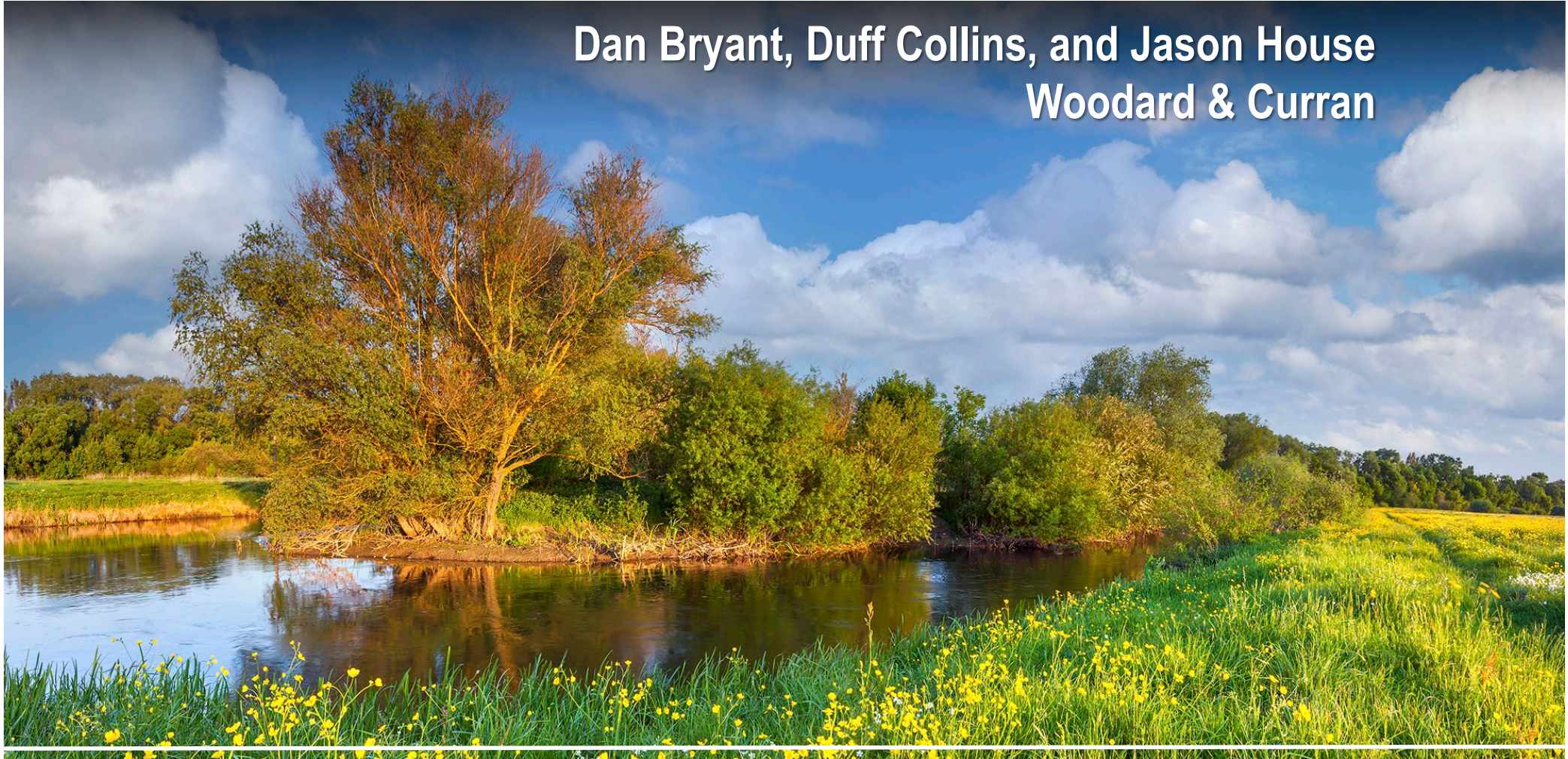


Leveraging Warm Water from Source Area Thermal Remedy for Synergistic Biotic and Abiotic Degradation of a CVOC Plume

Dan Bryant, Duff Collins, and Jason House
Woodard & Curran



Overview

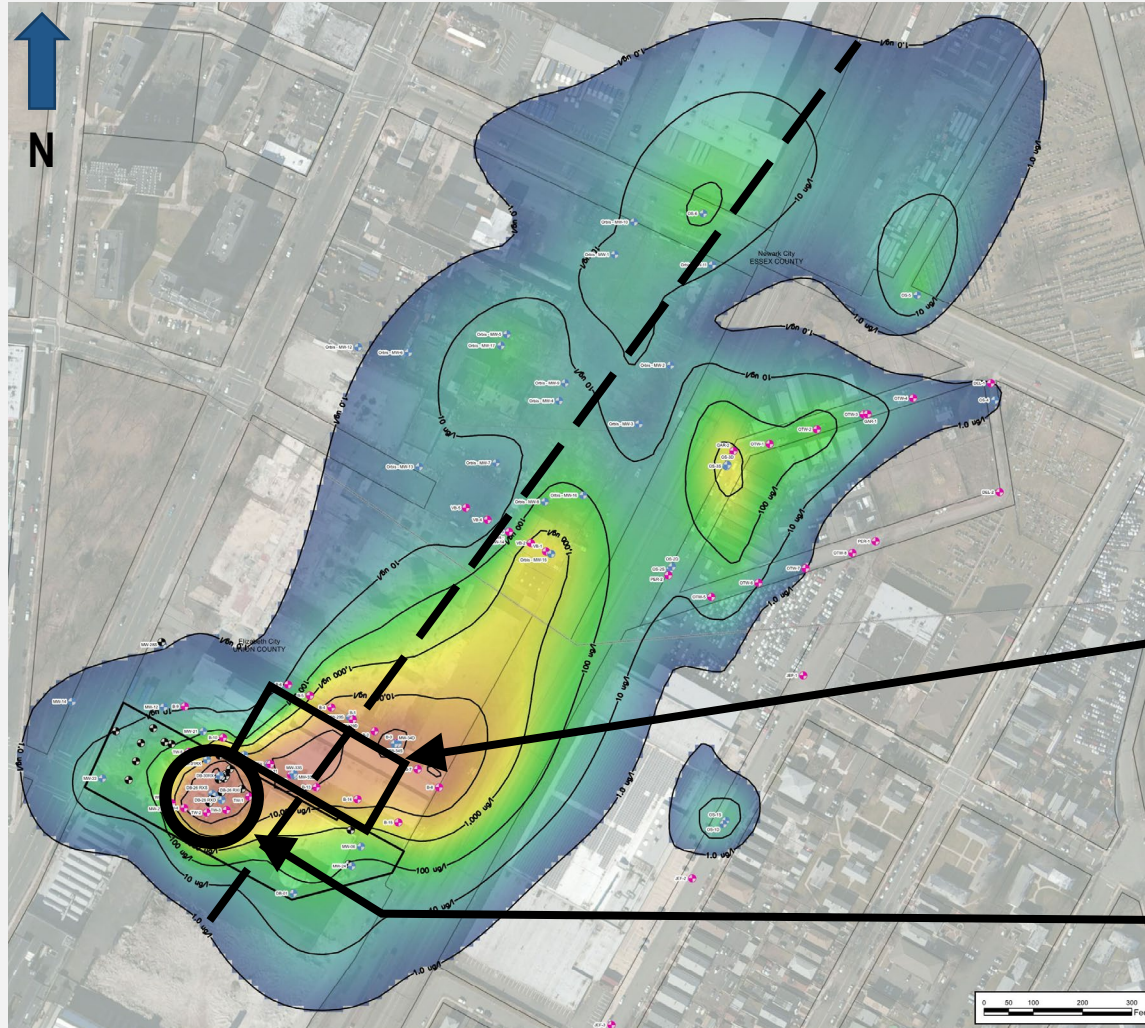
Background and Approach

- Thermal remedy in DNAPL source area
- Downgradient plume extends ~1,600 feet
- Leverage warm water for enhanced bioremediation
- Provect-IR – biotic and abiotic reaction mechanisms

Results

- Water temperatures have increased 3-22°C
- 10x to >100x reduction in plume VOC concentrations
- One well cluster with insufficient reagent

Site and Background

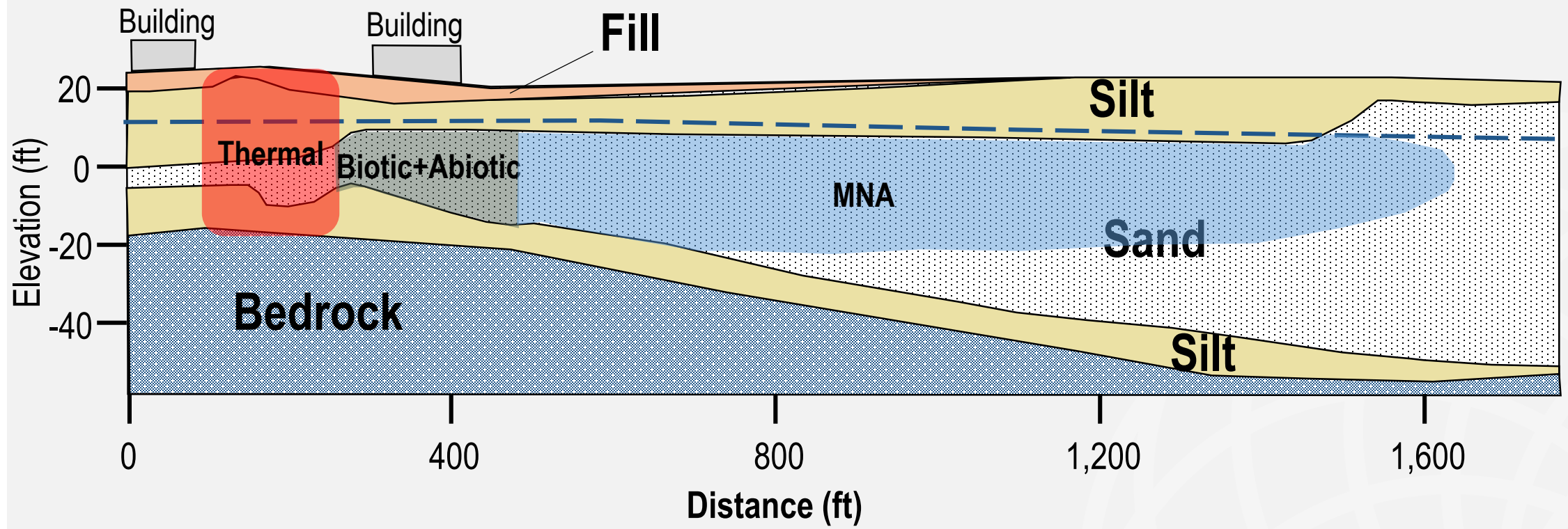


NJ - Urban / Industrial Area
Chlorinated Solvents (TCE, etc.)
~1,600-ft Dissolved Plume

Proximal Plume Area
(Biotic/Abiotic Remedy)

DNAPL Source Area
(Thermal Remedy)

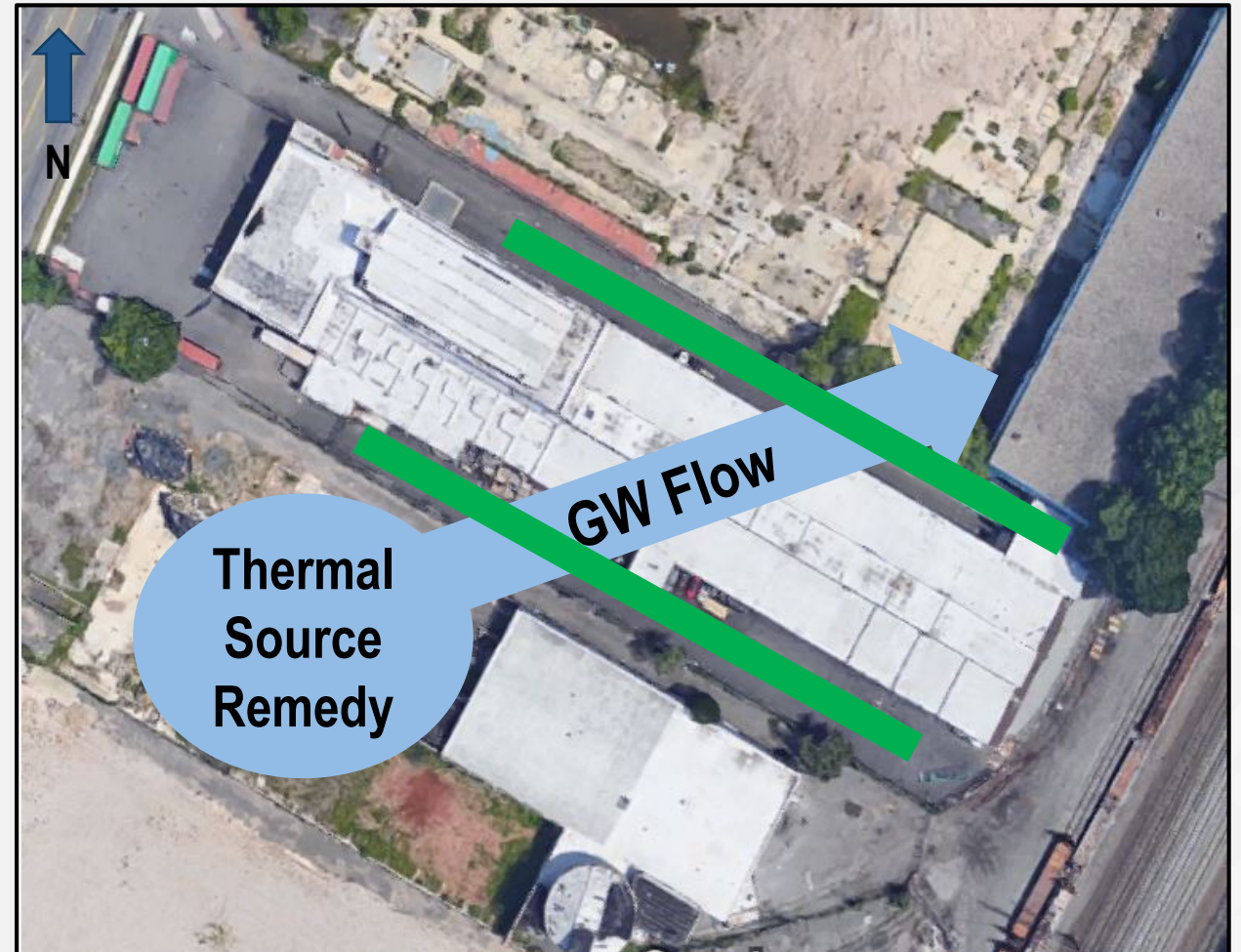
Site and Background



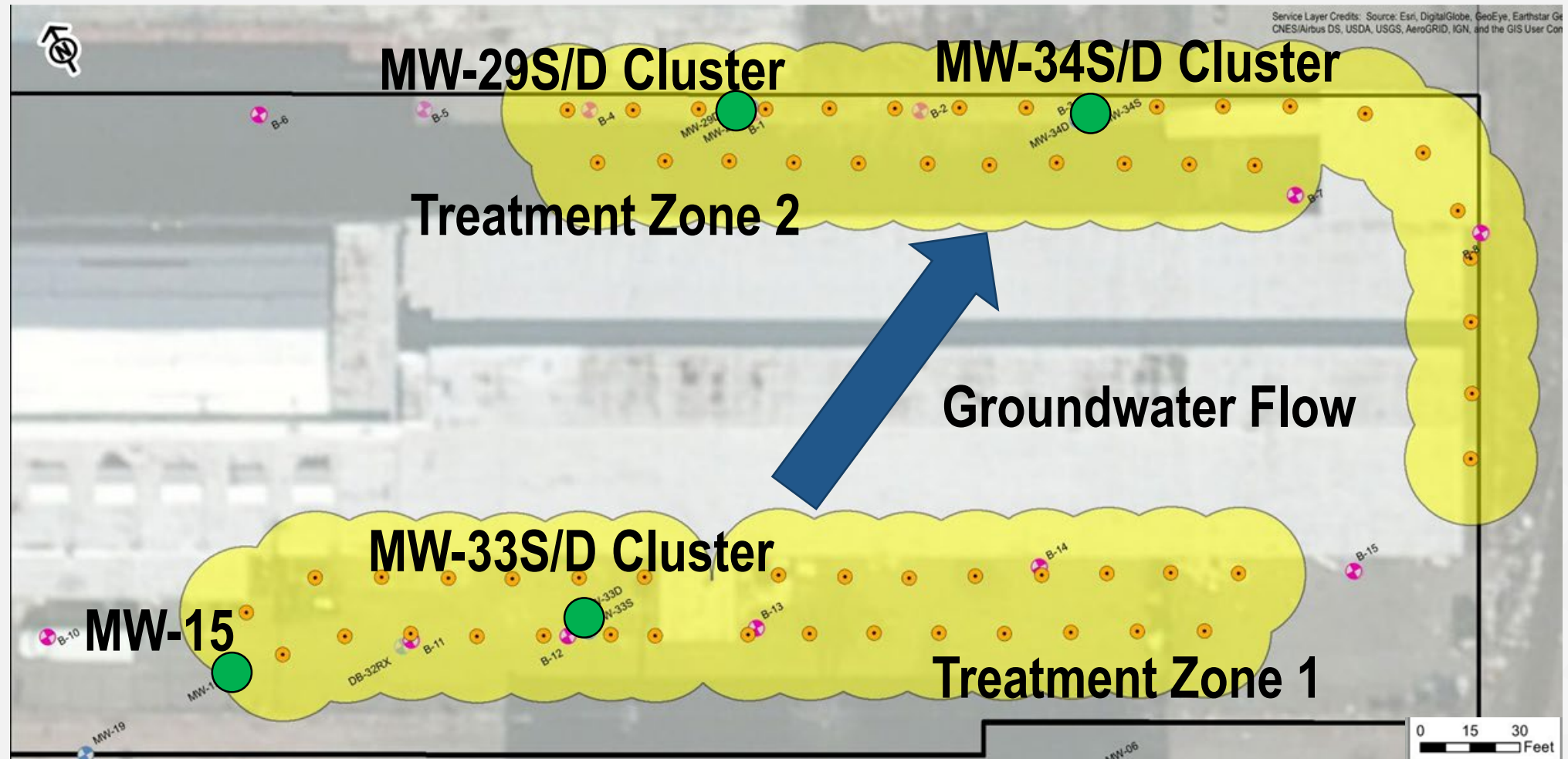
Thermal Remedy Effects

- Warm water transport downgradient increases:
 - VOC desorption
 - Organic carbon release
 - Microbial activity
 - Abiotic degradation rates

➡ *Leverage these effects to enhance degradation in proximal plume area*



Injection Layout



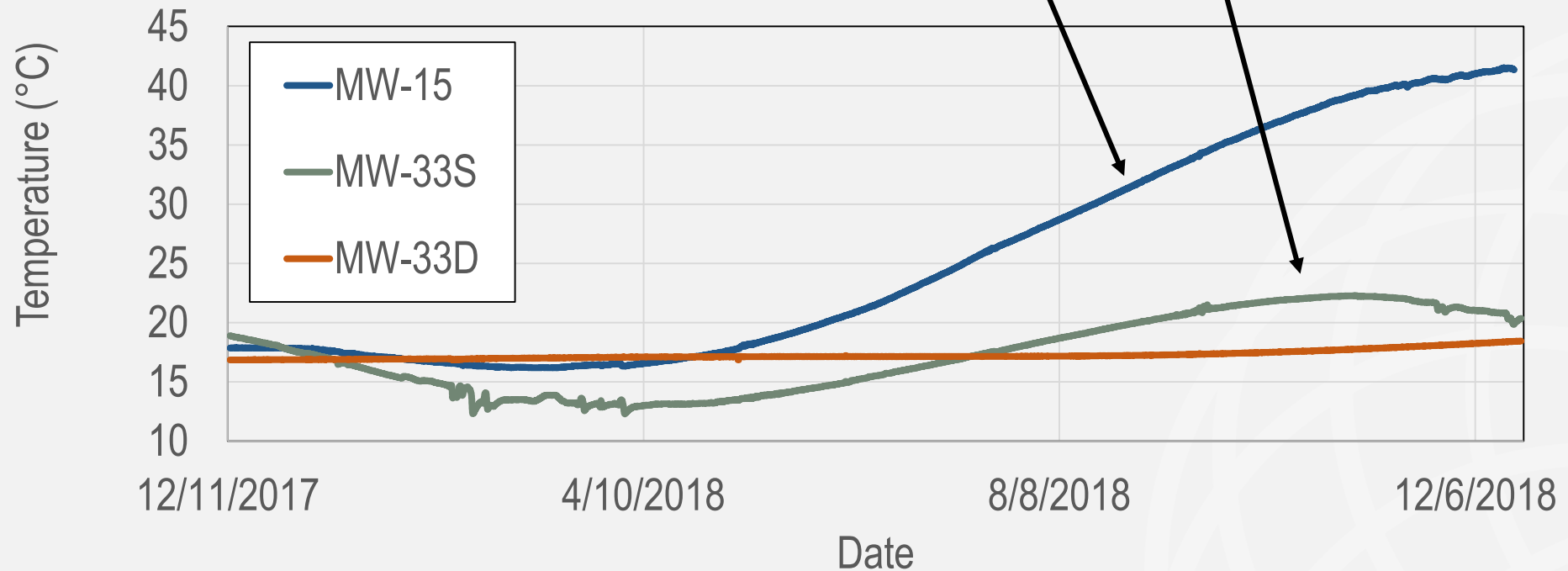
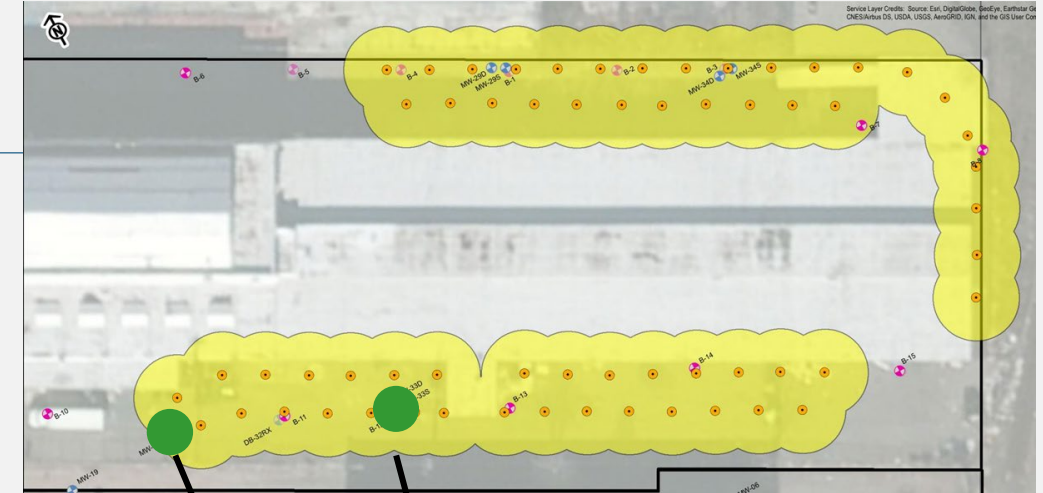
Injection Details

- Targeted transmissive sand zone, 14-57 ft below grade
- Direct-push injection
- 30% solids slurry
- 148,500 lbs Provect-IR
- 325 injection intervals
- 57 borings



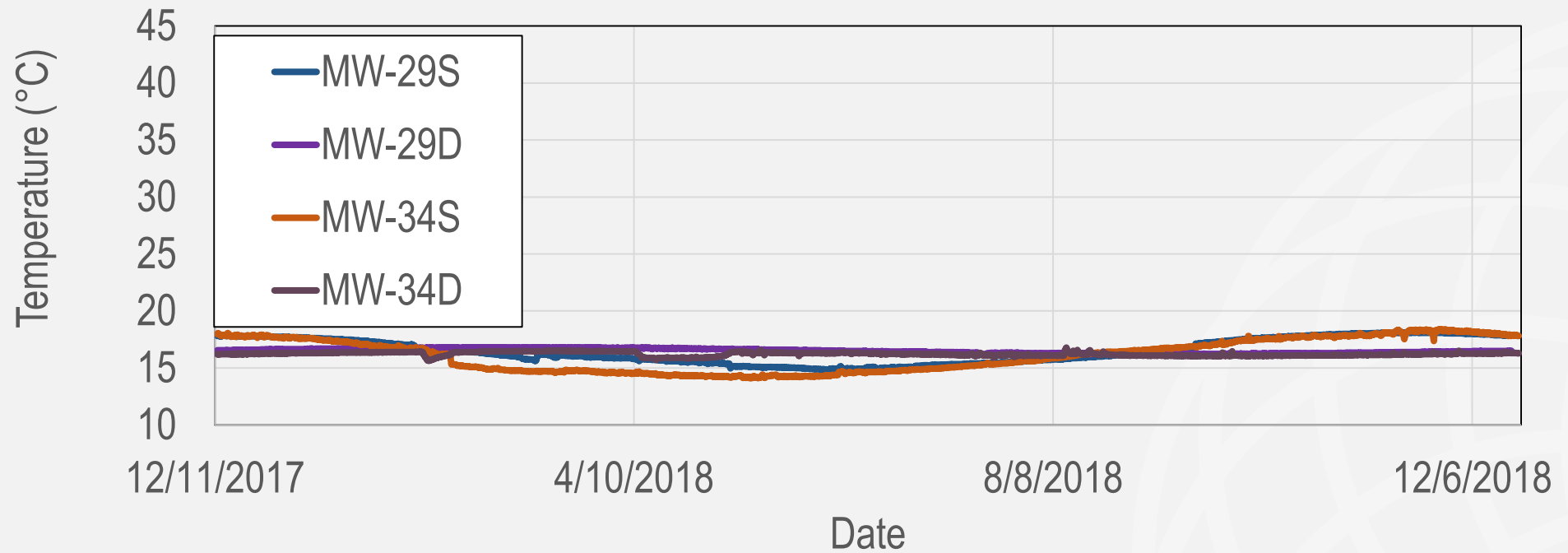
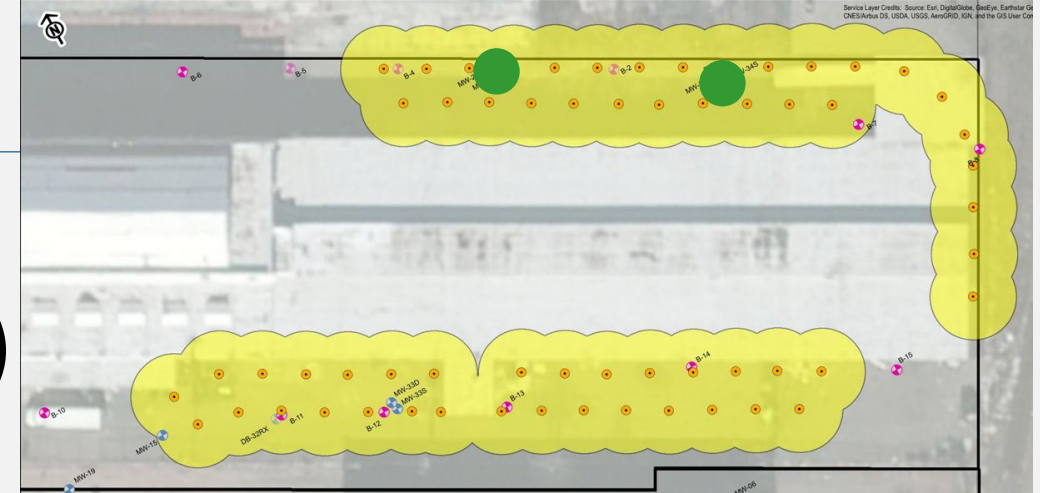
Temperature Results

Treatment Zone 1 (Upgradient)



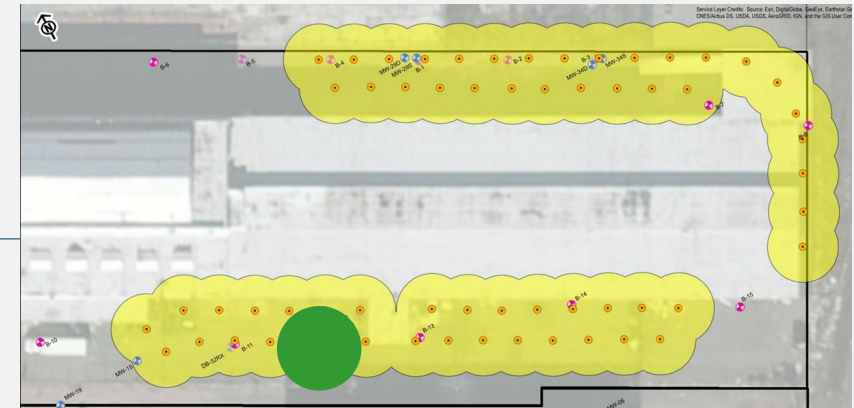
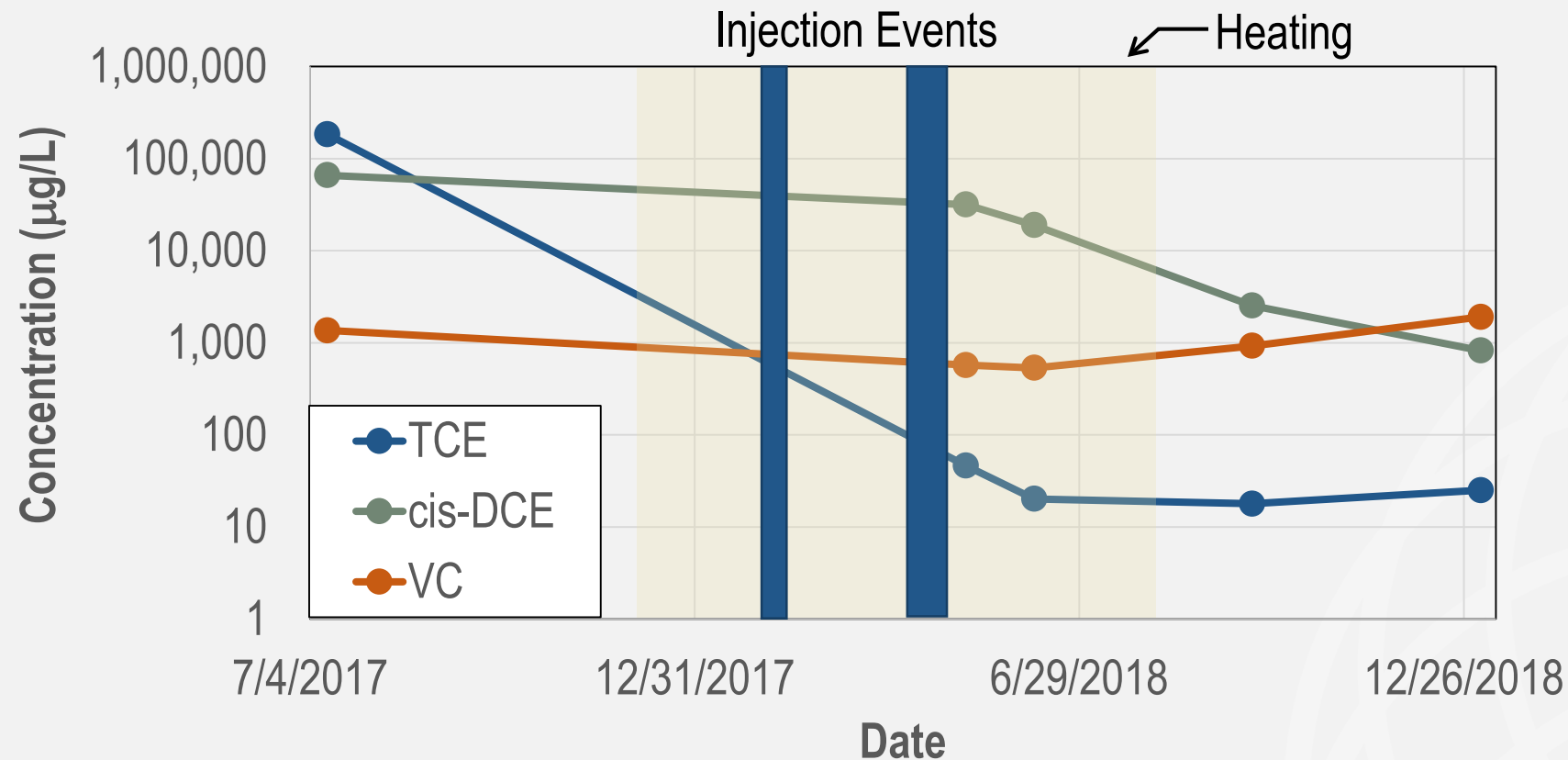
Temperature Results

Treatment Zone 2 (Downgradient)



VOC Results – Treat Zone 1

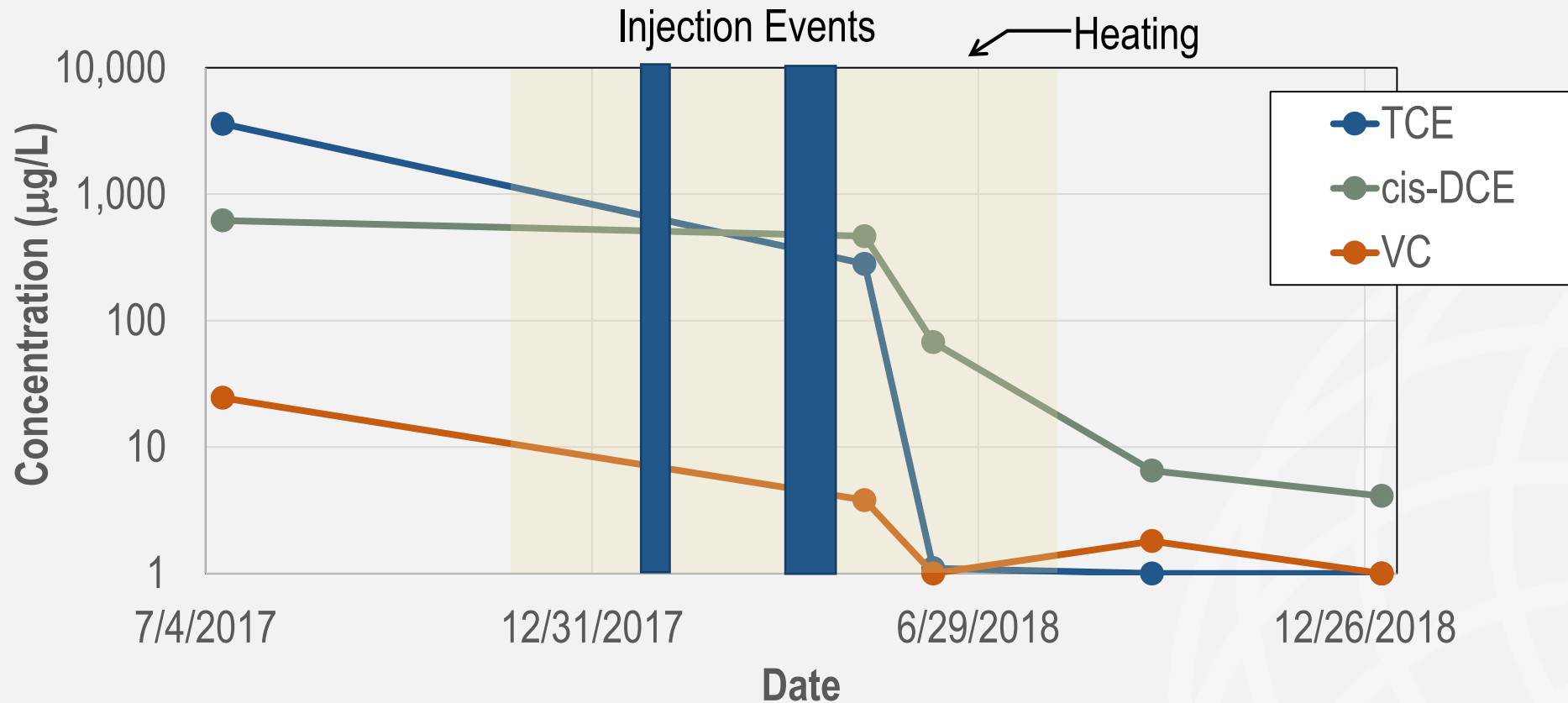
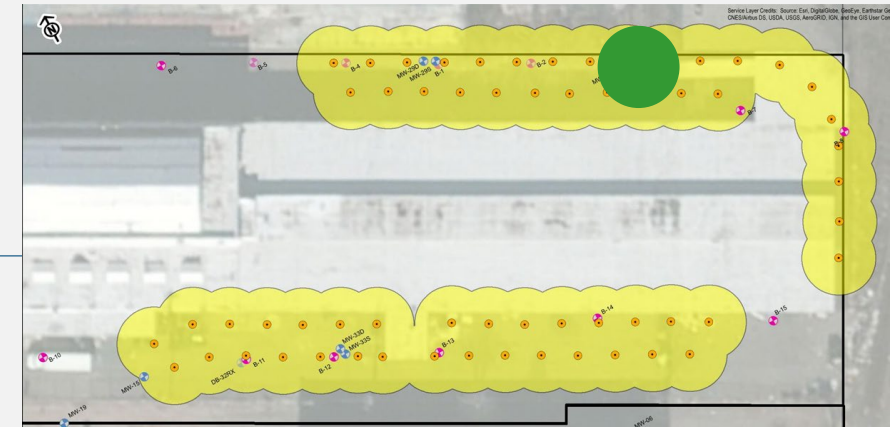
MW-33D



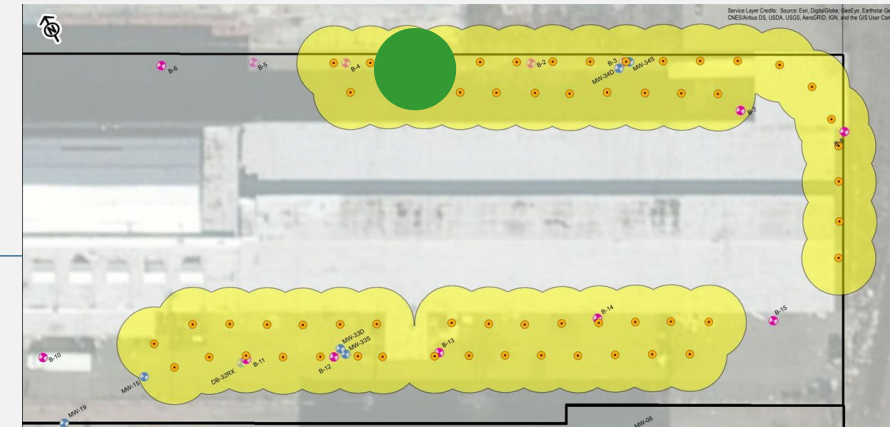
MW-33S
and MW-15
historically
<100 µg/L

VOC Results – Treat Zone 2

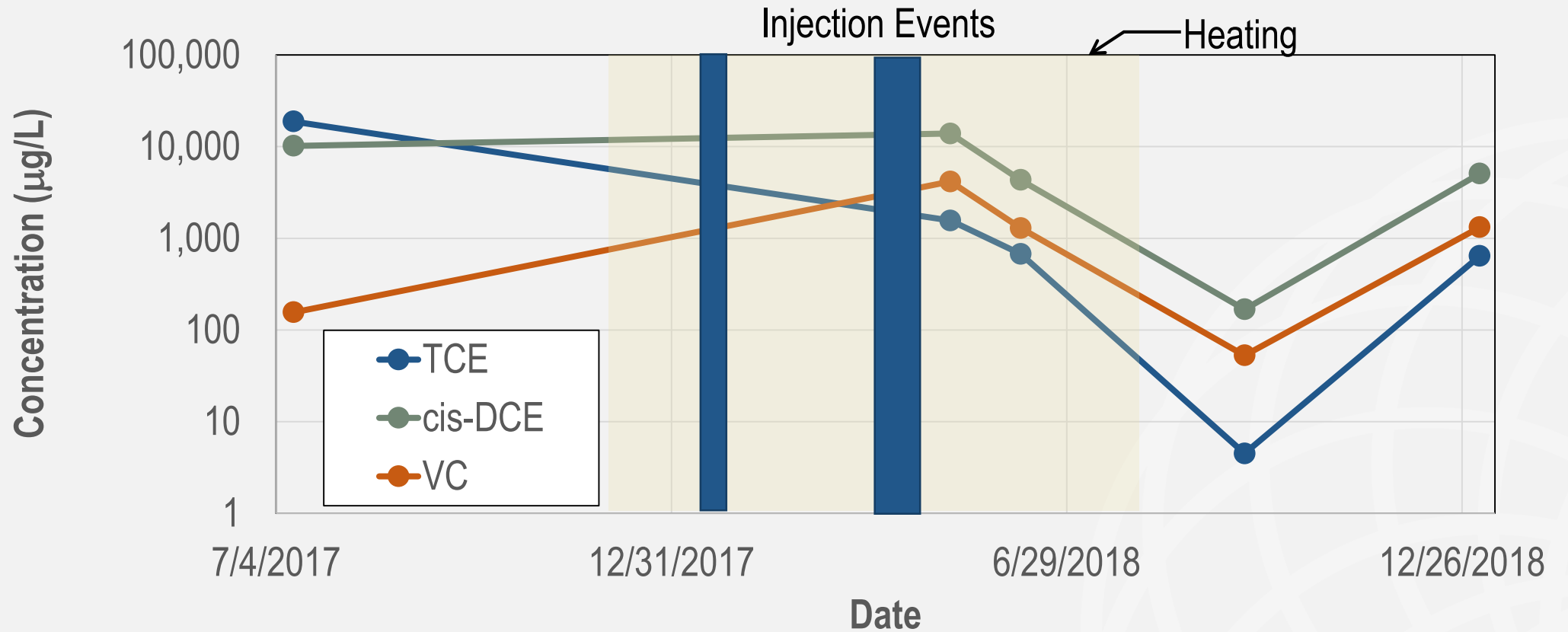
MW-34D



VOC Results – Treat Zone 2

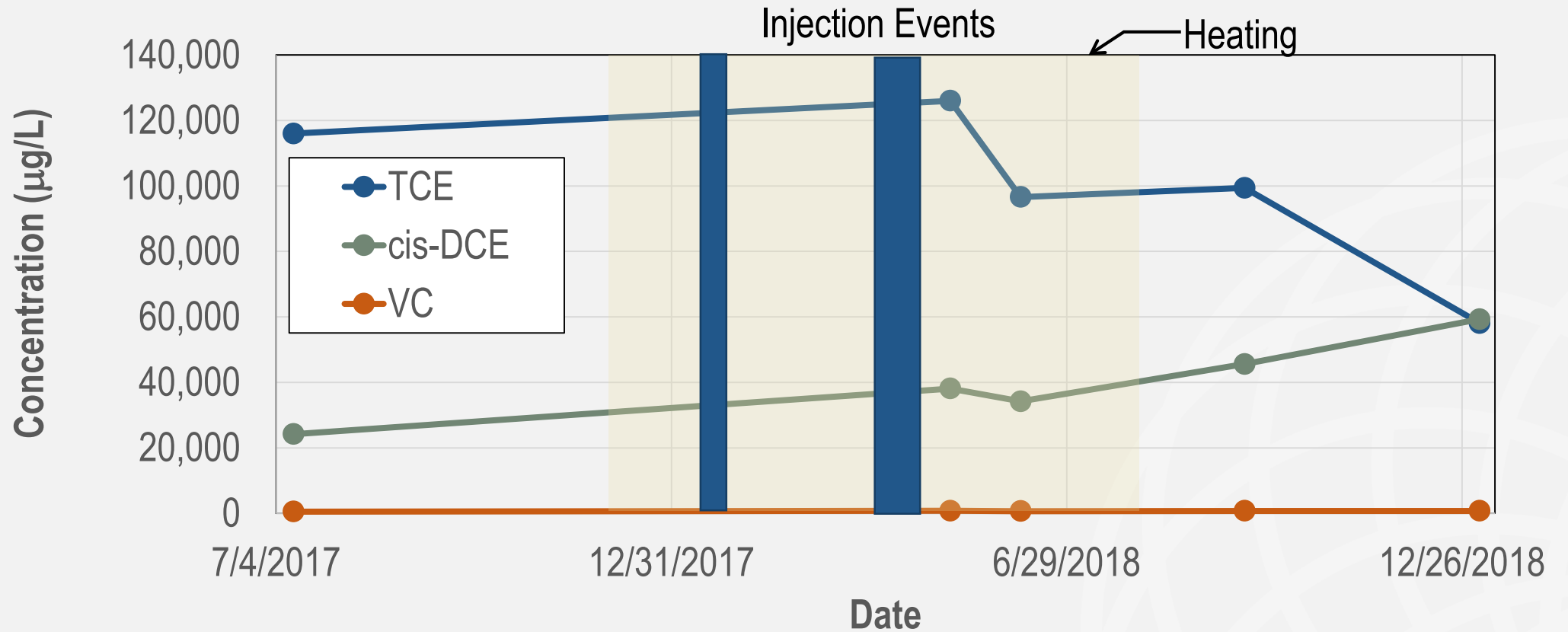
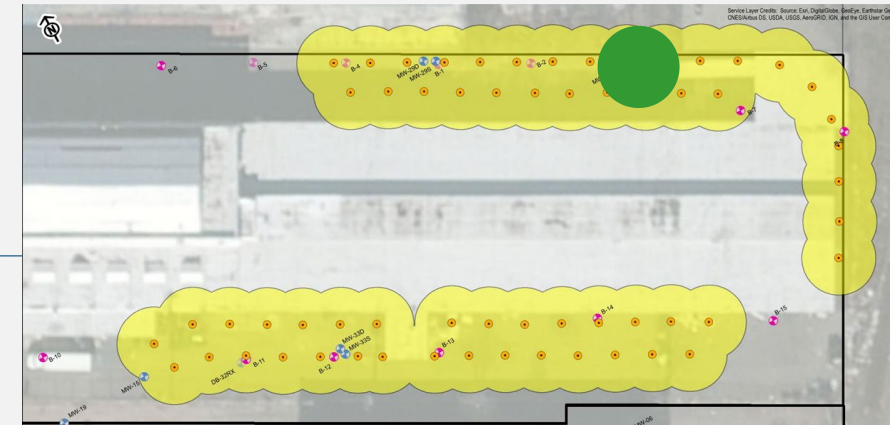


MW-29D



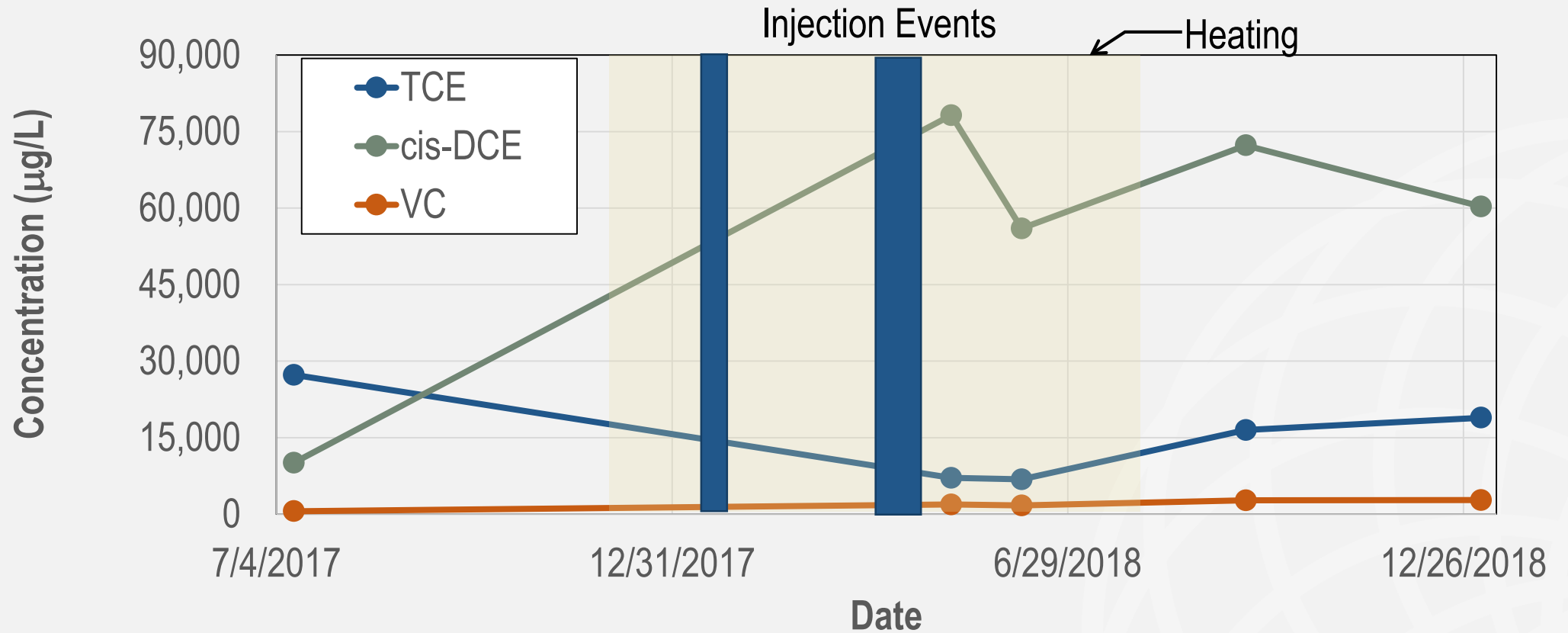
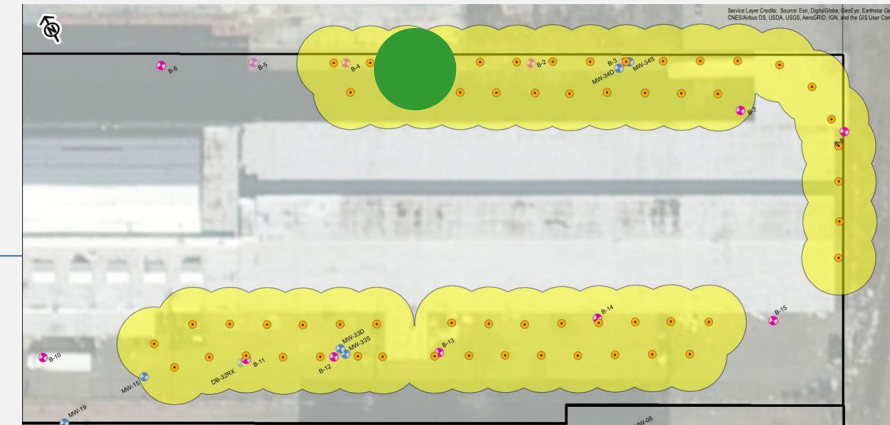
VOC Results – Treat Zone 2

MW-34S



VOC Results – Treat Zone 2

MW-29S



Wrap Up

- Leveraged warm water downgradient from thermal treatment area
- Utilized Provect-IR, combined biotic and abiotic treatment reagent
- Direct-push injection in two permeable reactive zones
- Temperature increases observed but less than expected
- One well cluster likely has insufficient reagent
 - TCE decrease 50%, cDCE increase 3x
- 10x to 100x reductions in other wells
- Continuing to evaluate semi-annually

Thank You!

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