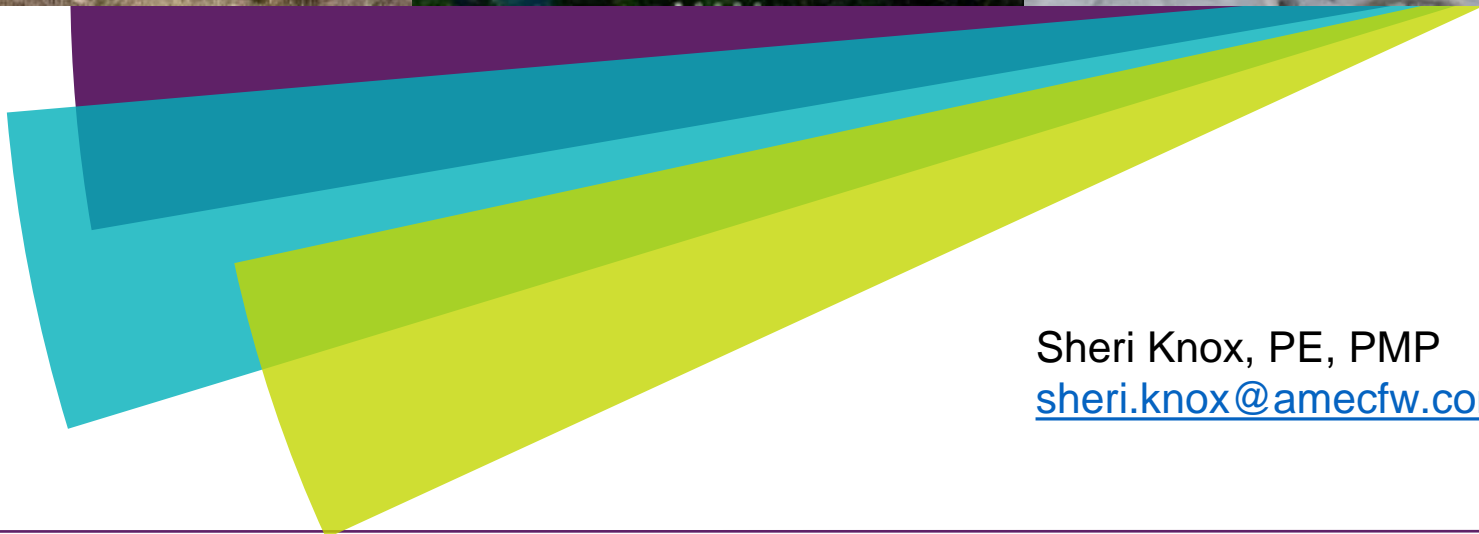


Assessing Sustainability After 20 Years of Pump & Treat



TRB 2016 Summer Workshop

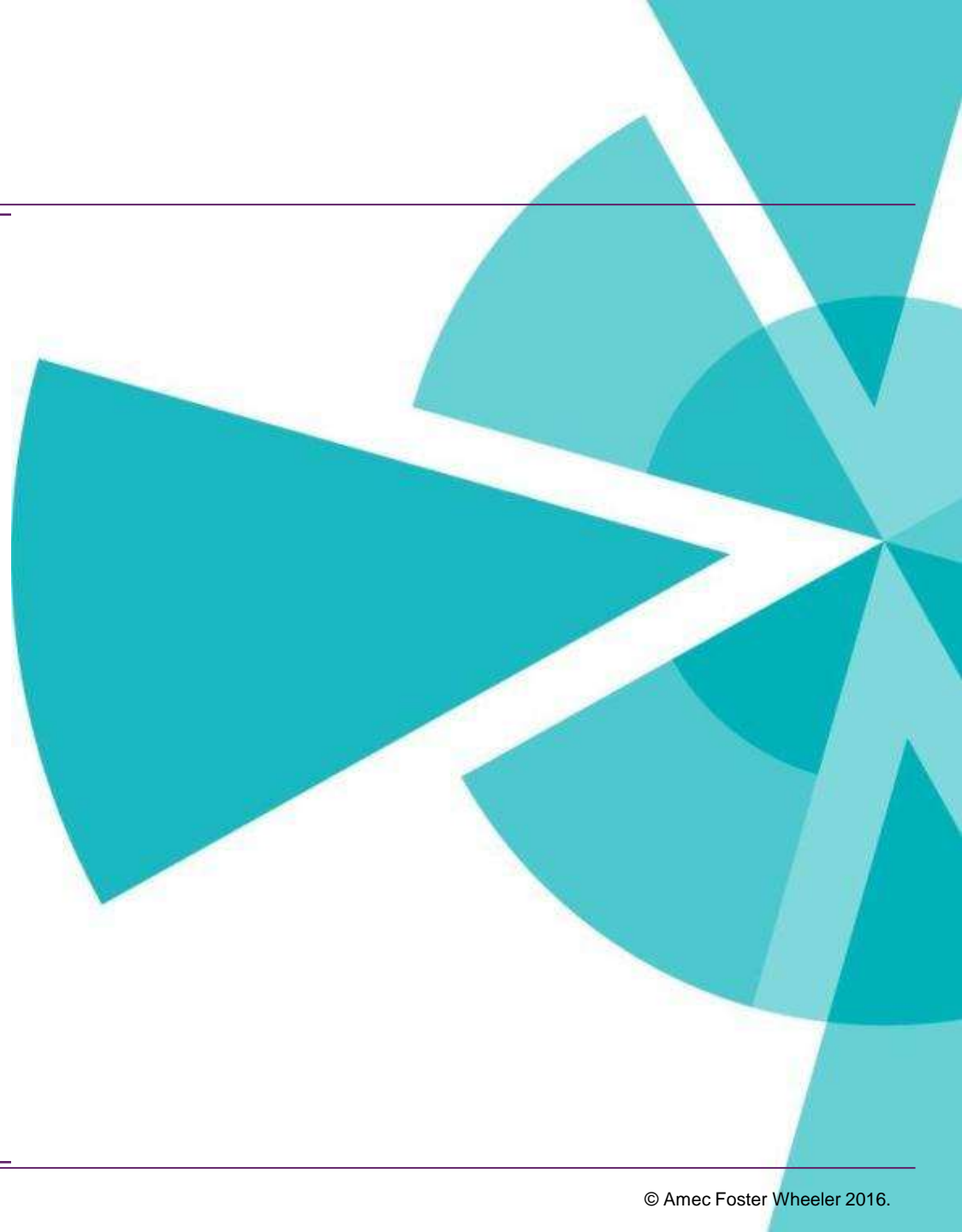


Sheri Knox, PE, PMP
sheri.knox@amecfw.com

Agenda

- **Site Description**
- **Redevelopment & Current Performance**
- **Results: Technical Solution is Only a Part of the Solution**
- **Summary & Lessons Learned**

Site Description





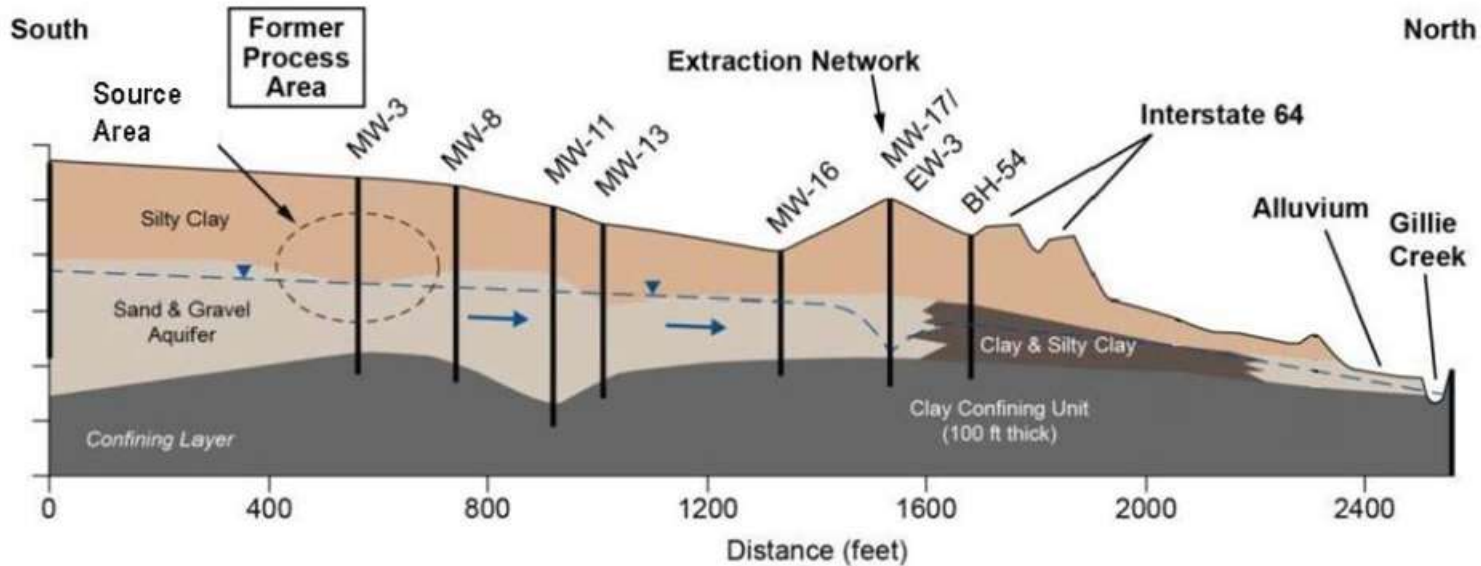
Circuit Board Manufacturer

- Release of TCA & MEC
- Receptor - Wetlands to North
- Receptor - Wells to Northwest



Note: Figure is not to scale

Site Generalized Cross Section



Notes:

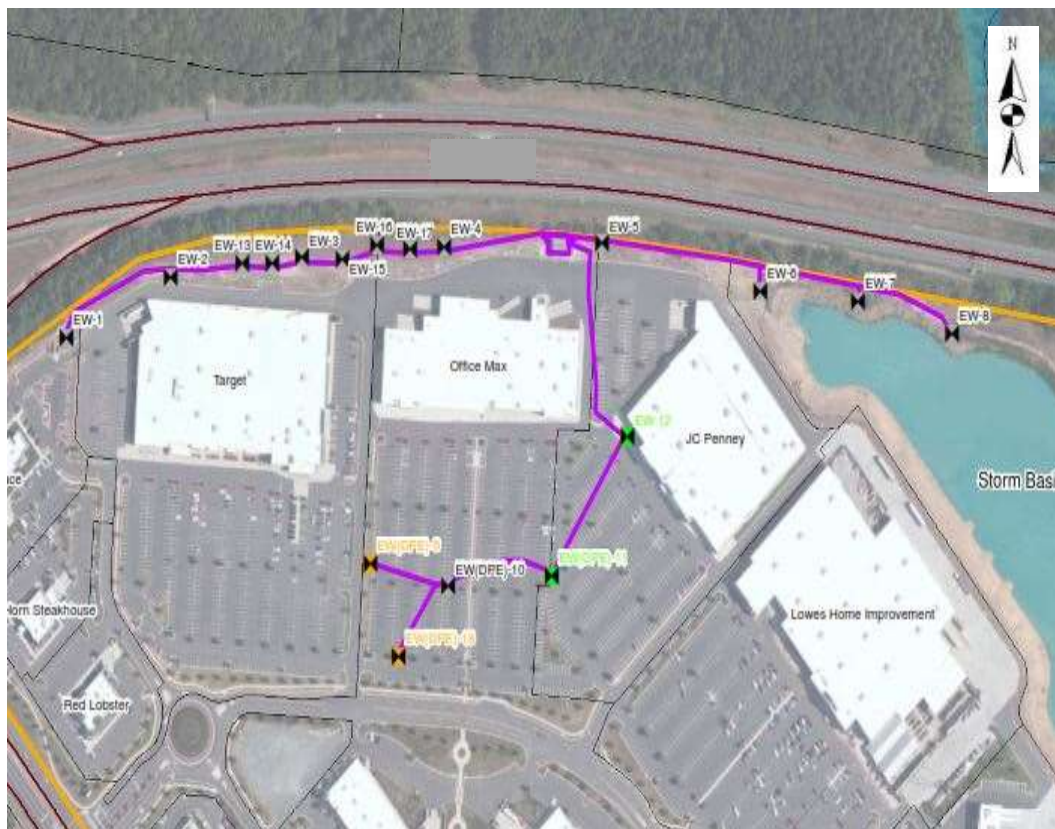
- Silty clay unit with interbedded sands 10 to 20 feet thick makes up the vadose zone
- Sands and gravel aquifer beneath vadose zone is approximately 10 to 25 feet thick
- Groundwater velocity in aquifer is 0.15 feet per day
- 100-foot thick clay confining unit is located beneath the aquifer
- Clay confining unit overlies the Patuxent Formation

Drawing is not to scale



Record of Decision

- **Pump & Treat**
- **Clean up goals**
 - 1,1,1-TCA - 200 parts per billion (ppb)
 - MEC - 5 ppb
 - 1,1-Dichloroethene (DCE) - 7 ppb
 - 1,1-Dichloroethane (DCA) - 4 ppb





2015 View Under Pumping Conditions



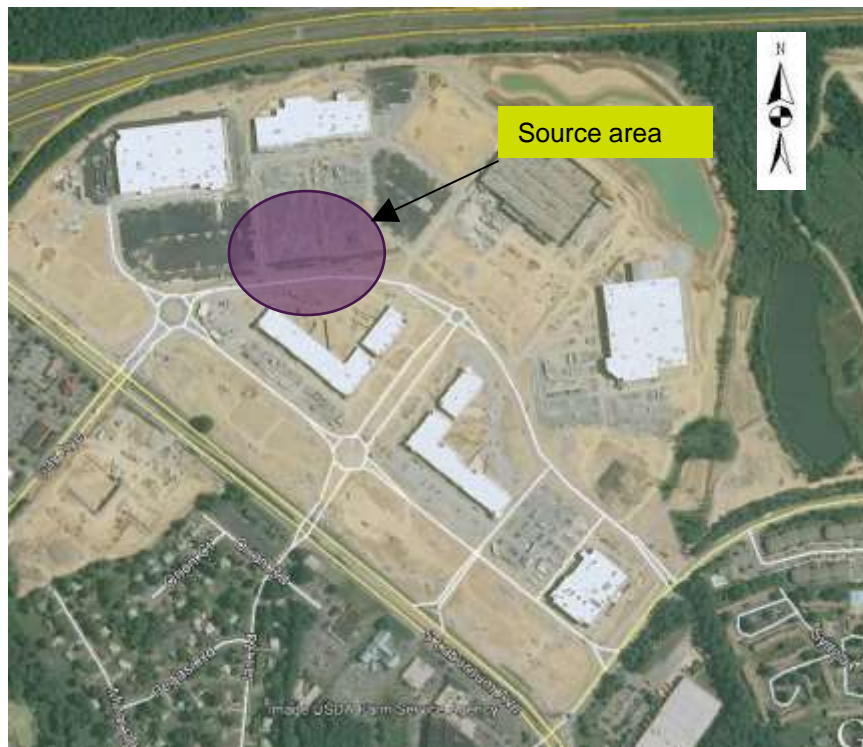
Redevelopment & Current Performance





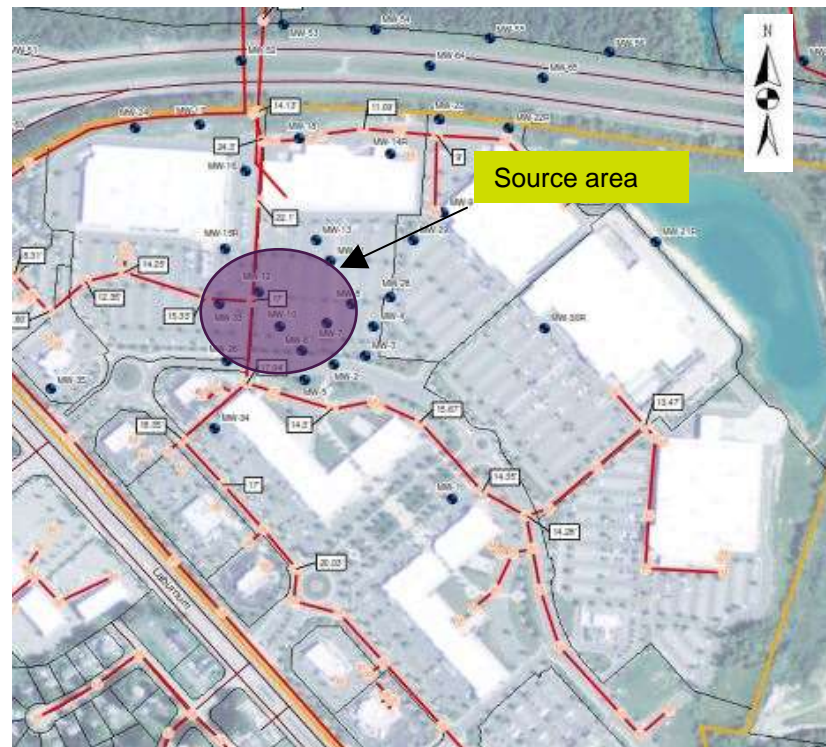
Redevelopment

Transition with 6 to 8 Feet Fill - 2008



Adjusted well top of casing 6 to 8 Feet during grading

Current Sewer Utility - 2014



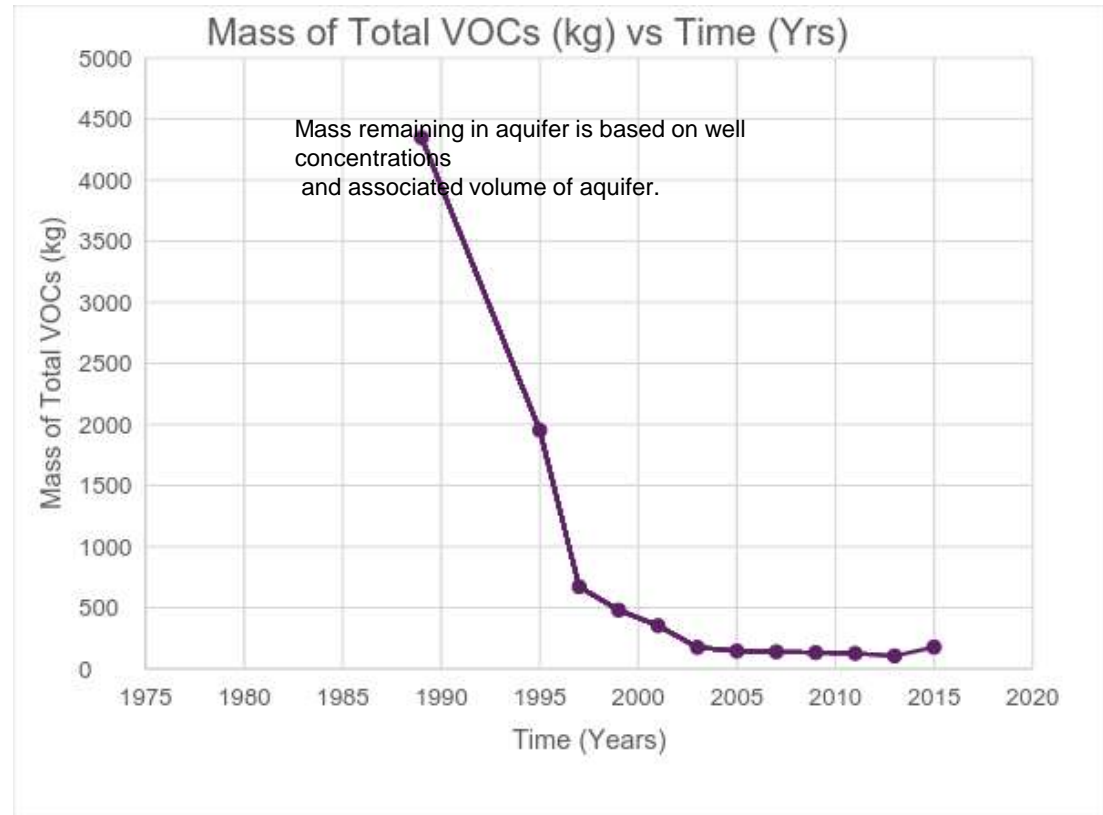
Utility in Source Area

Note: Figures are not to scale

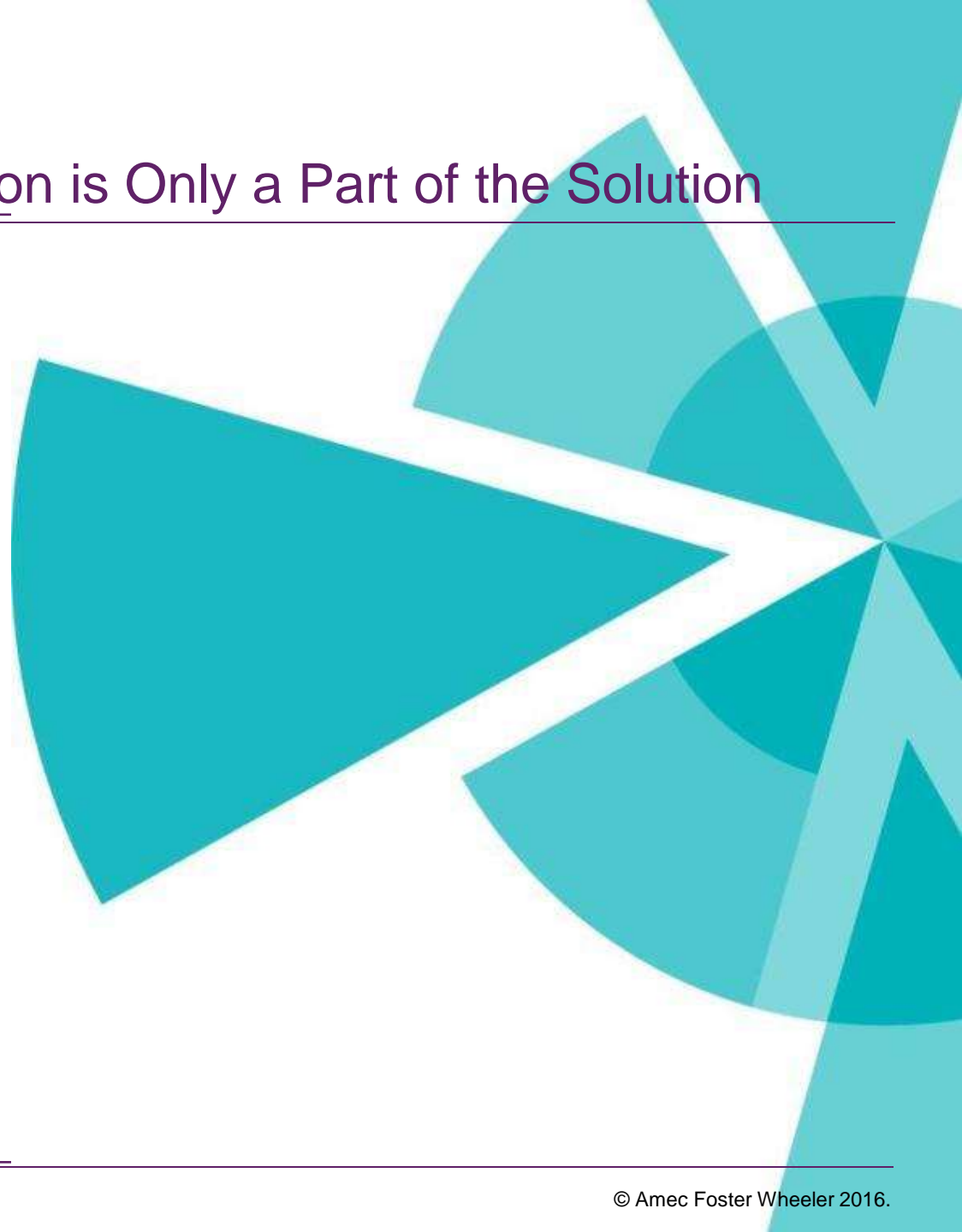


System Performance: Limited & Unsustainable

- Large distribution of COCs despite 20 years of Pump & Treat
- Pumps 1.5 MG per Month
- Mass in aquifer remains largely unchanged Since 2003
- 1,4-Dioxane present in Effluent
- Site conditions have changed - redevelopment



Results: Technical Solution is Only a Part of the Solution



Lengthy Discussions with EPA

Temporarily Inactivate System To Evaluate Plume Status Under Natural & Non-pumping Conditions

➤ **Area of Concern - Receptors**

- Assess downgradient receptors
- Evaluate future risk under non-pumping conditions

➤ **Area of Concern - Source**

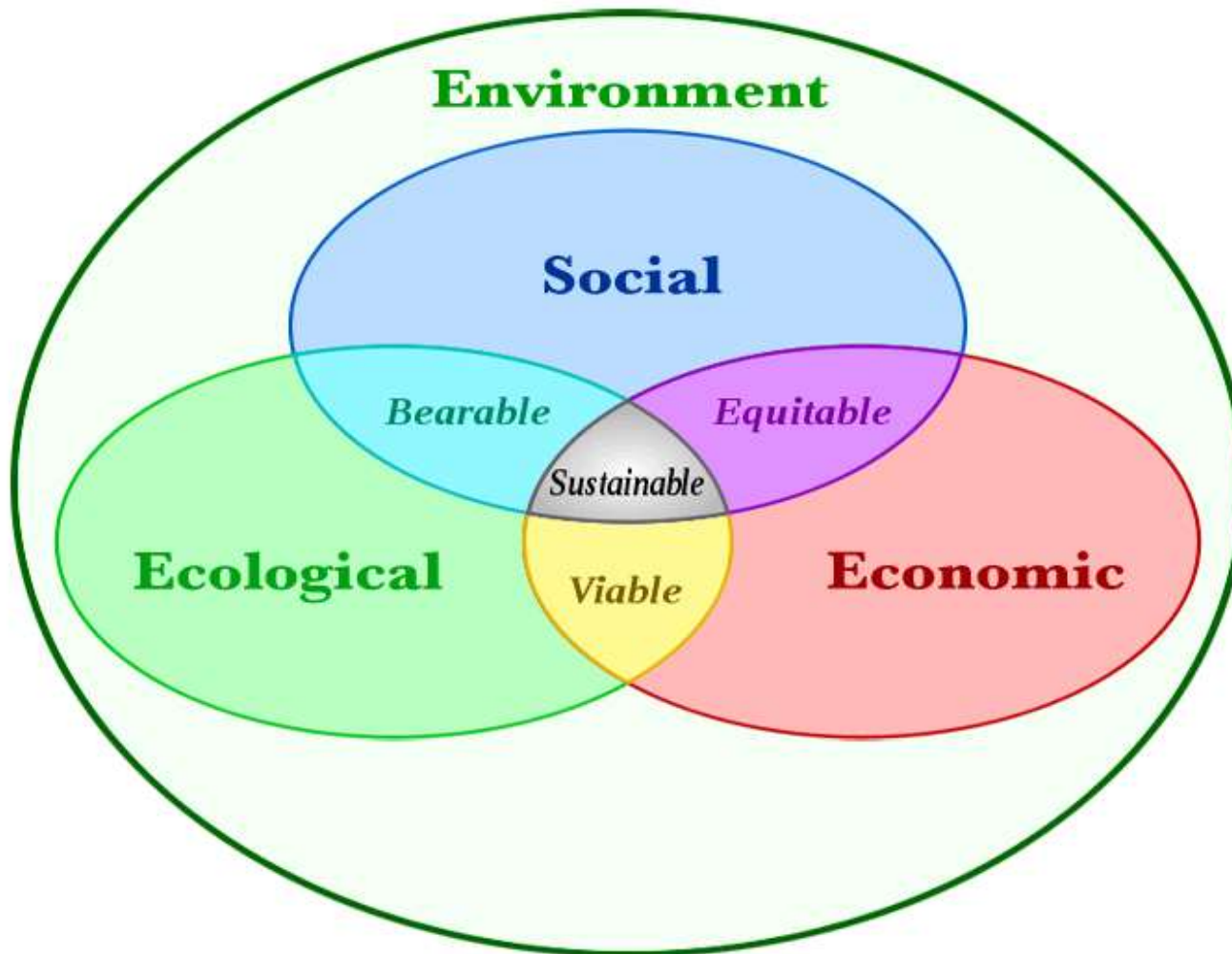
- Treat Source with In Situ Chemical Oxidation (ISCO)
- Keep Plume largely contained on Site with MNA and Source Treatment

➤ **Area of Concern – Efficient Treatment**

- Treatment should work and be efficient
- Client has same concern



Sustainability





Important Considerations

Social: Confirm Receptors

- Update receptors
- Evaluate potential for vapor intrusion
- Avoid disturbing stakeholders

Ecological: Pump & Treat Outdated

- System does not reduce source mass or treat 1,4-dioxane
- Using resources like electricity without results
- Altering the flow of the aquifer/wetlands without results (1.5 MG/month)

Economic: Pump & Treat Outdated

- Identify technology that is more efficient
- Keep cost reasonable, but treat aggressively
- Reuse system



Run my EVcar for 7 yrs per 1 yr System Operation

Planning ISCO Pilot Injection

System Inactivated: February 2016

Area of Concern - Receptors

- Assess downgradient receptors
- Evaluate future risk under non-pumping conditions

Destroy COCs & COIs At Once

- Sodium persulfate activated with NaOH > 2.0 eV
- Can destroy 1,4-dioxane as well as other COCs

Keep Cost Low, But Treat Aggressively

- Soil oxidant demand unusually low, so based on 5% solution
- Injection target similar to treatment target – replacing 25% portion of the pore volume accounting for heterogeneity (25%)
- Injected through existing extraction wells



Pilot Injection Results

➤ Focused alternatives evaluation:

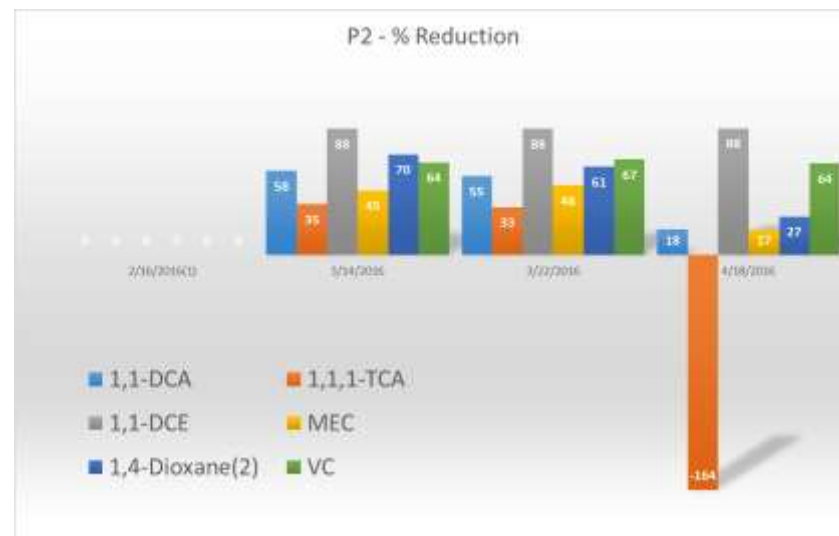
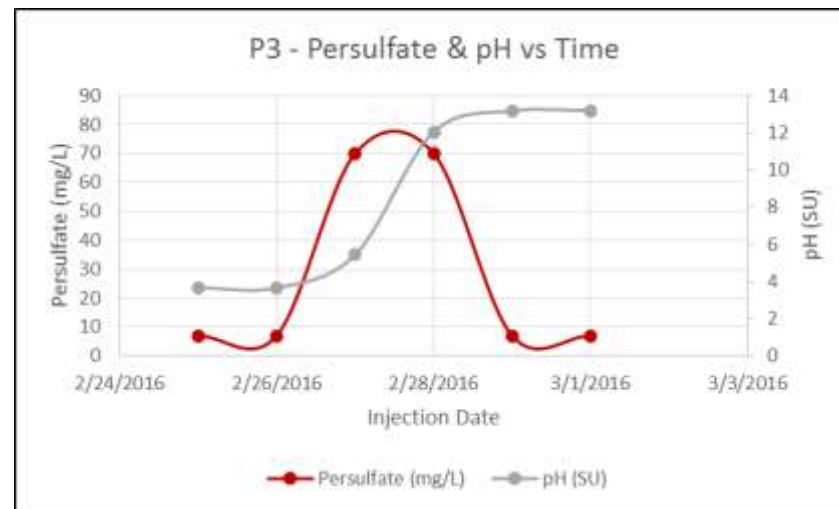
- Total 6 GPM with low PSI
- Injected 4,300 gallons of 5% persulfate solution into each of three extraction wells.
- Injected 635 gallons of NaOH into each of three extraction wells
- Delivery confirmed by Hach Kit & pH meter

➤ Results – Initial Reduction in COCs

- 1,1,1-TCA (43%)
- 1,1-DCA (75%)
- 1,1-DCE (87%)
- MEC (77%)
- 1,4-Dioxane (77%)
- VC (75%)

➤ Radius of influence: 30 feet

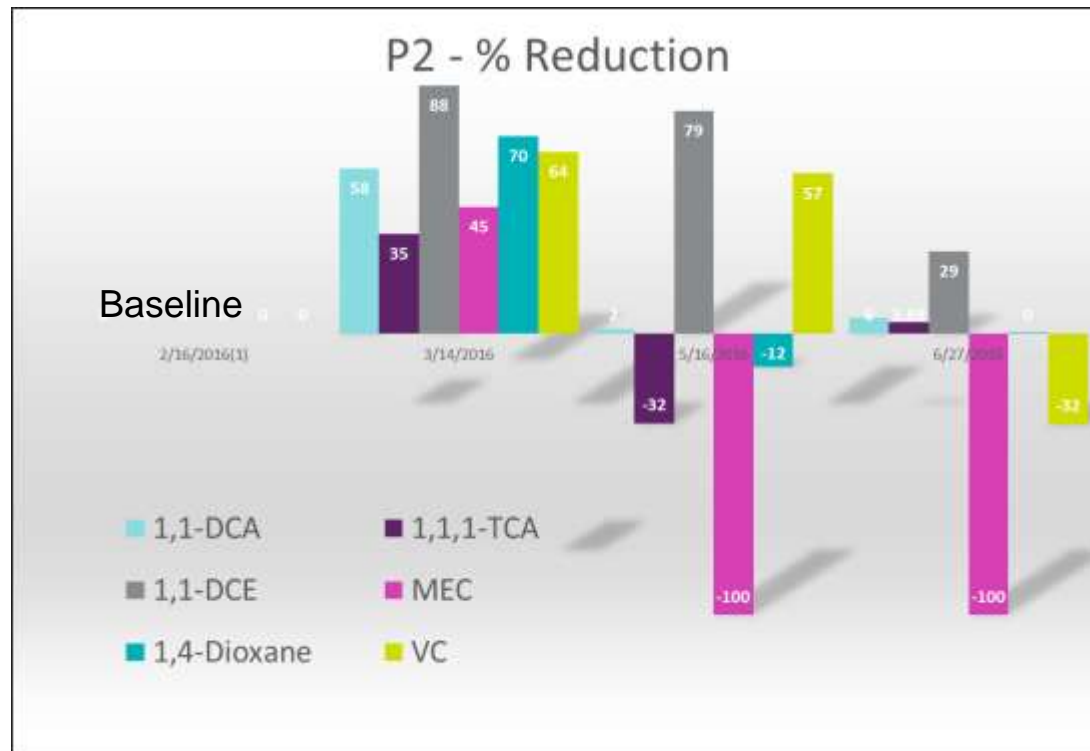
➤ Performance monitoring





Injection Results

- **Source Rebounds in about 3 months as expected**
 - MEC; sometimes TCA
 - Maintaining DCE
 - Injection life about 3 months
 - Model affect on MNA
- **Bouncing Around Baseline since May 2016**
- **Monitoring Residual Effects in nearby well**
 - MW-10

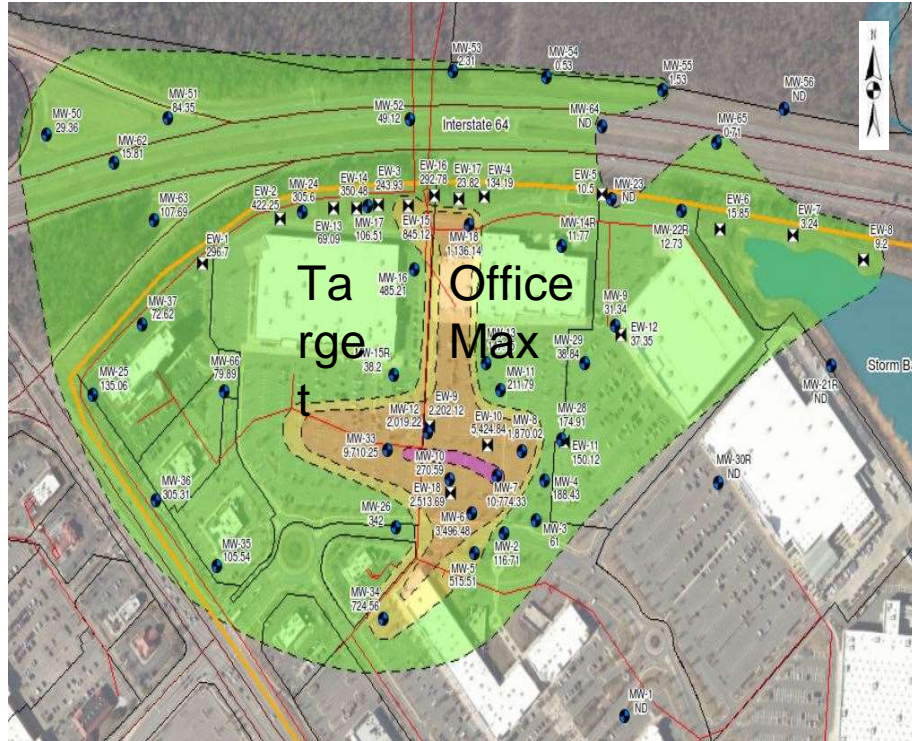




Plume Comparison Since Shut-down

November 2015: At 18 years of pumping

May 2016: 6 months after pilot & shut down





Summary: More Sustainable Solution Possible

- Social: Plume remains stable
 - NOW known problems areas can be addressed
 - Downgradient receptors known & considered in future plan
 - Vapor intrusion considered
 - Minimized disturbance to property owners
- Ecological
 - ISCO works with usual limitations
 - 1,4 dioxane treated
 - Resources will be managed more effectively
- Economic
 - COCs treated at once
 - System components repurposed
 - Minimized disturbance to customers
 - Eventually save on O&M and discharge fees (<\$60K year alone)



Lessons Learned

- Consider sustainability: The technical solution is ONLY a part of the solution
- Review approach with stakeholders regular basis
 - Review risk-based considerations
 - Optimize to improve efficiencies
- Avoid becoming complacent
 - Even if approach is “Going as Planned” more sustainable approach may be desirable and more cost effective

