

# Natural Gas Pipeline Release: Collaborative Efforts Create Opportunities for No Further Action

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# Natural Gas Pipeline Release

- In late 2005, two releases of unknown quantities of natural gas and condensate occurred from small pinholes in the pipeline
- Pipeline within easement but not on property owned by DTE Energy
- Residences with water supply wells nearby and down-gradient
- Depth to groundwater approximately 200 feet and soils comprised of sand
- Release regulated by Part 201



# Natural Gas Pipeline Release



# Collaborative Efforts Created Opportunities for No Further Action

- Release reported to DEQ and notices submitted to property owners
- DTE Energy communicated early and often with property owners and property owners association
- Local government notified/involved, access to road ROW obtained
- Soil and groundwater remedy implemented without MDEQ approval of response plan
- General vapor discharge permit received from MDEQ
- Updates provided to MDEQ and public
- MDEQ willing to meet and provide input
- All of the above facilitated access, (and property purchase) and implementation of investigation and remediation. Involved parties informed, on same page and supportive of progress and results.



# Release Response

- Initial response included pipeline repair/replacement and soil excavation.
- Approximately 120 cubic yards of impacted soil excavated and disposed off-site, excavation limited due to practical considerations
- Excavation floor and wall samples showed impact remained



# Some excavation floor and wall analysis...

Sample	Benzene [µg/kg]	Toluene [µg/kg]	Ethylbenzene [µg/kg]	Xylene [µg/kg]
West Wall 6'	930	2,100	320	910
South Wall 7'	5,900	53,000	8,200	21,600
East Wall 6'	1,800	5,200	820	2,450
North Wall 5'	1,800	8,500	1,700	4,300
East Floor 8'	250,000	400,000	47,000	114,000
West Floor 7'	3,100	14,000	2,200	5,900

# Investigation and Conceptual Site Model (CSM) Development

- Access negotiated with property owner for over a year
- Soil borings and monitoring wells installed in 2007 and 2008
- Total of 23 soil borings/wells installed, including nested monitoring wells between release and domestic water wells
- Weekly sampling of residential supply wells
- Horizontal and vertical delineation complete

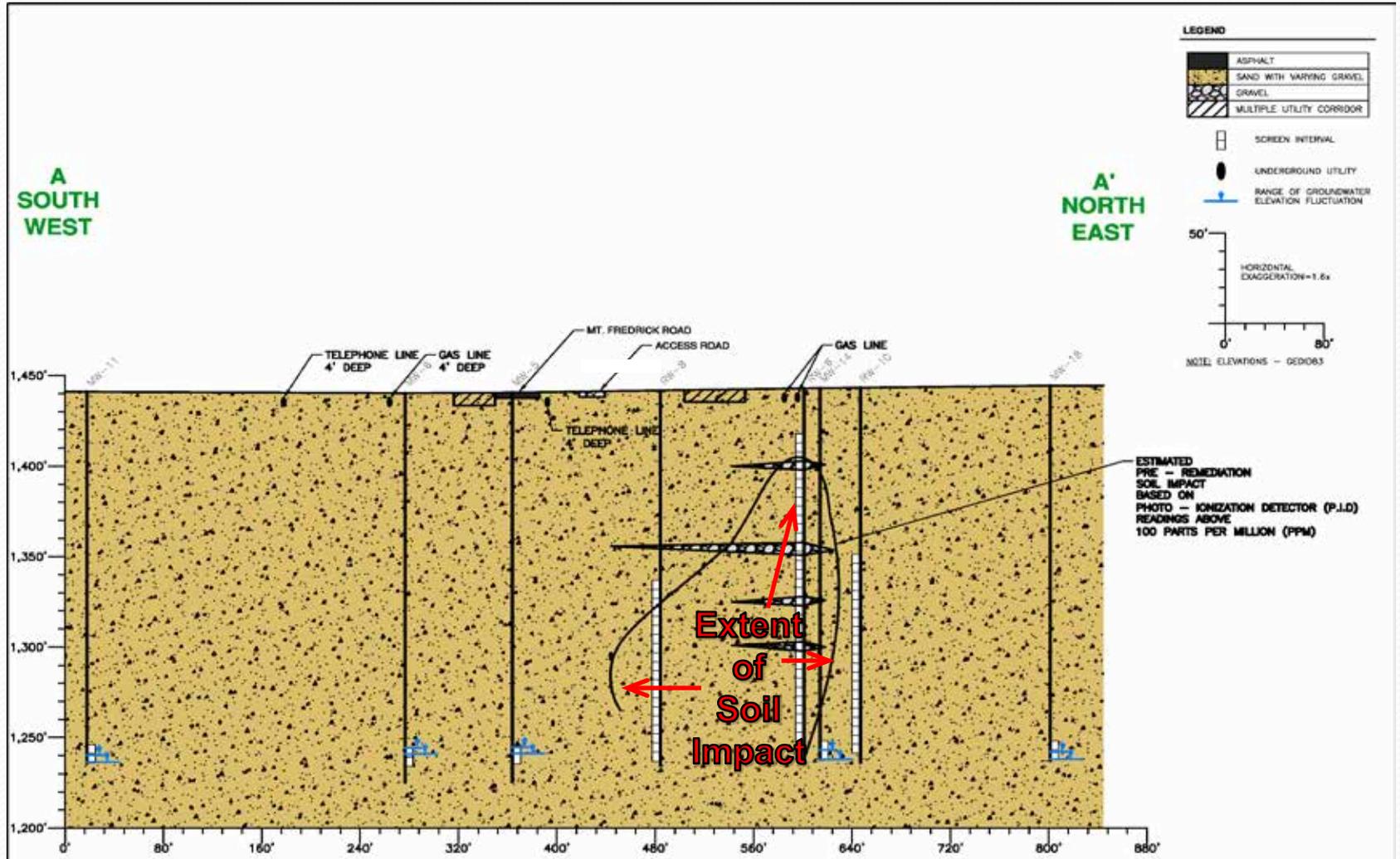


# CSM Elements

- Soil consisted primarily of sand
- Soil concentrations above Part 201 criteria extended to water table
- Elevated soil concentrations extended approximately 50 to 75 feet below grade
- Maximum soil concentration in borings was approximately 180,000  $\mu\text{g}/\text{kg}$  total BTEX
- Soil impact extended over approximately 1.4 acres

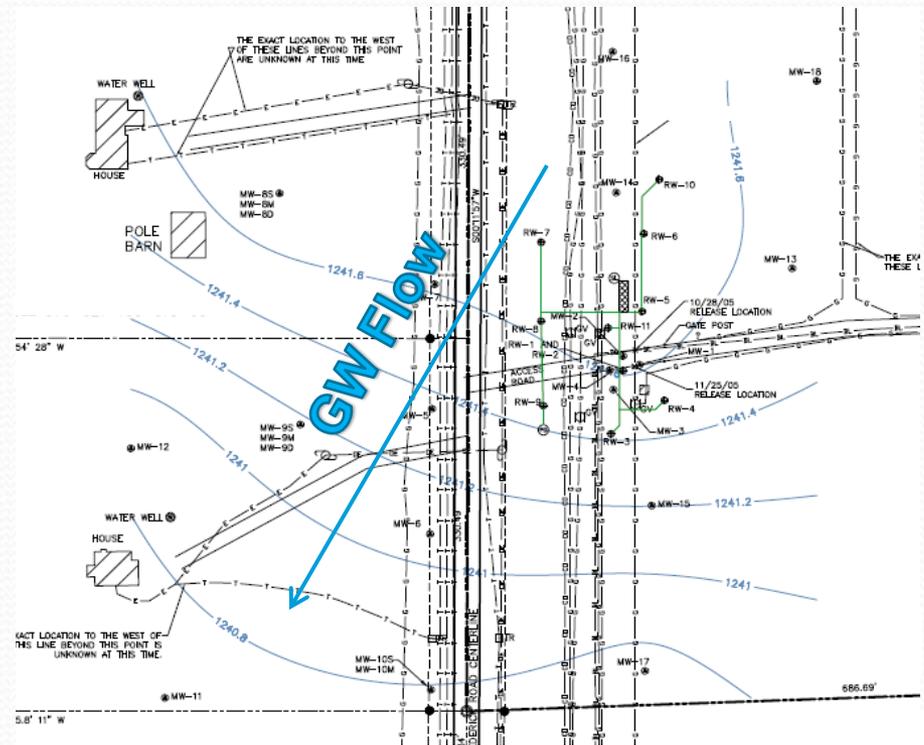


# CSM Elements



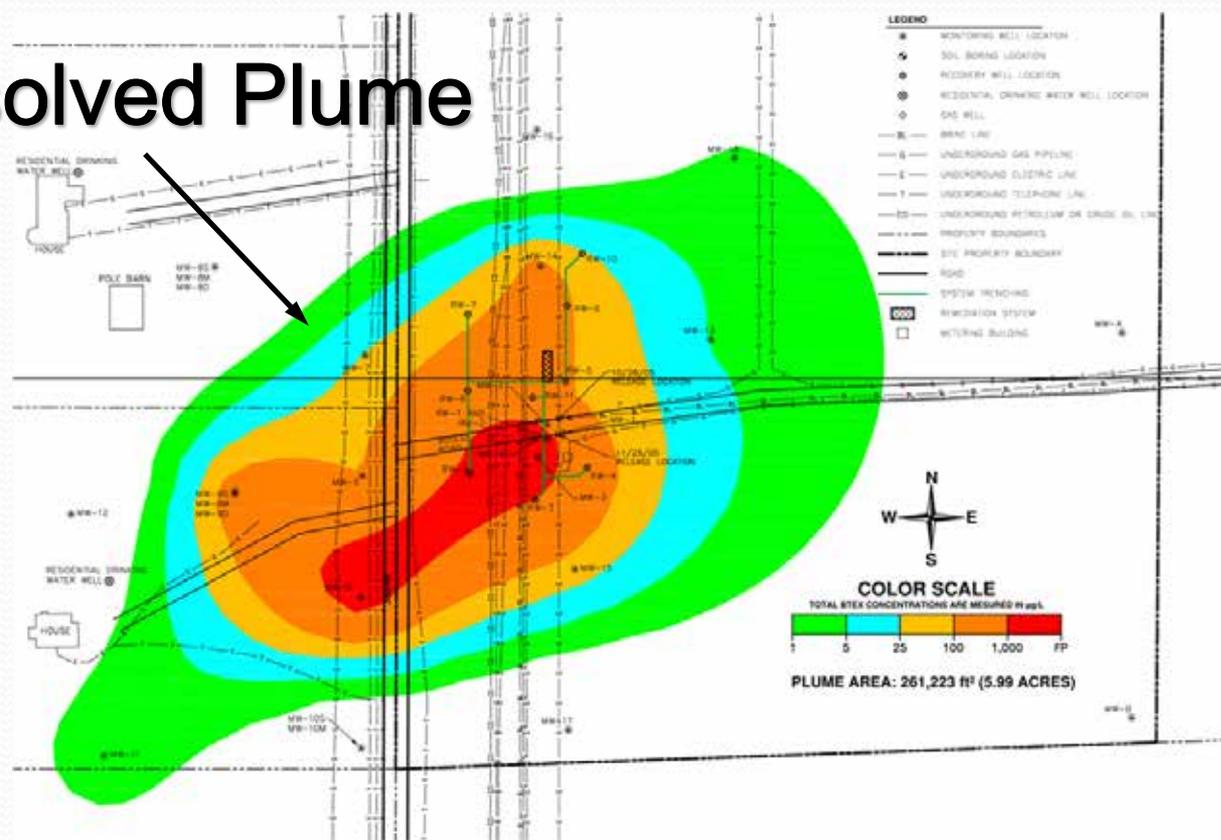
# CSM Elements

- Groundwater concentrations above Part 201 criteria
- Groundwater flow to the southwest
- Velocity approximately 100 feet/year
- Maximum groundwater concentration was approximately 16,000  $\mu\text{g}/\text{L}$  total BTEX
- No mobile LNAPL detected
- Groundwater plume above criteria approximately 600 feet long and extended over approximately 6 acres
- Groundwater criteria exceedances only in wells bisecting water table
- Supply wells screened 30 to 50 feet below water table



# CSM Elements

## Dissolved Plume



# Response Activity

- Negotiations and purchase of properties completed in 2008
- Feasibility study completed in 2009
- Soil venting system design and installation completed in 2009 and 2010
- Soil venting system started in 2010
- Groundwater recirculation pilot test completed in 2010
- Groundwater recirculation system design and installation completed in 2010 and 2011
- Groundwater recirculation system started in 2011



# Feasibility Study Recommendations

## Soil Venting

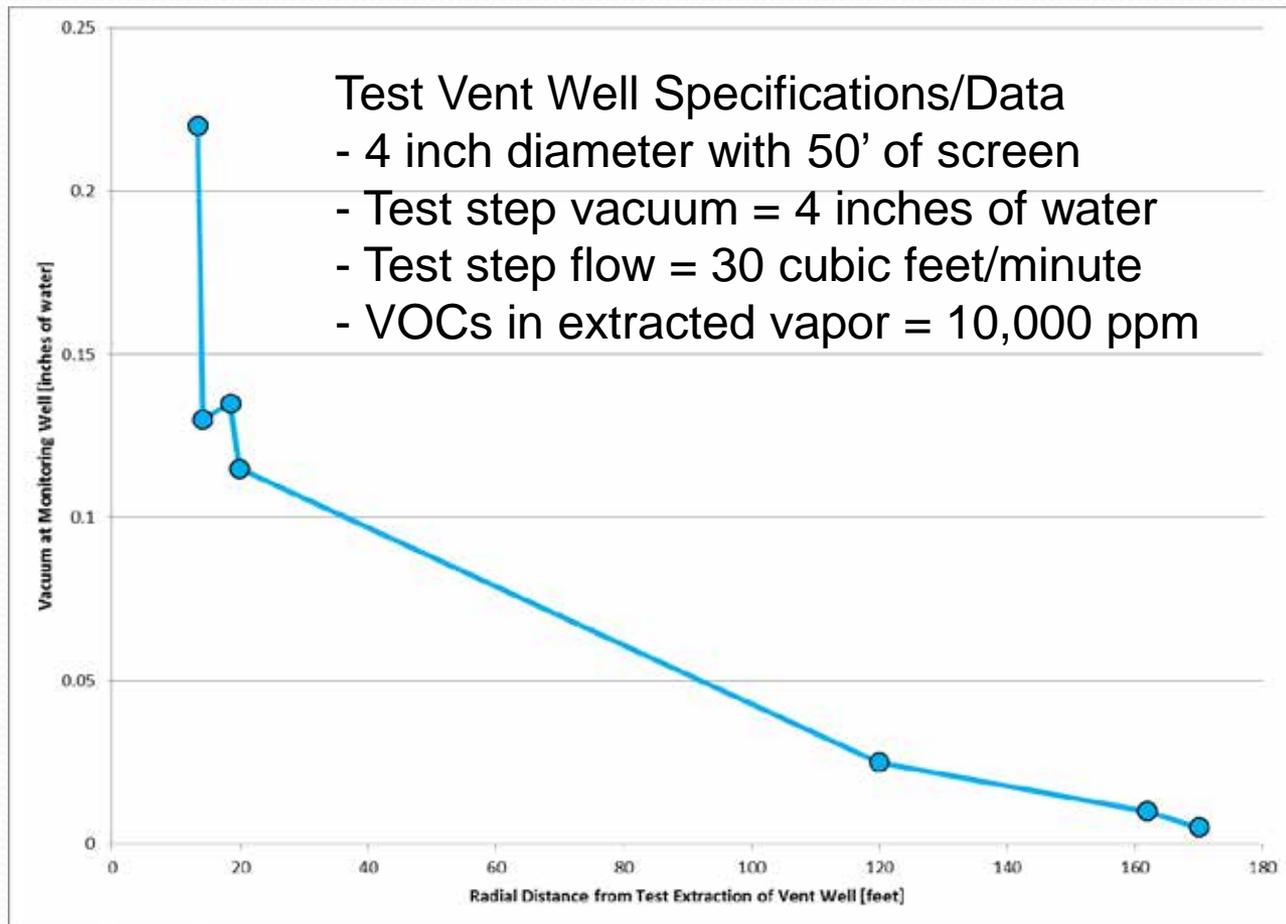
- Proven technology
- Effective for remediation of volatile and biodegradable contaminants from permeable/conductive soils
- Relatively low cost for remediation of deep impacts
- Minimally disruptive of site
- Simple operation and maintenance

## Groundwater Recirculation

- Does not require groundwater withdrawal, ex-situ treatment or discharge (significant benefit and DTE Energy preferred)
- Effective and relatively low cost for remediation of volatile and biodegradable contaminants from permeable/conductive and thick saturated zones
- Provides benefits of air sparging and groundwater recovery
- Simple operation and maintenance

# Soil Venting Pilot Test

Vacuum



Distance

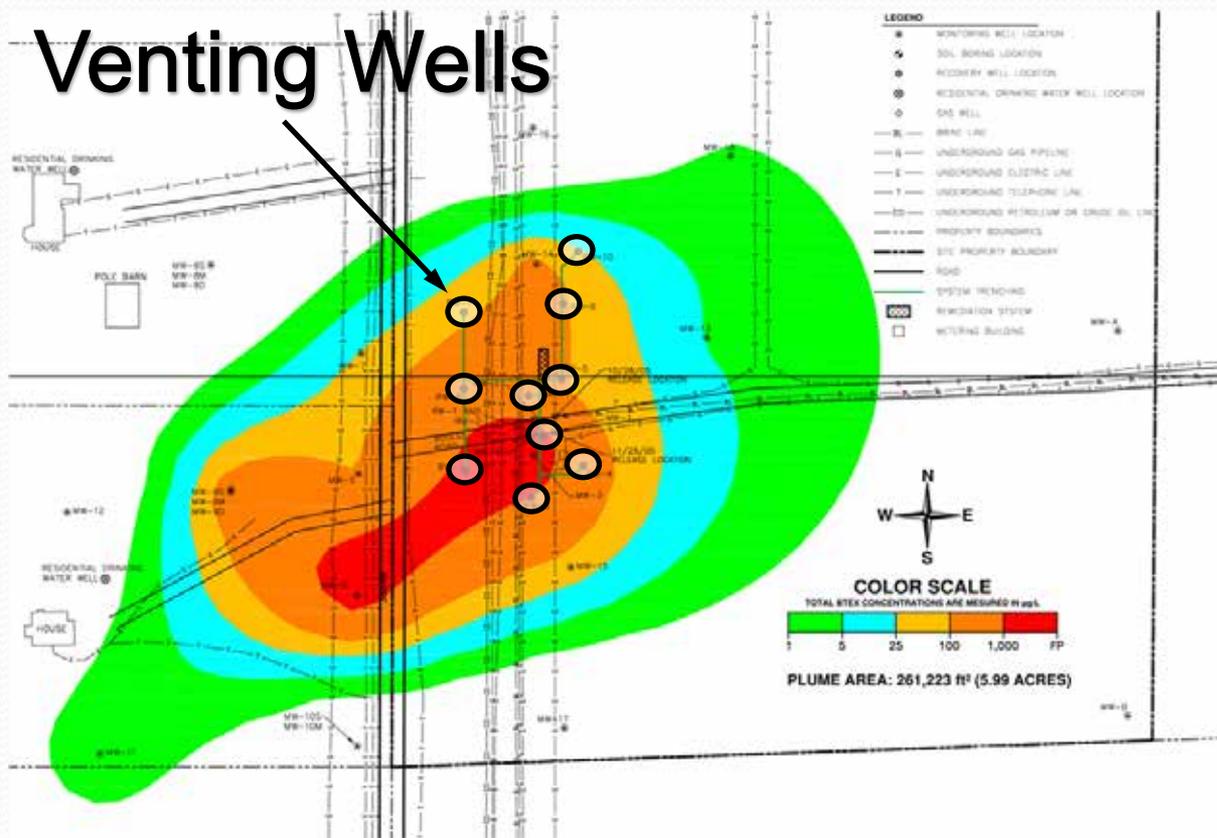


# Soil Venting System Install & Operation

- 10 vent system wells
- Wells 2 and 4 inch diameter
- Wells screened at various depths (screen lengths 50 to 175 feet long)
- System capable of approximately 400 cfm
- Extracted vapor volatile organic compound (VOC) concentrations decreased from 100s parts per million (ppm) to < 1 ppm in approximately 18 months

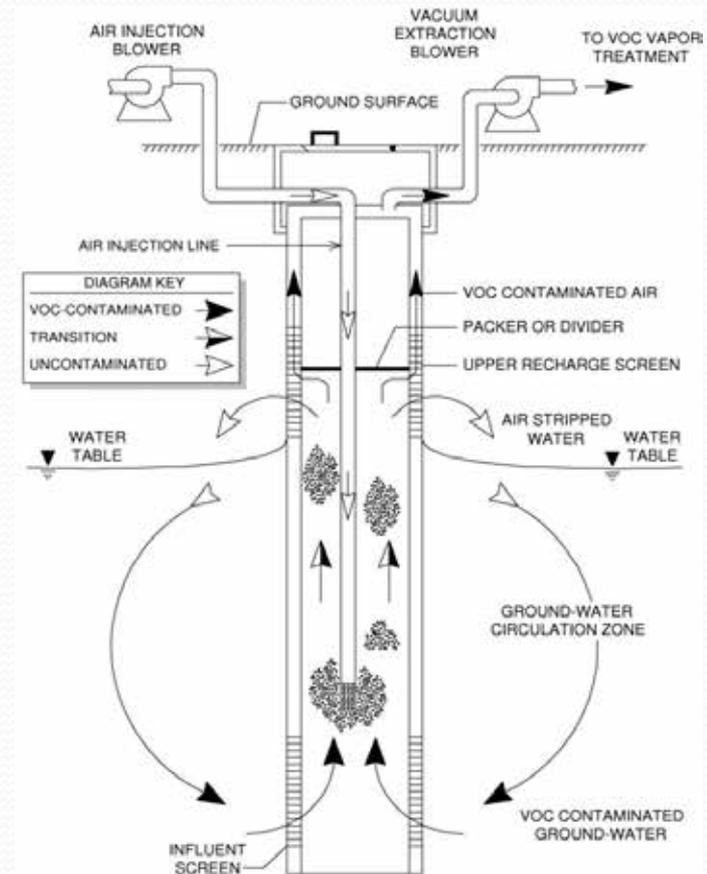


# Soil Venting System Layout



# Groundwater Recirculation Pilot Test

- Test conducted for 3 months
- Test well 6" diameter, with screen at water table and 50 feet below water table
- BTEX reductions in wells around test well up to 85%
- Dissolved oxygen increases in wells around test well up to 2 mg/L



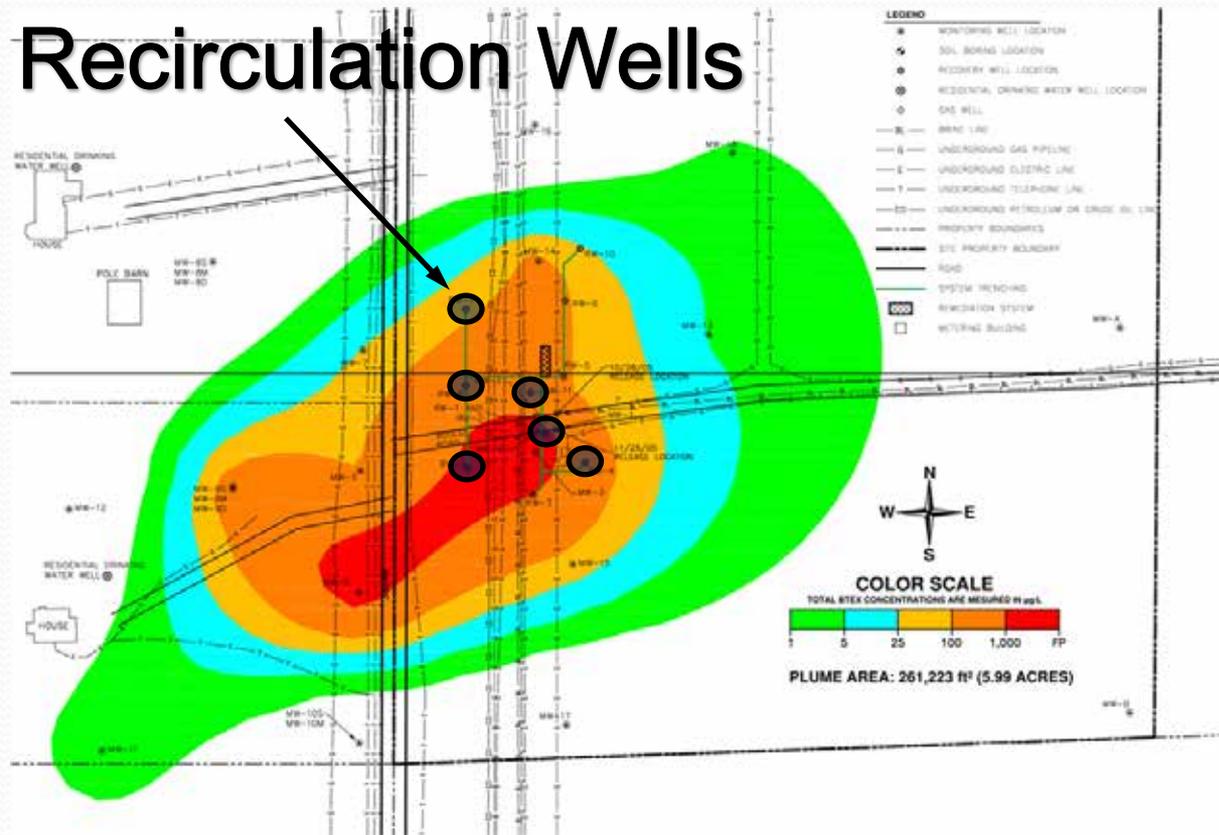
# Groundwater Recirculation System Install and Operation

- 6 recirculation wells
- Wells six inch diameter
- Wells screened at water table and approximately 50 feet below water table
- System capable of approximately 100 scfm



# GW Recirculation System Layout

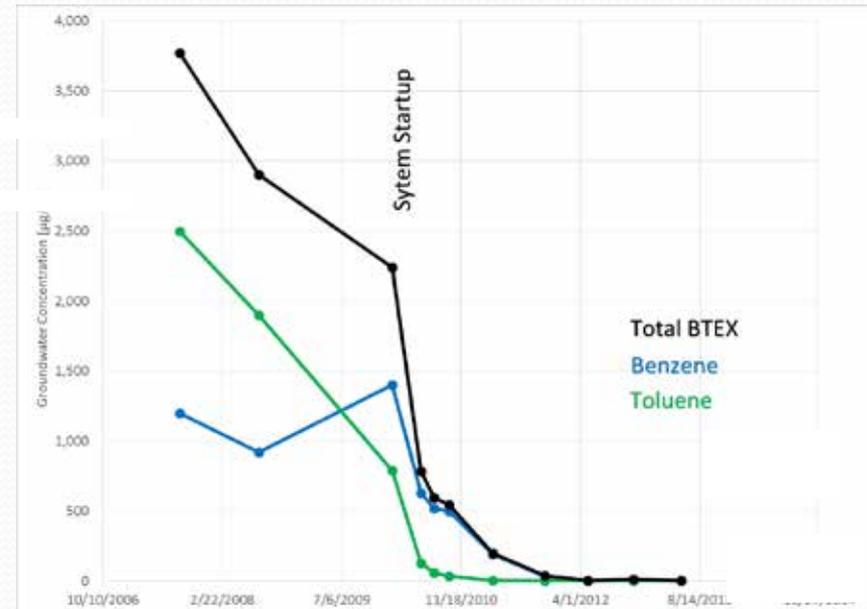
## GW Recirculation Wells



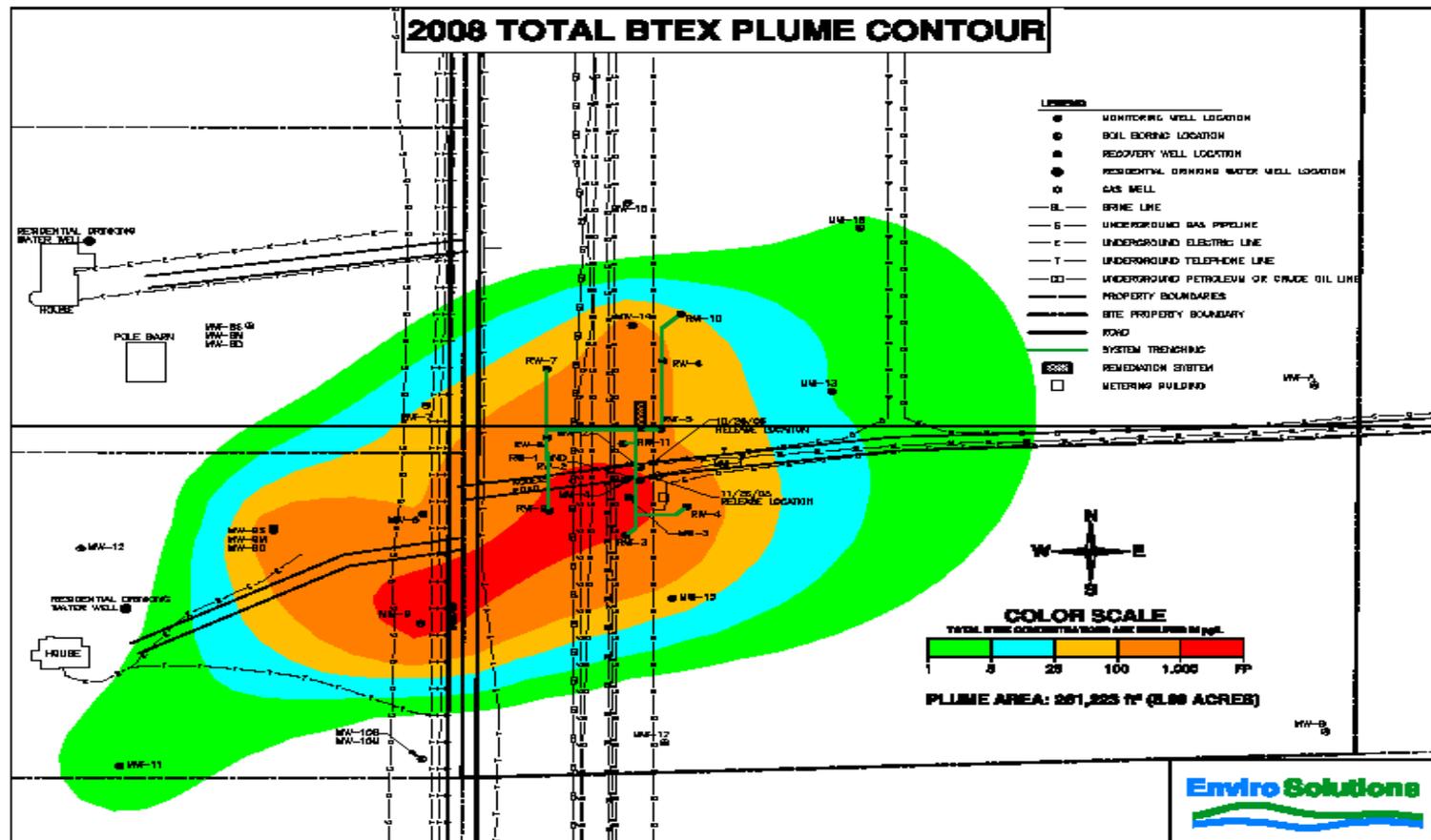
# System Performance

- Groundwater concentrations decreased dramatically after vent system startup
- Groundwater concentrations below Part 201 criteria after two years of groundwater recirculation startup
- Dissolved oxygen increased several mg/L in wells down-gradient and 1-2 mg/L in wells side-gradient and wells slightly up-gradient
- Systems simple to operate

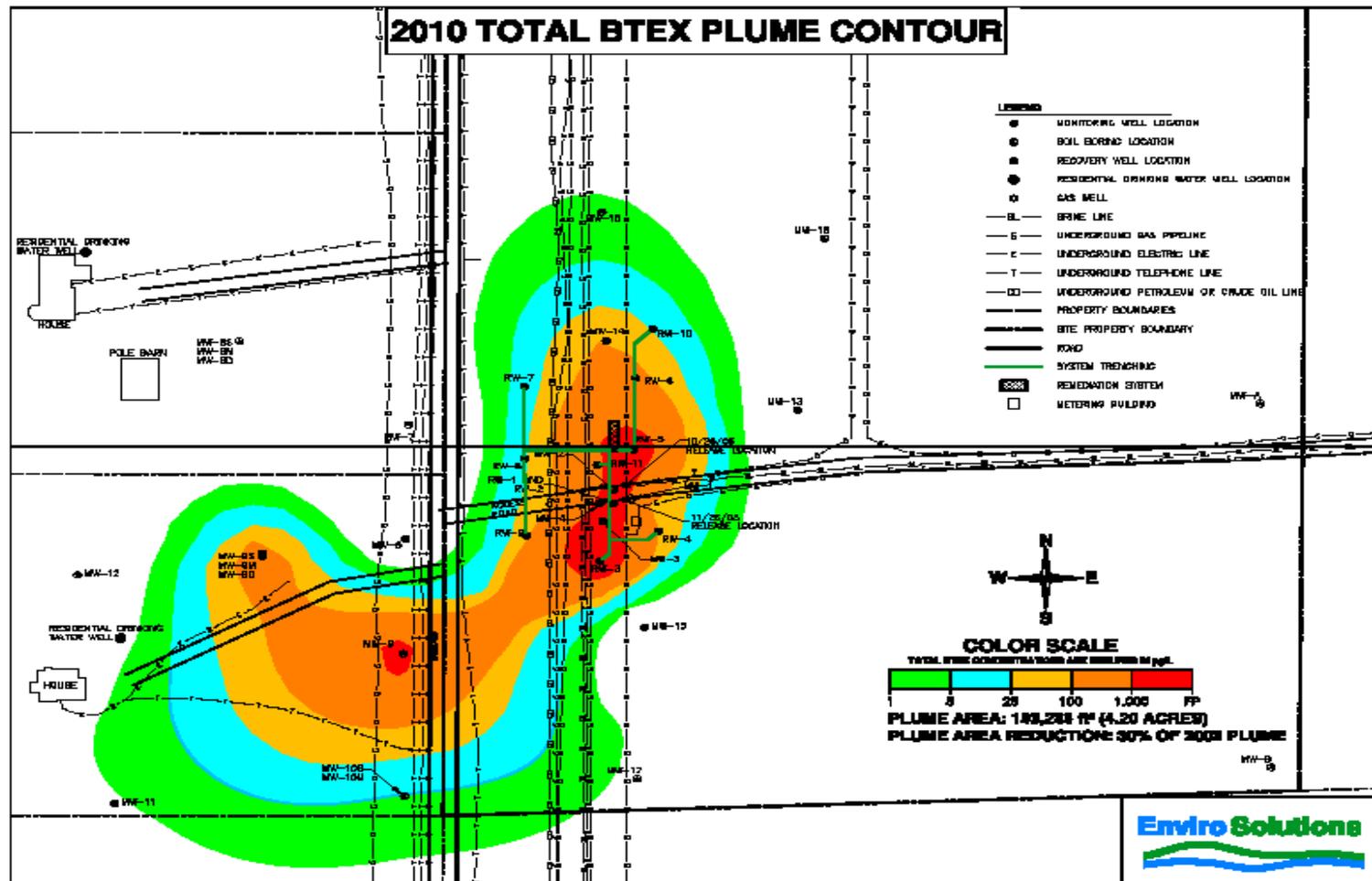
MW-3 (Down-gradient)  
Groundwater  
Concentrations vs. Time



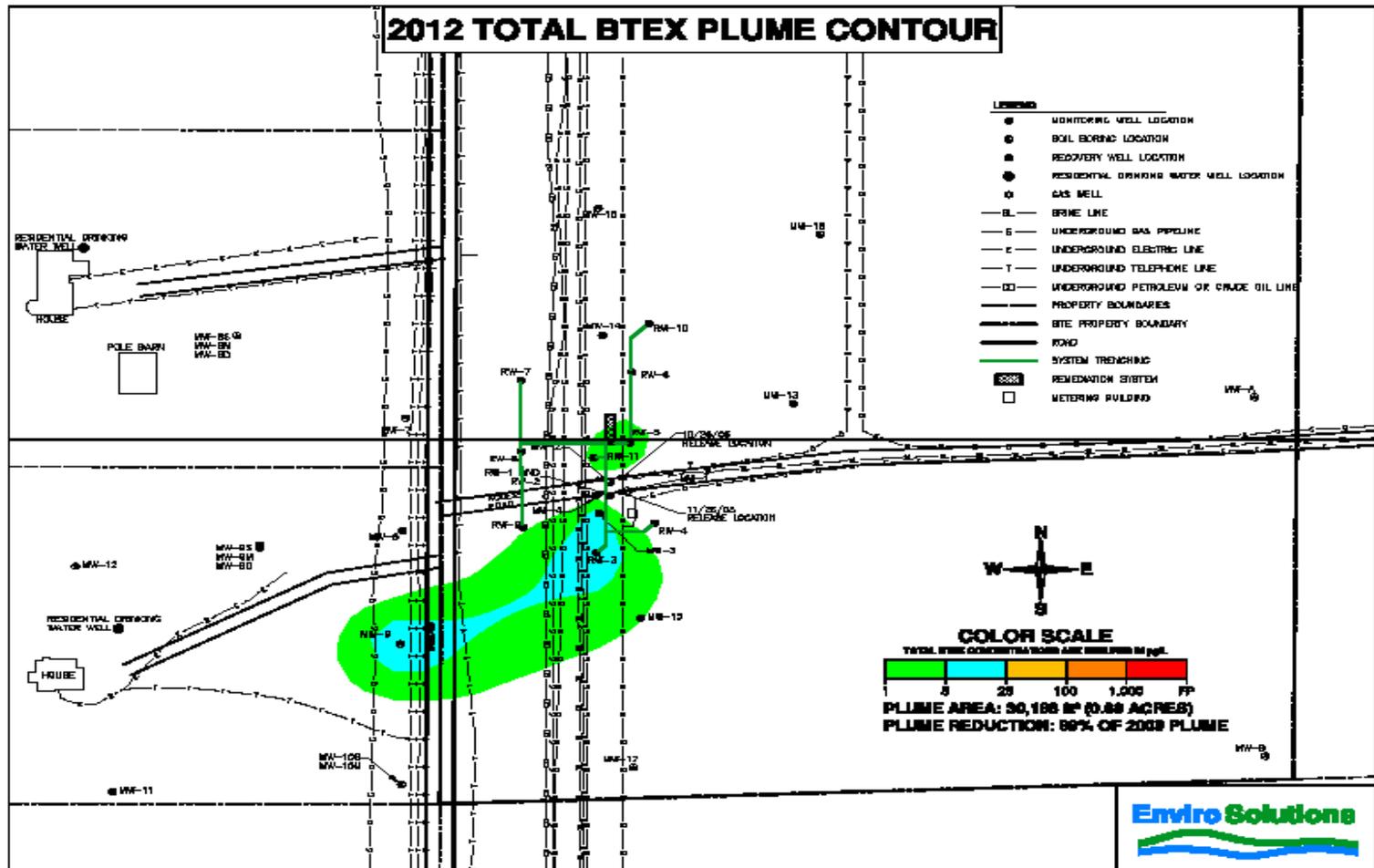
# Pre-Remediation Groundwater Concentrations



# Groundwater Concentrations Months after System Startup



# Groundwater Concentrations 1 Year after Groundwater Recirculation Startup



# Verification Sampling

- Soil & groundwater sampling plan submitted to MDEQ
- MDEQ raised questions and concerns
- Met with MDEQ (Dave Lindsay and Randy Rothe of Gaylord District, submitted additional information and met again to finalize plan)
- Quickly reached reasonable compromise, MDEQ requested two additional borings and an additional round of groundwater sampling
- MDEQ provided informal approval of sampling plan



# Verification Sampling

## Soil

- Five verification soil borings completed
- Verification borings installed at former excavation sample locations and borings/wells with elevated concentrations
- Included one boring to water table
- No evidence of remaining soil impact based on field screening
- Lab analysis did not detect any impact above generic part 201 criteria

## Groundwater

- Groundwater samples collected quarterly for 5 quarters post-system shutdown
- Lab analysis did not detect any impact above generic Part 201 criteria groundwater samples

**NFA Report to be submitted in 2015**

# Lessons Learned

## Agency Perspective

- Communication with DEQ is key – even when following the self implementation path. Know your stakeholders and communicate early and often.
- Understand what outcome the stakeholder is seeking.
- Work with the regulated stakeholder closely and facilitate / collaborate with other stakeholders (e.g. property owners, County Health Department, community).

## Utility Perspective

- Define your remedy with the end-game in mind and benchmark what success looks like specific to your challenges and local concerns.
- Collaborate with DEQ early and keep them informed – even under self implementation.



# THANK YOU!

## Michigan Department of Environmental Quality

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