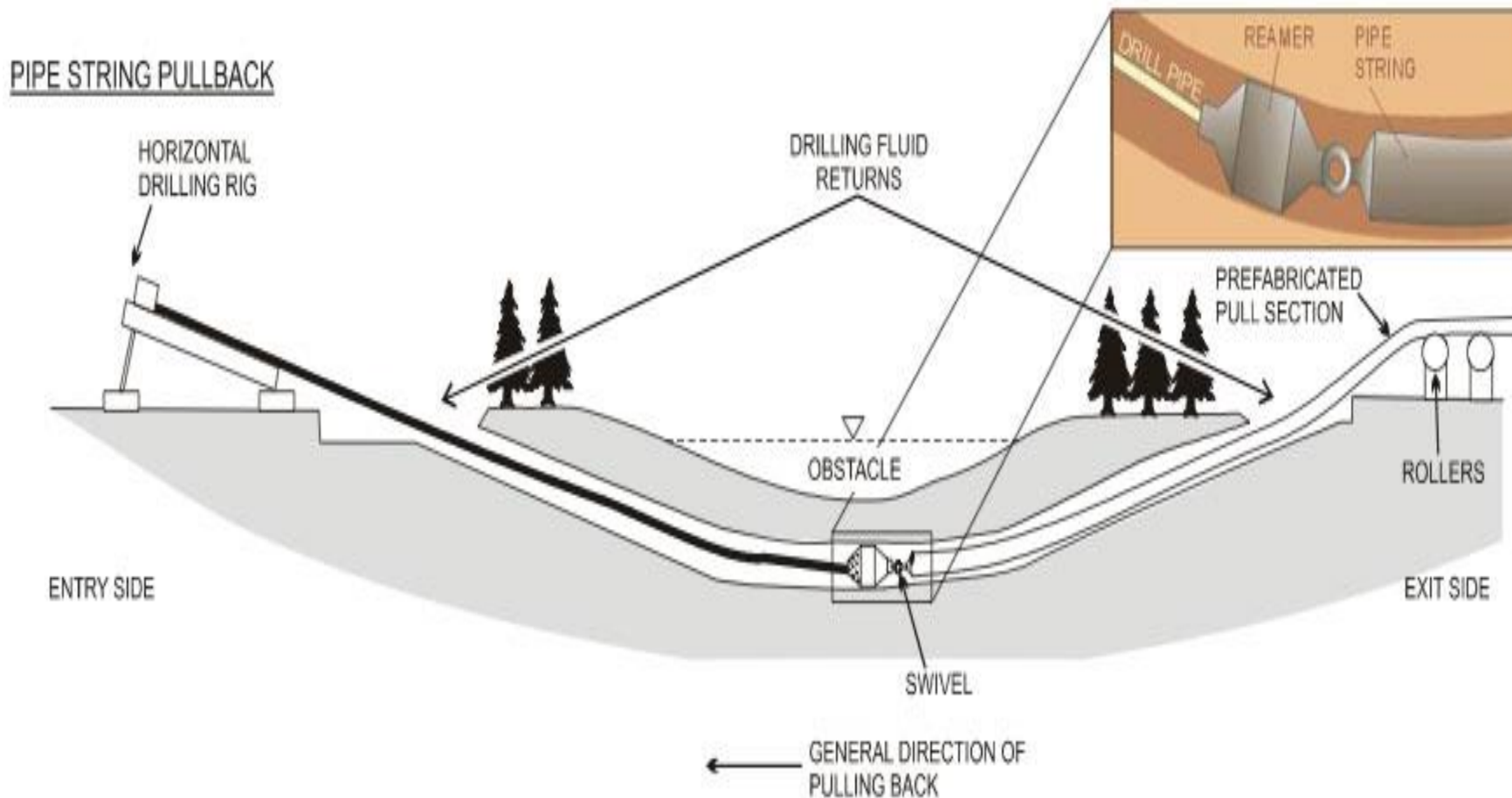


Horizontal Directional Drilling (HDD) Projects

and

The Rover Pipeline Inadvertent Return in Stark County, Ohio

HDD Diagram









History of Inadvertent Returns In Ohio

- 2012-2013 large build out of Oil and Gas related transmission lines facilities in Ohio.
- 10-inch and smaller pipelines
- Lots of “small” IRs
- Shortage of drilling knowledge concerning HDD work and eastern Ohio geology.







Date & Time: Fri Apr 14 11:58:21 EDT 2017

Position: 040° 49' 46.1" N / 082° 25' 4.5" W

Altitude: 1007ft

Datum: WGS-84

Azimuth/Bearing: 138° S42E-2453mils (True)

Elevation Angle: -10.5°

Horizon Angle: -02.1°

Zoom: 1X

170756 amw



Oientangy River Watershed
4/17/2006
Photo by: Harry Kallipolitis

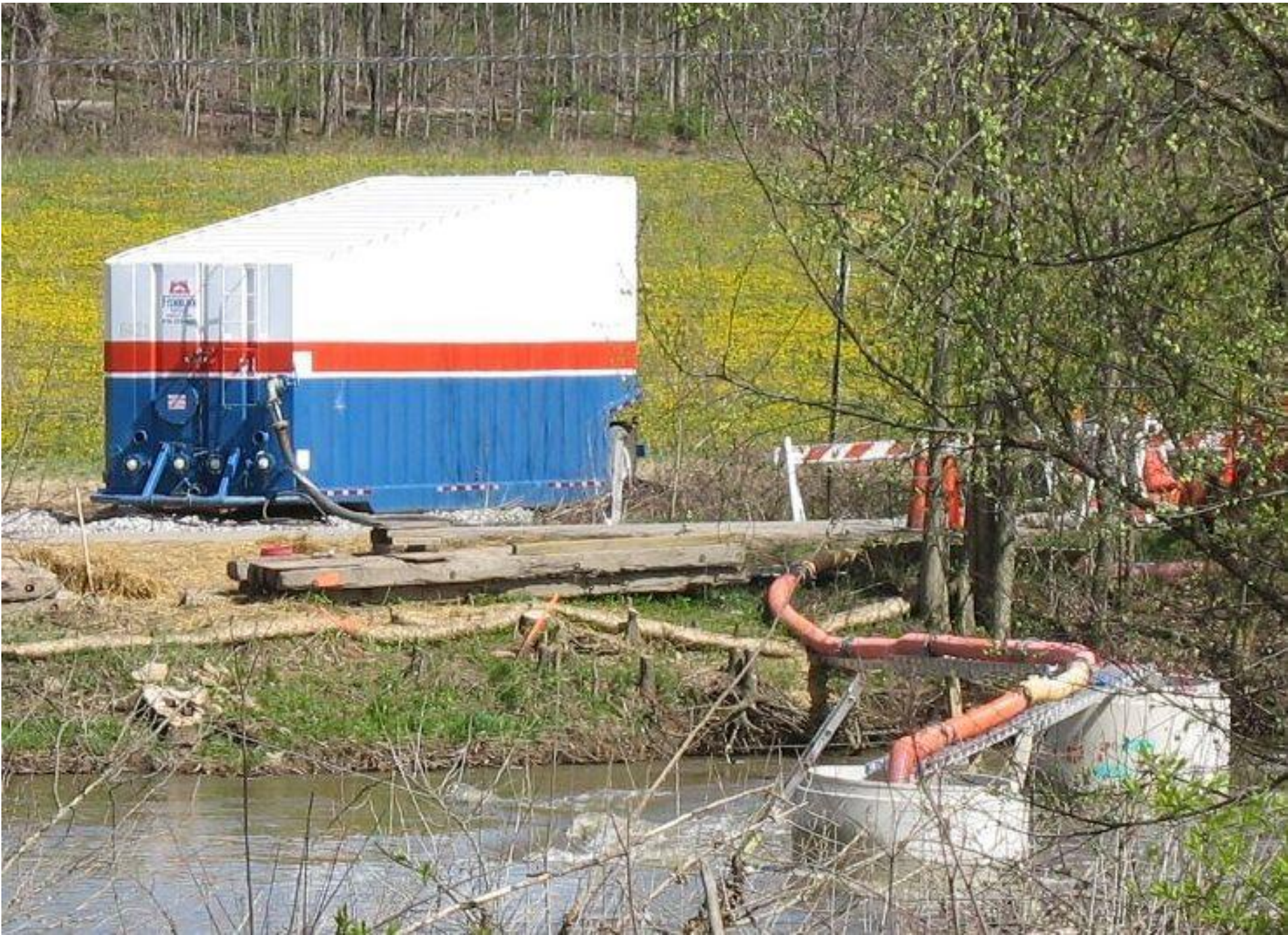


04/17/2005



Olentangy River Watershed
Delaware County
March 22, 2006
Photo by: Harry Kalipolitis





Ohio EPA Experiences with HDD after modified BMPs in place

- Drilling companies refocused Contingency Plans and preventative practices.
- Significant drop in severity & number of inadvertent returns.

Ohio EPA Recommended BMPs

- Administrative BMPs:
 - Anticipate IRs.
 - Establish a Hotline for local landowners and citizens to report anomalies they observe during operations.
 - Right of Way Issues
 - Identify sensitive areas that require more vigilant monitoring while drilling.

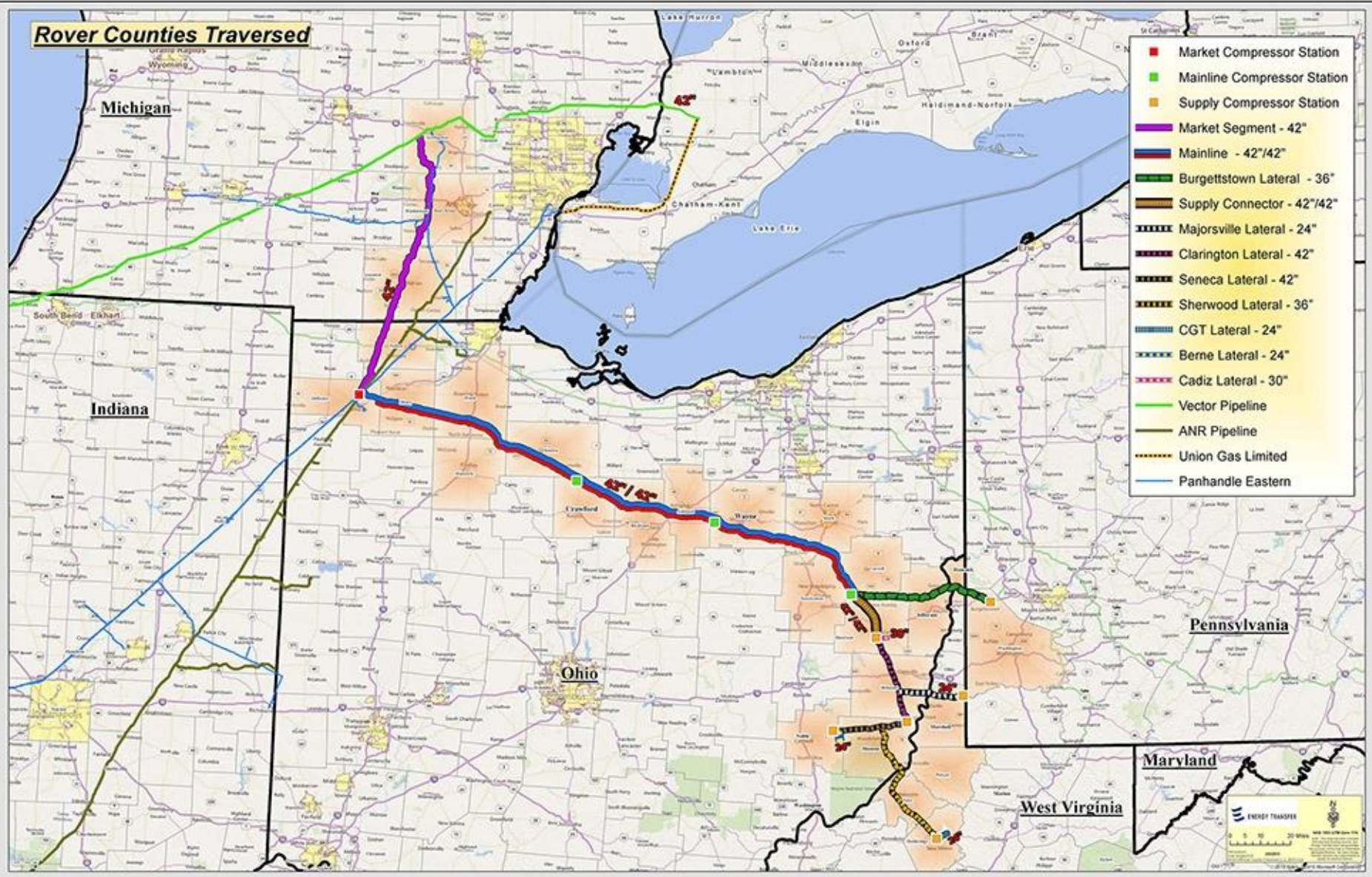
Stark County Inadvertent Return

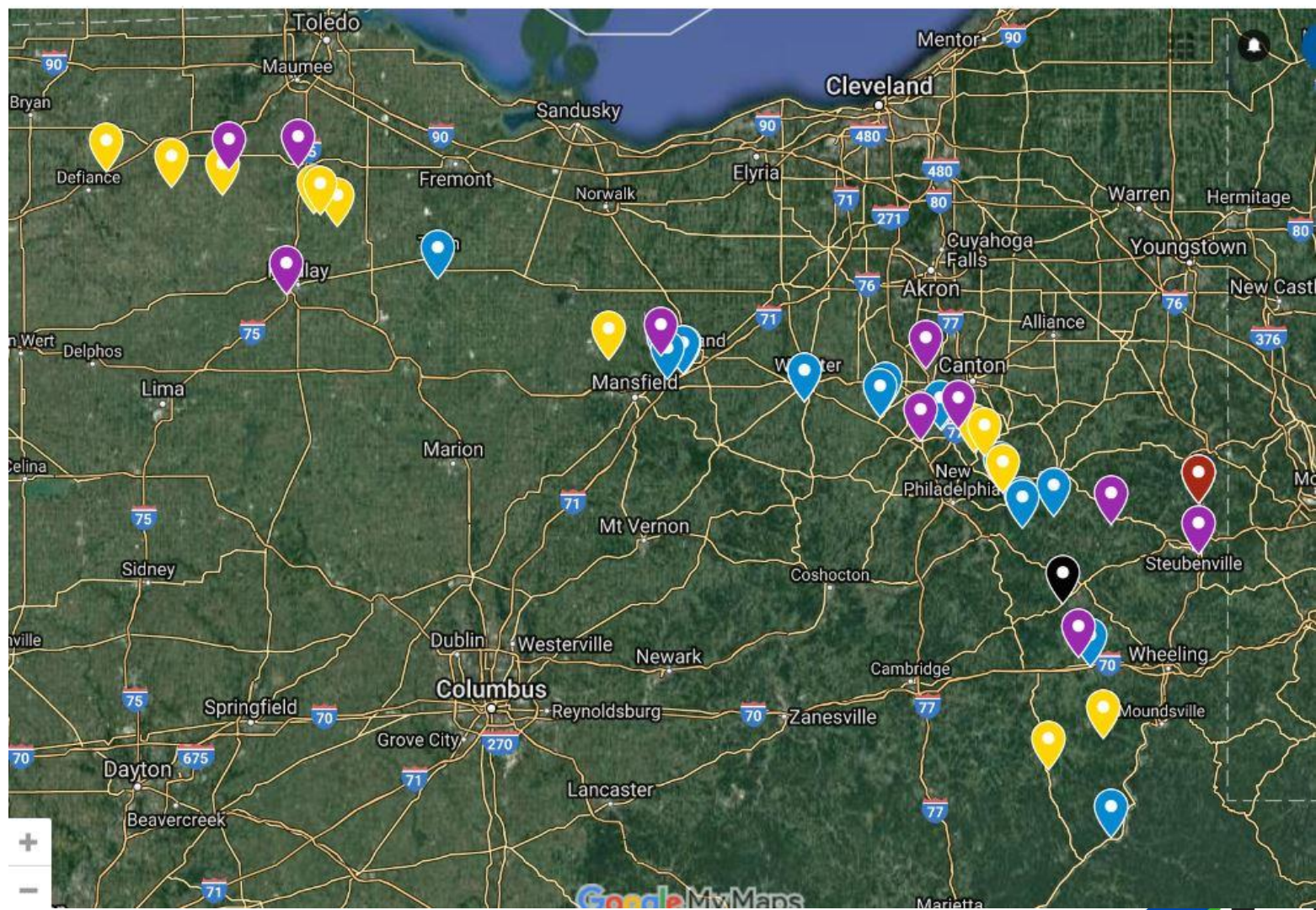
April 13, 2017

Rover Pipeline

- 713 mile, dual 42-inch Pipeline;
- \$4.2 billion Interstate Natural Gas Project;
- Transport 3.25 billion cubic feet per day (Bcf/day) of domestically-produced natural gas; and,
- Required a 60-inch HDD borehole

Rover Counties Traversed









Apr 27, 2017



Apr 13, 2017



Apr 13, 2017





04.28.2017 12:51



Apr 27, 2017



Apr 14, 2017





Apr 27, 2017





Jul 3, 2017



04.28.2017 13:08



JUL 3, 2017



Jul 21, 2017



Ohio EPA Recommended BMPs

- Technical Field BMPs:
 - Provide adequate isolation between the borehole and the feature.
 - Pre stage remediation equipment trucks during drilling activities.
 - Have redundancy built in for critical systems. Evaluate each bore for changes in critical system needs.
 - Utilize drone technology to serve as tool in operations for assessment team.

Ohio EPA Recommended BMPs

- Storm Water Runoff Issues





Jul 28 2017



Ohio EPA Recommended BMPs

- Storm Water specific BMPs:
 - Timely reclamation and stabilization.
 - Proper dewatering.
 - Slope breaks.
 - Stream protection controls.
 - Effective perimeter controls.
 - Utilize sediment ponds/traps when design parameters of perimeter controls are exceeded.
 - Knowledge of Rain Water and Land Development Manual.