIO 43224 Phone: 614-265-6633		ODNR Mineral Resources Management						
PROJECT NAME: Tunnel Hill Road - 6558		PROJECT TYPE: Emergency		S/P NUMBER: C-1				
COMPLAINT NUMBER: 6558		PROJECT OFFICER: Bill Jonard		SHEET: 2 of 2				
STREET ADDRESS: Tunnel Hill Road		WELL TYPE: D-W <input type="checkbox"/> P-W <input type="checkbox"/> C-W <input type="checkbox"/>		ELEVATION: 34.0				
COUNTY: Perry		DRILLED BY: Watts		TOTAL DEPTH: 34.0				
TOWNSHIP: Pike		LOGGED BY: Dawson		STATUS WATER LEVEL:				
COORDINATES:		EQUIPMENT: CME-805		START DATE: 4/7/03				
FINISH DATE: 4/7/03								
SUBSURFACE PROFILE			SAMPLE			GRAPHIC WELL	REMARKS	
DEPTH	ELEVATION	DESCRIPTION	NUMBER	TYPE	SAMPLE DEPTH			BLOWS PER 6 INCHES
					FROM TO			
			11		24.0 29.0		80%	N/A
		gray sandstone	12		29.0 34.0		86%	66%

Ohio's Underground Mine Hazards

1855 FOUNTAIN SQUARE BUILDING H-3 COLUMBUS, OHIO 43224 Phone: 614-265-6633		ODNR Mineral Resources Management								
PROJECT NAME: Tunnel Hill Road - 6558		PROJECT TYPE: Emergency	BOREHOLE: A-6	SHEET: 1 of 2						
COMPLAINT NUMBER: 6558		PROJECT NUMBER:	PROJECT OFFICER: Bill Jonard	ELEVATION:						
STREET ADDRESS: Tunnel Hill Road		WELL TYPE: DRILL <input type="checkbox"/> PNEUM <input type="checkbox"/> CLUMP <input type="checkbox"/>	TOTAL DEPTH: 31.0							
COUNTY: Perry		DRILLED BY: Watts	STATIC WATER LEVEL:							
TOWNSHIP: Pike		LOGGED BY: Dawson	WATER SAMPLE:							
COORDINATES:		FIG. EQUIPMENT: CME-850	START DATE: 4/8/03	FINCH DATE: 4/8/03						
SUBSURFACE PROFILE			SAMPLE			GRAPHIC WELL	REMARKS			
DEPTH	ELEVATION	GRAPHIC LOG	DESCRIPTION	NUMBER	TYPE			SAMPLE DEPTH FROM TO	BLOWS PER 6 INCHES	% RECOVERY
		[Hatched Pattern]	silts and clays little resistance able to push augers		[Black Line]	0.0 31.0				
		[Hatched Pattern]	some resistance							SWL
		[Hatched Pattern]	open void							Open Void 25-30

1855 FOUNTAIN SQUARE BUILDING H-3 COLUMBUS, OHIO 43224 Phone: 614-265-6633		ODNR Mineral Resources Management								
PROJECT NAME: Tunnel Hill Road - 6558		PROJECT TYPE: Emergency	BOREHOLE: A-6	SHEET: 2 of 2						
SUBSURFACE PROFILE			SAMPLE			GRAPHIC WELL	REMARKS			
DEPTH	ELEVATION	GRAPHIC LOG	DESCRIPTION	NUMBER	TYPE			SAMPLE DEPTH FROM TO	BLOWS PER 6 INCHES	% RECOVERY
			sandstone		[Black Line]					Mine Floor

S:\H D\NEEDR TUNNELH-6558.DWG -H D\NEEDR.DWT 7/10/03

S:\H D\NEEDR TUNNELH-6558.DWG -H D\NEEDR.DWT 7/10/03

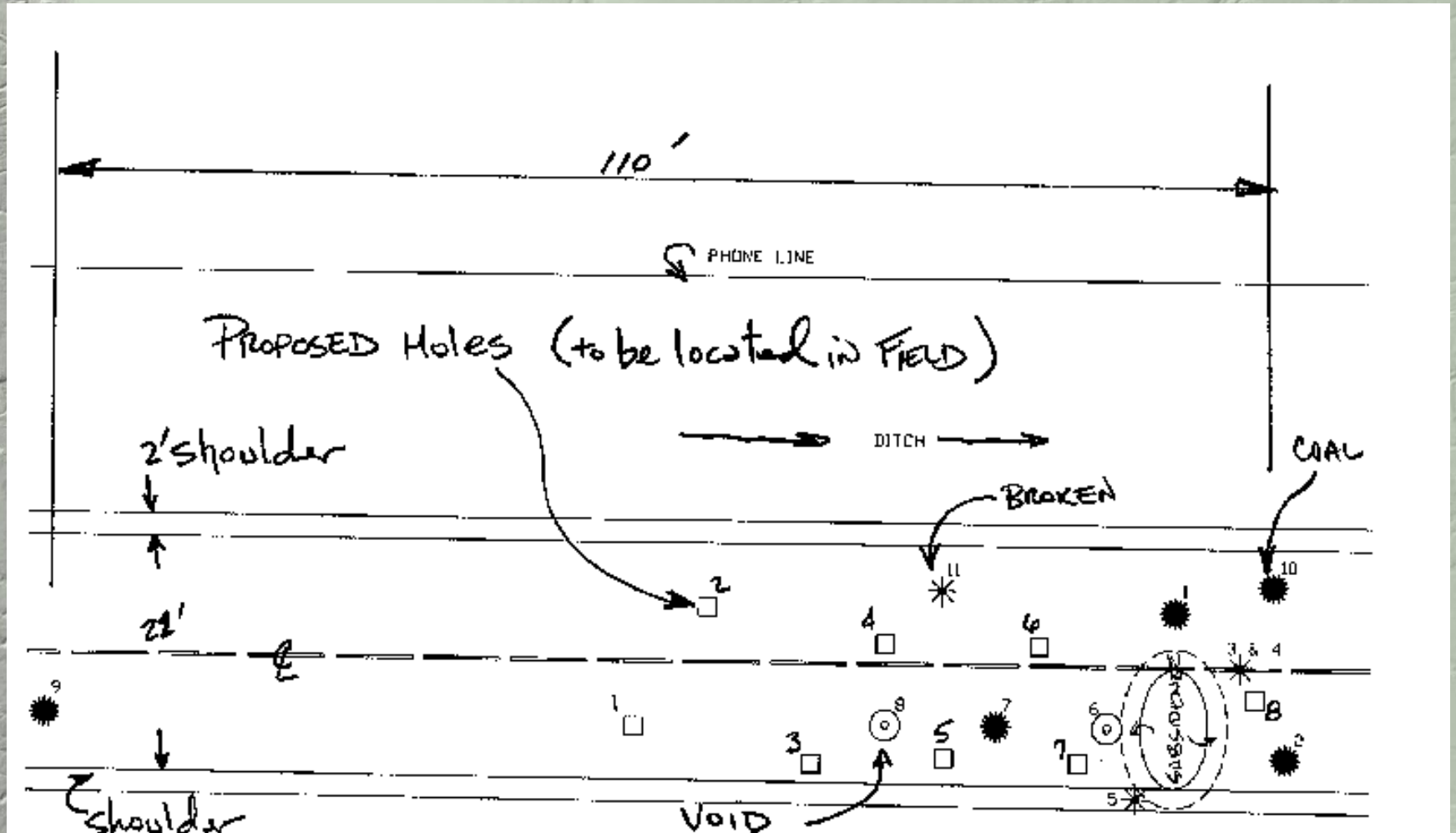
Ohio's Underground Mine Hazards

- **CONSTRUCTION:**

- Stabilizing about a length of 60 feet
- 10 borings drilling to a depth of 31 feet
- Placed in the field (~ 15 feet alternating)
- Casing to keep holes from collapsing
- Inject grout 200 CYD (500 psi 10 inch slump)
- Engineers estimate \$26, 220.00



Ohio's Underground Mine Hazards



Ohio's Underground Mine Hazards

- **CONSTRUCTION:**

- Some borings collapsing before casing
- No large open mine voids
- Mine void filled with water & gob
- Grout takes not as high as estimated
- Project cost \$14,067.75

Ohio's Underground Mine Hazards

- **Time Frame**

- 4-3-2003 @ 5:00 p.m. Subsidence occurred
- 4-4- 2003 - Complaint received
- 4-4- 2003 - Field visit
- 4-7-2003 to 4-8-2003 - Exploratory Drilling
- 4-11-2003 - Design completed
- 4-16-2003 - Construction start
- 4-18-2003 - Construction Completed



Ohio's Underground Mine Hazards

Case Study #2
Halsey Subsidence



Ohio's Underground Mine Hazards

- Subsidence in a field -big deal !?!?
- Another , another , another -
- Hey - What's this by the road?

Ohio's Underground Mine Hazards



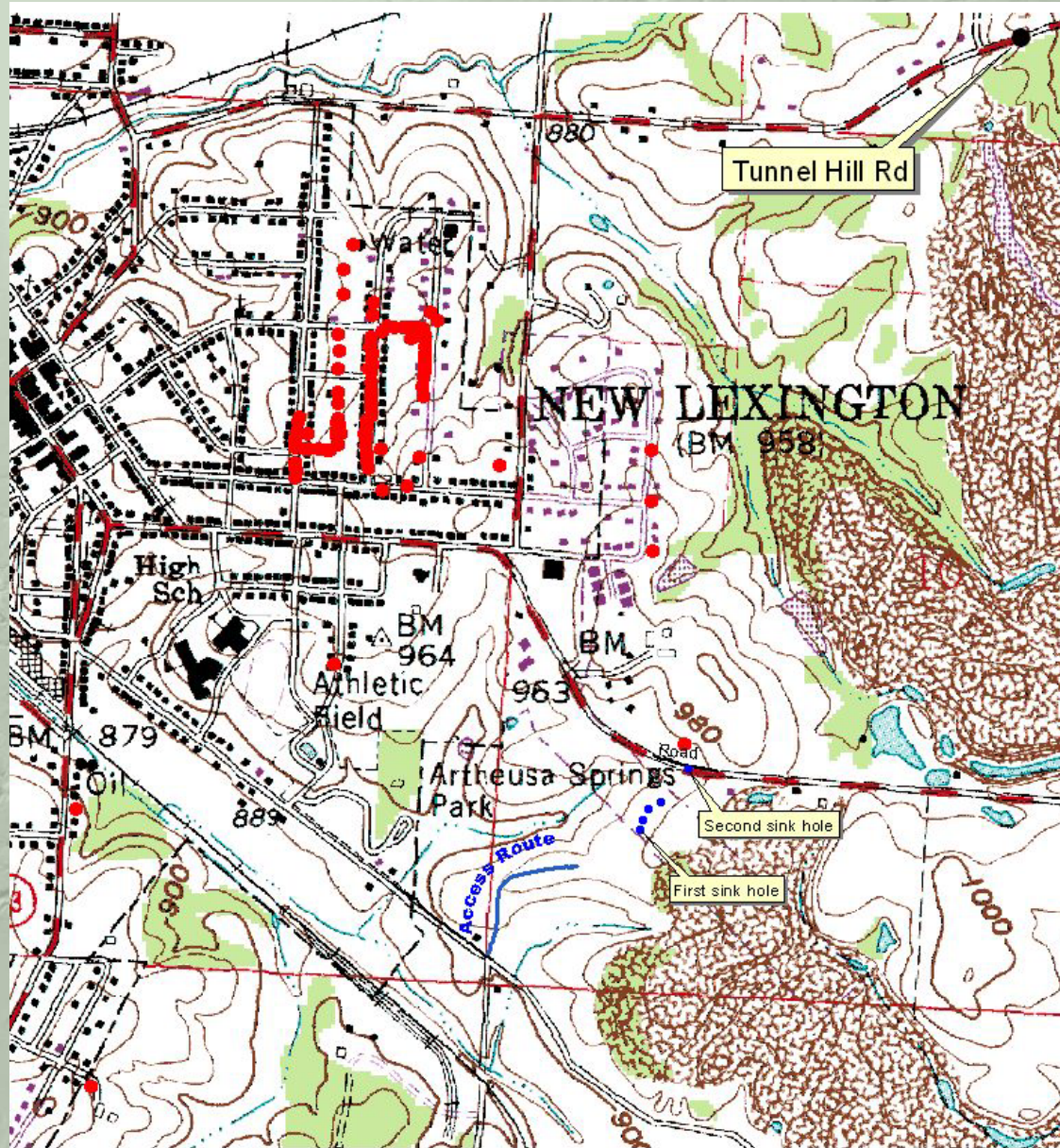
Ohio's Underground Mine Hazards

- Subsidence in a field -big deal !?!?
- Another , another, another -
- Hey - What's this by the road?

- **Office Research**
 - No MAPPED mines in vicinity
 - Lots of projects



Ohio's Underground Mine Hazards



Ohio's Underground Mine Hazards

- Subsidence in a field -big deal !?!?
- Another , another, another -
- Hey - What's this by the road
- Office Research

No drilling needed

Yea - We can reach it with a track hoe



Ohio's Underground Mine Hazards



Ohio's Underground Mine Hazards



30 10 2003

- Not on road but in close proximity
- Small diameter - It doesn't look like much
- Must know the area & history



Ohio's Underground Mine Hazards



NOV 21 2003

Ohio's Underground Mine Hazards



NOV 21 2003

Ohio's Underground Mine Hazards

Construction:
Excavate & Backfill



Ohio's Underground Mine Hazards



NOV 21 2003

Ohio's Underground Mine Hazards



NOV 21 2003

Ohio's Underground Mine Hazards



Ohio's Underground Mine Hazards



NOV 21 2003

Ohio's Underground Mine Hazards



NOV 21 2003

Ohio's Underground Mine Hazards

- **Construction**

- Stabilize TWO subsidences
- Excavation - 6 ft X 6 ft on the mine floor
- Lined with filter fabric
- Place type "C" stone
- Mix in #57 stone
- Cover with filter fabric
- Site restore
- Engineers estimate - \$7,291.00



Ohio's Underground Mine Hazards

- **Engineers Estimate**

- Stabilizing TWO subsidences
- Excavation - 340 CYD
- Filter Fabric - 400 SYD
- Type "C" stone - 22 Tons
- Type #57 stone - 22 Stone
- Engineers estimate - \$7,291.00

Ohio's Underground Mine Hazards

