



CAT 100 Applied at Indiana Industrial DNAPL Site

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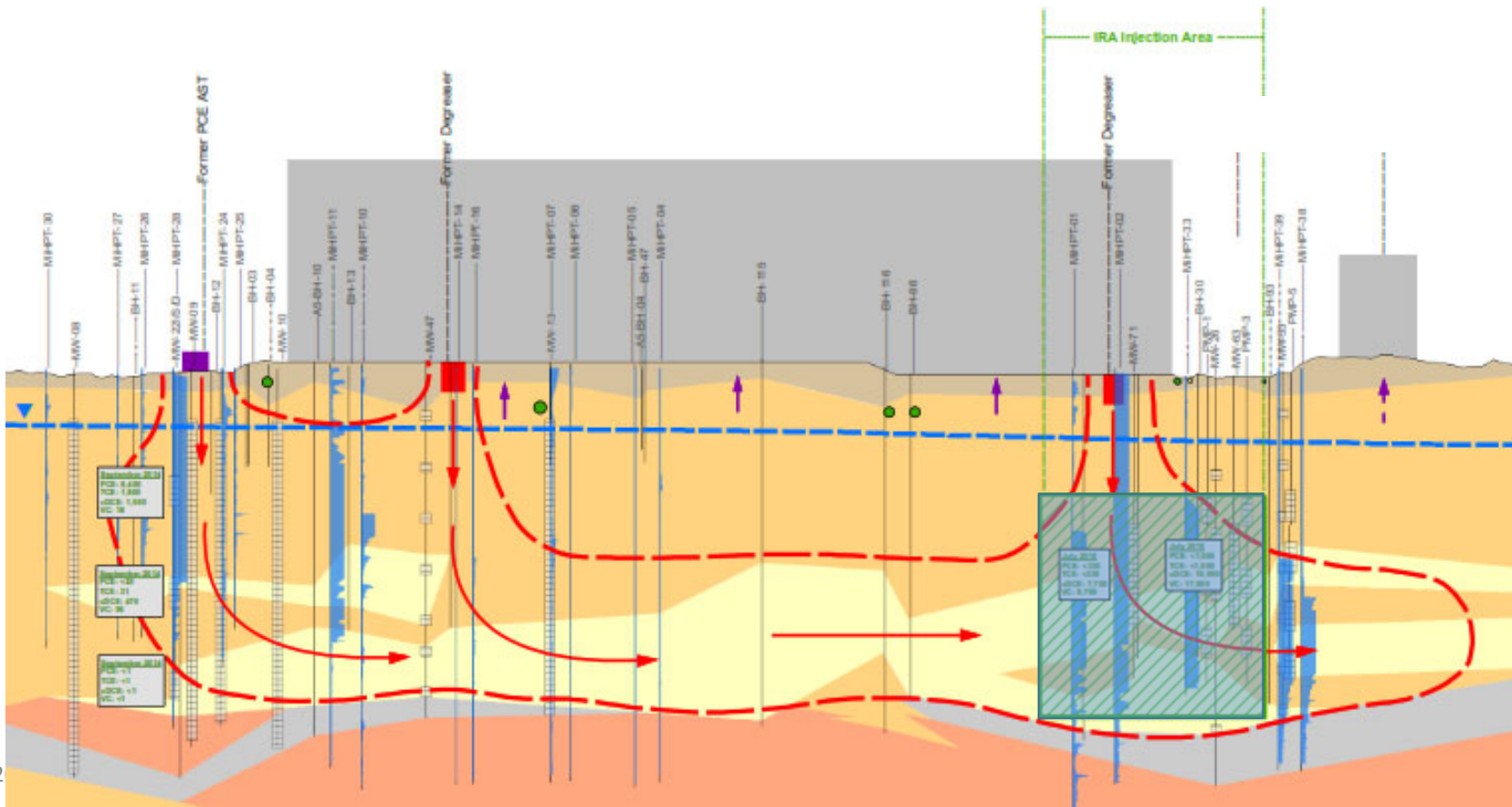
Outline

- Background
- Conceptual Site Model
- Remedial Design Characterization (RDC) for Interim Remedial Measure (IRM) at a former degreaser (Area 1)
- Reagent Selection for IRM
- Implementation of IRM
- Results
- IRM Success Leads to downgradient Permeable Reactive Barrier (PRB)

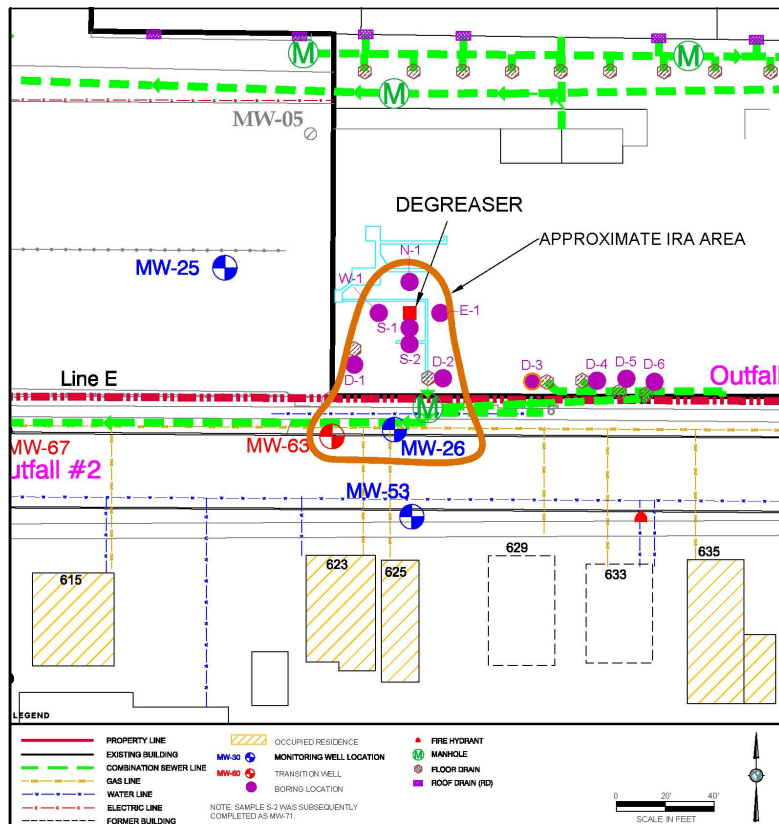
Site Background

- Confidential manufacturing site that operated from 1913 to 2004. Manufacturing included steel stamping, forming, machining, parts cleaning and degreasing, heat treating, electroplating, painting and assembly.
- Investigations identified four primary source areas (two degreasers, a metal scrap handling area, and a drum storage area) where releases to the ground surface (and potentially from below grade process lines) occurred.
- The primary purpose of the remedy is to reduce the total mass of chlorinated volatile organic compounds (CVOCs) in saturated soil and groundwater, thereby mitigating the potential vapor intrusion pathway and reducing the risk posed by the Site so that closure can be achieved.

Conceptual Site Model



Remedial Design Characterization – IRM Area



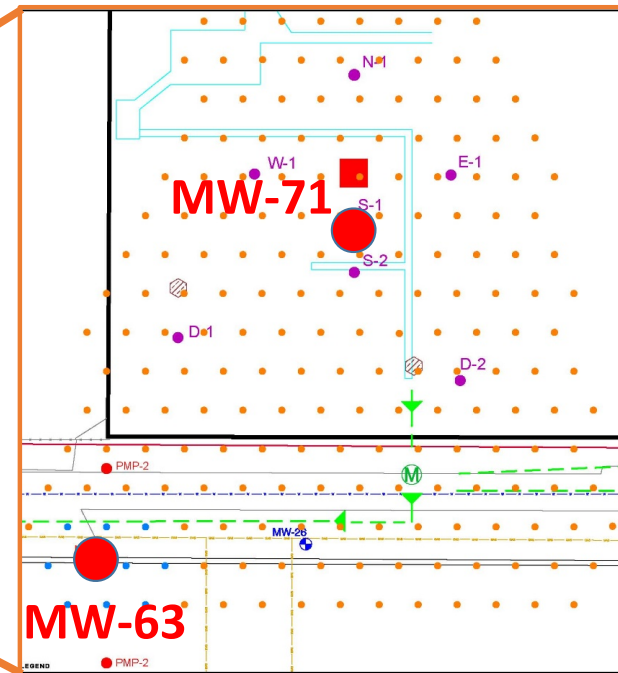
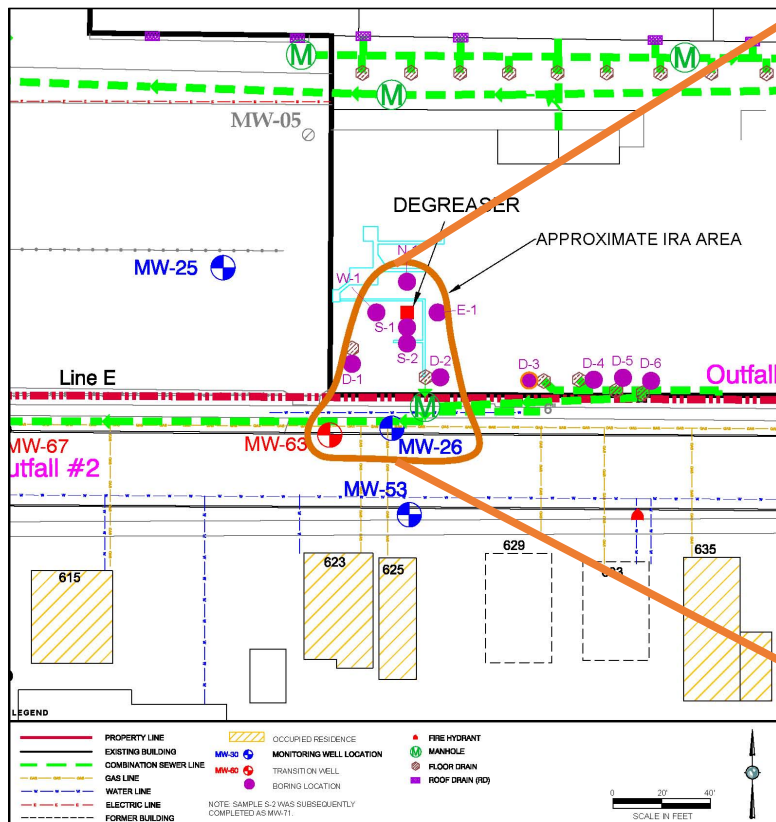
- RDC near Degreaser in September 2014 – 11 borings and 1 grab gw sample
- 2015 – BOS 100 Pilot to demonstrate effective distribution of slurry near MW-63
- 2015 - 4 borings and 12 gw samples from nested wells, plus gw samples from MW-63 and MW-26

IRM Goal & Reagent Selection

- IRM Goal – Achieve Contaminant Migration Control from a Former Degreaser exhibiting saturated soil and groundwater CVOC concentrations $>1,000$ mg/Kg and $>1,000$ mg/L
- CAT 100
 - Activated Carbon Impregnated with Metallic Iron (BOS 100[®])
 - Complex Carbohydrate – Food Grade Starch
 - One Set of Microorganisms Designed to Degrade COCs
 - Second Set of Microorganisms Designed to Degrade the Carbohydrate
- Tightly Spaced Injection Point (5' triangular grid), injected top-down from ~9' bgs to 32' bgs via direct push rods.



Implementation - IRM



- ~5,400 ft²
- 11,300 lbs of CAT 100 installed in 215 injection points in January & February 2016

5/1/2019



IRM Monitoring Results 3 Years of Data

5/1/2019

MW-71 VOC Trends

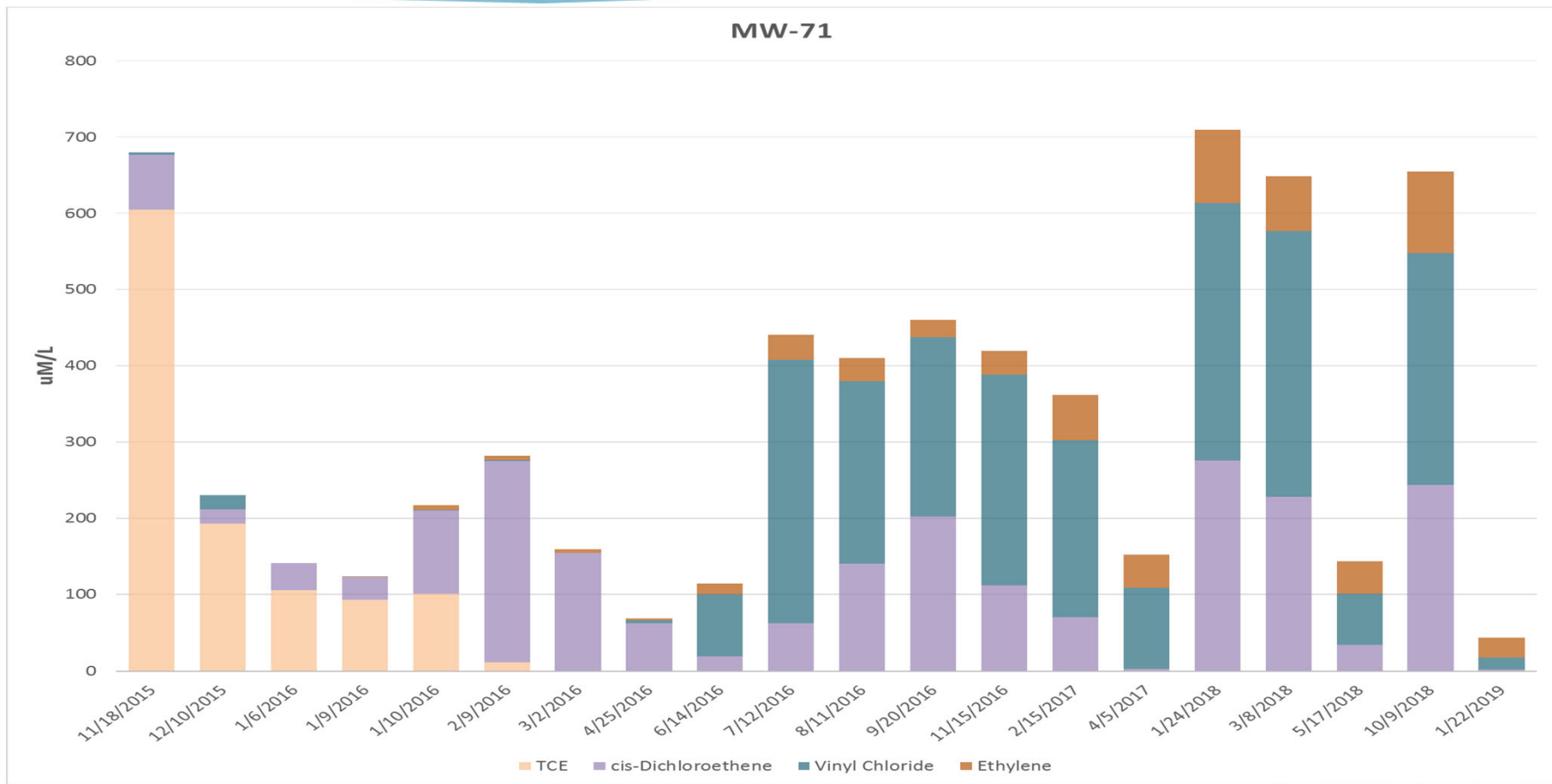
MW-71



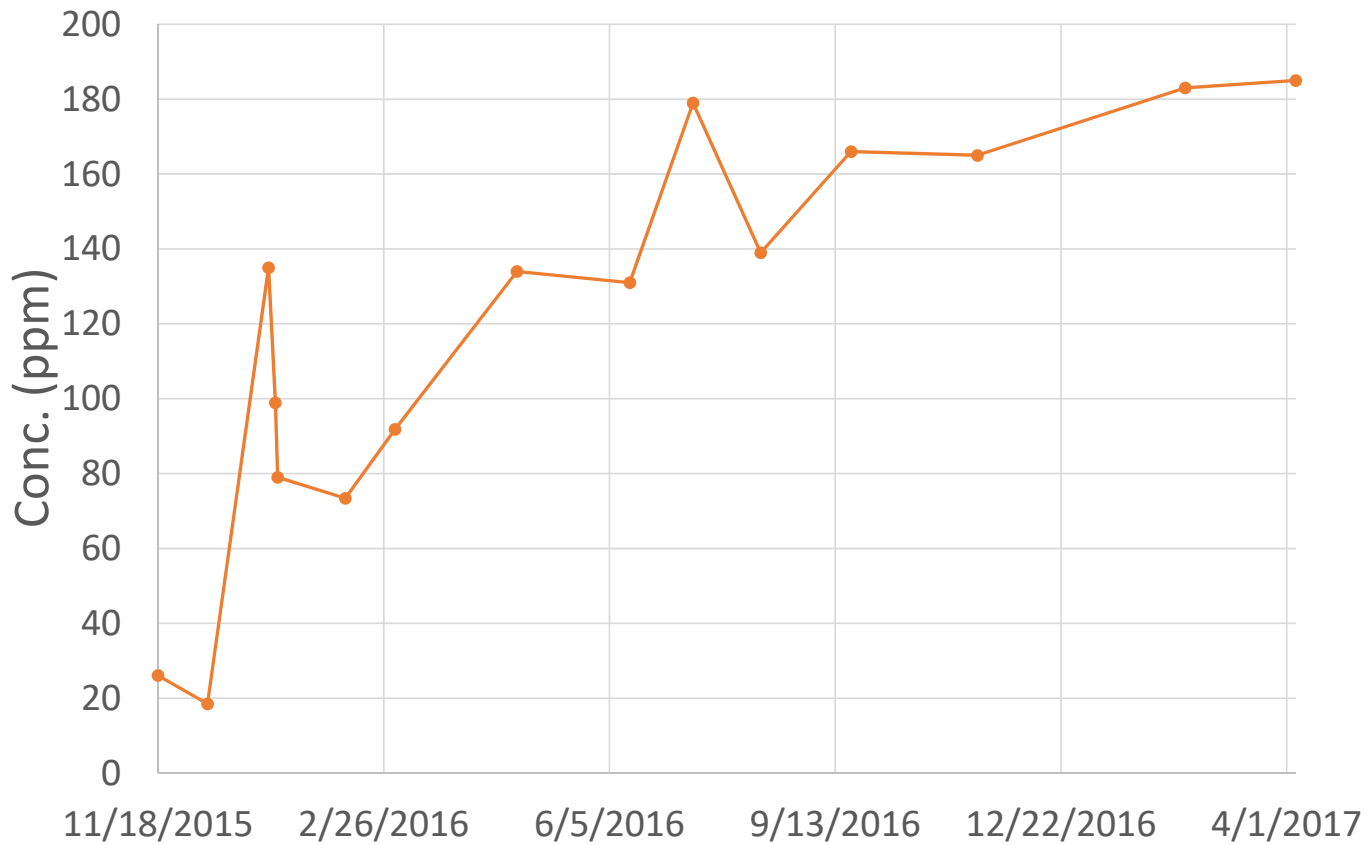
1/22/19 Results (ug/l)
 PCE – ND
 TCE – ND
 cis-DCE – 209
 VC – 984

 Ethylene – 724
 Ethane - 41

MW-71 Molar Trends



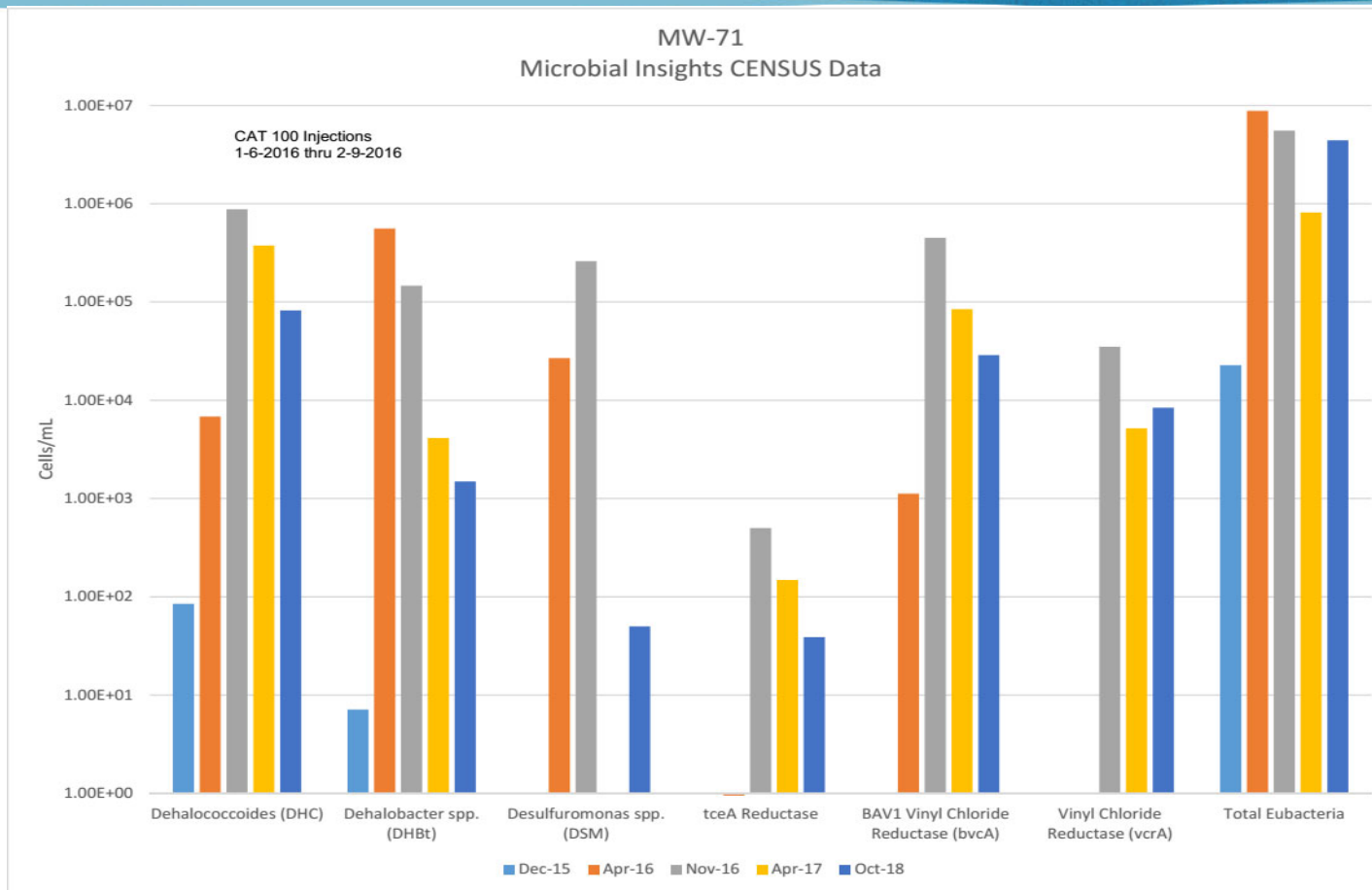
MW-71 Chloride



Chloride Concentration (mg/L)

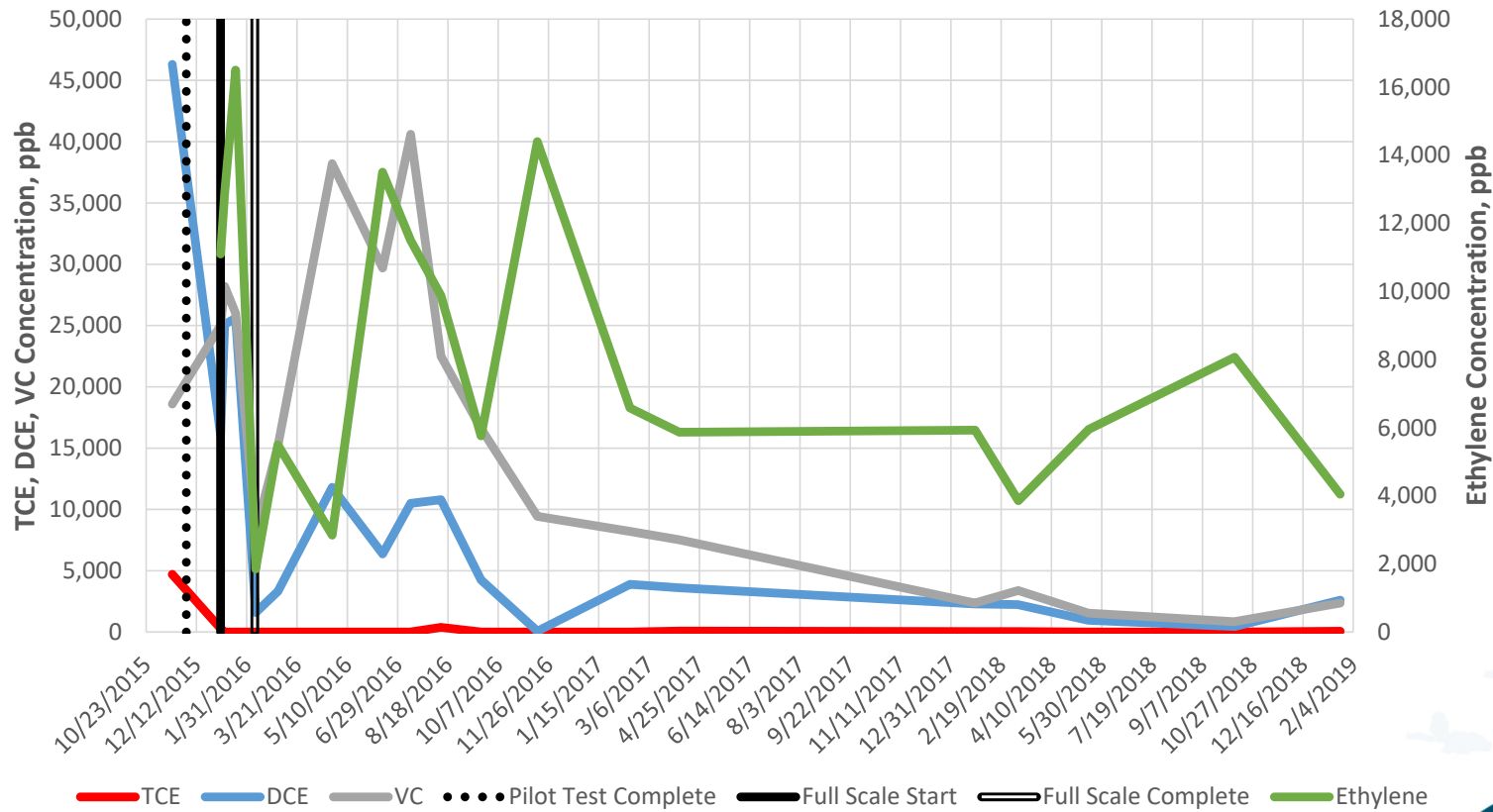
- 1/2018 – 210
- 3/2018 – 249
- 5/2018 - 234
- 10/2018 - 240
- 1/2019 - 198

MW-71 Biological Signature



MW-63 VOC Trends

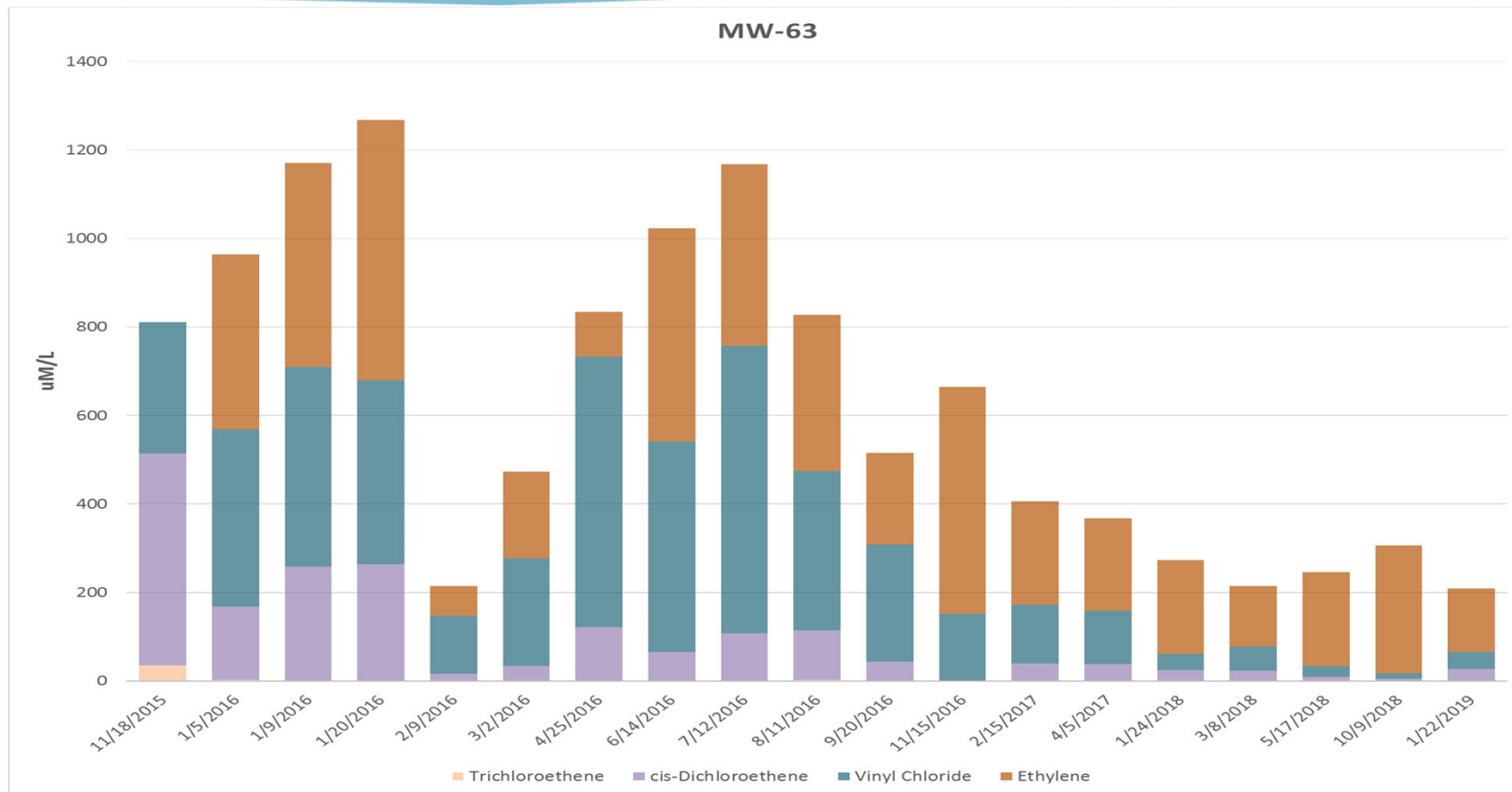
MW-63



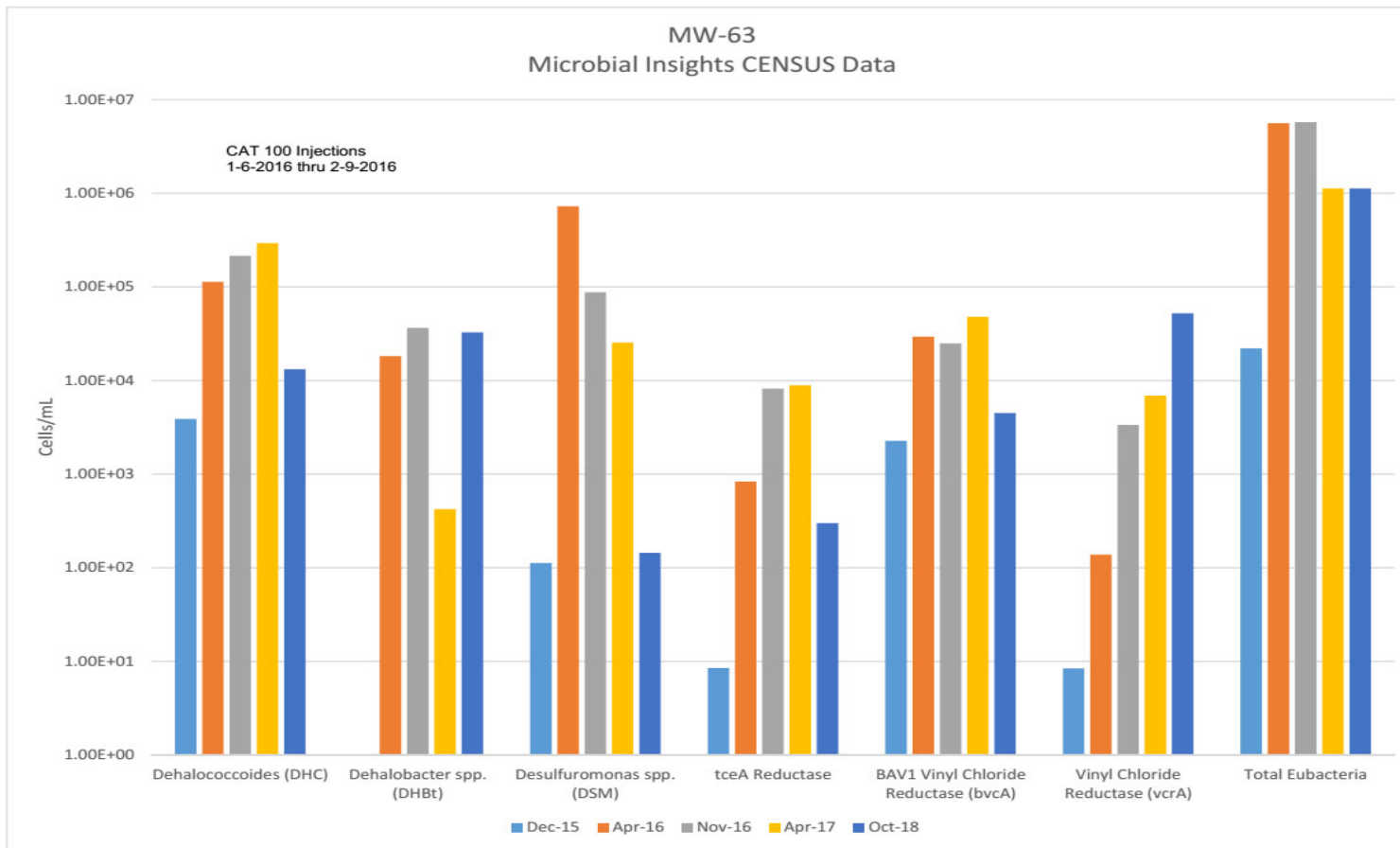
1/22/19 Results (ug/l)
 PCE – 163
 TCE – 67
 cis-DCE – 2,590
 VC – 2,370

 Ethylene – 4,050
 Ethane - 113

MW-63 Molar Trends



MW-63 Biological Signature

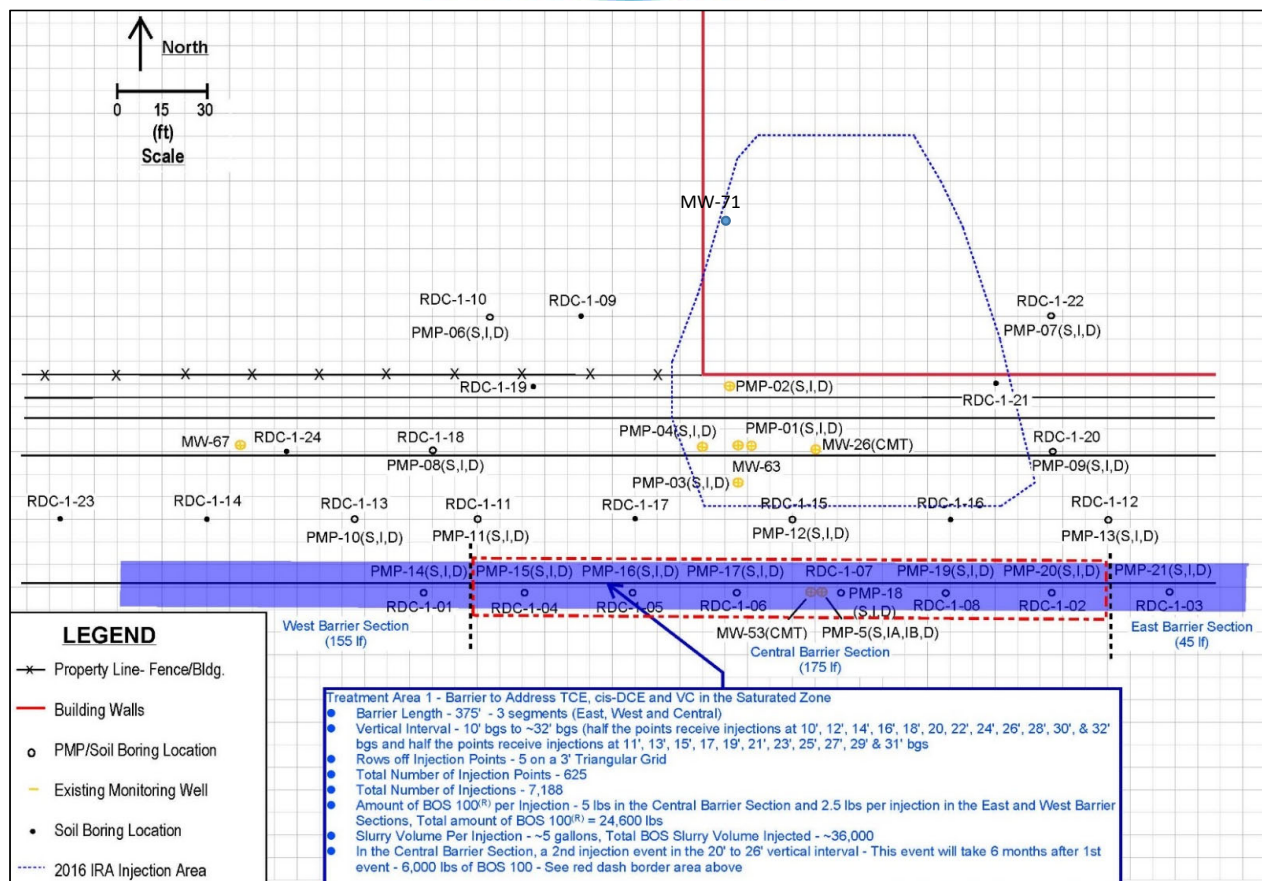




IRM Success Leads to Downgradient PRB

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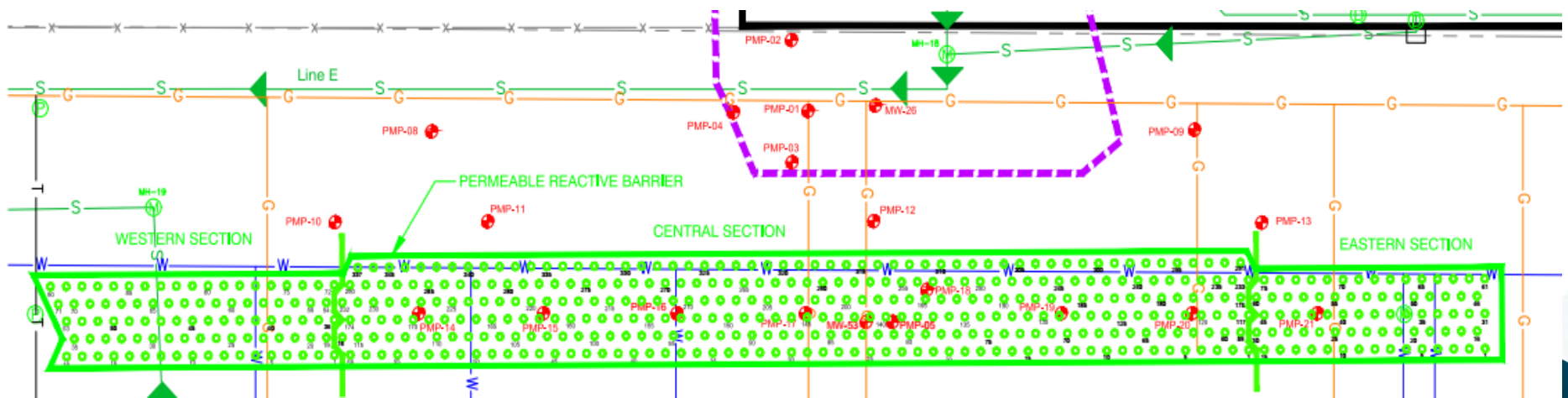
RDC – Downgradient PRB 2017



- 22 Soil Borings
- 3 discrete interval micro wells per boring location plus MW-53, MW-67 and MW-26 and MW-63
- RDC Results
 - Length of PRB increased by 40%
 - Vertical intervals adjusted
 - Second round of injections needed in core area

Implementation – Downgradient PRB (2018)

- 375' long PRB with 5 rows of injection points on 3' triangular grid injection the BOS 100® slurries installed using a top down approach thru direct push rods.
- Center 175' section required two injection event due to contaminant mass present



5/1/2019



Thank you.

Questions?

