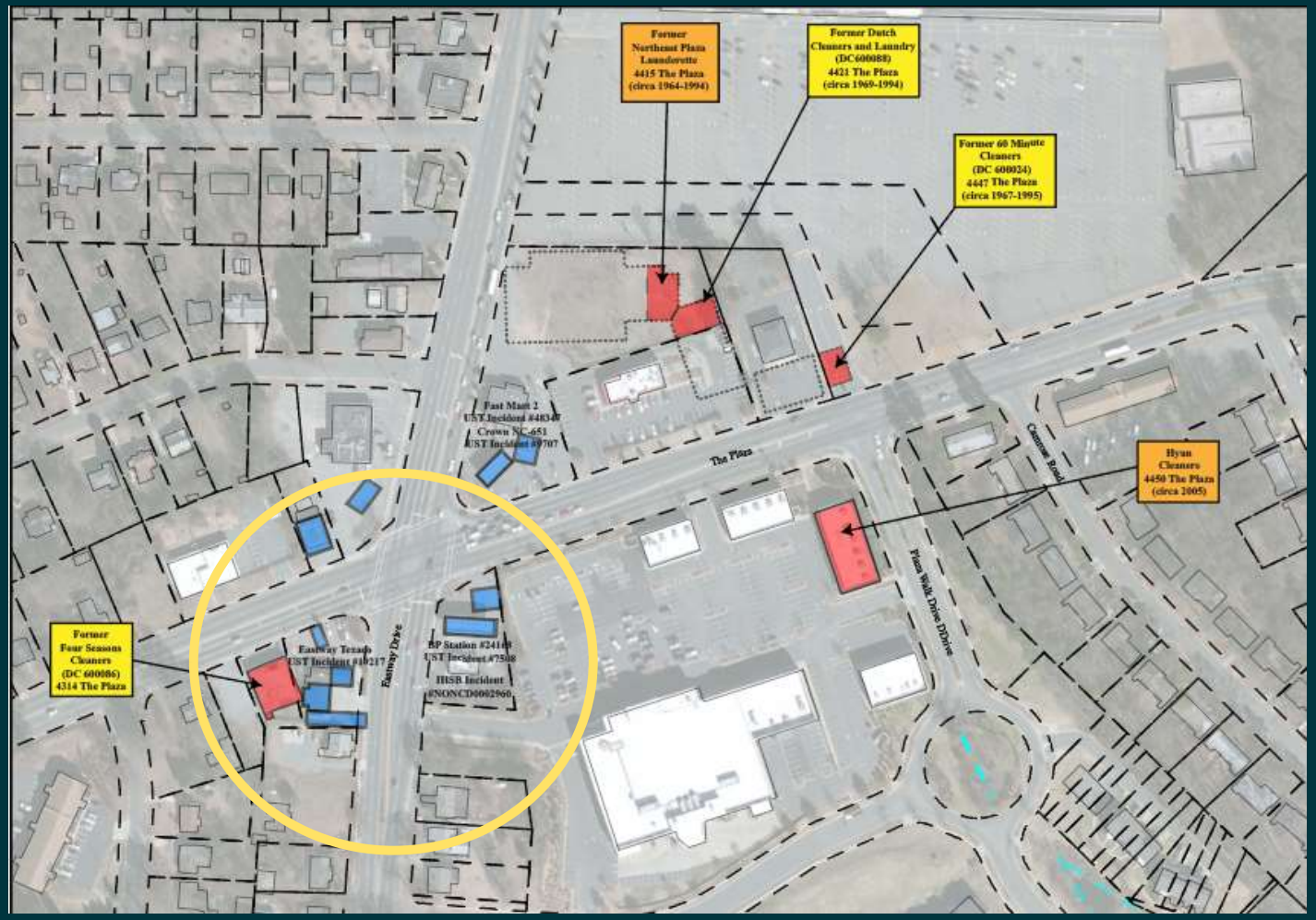
Thanks Delonda and Billy for the opportunity to present the findings of our assessment and remediation activities at the Four Seasons Cleaners site in Charlotte. Our presentation will be a high-level overview of how we used our assessment data to build a conceptual site model for the purpose of mitigating and remediating indoor air quality at the abandoned dry cleaner location.

Introduction: Four Seasons Cleaners, DC600068

1. Here we have a view of the site building currently occupied by Metro by T-Mobile, a cell phone store, and the GEB Food Mart (now Plaza Convenience Store)
2. The former Four Seasons Cleaners operated as a full-service PERC dry-cleaning facility inside the Metro by T-Mobile between 1964 and 1979.

Site Vicinity & Surrounding Release Incidents



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1. The site is surrounded by numerous other sources of contamination
2. Of note are the Eastway Texaco and the IHSB Incident located a little further east and downgradient of the site
3. Both the Eastway Texaco and IHSB Incident have documented PCE in soil and/or groundwater
4. As we developed our conceptual site model for this site and evaluated risk associated with the source of contamination from the former Four Seasons Cleaners operations, the presence of the adjacent and adjacent solvent impacts associated with the releases focused DSCA-related assessment activities on the site and surrounding properties to the north, south, and west.

Site Assessment Activities - Soil

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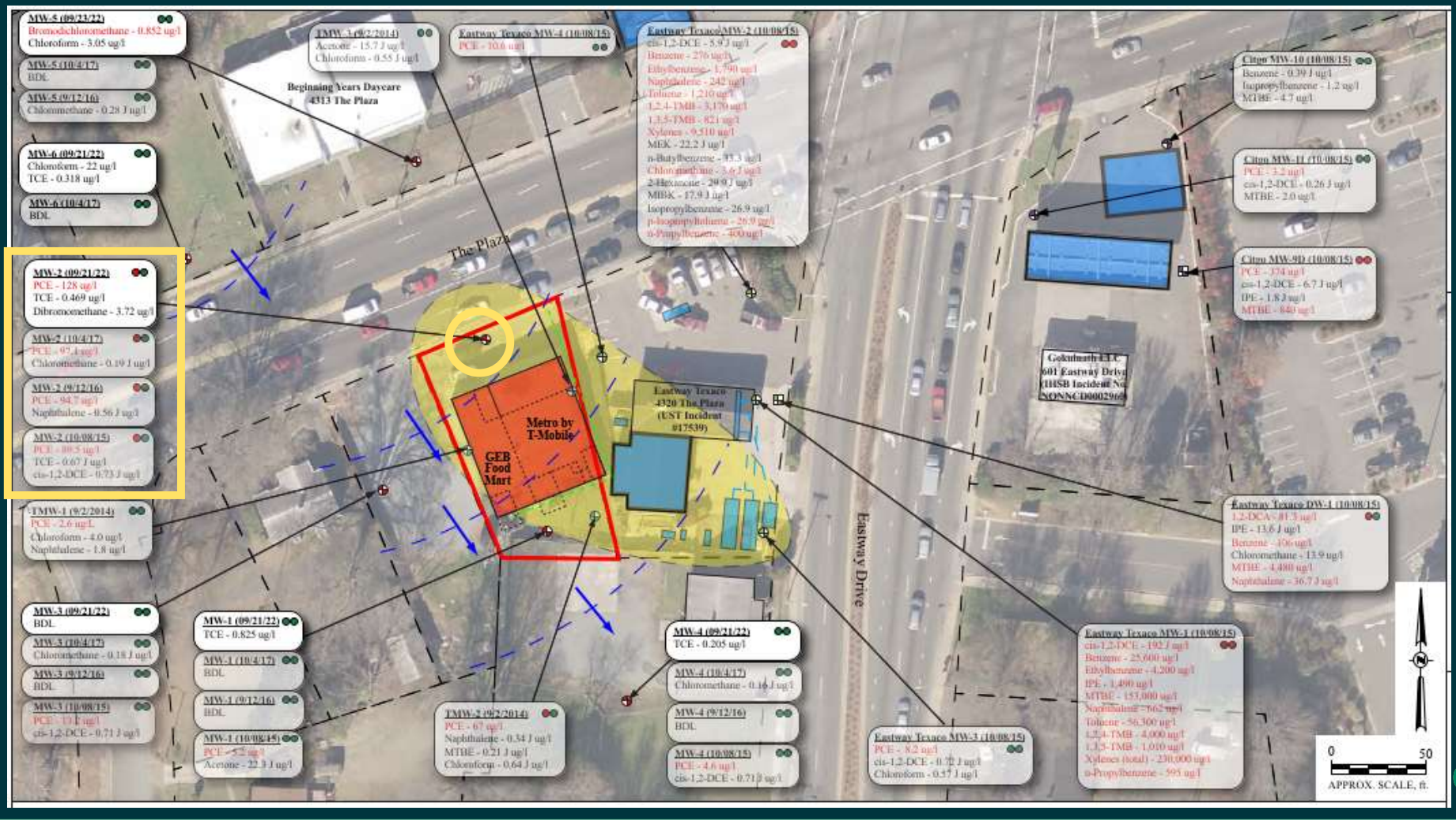
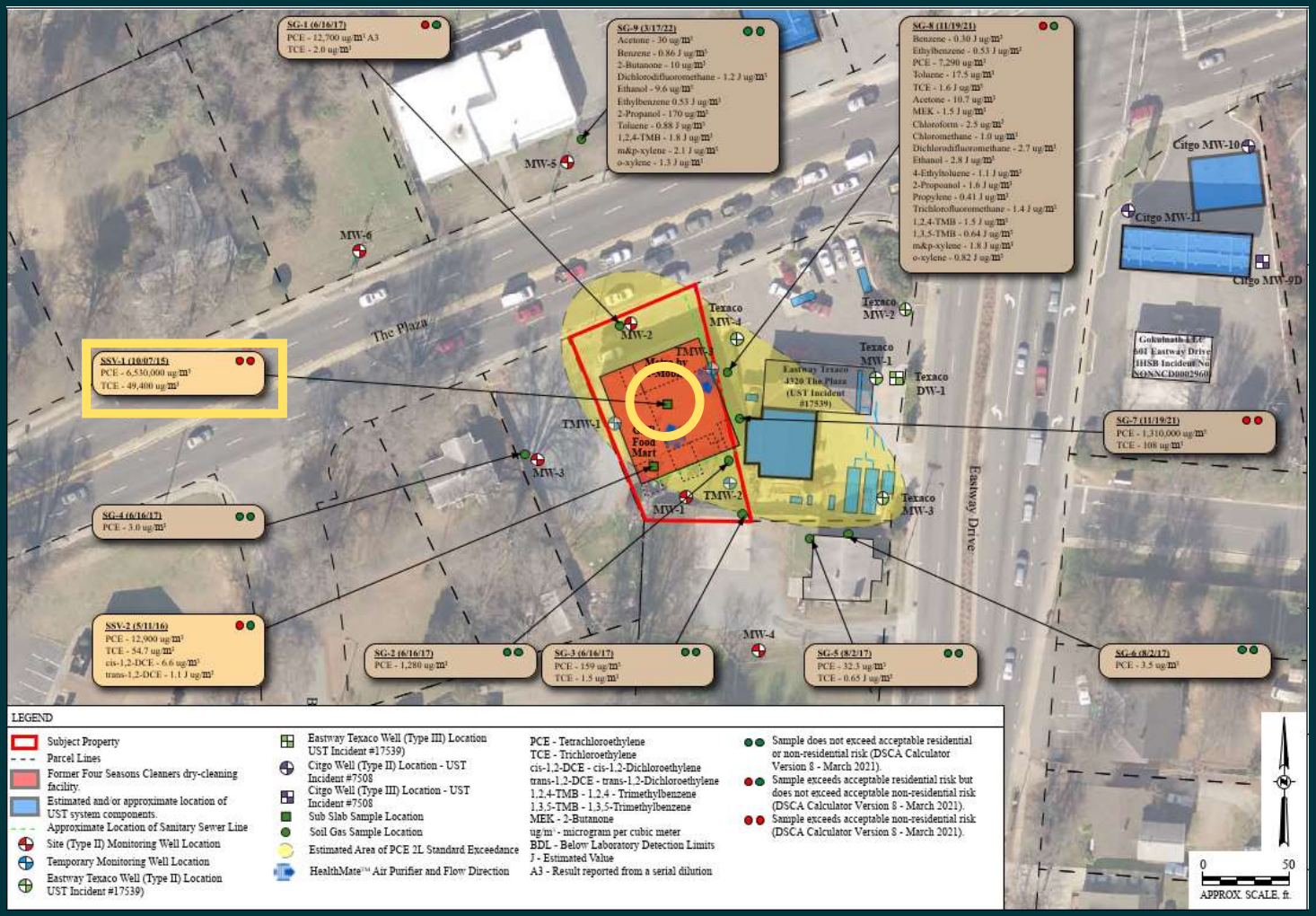
1. The first phase of developing our conceptual site model involved assessment of soil, groundwater, vapor, and indoor air.
2. This slide shows our shallow source soil impacts exceeding the Preliminary Soil Remediation Goal which are generally defined and located directly beneath the Metro by T-Mobile tenant space.

Site Assessment Activities - Groundwater



1. This slide shows our groundwater impacts exceeding the NC 2L Groundwater Quality Standard for PCE
2. The site is located on topographic high and groundwater flow direction varies from southeast to northwest but groundwater exceedances of the 2 L standard are adequately defined
3. As shown, the groundwater impacts from the Four Seasons Cleaners site are comingled with groundwater impacts associated the former Eastway Texaco
4. For those not familiar with the red and green dots, they are graphic depictions of calculated vapor intrusion risk – which makes it easy to see where site conditions may create a vapor intrusion exposure pathway
5. Our highest vapor intrusion risk determined from DSCAs risk calculators correlates closely with our soil source findings.

Site Assessment Activities – Soil Gas & Sub-slab Vapor (Pre-Mitigation)



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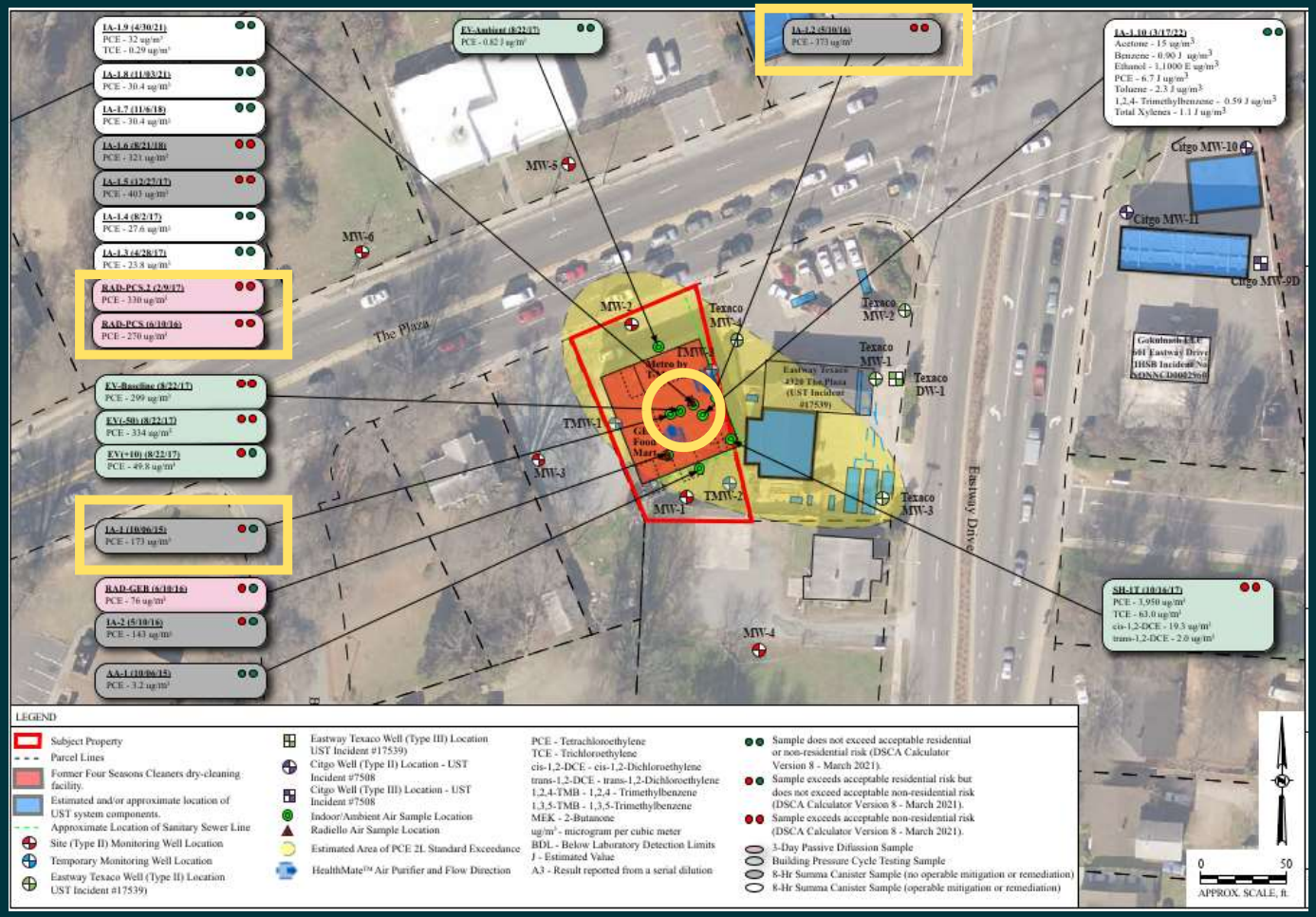
1. This slide shows our sub-slab vapor and soil gas impacts collected to date
2. Of particular importance we have sub-slab vapor data indicating potential VI risk to the current occupants
3. I'd also like to point out that the sub-slab vapor quality data also correlates closely with our soil and groundwater source findings
4. In addition, there is a soil gas point along the eastern property boundary that fails both residential and non-residential exposure which does create potential offsite exposure issue
5. However as previously mentioned this site does have its own PCE impacts and is overseen by the UST program.

Site Assessment Activities – Indoor Air Quality



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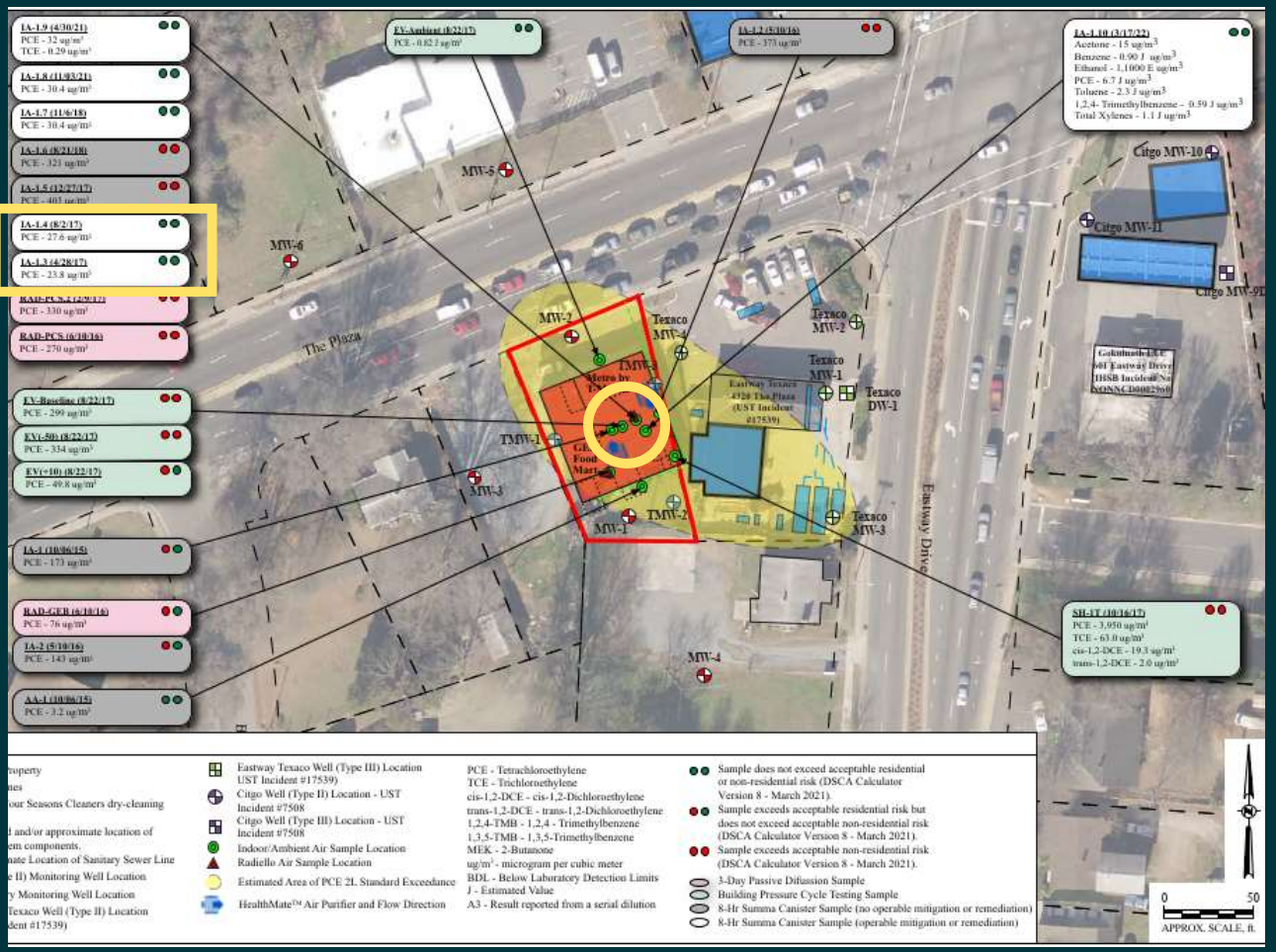
1. There is a lot going on with this slide, but it summarizes our indoor air quality data generated to date
2. Highlighted is the 2015, 2016, and 2017 data that prompted action due to unacceptable inhalation exposure risk to the current workers.

Source Evaluation and Mitigation – Other



ENVIRONMENT

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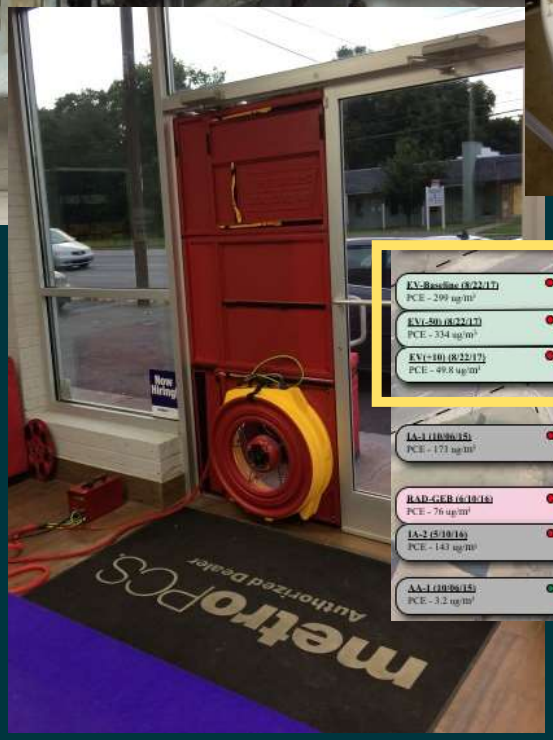
1. As an interim measure, we installed Air Purifying Units (APUs) to filter IA concentrations to acceptable non-residential worker concentrations / risk
2. These are typically used for rapid response to TCE exposure, but we implemented them at this site to allow additional time to evaluate the cost/ benefit of HVAC modifications, a sub-slab depressurization system, a soil vapor extraction system, and some other mitigation and remedial options.

Source Evaluation and Mitigation – Other



ENVIRONMENT

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1. With the interim remedial action in place, we:
   - Sealed up floor crack and patched holes in walls
   - Looked at altering the HVAC and finishing the floor and walls
   - And conducted “envelope” or building pressure cycle testing (BPCT)
2. Under positive pressure conditions, the indoor air quality was acceptable
3. However, under negative pressure, it was obvious that the dry traps in the unused restroom were a contributing factor to poor indoor air quality was observed, but it was not believed to be the only source.

Source Evaluation and Mitigation – Heat Map

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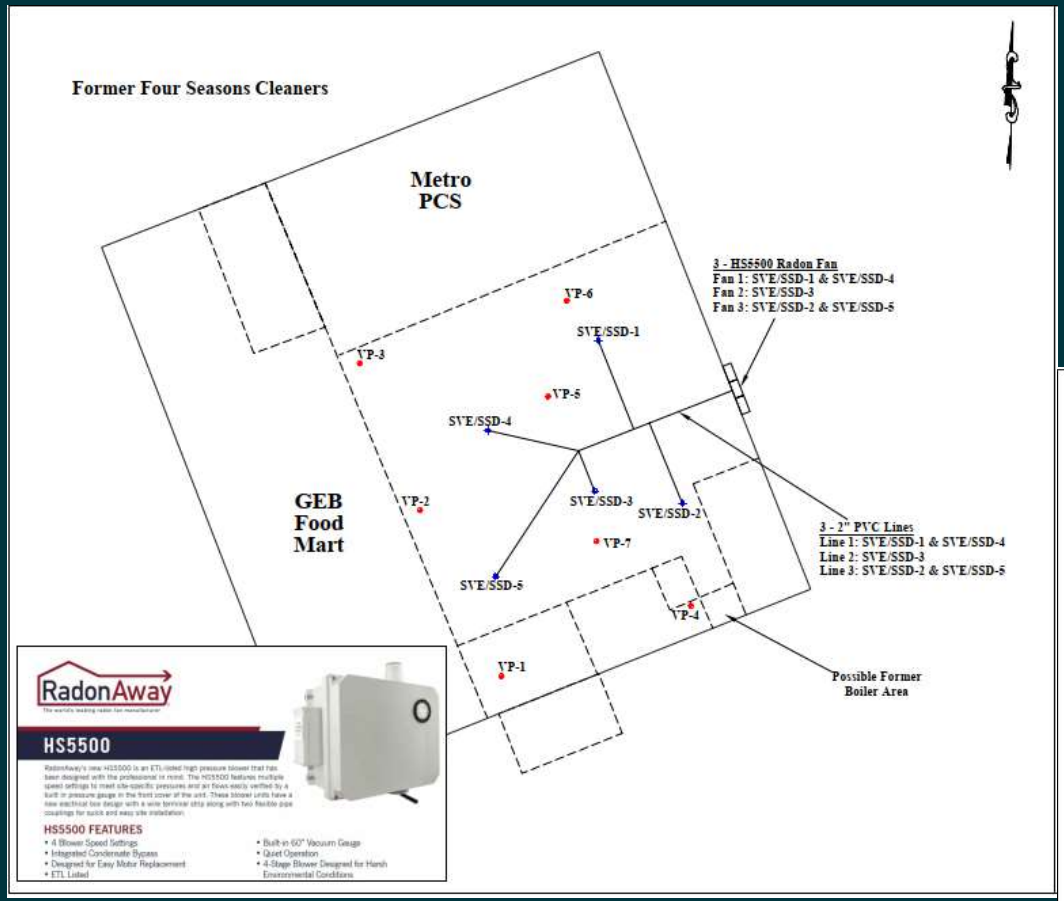
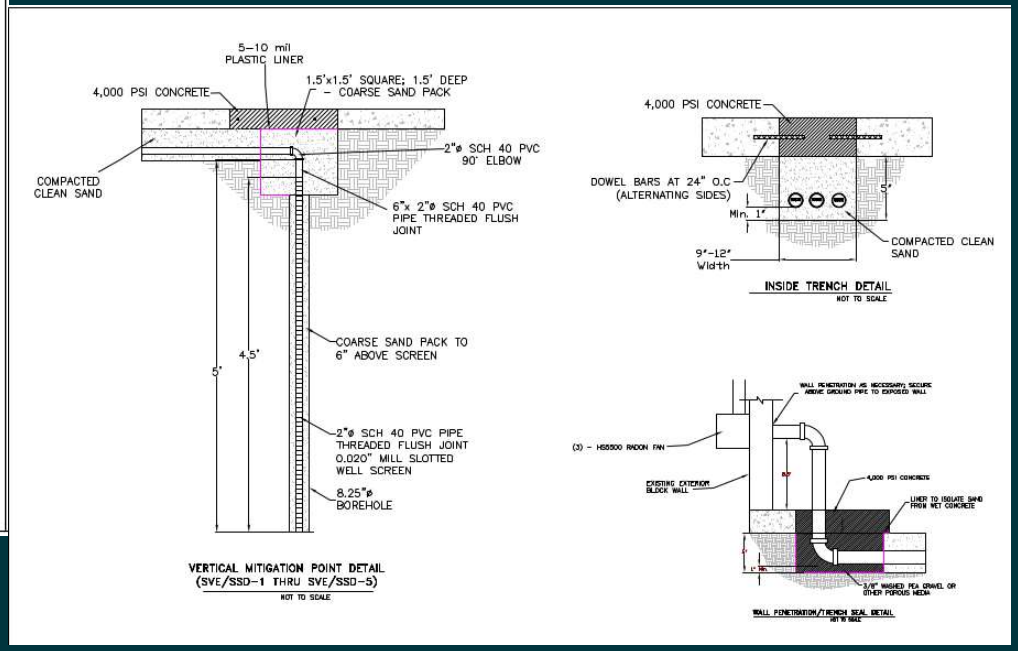
1. To further evaluate source areas at the site, we installed 20 temporary vapor monitoring points in a gridded array and screened total vapor concentrations beneath the slab
2. We used the vapor screening measurements to create the “heat” map you see here
3. The red shows the area of greatest impact which correlates well with the previously generated soil, groundwater, and other sub-slab vapor data
4. The soil, groundwater, and vapor data all pointed to a localized area for mitigation and remediation that could be targeted
5. Based on this configuration, as well as the results of a ROI influence test, it looked possible to not only mitigate but to possibly remediate and improve conditions enough that long term system operation would not be necessary
6. As such, a soil vapor extraction or SVE system was selected as our remedial approach.

Soil Vapor Extraction/Sub-slab Depressurization System As-Built





ENVIRONMENT

1. This slide shows the SVE system layout and schematics
2. For remediation purposes, the SVE system design incorporated 5 vertical extraction points to perform mass removal from the shallow soil impacts
3. In addition, the extraction points were constructed so the system could act dually as a sub-slab depressurization system SSD system to mitigate vapor intrusion impacts if the system needed to be operational for a longer period of time
4. Theoretically, the dual functions would allow the system to aggressively strip and remove contaminant mass from the soil and reduce the available contaminant mass available to impact indoor air quality.

Sub-slab Vapor Extraction/Sub-slab Depressurization System

RadonAway

The world's leading radon fan manufacturer

HS5500

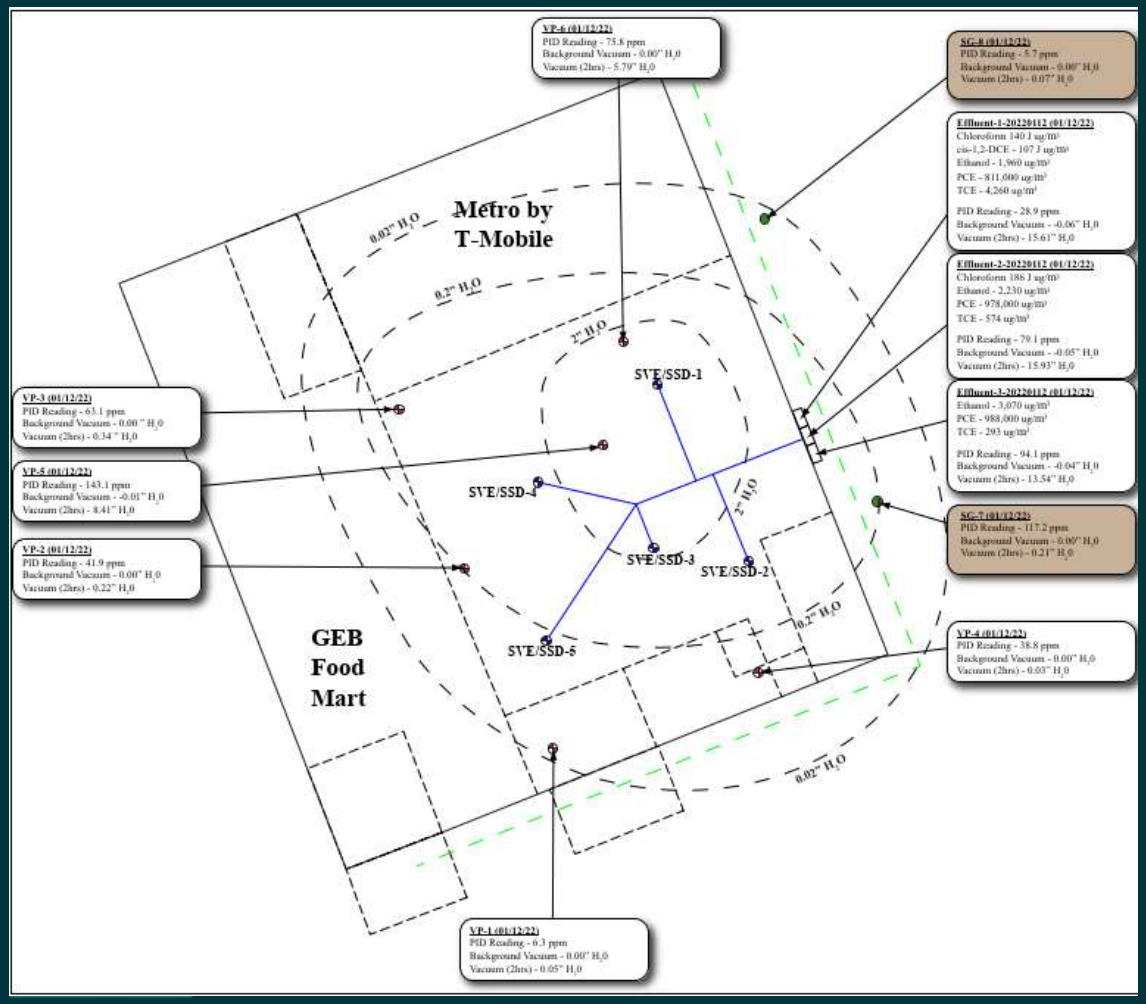
RadonAway's new HS5500 is an ETL-listed high pressure blower that has been designed with the professional in mind. The HS5500 features multiple speed settings to meet site-specific pressures and air flows easily verified by a built in pressure gauge in the front cover of the unit. These blower units have a new electrical box design with a wire terminal strip along with two flexible pipe couplings for quick and easy site installation.

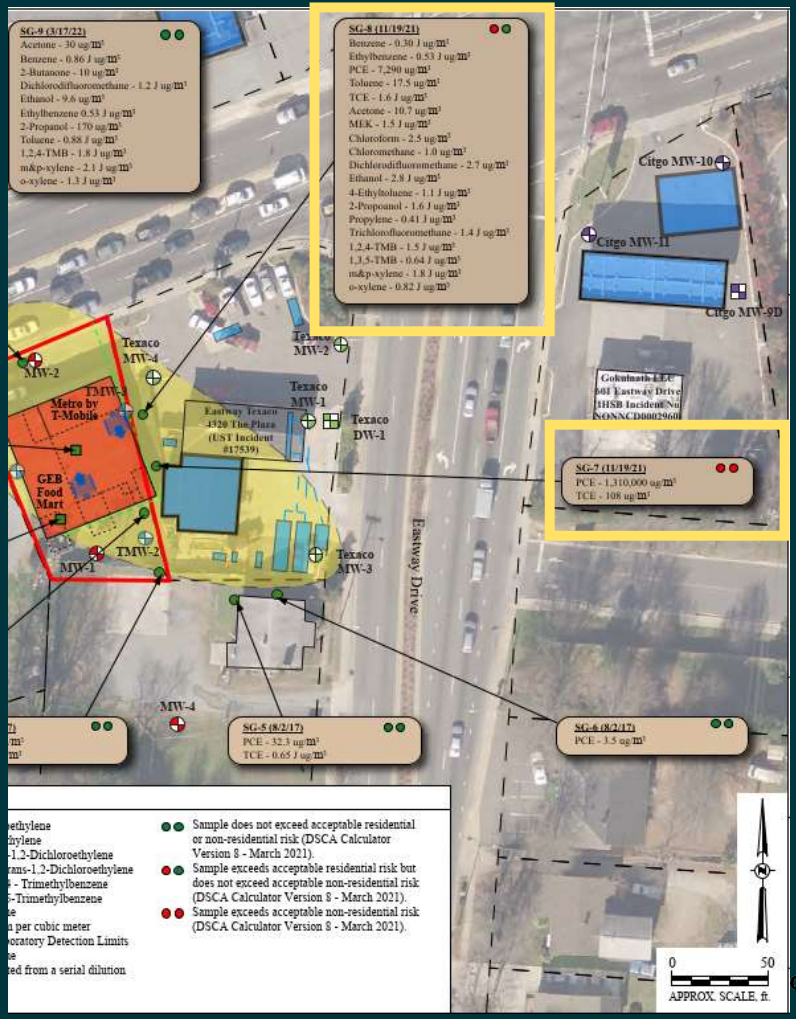
HS5500 FEATURES

- 4 Blower Speed Settings
- Integrated Condensate Bypass
- Designed for Easy Motor Replacement
- ETL Listed
- Built-in 60" Vacuum Gauge
- Quiet Operation
- 4-Stage Blower Designed for Harsh Environmental Conditions

1. This slide has a couple pictures of the system installation and the blowers that were selected
2. For our system, we opted to install some smaller high-powered radon fans to reduce costs, noise, and maintenance
3. Because the fans were much smaller, we were able to mount them up high on the exterior wall and eliminate housing
4. The reduced cost also allowed us to split the system up into 3 different legs so that in the case of a fan failure, the system would still be able to operate as intended using the other fans

Sub-slab Vapor Extraction/Sub-slab Depressurization System As-Built





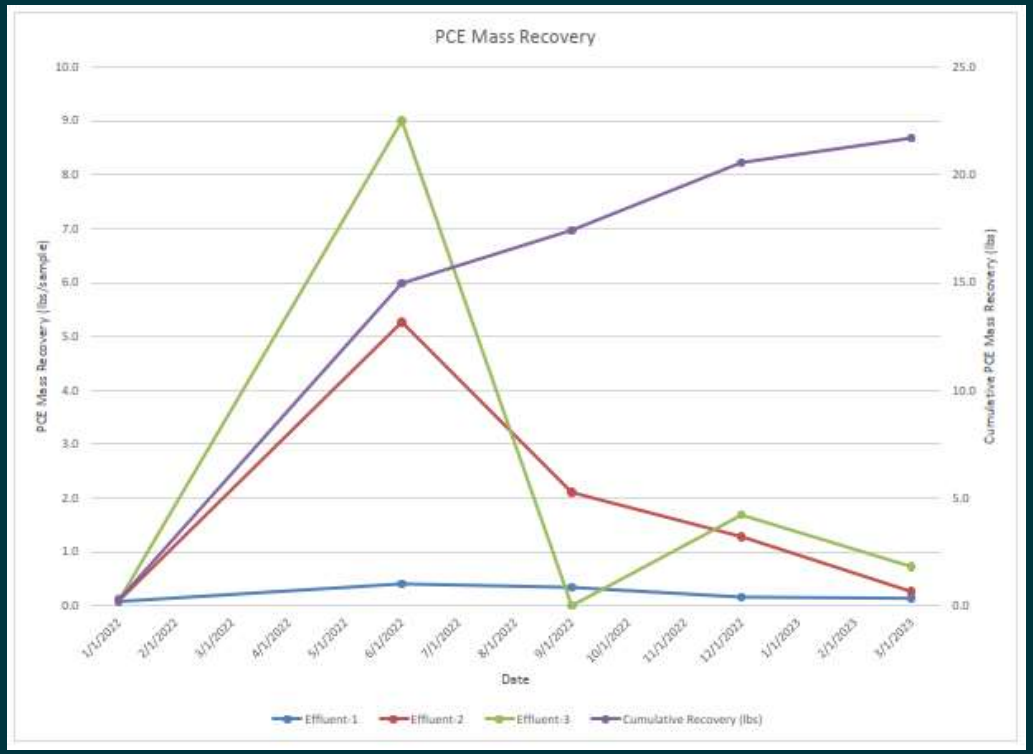
1. After startup we observed significant influence beneath the slab of the building
2. The goal of the system was mass removal, but as you can see here the system was able to induce a pressure field that met mitigation criteria of negative 4 pascal or 0.02 inches of water beneath the slab of the Metro by T-Mobile tenant space
3. As an added bonus, influence was also measurable at the shared property boundary to the east where elevated soil gas concentrations were observed in soil gas points SG-7 and SG-8

SVE/SSD System Effectiveness

Table 9
SVE/SSDS MASS REMOVAL CALCULATIONS
DATA ANALYSIS
Four Seasons Cleaners

Sample Date	Air Sample ID	Elapsed Operating Time Between Samples (min)	Air Flow Rate[1] (ft^3/min)	Tetrachloroethylene[2] ($\mu g/m^3$)	Conversion Factor[3] ($lb\text{-}m^3/mg\text{-}ft^3$)	PCE Mass Removal per Sample[4] (lb. recovered per sample)
01/12/22	Effluent-1-20220112	30	55	811	6.243E-08	0.084
01/12/22	Effluent-2-20220112	30	55	987	6.243E-08	0.102
01/12/22	Effluent-3-20220112	30	55	988	6.243E-08	0.102
06/28/22	Effluent-1-20220628	240,480	55	0.50	6.243E-08	0.413
06/28/22	Effluent-2-20220628	240,480	55	6.38	6.243E-08	5.268
06/28/22	Effluent-3-20220628	240,480	55	10.90	6.243E-08	9.000
09/26/22	Effluent-1-20220926	129,600	55	0.775	6.243E-08	0.345
09/21/22	Effluent-2-20220921	122,400	55	5.01	6.243E-08	2.106
09/21/22	Effluent-3-20220921	122,400	55	0.0146	6.243E-08	0.006
12/12/22	Effluent-1-20221212	110,880	55	0.43	6.243E-08	0.164
12/12/22	Effluent-2-20221212	110,880	55	3.36	6.243E-08	1.287
12/12/22	Effluent-3-20221212	110,880	55	4.43	6.243E-08	1.687
03/09/23	Effluent-1-20230309	125,280	55	0.331	6.243E-08	0.142
03/09/23	Effluent-2-20230309	125,280	55	0.616	6.243E-08	0.265
03/09/23	Effluent-3-20230309	125,280	55	1.70	6.243E-08	0.731
	Average Airflow:		**55.00**	**Total Recovered PCE (lb):**		**21.70**

Notes:
1. Air flow rates were extrapolated using system vacuum readings and RadonAway HS5500 blower curve.
2. PCE concentrations in the exhaust are based on analytical data collected during site visits.
3. Conversion factor to convert units of concentration from ug/m^3 to lb/ft^3.
4. Mass removal rate (lb) = (air flow rate) x (PCE Conc.) x (conversion factor) x (elapsed operating time).
5. Effluent-1, Effluent-2, and Effluent-3 were redesignated as SSDS-1, SSDS-2, and SSDS-3 in May 2022.



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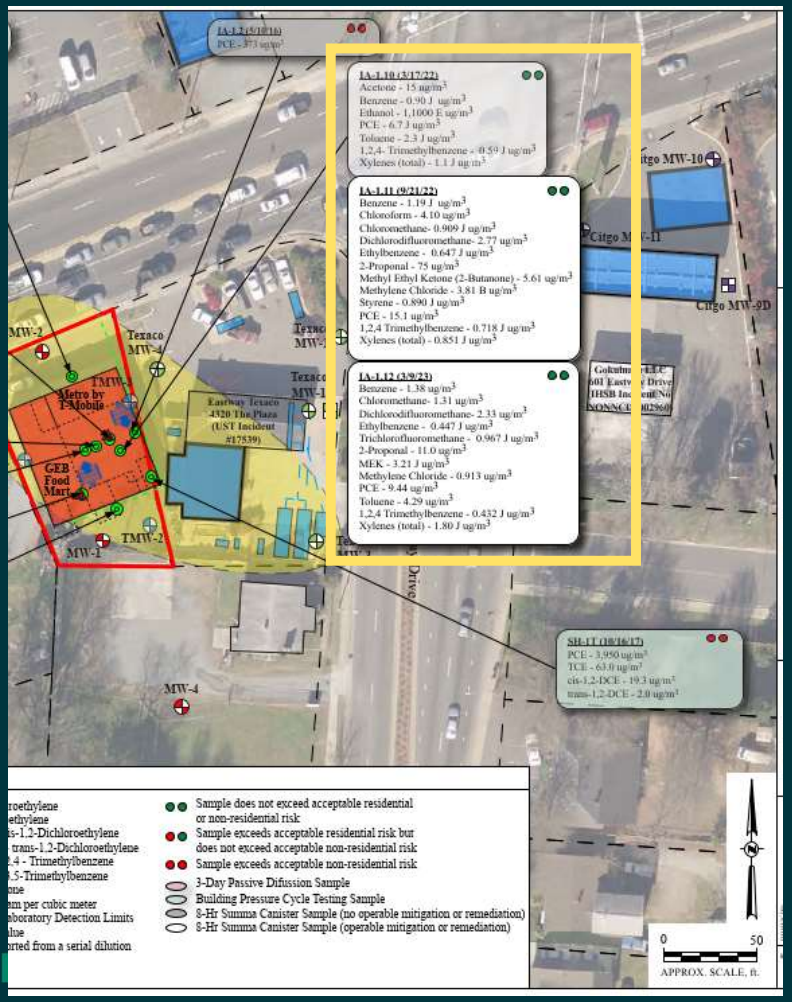
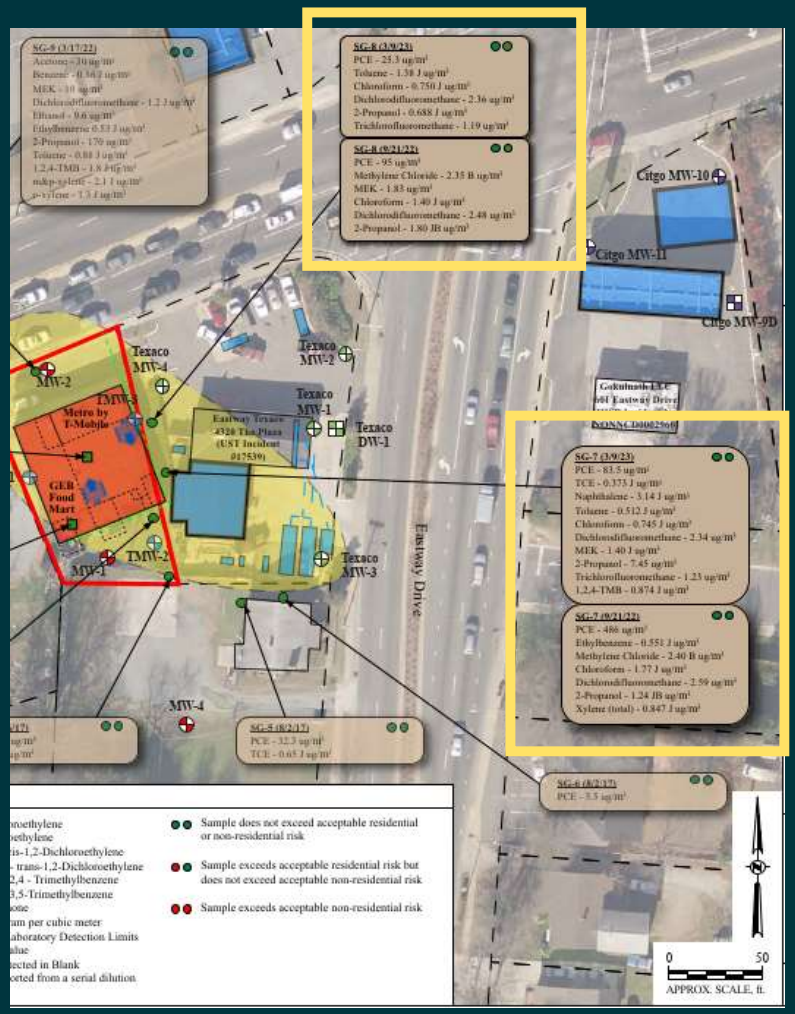
1. As of March 2023, the system has removed approximately 22 pounds of PCE and is approaching asymptotic conditions.

Updated Indoor Air and Soil Gas Quality Data





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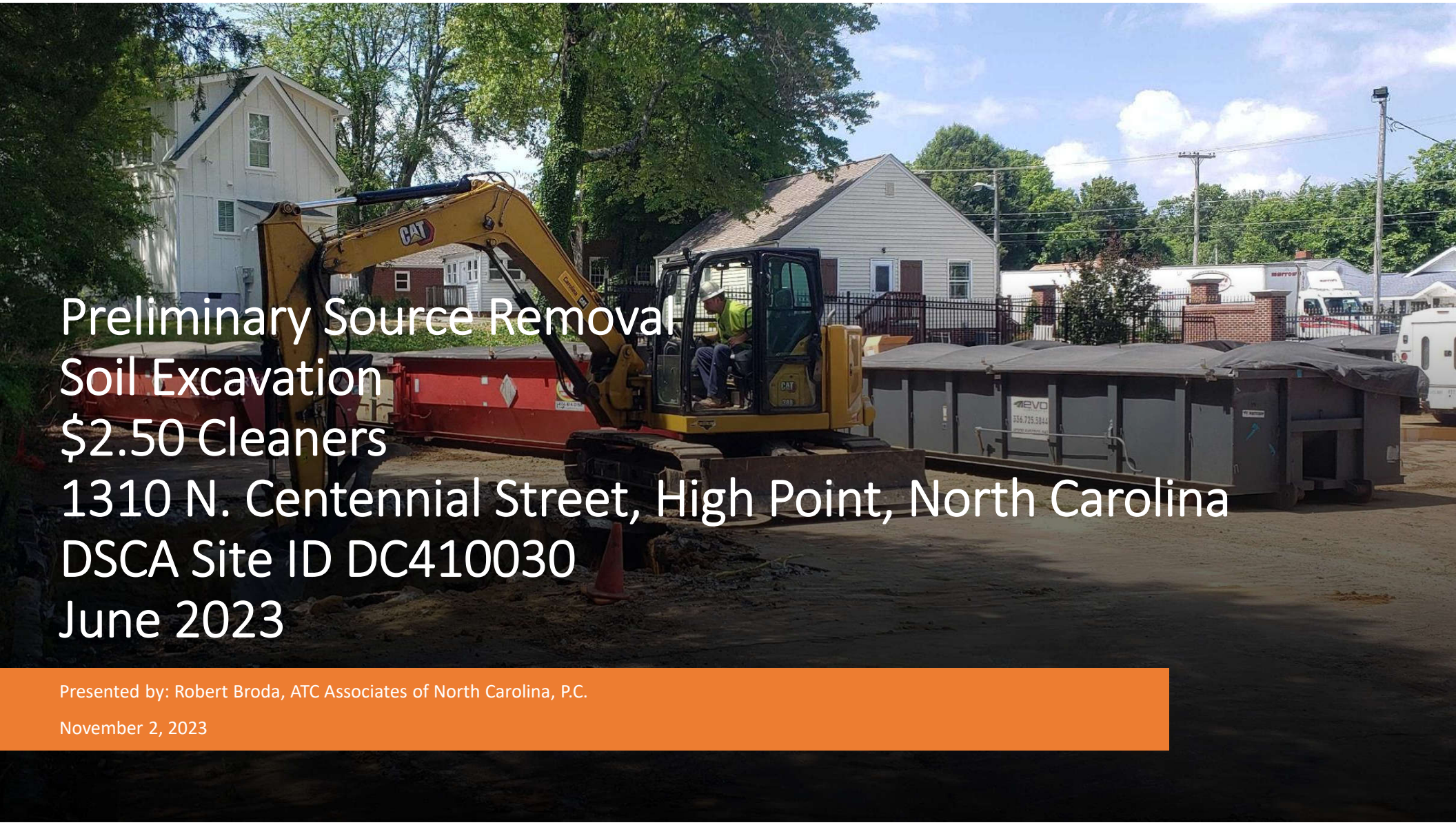
1. Finally, this slide shows the effect of the mass removal and mitigation efforts have had on the indoor air quality and identified vapor intrusion risks
2. On the left, you can see indoor air quality has shown significant improvement while the system has been operational
3. On the right, we also see significant reduction in PCE impacted soil gas at the shared property boundary

In summary, our conceptual site model for the Four Seasons Cleaners site identified an indoor air inhalation exposure risk to the current workers inside the Metro by T-Mobile store, as well as potential vapor intrusion risks to the off-site property to the east and future use scenarios. However, the selected system design appears to be successful at removing the PCE mass beneath the slab as well as mitigating the vapor intrusion impacts to the site building and the adjacent property to the east.

Thank you!
Questions?

AECOM Delivering a better world

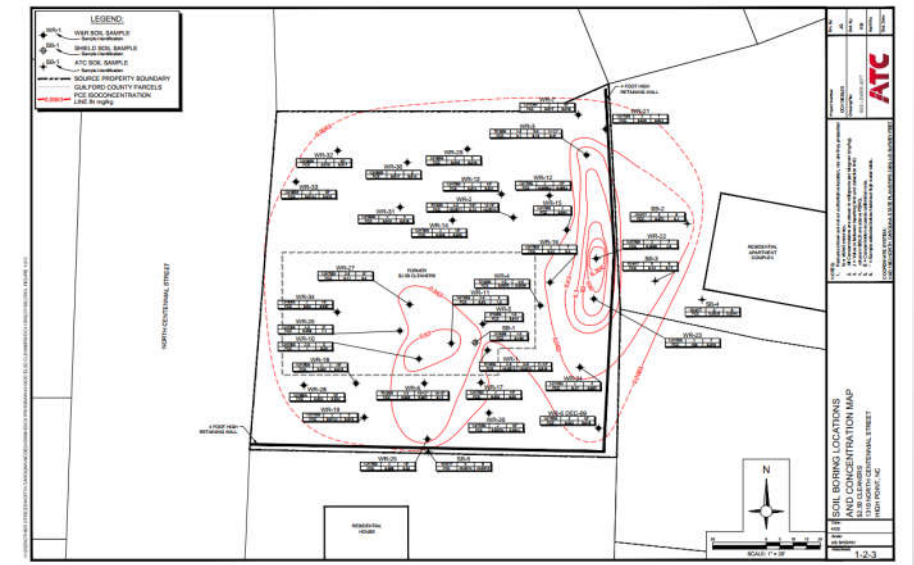
This story is to be continued, as we will continue to monitor the system's performance, evaluate the necessity for continued operation, and assess potential rebound if the system is taken offline. But I'd like to thank you for your time and feel free to ask any question.



Preliminary Source Removal
Soil Excavation
$2.50 Cleaners
1310 N. Centennial Street, High Point, North Carolina
DSCA Site ID DC410030
June 2023

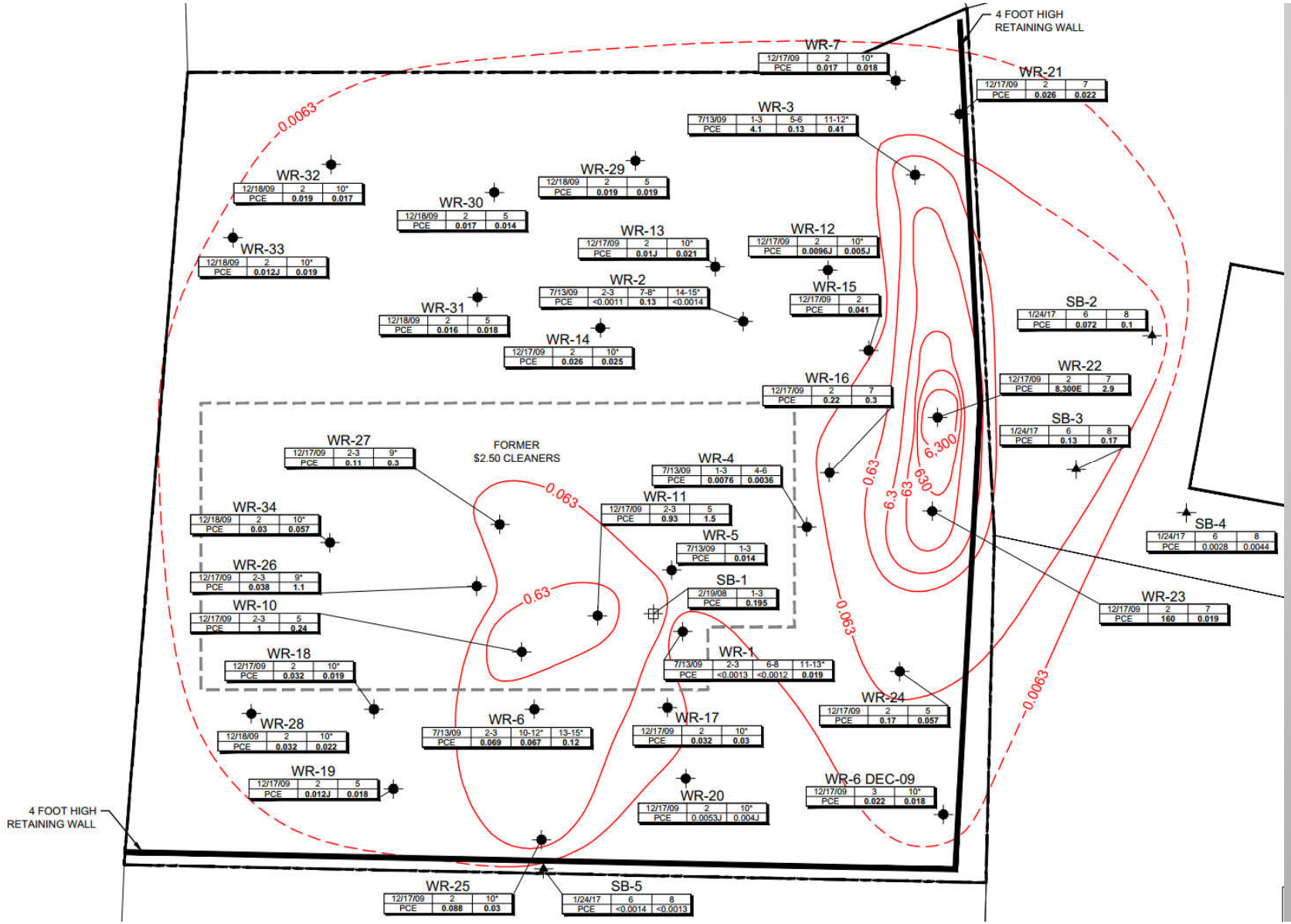
Presented by: Robert Broda, ATC Associates of North Carolina, P.C.

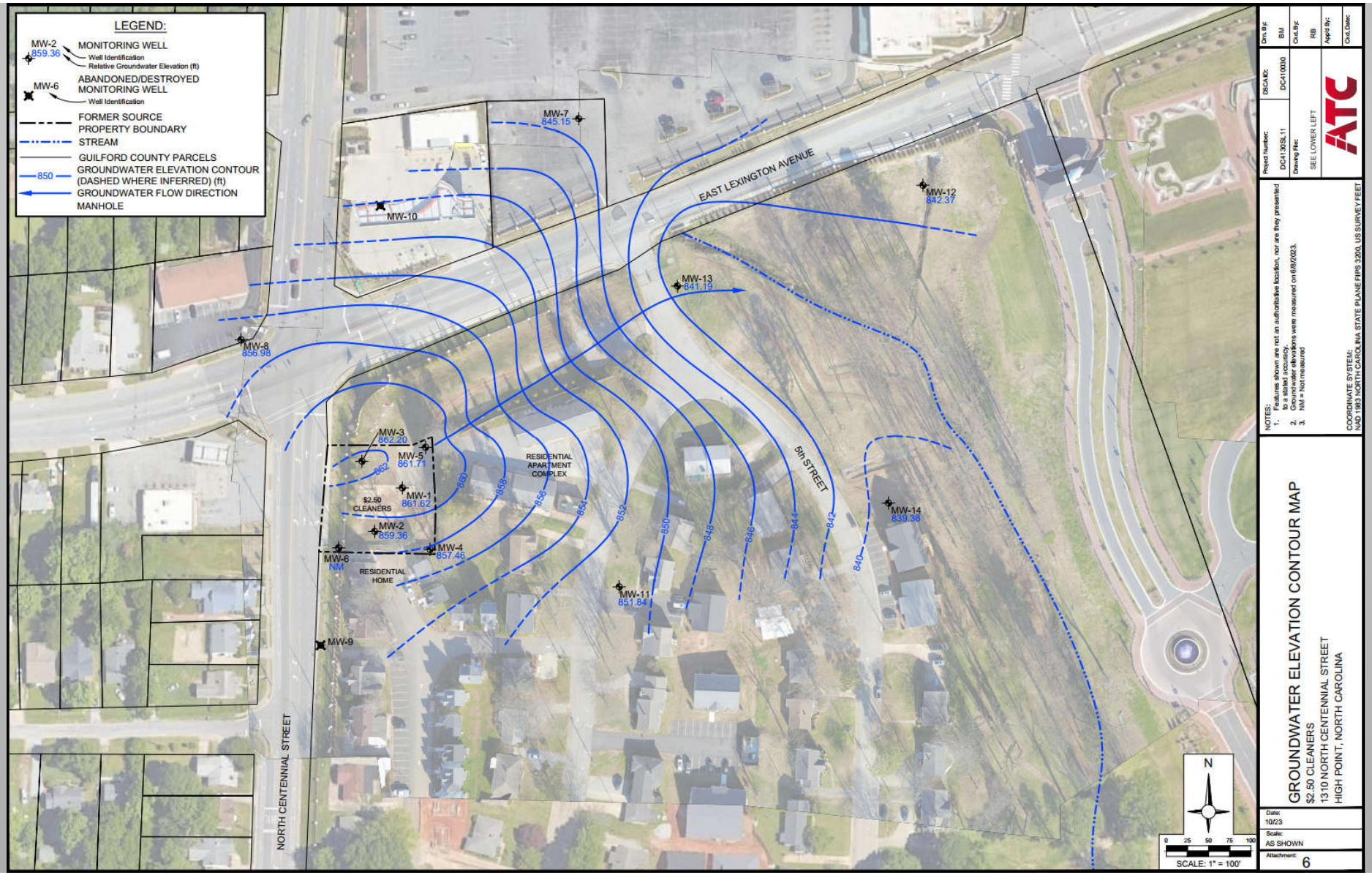
November 2, 2023



Site Background and Justification for Excavation

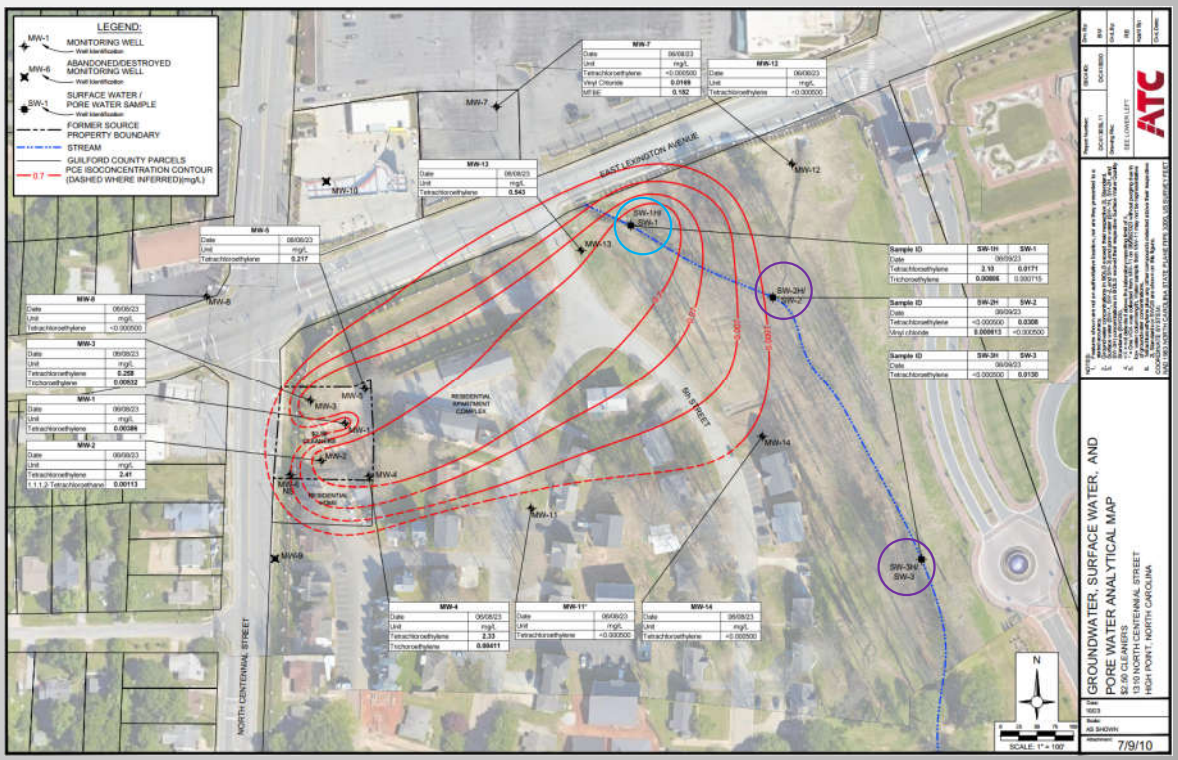
- Soil tetrachloroethylene (PCE) concentrations were measured up to **8,300** mg/kg in 2009 (concentrations indicative of NAPL).
- Dry-cleaning building was demolished in August 2017 and source property is a vacant lot near a residential neighborhood.
- New owner had aspirations of redeveloping the aera and turning area into a parking lot and/or residential housing.
- Removal of impervious surface may have increased the risk of rainwater extracting sorbed PCE from the soil and transferring it into the groundwater.
- Goal of excavation: Remove highly impacted soil and emplace remediation agent below the seasonal high water table in efforts to reduce groundwater concentrations and consequently reduce vapor intrusion risk and surface water impacts.

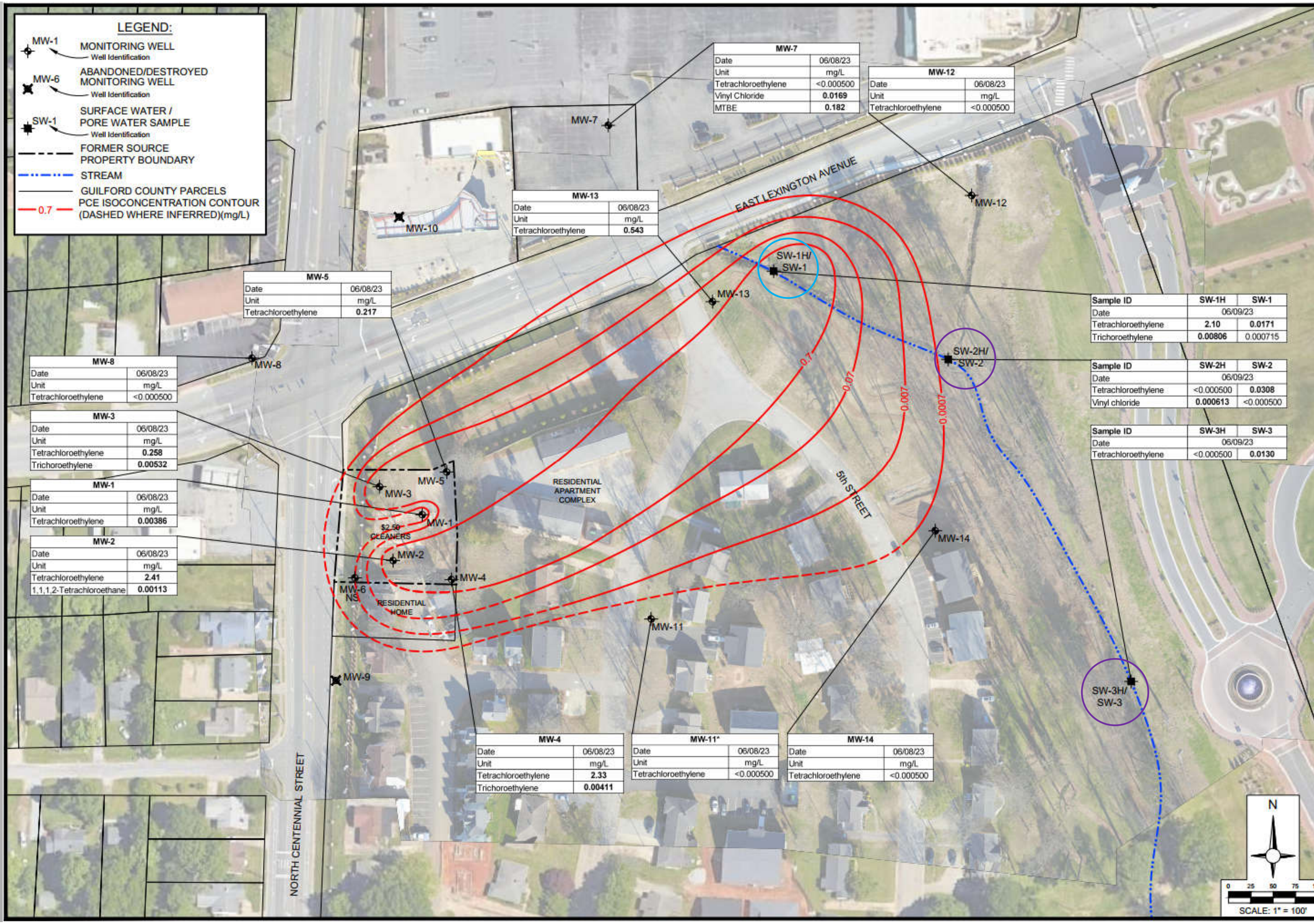

4 FOOT HIGH RETAINING WALL
WR-7
12/17/09 | 2 | 10*
PCE | 0.017 | 0.018
WR-21
12/17/09 | 2 | 7
PCE | 0.026 | 0.022
WR-3
7/13/09 | 1-3 | 5-6 | 11-12*
PCE | 4.1 | 0.13 | 0.41
0.0063
WR-32
12/18/09 | 2 | 10*
PCE | 0.019 | 0.017
WR-29
12/18/09 | 2 | 5
PCE | 0.019 | 0.019
WR-30
12/18/09 | 2 | 5
PCE | 0.017 | 0.014
WR-33
12/18/09 | 2 | 10*
PCE | 0.012J | 0.019
WR-13
12/17/09 | 2 | 10*
PCE | 0.01J | 0.021
WR-12
12/17/09 | 2 | 10*
PCE | 0.0096J | 0.005J
WR-2
7/13/09 | 2-3 | 7-8* | 14-15*
PCE | <0.0011 | 0.13 | <0.0014
WR-15
12/17/09 | 2
PCE | 0.041
SB-2
1/24/17 | 6 | 8
PCE | 0.072 | 0.1
WR-31
12/18/09 | 2 | 5
PCE | 0.016 | 0.018
WR-14
12/17/09 | 2 | 10*
PCE | 0.026 | 0.025
WR-16
12/17/09 | 2 | 7
PCE | 0.22 | 0.3
WR-22
12/17/09 | 2 | 7
PCE | 8,300E | 2.9
SB-3
1/24/17 | 6 | 8
PCE | 0.13 | 0.17
6,300
630
6.3
0.63
FORMER
$2.50 CLEANERS
WR-27
12/17/09 | 2-3 | 9*
PCE | 0.11 | 0.3
WR-4
7/13/09 | 1-3 | 4-6
PCE | 0.0076 | 0.0036
0.063
WR-11
12/17/09 | 2-3 | 5
PCE | 0.93 | 1.5
WR-34
12/18/09 | 2 | 10*
PCE | 0.03 | 0.057
WR-5
7/13/09 | 1-3
PCE | 0.014
SB-4
1/24/17 | 6 | 8
PCE | 0.0028 | 0.0044
WR-26
12/17/09 | 2-3 | 9*
PCE | 0.038 | 1.1
SB-1
2/19/08 | 1-3
PCE | 0.195
WR-10
12/17/09 | 2-3 | 5
PCE | 1 | 0.24
WR-23
12/17/09 | 2 | 7
PCE | 160 | 0.019
WR-18
12/17/09 | 2 | 10*
PCE | 0.032 | 0.019
WR-1
7/13/09 | 2-3 | 6-8 | 11-13*
PCE | <0.0013 | <0.0012 | 0.019
WR-24
12/17/09 | 2 | 5
PCE | 0.17 | 0.057
WR-28
12/18/09 | 2 | 10*
PCE | 0.032 | 0.022
WR-6
7/13/09 | 2-3 | 10-12* | 13-15*
PCE | 0.069 | 0.067 | 0.12
WR-17
12/17/09 | 2 | 10*
PCE | 0.032 | 0.03
WR-19
12/17/09 | 2 | 5
PCE | 0.012J | 0.018
WR-20
12/17/09 | 2 | 10*
PCE | 0.0053J | 0.004J
WR-6 DEC-09
12/17/09 | 3 | 10*
PCE | 0.022 | 0.018
4 FOOT HIGH RETAINING WALL
WR-25
12/17/09 | 2 | 10*
PCE | 0.088 | 0.03
SB-5
1/24/17 | 6 | 8
PCE | <0.0014 | <0.0013


LEGEND:
MW-2 859.36 MONITORING WELL
Well Identification
Relative Groundwater Elevation (ft)
MW-6 ABANDONED/DESTROYED MONITORING WELL
Well Identification
FORMER SOURCE PROPERTY BOUNDARY
STREAM
GUILFORD COUNTY PARCELS
850 GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED) (ft)
GROUNDWATER FLOW DIRECTION
MANHOLE
EAST LEXINGTON AVENUE
NORTH CENTENNIAL STREET
5th STREET
RESIDENTIAL APARTMENT COMPLEX
$2.50 CLEANERS
RESIDENTIAL HOME
MW-1 861.62
MW-2 859.36
MW-3 862.20
MW-4 857.46
MW-5 861.71
MW-6 NM
MW-7 845.15
MW-8 856.98
MW-9
MW-10
MW-11 851.84
MW-12 842.37
MW-13 841.19
MW-14 839.38
862
860
858
856
854
852
850
848
846
844
842
840
N
0 25 50 75 100
SCALE: 1" = 100'
NOTES:
1. Features shown are not an authoritative location, nor are they presented to scale.
2. Groundwater elevations were measured on 6/8/2023.
3. NM = Not measured
COORDINATE SYSTEM:
NAD 1983 NORTH CAROLINA STATE PLANE FIPS 3200, US SURVEY FEET
GROUNDWATER ELEVATION CONTOUR MAP
$2.50 CLEANERS
1310 NORTH CENTENNIAL STREET
HIGH POINT, NORTH CAROLINA
Date: 10/23
Scale: AS SHOWN
Attachment: 6
Project Number: DC413038.11
Drawing File: SEE LOWER LEFT
DSCA ID: DC410030
Drn. By: BM
Chk. By: RB
Appd By:
Cad. Disc:
ATC

Groundwater and Surface Water Impacts

- Groundwater PCE plume is adequately delineated.
- The PCE plume underlies multiple residential structures.
- Surface water is impacted by PCE above 2B standards in SW-1, SW-2, and SW-3.
- Pore water is impacted by PCE in SW-1H.





MW-7	
Date	06/08/23
Unit	mg/L
Tetrachloroethylene	<0.000500
Vinyl Chloride	**0.0169**
MTBE	**0.182**

MW-12	
Date	06/08/23
Unit	mg/L
Tetrachloroethylene	<0.000500

MW-13	
Date	06/08/23
Unit	mg/L
Tetrachloroethylene	**0.543**

MW-5	
Date	06/08/23
Unit	mg/L
Tetrachloroethylene	**0.217**

MW-8	
Date	06/08/23
Unit	mg/L
Tetrachloroethylene	<0.000500

MW-3	
Date	06/08/23
Unit	mg/L
Tetrachloroethylene	**0.258**
Trichoroethylene	**0.00532**

MW-1	
Date	06/08/23
Unit	mg/L
Tetrachloroethylene	**0.00386**

MW-2	
Date	06/08/23
Unit	mg/L
Tetrachloroethylene	**2.41**
1,1,1,2-Tetrachloroethane	**0.00113**

MW-4	
Date	06/08/23
Unit	mg/L
Tetrachloroethylene	**2.33**
Trichoroethylene	**0.00411**

MW-11*	
Date	06/08/23
Unit	mg/L
Tetrachloroethylene	<0.000500

MW-14	
Date	06/08/23
Unit	mg/L
Tetrachloroethylene	<0.000500

Sample ID	SW-1H	SW-1
Date	06/09/23	
Tetrachloroethylene	**2.10**	**0.0171**
Trichoroethylene	**0.00806**	0.000715

Sample ID	SW-2H	SW-2
Date	06/09/23	
Tetrachloroethylene	<0.000500	**0.0308**
Vinyl chloride	**0.000613**	<0.000500

Sample ID	SW-3H	SW-3
Date	06/09/23	
Tetrachloroethylene	<0.000500	**0.0130**

Drn. By: BM
Ckd. By: RB
Appd By:
Ckd. Date:
Project Number: DC4130SL11
DSCAID: DC410030
Drawing File: SEE LOWER LEFT

ATC

NOTES:
1. Features shown are not an authoritative location, nor are they presented to a stated accuracy.
2. Groundwater concentrations in BOLD exceed their respective 2L Standard.
3. Surface water (SW-1, SW-2, and SW-3) and pore water (SW-1H, SW-2H, and SW-3H) concentrations in BOLD exceed their respective Surface Water Quality Standards (SWQS).
4. <X = not detected above the laboratory reporting limit of X.
5. * = One VOA was collected from MW-11 on 06/08/2023 without purging due to low water column length. Water sample from MW-11 may not be representative of groundwater concentrations.
6. Tetrachloroethylene plus any other compounds detected above their respective 2L Standards or SWQS are shown on the figure.

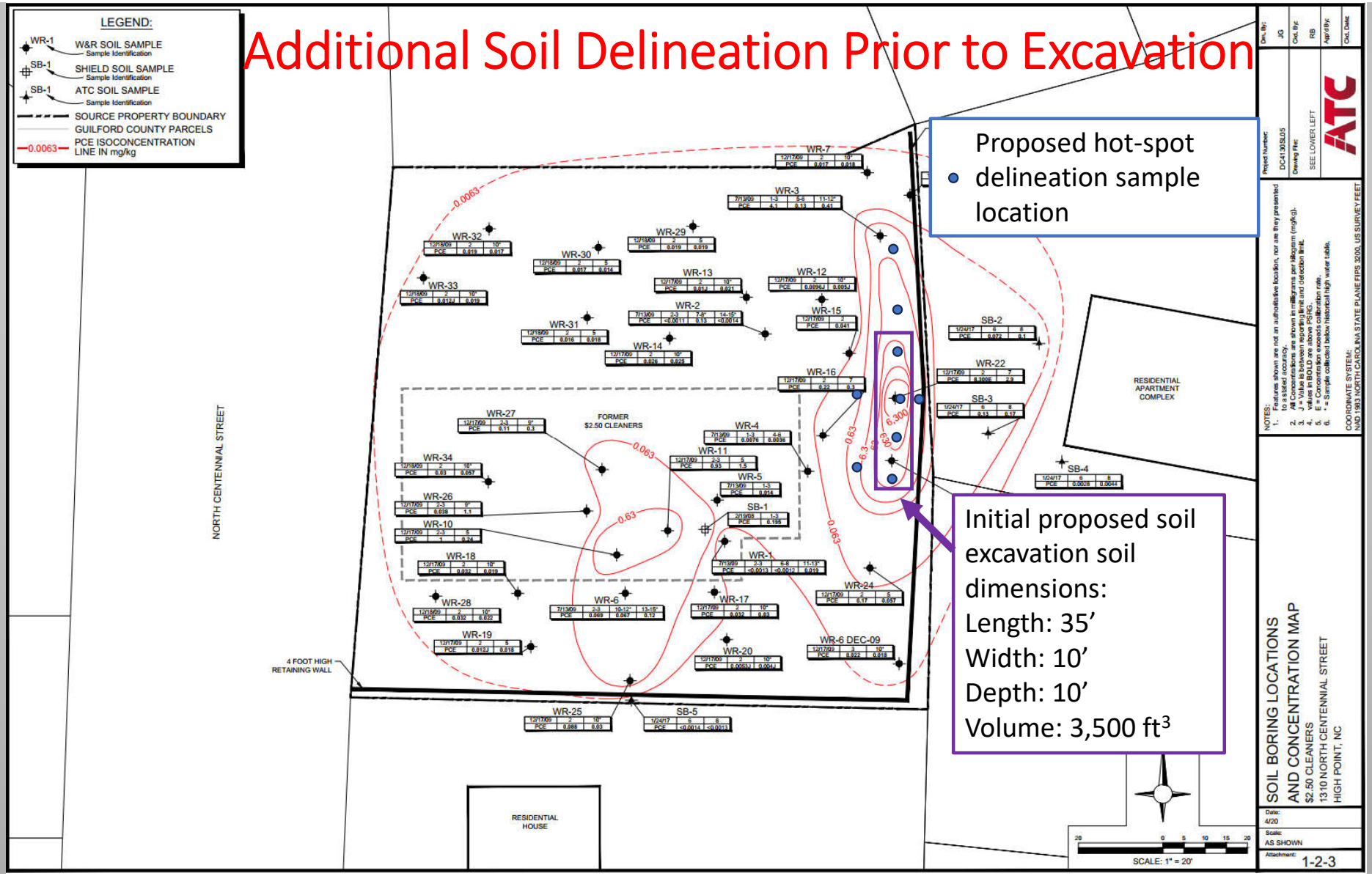
COORDINATE SYSTEM:
NAD 1983 NORTH CAROLINA STATE PLANE FIPS 3200, US SURVEY FEET

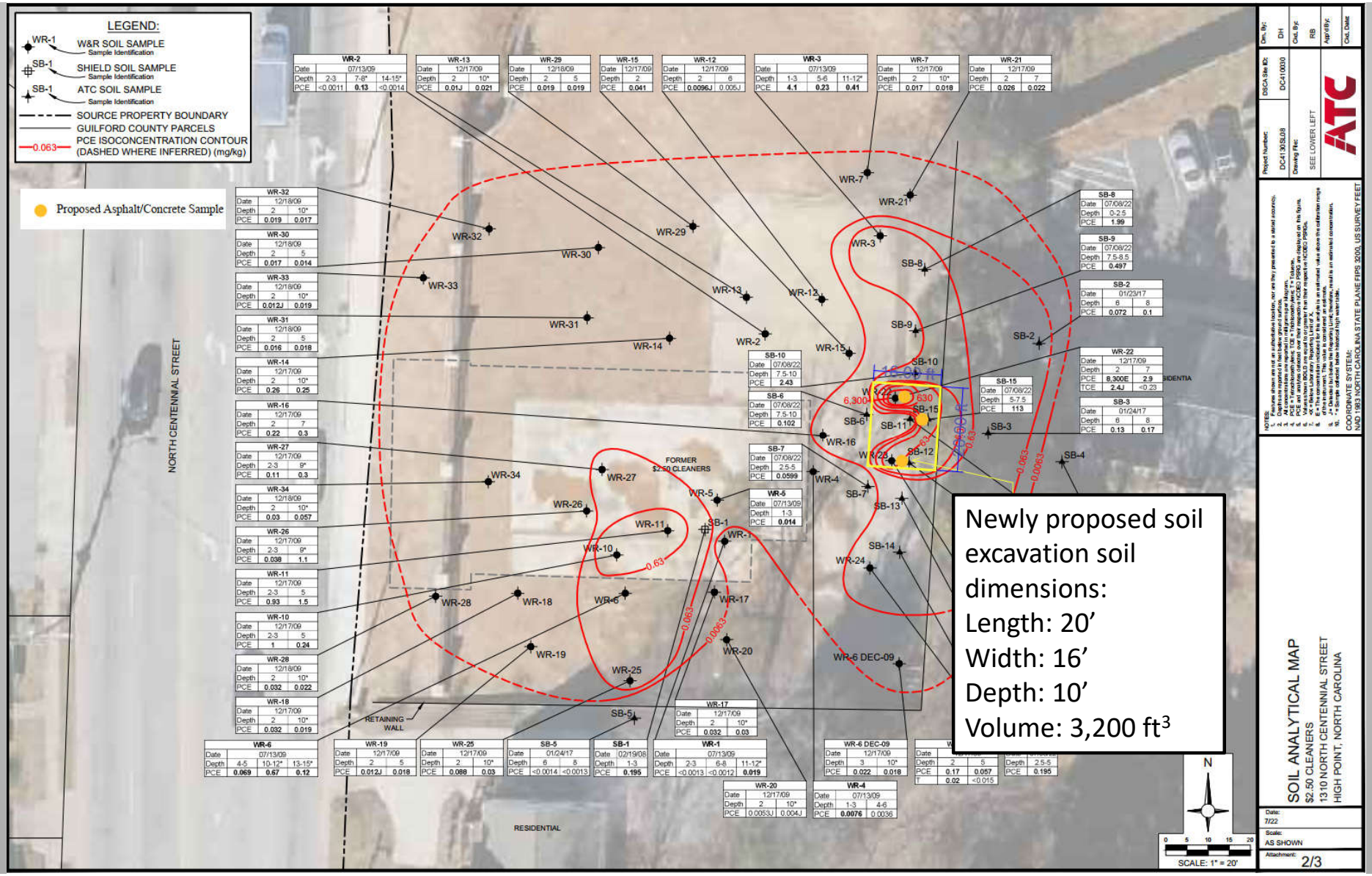
GROUNDWATER, SURFACE WATER, AND PORE WATER ANALYTICAL MAP

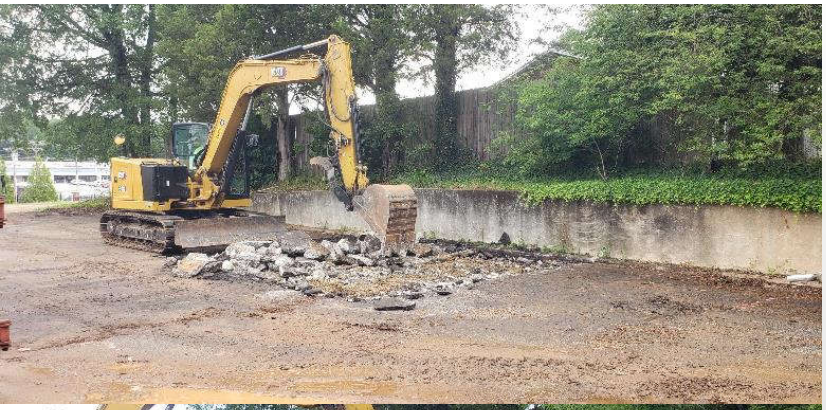
$2.50 CLEANERS
1310 NORTH CENTENNIAL STREET
HIGH POINT, NORTH CAROLINA

Date: 10/23
Scale: AS SHOWN
Attachment: 7/9/10

Additional Soil Delineation Prior to Excavation




LEGEND:
WR-1 W&R SOIL SAMPLE Sample Identification
SB-1 SHIELD SOIL SAMPLE Sample Identification
SB-1 ATC SOIL SAMPLE Sample Identification
SOURCE PROPERTY BOUNDARY
GUILFORD COUNTY PARCELS
0.063 PCE ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED) (mg/kg)
Proposed Asphalt/Concrete Sample
NORTH CENTENNIAL STREET
FORMER $2.50 CLEANERS
RETAINING WALL
RESIDENTIAL
Newly proposed soil excavation soil dimensions:
Length: 20’
Width: 16’
Depth: 10’
Volume: 3,200 ft3
SOIL ANALYTICAL MAP
$2.50 CLEANERS
1310 NORTH CENTENNIAL STREET
HIGH POINT, NORTH CAROLINA
SCALE: 1" = 20'
2/3



Excavation Performed in Compliance with the "Contained-in" Policy

- Removed 199.18 tons of soil and stored in 12 roll offs
- Sampled each roll off for proper waste characterization
  - 7 roll offs (119.94 tons) disposed as non-hazardous.
  - 5 roll offs (79.24 tons) disposed as hazardous requiring incineration.
- Removed 10.29 tons of asphalt/concrete is 1 roll off and disposed as non-hazardous

Health and Safety: Air Monitoring

110 $2.50 CLEANERS ADS

Air Monitoring Log

Date	Time	PID (VOC ppm)	PCE (Dräger Tube ppm)	TCE (Dräger Tube ppm)	Notes
6/12/23	0850	12.2	NA	NA	Sack - manning
6/12/23	1005	1.3	NA	NA	Slab removal
6/12/23	1050	0.0	NA	NA	Slab removal
6/12/23	1115	96.3	2	0(ND)	Excav.
	- downwind of dumpster				
	- PID 203.1 @ dumpster lip				
6/12/23	1345	863.2	20	NA	Edge of roll off
6/13/23	0800	754.1	>40 <50	ND	Edge of roll off
6/13/23	1435	1.9	NA	NA	Site
6/14/23	0805	0.0	NA	NA	Site
6/14/23	0835	21.9	NA	NA	Mixing Pneumatic
6/15/23	0900	0.0	NA	NA	Site

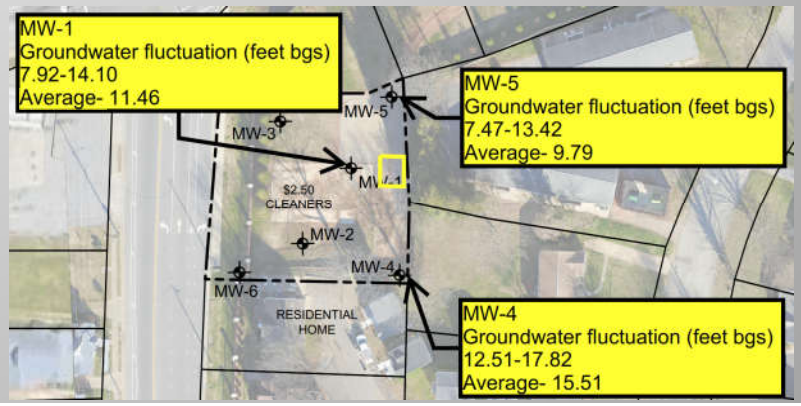
- PID used to screen for organic vapor levels
- If a PID threshold concentration was exceeded, Dräger-Tubes (PCE and TCE) were to measure chemical specific concentrations.
- No Dräger-Tube measurements required implantation of additional PPE (respirators)






Implementation of Remediation Agent: Provect-OX2

- ATC emplaced 2,000 lbs of Provect-OX2 at the bottom of the excavation pit.
- Provect-OX2 is an extended release in situ chemical oxidation with an enhanced bioremediation reagent.
- Tilled it into the subsurface from ~10-12’ bgs.
- Tilled zone is below the seasonal high water table, which targets reduction of sorbed and dissolved phase contaminants.
- Provect-OX2 mineralizes PCE to chloride. Therefore, vapor intrusion concerns from PCE breaking down to TCE is not expected.



Backfilling The Excavation Pit

- ATC backfilled the pit immediately after the excavation was complete.
- Excavation surface was initially intended to be immediately covered with asphalt to prevent rainwater from entering the pit and extracting sorbed PCE from the soil into the groundwater.
- However, roll offs could not be removed until waste characterizations and arrangements for disposal were completed. ATC did not want to damage the fresh asphalt during roll off removal.
- A tarp was temporarily used to cover the surface until all roll off could be removed.
- After all roll offs were removed from the site, the excavation pit was finished at the surface with asphalt.

Thank You for Your Time

Questions?

ATC

ENVIRONMENTAL • GEOTECHNICAL
BUILDING SCIENCES • MATERIALS TESTING