MEMO

ARCADIS Design & Consultancy for natural and built assets

To:
Mr. Brandon Alger
MDEQ SE Michigan District Office
27700 Donald Ct.
Warren, MI 48092

Copies:
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Rob Ellis - Arcadis

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Fax 248 994 2241

From:

Mitch Wacksman, Joe Quinnan

Date:

July 20, 2017

Arcadis Project No.:

MI001322.0001

Subject:

Ford Livonia Transmission Plant - Offsite VI Study

Mr. Alger,

This memo is provided in response to your email dated May 26, 2017 regarding the Michigan Department of Environmental Quality-Remediation and Redevelopment Divisions' (MDEQ-RRD) review of the *Soil Vapor Evaluation Work Plan for Commercial Area and Residential Neighborhood East of Ford Motor Company Livonia Transmission Plant* (work plan) that we provided to you on April 20, 2017. In the following section, we respond to your comments and thoughts on the study and the need for a conceptual site model (CSM).

To facilitate your review, we have included: Attachment 1: Figures 1-4, which include newly collected soil vapor and groundwater data; Attachment 2: Slide deck from our meeting on March 21, 2016 and subsequent letters dated April 22, 2016; and Attachment 3: Slide deck from our meeting on September 7, 2016 and a brief narrative that summarizes the presentation. The key elements of the CSM and multiple lines of evidence approach for evaluating potential vapor intrusion (VI) are included in both slide decks. The CSM includes maps that depict the lateral extents of groundwater impacts based on 250 vertical aquifer profile groundwater samples collocated with 82 hydraulic profiling testing (HPT) boring locations. The CSM also includes figures that illustrate the vadose zone thickness and distribution and thickness of the clean water lens. At the time of the September 7, 2016 meeting, we were initiating a review of the City of Livonia records to evaluate building construction and proposing a survey of the residents to verify building construction. We also discussed key factors to be considered and presented two example flow charts to foster discussion and inform a systematic, multiple lines of evidence approach for evaluating potential VI pathways, considering that the MDEQ was, and is currently, in the process of revising its 2013 VI guidance and Part 201 clean up criteria.

Ford installed 43 temporary soil vapor monitoring points east of the Livonia Transmission Plant. As shown on Attachment 1: Off-Site Vapor Intrusion Assessment Figures 1 and 2, vinyl chloride and trichloroethene results are all below MDEQ action levels. To provide additional data, Ford also analyzed groundwater beneath the soil vapor monitoring points located on residential properties. As shown on Attachment 1: Off-Site Vapor Intrusion Assessment Figures 3 and 4, the results are consistent with groundwater monitoring for the area and indicate the extent of vinyl chloride in groundwater has successfully been defined and there is no impact to drinking water in the area.

Your comments and our responses are presented below:

Comment: *The 100' map appears to encompass parcels which are 100' from the nearest collected contaminated groundwater sample. This 100' distance needs to be from the edge of the plume, but since we have no groundwater plume definition, no determination can be made on if the extent of this investigation is sufficient. Furthermore, without further geologic and structural information related to a site-specific CSM the parameters at which the "edge of plume" can be defined can't be determined.*

Response: Comment is acknowledged. Parcels located within 100' of groundwater where volatile organic compounds (VOCs) were detected above the screening criteria (2.0 micrograms per liter [µg/L]), at any depth, were included for further evaluation (See Slide 7 in Attachment 3). The sample locations with green symbols showed maximum detections of vinyl chloride above 2 µg/L, at any depth interval sampled. All detections in the residential area were single digit µg/L. The blue symbols show locations where the maximum vinyl chloride detection was less than or equal to 2 µg/L. The gold shaded parcels conservatively depict properties within 100' of vinyl chloride at or above 2 µg/L, at any depth. Note that our convention was to extend the shading to the non-detect sample location, or one or more buffer parcels when there were several parcels between sample locations.

Comment: *While the idea that a "clean water" buffer could potentially be used to demonstrate a lack a risk, a CSM for each potentially impacted property and its interaction with the groundwater table would be necessary in order to determine if Soil Vapor Monitoring Points (SVMP) sampling is sufficient in determining if this zone exists, is stable, and can be relied upon for any permanent regulatory decisions.*

Response: Comment is acknowledged. The 2013 MDEQ VI guidance states "*If contaminated groundwater is overlain by clean water (upper versus lower aquifer systems or significant downward groundwater gradients), then vapor phase migration or partitioning of the volatile chemicals is unlikely*." The VI work plan submitted in April was designed to collect the information needed to determine if the apparent clean water lens is acting as an effective barrier for vapor movement. As discussed in our meeting on September 7, 2016, this was one step in a multiple line of evidence approach to evaluate the potential for VI at properties within 100' of vinyl chloride impacts greater than 2 µg/L. This information, combined with the results of the proposed property survey and sampling from permanent groundwater monitoring wells will be used to update the CSM. Specific information from each property will be considered during this process and used to inform the next steps in the evaluation.

Comment: *This plan consists entirely of SVMP which are either near structures or in the right-of-way. This may be acceptable, but without a more detailed CSM it would be premature to indicate if these Points of Detection can be extrapolated to calculate risk at any potential Points of Exposure.*

Response: Comment is acknowledged. On April 22, 2016, the MDEQ was provided information related to the on-site and off-site assessments. A meeting was conducted on September 7, 2016 with the MDEQ to provide details of the additional off-site assessment that had been completed and to discuss next steps. As indicated above, the objective of the SVMP work is to refine the CSM and collect additional information that can be used to inform the next steps in the VI evaluation. The need for additional data collection will

be considered and discussed with the MDEQ and all appropriate parties after reviewing and evaluating the SVMP data collected in June 2017.

Comment: *As part of a more developed CSM the DEQ-RRD would want to see details about the plume shape, concentration, & stability, models of the structures and their interaction with the groundwater and nearby geology, details about on-site groundwater/soil/soil-gas concentrations, the rates at which they decrease aerially, and any potential for migration to the subdivision via utility corridors.*

Response: Comment is acknowledged. Please refer to the April 22, 2016 letter and information included in Attachment 2. The attached "*Narrative for Slides from September 7, 2016 Meeting with MDEQ*" presents some of the additional detail requested above (Attachment 3). The results of the groundwater sampling from the permanent monitoring well network and soil vapor sampling points will be presented to MDEQ at an in-person meeting or subsequent submittal. Additional updates to the CSM will occur as new data are collected and this information will continue to be shared with the MDEQ.

Closing

We appreciate the MDEQ-RRD's continued engagement and comments on the VI Study. We trust that the information provided addresses your comments and questions. We also believe that the results of the SVMP sampling and permanent groundwater monitoring well sampling that is ongoing will further refine the CSM and inform the next steps in the multiple lines of evidence approach for VI assessment. We look forward to the opportunity to discuss the results with you and the MDEQ-RRD team in the near future.

Attachments

Attachment 1: Figure 1 – Off-Site Vapor Intrusion Assessment Vinyl Chloride in Soil Vapor

Figure 2 - Off-Site Vapor Intrusion Assessment Trichloroethene in Soil Vapor

Figure 3 - Off-Site Vapor Intrusion Assessment Vinyl Chloride in Groundwater

Figure 4 - Off-Site Vapor Intrusion Assessment Trichloroethene in Groundwater

Attachment 2: Slide deck from March 21, 2016 meeting and letters dated April 22, 2016

Attachment 3: Slide deck from September 7, 2016 meeting and summary narrative

ATTACHMENT 1

Figure 1 – Off-site Vapor Intrusion Assessment Vinyl Chloride in Soil Vapor

Figure 2 - Off-site Vapor Intrusion Assessment Trichloroethene in Soil Vapor

Figure 3 - Off-site Vapor Intrusion Assessment Vinyl Chloride in Groundwater

Figure 4 - Off-site Vapor Intrusion Assessment Trichloroethene in Groundwater

DRAFT - FOR DISCUSSION PURPOSES ONLY *UPDATED JUNE 29, 2017*

SVMP-25 (3.0 FT) 6/19/2017: Non-detect
SVMP-25 (6.0 FT) 6/19/2017: Non-detect
SVMP-26 (4.0 FT) 6/19/2017: Non-detect
SVMP-32 (3.0 FT) 6/15/2017: Non-detect
SVMP-32 (6.0 FT) 6/15/2017: Non-detect
SVMP-27 (4.5 FT) 6/19/2017: Non-detect
SVMP-08 (3.5 FT) 6/15/2017: Non-detect
SVMP-09 (4.0 FT) 6/14/2017: Non-detect
SVMP-28 (3.0 FT) 6/19/2017: Non-detect
SVMP-29 (3.5 FT) 6/14/2017: Non-detect
SVMP-29 (7.5 FT) 6/14/2017: Non-detect
SVMP-01 (3.5 FT) 6/8/2017: Non-detect
SVMP-01 (7.0 FT) 6/8/2017: Non-detect
SVMP-34 (4.0 FT) 6/15/2017: Non-detect
SVMP-33 (4.0 FT) 6/15/2017: Non-detect
SVMP-11 (3.5 FT) 6/13/2017: Non-detect
SVMP-12 (3.5 FT) 6/13/2017: Non-detect
SVMP-15 (2.0 FT) 6/16/2017: Non-detect
SVMP-14 (2.0 FT) 6/16/2017: Non-detect
SVMP-13 (2.0 FT) 6/16/2017: Non-detect
SVMP-10 (3.0 FT) 6/13/2017: Non-detect
SVMP-06 (4.5 FT) 6/13/2017: Non-detect
SVMP-07 (3.5 FT) 6/13/2017: Non-detect
SVMP-35 (4.0 FT) 6/15/2017: Non-detect
SVMP-31 (5.5 FT) 6/14/2017: Non-detect
SVMP-03 (3.5 FT) 6/12/2017: Non-detect
SVMP-03 (7.0 FT) 6/12/2017: Non-detect
SVMP-02 (4.5 FT) 6/9/2017: Non-detect
SVMP-02 (8.5 FT) 6/9/2017: Non-detect
SVMP-22 (3.0 FT) 6/19/2017: Non-detect
SVMP-23 (3.0 FT) 6/19/2017: Non-detect
SVMP-19 (3.0 FT) 6/16/2017: Non-detect
SVMP-20 (3.0 FT) 6/19/2017: Non-detect
SVMP-21 (2.0 FT) 6/19/2017: Non-detect
SVMP-16 (2.0 FT) 6/16/2017: Non-detect
SVMP-05 (4.5 FT) 6/12/2017: Non-detect
SVMP-04 (3.5 FT) 6/12/2017: Non-detect
SVMP-30 (4.0 FT) 6/14/2017: Non-detect
SVMP-24 (4.0 FT) 6/19/2017: Non-detect
SVMP-36 (4.0 FT) 6/16/2017: Non-detect
SVMP-18 (3.0 FT) 6/16/2017: Non-detect
SVMP-37 (2.5 FT) 6/16/2017: Non-detect
SVMP-17 (2.0 FT) 6/16/2017: Non-detect

ROSATI AVE
CONCORD ST
CAPITOL ST
STARK RD
BEACON ST
BELDEN CT
BREWSTER ST
WADSWORTH ST
BOSTON POST ST
PRISCILLA LN
PLYMOUTH RD
WAYNE RD
LAUREL ST

LEGEND

- PROPERTY BOUNDARIES
- FORD PROPERTY BOUNDARY
- OFF-SITE SVMP VINYL CHLORIDE < 56 µg/m^3

NOTES:

µg/m^3 - MICROGRAMS PER CUBIC METER

THE MDEQ MDHHS CONSENSUS INTERIM ACTION LEVEL FOR VINYL CHLORIDE IS 56 µg/m^3

THE MDEQ MDHHS CONSENSUS INTERIM TRIGGER LEVEL FOR VINYL CHLORIDE IS 56 µg/m^3

MDEQ = MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

MDHHS = MICHIGAN DEPARTMENT OF HEALTH AND HUMAN SERVICES

FT = FEET BELOW GROUND SURFACE

NON-DETECT INDICATES VALUE IS BELOW THE LABORATORY REPORTING LIMIT, RANGING FROM 2.7 TO 3.3 µg/m^3, FOR VINYL CHLORIDE

SVMP = SOIL VAPOR MONITORING POINT

RESULTS COLLECTED DURING JUNE 2017 SAMPLING EVENT.

0 300 600
SCALE IN FEET

FORD MOTOR COMPANY
LIVONIA TRANSMISSION PLANT
LIVONIA, MICHIGAN

OFF-SITE VAPOR INTRUSION ASSESSMENT VINYL CHLORIDE IN SOIL VAPOR

ARCADIS Design & Consultancy for natural and built assets

FIGURE 1

CITY: NOVI DIV: ENV DB: MG PIC: R. ELLIS PM: K. HINSKEY TM: T. STEVENS TR: P. CURRY PROJECT NUMBER: MI001386.0001.00003 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet
Z:\GISProjects_ENV\NoviBrighton_MI\Ford\Livonia\GIS\docs\2017-06\VC_Offsite_SVMP_20170627.mxd PLOTTED: 6/29/2017 8:52:55 AM BY: mgress

DRAFT - FOR DISCUSSION PURPOSES ONLY *UPDATED JUNE 29, 2017*

SVMP-25 (3.0 FT) 6/19/2017: Non-detect
SVMP-25 (6.0 FT) 6/19/2017: Non-detect
SVMP-26 (4.0 FT) 6/19/2017: Non-detect
SVMP-27 (4.5 FT) 6/19/2017: Non-detect
SVMP-28 (3.0 FT) 6/19/2017: Non-detect
SVMP-32 (3.0 FT) 6/15/2017: Non-detect
SVMP-32 (6.0 FT) 6/15/2017: Non-detect
SVMP-08 (3.5 FT) 6/15/2017: Non-detect
SVMP-07 (3.5 FT) 6/13/2017: Non-detect
SVMP-35 (4.0 FT) 6/15/2017: Non-detect
SVMP-29 (3.5 FT) 6/14/2017: Non-detect
SVMP-29 (7.5 FT) 6/14/2017: Non-detect
SVMP-01 (3.5 FT) 6/8/2017: Non-detect
SVMP-01 (7.0 FT) 6/8/2017: Non-detect
SVMP-34 (4.0 FT) 6/15/2017: Non-detect
SVMP-33 (4.0 FT) 6/15/2017: Non-detect
SVMP-09 (4.0 FT) 6/14/2017: 6.9 µg/m^3
SVMP-06 (4.5 FT) 6/13/2017: Non-detect
SVMP-31 (5.5 FT) 6/14/2017: Non-detect
SVMP-11 (3.5 FT) 6/13/2017: Non-detect
SVMP-12 (3.5 FT) 6/13/2017: Non-detect
SVMP-10 (3.0 FT) 6/13/2017: Non-detect
SVMP-13 (2.0 FT) 6/16/2017: Non-detect
SVMP-22 (3.0 FT) 6/19/2017: Non-detect
SVMP-05 (4.5 FT) 6/12/2017: Non-detect
SVMP-03 (3.5 FT) 6/12/2017: Non-detect
SVMP-03 (7.0 FT) 6/12/2017: Non-detect
SVMP-02 (4.5 FT) 6/9/2017: Non-detect
SVMP-02 (8.5 FT) 6/9/2017: Non-detect
SVMP-23 (3.0 FT) 6/19/2017: Non-detect
SVMP-04 (3.5 FT) 6/12/2017: Non-detect
SVMP-30 (4.0 FT) 6/14/2017: 31 µg/m^3
SVMP-19 (3.0 FT) 6/16/2017: Non-detect
SVMP-20 (3.0 FT) 6/19/2017: Non-detect
SVMP-21 (2.0 FT) 6/19/2017: Non-detect
SVMP-15 (2.0 FT) 6/16/2017: Non-detect
SVMP-14 (2.0 FT) 6/16/2017: Non-detect
SVMP-24 (4.0 FT) 6/19/2017: Non-detect
SVMP-36 (4.0 FT) 6/16/2017: Non-detect
SVMP-18 (3.0 FT) 6/16/2017: Non-detect
SVMP-37 (2.5 FT) 6/16/2017: Non-detect
SVMP-17 (2.0 FT) 6/16/2017: 18 µg/m^3
SVMP-16 (2.0 FT) 6/16/2017: Non-detect

ROSATI AVE
CONCORD ST
CAPITOL ST
STARK RD
BEACON ST
BREWSTER ST
WADSWORTH ST
BOSTON POST ST
PRISCILLA LN
BELDEN CT
WAYNE RD
PLYMOUTH RD
LAUREL ST

LEGEND

- PROPERTY BOUNDARIES
- FORD PROPERTY BOUNDARY
- OFF-SITE SVMP TRICHLOROETHENE < 70 µg/m^3

NOTES:

µg/m^3 - MICROGRAMS PER CUBIC METER

THE MDEQ MDHHS CONSENSUS INTERIM ACTION LEVEL FOR TRICHLOROETHENE IS 70 µg/m^3

THE MDEQ MDHHS CONSENSUS INTERIM TRIGGER LEVEL FOR TRICHLOROETHENE IS 160 µg/m^3

MDEQ = MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

MDHHS = MICHIGAN DEPARTMENT OF HEALTH AND HUMAN SERVICES

FT = FEET BELOW GROUND SURFACE

NON-DETECT INDICATES VALUE IS BELOW THE LABORATORY REPORTING LIMIT, RANGING FROM 5.8 TO 6.9 µg/m^3, FOR TRICHLOROETHENE

SVMP = SOIL VAPOR MONITORING POINT

RESULTS COLLECTED DURING JUNE 2017 SAMPLING EVENT.

0 300 600
SCALE IN FEET

FORD MOTOR COMPANY
LIVONIA TRANSMISSION PLANT
LIVONIA, MICHIGAN

OFF-SITE VAPOR INTRUSION ASSESSMENT TRICHLOROETHENE IN SOIL VAPOR

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2

DRAFT - FOR DISCUSSION PURPOSES ONLY *UPDATED JUNE 29, 2017*

ROSATI AVE
CONCORD ST
CAPITOL ST
STARK RD
BEACON ST
BREWSTER ST
BOSTON POST ST
WADSWORTH ST
BELDEN CT
STANDISH ST
PRISCILLA LN
PLYMOUTH RD
WAYNE RD
LAUREL ST

VAP-32
8-11 FT: Non-detect
13-16 FT: Non-detect

VAP-33
7-10 FT: Non-detect
12-15 FT: Non-detect

VAP-34
7-10 FT: Non-detect
12-15 FT: 2.2 µg/L

VAP-35
7-10 FT: Non-detect
12-15 FT: Non-detect

VAP-31
7-10 FT: Non-detect
12-15 FT: Non-detect

VAP-29
9-12 FT: Non-detect
14-17 FT: Non-detect

VAP-30
6-9 FT: Non-detect
11-14 FT: Non-detect

VAP-36
7-10 FT: Non-detect
12-15 FT: Non-detect

VAP-37
4-7 FT: 1.4 µg/L

LEGEND

- PROPERTY BOUNDARIES
- FORD PROPERTY BOUNDARY
- OFF-SITE VAP VINYL CHLORIDE ≤ 2.0 µg/L
- OFF-SITE VAP VINYL CHLORIDE > 2.0 µg/L

NOTES:

µg/L - MICROGRAMS PER LITER (PARTS PER BILLION)

THE RESIDENTIAL DRINKING WATER CRITERIA FOR VINYL CHLORIDE IS 2.0 µg/L.

THE GROUNDWATER-SURFACE WATER INTERFACE CRITERIA FOR VINYL CHLORIDE IS 13 µg/L.

FT = FEET BELOW GROUND SURFACE

"NON-DETECT" INDICATES VALUE IS BELOW THE LABORATORY REPORTING LIMIT OF 1.0 µg/L FOR VINYL CHLORIDE.

VAP = VERTICAL AQUIFER PROFILE

RESULTS COLLECTED DURING JUNE 2017 SAMPLING EVENT.

BLUE BOX INDICATES EXCEEDANCE OF RESIDENTIAL DRINKING WATER CRITERIA

0 300 600
SCALE IN FEET

FORD MOTOR COMPANY
LIVONIA TRANSMISSION PLANT
LIVONIA, MICHIGAN

OFF-SITE VAPOR INTRUSION ASSESSMENT
VINYL CHLORIDE IN GROUNDWATER

ARCADIS Design & Consultancy for natural and built assets

FIGURE
3

CITY: NOVI DIV: ENV DB: MG PIC: R_ELLIS PM: K_HINSKEY TM: T_STEVENS TR: P_CURRY PROJECT NUMBER: MI001386.0001.00003 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet
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CITY: NOVI DIV: ENV DB: MG PIC: R. ELLIS PM: K_HINSKEY TM: T. STEVENS TR: P. CURRY PROJECT NUMBER: MI001386.0001.00003 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet
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DRAFT - FOR DISCUSSION PURPOSES ONLY *UPDATED JUNE 29, 2017*

VAP-36
7-10 FT: Non-detect
12-15 FT: Non-detect

VAP-34
7-10 FT: Non-detect
12-15 FT: Non-detect

VAP-32
8-11 FT: Non-detect
13-16 FT: Non-detect

VAP-33
7-10 FT: Non-detect
12-15 FT: Non-detect

VAP-37
4-7 FT: Non-detect

VAP-35
7-10 FT: Non-detect
12-15 FT: Non-detect

VAP-31
7-10 FT: Non-detect
12-15 FT: Non-detect

VAP-30
6-9 FT: Non-detect
11-14 FT: Non-detect

VAP-29
9-12 FT: Non-detect
14-17 FT: Non-detect

ROSATI AVE
CONCORD ST
CAPITOL ST
STARK RD
BEACON ST
BELDEN CT
BOSTON POST ST
BREWSTER ST
WADSWORTH ST
STANDISH ST
PRISCILLA LN
PLYMOUTH RD
WAYNE RD
LAUREL ST

LEGEND

- PROPERTY BOUNDARIES
- FORD PROPERTY BOUNDARY
- OFF-SITE VAP TRICHLOROETHENE ≤ 5.0 µg/L

NOTES:

µg/L - MICROGRAMS PER LITER (PARTS PER BILLION)

THE RESIDENTIAL DRINKING WATER CRITERIA FOR TRICHLOROETHENE IS 5.0 µg/L.

THE GROUNDWATER-SURFACE WATER INTERFACE CRITERIA FOR TRICHLOROETHENE IS 200 µg/L.

FT = FEET BELOW GROUND SURFACE

"NON-DETECT" INDICATES VALUE IS BELOW THE LABORATORY REPORTING LIMIT OF 1.0 µg/L TRICHLOROETHENE.

VAP = VERTICAL AQUIFER PROFILE

RESULTS COLLECTED DURING JUNE 2017 SAMPLING EVENT.

0 300 600
SCALE IN FEET

FORD MOTOR COMPANY
LIVONIA TRANSMISSION PLANT
LIVONIA, MICHIGAN

OFF-SITE VAPOR INTRUSION ASSESSMENT TRICHLOROETHENE IN GROUNDWATER

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FIGURE
4

ATTACHMENT 2

Slide deck from March 21, 2016 meeting and letters dated April 22, 2016

Ford Motor Company
Livonia Transmission Plant
36200 Plymouth Road
Livonia, Michigan 48150

April 22, 2016

Mr. Brandon Alger, Quality Analyst
Southeast Michigan District Office
Department of Environmental Quality
Remediation and Redevelopment Division
27700 Donald Court
Warren, MI 48902

Subject: Request for Information, Livonia Transmission Plant
36200 Plymouth Road, Livonia, Wayne County, Michigan 48150
MERA Number: 82002970

Dear Mr. Alger:

This letter is in response to your request for information dated February 23, 2016 regarding the site characterization conducted to date at the Livonia Transmission Plant (LTP). The responses detailed below are supported by the slide presentation (Attachment 1) that was presented during our March 21, 2016 informational meeting conducted at LTP. In addition, per your request, we provided a Technical Memorandum (Attachment 2) to supplement the information presented during our meeting.

Listed below are items described in your letter and our responses:

Please provide specific information, or access to the information, regarding the current and/or historical use and apparent release of chlorinated solvents on the property, which would allow the DEQ to construct a history and timeline of events leading to the off-site migration of contamination within 30 days of receipt of this request. This should include, but is not limited to:

a) *Information related to any investigations of the chlorinated solvents and any remediation activities which occurred preceding the Notices of Migration of Contamination, provided to the DEQ, on August 14, 2015 and December 18, 2015 (Notice).*

Soil impacts were first identified during construction activities in July 2014. Initial investigation near the southeastern portion of the LTP was ultimately expanded to include the entire building footprint, as well as the eastern portion of the 175 acre property. An area of LNAPL was identified beneath the building, as well as two chlorinated volatile organic (CVOC) impacts extending from the building to the east. The CVOC impacts consist primarily of trichloroethene (TCE), cis-1,2-dichloroethane, and vinyl chloride. By summer of 2015 vinyl chloride had been identified at the property boundary at three monitoring well locations. For more detailed information refer to slide 5 of Attachment 1 and page 2 of Attachment 2.

b) *If known, the specific source or cause of contamination to the site and any prior or ongoing treatment, containment, or removal of the contamination source. Including any information on the specific equipment and/or processes currently being used or historically where used in which chlorinated solvents were utilized.*

The specific source or cause of the release is unknown at this time. There are several potential sources outlined on slide 28 and described on page 4 of the technical memo.

c) *Any current or historical Conceptual Site Models regarding the contamination specified in the Notice, including proposed groundwater plume, vertical profiles, and a summary of data and data sources used to construct the model.*

A draft conceptual site model was presented to the MDEQ during the March 21, 2016 meeting conducted at the Livonia Transmission Plant. The technical memorandum (Attachment 2) provides an explanation of the presentation slides, Attachment 1.

d) *Other information related to the off-site migration of all hazardous wastes and solid wastes, with specific attention to trichloroethylene, tetrachloroethene,1,2-dichloroethene, and vinyl chloride.*

We note that the term "other information" is overly broad and ambiguous, and we interpret it as focused on technical information regarding the identified contaminants, rather than on unrelated information such as public outreach, access agreement negotiations, and the like. Accordingly, Ford has no other information with respect to other types of wastes other than what is provided on the public websitehttp://www.fordlivoniabostonbeaconproject.com/ and what was presented during our informational meetings. Ford plans to prepare a *Site Investigation Report*, which will include the data collected and findings.

Ford is committed to continue working closely with the City of Livonia and MDEQ on this project.

If you have any additional questions or need additional information, please contact Todd Walton of Ford's Environmental Quality Office at 313 845-1921.

Sincerely,

Robert A. Groden

Robert Groden
Plant Manager
Ford Motor Company

Copies:
Todd Walton – Ford EQO
Claudya Arana – Ford EQO
Michael McClellan - MDEQ
Gerald Tiernan - MDEQ
Paul Owens – MDEQ
David Lear – City of Livonia

Enclosures:

Attachments

Attachment 1 - Slide Presentation, March 21, 2016

Attachment 2 – Technical Memorandum

ATTACHMENT 1

Slide Presentation, March 21, 2016

INVESTIGATION STATUS UPDATE AND CONCEPTUAL SITE MODEL REVIEW

Ford Livonia Transmission Plant

March 21, 2016

Agenda

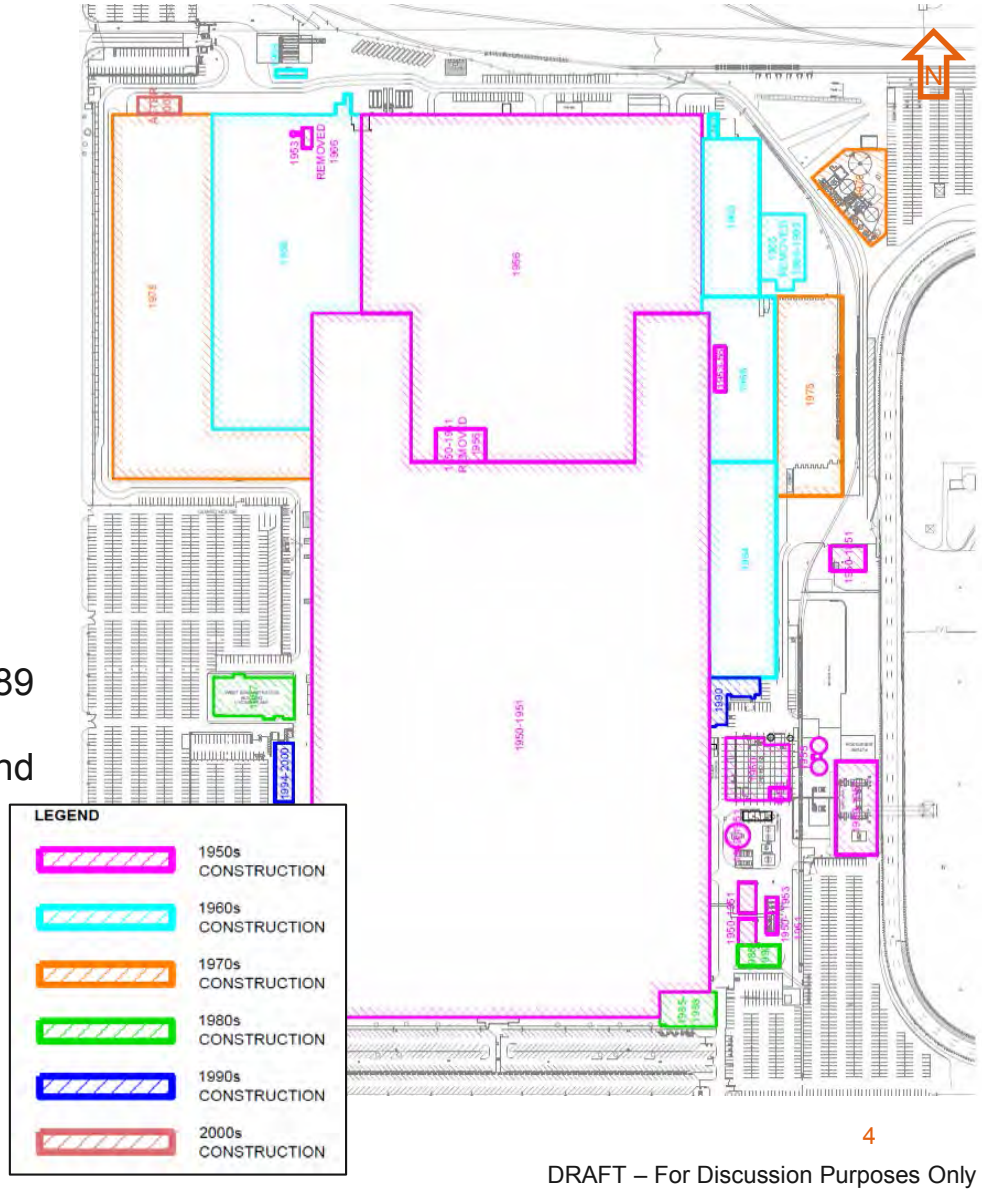
- Executive Summary
- Site Background
- Conceptual Site Model
  - Geology
  - Groundwater/Soil Impacts
    - Offsite Migration
    - Potential Sources
  - LNAPL Impacts
  - Soil Gas
  - Storm Sewers
- Next Steps

Executive Summary

- Groundwater/Soil Impacts – two CVOC plumes (north and south) migrate from the building to the east
  - Off-site impacts relatively limited
  - Several potential sources identified
- LNAPL – LNAPL located beneath the floor of the building
  - Primarily transmission, cutting and hydraulic oils
  - CVOCs present in oil in some areas
  - Methane generation indicative of bio-degradation
- Soil Gas– soil gas evaluated both interior and exterior
  - Interior – issues related to methane, VOCs limited to one sample location
  - Exterior – CVOCs detected at one on-site sample location above criteria, all other locations below criteria
- Storm Sewers – southern CVOC impacts potentially discharges to sanitary through damaged storm sewer line
  - Evaluating options for storm line repair and long-term groundwater remedy
  - Temporary permit to discharge is currently pending with the Great Lakes Water Authority

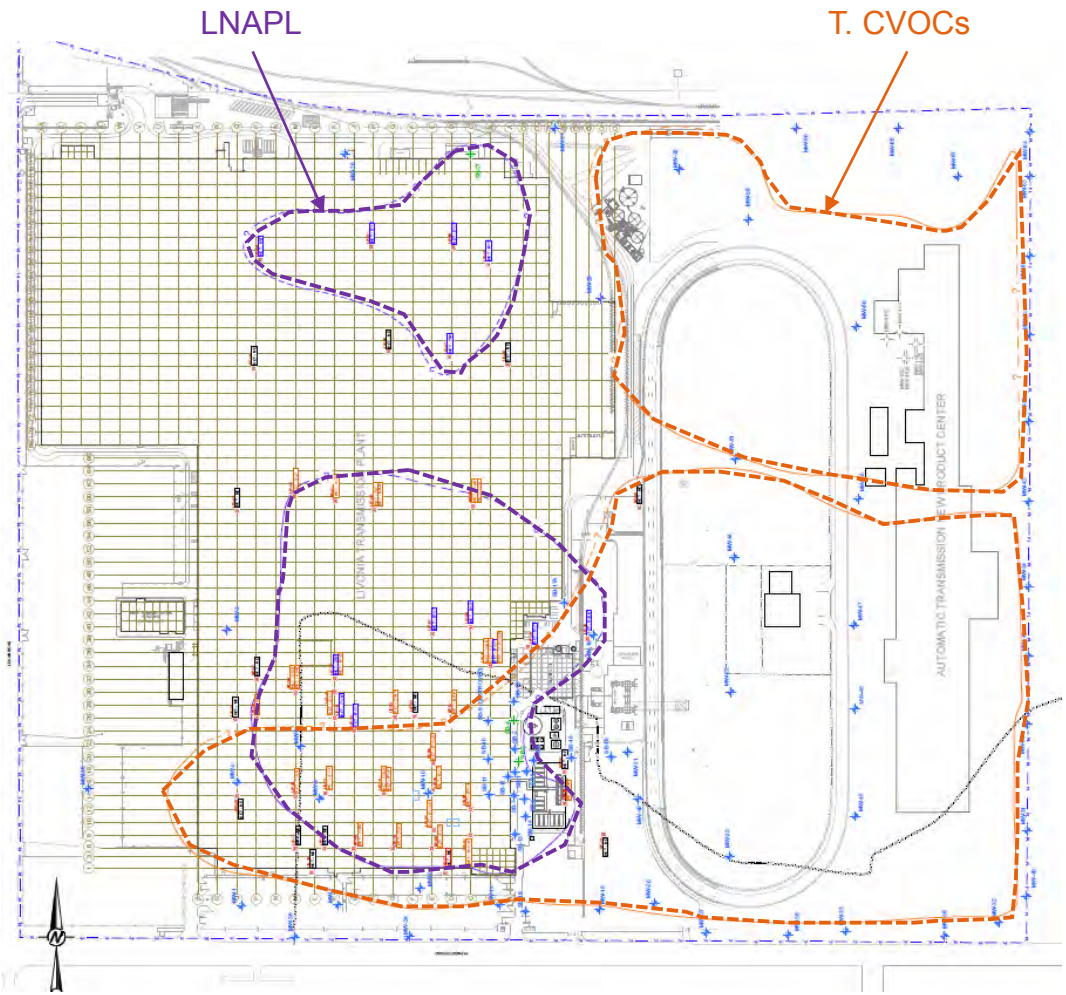
Site Background

- Original 1,450,000 ft^2 building constructed in 1950-51
  - Manufacture of the T-48 medium tank
  - Metal pressing and grinding, heat treating, assembly, painting, and copper plating
  - Currently slab on grade
- Numerous additions have been made since the original construction
  - Currently includes 3,100,000 ft^2 of floor space
- Automatic Transmission New Product Center (ATNPC) building was constructed beginning in 1989
  - Machining/assembly areas, prototype garage and dynamometer test cells
  - North portion includes X-ray operation
  - Slab on grade



Initial Investigation

- Stained soils and odors identified during construction activities in July 2014
- Fall 2014 - identified LNAPL in soils beneath the LTP building and a CVOC plume extending from the building to the eastern property boundary
  - LIF/temp wells to delineate LNAPL
  - Monitoring wells to define CVOC plume
- Summer 2015 - Vinyl chloride above DW Criteria at 3 wells along northeast property boundary



Golder Associates, July 2015

Characterization to Date

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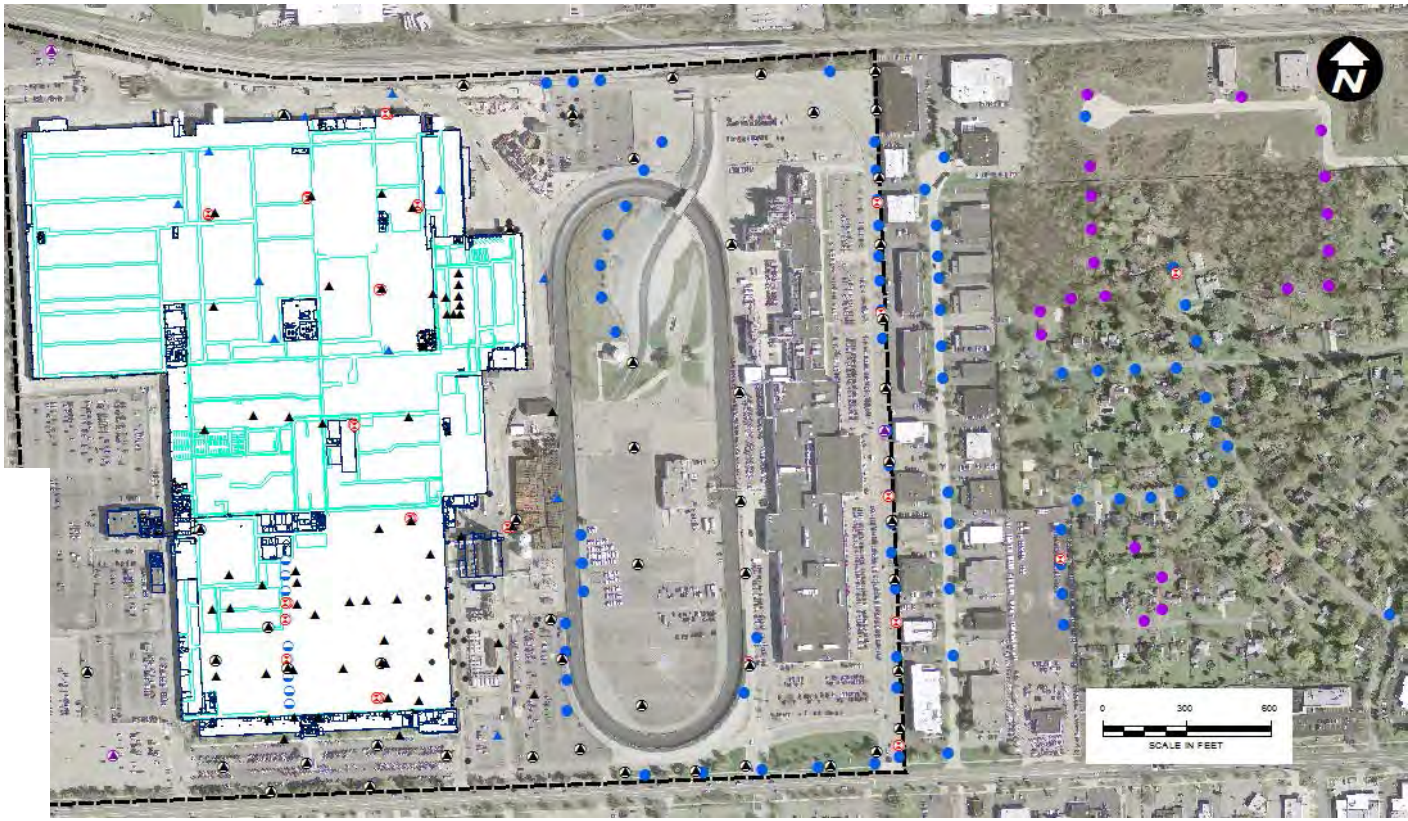
Totals to Date:

- 81 HPT Borings
- 77 LIF/LIF-HP Borings
- 63 MWs
  - 10 LNAPL MWs
- 20 Soil Gas Points
- 345 GW Samples
- 361 Soil Samples



LEGEND

COMPLETED 2014-2015

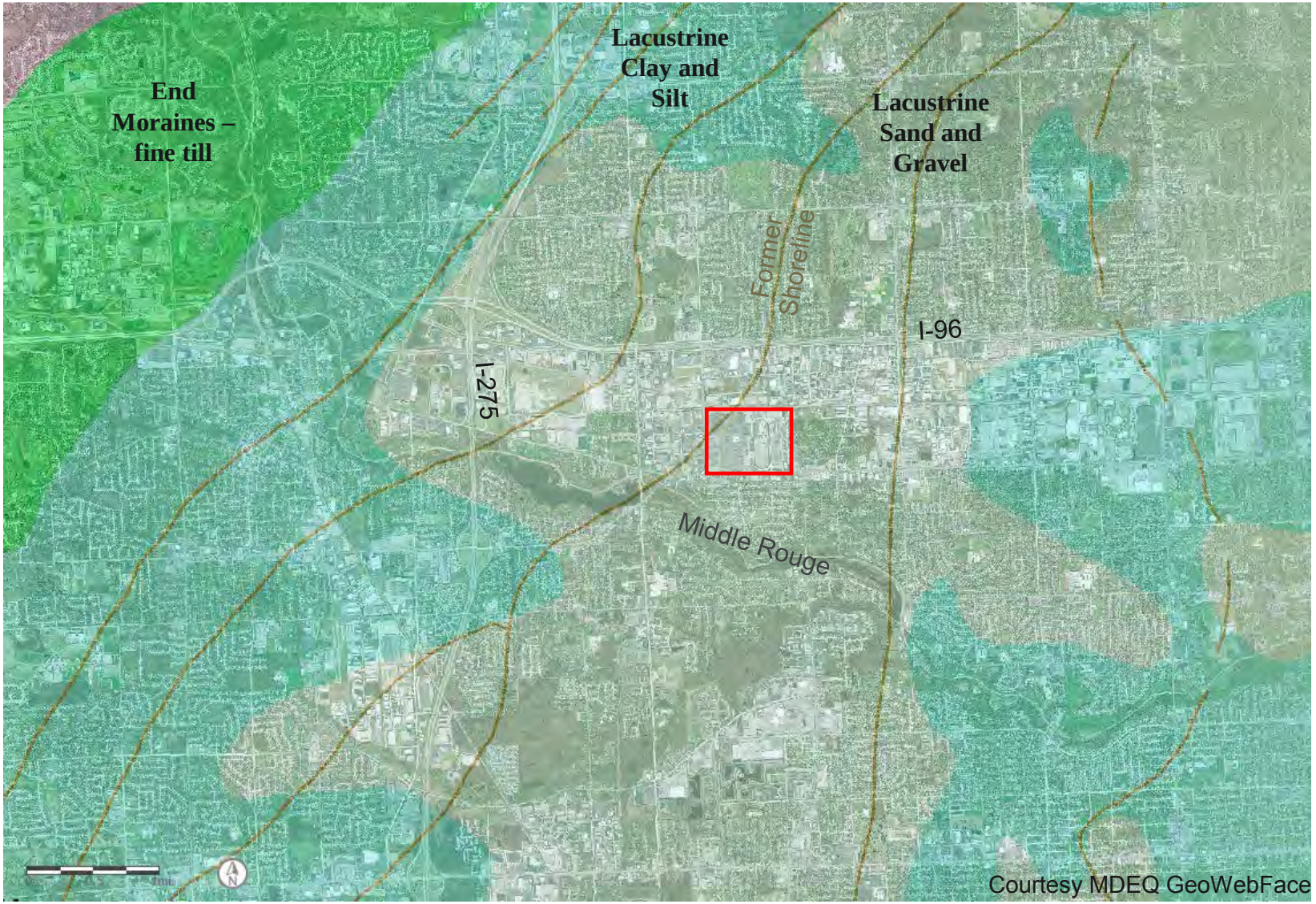
- SOIL BORING
- SHALLOW MONITORING WELLS
- LIF BORING

ADDITIONAL CHARACTERIZATION 2015-2016

- LIF-HP BORING
- LIF-HP WCSS BORING
- HPT-VAP BORING
- PROPOSED HPT-VAP BORING
- DEEP MONITORING WELL
- LNAPL MONITORING WELL
- SOIL VAPOR SAMPLING LOCATION
- APPROXIMATE PROPERTY BOUNDARY

Site Geology

Geologic Setting



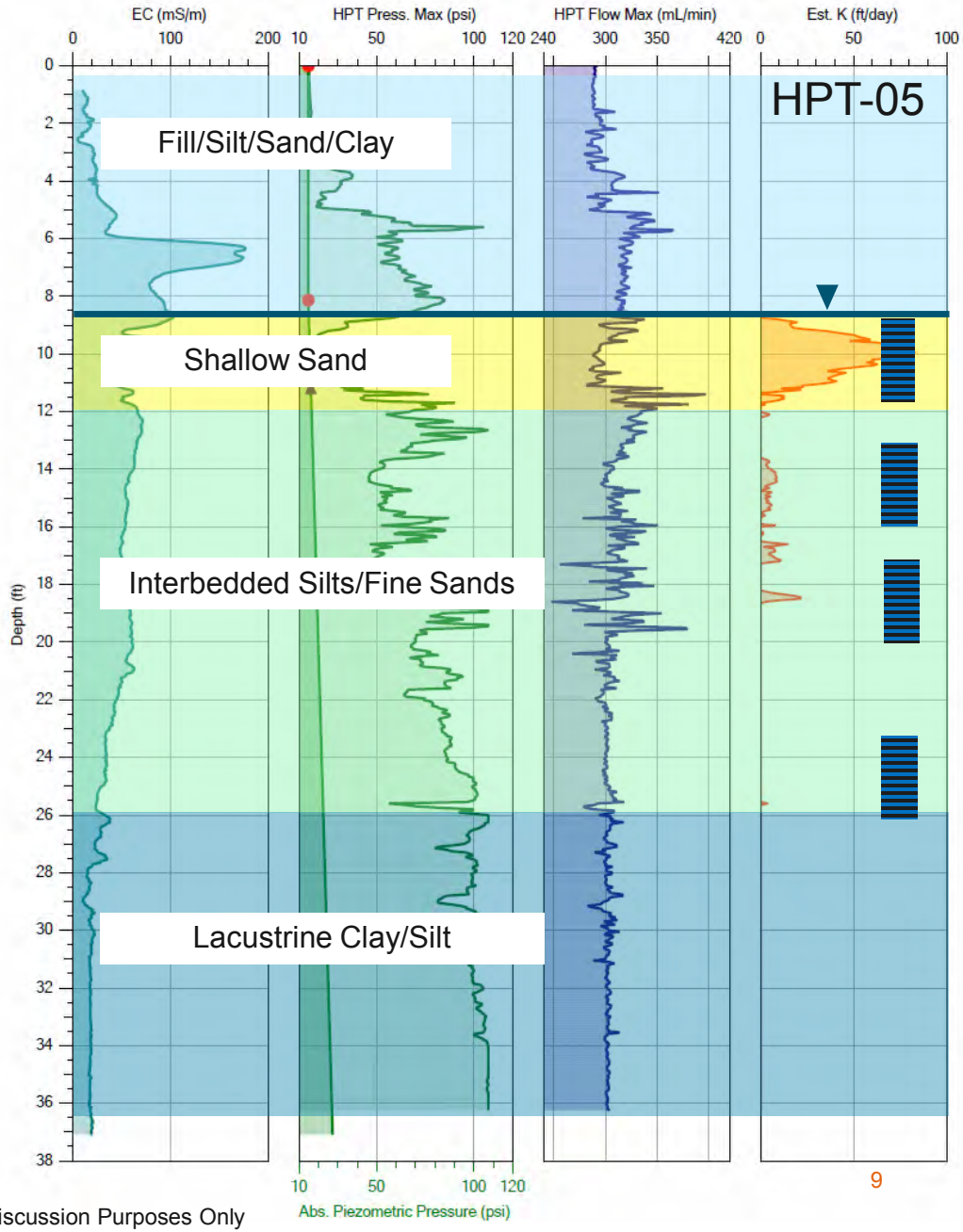
HPT Log

Geoprobe® Hydraulic Profiling Tool

- Direct push probe that injects small amount of water into the formation and records pressure response

Flow (Q) / Pressure (P) = Est. K (Q/P)

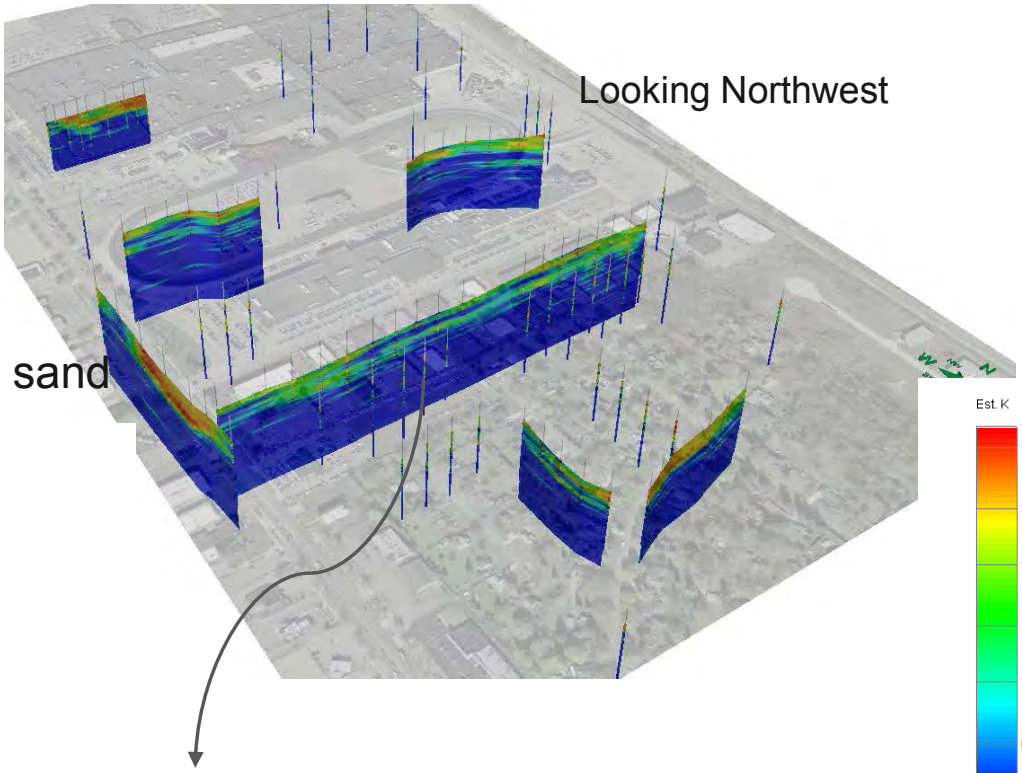
- Est. K is Q/P corrected by an empirical relationship developed by Geoprobe

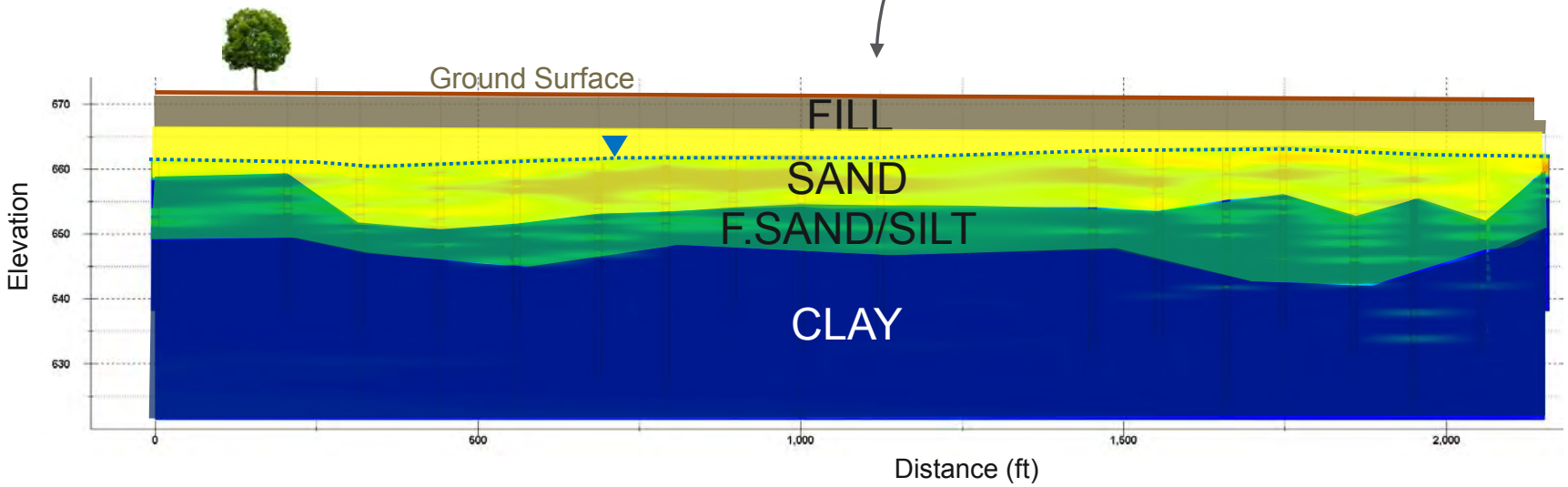


Geology

General Hydrostratigraphic Units:

- ~0-5 Shallow fill/silt/sand/clay
- ~5-12 Sandy outwash
- ~12-25 Interbedded lacustrine fine sand and silt
- ~25-30' Lacustrine clay and silt
- ~30 → Clay



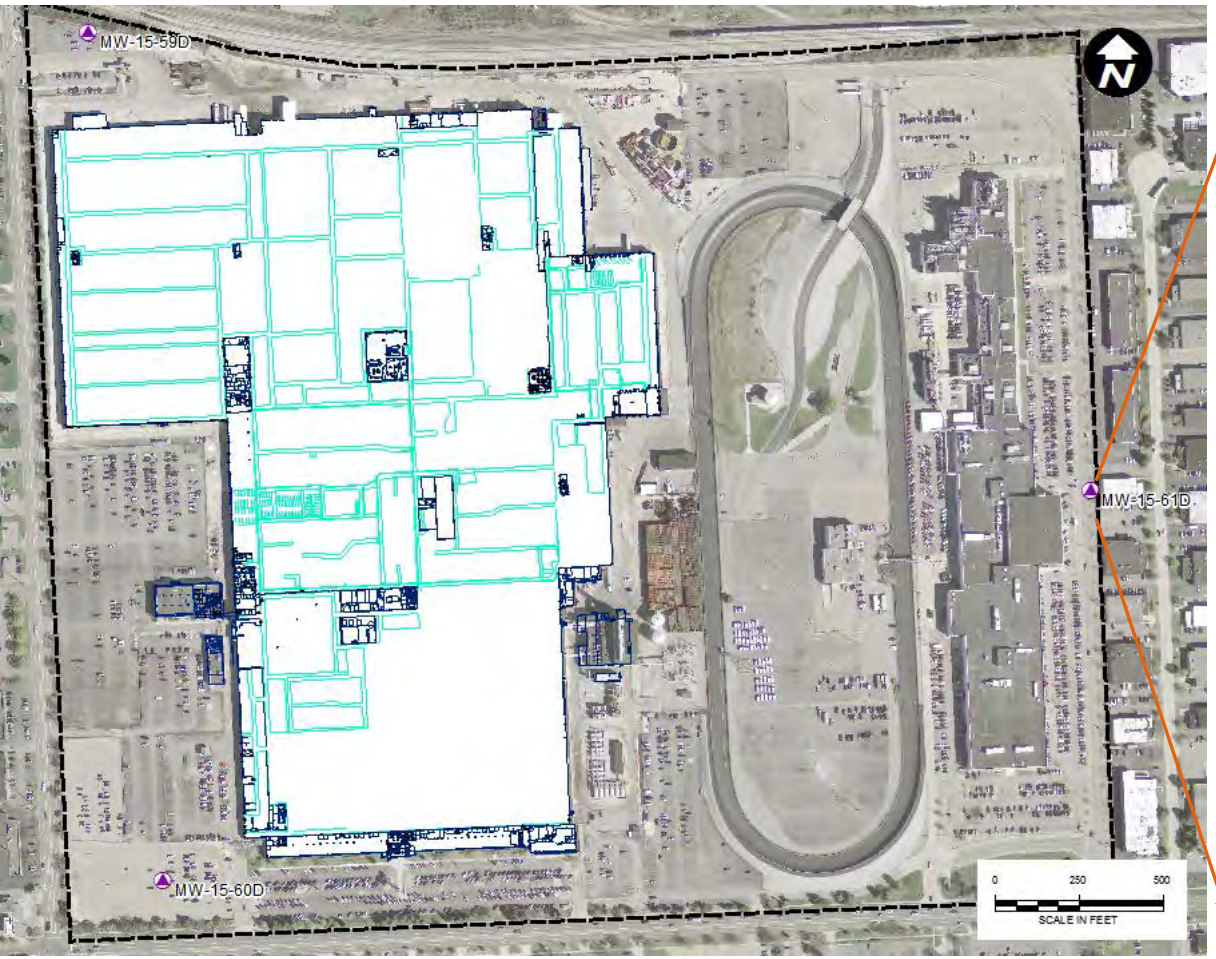


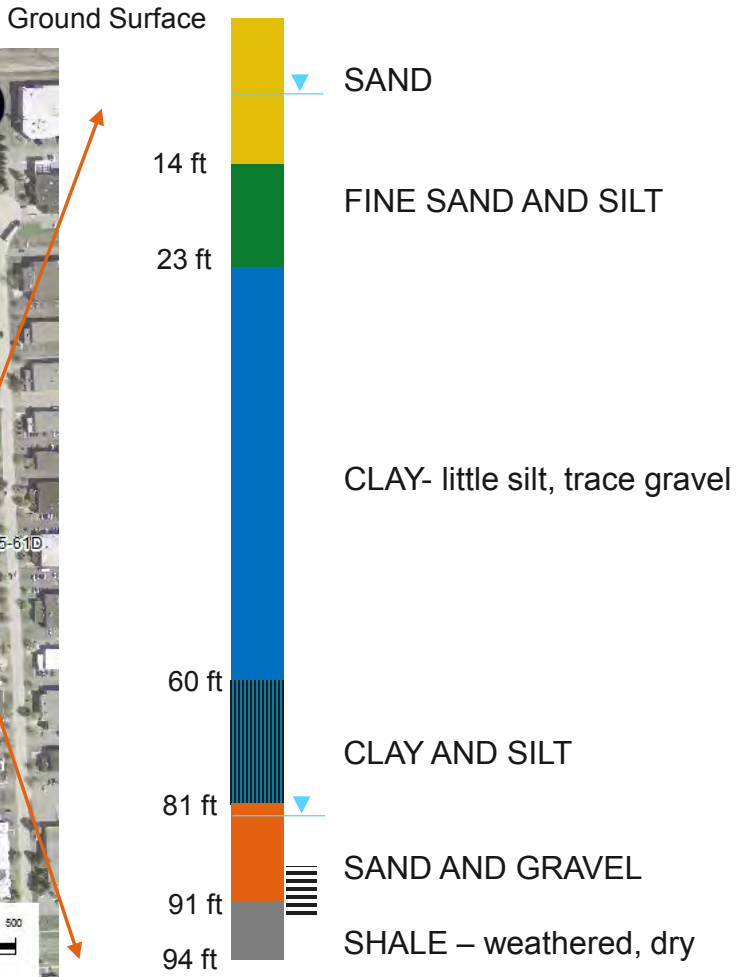
DRAFT – For Discussion Purposes Only

Link-3D Model

Deep Well Installation

- All VOCs below criteria





Groundwater/Soil Impacts

On-Site Laboratory

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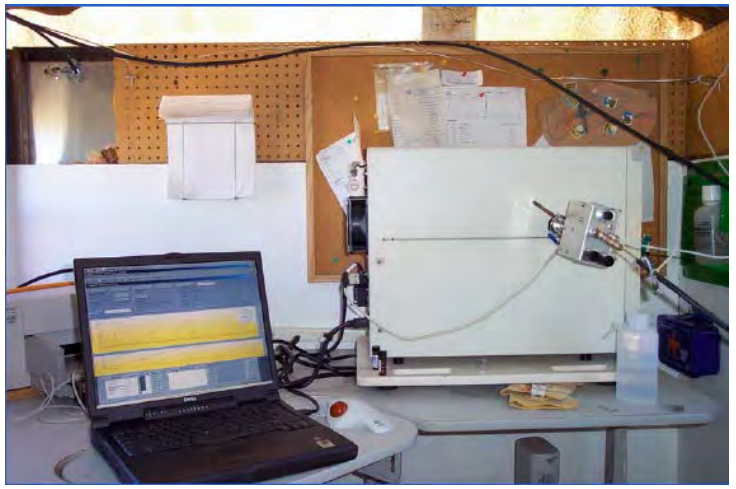
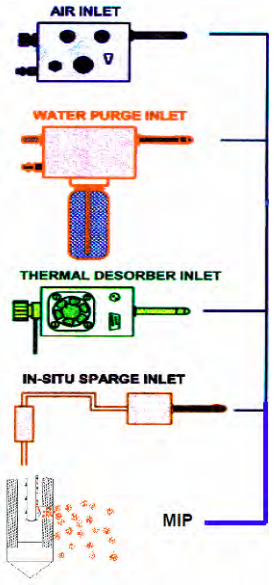
On-site Laboratory:
Triad Environmental Services

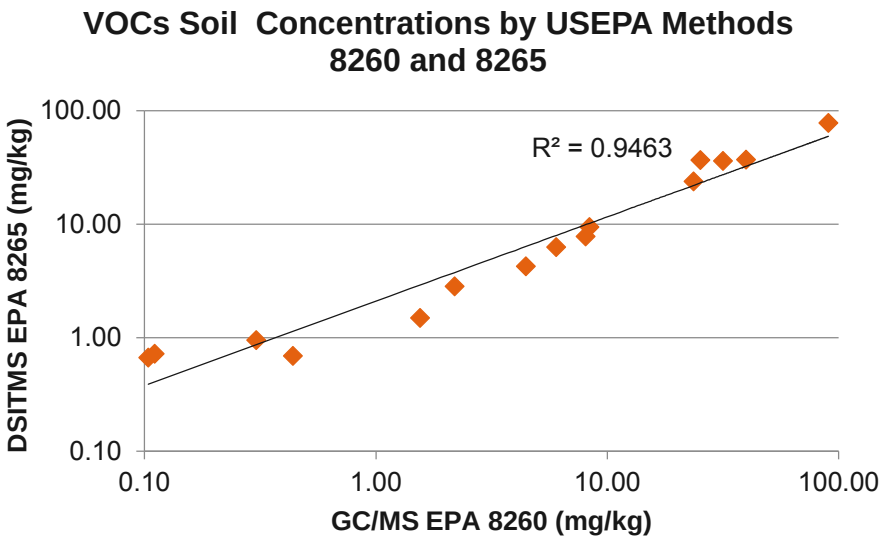


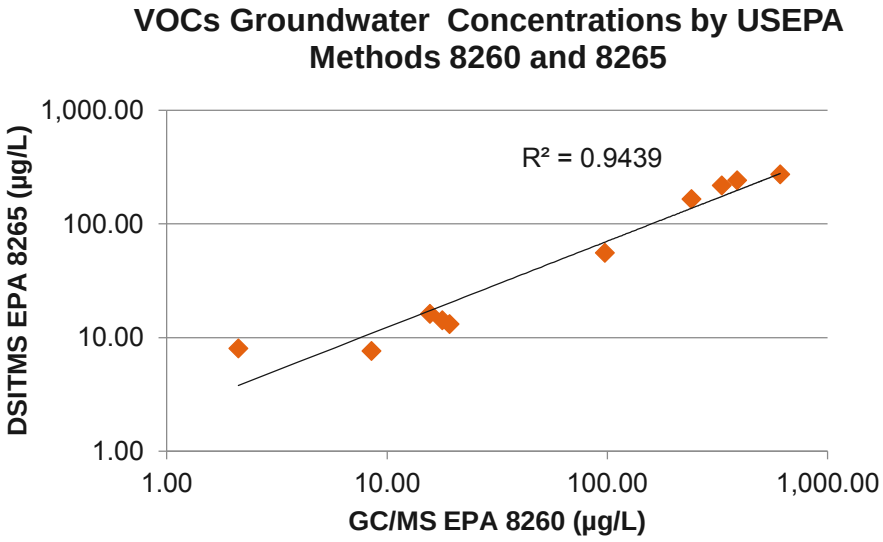
- Can process up to 80 samples per day for VOCs
  - USEPA Method 8265 (DSITMS)
  - Limit list of reported constituents to primary COCs
- DL for VOCs in water: 1.0 µg/L
- DL for VOCs in soils: 150-200 µg/Kg
- Good correlation with fixed lab methods (i.e. Method 8260)



Method 8265 vs. Method 8260

- Split samples sent to Pace Laboratory for analysis using USEPA Method 8260B
- Good agreement between the methods over a wide range of concentrations
- DSITMS reliable indicator of VOCs in soil and groundwater





Saturated Soil to Equivalent Groundwater Calculation

$$C_t = C_w * [(K_{oc} * f_{oc}) + (\Theta_w/\rho_b)]$$

- Chemical and soil properties used to convert saturated soil data to equivalent groundwater concentration
- Good approximation, not exact – GW concentrations influenced by several factors:
  - organic carbon content
  - chemical-specific carbon partitioning
  - soil porosity
  - soil density

Parameter/Definition	Default
C_t = bulk soil concentration	--
C_w = groundwater concentration	--
K_{oc} = organic carbon partition coefficient	Chemical specific
f_{oc} = fraction of organic carbon	0.002 kg/kg (0.2%)
Θ_w = water filled soil porosity	0.43 (L/L)
ρ_b = dry bulk density	1.5 (kg/L)

Use site-specific parameters based on soil types

Groundwater CVOC Impacts

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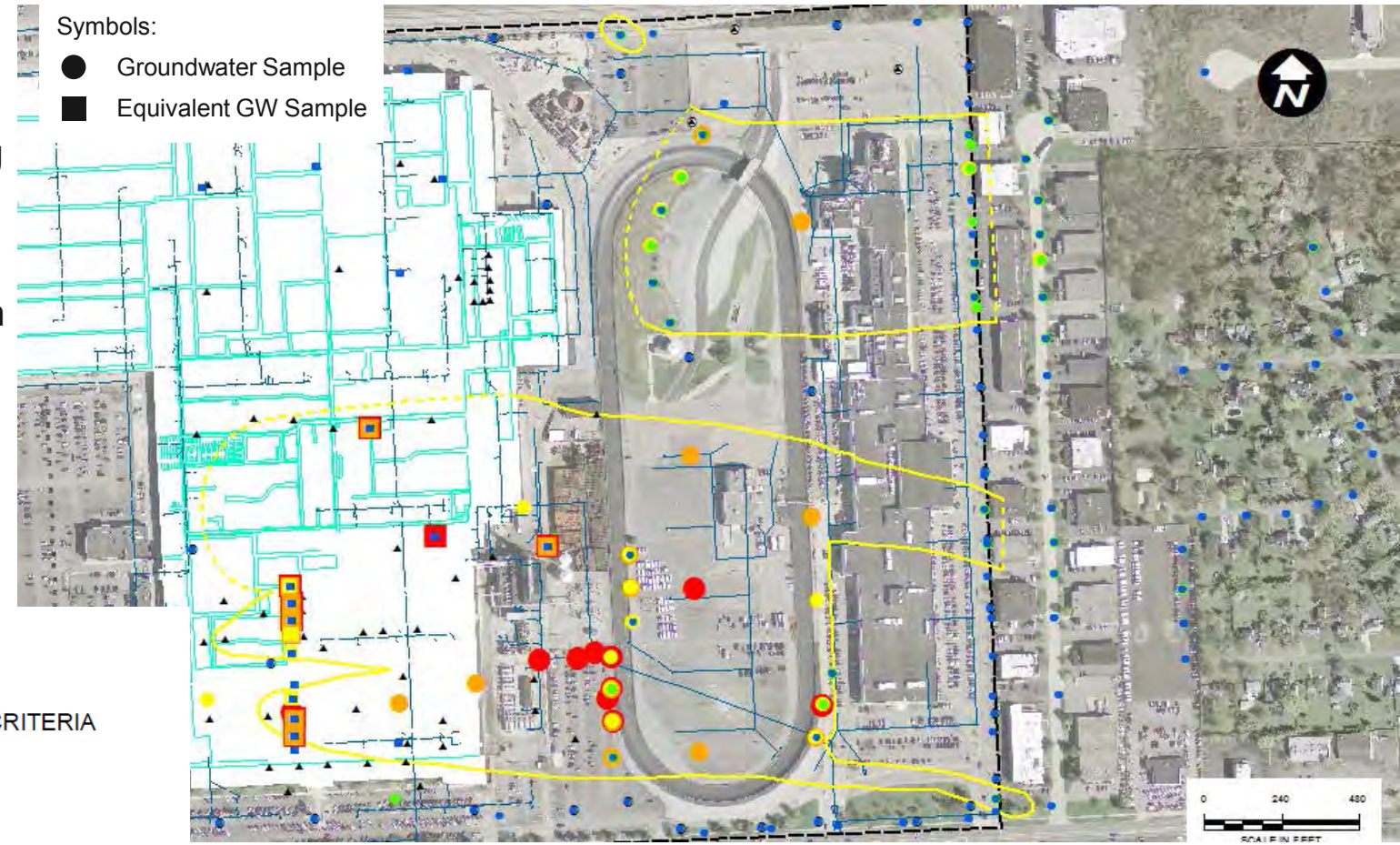
Two groundwater plumes:

- South – extending from sources in 9FM & 6R
- North – source currently unknown



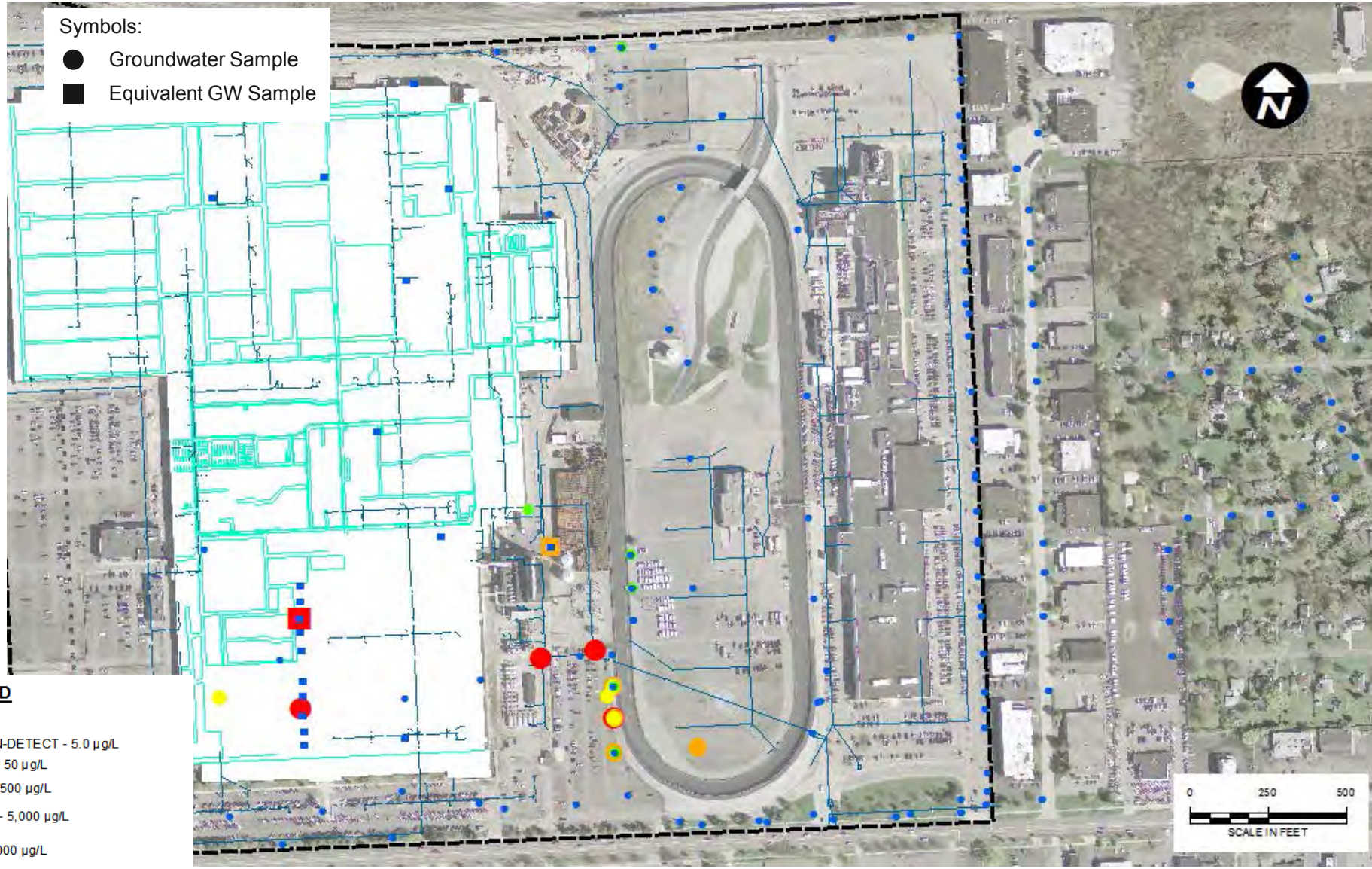
LEGEND

NORMALIZED DATA

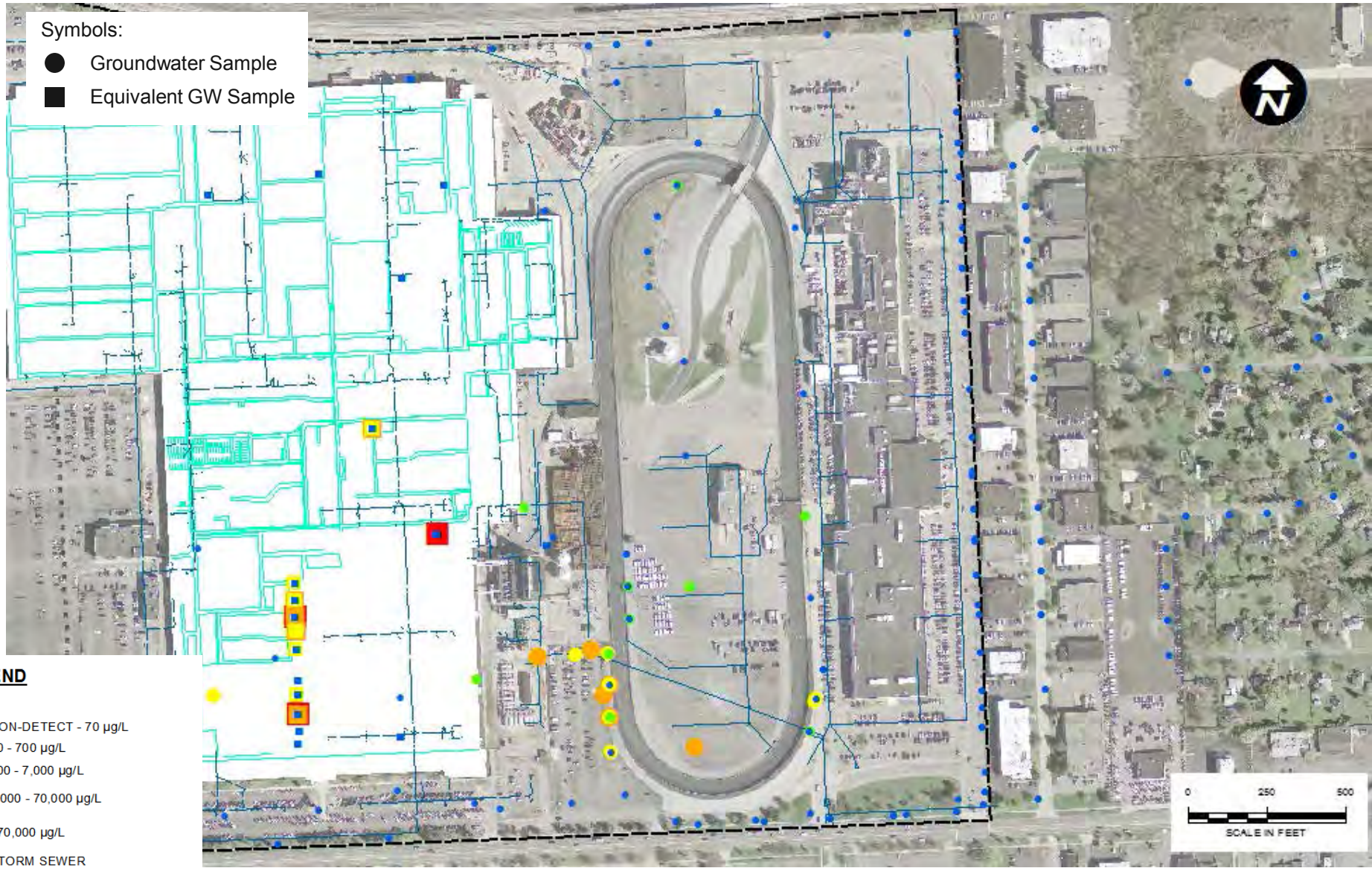
- BELOW CRITERIA - 1x CRITERIA
- 1x - 10x CRITERIA
- 10x - 100x CRITERIA
- 100x - 1,000x CRITERIA
- > 1,000x CRITERIA
- EXISTING MONITORING WELLS
- EXISTING LIF BORING
- APPROXIMATE EXTENT OF TCVOC IMPACTS (DASHED WHERE INFERRED)

NOTE: All data normalized to Part 201 Residential Drinking Water Criteria. The concentration of each individual compound is divided by the criteria. Values less than one are ignored. The remaining values are added together to provide a measure of plume strength and indicate where one or more CVOC compounds exceed criteria.

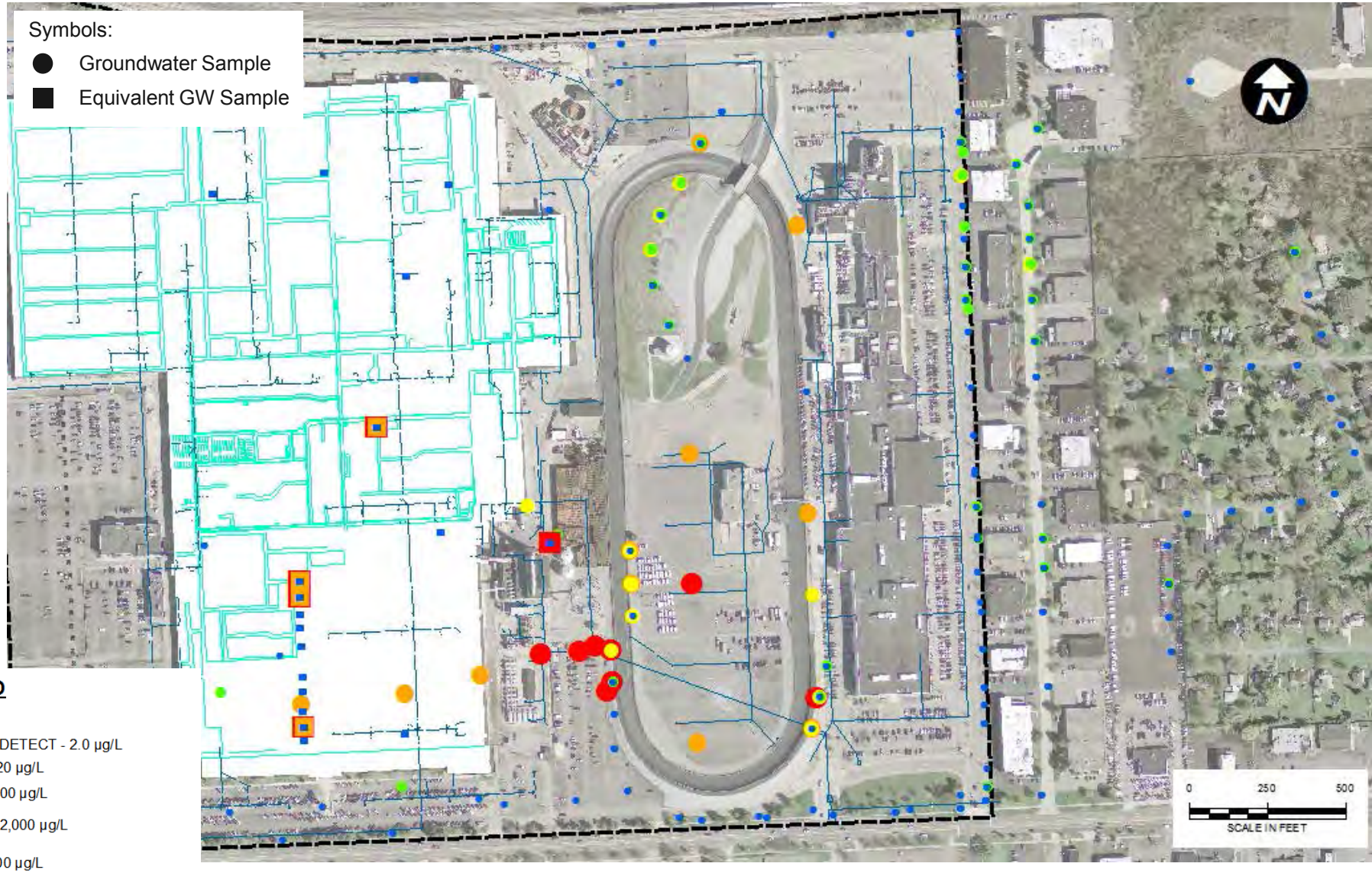
TCE


Symbols:
Groundwater Sample
Equivalent GW Sample
N
0
250
500
SCALE IN FEET
LEGEND
TCE
NON-DETECT - 5.0 µg/L
5.0 - 50 µg/L
50 - 500 µg/L
500 - 5,000 µg/L
> 5,000 µg/L
STORM SEWER
BUILDING AISLE
APPROXIMATE PROPERTY BOUNDARY

T. DCE


Symbols:
Groundwater Sample
Equivalent GW Sample
N
LEGEND
DCE
NON-DETECT - 70 µg/L
70 - 700 µg/L
700 - 7,000 µg/L
7,000 - 70,000 µg/L
>70,000 µg/L
STORM SEWER
BUILDING AISLE
APPROXIMATE PROPERTY BOUNDARY
0
250
500
SCALE IN FEET

Vinyl Chloride



LEGEND

VC

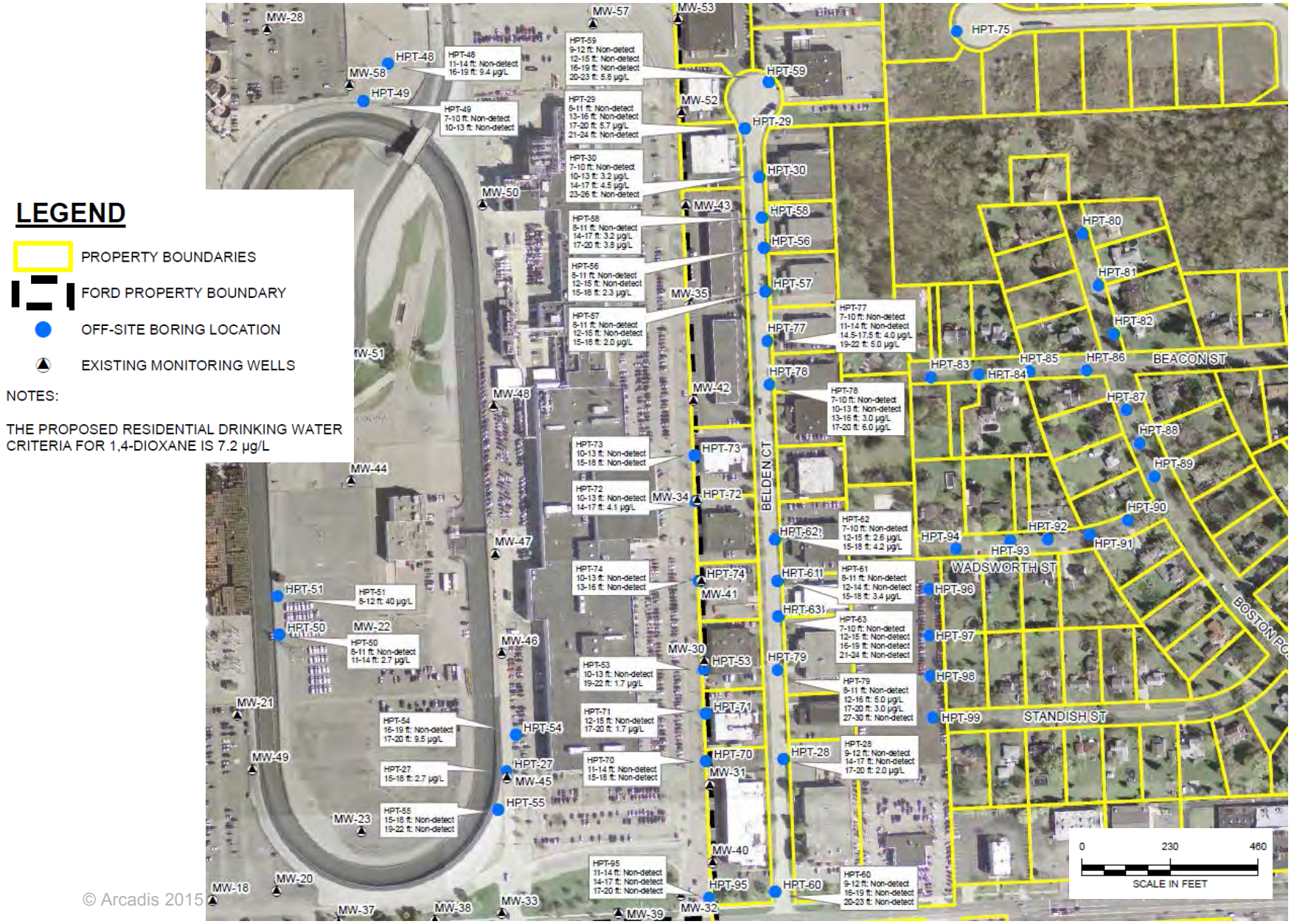
- NON-DETECT - 2.0 µg/L
- 2.0 - 20 µg/L
- 20 - 200 µg/L
- 200 - 2,000 µg/L
- > 2,000 µg/L

STORM SEWER

BUILDING AISLE

APPROXIMATE PROPERTY BOUNDARY

1,4-Dioxane



LIF-HP Data

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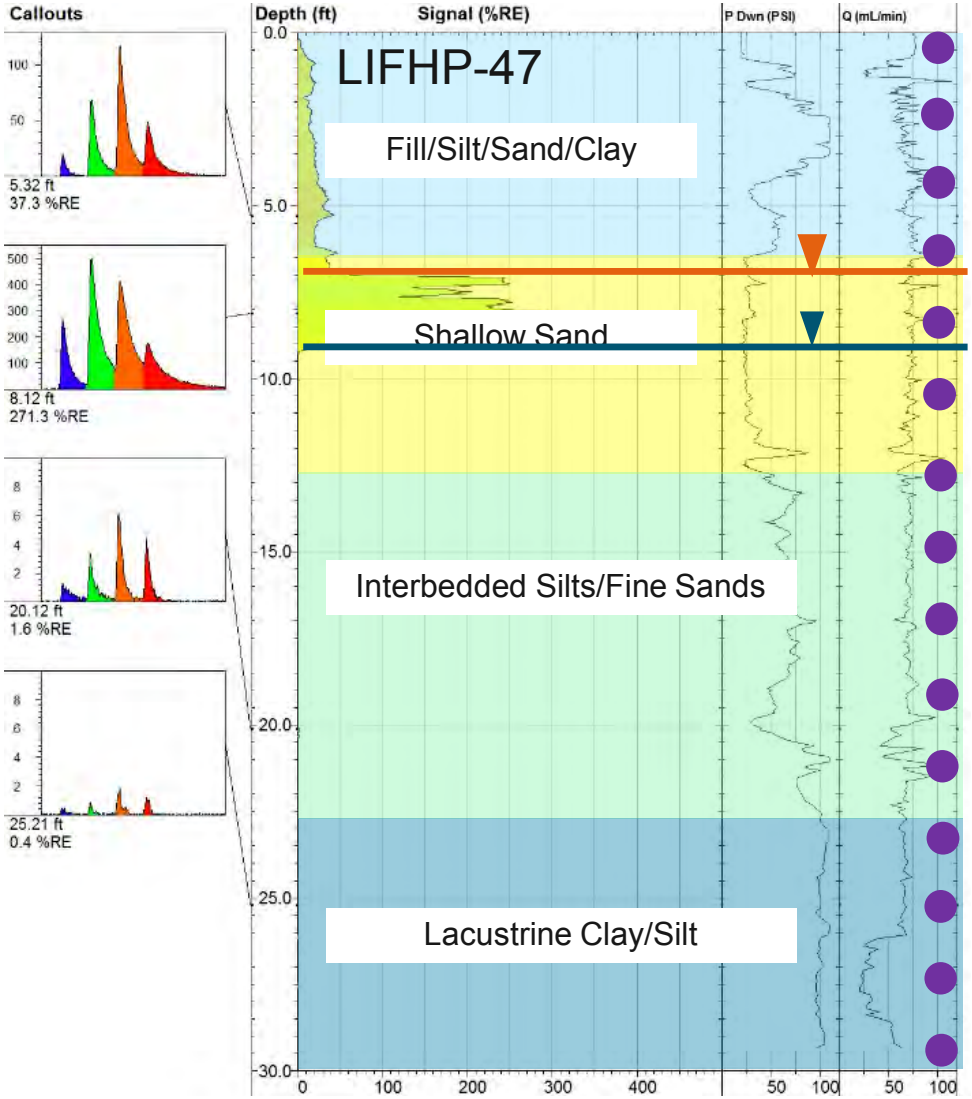
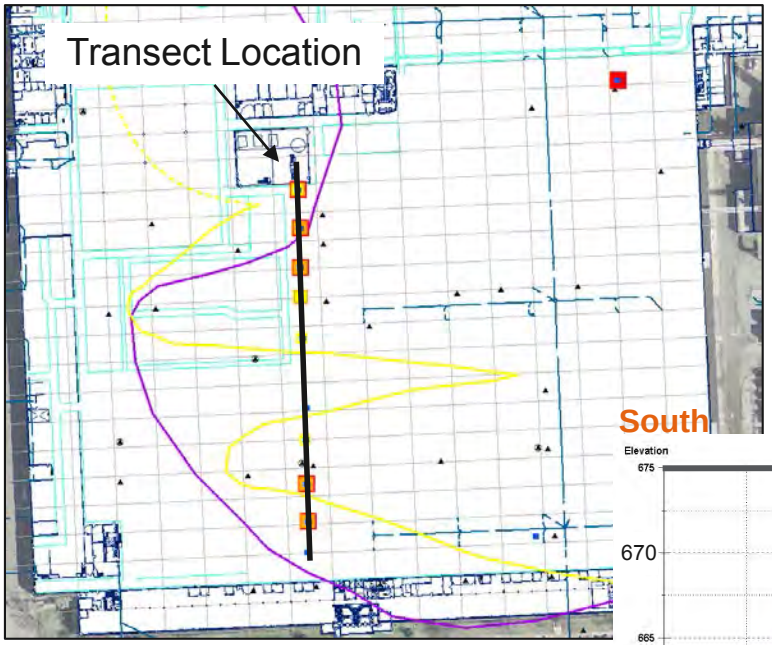
Example Soil Sampling Intervals

Dakota Technologies® Laser Induced Fluorescence & Hydraulic Profiling tool

- Direct push probe records LNAPL laser induced fluorescence and also injects a small amount of water while recording pressure response
- We can use the uncorrected Q/P as an estimate of "relative" K.



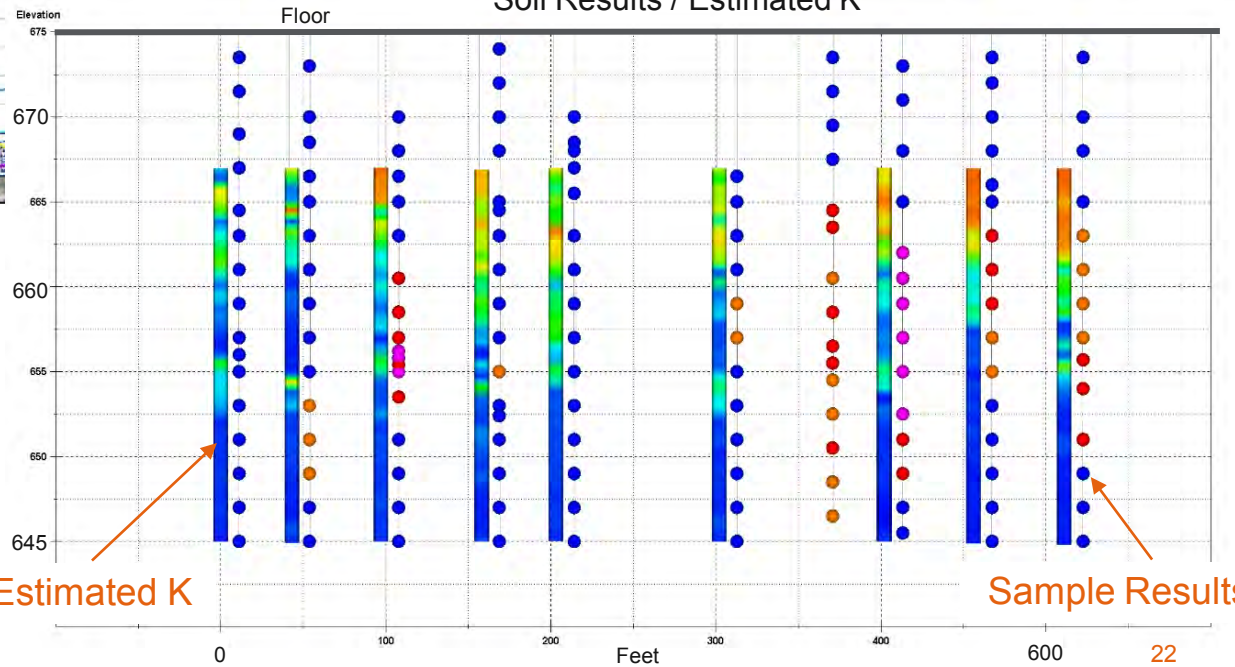
Interior Soil Sampling – Transect 1



South

Soil Results / Estimated K

North

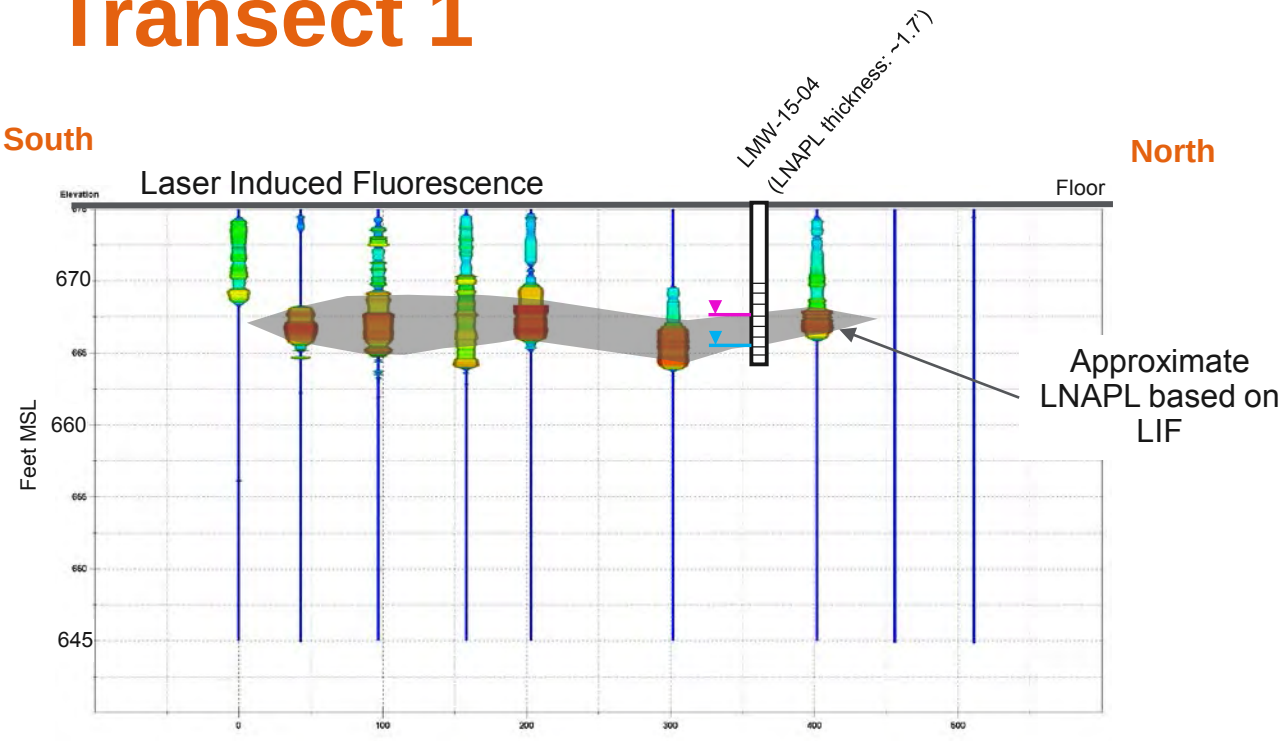


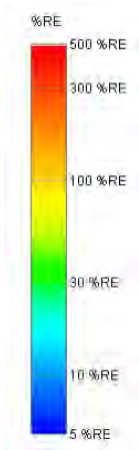
Vertical Exaggeration: 10X

Transect 1

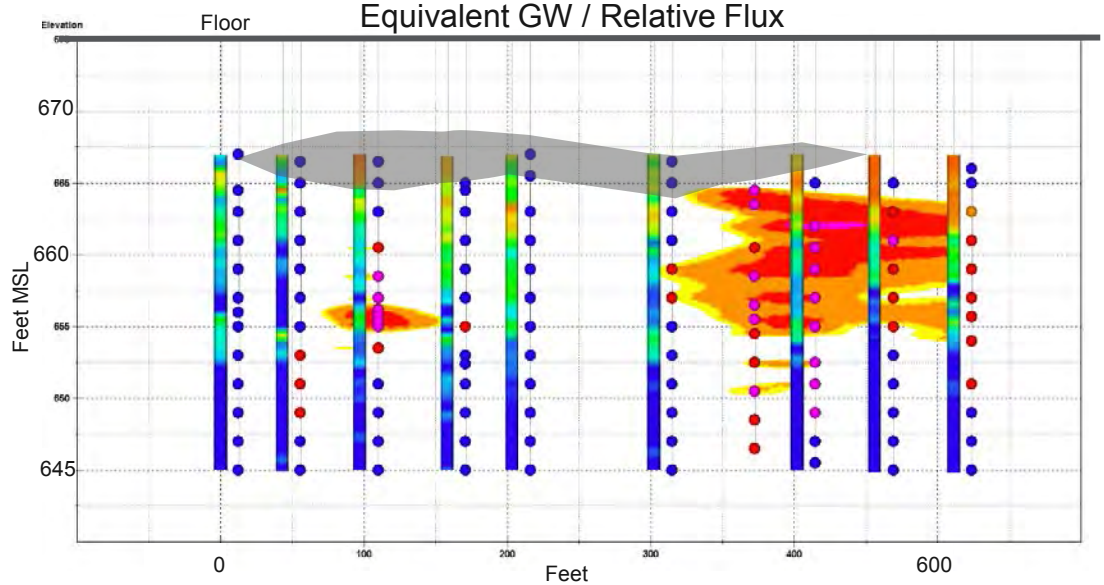
ARCADIS Design & Consultancy for natural and built assets

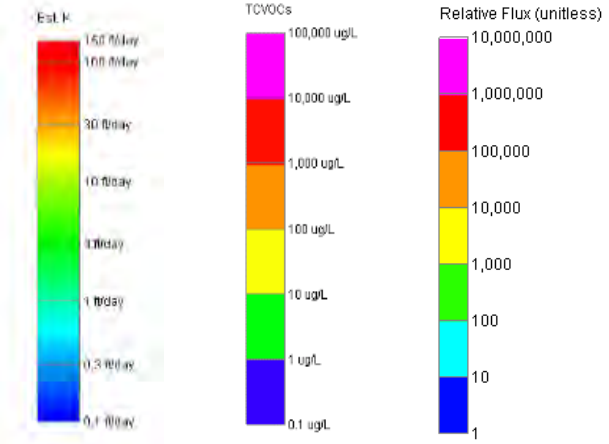
South **North**



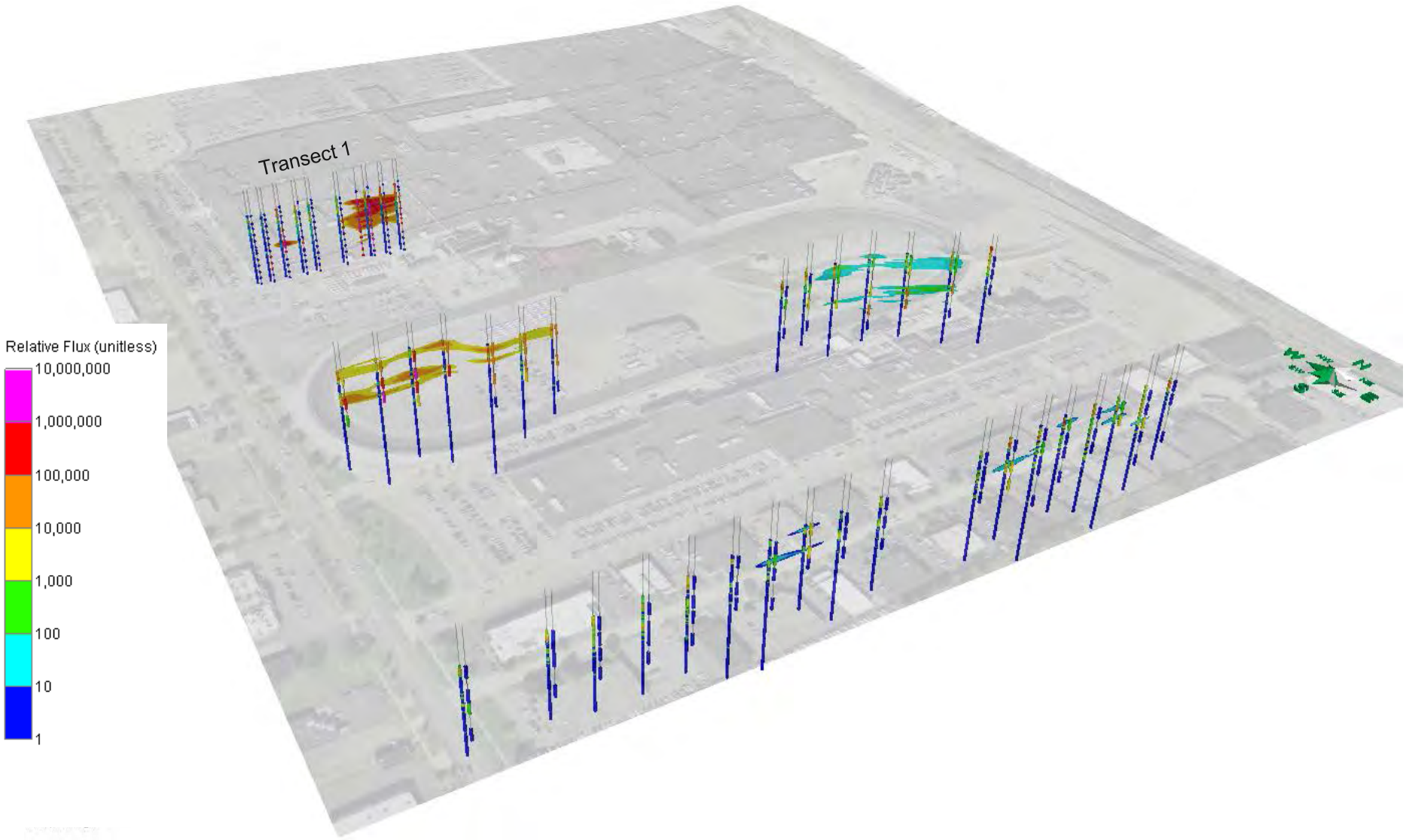


Vertical Exaggeration: 10X



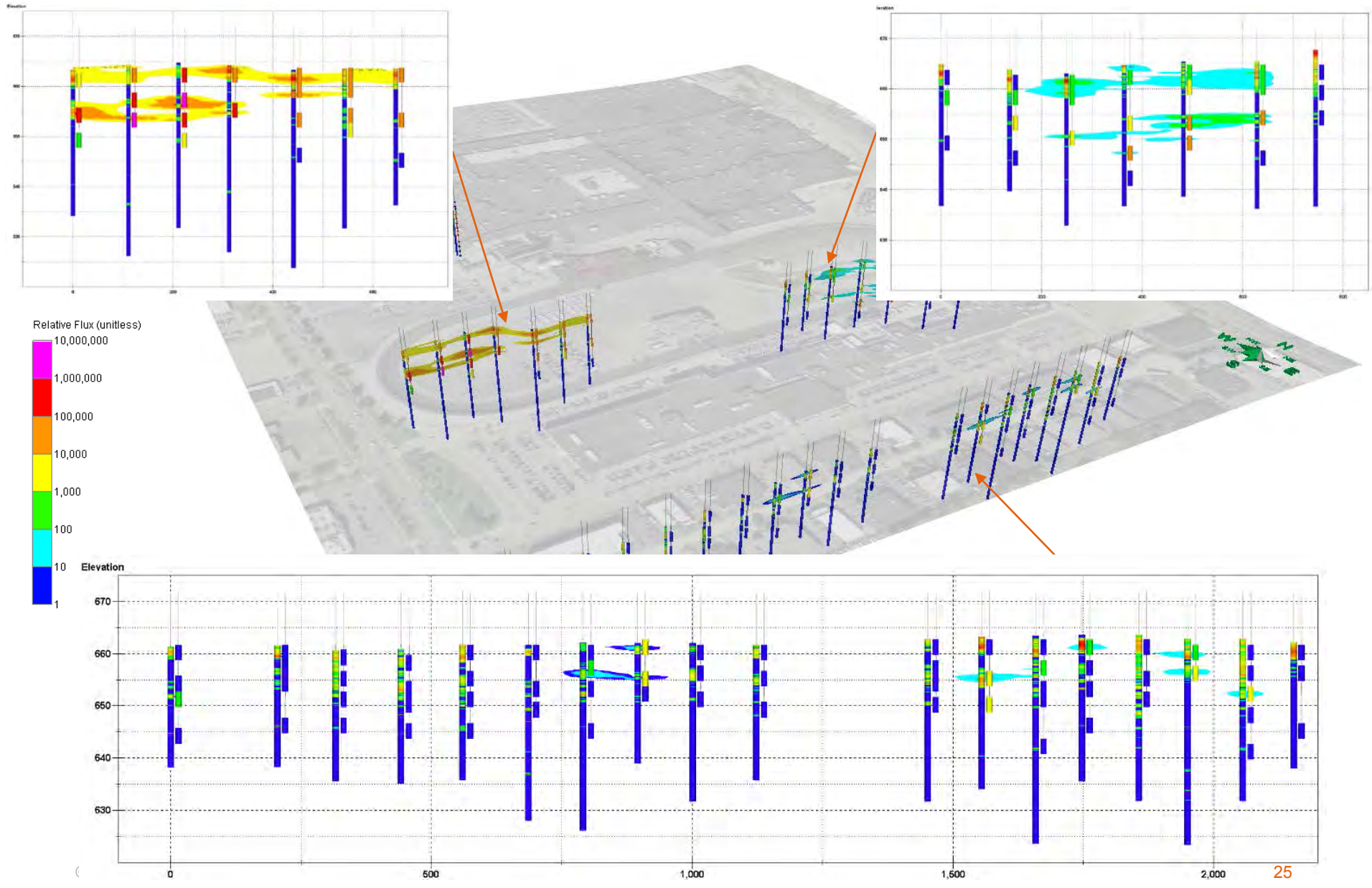


Stratigraphic Flux Model



Stratigraphic Flux Model

ARCADIS Design & Consultancy for natural and built assets



Link-3D Model

Off-site Groundwater Impacts

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LEGEND

- PROPERTY BOUNDARIES
- FORD PROPERTY BOUNDARY
- OFF-SITE SOIL BORING VINYL CHLORIDE ≤ 2.0 µg/L
- OFF-SITE SOIL BORING VINYL CHLORIDE > 2.0 µg/L

NOTES:

µg/L - MICROGRAMS PER LITER (PARTS PER BILLION)

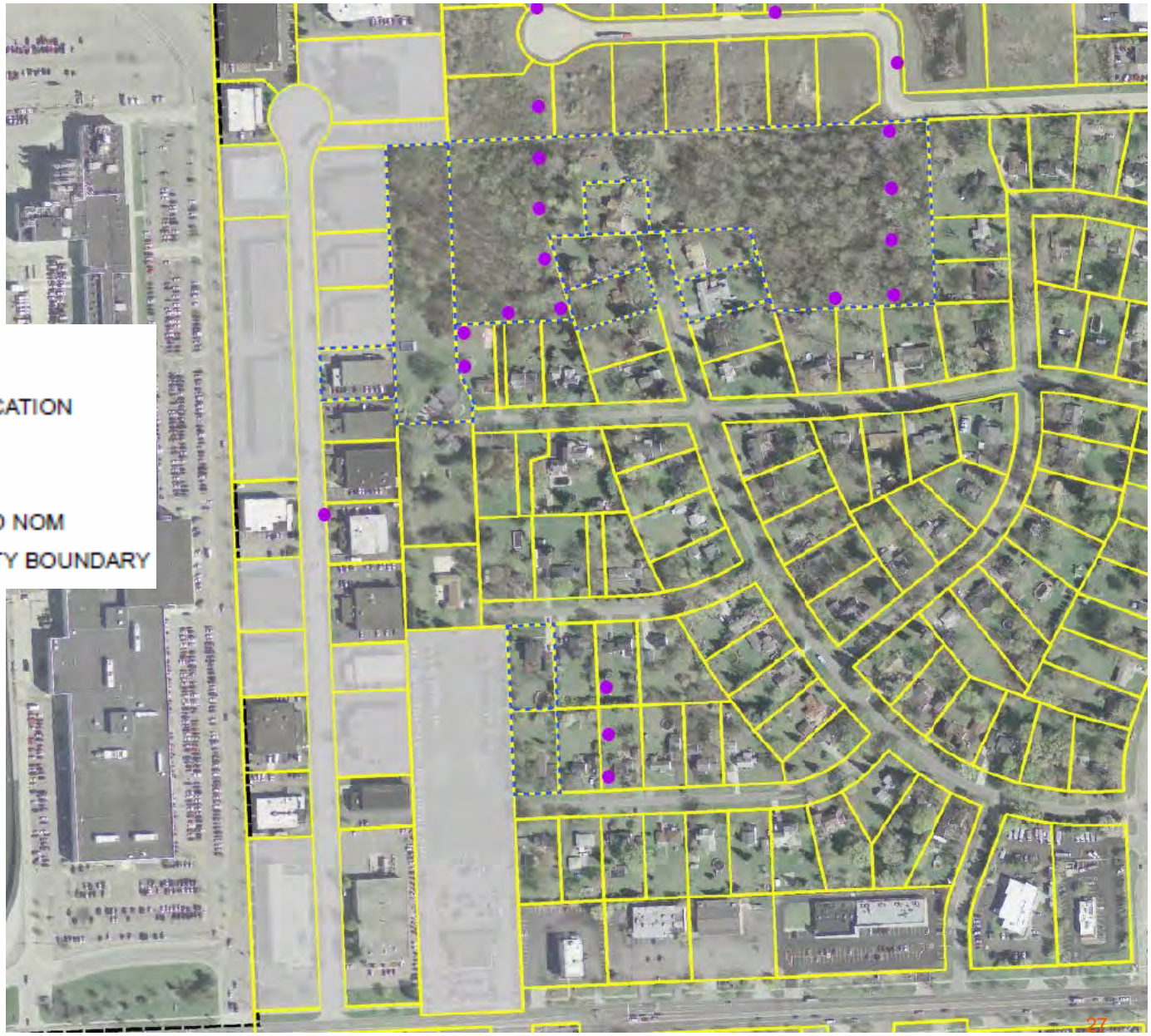
THE RESIDENTIAL DRINKING WATER CRITERIA FOR VINYL CHLORIDE 2.0 µg/L.

THE GROUNDWATER-SURFACE WATER INTERFACE CRITERIA FOR VINYL CHLORIDE IS 13 µg/L.

0 200 400

SCALE IN FEET

Additional Off-site Work



Potential Groundwater Sources

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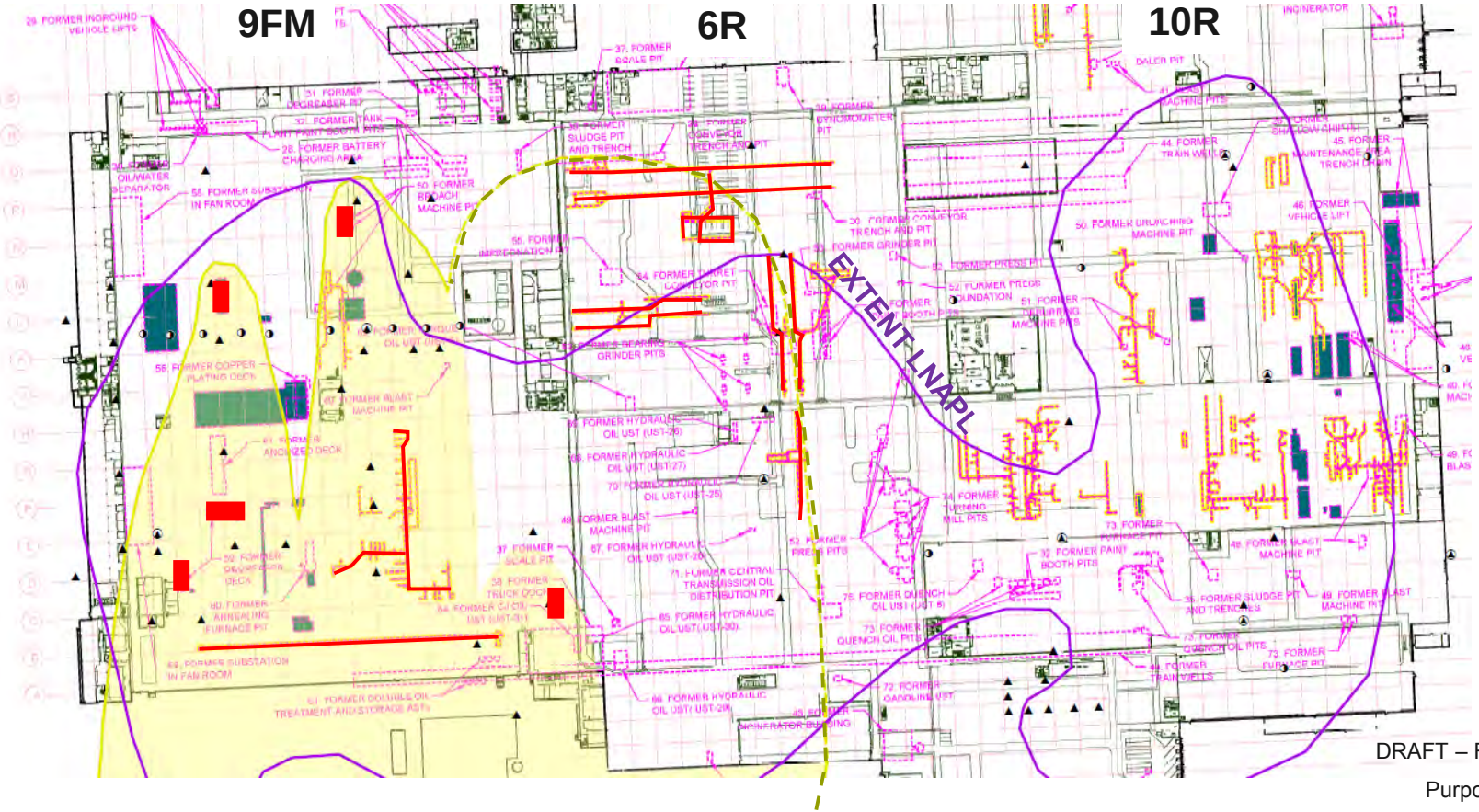
Numerous possible sources in 9FM/6R:

- former broach machine pit
- former degreaser deck
- coolant and process lines
- former screw oil machine
- transmission oil hot test stands

Impacts in 10R appear more limited:

- WWTP Area to east
- LNAPL source area
- chlorinated coolants



LNAPL

LNAPL Management Strategy

Compositional Concerns - evaluate potential for exposure

- Vapor, direct contact, dissolved phase exposure hazards

Mobility Concerns – evaluate LNAPL mobility

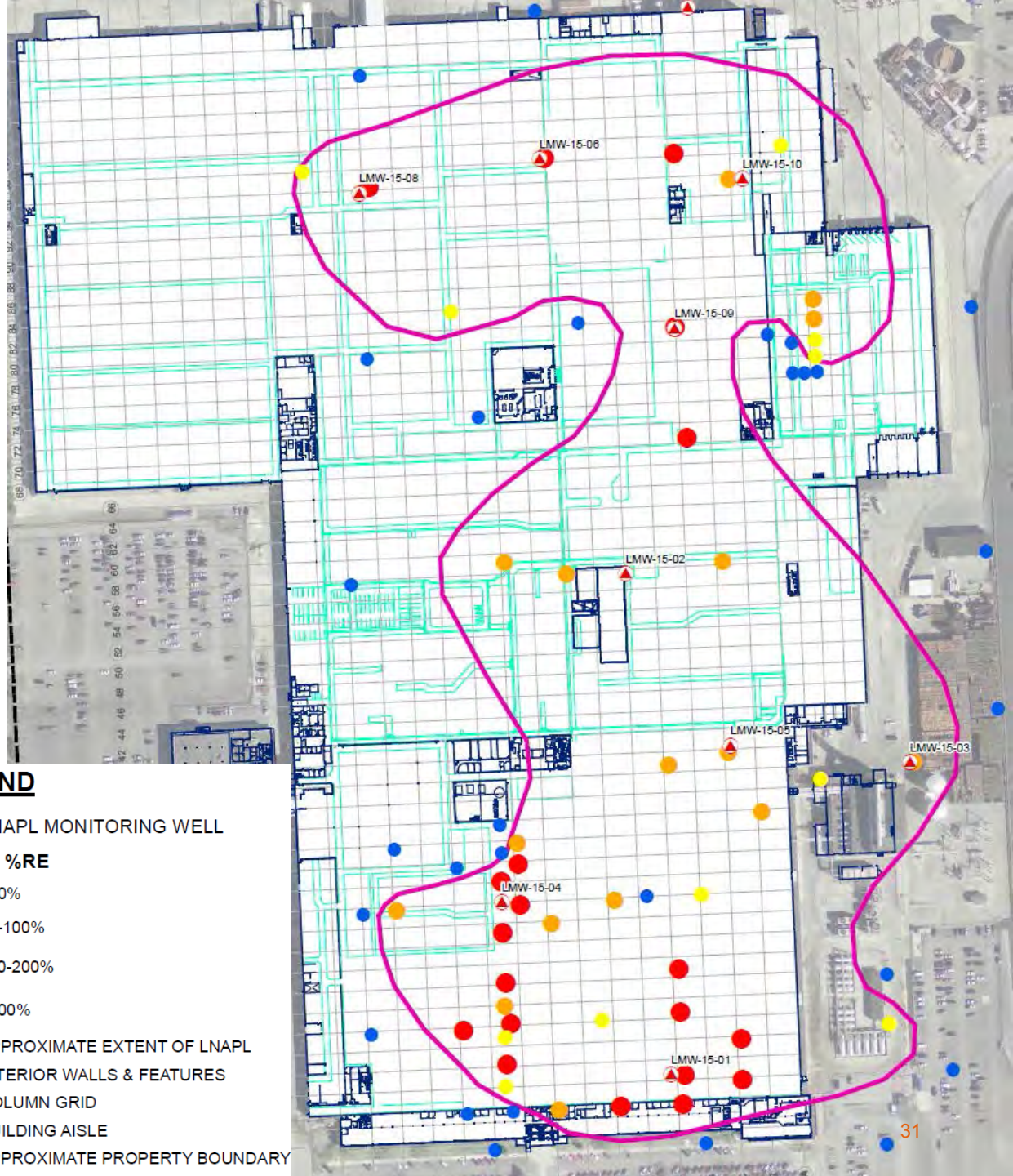
- LNAPL transmissivity testing
- Perimeter monitoring

Based on LNAPL characteristics, evaluate appropriate remedy

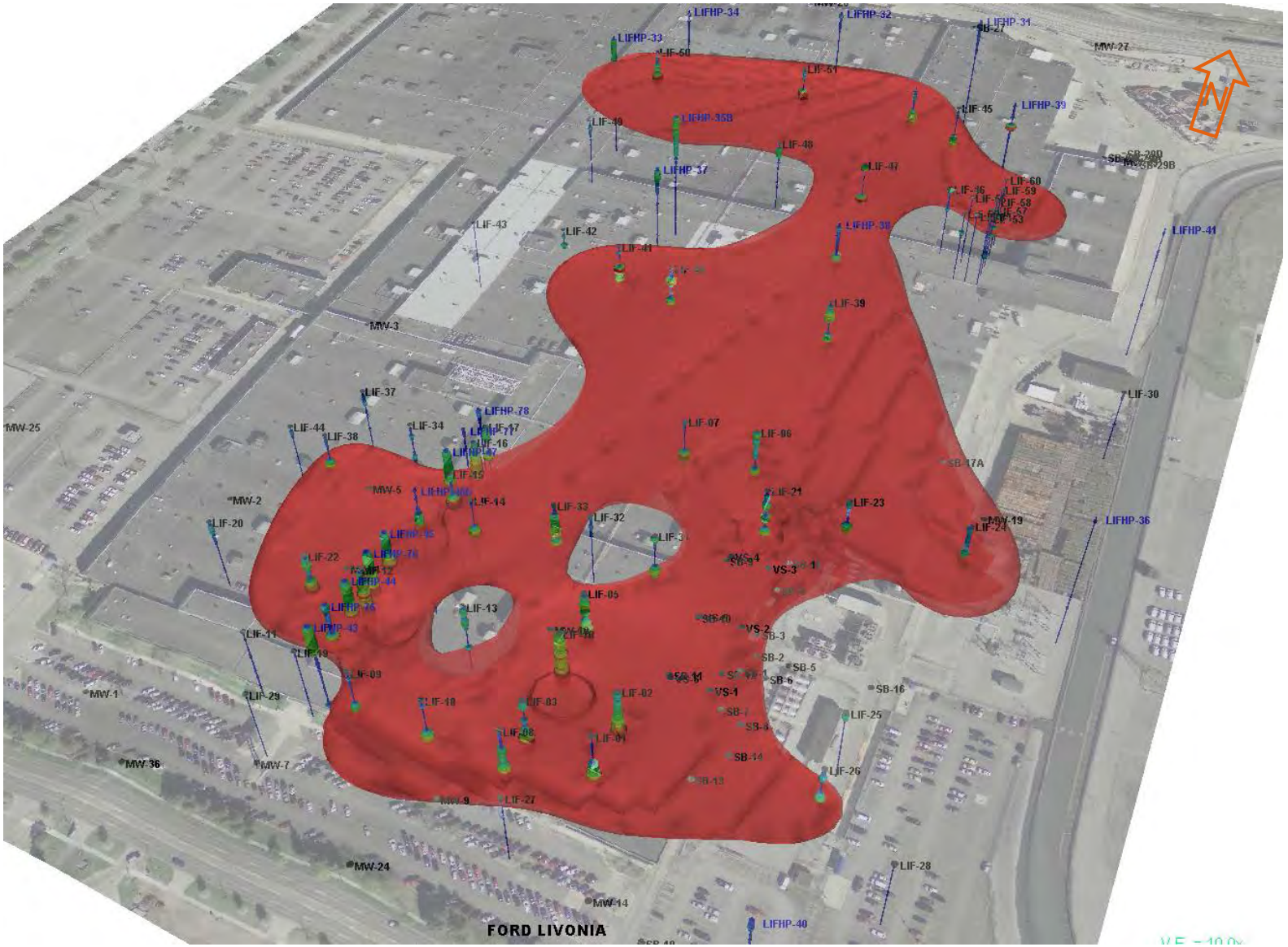
LNAPL Delination

Gauged thickness ranges from 0.1 feet to 3.0 feet

- 0.1 feet at LMW-15-07 & LMW-15-08
- 3.0 feet at LMW-15-01

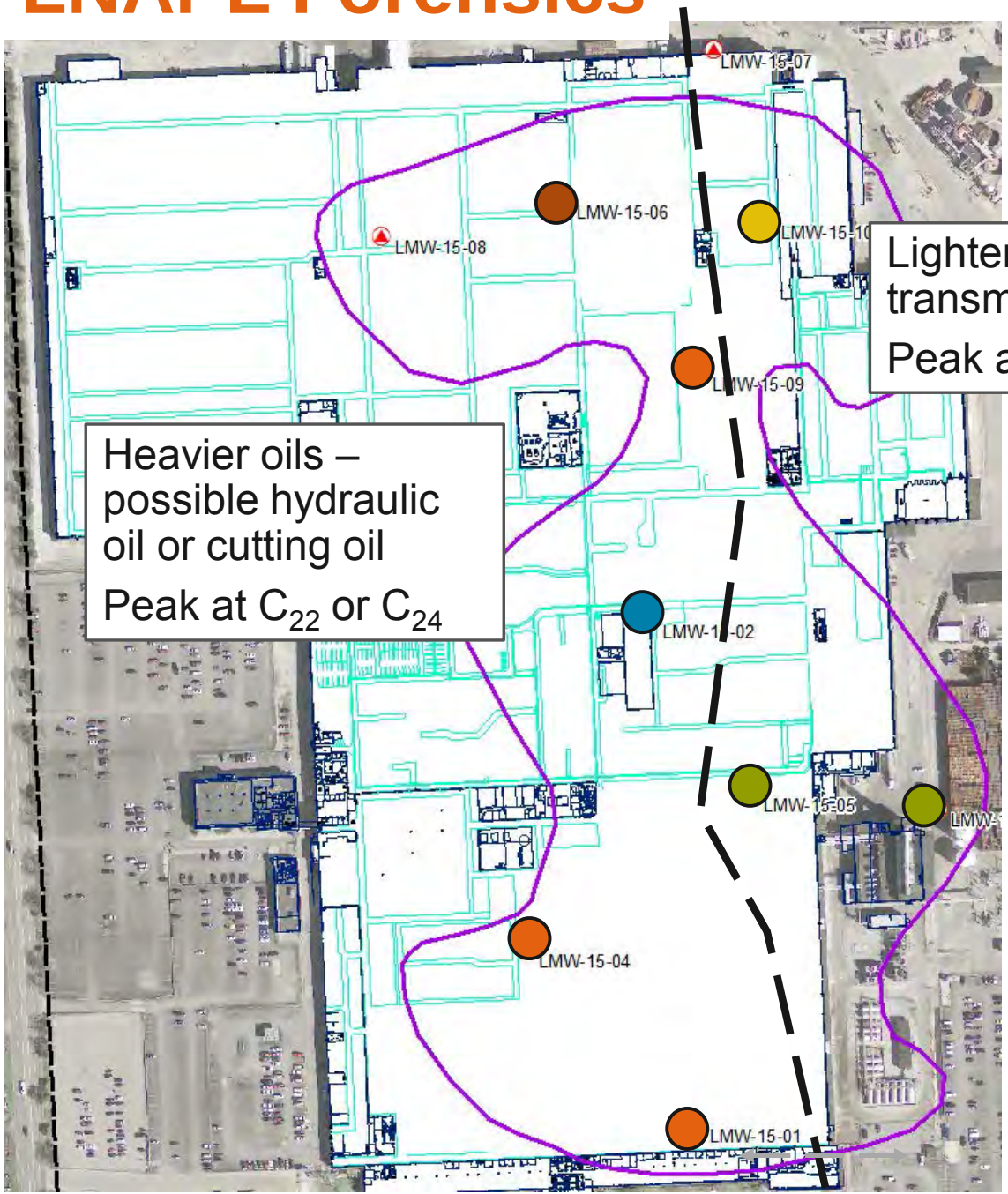


LNAPL Delineation



Link-3D Model

LNAPL Forensics



Lighter oils – possible transmission oil

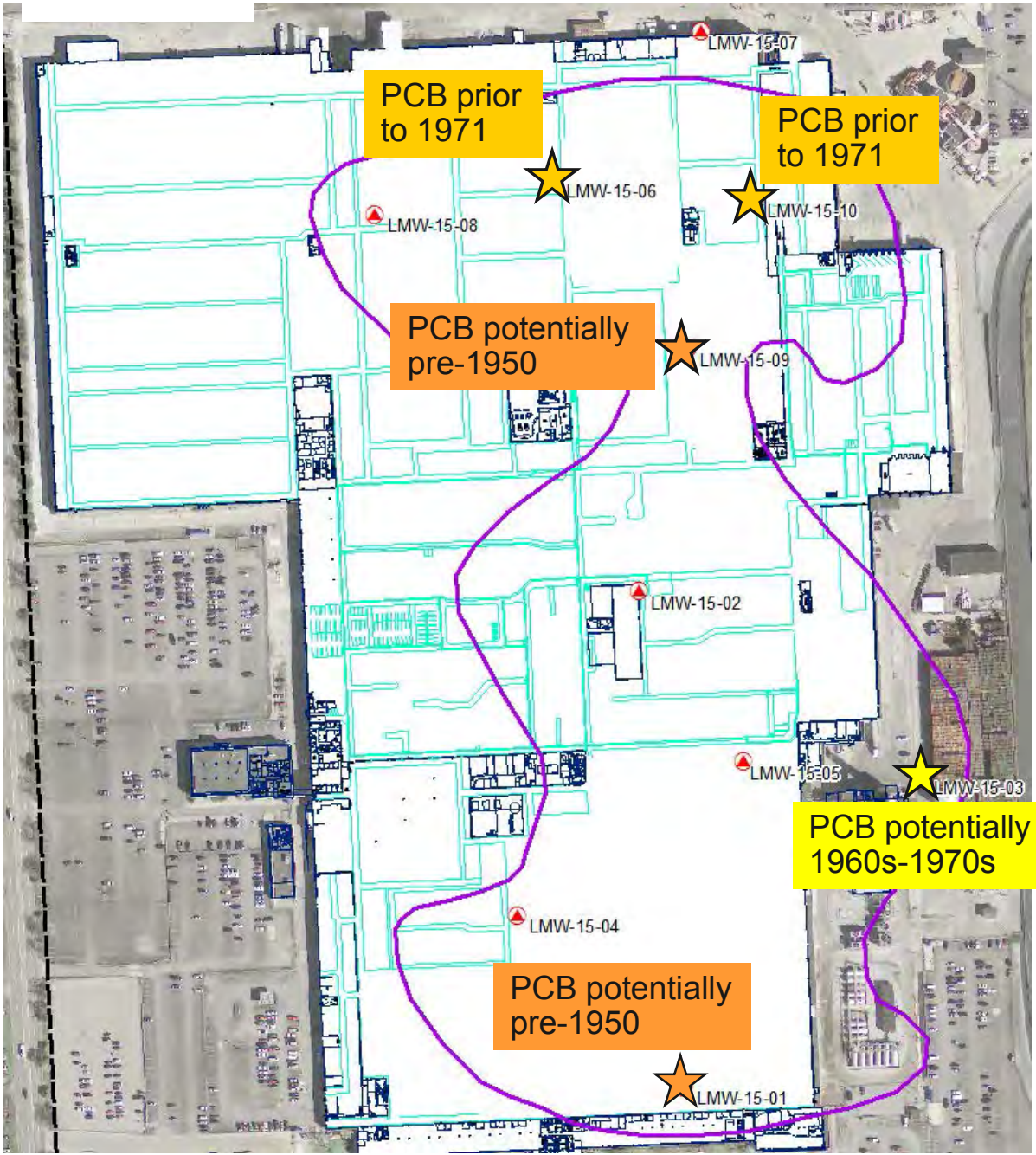
Peak at C_{18} or C_{19}

Heavier oils – possible hydraulic oil or cutting oil

Peak at C_{22} or C_{24}

- Possible transmission oil, weathered. Peak at C_{18}
- Possible transmission oil, partially weathered. Peak at C_{19}
- Possible hydraulic oil or cutting oil, partially weathered. Peak at C_{22}
- Possible hydraulic oil or cutting oil, unweathered. Peak at C_{22}
- Possible hydraulic oil or cutting oil, partially weathered. Peak at C_{24}
- Theoretical divide between lighter and heavier oils

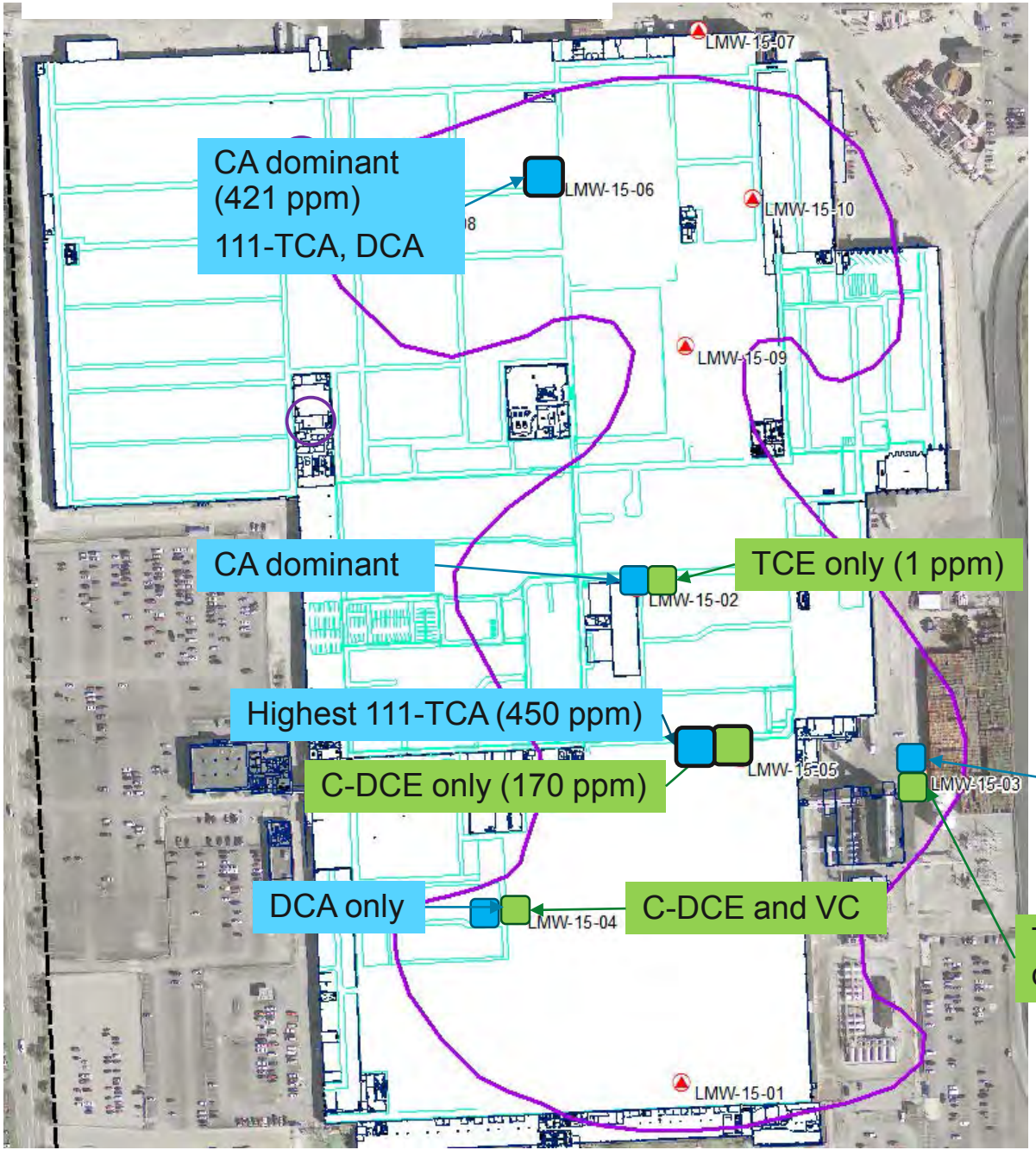
PCBs



- PCB detections indicated by star, otherwise not detected
- PCB concentrations in oil ≤ 5 ppm
- PCBs in oil have congeners that can be used to correlate era of oil manufacture
- PCBs may be inherent in oil, but no clear relation between PCB type and oil type

★ PCB-1242
★ PCB-1248
★ PCB-1260

VOCs in LNAPL



- VOC concentrations in oil <0.1%
- Highest concentrations, at LMW-15-05
- Distribution of CVOCs consistent with presence of southern plume
- Limited CVOCs to the north

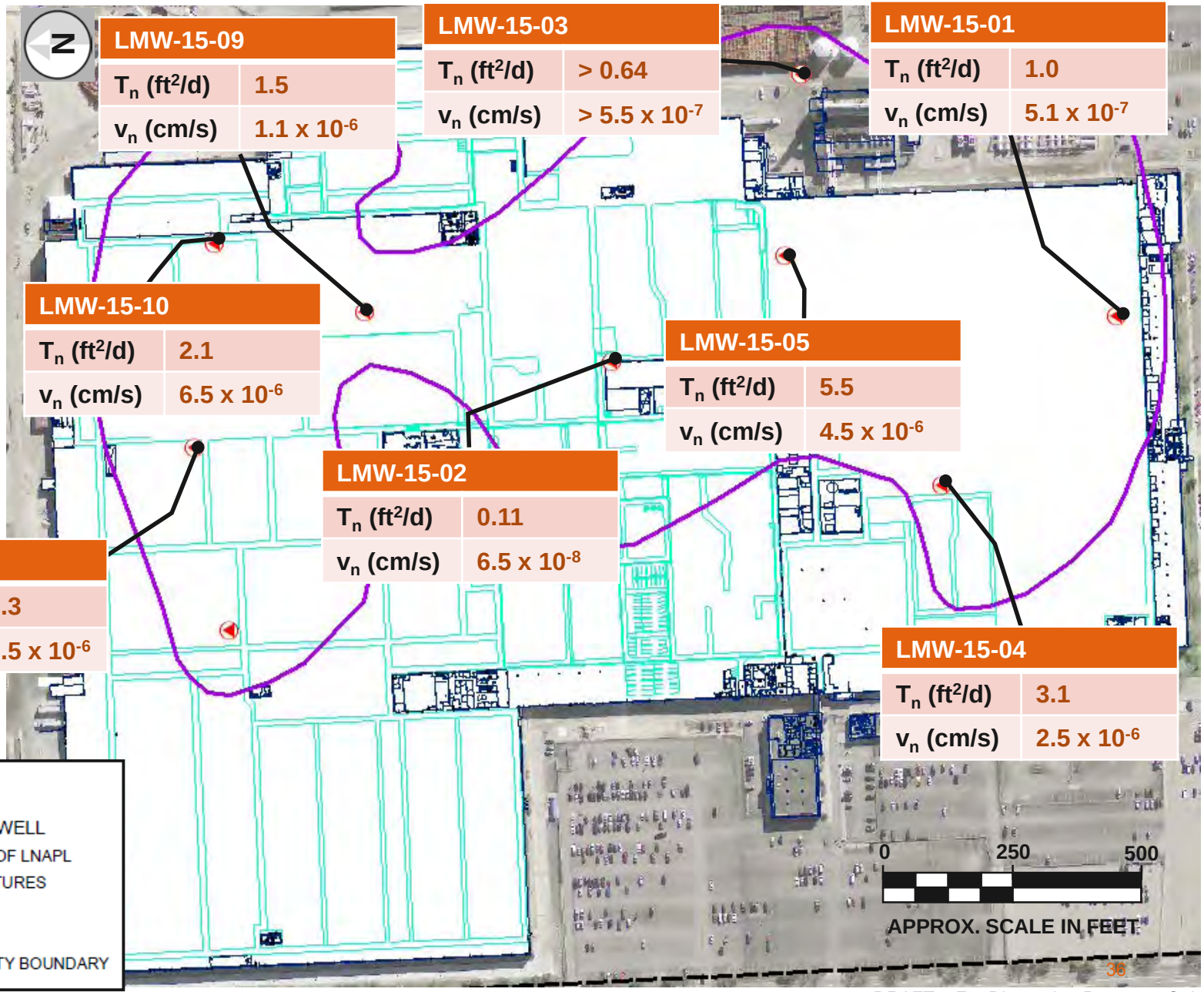
Chlorinated Ethanes

Chlorinated Ethenes

LNAPL Mobility / Transmissivity

MDEQ threshold for LNAPL recoverability:

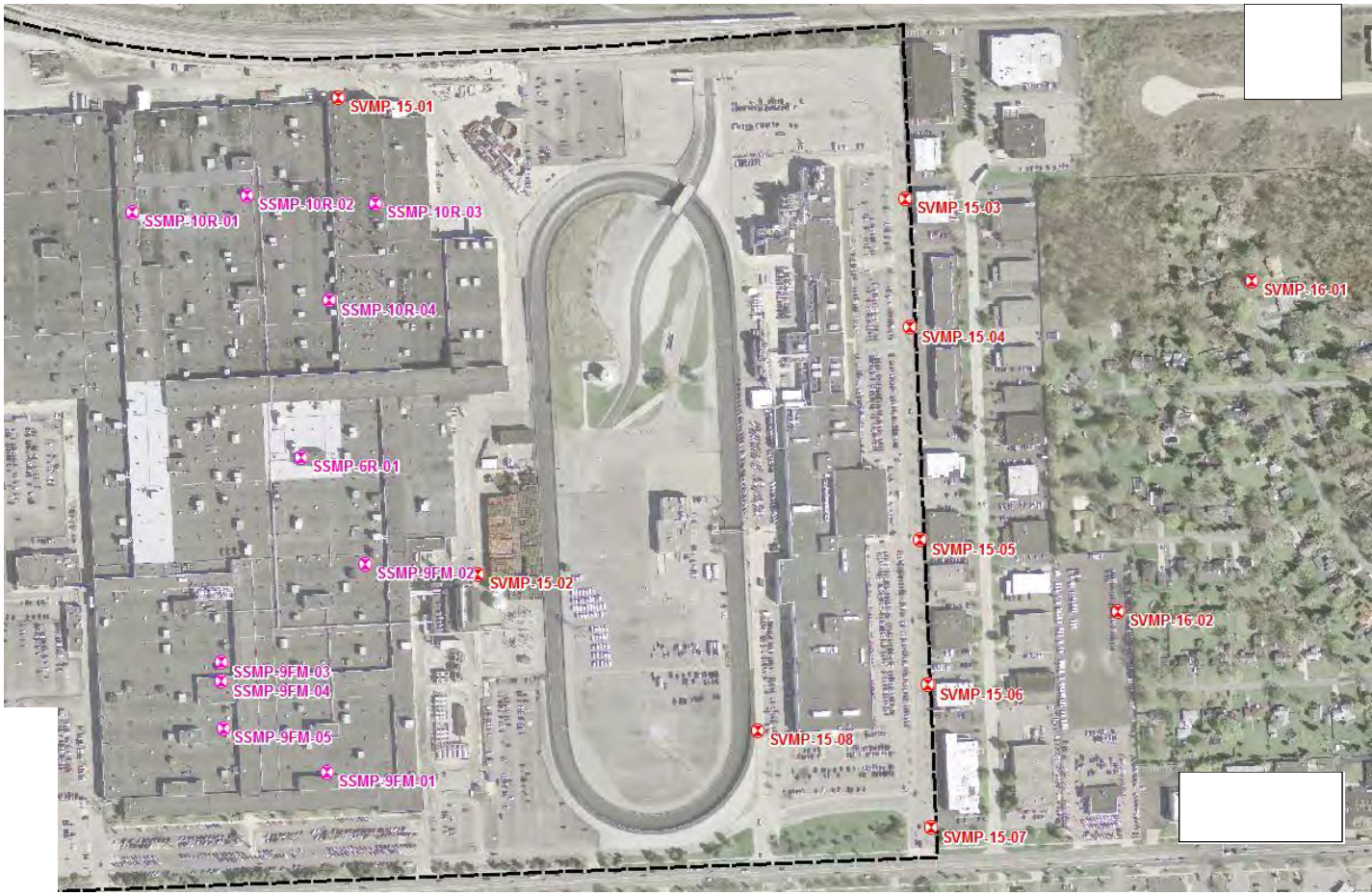
T_n > 0.5 ft^2/day



Soil Gas

Soil Vapor Sampling

Deep soil gas and sub-slab sampling completed in areas of highest impacts

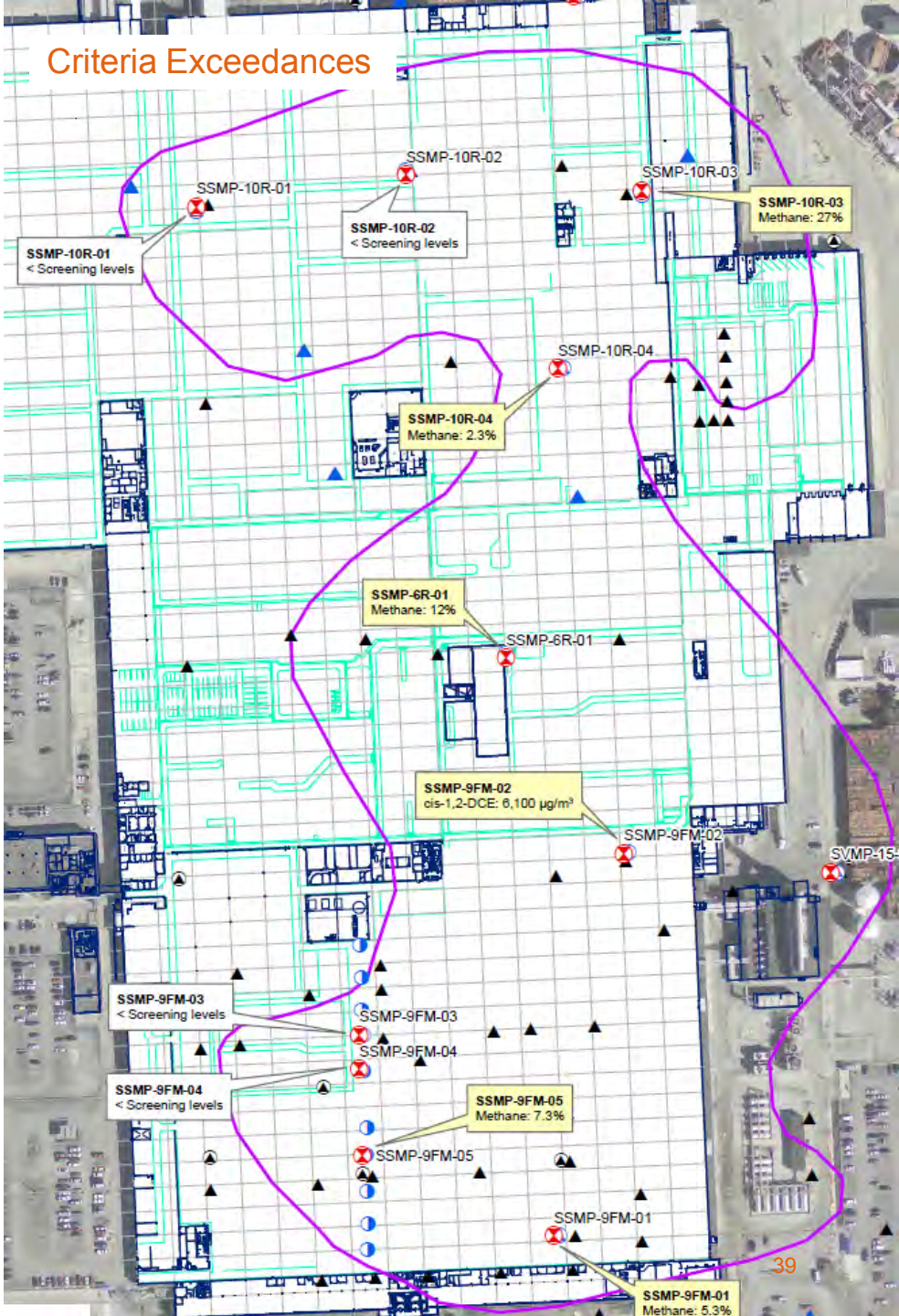


LEGEND

- SUB-SLAB SOIL GAS SAMPLE
- DEEP SOIL GAS SAMPLE
- APPROXIMATE PROPERTY BOUNDARY

Interior Methane & Soil Gas

- Biodegradation of LNAPL Produces Methane
  - Limited Oxygen Ingress to Support Methane Oxidation
  - Methane above MDEQ screening criteria of 1.25%Vol
- Cis-1,2-DCE at one location above MDEQ NR screening criteria of 4,100 µg/m^3



LEGEND

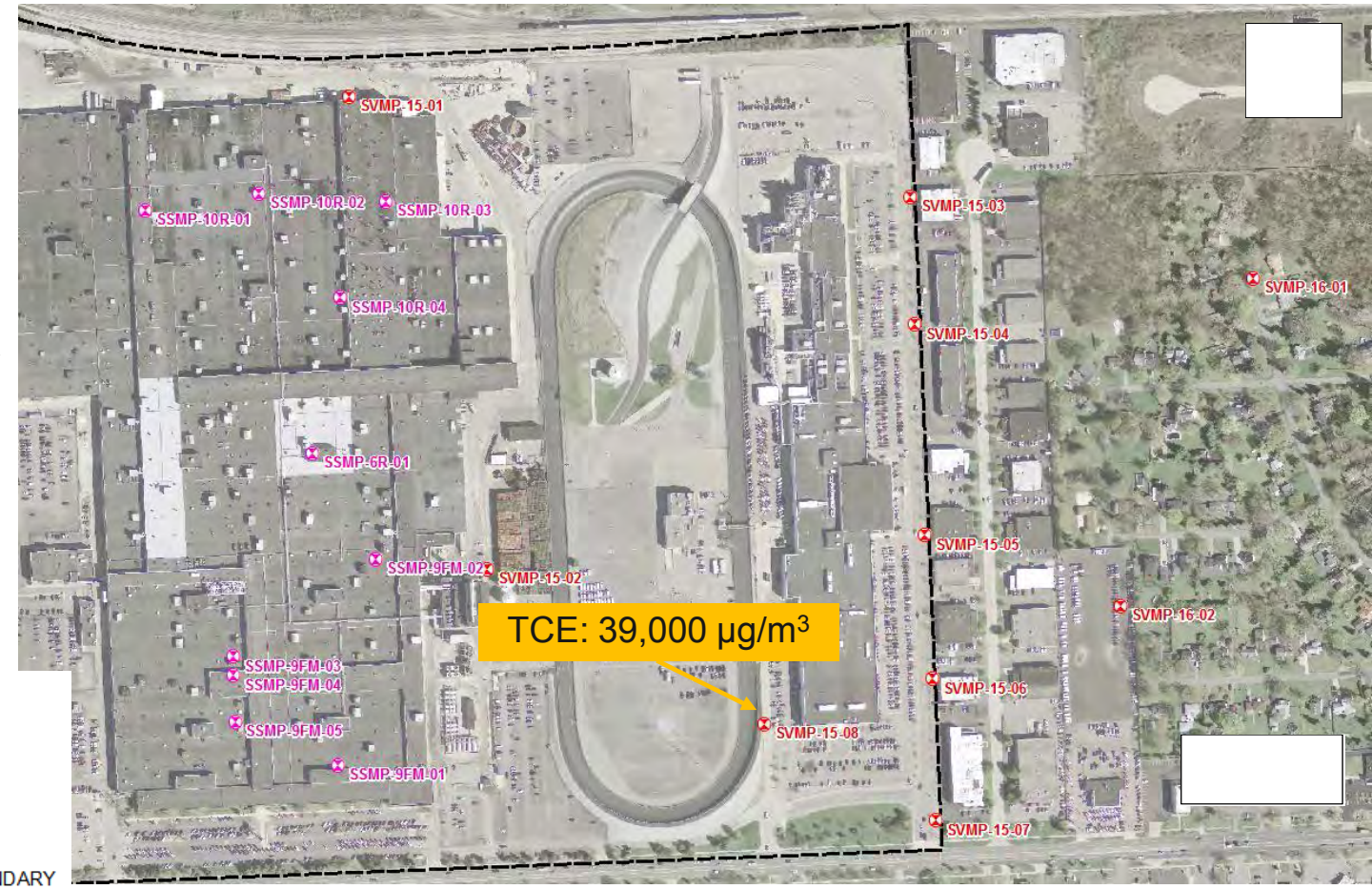
- SOIL VAPOR SAMPLING
- HPT-VAP BORING
- LIF-HP-WCSS BORING
- LNAPL MONITORING WELL BORING
- LIF-HP BORING

PREVIOUSLY INSTALLED

- MONITORING WELLS
- LIF BORING
- APPROXIMATE EXTENT OF LNAPL

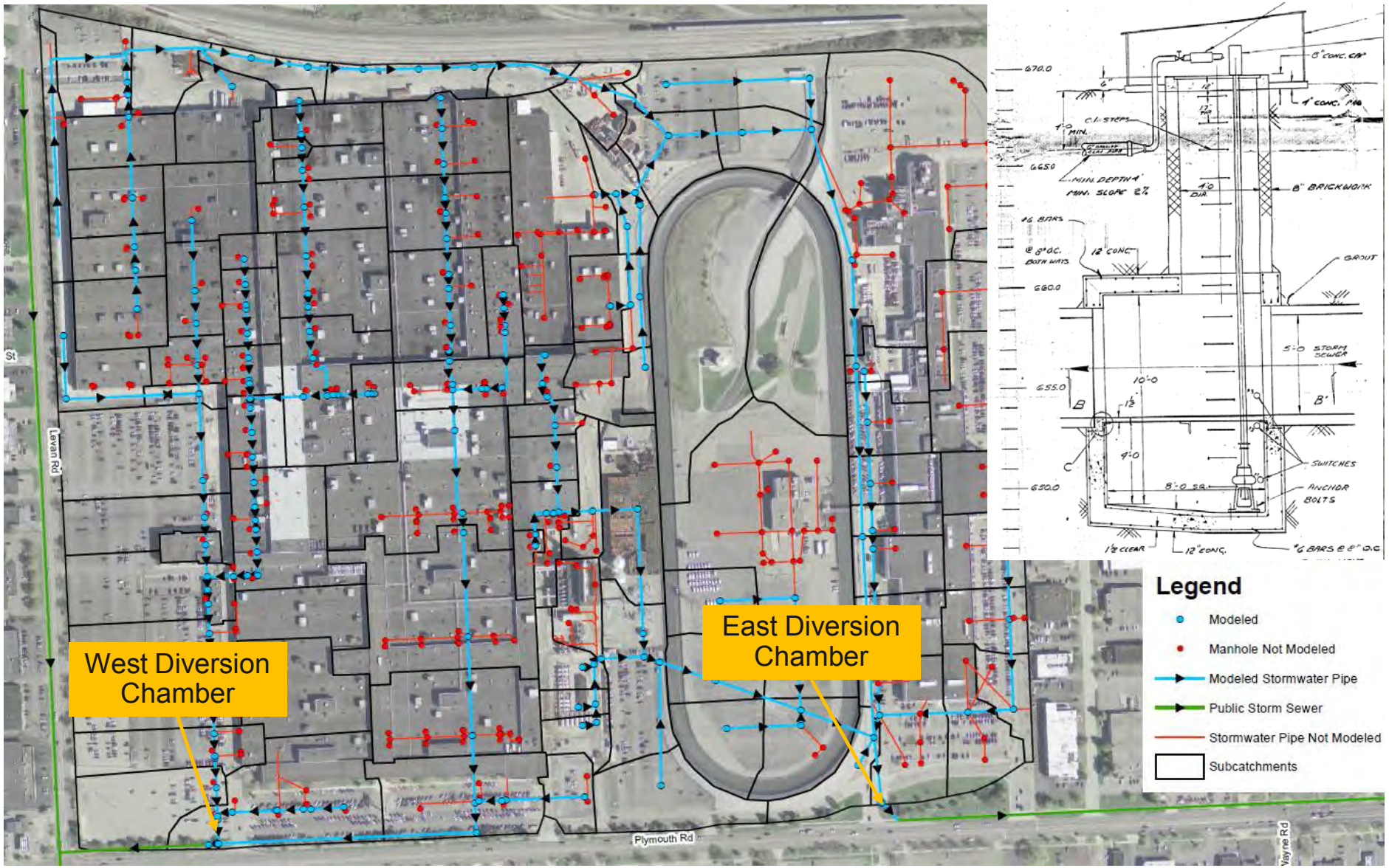
Exterior Soil Gas Exceedance

- One exceedance of non-res screening criteria on-site for TCE (Criteria: 12,000 µg/m^3)
- Vinyl chloride not detected at property boundary or off-site
- All other VOCs below criteria at property boundary and off-site



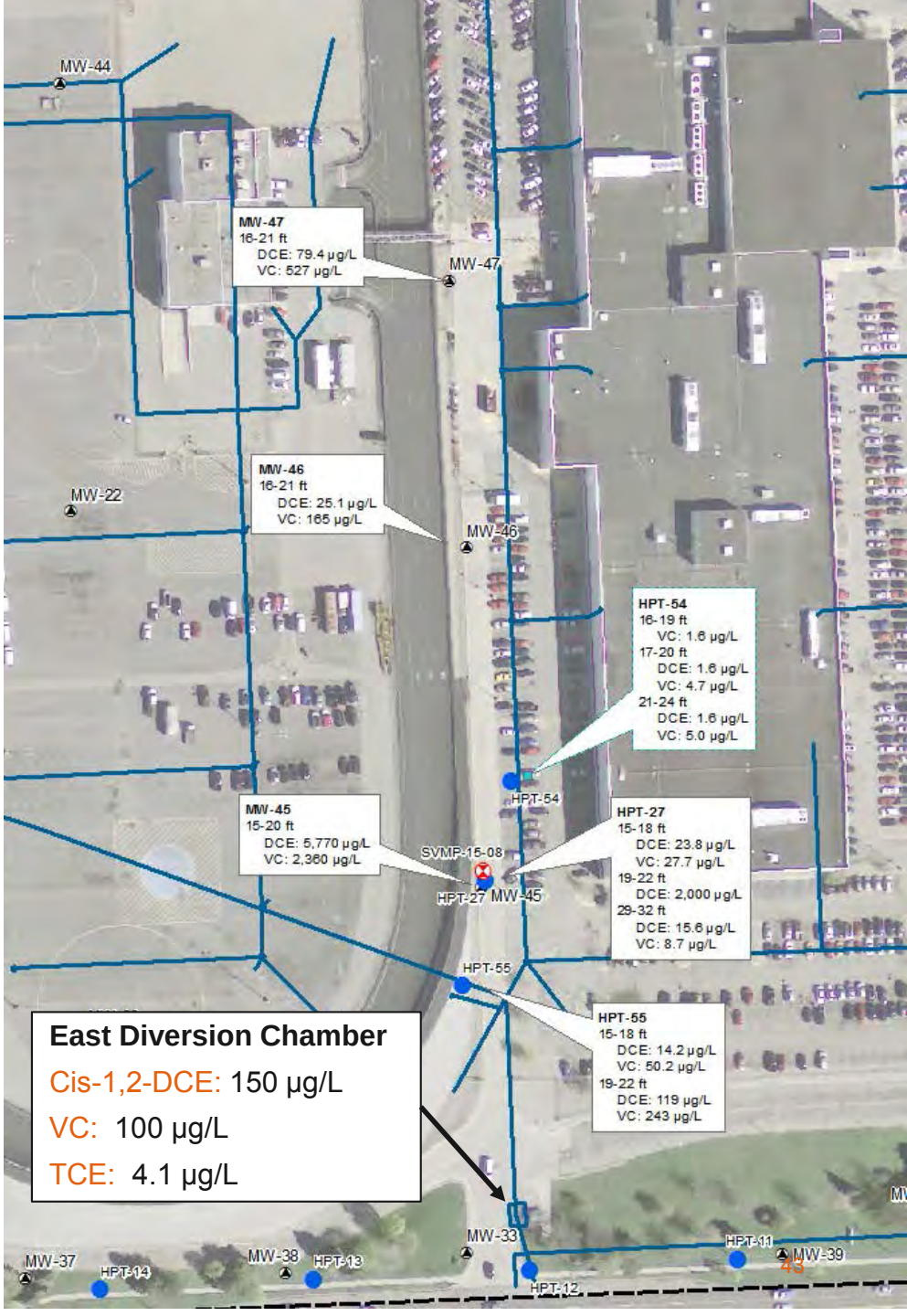
Storm Sewers

LTP Storm System



Discharge to Eastern Storm Main

- Storm water discharges to sanitary sewer
- Temporary permit is currently pending with the Great Lakes Water Authority
- Groundwater plume at 8 ppm total CVOCs west of storm main, vanishes to the east
- Water table depression around MW-45 area



LEGEND

- HPT-VAP BORING
- SOIL VAPOR SAMPLING LOCATION
- EXISTING MONITORING WELLS
- STORM SEWER

Path Forward

Next Steps

- Groundwater/Soil Impacts – additional characterization, remedy evaluation
  - Additional off-site delineation / soil gas sampling / monitoring well installation, as required
  - Northern property boundary investigation
  - Monitoring well sampling – evaluation of 1,4-dioxane and geochemistry
  - Feasibility study for plume treatment (i.e. east property boundary / storm sewer)
- LNAPL – evaluate stability, long-term strategy
  - Additional monitoring well installation along plume boundaries. Further evaluate mobility
  - Further characterize natural source zone depletion / methane
- Soil Gas – follow-up based on initial findings
  - Interior
    - Additional methane gas delineation inside of LTP building
    - Quarterly sampling of soil gas near SVMP-9FM-02, indoor air sampling as necessary
  - Exterior – additional soil gas characterization around southern ATNPC building, additional locations off-site, as needed
- Storm Sewers – evaluate discharge, evaluate remedy, complete repairs
  - Base flow sampling of storm sewers
  - Evaluation and installation of remedy to capture southern plume
  - Repair of 1,500 feet of eastern storm main

ATTACHMENT 2

Technical Memorandum

MEMO

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From:

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Date:

April 22, 2016

Arcadis Project No.:

MI0001304.0002

Subject:

Investigation Status Update and Conceptual Site Model Review

Ford Livonia Transmission Plant, Livonia, Michigan

In response to the Michigan Department of Environmental Quality (MDEQ) Request for Information submitted to Ford on February 23, 2016, the following technical memorandum provides a summary of the presentation provided to the MDEQ on March 21, 2016. The goal of the presentation was to provide the MDEQ with an update on the status of the site characterization currently underway at the Ford Livonia Transmission Plant (Site).

The presentation was organized into several sections outlining the information gathered for the Site to date. The following provides a brief discussion around each slide with the goal of supplementing and/or clarifying the information included in the presentation.

EXECUTIVE SUMMARY (SLIDE 3)

The executive summary briefly outlines the current results for the investigation completed to date. The overall conclusions are centered on the four main focus areas for the investigation:

1. Groundwater/Soil Impacts –chlorinated volatile organic compound (CVOC) have been identified in potentially two areas (north and south) that potentially have migrated from the building in groundwater to the east. An additional investigation will be conducted to complete the site characterization as discussed during our March 21, 2016 meeting.

2. LNAPL – An area of light non-aqueous phase liquid (LNAPL) is present beneath the Livonia Transmission Plant (LTP) building. The LNAPL consists primarily of transmission, cutting and hydraulic oils with CVOCs present in oil in some areas. The presence of LNAPL can generate methane gas due to the natural degradation process.
3. Soil Gas – Impacts to soil gas were evaluated both sub-slab beneath the LTP building, as well as at outdoor locations, bias to areas of highest soil or groundwater impact. Volatile organic compound (VOC) impacts to soil gas beneath the LTP above screening criteria were limited to one sample location. Outside of the building, VOCs were detected at one on-site sample location above MDEQ Residential Screening Criteria. All other locations, including those at the property boundary and off-site, were below screening criteria and vinyl chloride was not detected in soil gas at any location.
4. Storm Sewers – based on the results of the investigation, the southern CVOC groundwater impacts potentially discharge, in part, to the on-site storm sewer system. The on-site storm sewers are pumped to the municipal sanitary sewer operated by the Great Lakes Water Authority. A temporary permit to discharge VOCs to the sanitary sewer is pending by Great Lakes Water Authority but has been approved by the City of Livonia on April 4, 2016.

SITE BACKGROUND (SLIDES 4 TO 6)

The construction of the LTP began in 1950 and has included numerous expansions over the years to encompass the current building footprint of 3,100,000 square feet.

Soil impacts were first identified during construction activities in July 2014. Initial investigation near the southeastern portion of the LTP was ultimately expanded to include the entire building footprint, as well as the eastern portion of the 175 acre property. An area of LNAPL was identified beneath the building, as well as two chlorinated volatile organic (CVOC) areas potentially extend from the building to the east. The CVOC impacts consist chiefly of trichloroethene (TCE), cis-1,2-dichloroethane, and vinyl chloride. By the summer of 2015, vinyl chloride had been identified at the eastern property boundary at three monitoring well locations.

Additional characterization work beginning in the fall of 2015 focused on 1) perimeter and off-site CVOC characterization, delineation and mass flux characterization, 2) evaluation of mass flux near known sources beneath the LTP, 3) LNAPL characterization including delineation, type, composition, and mobility, 4) soil gas characterization, both beneath the LTP and at the property boundary, and 5) evaluation of deep groundwater. In addition, the results of the investigation indicated a portion of the southern CVOC impacts may discharge to the on-site storm sewer system and additional work was completed to evaluate the storm sewers as a potential receptor.

Characterization to Date (slide 6)

The current conceptual site model incorporates existing site knowledge such as geologic setting with high-resolution permeability profiling and sampling. Initial characterization was completed using Dakota Technologies™ Laser Induced Fluorescence (LIF) tool to map out LNAPL, coupled with standard monitoring well installation to broadly delineate groundwater impacts.

Follow-up exterior work was focused on permeability mapping with the Geoprobe™ Hydraulic Profiling Tool (HPT), and high-frequency vertical aquifer profile (VAP) groundwater sampling to characterize the hydrostratigraphy, contaminant distribution and mass flux.

Beneath the LTP, high-frequency soil sampling was completed in lieu of VAP sampling to evaluate CVOC distribution through the LNAPL and within the saturated soil column. Additional LNAPL delineation utilized a state-of-the-art LIF-hydraulic profiling (LIF-HP) tool to simultaneously map LNAPL distribution and log the relative permeability of the soil. Based on LIF/LIF-HP results, LNAPL monitoring wells were installed for LNAPL sampling and mobility testing.

Overall, the results of the CVOC and LNAPL characterization were used to guide sub-slab soil gas sampling (interior) and deep soil gas sampling (exterior) in areas of greatest impact to evaluate the potential for soil gas impacts, both beneath the LTP building, at the property boundary, and off-site.

SITE GEOLOGY (SLIDES 7 TO 11)

The shallow sediments at the Site are associated with a near-shore lacustrine setting and consist of varying amounts of fill material between 0 and 5 feet below ground surface (ft bgs) followed by sandy outwash from approximately 5 to 12 ft bgs. From approximately 12 ft bgs to 25 ft bgs, a zone of fine sand and silt is encountered that transitions to a low permeability clay. Groundwater is typically encountered at 6 to 8 ft bgs. Groundwater impacts at the Site appear to be confined to these shallow sediments. The majority of the mass flux at the Site (i.e. the portion of the groundwater impacts that are mobile and migrate) are isolated within the more permeable sand seams located within the top 20 feet of sediments.

Soils logged during deep monitoring well installation around the perimeter of the Site indicate the clay extends to depths up to 80 ft bgs followed by a gravelly unit above shale encountered at approximately 90 ft bgs. Groundwater samples collected from deep monitoring wells (MW-15-59 through MW-15-61) indicate VOCs are below criteria.

GROUNDWATER/SOIL IMPACTS (SLIDES 12 TO 28)

An evaluation of data collected from monitoring wells indicated the primary constituents of concern at the Site were TCE, cis-1,2-dichloroethene (DCE) and vinyl chloride. To facilitate the adaptive investigation and allow for real-time decision making during the field work, a mobile laboratory (Triad Environmental) was used to analyze this select list of CVOCs in real time for both soil and groundwater samples. A subset of the samples were also split to Pace Analytical Services, Inc. located in Livonia, MI to verify the accuracy of the on-site laboratory results. The comparison of the two laboratory methods indicated good agreement of the analytical results.

Saturated soil samples collected beneath the building were evaluated to determine an “equivalent groundwater concentration” using a soil to groundwater partitioning equation (slide 14). The calculated groundwater equivalent provides an approximation of CVOCs expected in groundwater given the concentration present in the saturated soil, and allows for a direct comparison of soil results to the downgradient groundwater samples (slide 15).

CVOC groundwater impacts potentially extend from the LTP building to the east toward the Site property boundary. The results of the soil (i.e. equivalent groundwater) and groundwater sampling completed to date are provided as slide 16. This map shows the total CVOC results displayed as maximum values at each location normalized to drinking water criteria. Slides 17 through 20 provide the results for individual compounds including TCE, total DCE and vinyl chloride, as well as 1,4-dioxane.

During the investigation a split sample collected from an LNAPL saturated soil indicated the presence of 1,1,1-trichloroethane (1,1,1-TCA). The compound 1,4-dioxane was historically used as a stabilizer in 1,1,1-TCA and based on this result, VAP samples collected during the remainder of the investigation were

split to Test America located in North Canton, Ohio for analysis of 1,4-dioxane. In addition, soil samples and groundwater samples were re-analyzed for 1,1,1-TCA. The 1,1,1-TCA impacts at the Site were not significant and to date, only three on-site locations exceed the proposed MDEQ Residential Drinking Water Criteria (RDWC) for 1,4-dioxane of 7.2 micrograms per liter (µg/L). At the property boundary and along Belden Court to the east, all 1,4-dioxane results are less than the proposed 7.2 µg/L 1,4-dioxane criteria.

Slide 21 provides an example of the LIF-HP data, including the LIF response indicating the presence of hydrocarbons, as well as a stratigraphic interpretation of the hydraulic profiling pressure response. In addition to delineating the LNAPL, this LIF-HP pressure response was used to create an estimate of hydraulic conductivity for use in the "stratigraphic flux" evaluation beneath the southern portion of the LTP building.

Portions of the stratigraphic flux model are illustrated on slides 22 through 25. Stratigraphic Flux is a relative measure of mass flux based on the estimated hydraulic conductivity provided by the HPT / LIF-HP data multiplied by the total concentration of CVOCs. It provides an indication of where the groundwater impacts are migrating and can be used to focus a remedy on the zones of impact that really matter. Slides 22 and 23 illustrate the data collected beneath the southern portion of the LTP building (Transect 1) using the LIF-HP probe and high-resolution soil sampling. Slide 22 shows the LIF-HP boring raw data – estimated hydraulic conductivity based on the hydraulic probe portion of the data, and the soil sampling results as total CVOCs. Slide 23 illustrates the LIF portion of the data with apparent extent LNAPL, and then a version of the transect showing the estimated hydraulic conductivity, equivalent groundwater concentrations and stratigraphic flux. As shown on slide 23, there are two areas of high flux noted along Transect 1.

Slides 24 and 25 illustrate stratigraphic flux along all of the different transects completed at the Site. The flux illustrated on each transect represents 99% or more of the mobile mass in each cross-sectional area. The color of the flux along each transect relates to the same relative scale. There is a huge range in flux observed at the Site. Transect 1, located near a source area beneath the building ranges from 100,000 to 10,000,000 relative mass flux (unit less). The range of flux along the eastern property boundary ranges from 1 to 100 and illustrates a four to five or more order of magnitude decrease in CVOC impacted groundwater strength from source area to property boundary.

Two areas along the eastern property boundary were identified where vinyl chloride migrates off-site above the 2.0 µg/L RDWC. These areas are illustrated on slide 26, along with the additional off-site HPT/VAP borings completed east of the Site to delineate vinyl chloride impacts. Based on the initial off-site characterization, two locations east of the Site indicated concentrations of vinyl chloride above RDWC. Additional borings are proposed both up and downgradient of these locations to further refine the area of impact and complete the delineation of the off-site vinyl chloride (slide 27).

There are multiple potential sources for the southern CVOC impacts located beneath the building. Some of these potential sources are illustrated on slide 28. One of the potential sources is the former broach machine pit located beneath the southwestern portion of the LTP immediately upgradient of a zone of high CVOC mass flux observed on Transect 1 (slide 23). The source of the northern CVOC groundwater impacts is not currently known. CVOC impacts were not identified in soil and groundwater beneath the northern portion of the LTP at the LIF-HP boring locations. Additional work is planned in the northern portion of the Site to further evaluate the potential for sources beneath the building, as well as evaluate the area around the northeast of the building in the vicinity of the industrial wastewater pre-treatment facility.

LNAPL (SLIDES 29 TO 36)

LNAPL was evaluated relative to two primary factors in accordance with MDEQ guidance: composition and potential mobility. The approximate extent of LNAPL based on the LIF and LIF-HP data is illustrated on slides 30 and 31. In general, the LNAPL consists of mix of transmission, cutting and hydraulic oils. Low concentrations of polychlorinated biphenyls (PCBs) were detected, but at concentrations less than 5 parts per million. The specific PCB congeners suggest all of the PCBs were released prior to 1971. There are some areas of elevated CVOCs within the LNAPL; most notably at well LMW-15-05. At well LMW-15-05 1,1,1-TCA and cis-1,2-DCE were detected at concentrations greater than 100 parts per million.

LNAPL baildown testing was completed at each LNAPL monitoring well to evaluate LNAPL transmissivity. The MDEQ defines the threshold for LNAPL recoverability (i.e. the transmissivity at which LNAPL can be recovered cost effectively) at 0.5 square feet per day (ft^2/day). The results of the baildown testing ranged from 0.11 to 5.5 ft^2/day.

SOIL GAS (SLIDES 37 TO 40)

Soil gas samples were collected in the areas demonstrating elevated concentrations of CVOCs above the LNAPL and CVOC groundwater impacts. The primary detection beneath the LTP building is methane related to the degradation of the LNAPL. Several locations beneath the building exceed the 1.25% (by volume) MDEQ Screening Criteria. Only one location beneath the building exceeds sub-slab screening criteria for CVOCs: cis-1,2-DCE exceeds the MDEQ Non-Residential Screening Criteria at location SSMP-9FM-02 adjacent to the LNAPL monitoring well LMW-15-05. As noted above, the LNAPL sample collected at LMW-15-05 indicated elevated concentrations of DCE present in the LNAPL. At other sample locations the LNAPL may act as a cap above the CVOC groundwater impacts that prevent CVOCs from impacting soil gas.

The deep soil gas samples collected exterior to the LTP building also indicated only one exceedance of MDEQ screening criteria. A sample collected SVMP-15-08 in the southeast portion of the Site exceeds the MDEQ Non-Residential Screening Criteria for TCE. All other exterior samples were below criteria for VOCs and vinyl chloride was not detected in soil gas at the plant boundary above the highest concentrations on vinyl chloride in groundwater.

Additional deep soil gas sampling was completed at off-site locations adjacent to the two vinyl chloride exceedances noted in groundwater. Samples were collected at locations adjacent to HPT-80 at the north end of Boston Post Street, and at HPT-97 located behind the Bill Brown Ford Dealership (slide 26). Both samples were two or more orders of magnitude below MDEQ Residential Screening Criteria for VOCs and vinyl chloride was not detected in the samples.

STORM SEWERS (SLIDES 41 TO 43)

The morphology of the southern CVOC impact (slide 16) suggests groundwater impacts may be potentially discharging to the storm sewer collection system. The LTP storm sewers flow to one of two diversion chambers located along Plymouth Road where it is pumped up to the sanitary sewer operated by the Great Lakes Water Authority. Follow-up sampling of the east storm water diversion chamber located along Plymouth Road confirmed the presence of CVOCs in storm water discharging from the Site. Ford has requested a temporary permit to discharge VOCs to the sanitary sewer from the Great Lakes Water Authority. Ford has received approval from the City of Livonia on April 4, 2016 to discharge to the sanitary.

ATTACHMENT 3

Slide deck from September 7, 2016 meeting and summary narrative

MEMO

DRAFT - For discussion purposes only

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July 20, 2017

Arcadis Project No.:

MI001346.0001.00003

Subject:

Narrative for Slides from September 7, 2016 Meeting with MDEQ
Livonia Transmission Plant, Livonia, Michigan

The following memo provides a narrative to accompany the slides presented to the Michigan Department of Environmental Quality (MDEQ) by Ford and Arcadis on September 7, 2016 (Attachment 1). This narrative includes a summary of the conceptual site model (CSM) and proposed path forward for evaluating the offsite vapor intrusion (VI) pathway in the commercial and residential areas east of the Ford Livonia Transmission Plant (LTP). This memo is prepared to accompany the slide deck located in Attachment 1 presented to the MDEQ on September 7, 2016 and includes the following:

- Relevant background information,
- CSM as related to the potential for off-site VI,
- Key factors regarding the potential for off-site VI,
- Multiple lines of evidence approach for off-site VI evaluation, and
- Proposed path forward.

OFF-SITE GROUNDWATER INVESTIGATION

A groundwater investigation was completed east of the LTP site in four phases beginning in November 2015 and completed in September 2016. All groundwater delineation work was completed using a Geoprobe™ Hydraulic Profiling Tool (HPT) and vertical aquifer profile (VAP) groundwater sampling.

- Approximately 90 borings were completed on public right-of-ways (ROW) and private properties east of the LTP facility property boundary.
- The HPT provided a continuous log of relative permeability at each location. Based on the permeability profile, VAP samples were collected biased toward more permeable intervals.
- At each boring location, approximately three to five groundwater samples were collected from the silt/sand interbedded zone that overlies the regional lacustrine clay.
- A total of 250 groundwater samples were collected at off-site boring locations.

Groundwater sample locations and results are presented on Slide 3. Data were compared to MDEQ VI Shallow Groundwater Screening Values (2013). Slide 4 presents the maximum concentration detected at any depth at each location.

- Vinyl chloride exceedances were noted at 24 off-site locations as indicated on Slide 3. Exceedances of the screening value are presented in blue text.
    - Vinyl chloride was not detected, or not detected above the screening level at the top of the water table / shallowest sample interval at 18 of these 24 locations.
        - These sample results indicate the presence of a clean water lens at most locations sampled.
    - Vinyl chloride was only detected above the screening level at the top of the water table at sample locations HPT-30, HPT-58, HPT-56, HPT-63, HPT-145, and HPT-171 (Slide 3).

To further aid in characterizing off-site groundwater additional groundwater monitoring wells were proposed and presented on Slide 5. Additional groundwater wells were proposed to pick-up where the VAP sampling leaves off to allow for an evaluation of plume stability and natural attenuation. Proposed wells were shown in 14 locations on a combination of public ROWs and private properties. These wells were proposed as permanent monitoring well to be sampled quarterly (Slide 5).

CONCEPTUAL SITE MODEL

A CSM has been developed for the off-site area east of the LTP by integrating items presented in the MDEQ VI guidance with available data for the site. The CSM was developed to aid in communication with stakeholders and inform the proposed path forward for investigating the VI pathway. The CSM is designed to be “evergreen” and will be revised as additional data points become available.

As presented in the MDEQ VI guidance (2013) “*If contaminated groundwater is overlain by clean water (upper versus lower aquifer systems or significant downward groundwater gradients), then vapor phase migration or partitioning of the volatile chemicals is unlikely*.” As presented above, a clean-water lens is present above zones of impacted groundwater at 18 of 24 locations sampled (Slide 3).

To evaluate the potential for VI in the off-site area, site data was considered in light of current MDEQ regulations (2013 Part 201 Groundwater Volatilization to Indoor Air Inhalation Criteria) and guidance (2013 Final VI Guidance) (Slide 6). MDEQs Part 201 is currently undergoing a revision but it is unclear when a final version may be released to the public. At MDEQs request, the potential for VI is currently being evaluated using interim action and trigger values provided by MDEQ.

To refine the CSM a VI receptor survey was conducted to identify all properties within 100-feet of groundwater where vinyl chloride exceeded the MDEQ screening value (2013). This 100-foot distance is considered the preliminary off-site screening area (MDEQ 2013). As presented on Slide 7, 19 commercial

buildings, 37 residential buildings, and 7 vacant properties are located within 100-feet of a confirmed groundwater impact. Based on the November 2015 HPT sampling the depth to water is variable in the off-site area ranging from less than one foot to about 10 feet below ground surface.

Conceptual illustrations presenting the possible interface of water and developed off-site properties are presented on Slides 8 and 9. These scenarios include properties where a clean water lens is present and groundwater is not in contact with the lowest portion of a building (Slide 8) and properties where water may be in contact with the lowest portion of the building (Slide 9).

As presented in the MDEQ VI Guidance (2013), where a clean water lens is present between impacted groundwater and the lowest level of a building, vapor migration is unlikely. VI is not likely to occur where the clean water lens exists. Vinyl chloride can be readily broken down via aerobic biodegradation in the vadose zone (further information: https://www.ncbi.nlm.nih.gov/pubmed/23999077). In these areas, exterior soil vapor sampling can be used to evaluate the potential for VI and attenuation of vinyl chloride.

As presented on Slide 9, there are potential scenarios where no vadose zone is present beneath a property due to a shallow water table or a sub-grade structure intersecting the water table. At these properties, there is a potential that the foundation could be in contact with groundwater or water may be present in a sump at some time during the year. Exterior soil vapor sampling is not likely to yield useful information in these locations. Sub-slab soil vapor sampling inside each property may be considered to ensure VI is not occurring in these buildings.

Considering the variability in construction technique of residential properties, the depth to water becomes important in understanding the potential for VI. The HPT/VAP data were used to map the clean water lens in relation to off-site properties (Slide 10). Most of the off-site area is underlain by 4 to 12 feet of clean water over the top of any vinyl chloride impacts that are mostly deeper in the aquifer (Slide 10). A thicker clean water lens is present in some areas. Some thickness of clean water is present beneath most properties identified for VI evaluation (Slide 10).

The HPT/VAP data were also used to estimate the depth to water at each location and allow for contouring the depth to water across the off-site area. The depth to water encountered during groundwater sampling can also be considered the vadose zone thickness and ranges from less than one foot to about 10 feet; the vadose zone thickness is presented on Slide 11.

Soil vapor samples have been collected from five locations along the eastern boundary of the LTP property and two locations within the residential neighborhood further east (Slide 12). At the LTP property boundary, as well as further offsite, samples were collected biased towards areas of elevated vinyl chloride in groundwater. Vinyl chloride was not detected in any of these soil vapor samples even though the soil vapor samples were collected near the top of groundwater at each location. Where vinyl chloride was detected at the top of the water table, vinyl chloride was not detected in soil vapor suggesting aerobic biodegradation in the vadose zone. Where a clean water lens was present vinyl chloride was not detected. These results are consistent with our working CSM that low levels of vinyl chloride in groundwater are not leading to VI off-site.

KEY FACTORS FOR CONSIDERATION

Multiple factors have been considered on a property-by-property basis to evaluate if further VI investigation is warranted (Slide 13). These factors include:

- Groundwater quality within 100 feet of structure,

- The presence of a clean water lens,
- Building construction, and
- Vadose zone presence and thickness beneath the lowest level of each property.

MULTIPLE LINES OF EVIDENCE APPROACH

Example flow charts were prepared and presented to MDEQ to engage outside opinions and start a conversation regarding the appropriate investigation strategy and consider the active updates MDEQ is currently undertaking on their VI Guidance, VI screening levels, and Part 201 criteria. Additionally, Arcadis has become aware from experience on other projects that the MDEQ/TAPS team has not finalized their position on appropriate indoor air sampling methods and how to interpret indoor air sampling results. The flow charts presented on Slides 14 and 15 presented two different options for discussion purposes only. As presented in the flow chart on Slide 14 and 15, multiple lines of evidence are proposed for use in decision making regarding off-site properties. Lines of evidence used to support the off-site VI evaluation could include:

- Groundwater quality and depth,
- Building construction details (Assessor's records and site-specific questionnaire),
- Soil vapor quality information from both previously collected and proposed samples,
- Proposed sub-slab soil vapor sampling results, and
- Proposed crawl space and indoor air sampling results

Each property should be considered separately to evaluate all potential VI exposures. Although samples may not be collected from each property, representative samples from a nearby area may be used to guide decision making. At some locations, exterior soil vapor sampling may be sufficient for decision making while at others interior sampling may be needed.

PATH FORWARD

Upon reaching concurrence with the MDEQ on the sampling approach and locations, Ford and Arcadis will conduct the off-site VI evaluation starting with a desktop review of public records and a property owner questionnaire to verify building construction. Items included in the proposed path forward are included in Slide 16. After verifying construction on all properties sampling will be executed. Permanent monitoring wells will be installed and when the additional groundwater data is available, this data will be used to refine the CSM. Arcadis and Ford will continue to discuss plans and data as it is obtained with the MDEQ to reach consensus on the need for additional sampling and potential next steps.

Attachments

1 – LTP Offsite Strategy Discussion 090716 DRAFTv2.pptx

ARCADIS Design & Consultancy for natural and built assets

OFF-SITE GROUNDWATER IMPACTS STRATEGY

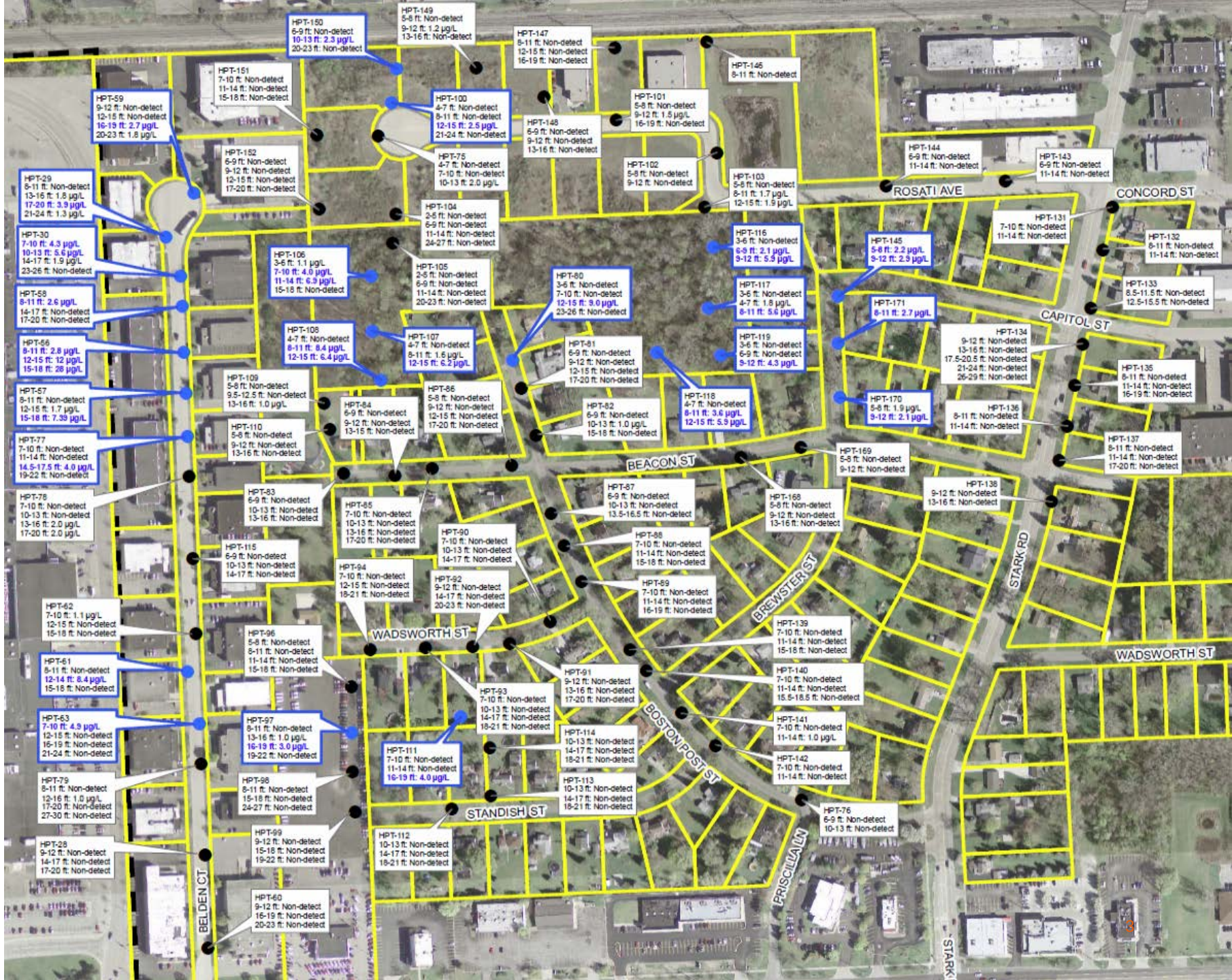
Ford Livonia Transmission Plant

September 7, 2016

Agenda

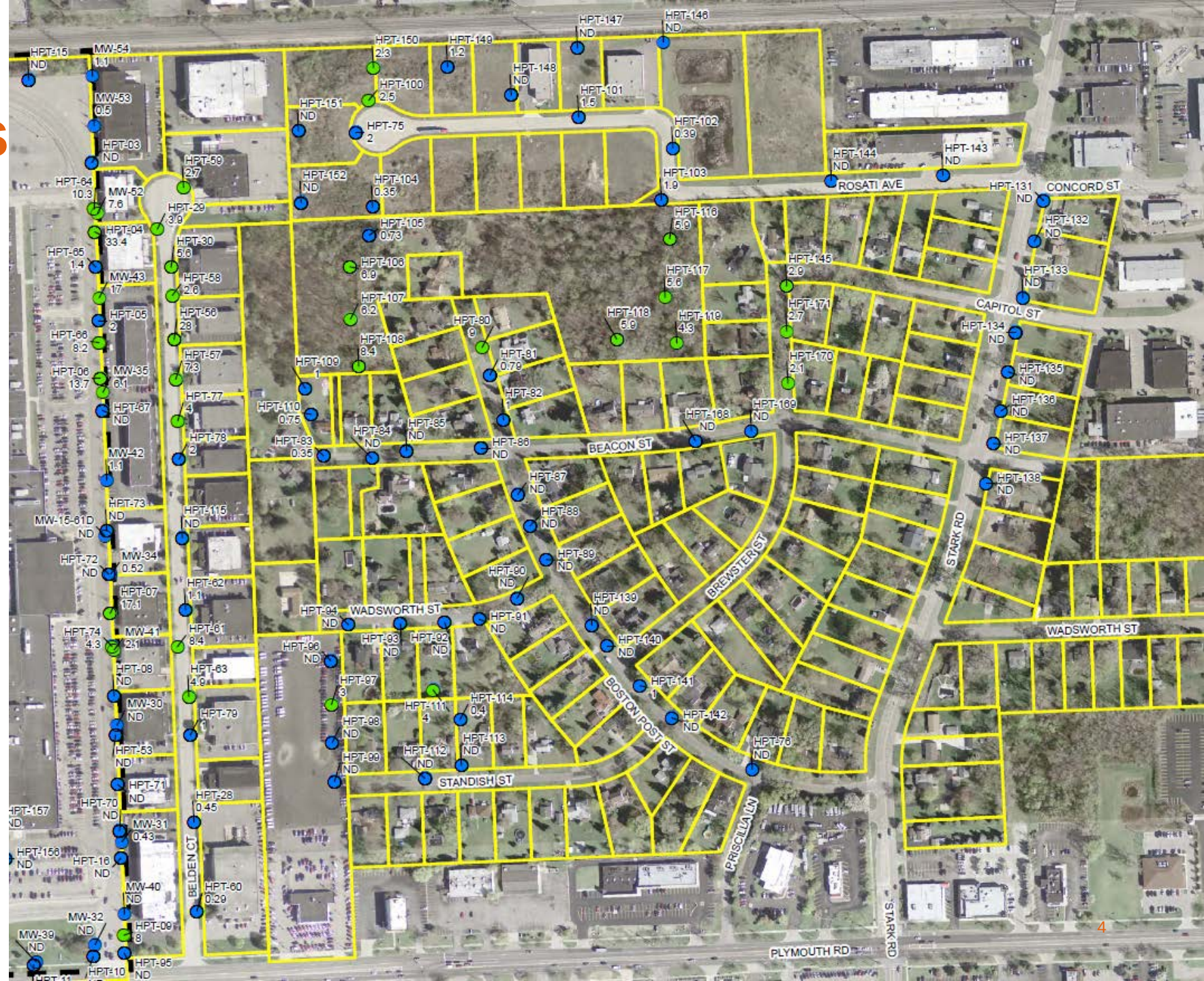
- Off-Site Results
- Monitoring Well Installation / Groundwater Monitoring
- Regulatory Considerations
- Soil Vapor Evaluation Strategy
- Path Forward

Off-Site
Vinyl Chloride



Off-Site Vinyl Chloride Impacts

- Max Values
- Clean water layer present in most, but not all locations

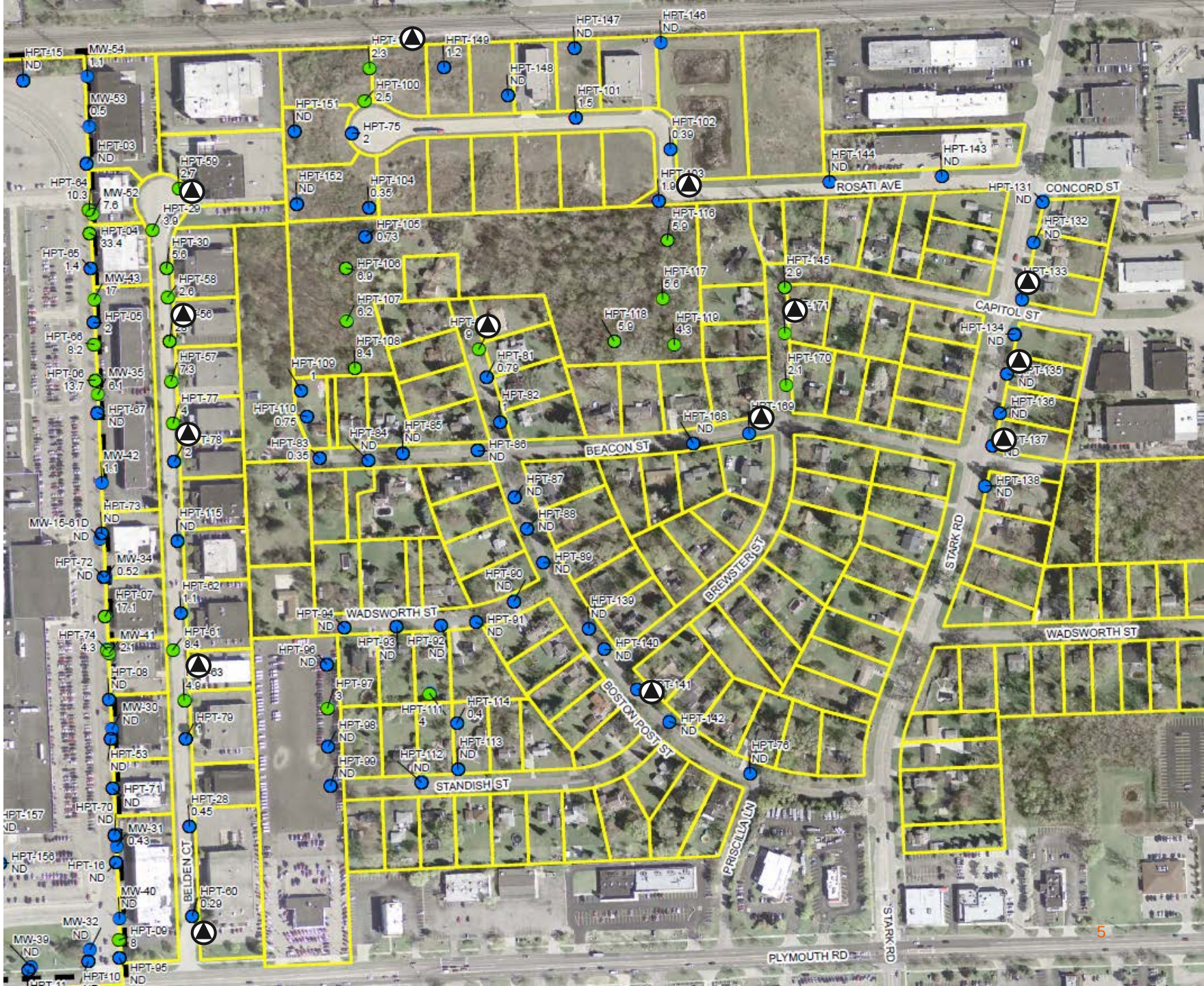


Off-Site Monitoring

Installation of ~14 monitoring wells

Goal: Evaluate plume stability and natural attenuation:

- Quarterly monitoring of VOCs for minimum of six quarters
- Minimum two seasonal rounds basic geochemistry:
  - Nitrate/nitrite
  - Sulfate/sulfite
  - Ferris/ferric iron
  - Manganese II and IV
  - Methane
  - Ethane
  - Ethene
  - DO & ORP
  - Organic carbon



Regulatory Considerations – Current VI Criteria

- Current (2013) Part 201 GW Volatilization to Indoor Air Inhalation Criteria (GVIIC)
  - Vinyl chloride = 1,100 µg/L
  - Not applicable to this site
    - GVIIC developed for sites where GW is >3 meters bgs

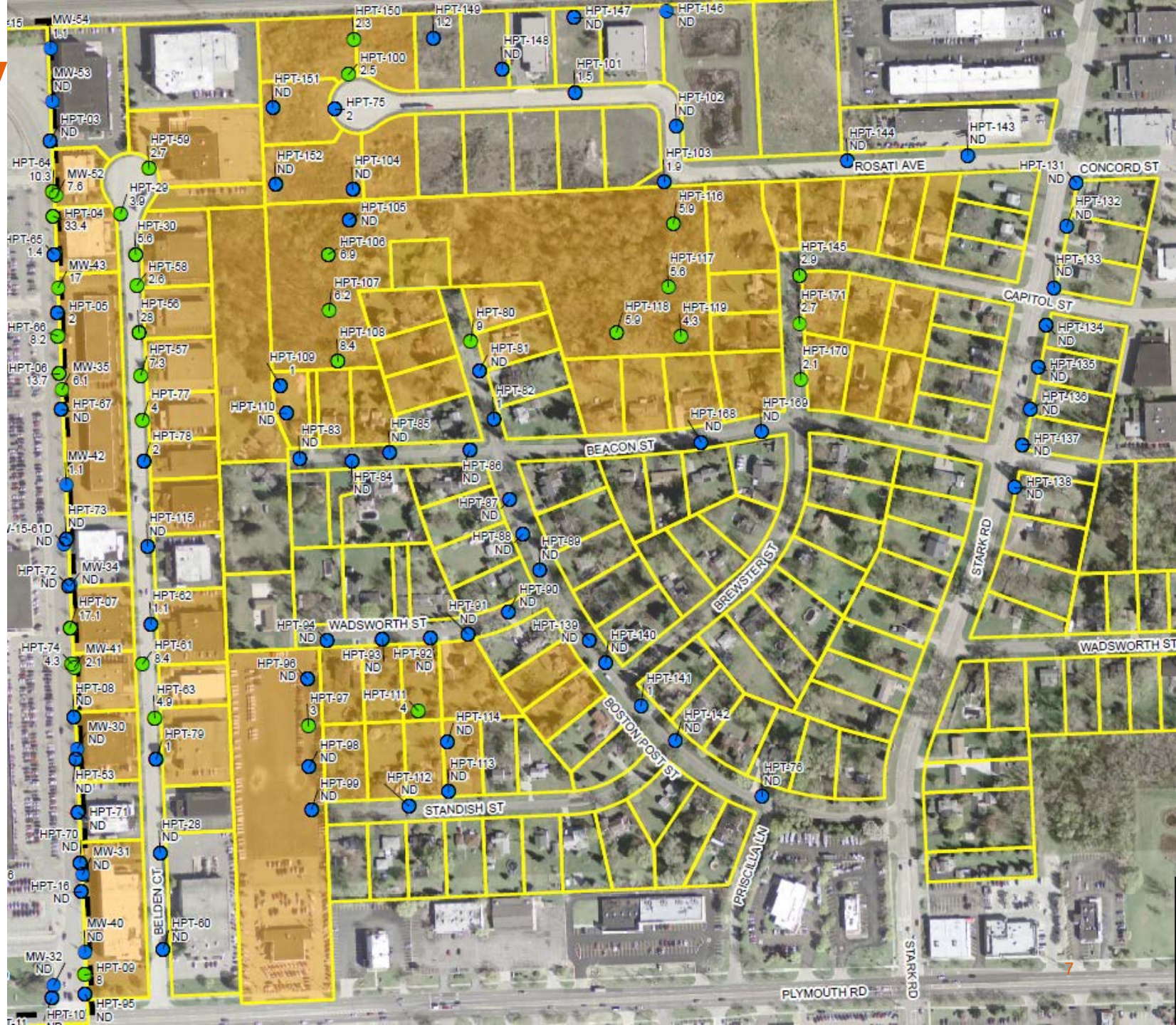
- 2013 Final VI Guidance groundwater screening levels
  - May be applicable to site
  - Groundwater in a sump = 2 µg/L (res and non-res)
    - Defaults to Drinking Water Criteria
  - Groundwater not in sump, res = 2.8 µg/L, non-res = 52 µg/L
    - Assumes GW not in contact with building foundation

Parcels Potentially Affected (≥2 µg/L)

Current Guidance:

- VI evaluation includes all parcels within 100 feet of detections of vinyl chloride > 2 µg/L

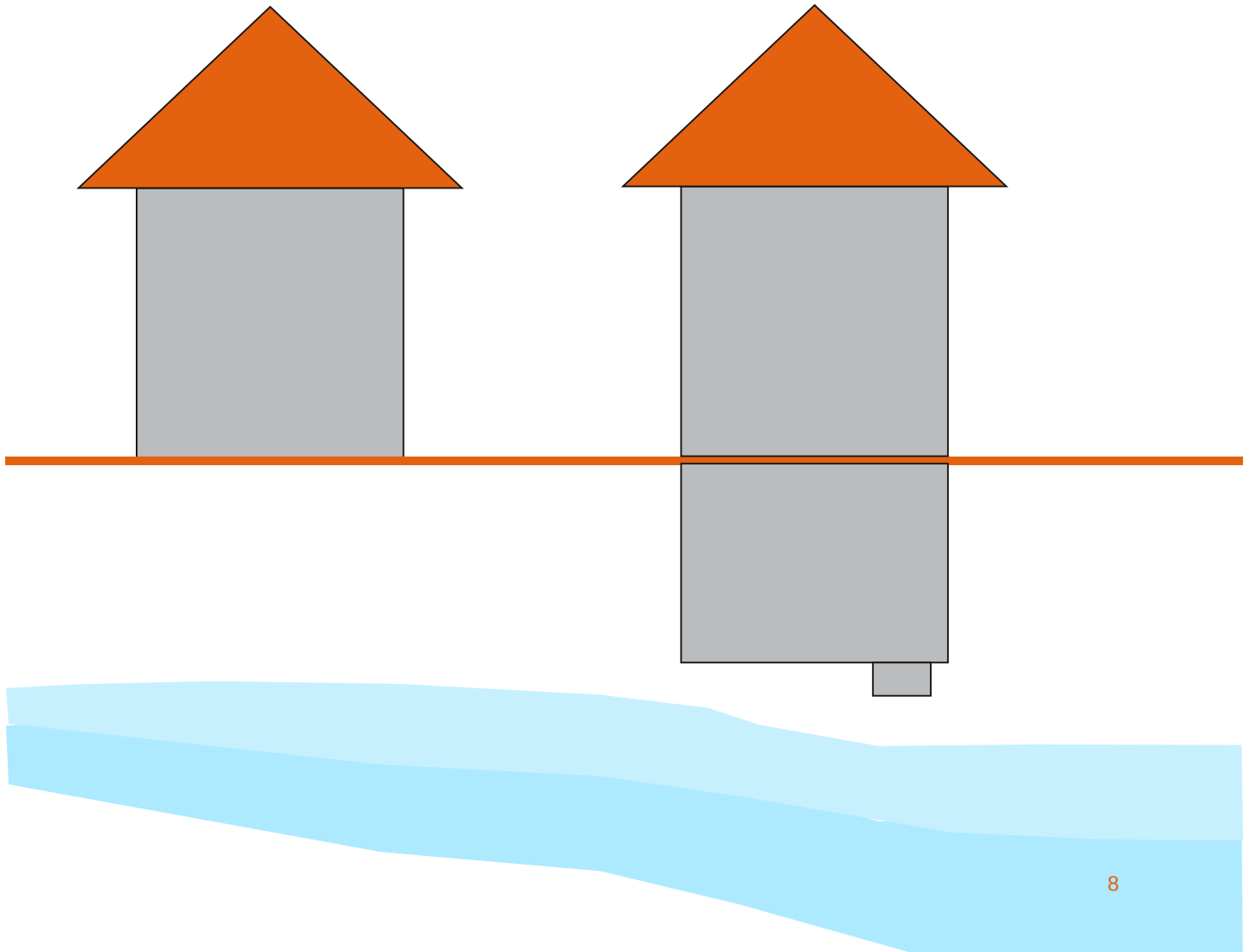
- 19 Commercial buildings
- 37 Residential buildings



Vadose zone present beneath

- Biodegradation of vinyl chloride likely to occur
- No water in contact with foundation
- No water present in building sump

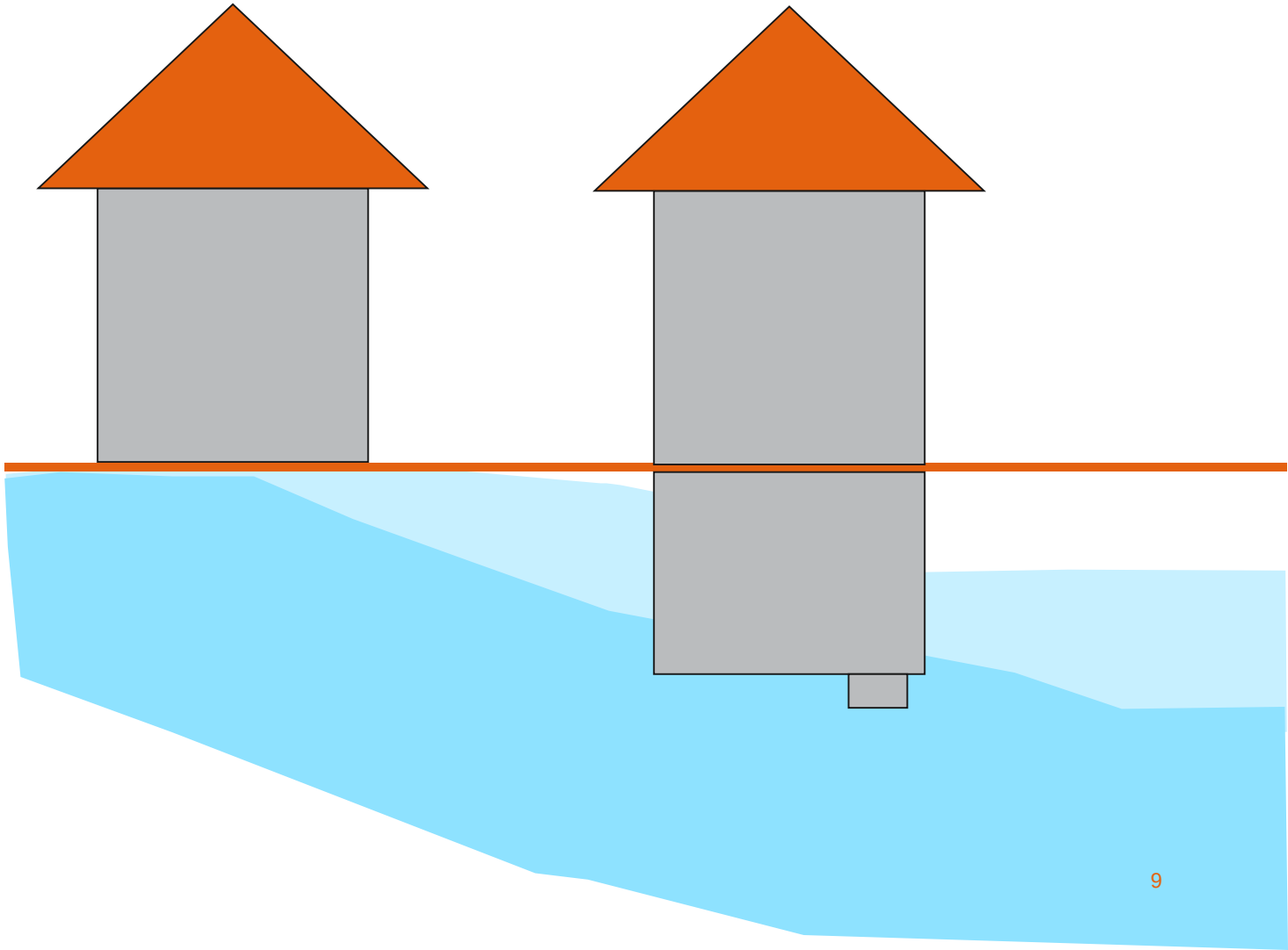
Assess potential VI using soil gas sampling



No vadose zone present beneath

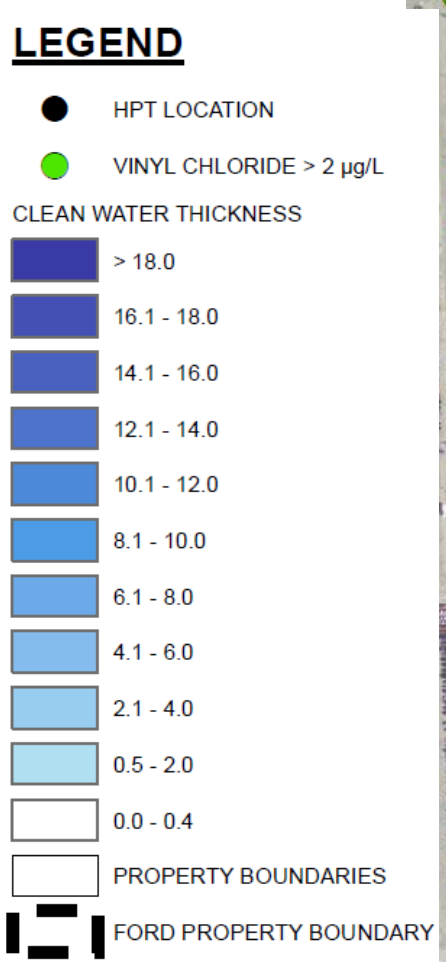
- Biodegradation of vinyl chloride not likely to occur
- Water may be present in basement or sump
- Water may be present directly under crawl space
- Sump pump may influence water movement

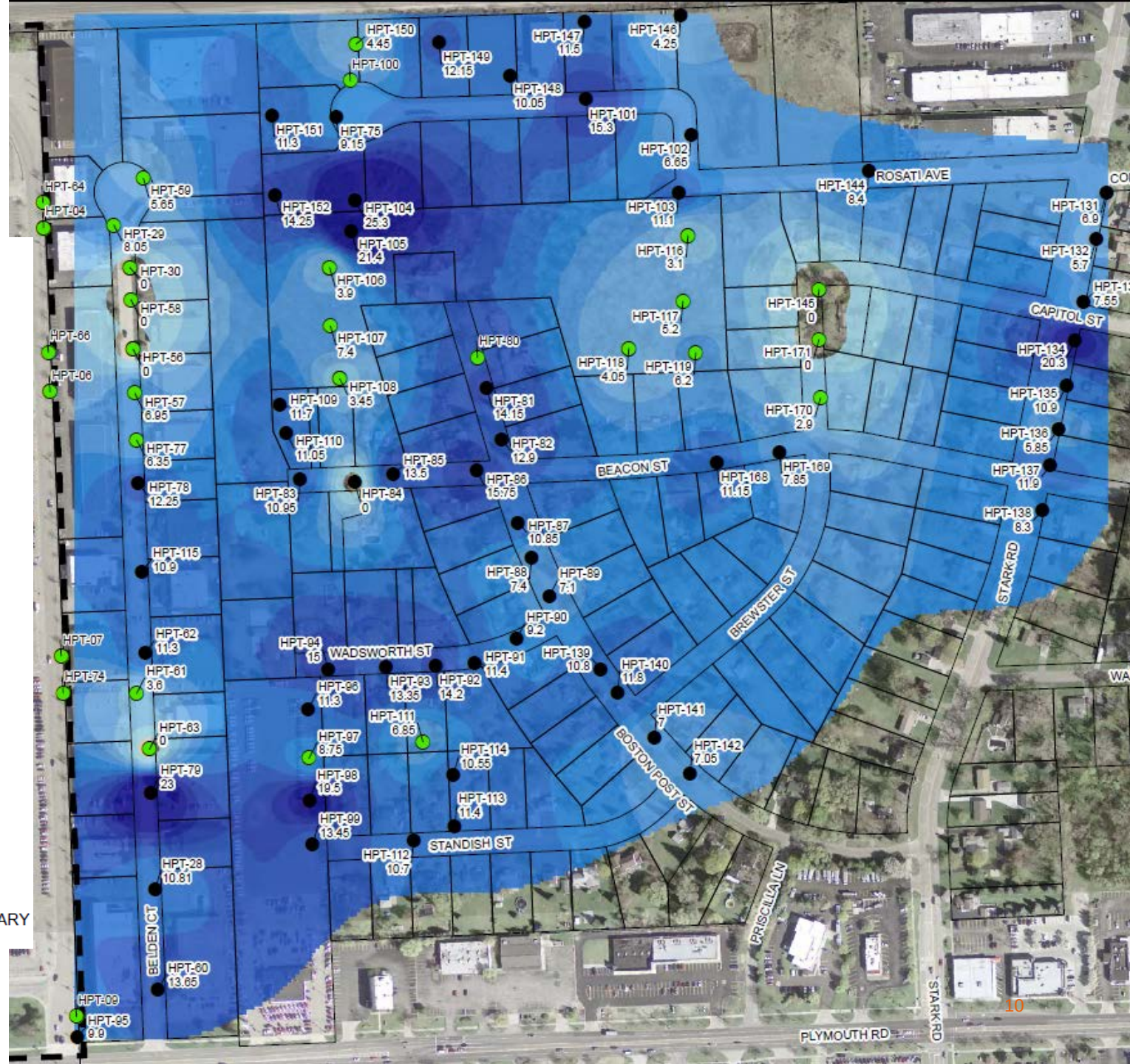
Cannot assess VI using soil gas sampling



Clean Water Lens

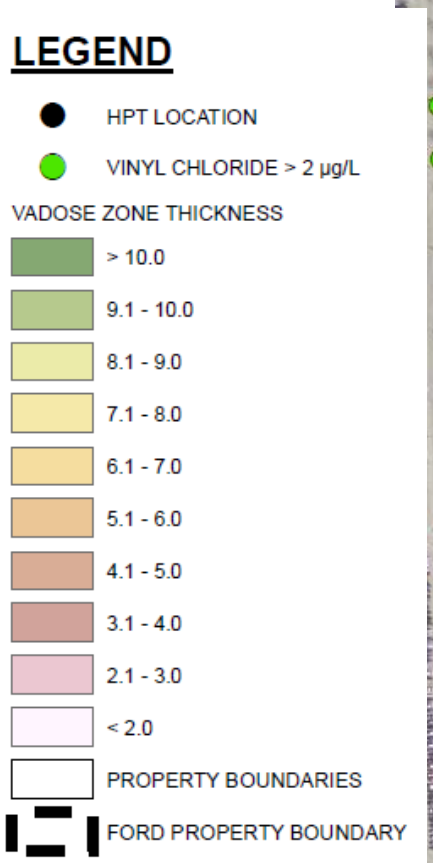
- Impacted zones are overlain by a lens of clean water with the exception of a few areas
- Areas with a clean water lens would not likely be an issue for homes with no basement or sump

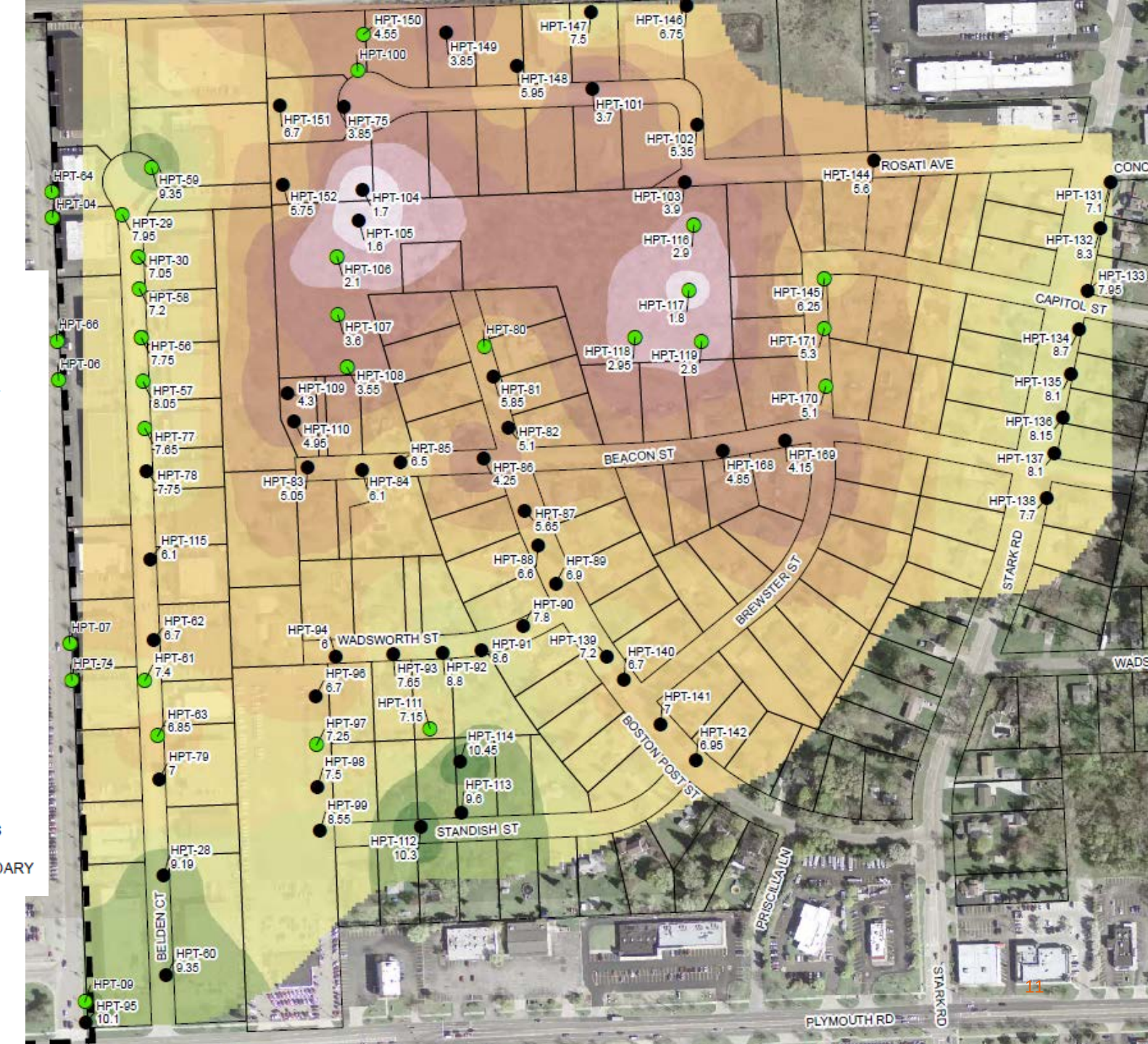




Vadose Zone Thickness

- Vadose zone thickness drives investigation options for homes





Current Soil Vapor Conditions

Soil vapor co-located with groundwater at seven locations

- Soil vapor samples collected above water table
- Site data supports aerobic biodegradation is occurring
  - Henrys law predicts ~1,100 µg/m^3 soil vapor from 1 µg/L water
  - Site soil vapor is non-detect, although VC in groundwater detected from 4-10 µg/L

Current Residential Guidance for VC:

>5’ 550 µg/m^3

<5’ 55 µg/m^3

Proposed Tier 1 Sub-slab criteria:

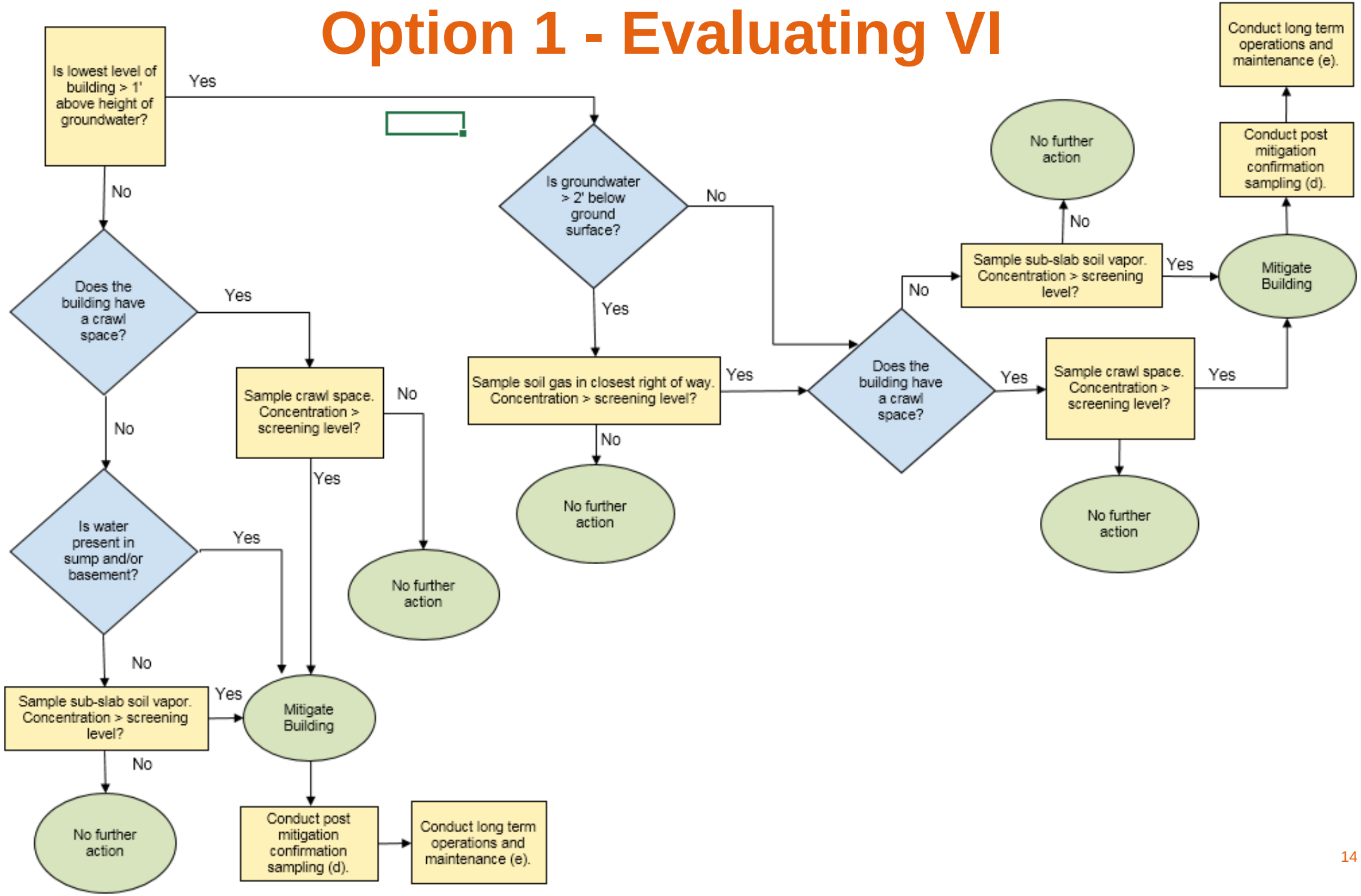
80 µg/m^3

Evaluating VI

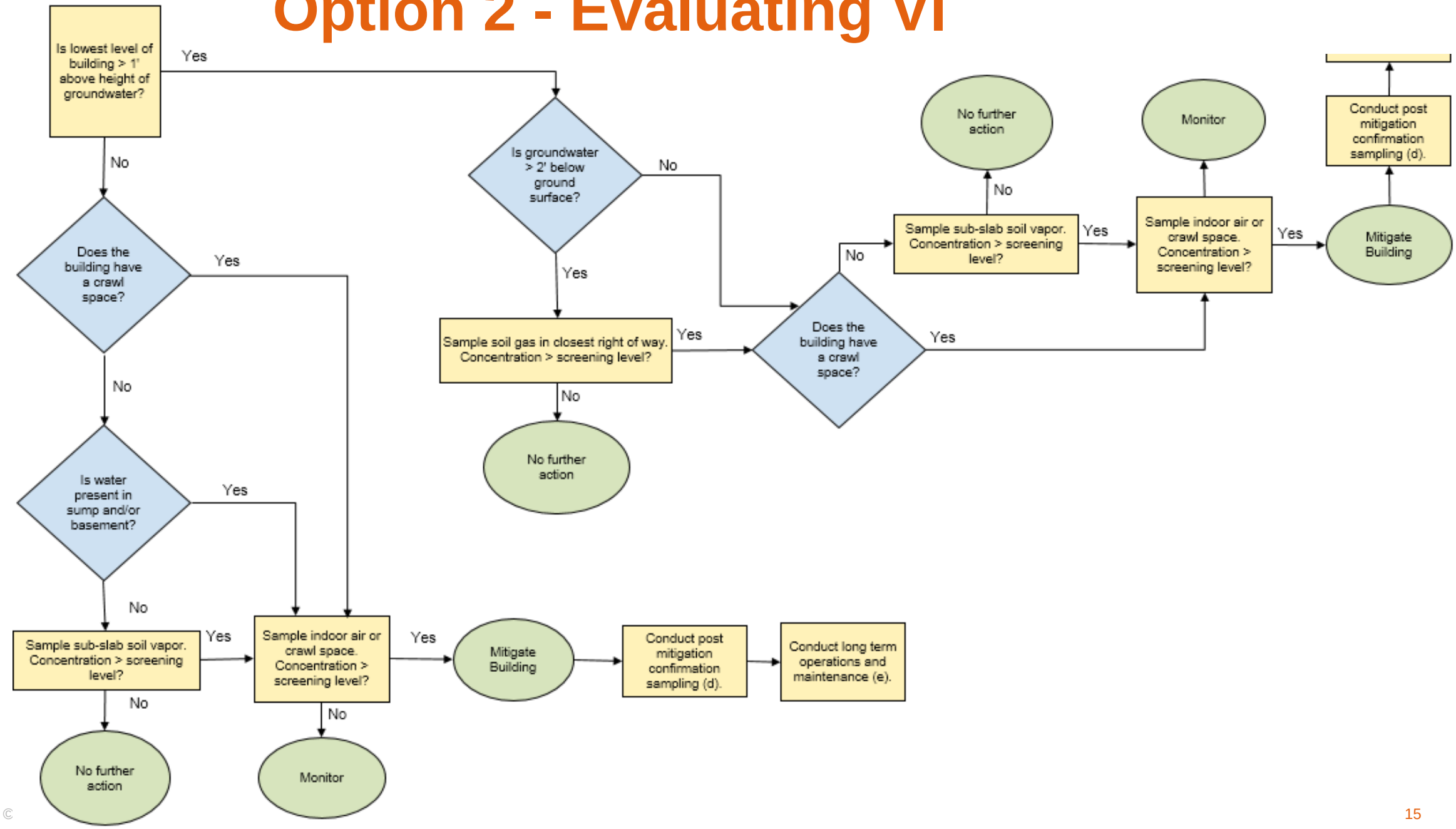
Factors to consider:

- Building distance from groundwater with >2 µg/L vinyl chloride
- Building construction (e.g. slab on grade, crawl space, basement)
- Depth to groundwater beneath the lowest floor of building
  - Presence of sumps
- Need for additional data
  - ROW soil gas samples
  - Indoor air / basement / crawlspace samples
- Mitigation of vapor, if warranted

Option 1 - Evaluating VI



Option 2 - Evaluating VI



Path Forward

- Installation of permanent monitoring wells
- Complete desktop analysis of property construction
  - Assessment records
  - Building specific information (construction, presence of sump, pumping status)
- Field survey of properties identified with potential for VI
- Additional soil vapor sampling to understand conditions across off-site area, if warranted
- Indoor air sampling, if warranted
  - Building survey / chemical inventory and property owner questionnaire
- Mitigate, if warranted