MINING OF THE OSIS AUGMENTATION AND RELIEF SEWER (OARS) TUNNEL

BRIAN E. MOTT, P.G.
Project Background
How a Combined Sewer System Works

Sources of sewer waste water:

- Homes
- Storm drains
- Business & commerce

OVERFLOW

-Streams, rivers & lakes

OVERFLOW POLLUTION

- Normal flows from combined sewers are diverted by control devices...
- ...into an interceptor drain and on to the sewage treatment plant.
- Storm water runoff can create excessive water flows that overwhelm the control device...
- ...allowing untreated waste water into streams and rivers.
Areas of Columbus Served by CSOs
The End of the Pipe
Project Description
Deep Tunnel Issues

- All access points and connections will require very deep shafts.
- Shafts will be excavated through deep saturated granular soils in some locations.
- Bedrock is limestone and Dolomite which contains karstic conditions.
- Large inflows of groundwater would be expected through joints/fractures in rock and granular soils.
- Hydraulic connection to adjacent river.
OARS System

- 23,300 Feet of 20’ Diameter Tunnel
- 180’ Invert Depth
- 6 Shafts
- 3 Relief Structures
- Screen Structure
- Pumping System
New Deep Tunnel Sewer

Legend
- OARS TUNNEL
- OSIS

JPWWTP
Shaft 1
Shaft 2
Shaft 3
Berliner Park
Connecting the OSIS to the OARS
Extensive Subsurface Investigation

- Drilling over 200 boreholes
- Recovered and classified
  - Over 3,350 SPT soil samples
  - Over 11,200 feet of NQ2 rock core
- Install numerous piezometers
Other Tools Used on the Project

- Seismic Reflection Survey
- Borehole Geophysics
- Borehole Video Logging
- Specialized Hydrogeologic Testing
Drilling Downtown
River Drilling
Large Well Installation
Pump Testing
Insitu Permeability Testing
Bedding and Joint Systems
Quarry Face
Aerial View of Quarry
Low Angle Fracture/Joint
High Angle Fracture/Joints
Karst

- Due to the high purity the Columbus Limestone is prone to karst conditions.

- Paleokastatic conditions were also identified in the Salina Dolomite where numerous collapse features and voids were identified.
Solutioning and Karst

TB-35 Significant Core Loss 175′-185′
Solutioning and Karst
Solutioning and Karst
Water Ejection from Nearby Well
Erosional Surfaces and Deformed Bedding
Typical Bedding
Unusual Bedding and Structure
Faulting

- Offsets in beds suggested movement in the subsurface
- Erosional surfaces also indicated potential zones of weak rock
- Thinning of beds over the deformed area and thickening in the depressed layers also suggested displacement
Results of the Seismic Survey
Interpreted Faults
Mining the Shaft
Underground
Water Problems
Other Issues
Petroleum Contaminated Rock?
Unexploded Trimex
The Contractor’s Geologist/Engineer
Tunnel Boring Machine (TBM)
Images of the Work in Progress
Questions?

Brian E. Mott, P.G. | Sr. Geologist/Environmental Scientist

614.888.0040 (office) | 614.888.6415 (fax) | 614.987.1450 (Direct)
bmott@dlz.com | www.dlz.com

04/04/2013