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Department of the Environment

Texas Quarry Zone of Influence

September 29, 2010

Maryland Ground Water Symposium

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Zone of Influence

- Law applies to Quarries in Karst terrain in Baltimore, Carroll, Frederick and Washington Counties
- Covers the area potentially affected by quarry dewatering
- Based on ultimate size and depth of the quarry
- May be modified if operations at the quarry change or new data is obtained by the Department
- Areas in the ZOI may remain unaffected for many years, or may never be affected

Karst Terrain

Karst Terrain is a landscape shaped by the dissolution of carbonate bedrock such as dolomite and limestone

These landscapes display distinctive surface features and underground drainages. May be prone to sinkholes

Protection Provided by the ZOI

Water Supply replacement

Property damage due to land subsidence (Sinkholes). Each claim will be investigated to determine if quarry dewatering is the proximate cause

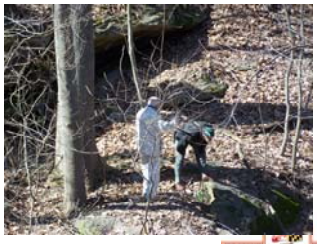
This provision does not apply to improvements made to real property after the implementation of the ZOI

Data utilized to establish zone of influence for the Texas Quarry

- Stream Gauging
- Geologic mapping
- Literature review
- Reconnaissance/mapping of the area
- Monitoring Well Data

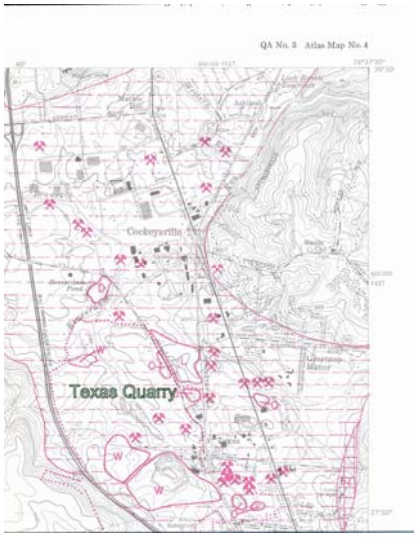
Stream Gauging & Identifying Springs

- 2 streams were Gauged by the Department; Beaver Dam Run & Padonia Creek
- Beaver Dam Run (gaining)
- Padonia Creek (gaining)



Local Geology

- The Cockeysville Marble is the stone mined in the quarry.
- Mining of the Cockeysville Marble has known to have existed since 1829.



1975 Map showing historical Mining Locations in the Cockeysville Region

Local Geology

•Despite the high volumes of mining sites in the past, there are only two accounts of sinkholes in the Cockeysville Marble.

•The marble does not possess karst features as compared to the limestone formations present in the Frederick and Hagerstown Valleys.

•There is a geologic contact with the Loch Raven Schist to the west of the site.

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Pictures showing upstream portion of the Goodwin Run Sinkhole repair.

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Local Geology

- **Red & Blue- Loch Raven & Rush Brooke Schist Formations. Schist formations are not prone to sinkholes**
- **Purple, Orange & Green- Three subunits of the Cockeysville Marble Formation**

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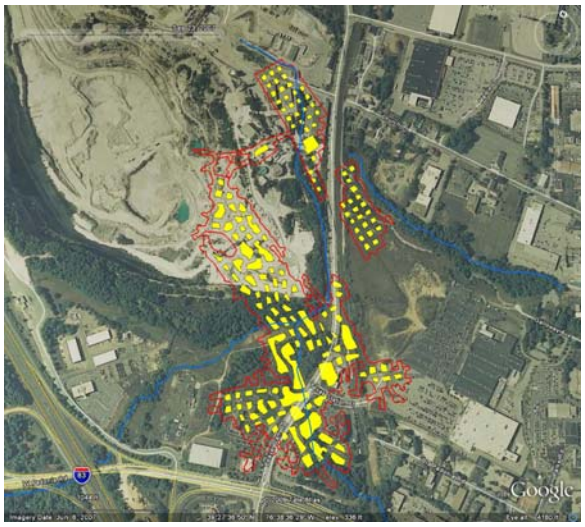
Mining History

- Mining at the Texas Quarry began in 1926.
- The Flinkote Company, Redland Genstar have operated the Quarry in the Past
- Today two companies operate at the Texas Quarry; Lafarge Mid Atlantic LLC mines stone for Construction Aggregate and E.C.C.A Calcium Products mines pure calcite at the quarry for an ingredient in plastic manufacturing, paint additives, paper dyes and wallboard
- In the past mining has occurred underground through a series of room and pillar network in the south and eastern side of the quarry.
- Today the underground mines are no longer active

Mapping of Underground Mine



- All areas above the abandoned underground mine are included in the ZOI.
- There are no known records of subsidence above the underground mine.
- Goodwin Run loses a portion of its flow into the underground mine.

Goodwin Run-Underground Connection

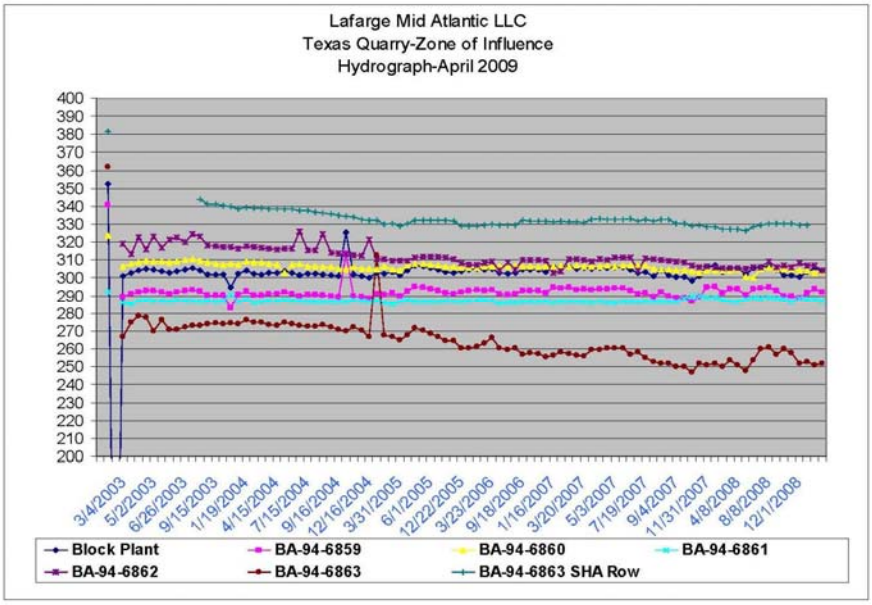




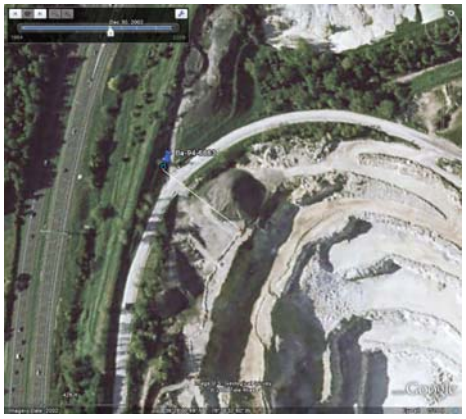

Monitoring Well Data

- **There are seven monitoring wells located around the Texas Quarry that have been in place since 2002.**
- **Monthly water level measurements have shown very little fluctuation in the local water table.**
- **The well located closest to active mining operations shows a slight drop in water table elevation.**

Monitoring Well Data-Hydrograph



BA-94-6863



View of Well # 94-6863 in 2002. The well was 419 feet away from the highwall in 2002

View of Well # 94-6863 in 2007. The well was 239 feet away from the highwall in 2007.

Monitoring Well Tag #	Date Drilled	Well Depth	Hours Pumped	Well Yield gpm	Surface Elevation	Avg Monitorring Level	Average Depth Below Casing
Block Plant	?	?	?	?	352	303	-49
BA-94-6859	12/4/2002	200	1	4	340	295	-45
BA-94-6860	12/4/2002	250	1	3	323	305	-18
BA-94-6861	12/4/2002	200	1	5	291	288	-11
BA-94-6862	12/2/2002	200	1	4	408	310	-98
BA-94-6863	12/4/2002	200	1	20	361	250	-111
SHA Row	?	?	?	?	381	335	-46
Averages		210	1	7.2	350	298	-54
USGS Monitioring Well Well @ Oregon Ridge		300	?	?	390	350	-40
USGS Measurments	Lowest	45.78		Highest	33.46		
Quarry Wells most affected:				USGS Well	Quarry Wells	Difference	
BA-94-68-62 & BA-94-6862			elevation	390	350	-40	
			static level	-40	-54	14	

ZOI- Description

- The west side of the zone follows the Geologic Contact between the Cockeysville Marble and the Loch Raven Schist Formation, until the contact reaches Beaver Dam Run.
- The northern limit of the zone follows the southern bank of Beaver Dam Run, a gaining stream until it reaches the light rail tracks, The Zone then parallels the rail bed, but does not include the rail bed. The creation of the rail bed has altered the natural drainage in this area.

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•The eastern limit of the zone follows Beaver Dam Road. The properties outside of the eastern edge include a landfill, mulching facility & a block plant. Three monitoring wells in the vicinity have remained unchanged in the past 7 years. These wells also have very similar characteristics to a USGS monitoring well located at Oregon Ridge. This monitoring well is located in the Cockeysville Marble but in a more natural setting. The eastern zone also includes all areas in front of Lowes which were once a wash plant associated with mining activities, which have since been reclaimed and developed over.

•The southern limit of the zone is offset to the north of Padonia Road. The commercial area between Padonia Road and the Quarry is situated above the underground mines. The monitoring well south of Padonia Road has the highest static water level and is also located further up gradient in the local watershed than the quarry. There is no evidence that mining has interfered with the water table south of Padonia Road.

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Data Used for Study

Week 12 Data Analysis April 13, 2009 - Zone of Influence, Texas Quarry

Type of Data	Type of Analysis with Data: GIS-Data, to be mapped	Surface Water	Groundwater	Geology	Well data	Sinkholes	Significant Investigatio	To be Graphed & Compared	Cross Section Data
Hard Data									
1. Cockeysville Quadrangle	x			x					x
2. MDE Sinkhole Field Reports	x			x		x	x		
3. Well Completion Reports			x		x			x	x
4. USGS Real Time Stream Flow Data		x						x	
6. Appropriation Permit Data			x					x	
a. Annual Pumpage Data			x					x	
b. Other Appropriation users in area	x		x						
7. Quarry Monitoring Wells	x		x		x				x
8. Survey Data of Quarry Monitoring Wells	x				x				x
a. Monthly Well Level Sampling Point Data			x						x
9. Precipitation Data									
BWI									
10. USGS Monitoring Well @ Oregon Ridge									
11. Permit to Surface Mine file: 77-SP-0055	x			x		x			x
12. Photos	x			x			x		
13. Stream Gauge Data									
a: Skully & Loy	x	x							
b. Departmental Stream Gauging	x	x							
GIS DATA	x								
2007 Imagery	x							x	
Historical Imagery	x					x		x	
Topography 2' contours	x								x
Watershed Boundary	x								
Real Property View	x								
Tax Maps	x								
C.N.A Engineering-Underground Room & Pillar Survey	x			x			x		
Streams	x	x							x
	GIS-Data, to be mapped	Surface Water	Groundwater	Geology	Well data	Sinkholes	Significant Investigation	To be Graphed & Compared	Cross Section Data
Totals	18	5	6	5	3	3	3	7	8

Peter A. Yencsik: April 13, 2009

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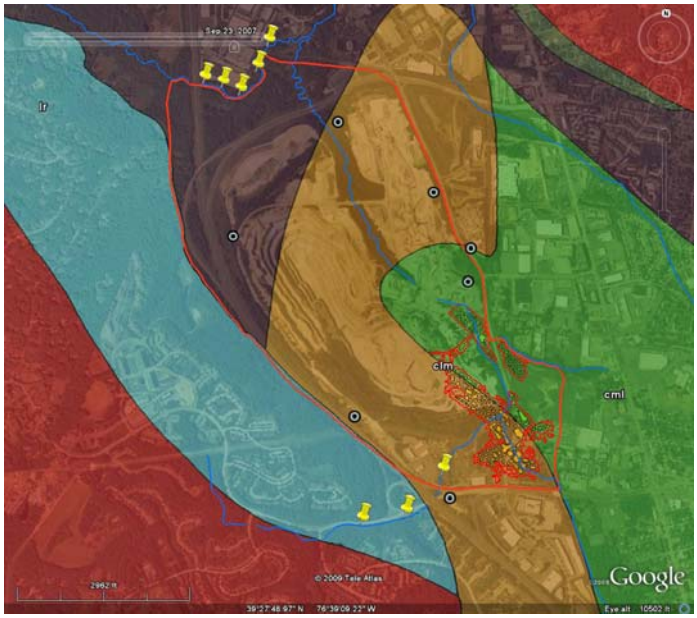
Zone of Influence



- Red & Blue= Schist
- Purple, Orange and Green = Schist
- Stream Gauge Locations
- Monitoring well location.
- Underground Mines

Special Thanks

- Dr. Dave Brezinski, MGS
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- Dr. Martin Roberge, Towson U.

For questions about the Texas ZOI Contact
Peter Yencsik, MDE Mining Program
410-537-3569 or
pyencsik@mde.state.md.us