2ND QUARTER PROGRESS REPORT

RACER Trust Plants 2, 3 & 6, Lansing, Michigan

July 15, 2019

Agenda

- Biosparge Update
- Plant 3 PFAS Investigation
- LNAPL Conceptual Site Model
  - LNAPL Decision Framework
  - LNAPL PFAS Evaluation
  - NSZD
  - Corrective Actions
- Plant 3 Storm Sewers
  - Review of 2018 work
  - Follow up monitoring
  - Proposed next steps
  - Performance monitoring and contingency
- Plant 2 Storm Sewers
  - Identify → Rank → Address
  - Plant 2 storm sewer investigation
  - Proposed modifications
  - Performance monitoring and contingency
- Schedule

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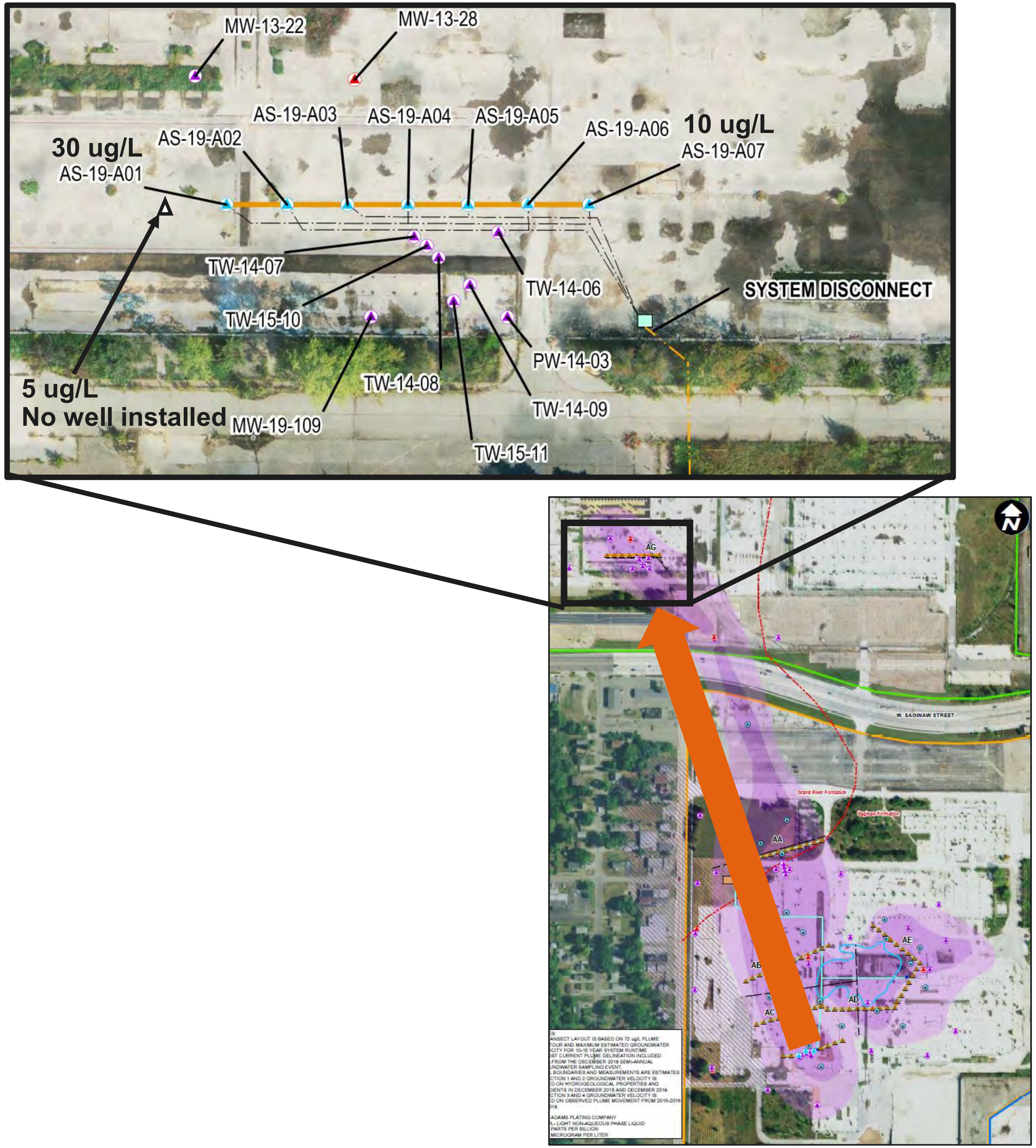
Biosparge Update

Plant 3 System

- Moved pilot system to Plant 3 to begin treatment in former source area
- Leveraged existing equipment and eliminated the need for directional boring beneath Saginaw St.
- Biosparge wells installed in May, sand lenses installed May/June
- Abovegrade hose for conveyance of gases to wells, covered in gravel for protection
- Currently troubleshooting wellhead leakage, once fixed system will start up
- Nutrient injection planned following 2-3 weeks of operation



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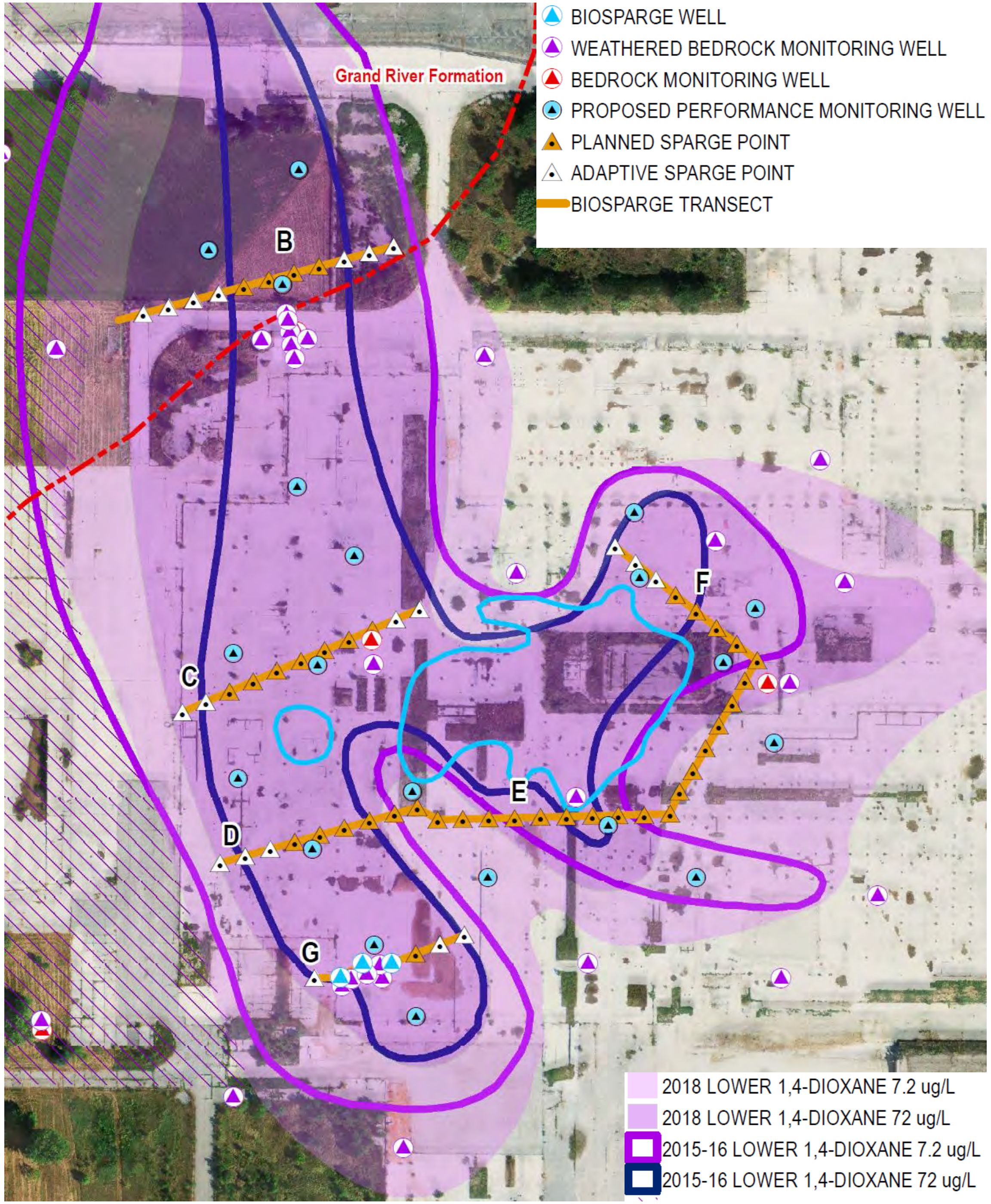
Transects

- Transect widths may change based on updated plume map
- Field sampling will be completed at the ends of the transects to confirm the limits of the plume
- Will install biosparge wells if 1,4-dioxane is ~72 ppb or greater
- Designing the system to handle maximum number of wells shown
- Re-checked the velocity and pore flushing calculations based on 2018 gradients and confirmed transect spacing spacing is still adequate for a 10-15 yr clean up timeframe



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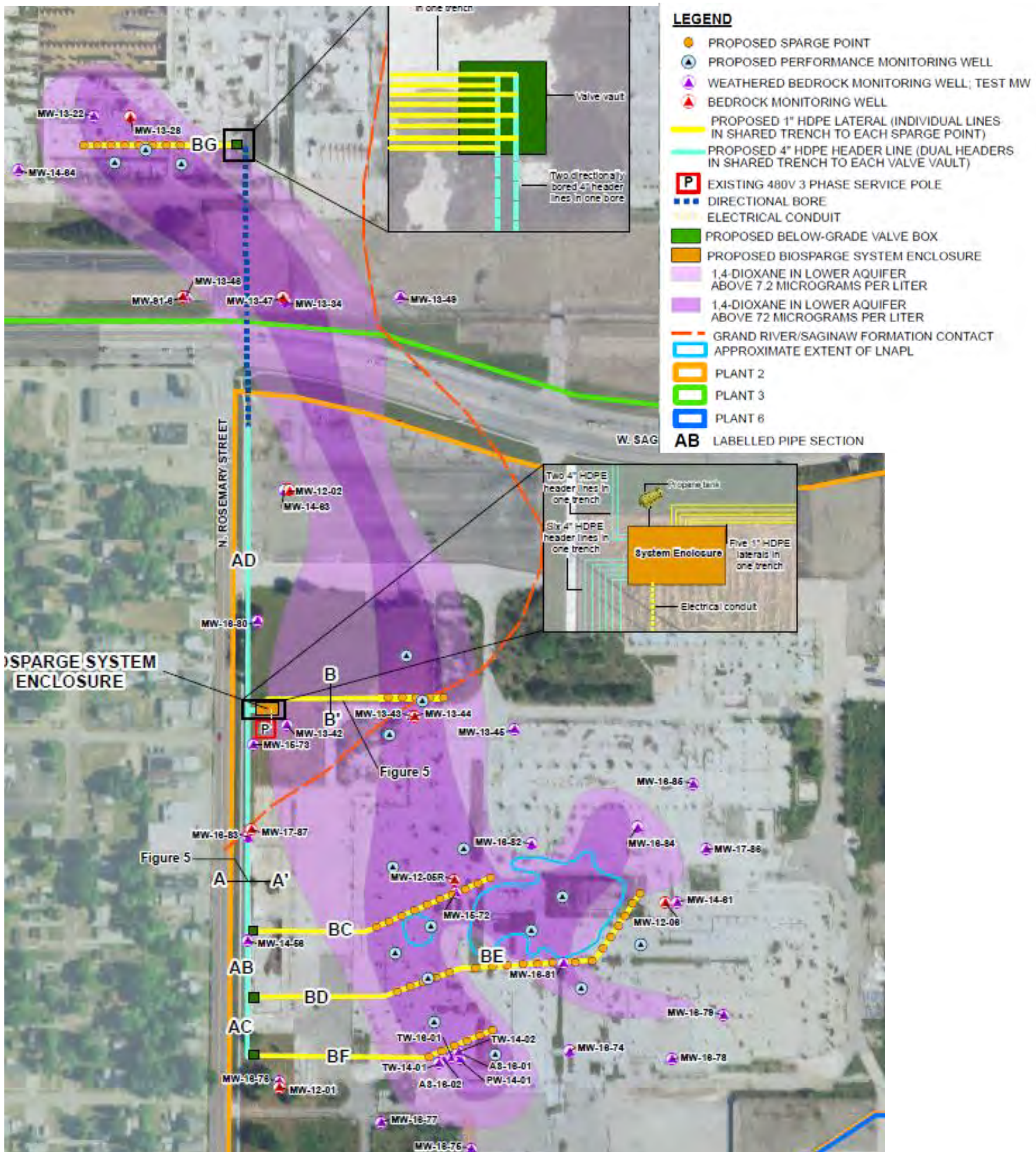
Plant 2 Piping Evaluation

- IM workplan piping design was based on installation to avoid impeding redevelopment to the maximum extent practicable, very conservative
- Moving the existing system allowed for more piping options to be evaluated
- This design is costly and has significant cost uncertainty based on the potential thickness of the slabs and other subgrade infrastructure
- Assessing options that:
  - Are flexible from an operational standpoint
  - Can be adapted to specific redevelopment plans in the future
  - Have higher levels of cost certainty



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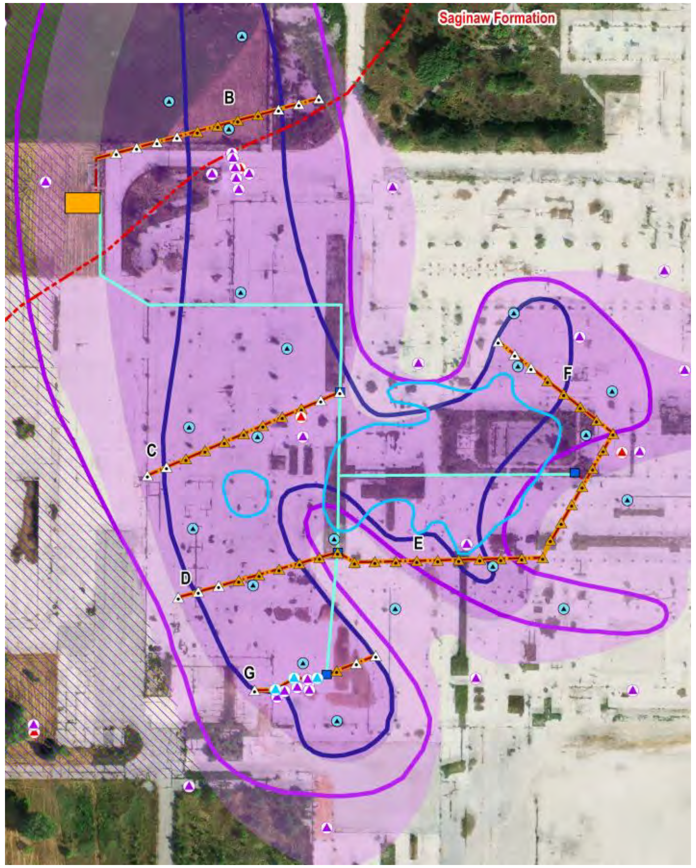
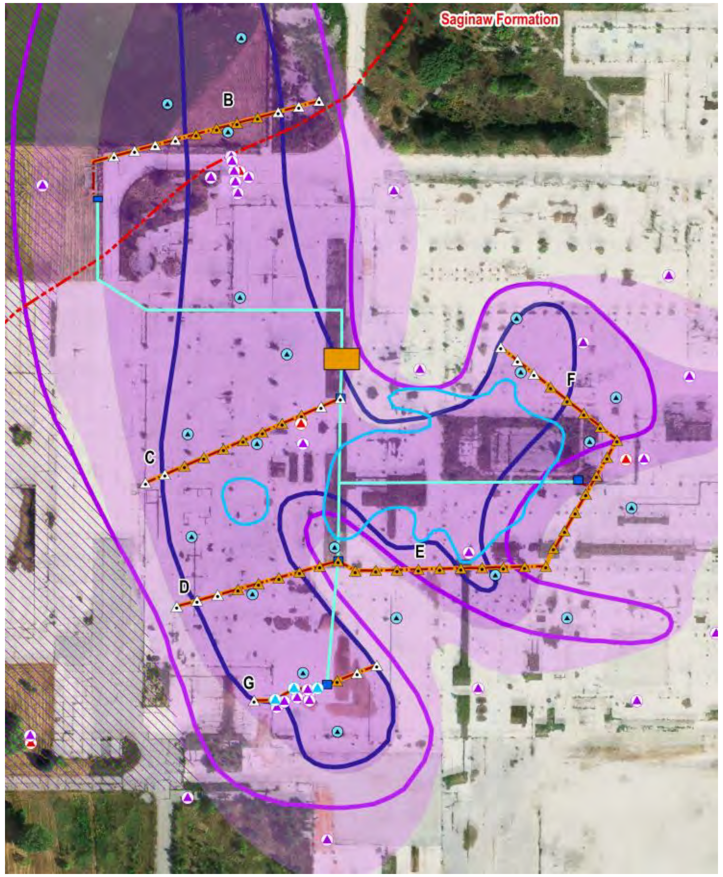
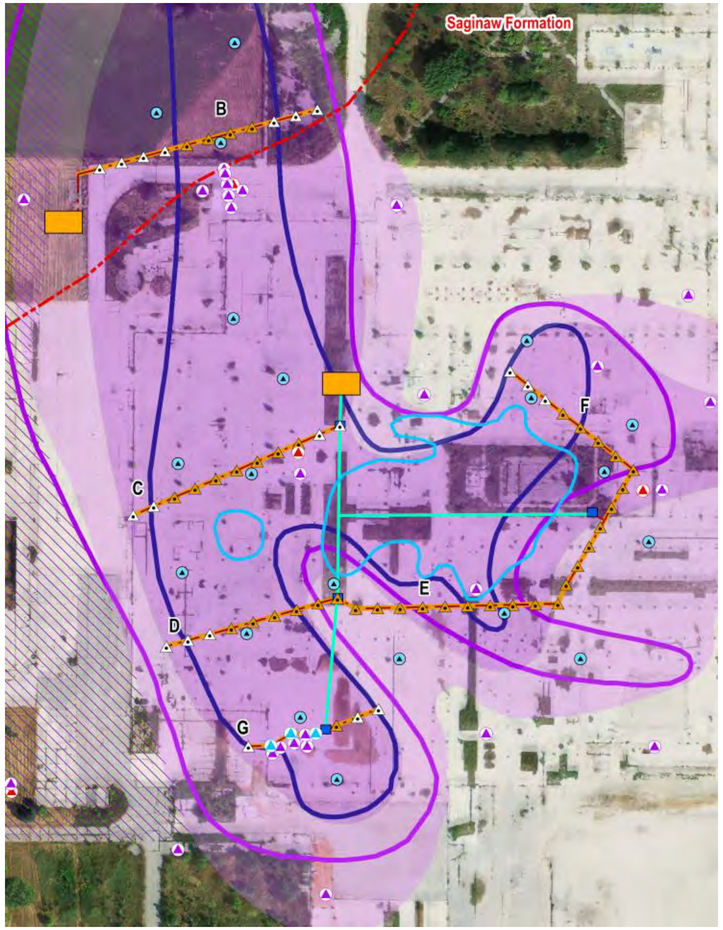
Piping Options



Option 1
- One system near northernmost transect
- Aboveground hose covered with gravel
- Minimizes electrical, more aboveground hose
- Start up Q2 2020



Option 2
- One system centrally located
- Aboveground hose covered with gravel
- Minimizes hose, more electrical
- Start up Q2 2020



Option 3
- Two systems
- Aboveground hose covered with gravel
- Smaller system start up in Q1 2020
- Smaller system will be mobile, flexibility on where to begin early treatment

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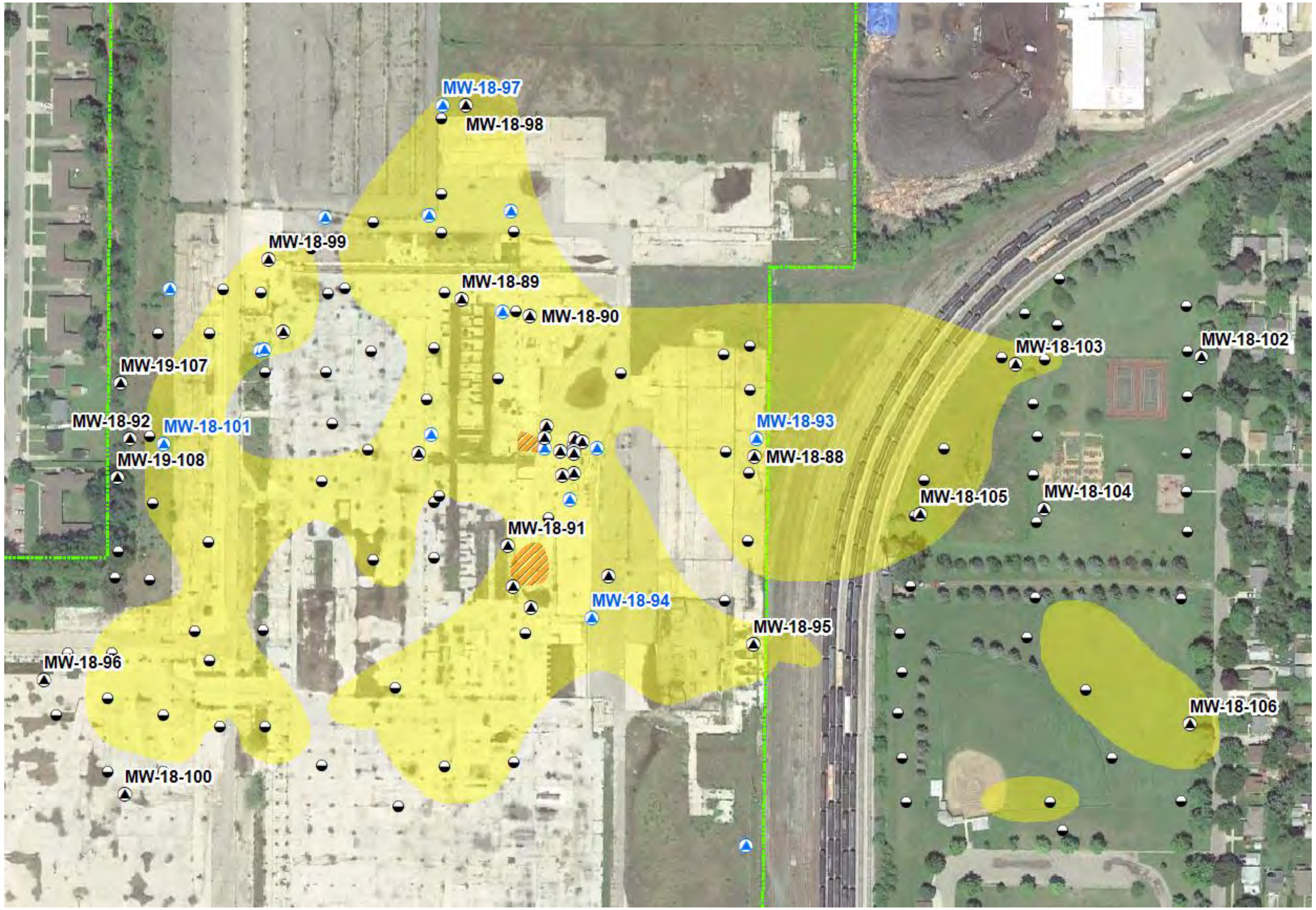
Plant 3 PFAS Investigation

Plant 3 PFAS Well Install

Follow-up installation of 16 PFAS monitoring wells

- 12 perched
- 4 deep overburden



LEGEND

- PERCHED MONITORING WELL
- DEEP OVERBURDEN MONITORING WELL
- SOIL BORINGS / VAP
- PFOS > 12 ng/L

APPROXIMATE PLANT BOUNDARIES

- PLANT 3

Perched Groundwater Flow

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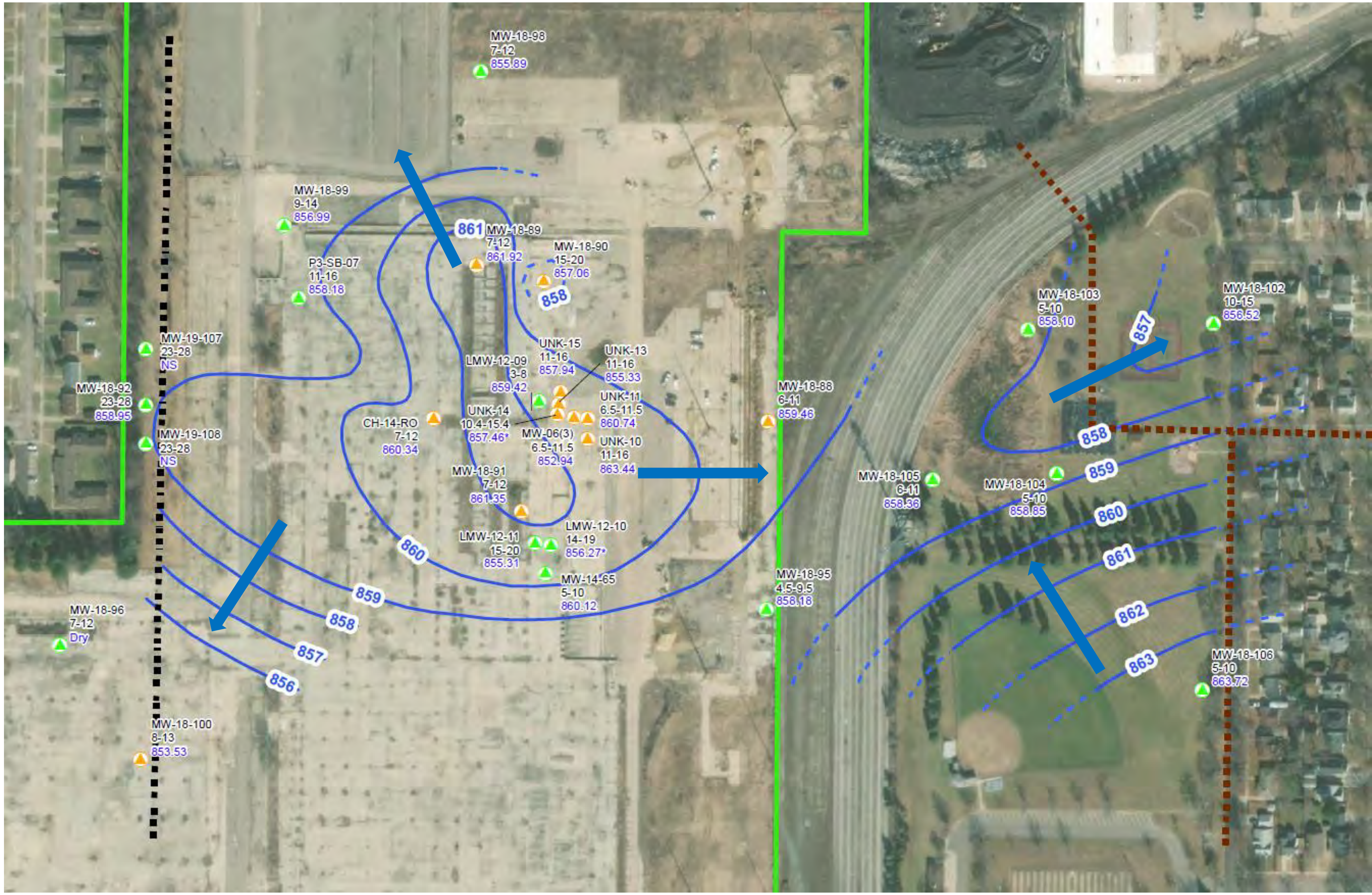
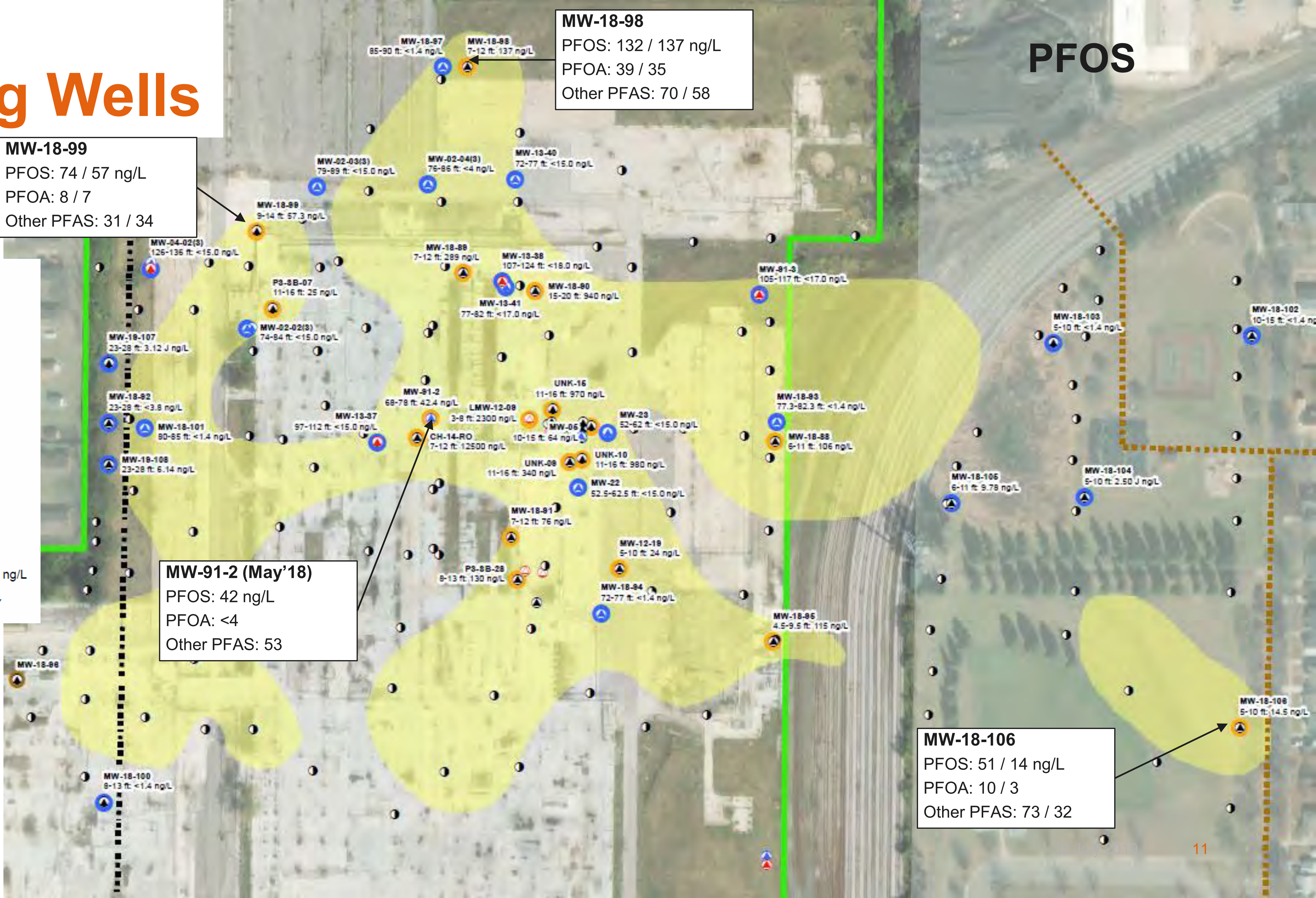
Apparent groundwater flow consistent with plume distribution

- Apparent flow in park appears to be influenced by deep sanitary main
- Apparent flow is northwesterly east of the baseball field



PFOS in Monitoring Wells



MW-18-98
PFOS: 132 / 137 ng/L
PFOA: 39 / 35
Other PFAS: 70 / 58

MW-18-99
PFOS: 74 / 57 ng/L
PFOA: 8 / 7
Other PFAS: 31 / 34

MW-91-2 (May'18)
PFOS: 42 ng/L
PFOA: <4
Other PFAS: 53

MW-18-106
PFOS: 51 / 14 ng/L
PFOA: 10 / 3
Other PFAS: 73 / 32

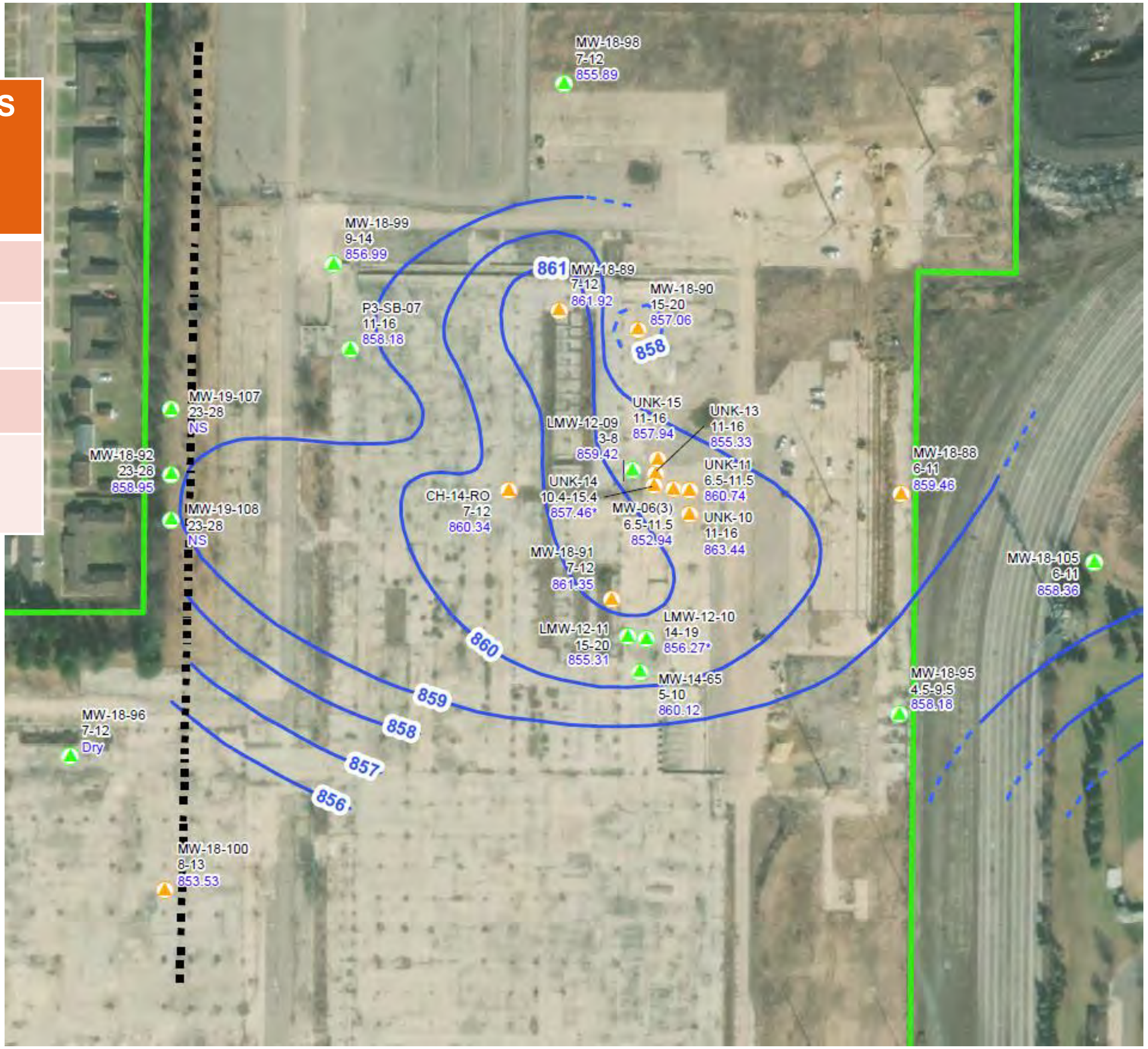
LEGEND

- BEDROCK WELL
- DEEP OVERBURDEN WELL
- VAP BORING LOCATION
- MONITORING WELL
- NAPL MONITORING WELL
- PFOS < 12 ng/L
- PFOS > 12 ng/L
- DRY VAP LOCATION
- MUNICIPAL SANITARY
- PFOS IN GROUNDWATER ABOVE 12 ng/L
- APPROXIMATE PLANT 3 BOUNDARY

Plant 3 Horizontal Migration

Direction	Gradient	K (Mean/Max) (ft/day)	Seepage Velocity (Silt/Sand) (ft/year)	Average PFAS Migration (ft/year)
East	0.004	5 to 20	50 to 200	25 to 100
West	0.003	0.1 to 3	1 to 20	0.5 to 10
North	0.017	0.1 to 3	4 to 120	2 to 60
South West	0.008	0.1 to 3	2 to 60	1 to 30

- Range of K based on monitoring well slug test data
  - 5-20 ft/day - mean/max of fill material and thicker sand seams
  - 0.1-3 ft/day - mean/max of silt/thin silt-sand seams
- Seepage velocity = Ki/n, n=0.15
- PFAS migration based on average for detected compounds, includes
  - K_{oc} for each compound
  - f_{oc} based on site specific results = 0.0013 kg/kg

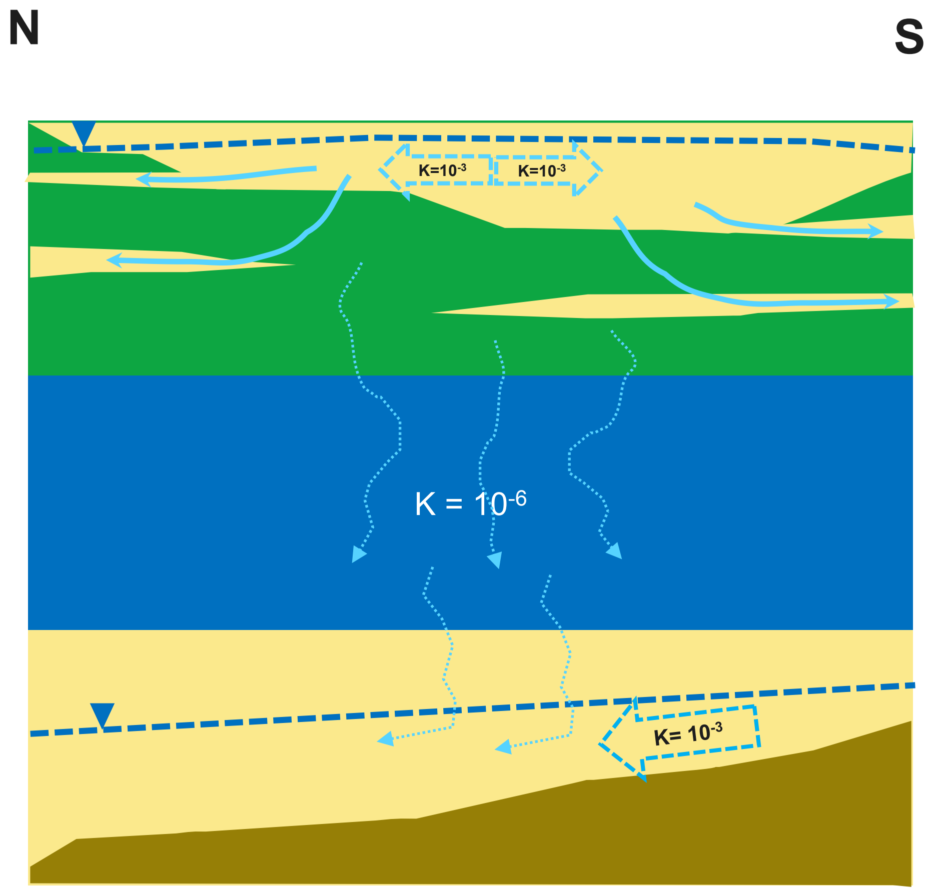


Plant 3 Vertical Migration

Low-level PFOS (up to 42 ng/L) at MW-91-2 in the middle of the source area:

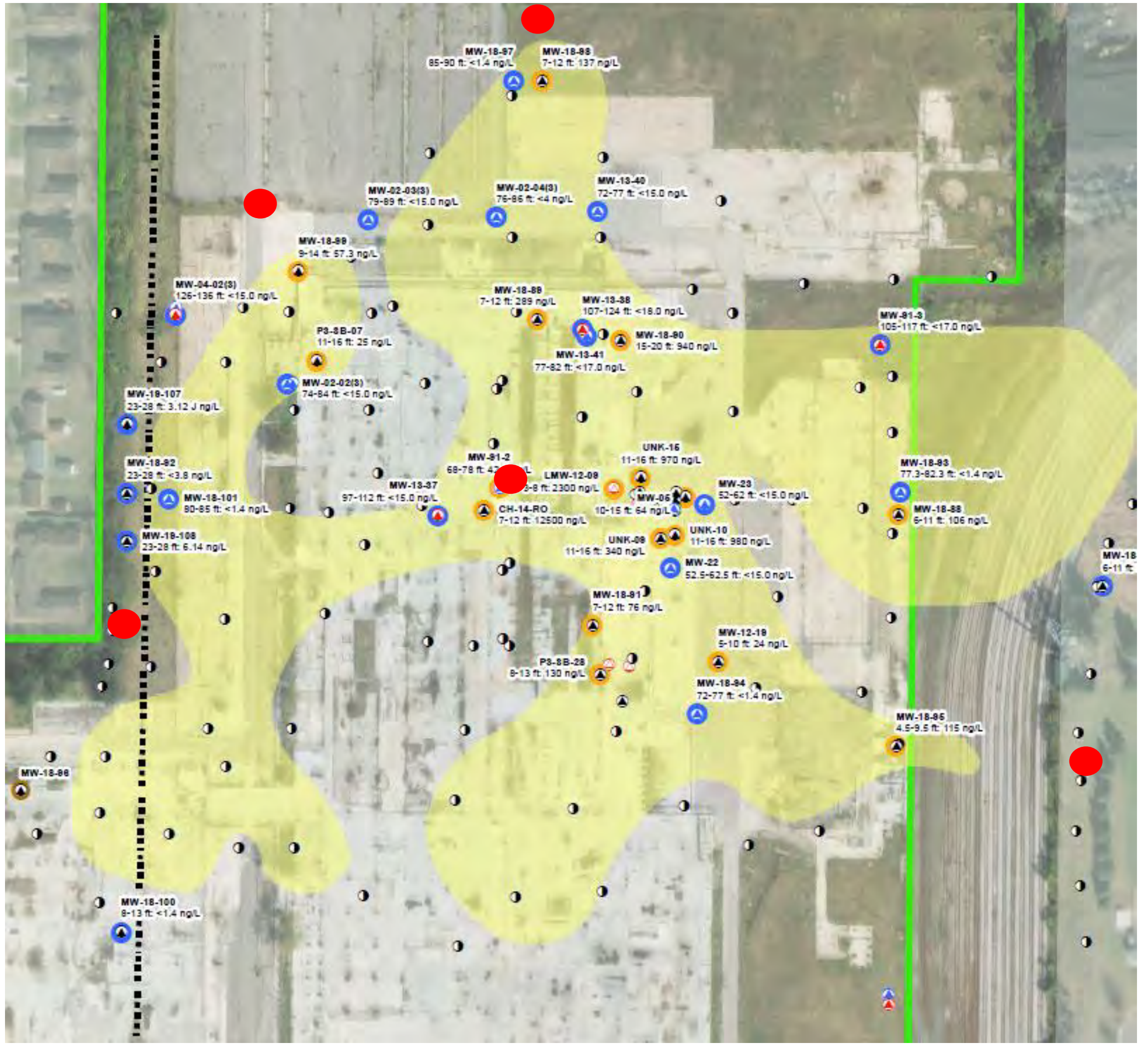
(although possible degradtion of annual seal)

- Using the ratio of vertical and horizontal K
  - Till: 10^{-5} to 10^{-6} cm/sec (Shelby tubes and sieve)
  - Fill/Sand Seams: 10^{-3} cm/sec (slug tests)
  - Ratio Vt/Hz: 1/100 to 1/1000
- Annual Recharge through 30,000 ft^2: 190,000 gallons per year (gal/y)
- Annual infiltration to deep overburden: 190 to 1,900 gal/y recharge to Deep Overburden
- Upon reaching the lower unit mixing occurs with the deep overburden flux
  - Using Q=KiA: Discharge through 10' X 250' section of deep overburden: 290,000 gal/y
- A discharge of 190 gal/y at 10,000 ng/L would be diluted by 2-3 orders of magnitude 10 to 100 ng/L in the deep overburden. Additional attenuation by adsorption.
- The concentration of PFOS in the deep overburden well adjacent to CH-14-RO (MW-91-2) has ranged between 2 and 42 ng/L.
  - PFOS+PFOA has not exceeded the current DW Criteria



Plant 3 Next Steps

- PFAS currently delineated vertically and horizontally - exception northwest of the former plating line
  - Install 4 additional perched wells north of MW-18-99 and 18-98, along the western boundary, and in the City Park
- Replacement of MW-91-2 to verify deep impacts are not associated with degrading well construction



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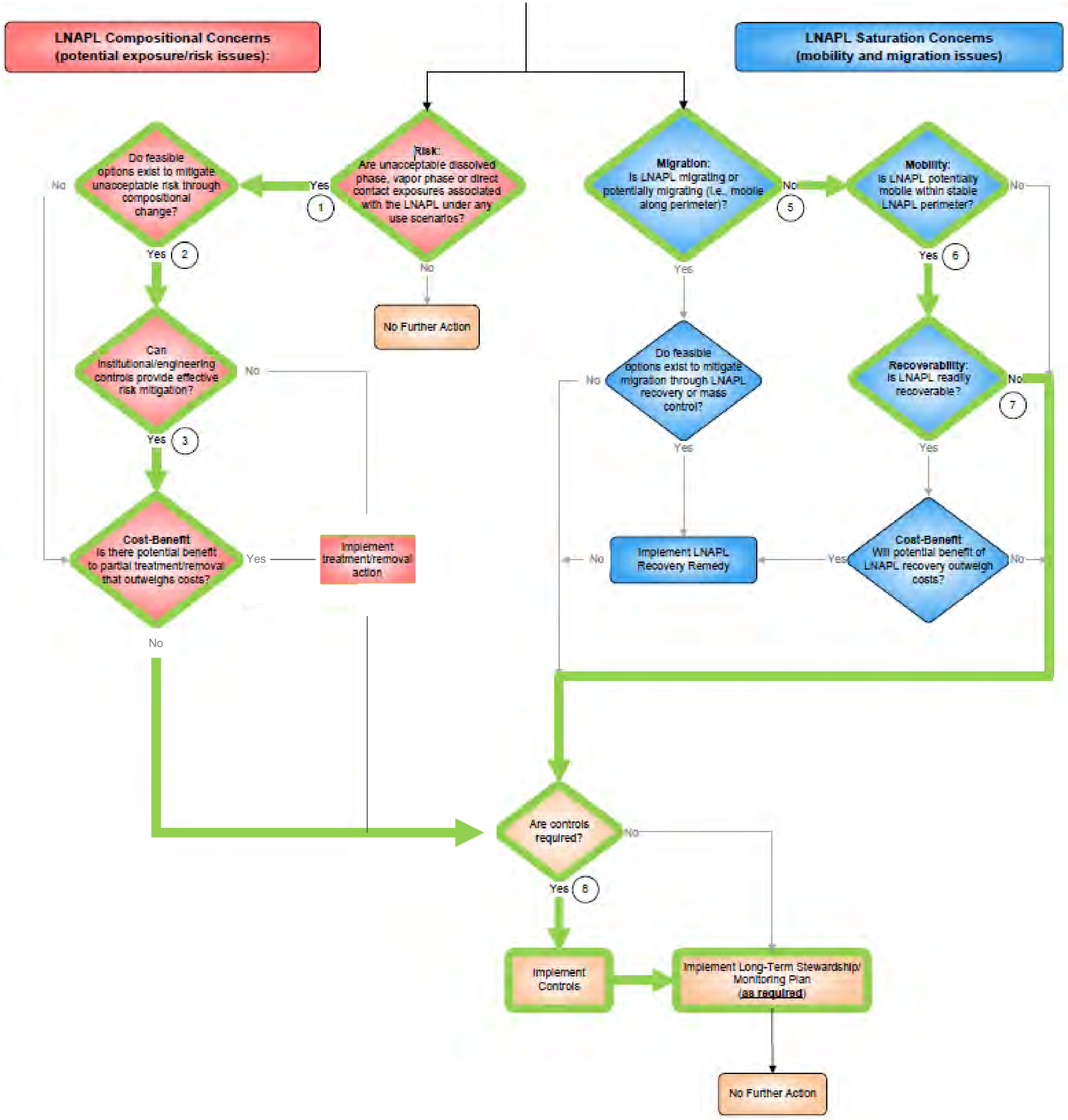
Plant 2 LNAPL CSM

Plant 2 LNAPL

- Land use controls to prevent on-site risks (i.e. vapor exposure, construction workers/subgrade exposure, soils management, etc.)
- Remaining potential risks are off-site exposures (i.e. drinking water, VI) associated with Constituents of Concern (COCs)
- Utilized the LNAPL CSM Decision Tree developed in collaboration with the MDEQ TAPs team to evaluate corrective measures



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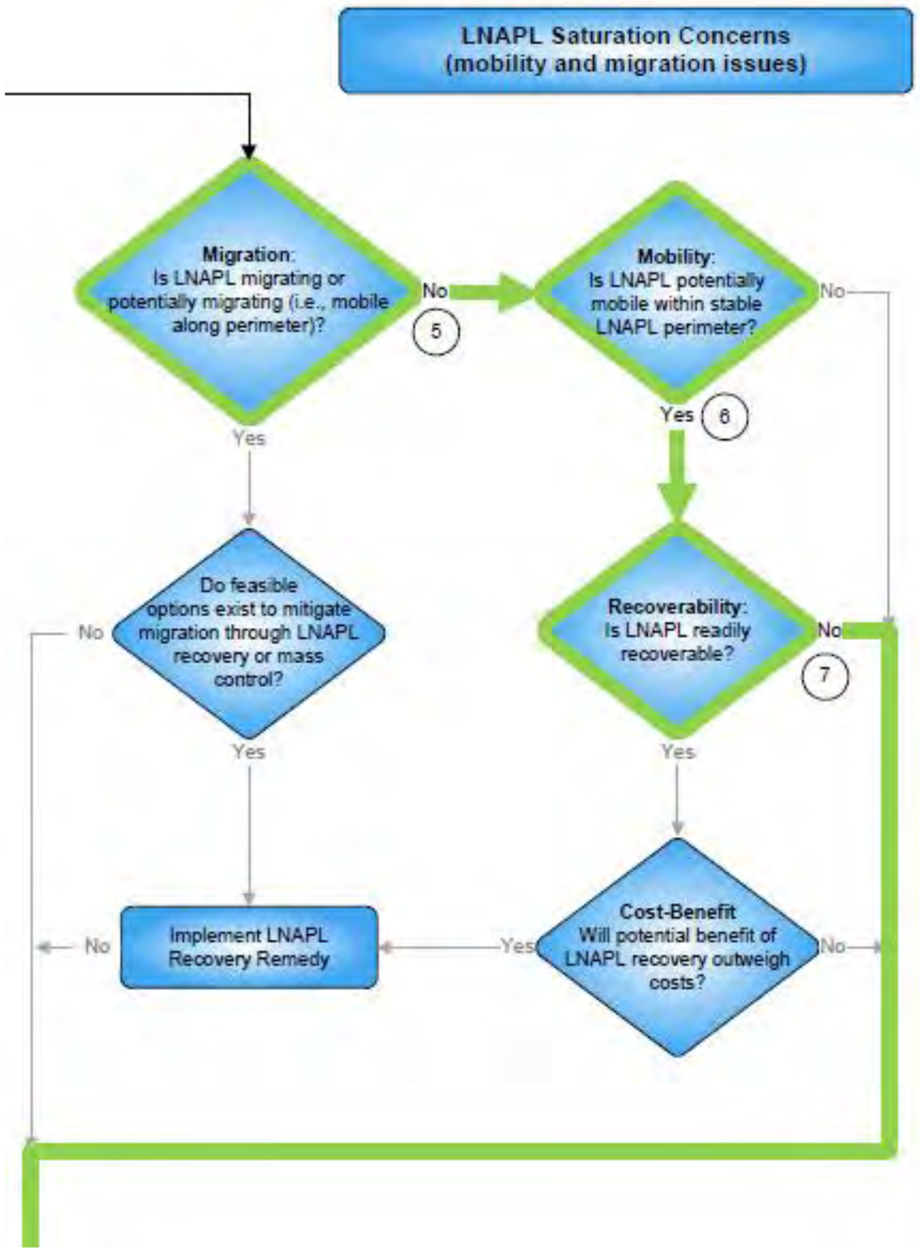
LNAPL Saturation Concerns

Is LNAPL migrating?

- No ongoing source + low transmissivity = no potential for migration in the future. Existing LNAPL in equilibrium
- LNAPL thickness stable or absent in wells on the perimeter of the LNAPL
- Large LNAPL thicknesses at deeper wells due to confined conditions and displacement of water from well
- No risk to off-site receptors

Is LNAPL recoverable?

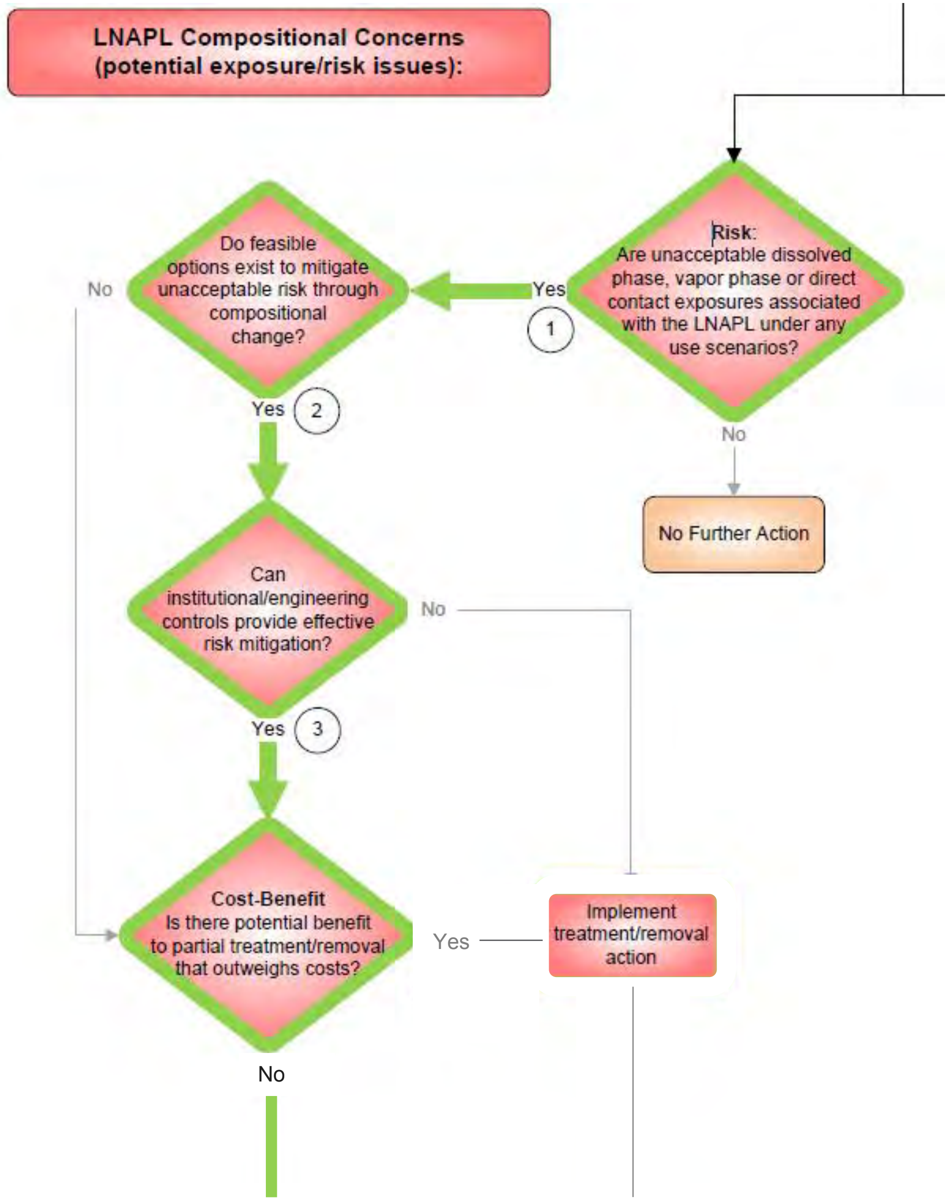
- Low transmissivity (<0.1 ft^2/d) based on bail down testing completed (Arcadis 2015)
- Recovery will have minimal benefit or effect on overall LNAPL mass and risk (or lack of risk)
- 2017-2019 manual removal has produced ~50 gallons per year



LNAPL Compositional Concerns

Are there unacceptable dissolved phase groundwater exposures associated with the LNAPL?

- Potential groundwater exposure related to Plant 2 LNAPL:
  - Off-site Municipal Wells
  - Off-Site VI
- Main constituents of concern:
  - 1,4-Dioxane
  - CVOC/VOCs
  - Other COCs (TPH, PCBs)
  - PFAS
- On-site restrictions will prevent unacceptable potential exposure to LNAPL and on-site GW



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LNAPL COCs

Groundwater results show that COCs associated with LNAPL are not migrating and are stable to decreasing in the perched groundwater at the Site (Arcadis 2014; 2019a):

- **1,4-Dioxane:** Exceeds Drinking Water (DW) Criteria. Soil SPLP analysis, groundwater sampling and LNAPL analysis all suggest the LNAPL is a depleted 1,4-dioxane source and has partitioned to surrounding groundwater (Arcadis 2017a).
  - LNAPL not a continuing source of 1,4-dioxane
  - Note that 1,4-dioxane previously dissolving from LNAPL into groundwater and migrating to weathered bedrock will be addressed with biosparge system and monitored for stability
- **VOCs:** Exceed DW and vapor intrusion (VI) criteria. Soil and groundwater results show leaching of VOCs is spatially limited and attenuate rapidly due to reducing conditions. Only sporadic detections in the weathered bedrock (Arcadis 2017a, 2017b).
  - VOCs/SVOCs attenuate rapidly and do not pose a threat to the municipal water supply
  - VI associated with future site development will be addressed with deed restriction
- **SVOCs/PCBs:** SVOCs and PCBs in LNAPL and soil exceed DW and Direct Contact criteria. SVOCs and PCBs are not generally mobile and can be addressed with deed restriction (Arcadis 2017b).
- **TPH:** Total petroleum hydrocarbon (TPH) fractionation analysis indicates that LNAPL constituents are predominantly middle- and heavy-end aliphatic hydrocarbons, which pose relatively little risk to groundwater (Arcadis 2017b).
- **PFAS:** PFAS exceeds DW and surface water criteria. PFAS is detected at low concentrations in LNAPL and surrounding groundwater suggesting an equilibrium condition (Arcadis 2019b).
  - LNAPL is not a significant source of PFAS

PFAS In Groundwater

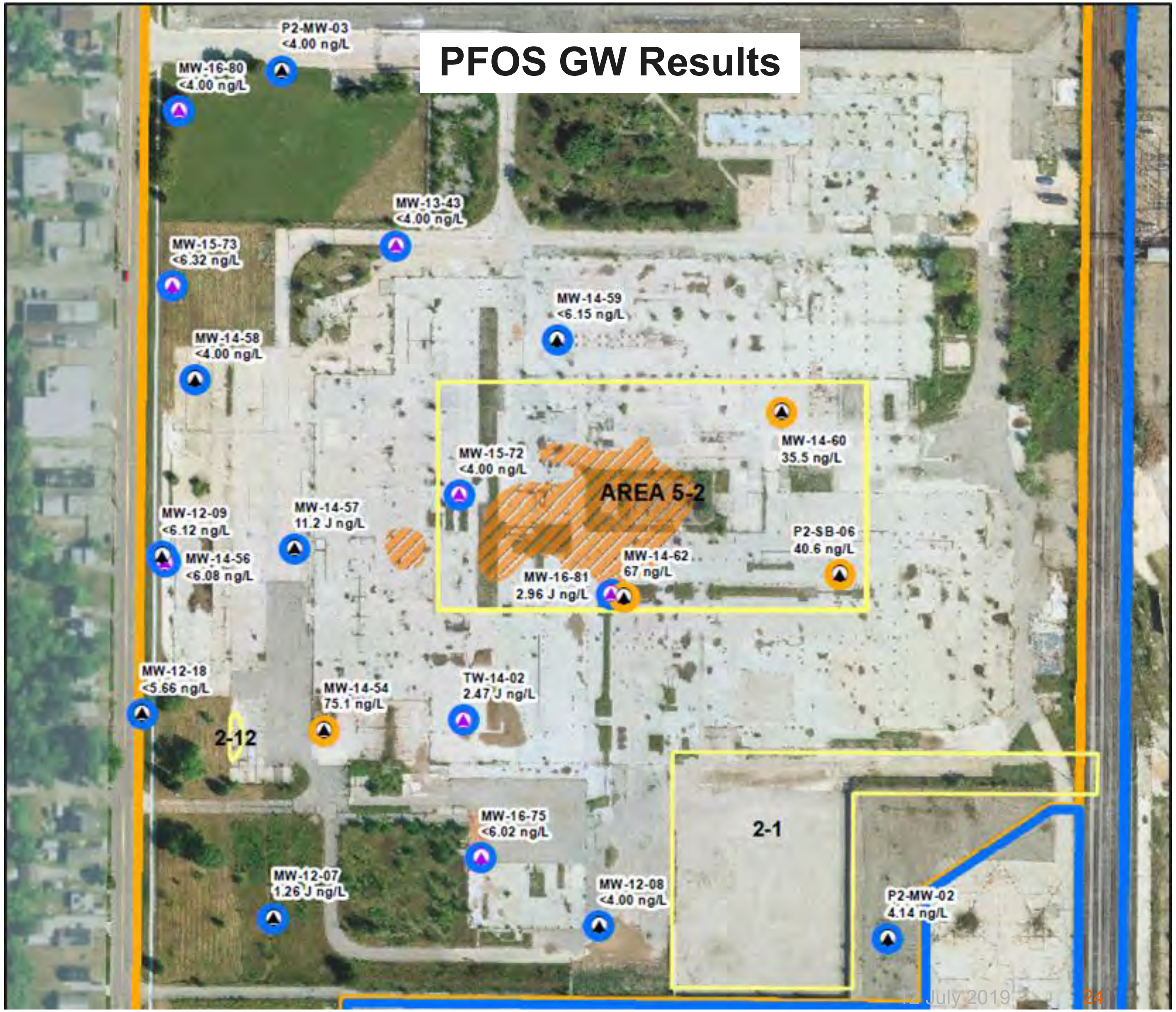
- Initial groundwater sampling in May 2018
- PFOS & PFOA exceedances identified in the perched zone
- Limited low detections (J flagged) in the weathered bedrock

LEGEND

- PERCHED ZONE MONITORING WELL
- WEATHERED BEDROCK MONITORING WELL
- PFOS <12 ng/L
- PFOS >12 ng/L
- AREA OF INTEREST
- APPROXIMATE EXTENT OF LNAPL

APPROXIMATE PLANT BOUNDARIES

- PLANT 2



LNAPL PFAS Investigation (Arcadis 2019b)

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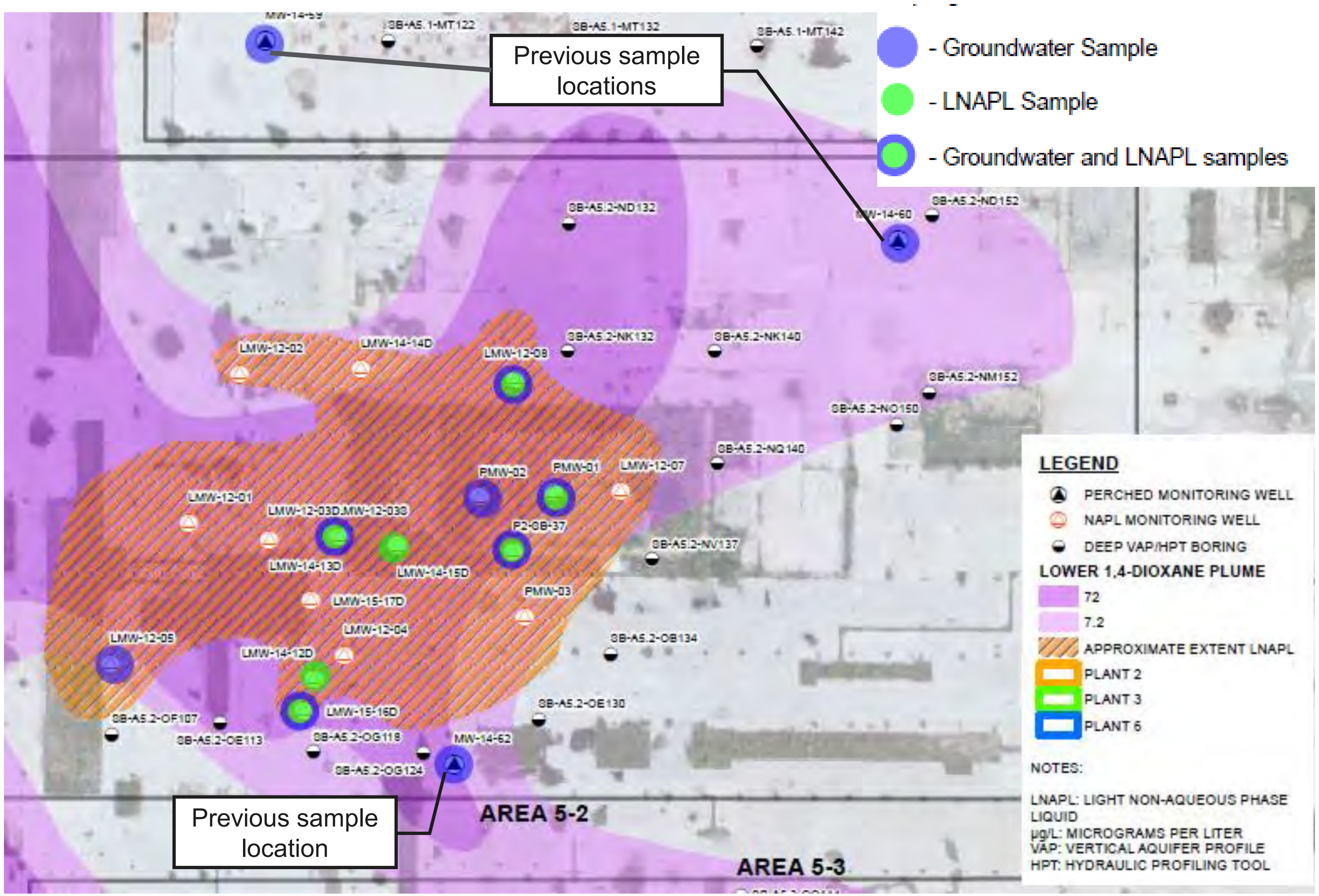
- 7 LNAPL samples
  - Custom extraction and analysis
- 7 groundwater samples
  - Care taken not to include any LNAPL in the samples
  - Analyzed using modified USEPA Method 537 with isotope dilution
- 5 LNAPL/groundwater samples were co-located



Development of LNAPL Method

- No established method for analysis of petroleum LNAPL for PFAS
- Worked with SGS Axys to come up with a custom analysis based on a method they employ for gasoline
- Based on MLA-110
- Utilizes a phase transfer monitored by isotopically labeled surrogates (isotope dilution)

1. Dilute 100mL Sample with 100mL hexane (to prevent emulsification)
2. Spike samples with surrogates using 500ml levels
3. Perform 3 sequential DI water “washes”
4. Result: 500mL aqueous sample
5. SPE
6. Analysis using LC-MS/MS
7. Correct concentrations to representative levels based on surrogates

Results - PFOS

PFOS Results:

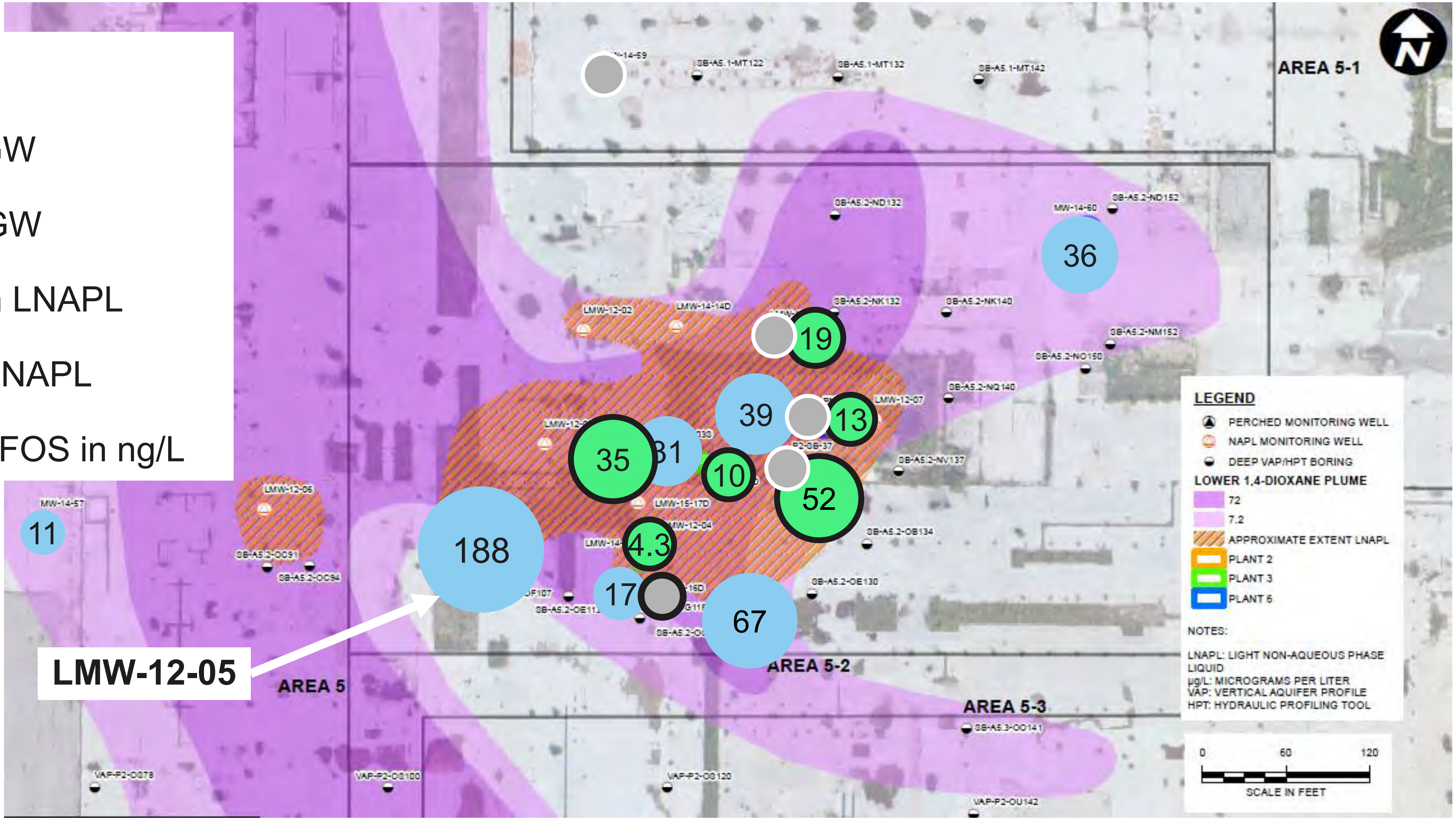
- Non-detect GW

31 - Detected in GW

- Non-detect in LNAPL

19 - Detected in LNAPL

Values represent PFOS in ng/L



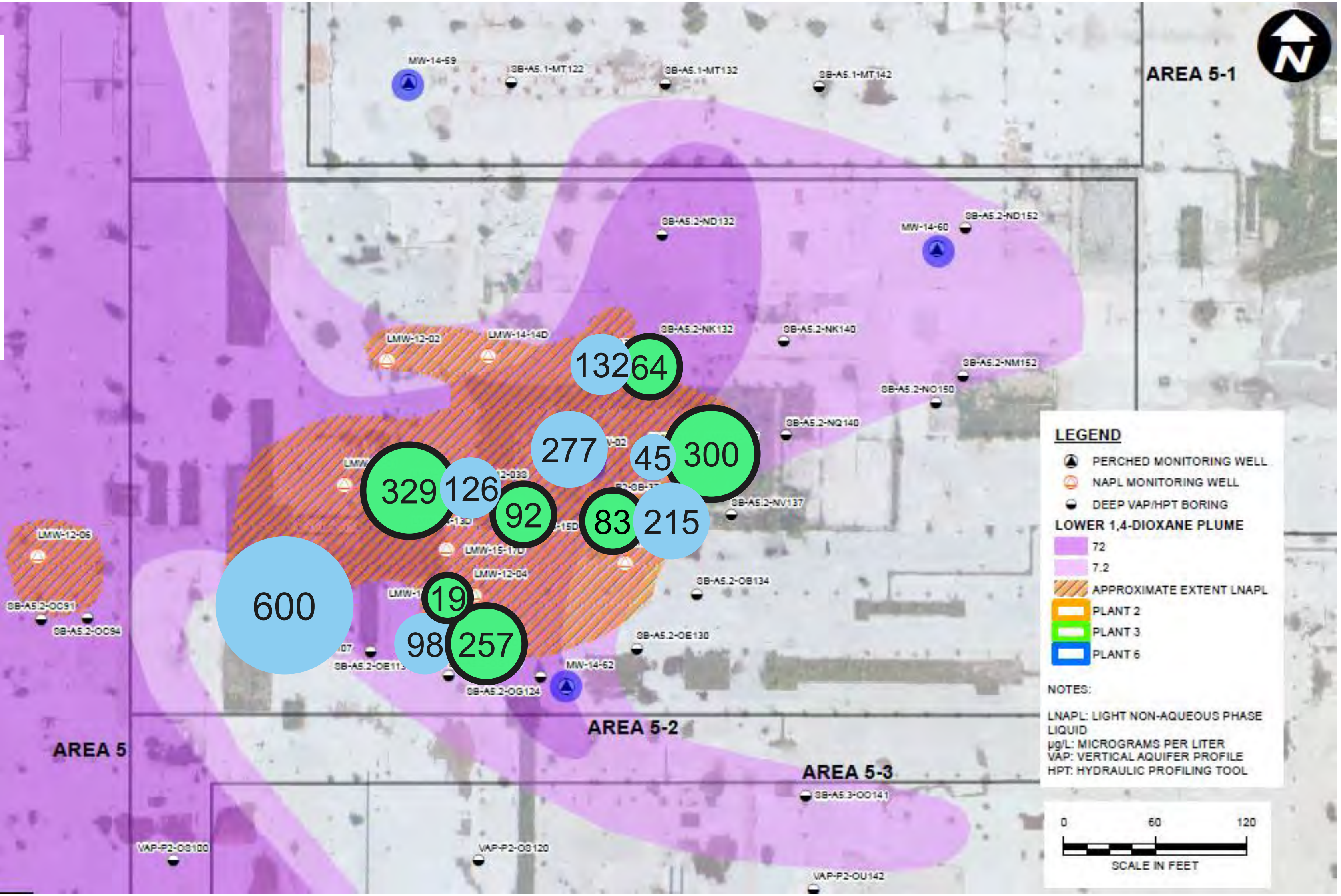
Results – Other PFAS

Other PFAS Results:

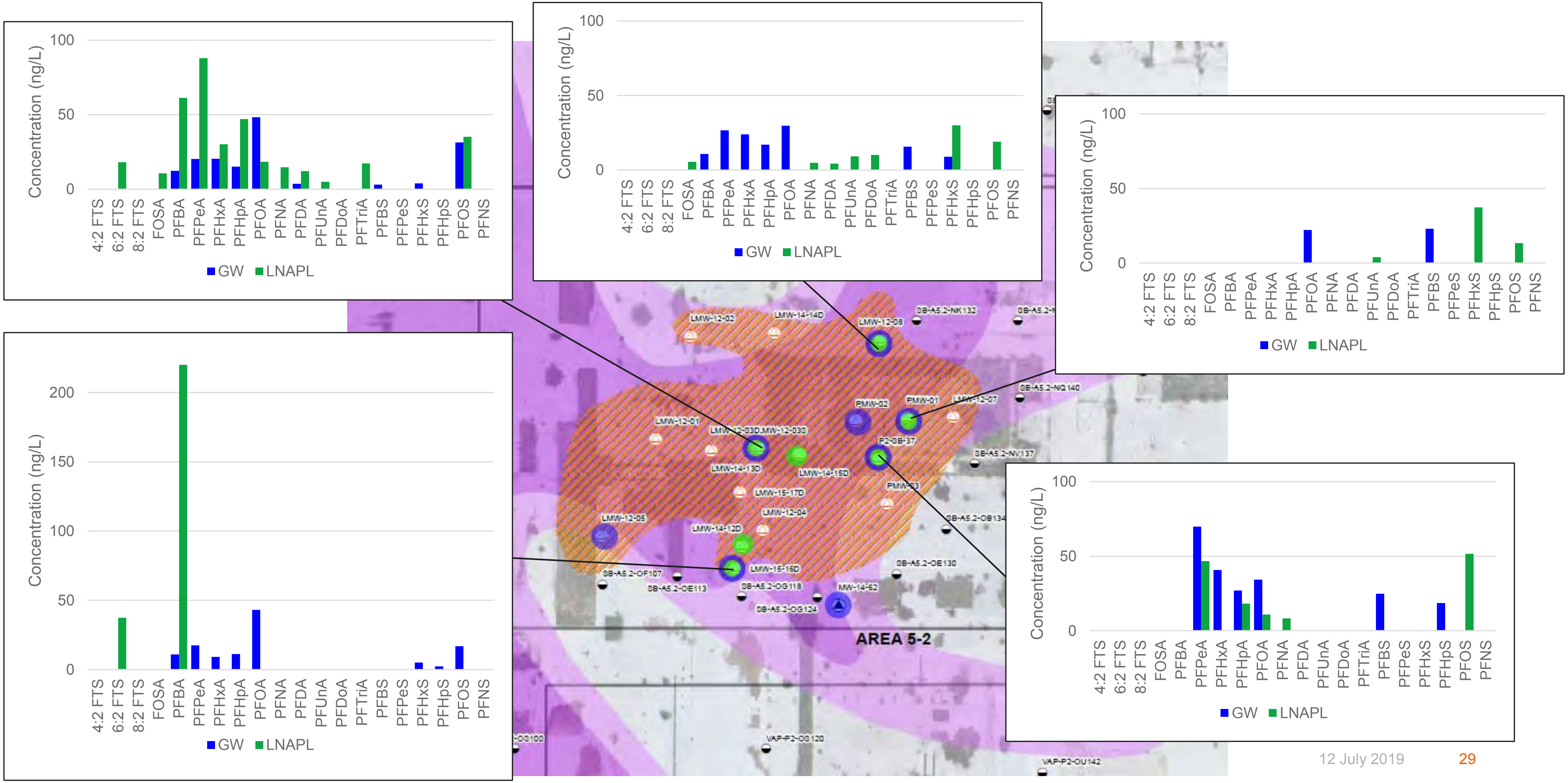
31 - Detected in GW

19 - Detected in LNAPL

Values represent PFOS in ng/L



Co-located Samples



Plant 2 LNAPL PFAS Summary

Comparison of the analytical results for both groundwater and LNAPL does not show a concentration bias toward either media.

- Highest concentrations of individual compounds within LNAPL are hundreds of nanograms per liter (ng/L) and typically less than 100 ng/L for PFOA and PFOS, similar to perched groundwater
- Results suggests that PFAS concentrations are in equilibrium between the two media
- LNAPL does not represent an ongoing significant source of PFAS
  - Possible that concentrations observed in LNAPL have partitioned from groundwater and related to a separate source

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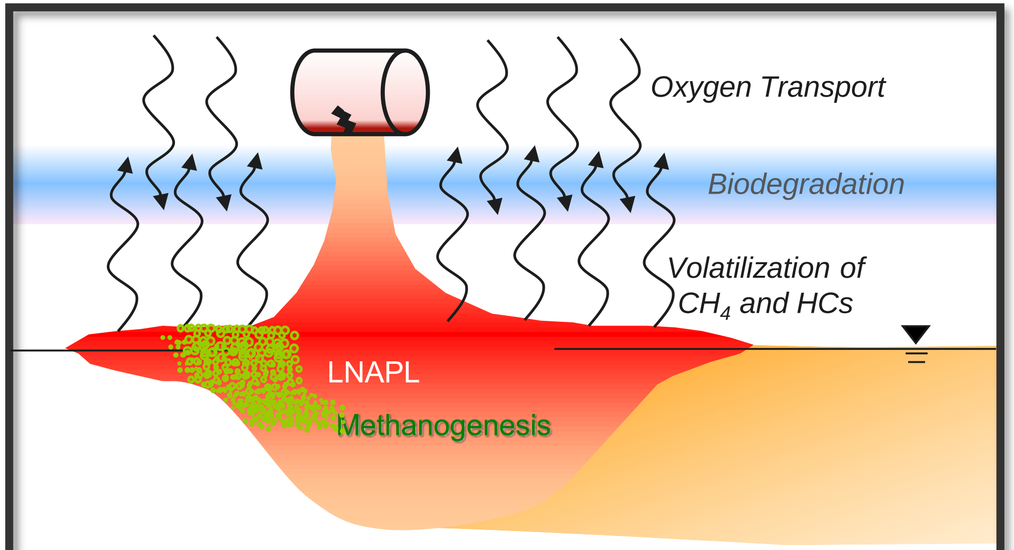
Natural Source Zone Depletion

NSZD Overview

- Conducted soil vapor screening to qualitatively evaluate the presence or absence of NSZD
- NSZD processes and rates were measured using two different methods at the Site:
  - Temperature profiles
  - Carbon dioxide/methane flux
- Phase I data collection was performed in August 2018
- Phase I results were used to make recommendations for Phase II more detailed round of data collection October 2018 through May 2019 to refine degradation rates

NSZD processes include:

- Volatilization
- Dissolution
- Biodegradation



Modified from ITRC, 2009 and Ririe, 2013

LNAPL is degrading on its own, and based on the low transmissivity of LNAPL at the Site, active recovery will not meaningfully change the rate of overall mass removal.

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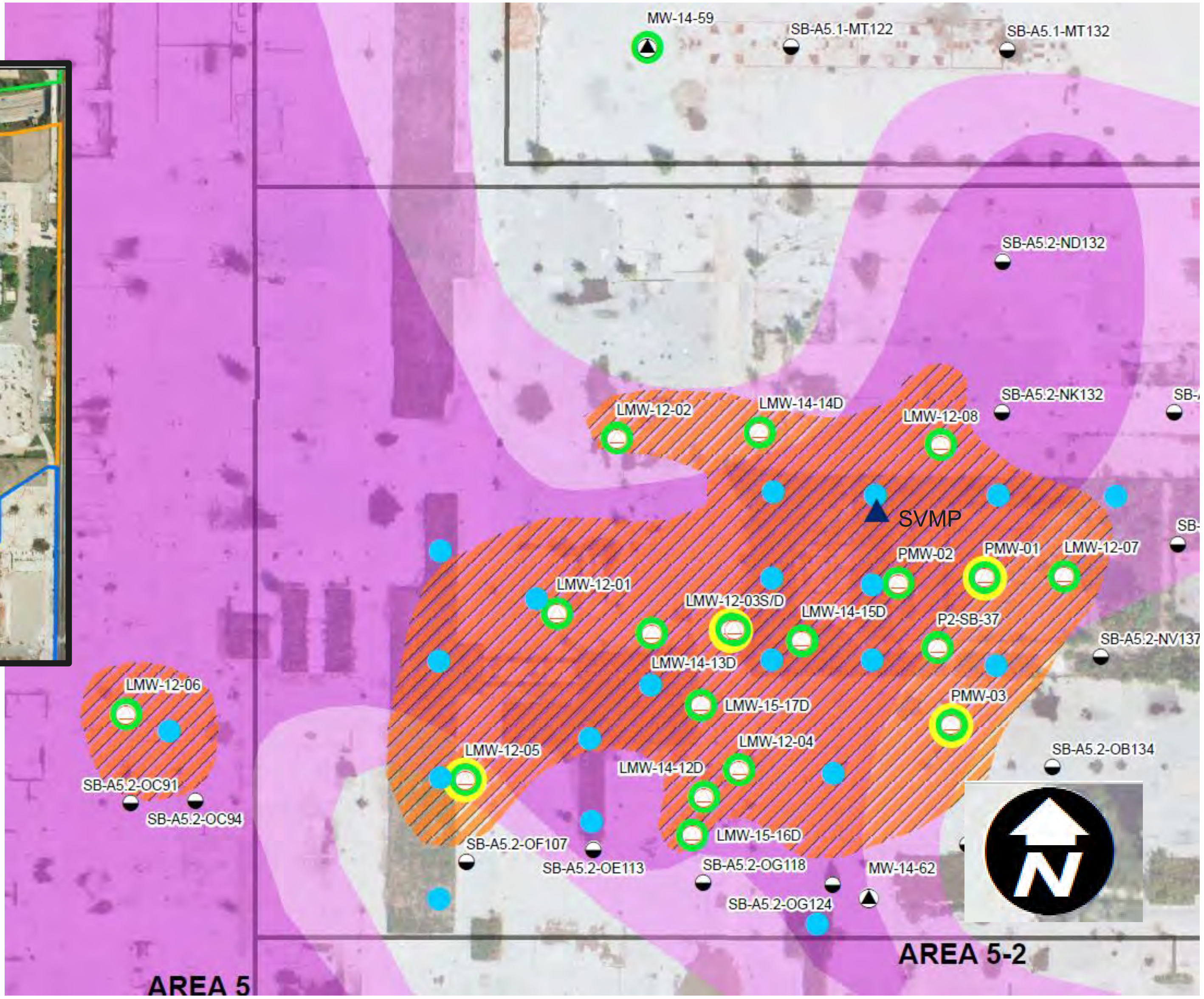
NSZD Evaluation Locations



LEGEND

- PERCHED MONITORING WELL
- NAPL MONITORING WELL
- SOIL GAS SCREENING LOCATION
- TEMPERATURE SCREENING LOCATION
- CARBON DIOXIDE FLUX SCREENING LOCATION
- NESTED SOIL VAPOR PROBE LOCATION
- DEEP VAP/HPT BORING
- APPROXIMATE EXTENT LNAPL

LOWER 1,4-DIOXANE PLUME

- 72
- 7.2

0 60 120
SCALE IN FEET

Soil Vapor Screening

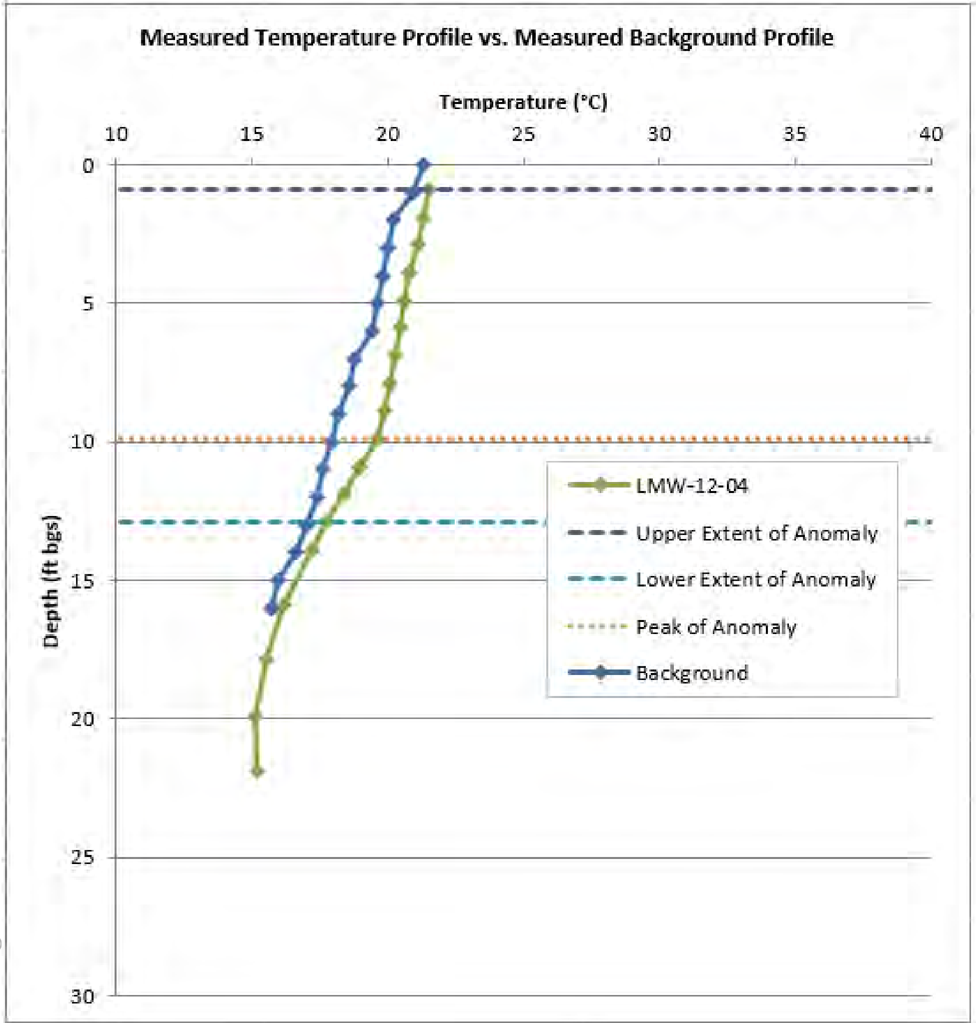
- Soil gas readings were taken at five locations
- The presence of VOCs in soil vapor, methane and/or carbon dioxide above atmospheric conditions, and oxygen below atmospheric concentrations can indicate NSZD is active and depleting LNAPL mass

Location	O_2 (% by volume)	CO_2 (% by volume)	CH_4 (% by volume)	VOCs (ppm)
SVMP-Shallow	17	3.53	2.04	0.0
SVMP-Deep	12.2	3.86	2.26	1.1
LMW-12-05	3.5	2.02	25.0	0.5
PMW-01	19.1	0.00	0.22	35.4
PMW-03	2.5	3.40	0.0	0.0
Typical Atmospheric	20.95	0.036	0.0005	0.0

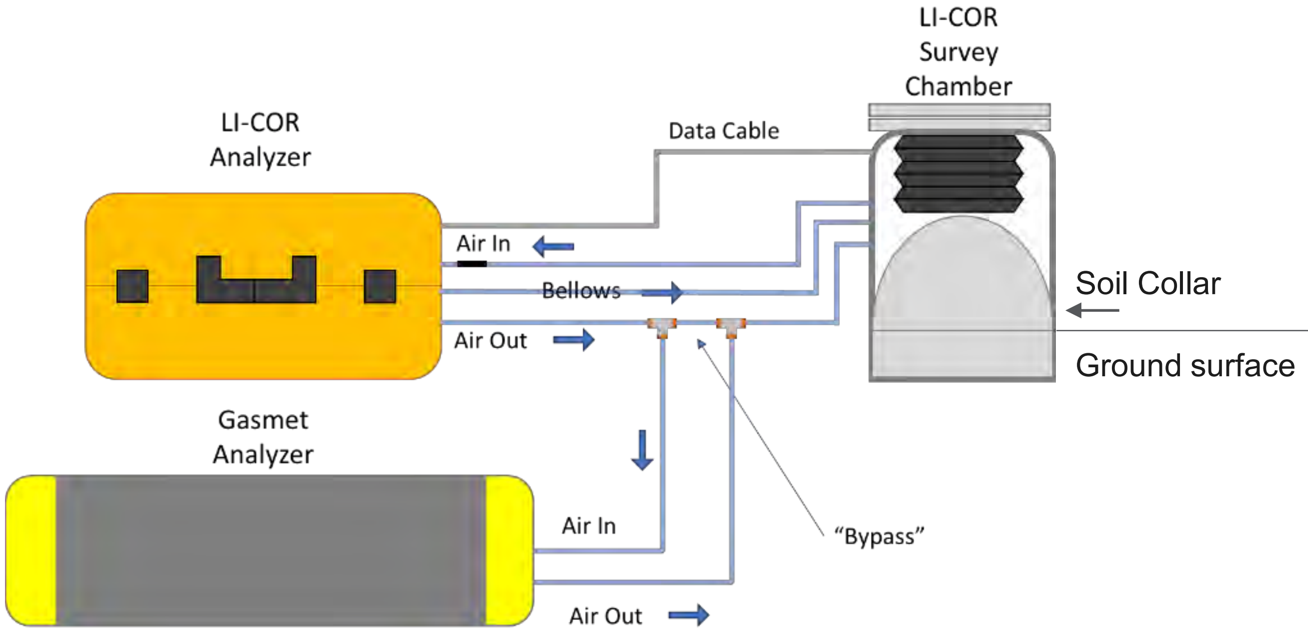
Soil gas readings indicate NSZD of LNAPL is actively occurring at the Site

Phase I Temperature and CO2/CH4 Flux Evaluation

- "Snapshot" temperature profiles collected at 18 MWs in 8/18.



- CO_2 and methane flux was measured at 20 locations across the Site.



Phase I Results Summary and Conclusions

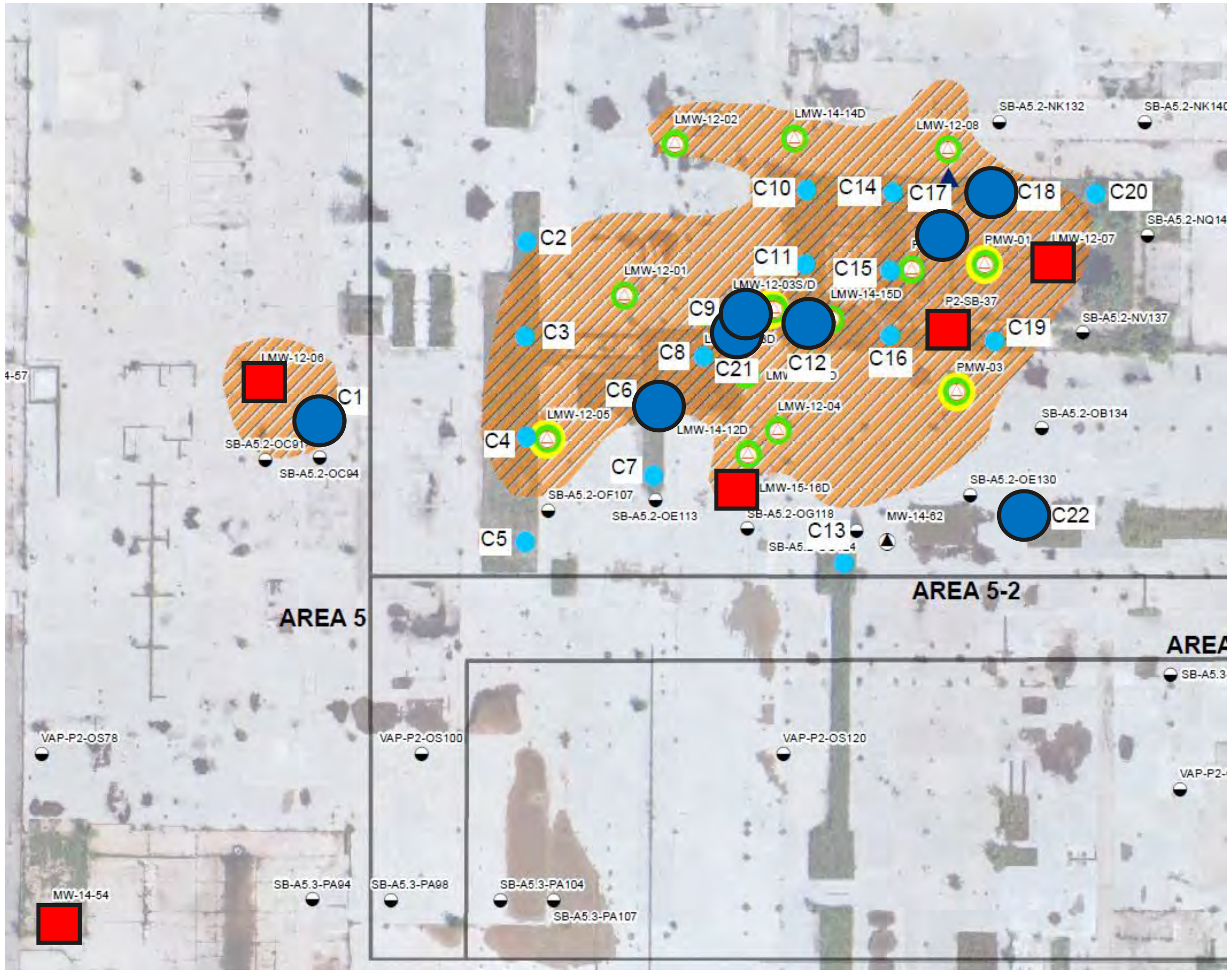
Method	LNAPL Depletion Rate (gal/ac/yr)
Temperature profiles	1,300 - 3,500
CO_2 Flux	1,200

- Initial data provides three lines of evidence that NSZD is active: vapor screening, temperature profiles, and CO_2 / Methane flux
- LNAPL is being degraded at a rate ranging from approximately 1,200 to 3,500 gallons/acres/year
- CO2 flux method does not account for naturally-occurring CO2 flux, likely an over estimate
- Using the minimum of the range, this equates to approximately 1,400 gallons of LNAPL depleted per year at the Site, based on a LNAPL footprint of 1.2 acres
  - For reference, manual LNAPL recovery efforts removed 57.8 gallons of LNAPL in 2017

Initial results show that NSZD is actively depleting LNAPL at Site, but additional data were needed to refine the degradation rate estimate

Phase II of Data Collection

- Measure CO_2 flux with sorbent traps
  - Deploy traps at 8 locations C1, C9, C17 (concrete); C6, C12, C18, C21, C22 (unpaved)
  - Deploy traps for 2 weeks to obtain a longer-term time-averaged measurement (compared to LI-COR snap-shot)
- Conduct long-term temperature monitoring
  - Monitor temperature in 5 wells: LMW-12-06, LMW-12-07, LMW-15-16D, P2-SB-37, and background well MW-14-54 for 3 months
  - Monitoring captures temperature variations and results in an LNAPL degradation rate estimate that is more representative of long-term conditions



CO_2 trap location

Temperature monitoring location

Phase II CO_2 Flux and Temperature Results

- LNAPL depletion rate calculated from CO_2 flux measured by traps is lower than previous estimates
  - This method accounts for naturally occurring CO_2 flux
  - Ground cover affects soil gas flux rate; locations in concrete less affected by precipitation and could see more soil gas flux as a result
- Longer term temperature data was utilized to account for seasonal changes, resulting lower LNAPL depletion rate than previous estimated of 200 – 1,000 gal/acre/yr

	Location	Fossil Fuel CO_2 Flux (µmol/m²/s)	LNAPL Depletion Rate (gal/acre/year)
Concrete	C1	0.31	195
	C9	0.58	361
	C17	1.45	909
Soil / Grass	C6	ND	ND
	C12	0.09	54
	C18	0.13	84
	C21	0.05	34

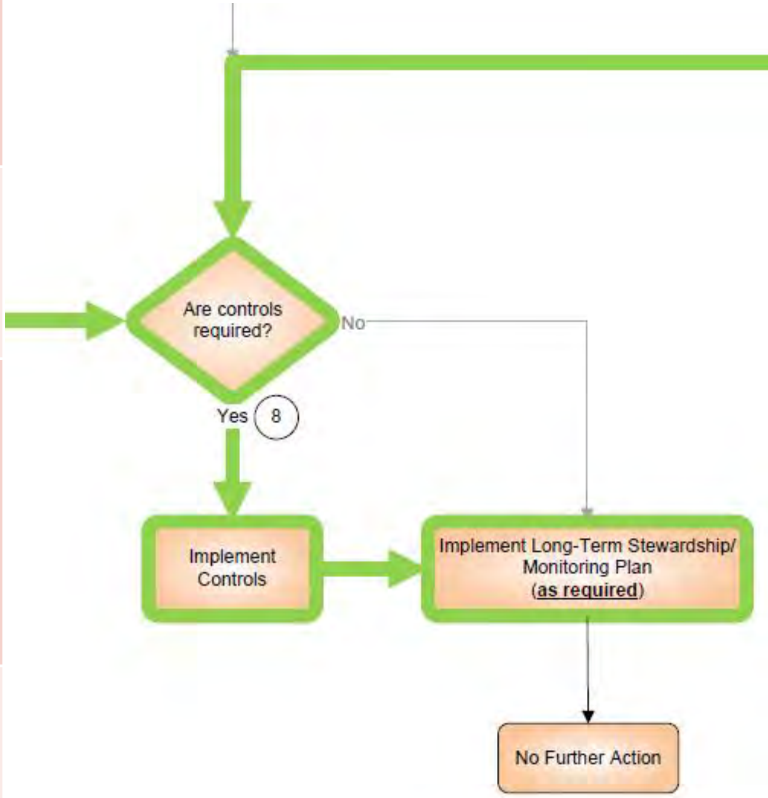
Phase II Results and Conclusions

- Second round of data collection confirms that NSZD is active and provides a time-averaged NSZD rate
- The longer-term monitoring methods used from October to May indicate LNAPL degradation rates ranging from approximately 50 to 1000 gallons per acre per year at individual locations.
- This range is lower than previously estimated but accounts for naturally-occurring CO_2 flux and seasonal changes.
- Using the average loss rate calculated from the long-term temperature measurements to represent the middle of the range, this equates to approximately ~600 gallons of LNAPL depleted per year at the Site, based on a LNAPL footprint of 1.2 acres

LNAPL is degrading on its own:
Estimated NSZD rate of ~600 gallons LNAPL per year

Plant 2 LNAPL CSM Summary

Evaluation Result	Corrective Measures
Plant 2 LNAPL is not mobile and has limited recoverability	Attenuation via NSZD (~600 gal/yr/acre)
No exposure to LNAPL & COCs with the exception of 1,4-dioxane	Contact and VI addressed via deed restriction
1,4-Dioxane migrates vertically and impacts the weathered bedrock	Although not currently related to LNAPL,1,4-Dioxane vertical migration will be addressed with biosparge system and evaluated for stability
Recharge through degrading concrete and courtyard/pit areas drive radial flow around LNAPL and aid vertical migration of 1,4-dioxane	Allow flushing through LNAPL area and migration of 1,4-dioxane to weathered bedrock for treatment. Monitor trends and reevaluate periodically. Contingency for cap.



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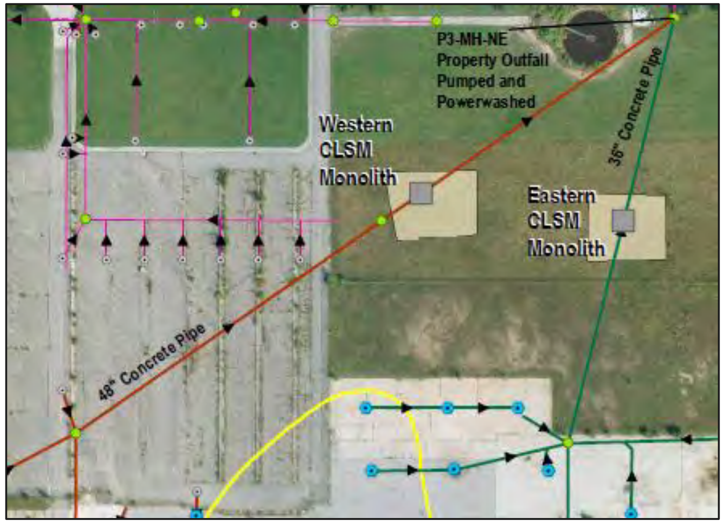
Plant 3 – Storm Sewers

2018 Storm Sewer Modifications – Plant 3

- Previously observed PFAS impacts in storm sewers discharging from site at the Plant 3 outfall
- Modifications made to the storm sewer aimed at mitigating flow out of the eastern and western mains at the Plant 3 outfall
- 2 CLSM monoliths installed away from northern property boundary
- Excavations to install monoliths were ~27 feet deep, no groundwater was encountered in the excavations
- About 150 catch basins capped to minimize flow into the storm system
- Two mains to the southwest bulkheaded to mitigate potential backflow of impacted water
- Completed in October 2018



Reduction in Discharge

- Off-site discharges were reduced 1 – 2 orders of magnitude after installation of monoliths, bulkheads and caps
- Pre-Bulkheading: 1-2 inches of water depth in 54" ≈ 20-90 gpm
- Post-Bulkheading: ¼ inch (film) of flow in 54" main ≈ 1 gpm

54" Outfall

Manning Open Channel Flow

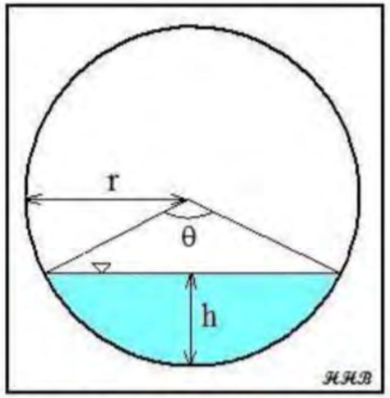


Figure 1. Partially Full Pipe Flow Parameters (Less than Half Full)

$$r = \frac{D}{2} \qquad h = y$$

$$\theta = 2 \arccos\left(\frac{r - h}{r}\right)$$

$$A = \frac{r^2(\theta - \sin\theta)}{2}$$

$$P = r\theta$$

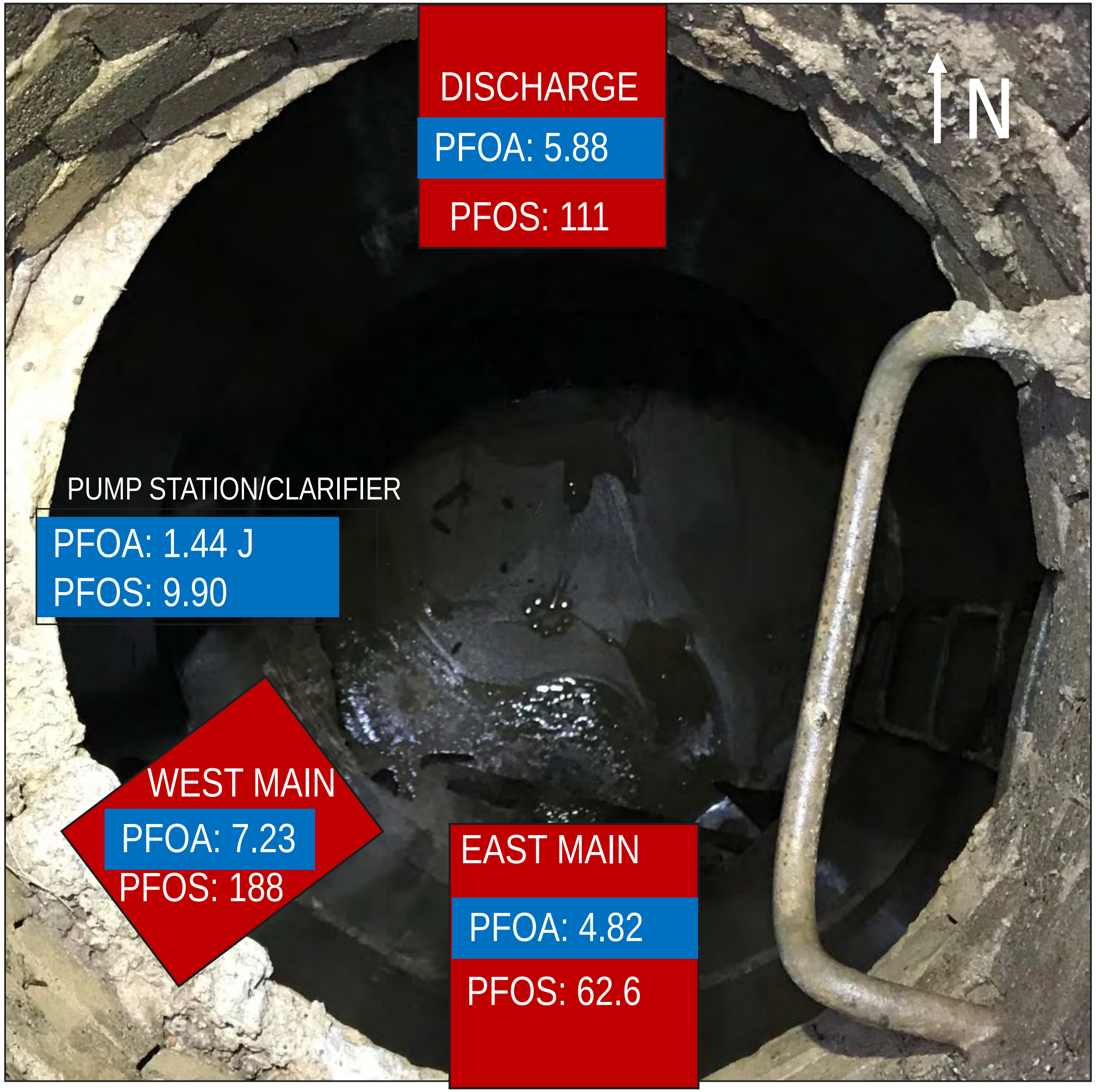
$$R_h = A/P$$

$$Q = (1.49/n)A(R_h^{2/3})S^{1/2}$$

Approximately 95% to 99% reduction in offsite discharge

March 2019 Invert Sampling

- All pipes contributing flow into the manhole at the northern property boundary were sampled individually with grab sampler
- Samples from the pipes showed concentrations above surface water criteria
- Flow from east main is apparent
- Standing water in west main backing up into sump



All concentrations are expressed in ng/L or ppt

PFOS = Perfluorooctanesulfonic acid
PFOA = Perfluorooctanoic Acid

= Above Criteria

= Below Criteria

Sample taken 3/19/2019

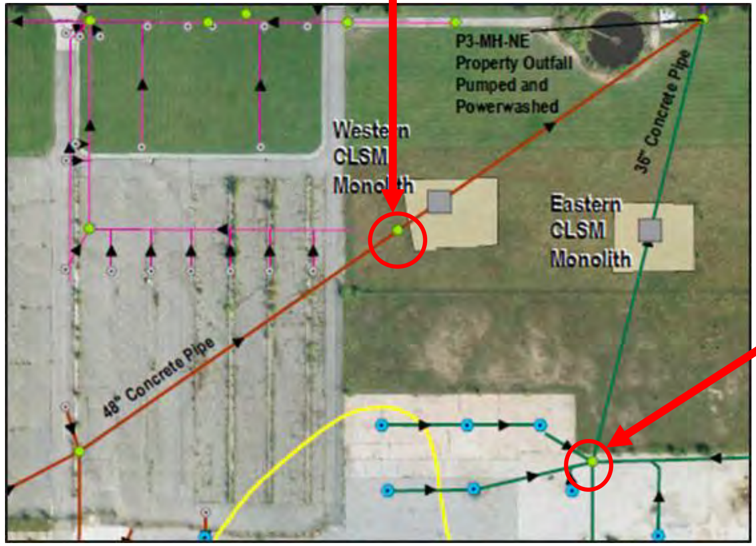
2016 PFOS Proposed MDEQ Rule 57 Human Non-Cancer Value for Surface Water from a Non-Drinking Water Source: 12
2016 PFOA MDEQ Rule 57 Human Non-Cancer Screening Value for Surface Water from a Non-Drinking Water Source: 12,000

Upstream Manhole Inspection

- The next manholes upstream of the monoliths inspected in April
- Western main water level backed up to within ~5ft bgs
  - Pre-bulkheading depth was about 21 feet to water
  - Backup indicates monolith is blocking water
- Eastern main water level is at 20' bgs
  - Pre-bulkheading depth was about 22 feet to water
  - Monolith-excavation interface could be a preferential pathway for flow around the monolith

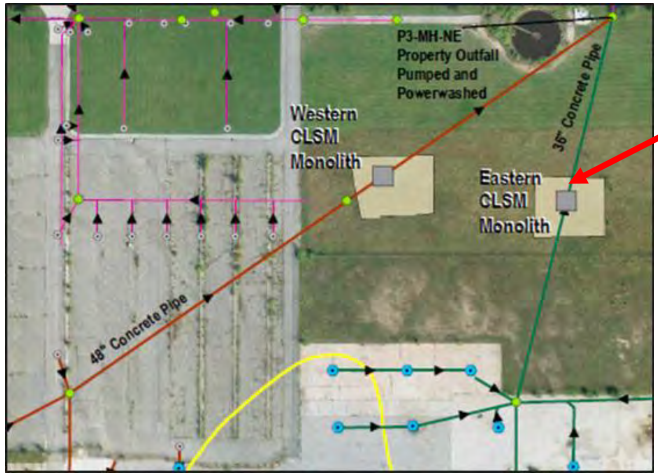
DTW = ~5 ft bgs

DTW = ~20 ft bgs



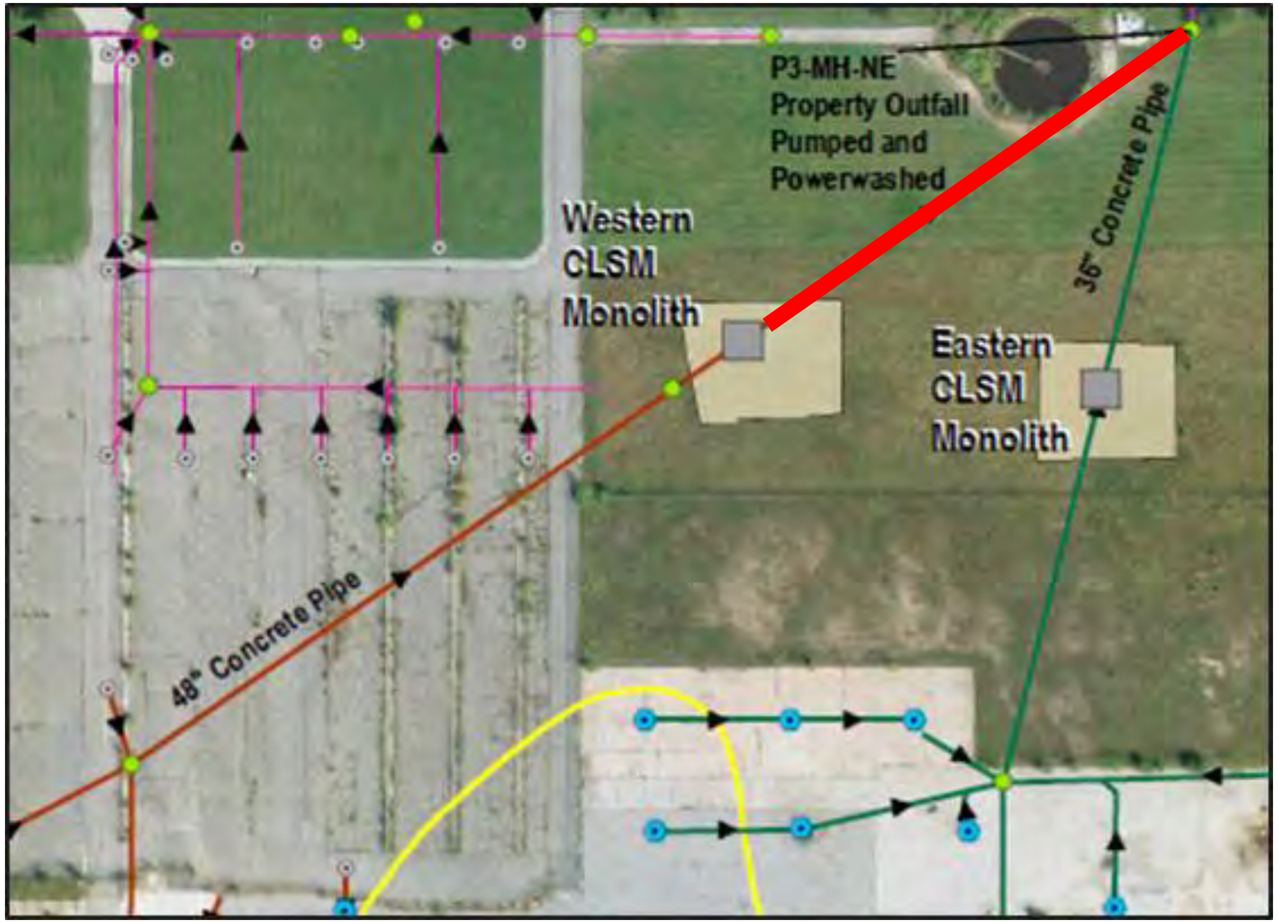
March 2019 Camera Survey

- Sewer camera crew dispatched to collect video on E and W mains
- East Monolith is effectively blocking water in sewer pipe
- Infiltration into the first concrete pipe joint downstream of monolith was observed
- Sediment buildup prevented inspection of west main



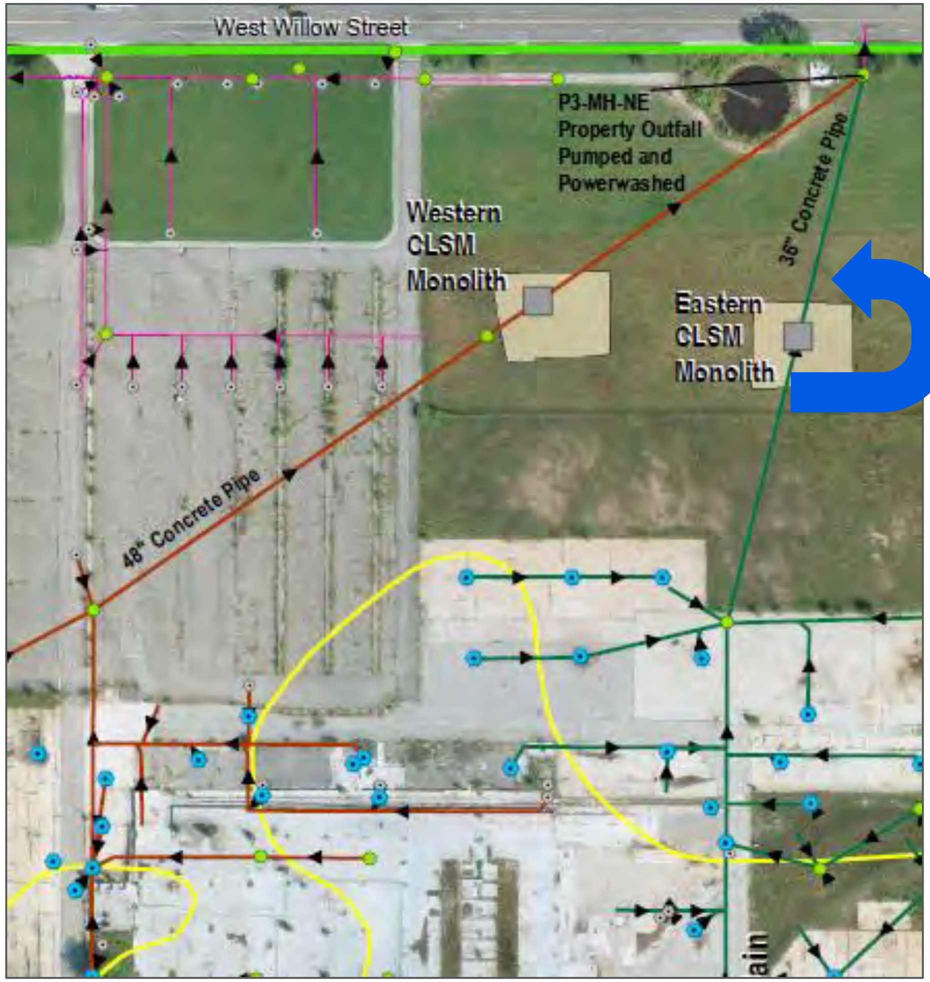
Plant 3 Next Steps: Cleaning and Inspection of West Main

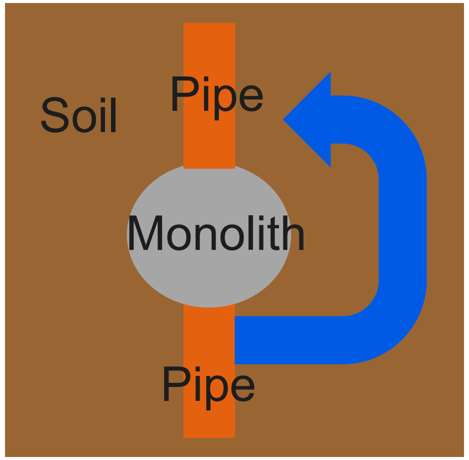
- Objective: Confirm no ongoing flow contribution from West Main
- Clean the western main and property outfall sump
  - Remove potentially stagnant water and sediment in main that could be serving as continuing source of PFAS, disposal offsite or in upstream sewers
- CCTV video inspection of 48” diameter West Main to assess pipe integrity and signs of infiltration
- Confirm no ongoing flow contributions into the sump after it is pumped down



Plant 3 Next Steps: Addressing Eastern Main

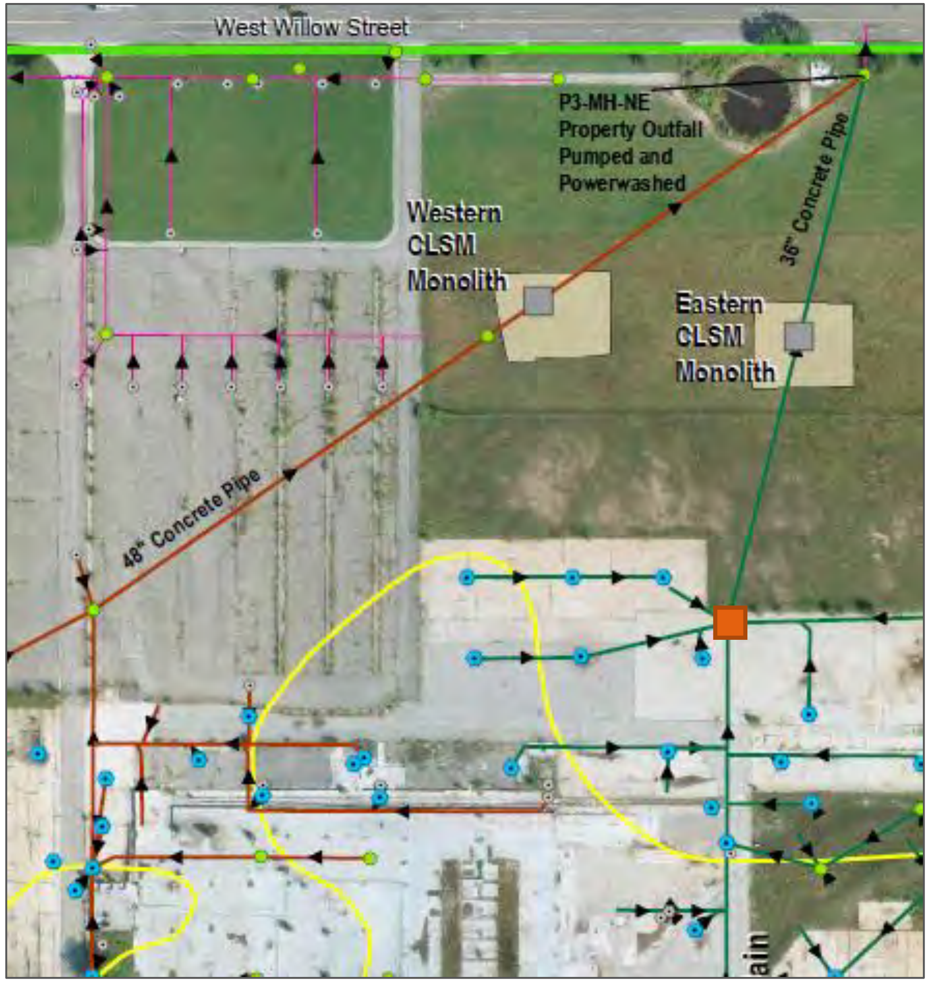
- Need to implement additional measures to mitigate the remaining trickle of flow from the East Main
- Water appears to be exfiltrating from pipe upstream of monolith, flowing through soil around monolith, and is re-infiltrating downstream
- Need to prevent water from reaching the East main monolith more upstream/interior to the Site.





Plant 3 Next Steps: Addressing Eastern Main

- Fill manhole south of monolith with concrete utilized for bridges that cures underwater. Concrete is mixed very thick and will not run significantly into connected inlet and outlet pipes.
- Minimal dewatering required and no confined space entry
- No engineered bulkheads, but concrete should flow a little into surrounding pipes to form a seal to prevent water from flowing in or out.
- Mitigates sewer flow toward the east monolith and exfiltration upstream of east monolith



Manhole to Fill

Performance Monitoring and Contingency

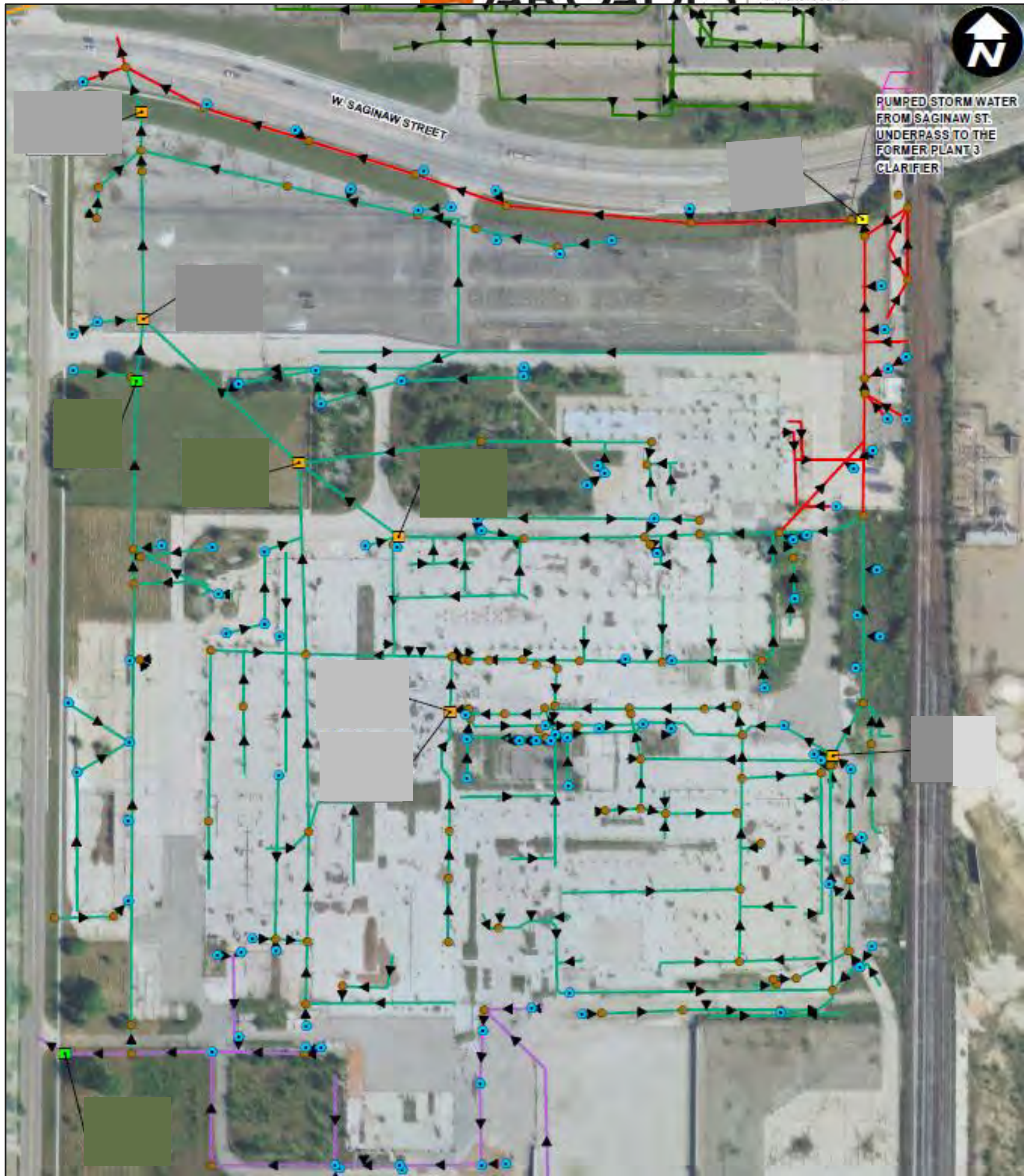
- Inspect outfall manhole P3-MH-NE quarterly for one year
- Inspect outfall manhole P3-MH-NE following first heavy rain event
- Sample for PFAS during inspections if discharge from the outfall is observed
- During performance monitoring, must keep in mind:
  - Possibility of infiltration of surface water and/or groundwater into sewer line downstream of the monolith
  - Discharge will likely not stop immediately, will require the pipe between the filled manhole and monolith to drain and reach equilibrium with surrounding soil
- If leakage/flow is observed in west main during camera inspection following cleaning, evaluate filling upstream manhole (P3MH-1-1) with underwater concrete.
- If PFOS discharge continues to exceed Rule 57 criteria, evaluate cleaning of the east main north of the monolith and/or the outfall sump to address water and/or sediment that could be a linger source of PFAS

Plant 2 – Storm Sewers

Systematic Approach

- Identify
  - Investigate storm sewers to identify distribution of PFAS in storm sewers
  - Incorporate flow conditions to evaluate mass flux in the system
- Rank
  - Rank the priorities based on mass flux (impacted and non-impacted)
- Address
  - Complete storm sewer modifications that reduce mass flux to outfall but maintain drainage in non-impacted area to the extent practicable
  - Modifications to be completed step wise starting internal to the Site / near source areas and working out from there

Identify → Rank → Address



Identify - Plant 2 PFOS Results Summary

- Initial round of sampling in January 2019 (9 structures)
  - 7 structures above PFOS criteria, including northern property outfalls
  - Southwestern outfall below criteria
- Confirmatory sampling and structure investigation took place in March 2019
  - Results consistent with January event

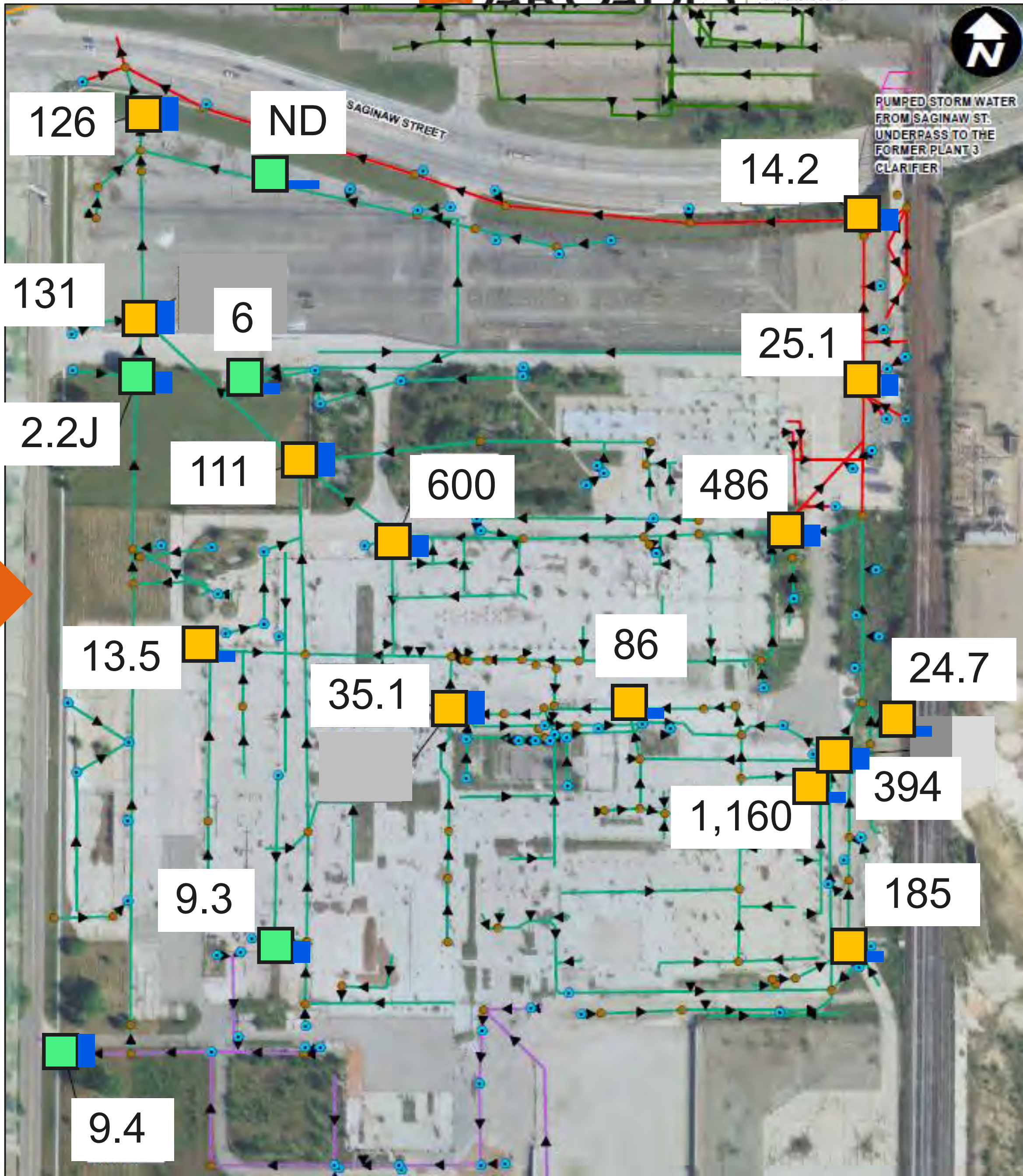
PFOS Results are in µg/L

- Does not exceed criteria
- Exceeds PFOS Surface Water Criteria (12 µg/L)

Flow Under Dry-Weather Conditions

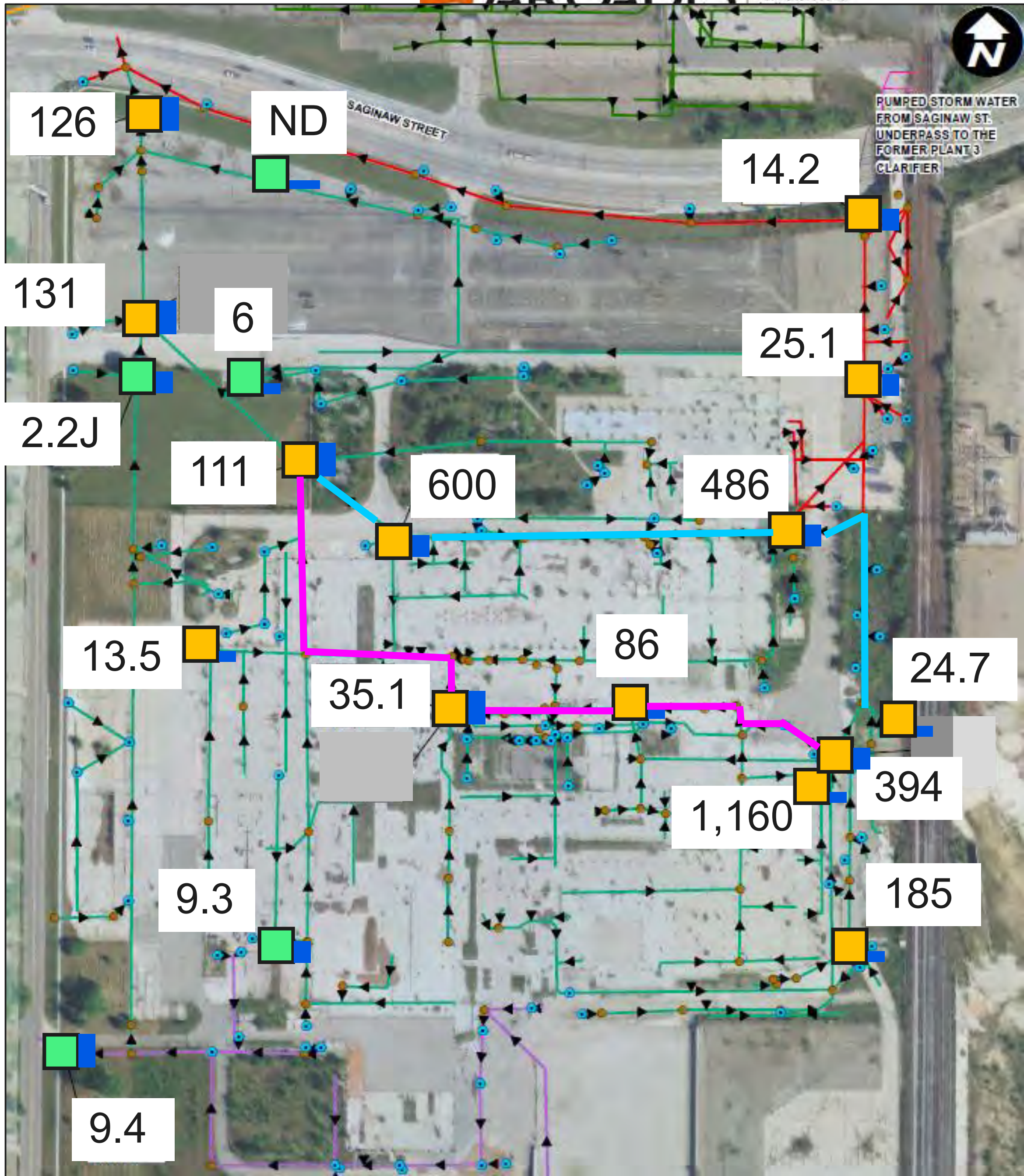
- Moderate Flow
- Little Flow
- Trickle

ARCADIS Design & Consultancy for natural and



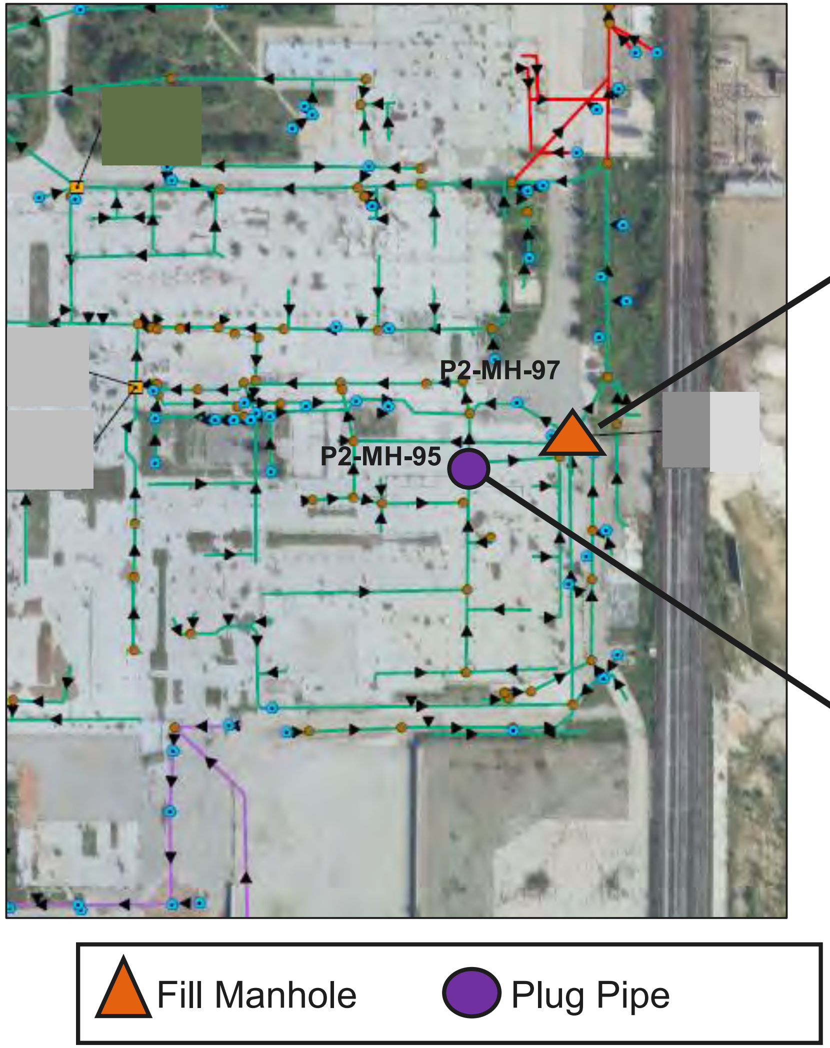
Rank Plant 2 Priorities

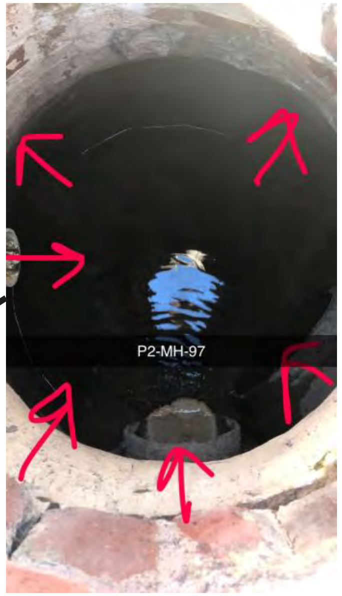
- P2-MH-96 : PFOS @ 1,160 ppt
  - Low flow, but concentrated contribution leading to elevated concentrations along northern flow path toward the northern Plant 2 outfall
- P2-MH-97 : PFOS @ 394 ppt
  - Higher flow, receiving inputs from P2-MH-96 and southern area with PFOS at 185 ppt
- Flow paths / drainage areas outside of the P2-MH-97 drainage area have low PFOS concentration



Address - Plant 2 Proposed Modifications

- Fill P2-MH-97 with underwater concrete
  - Underwater concrete minimizes generated waste (which will require disposal)
  - Quicker and safer installation
- Plug MH-95 to mitigate the risk of a backup and bypass
- Cap catch basins in drainage area
- Modifications internal to the Site
- Affected drainage area is relatively small
- Assess PFOS reductions in sewer network and at outfall following modification to evaluate if additional modifications are necessary





Performance Monitoring and Contingency

- Monitoring surface ponding and runoff for the first four precipitation events following the modifications
- Quarterly monitoring of of the perched water levels in nearby wells
- Quarterly monitoring of the Plant 2 outfall (P3-MH-30) for one year
- If PFOS discharge continues to exceed Rule 57 criteria, complete storm sewer sampling to re-assess the conditions and identify the next highest priority for potential sewer modification

Path Forward -

July 2019

- Plant 3 Biosparge Startup
- Plant 3 PFAS Addendum

July/August 2019

- Plant 2 Southeast PFAS Investigation
- Plant 6 PFAS Phase 2 investigation and sewer sampling addendum
- Plant 2 LNAPL CSM
- Plant 2 & 3 sewer modification
- Begin Plant 2 Biosparge Point Installation

August/September 2019

- Submit final revised IGMP
- Semi-Annual GW Sampling Report
- Plant 2 PFAS Investigation Memo
- Bedrock Monitoring Well Installation

References

Arcadis, 2014. Preliminary Geochemistry and Plume Stability Assessment. RACER Trust Site, Lansing, Michigan. September 17.

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Arcadis 2019b. Plant 2 LNAPL PFAS Investigation, RACER Trust Site, Lansing, Michigan. June 21