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

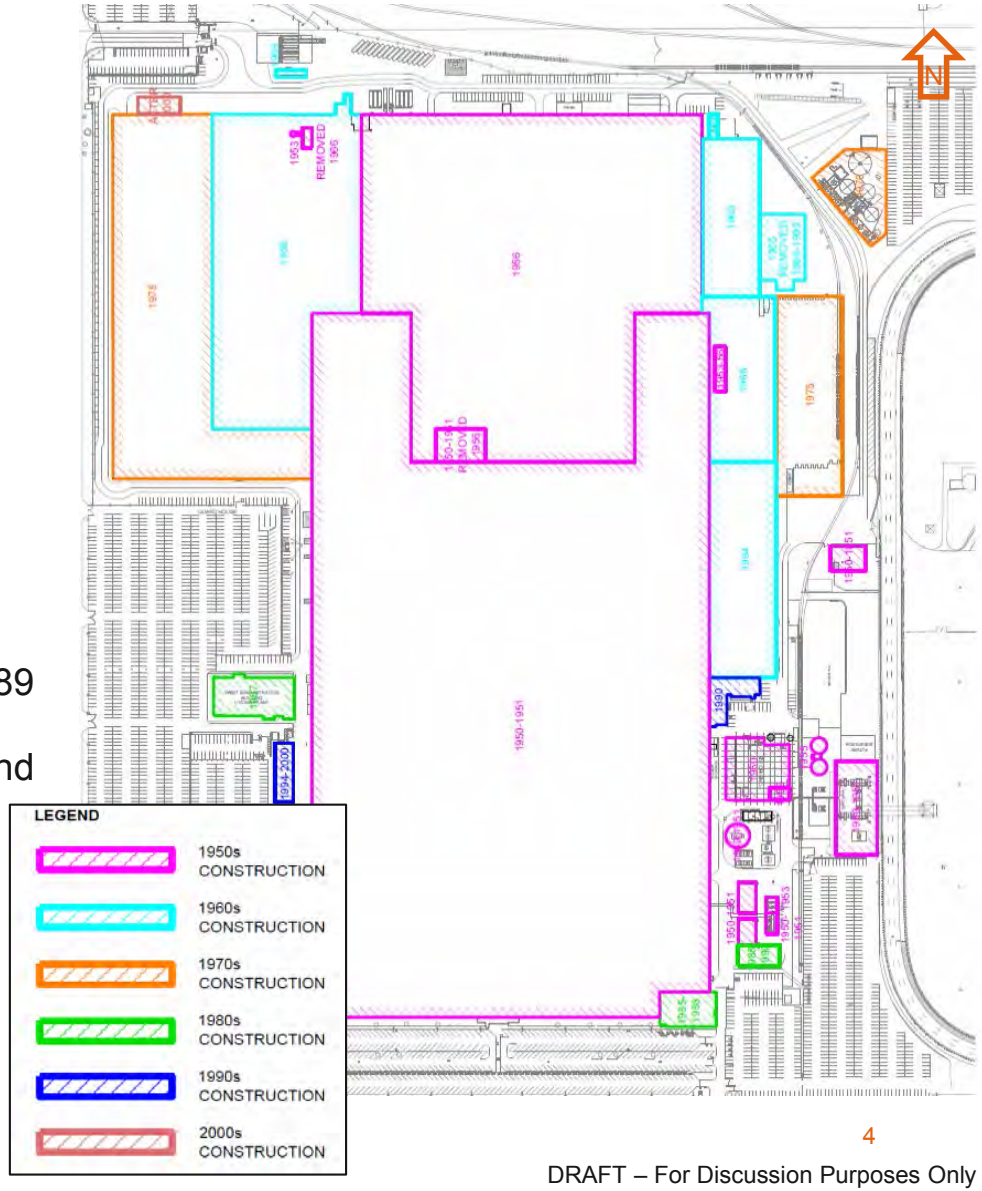
- Executive Summary
- Site Background
- Conceptual Site Model
  - Geology
  - Groundwater/Soil Impacts
    - Offsite Migration
    - Potential Sources
  - LNAPL Impacts
  - Soil Gas
  - Storm Sewers
- Next Steps

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

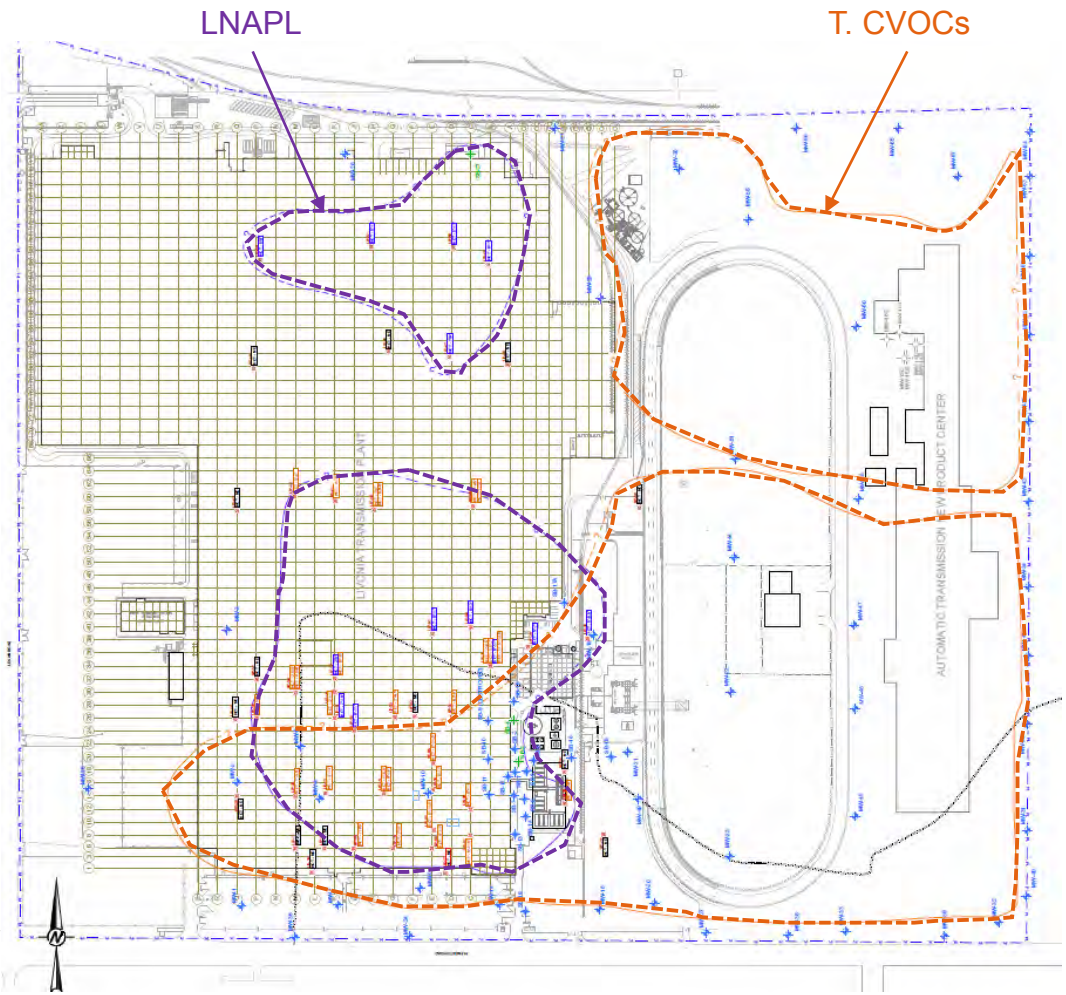
Site Background

- 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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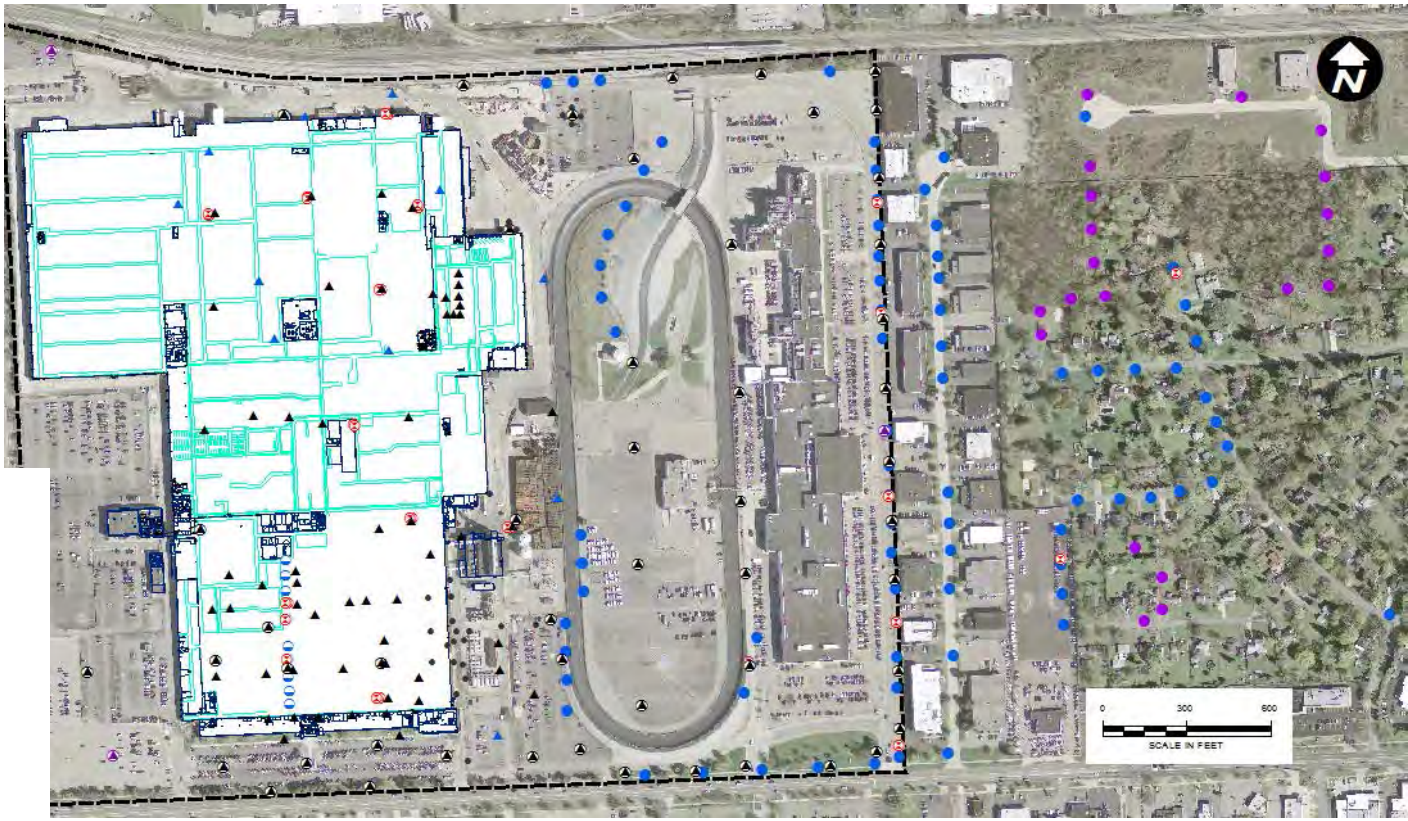
Totals to Date:

- 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

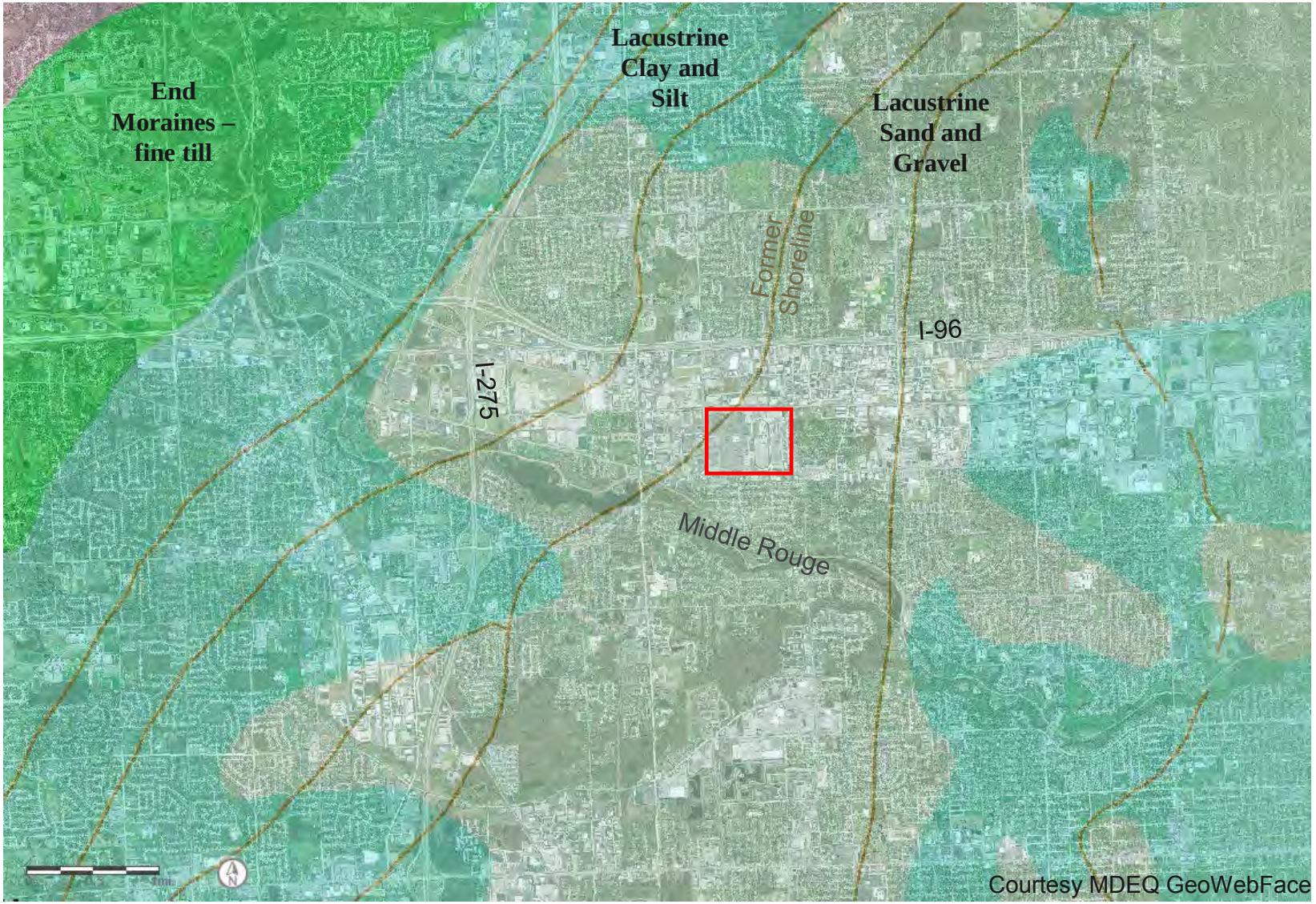
- SOIL BORING
- SHALLOW MONITORING WELLS
- LIF BORING

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



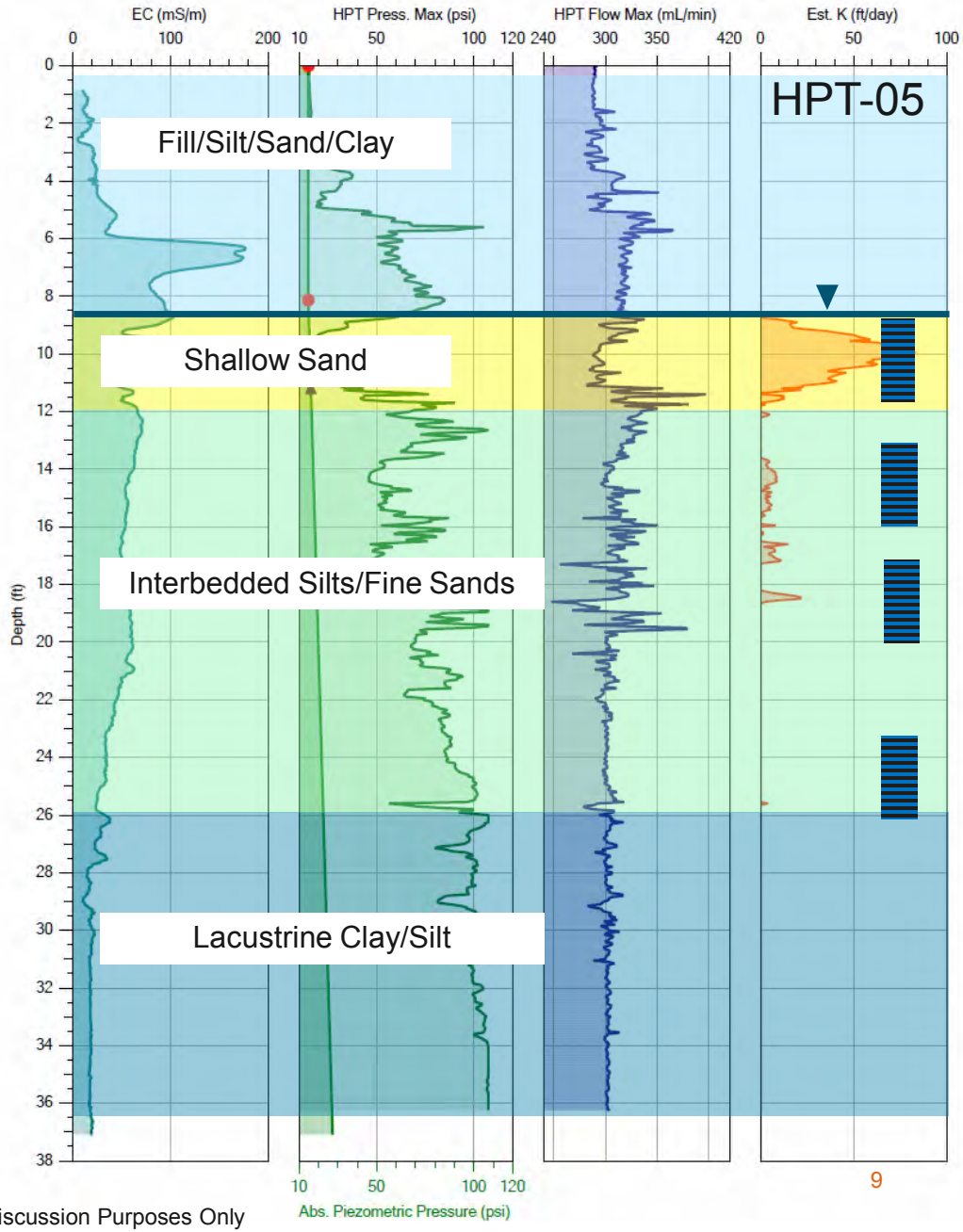
HPT Log

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)

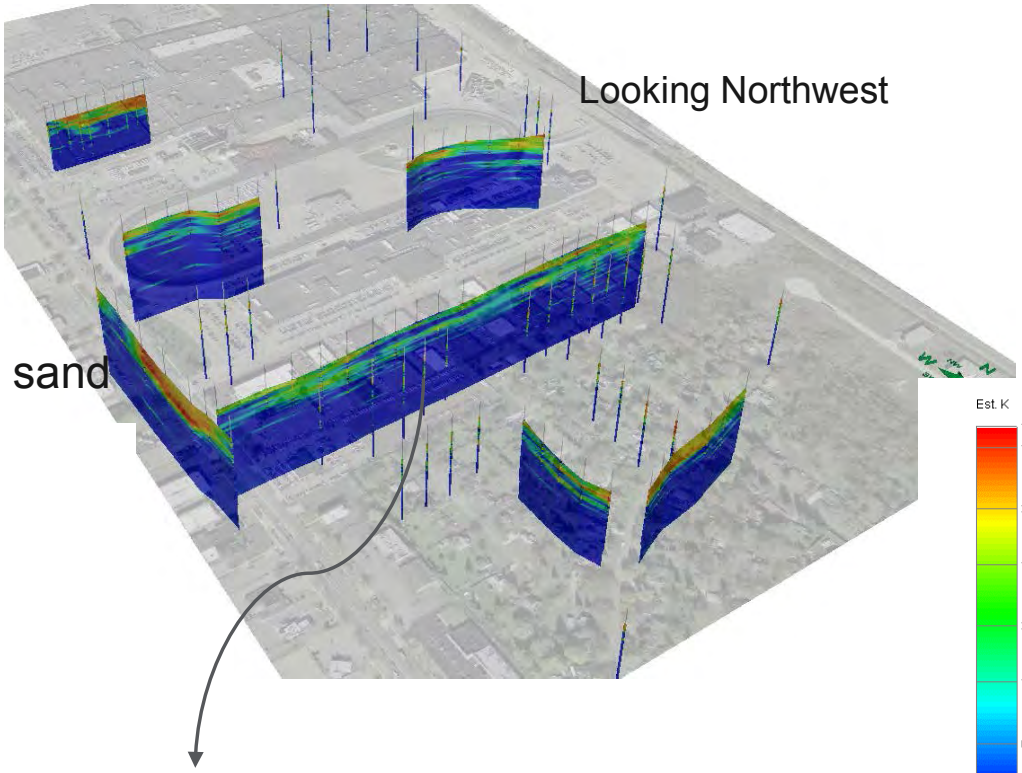
- Est. K is Q/P corrected by an empirical relationship developed by Geoprobe

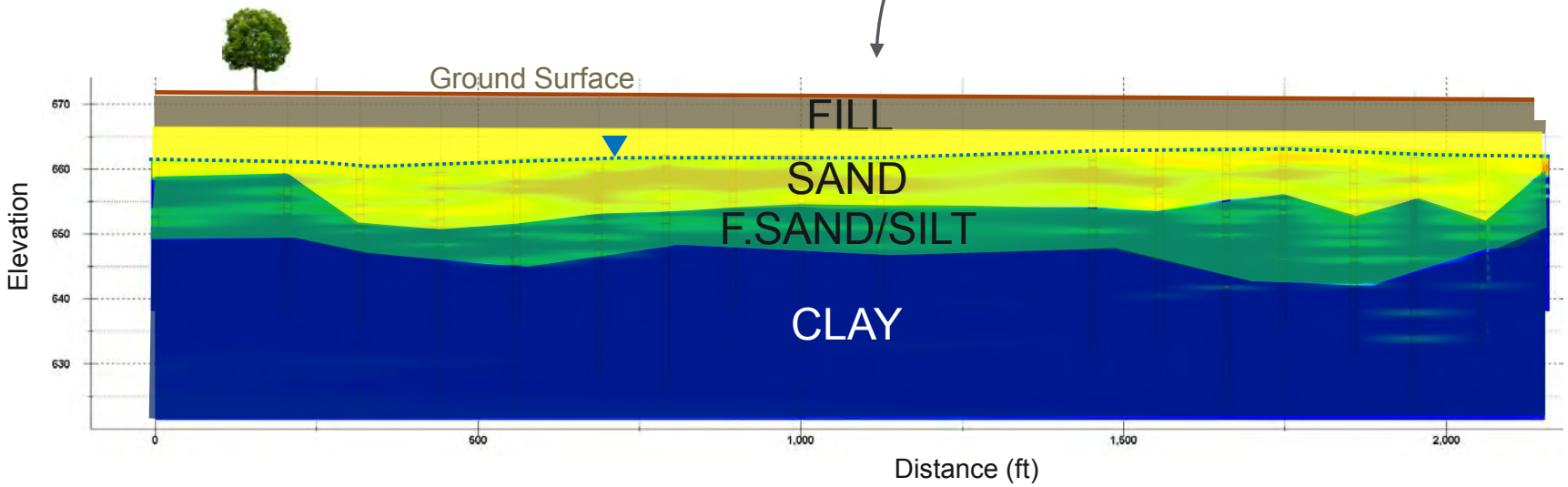


Geology

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



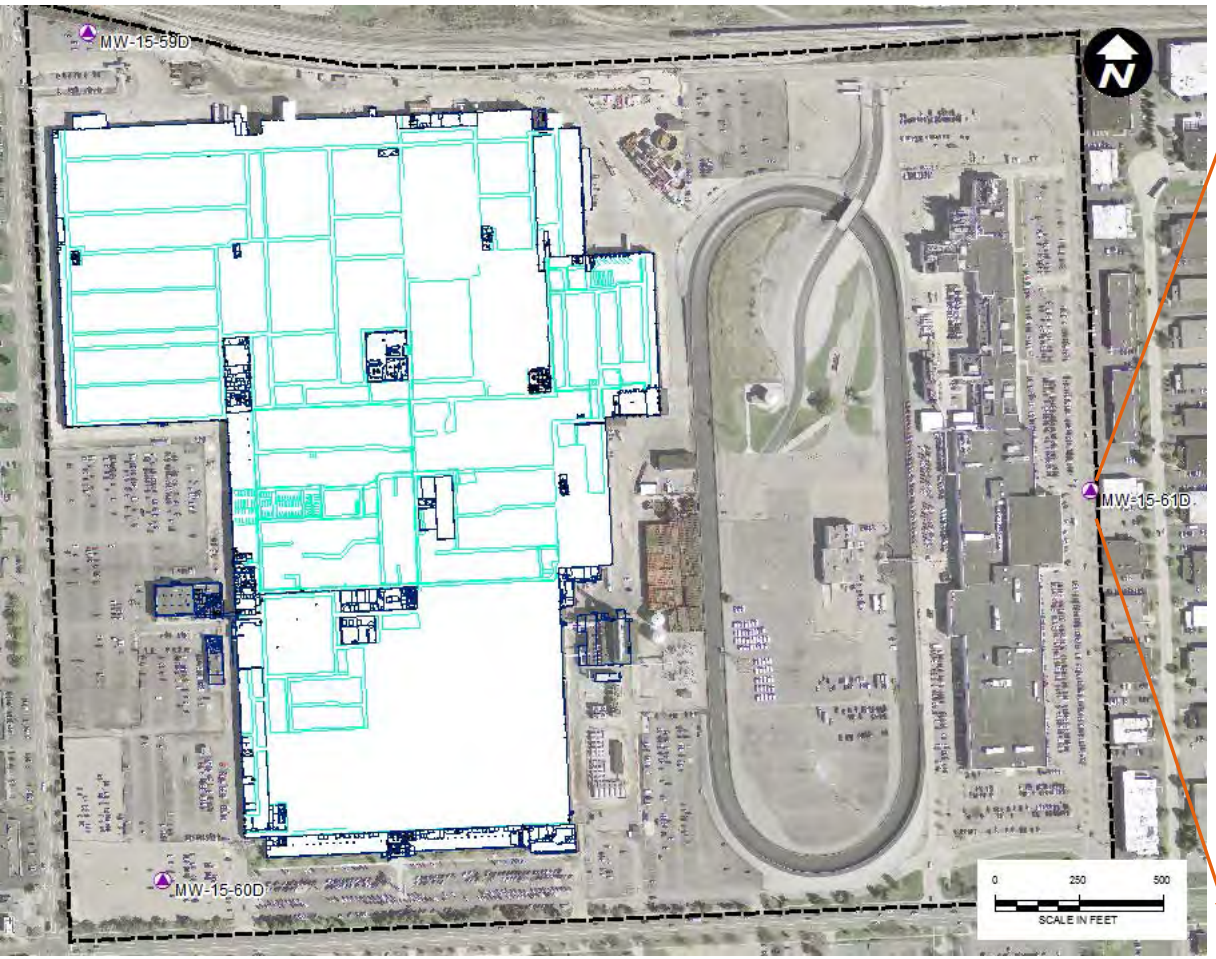


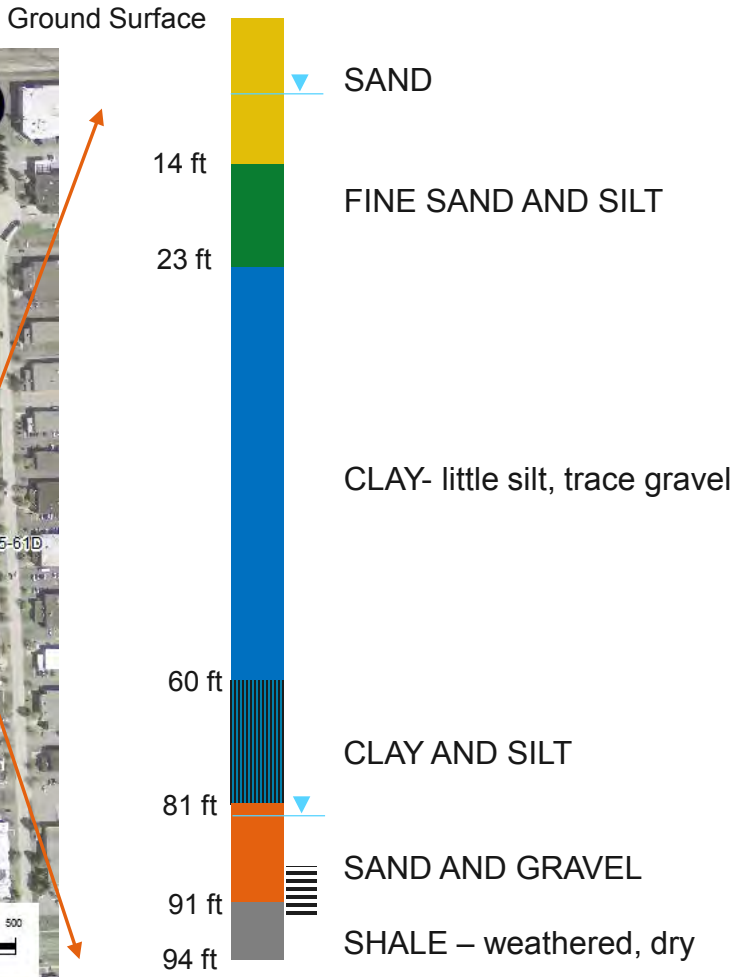
DRAFT – For Discussion Purposes Only

Link-3D Model

Deep Well Installation

- All VOCs below criteria





Groundwater/Soil Impacts

On-Site Laboratory

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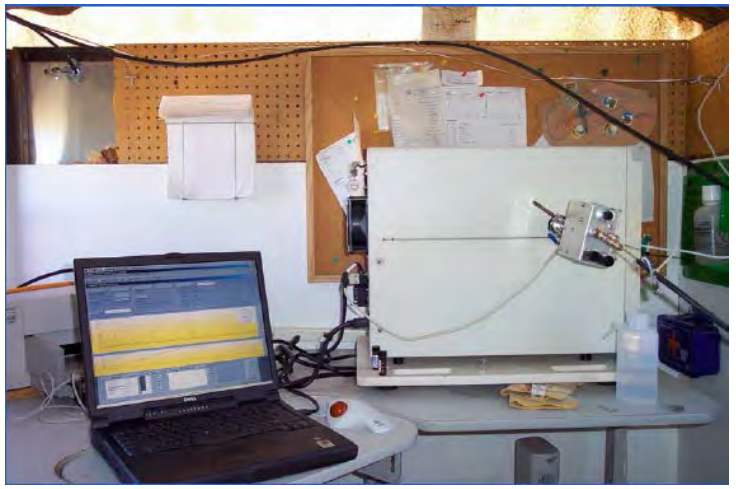
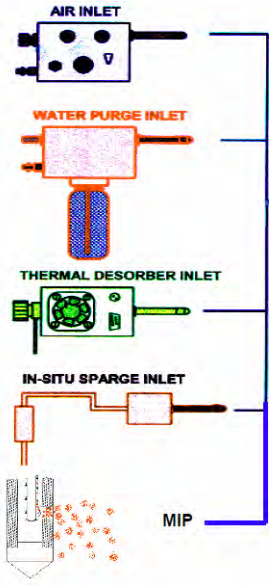
On-site Laboratory:
Triad Environmental Services

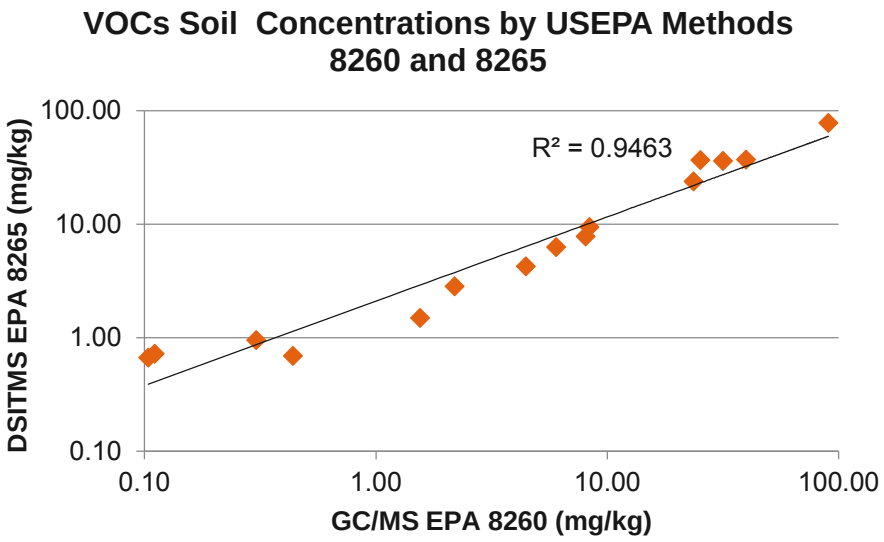


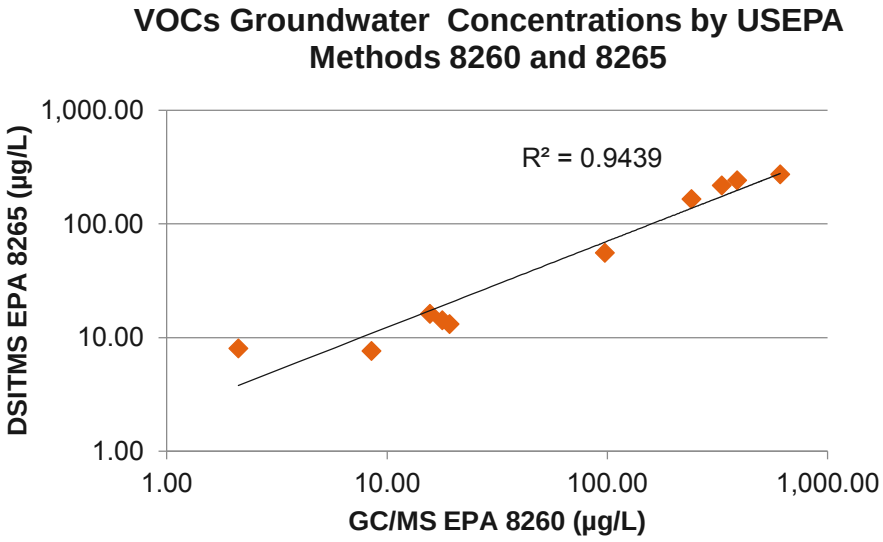
- Can process up to 80 samples per day for VOCs
  - USEPA Method 8265 (DSITMS)
  - Limit list of reported constituents to primary COCs
- DL for VOCs in water: 1.0 µg/L
- DL for VOCs in soils: 150-200 µg/Kg
- Good correlation with fixed lab methods (i.e. Method 8260)



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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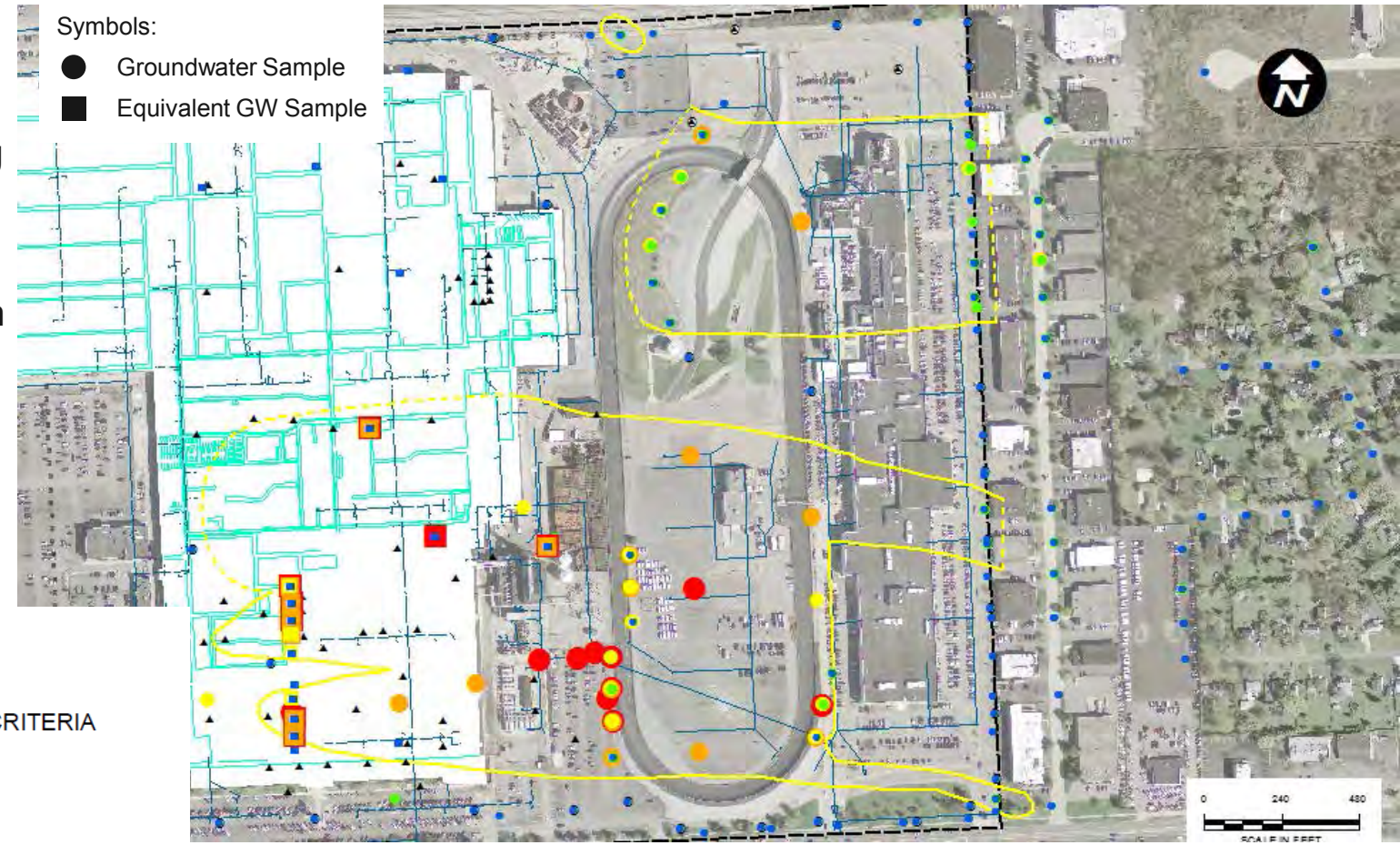
Two groundwater plumes:

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



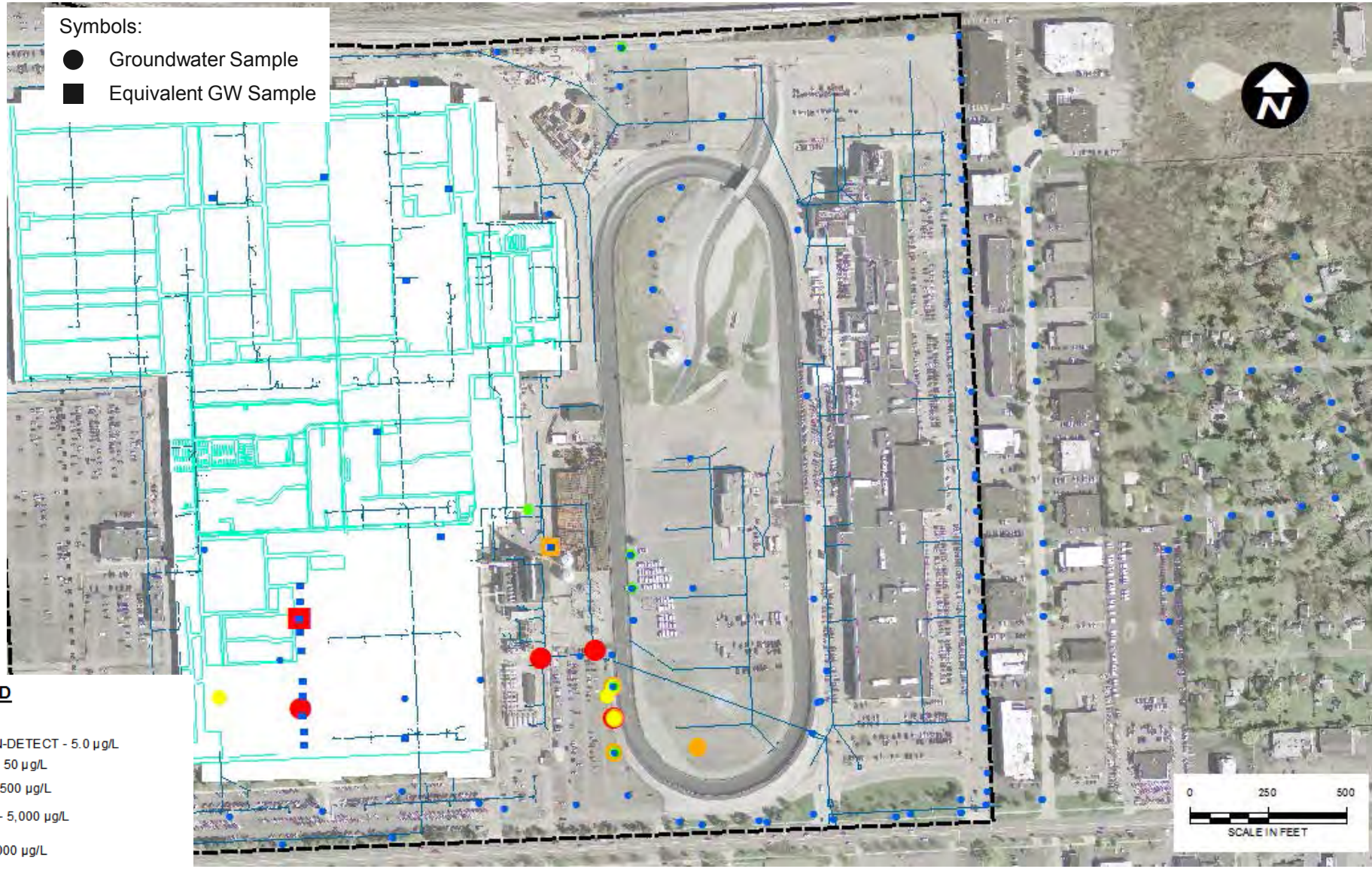
LEGEND

NORMALIZED DATA

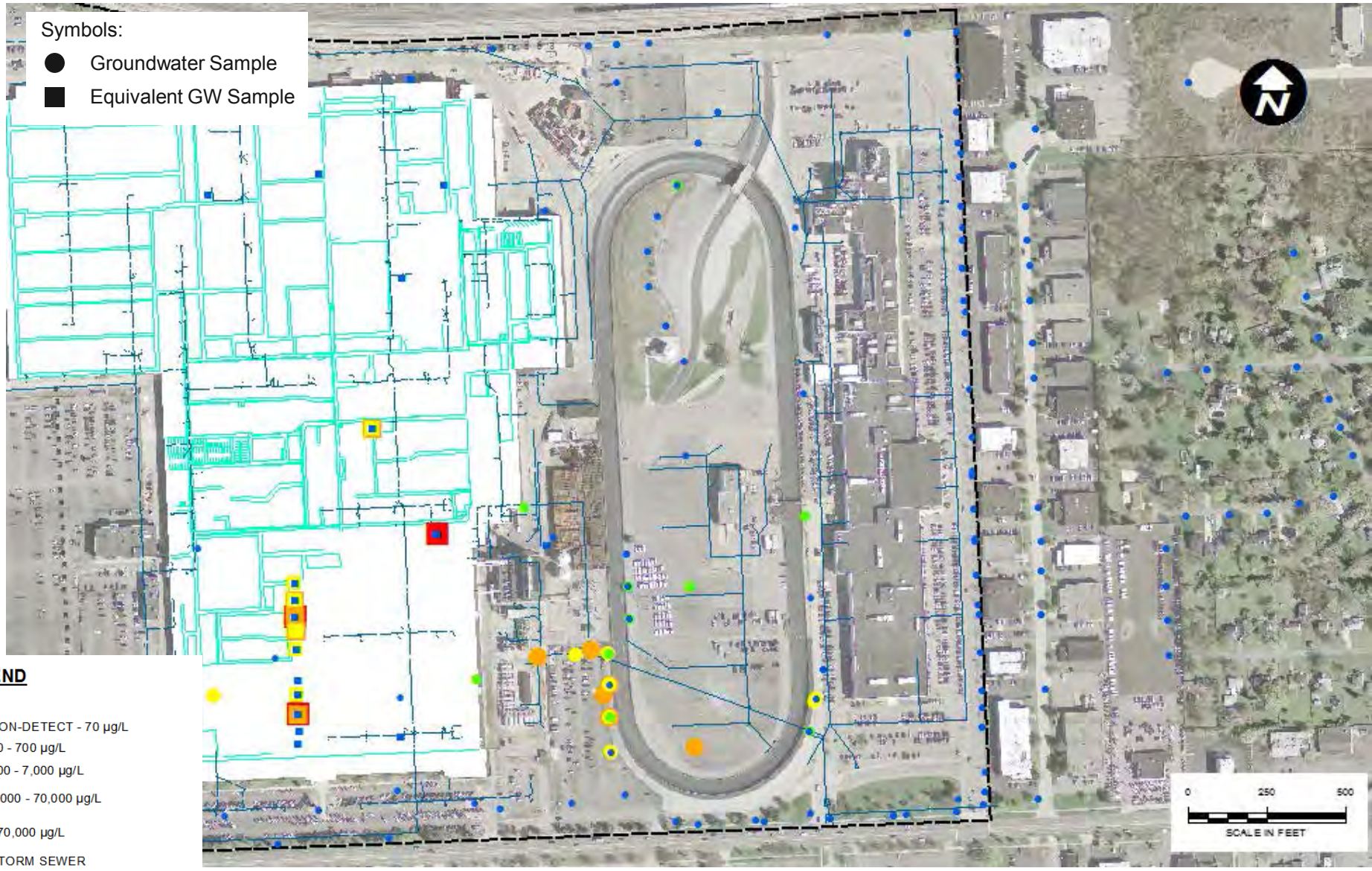
- BELOW CRITERIA - 1x CRITERIA
- 1x - 10x CRITERIA
- 10x - 100x CRITERIA
- 100x - 1,000x CRITERIA
- > 1,000x CRITERIA
- EXISTING MONITORING WELLS
- EXISTING LIF BORING
- APPROXIMATE EXTENT OF TCVOC IMPACTS (DASHED WHERE INFERRED)

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.

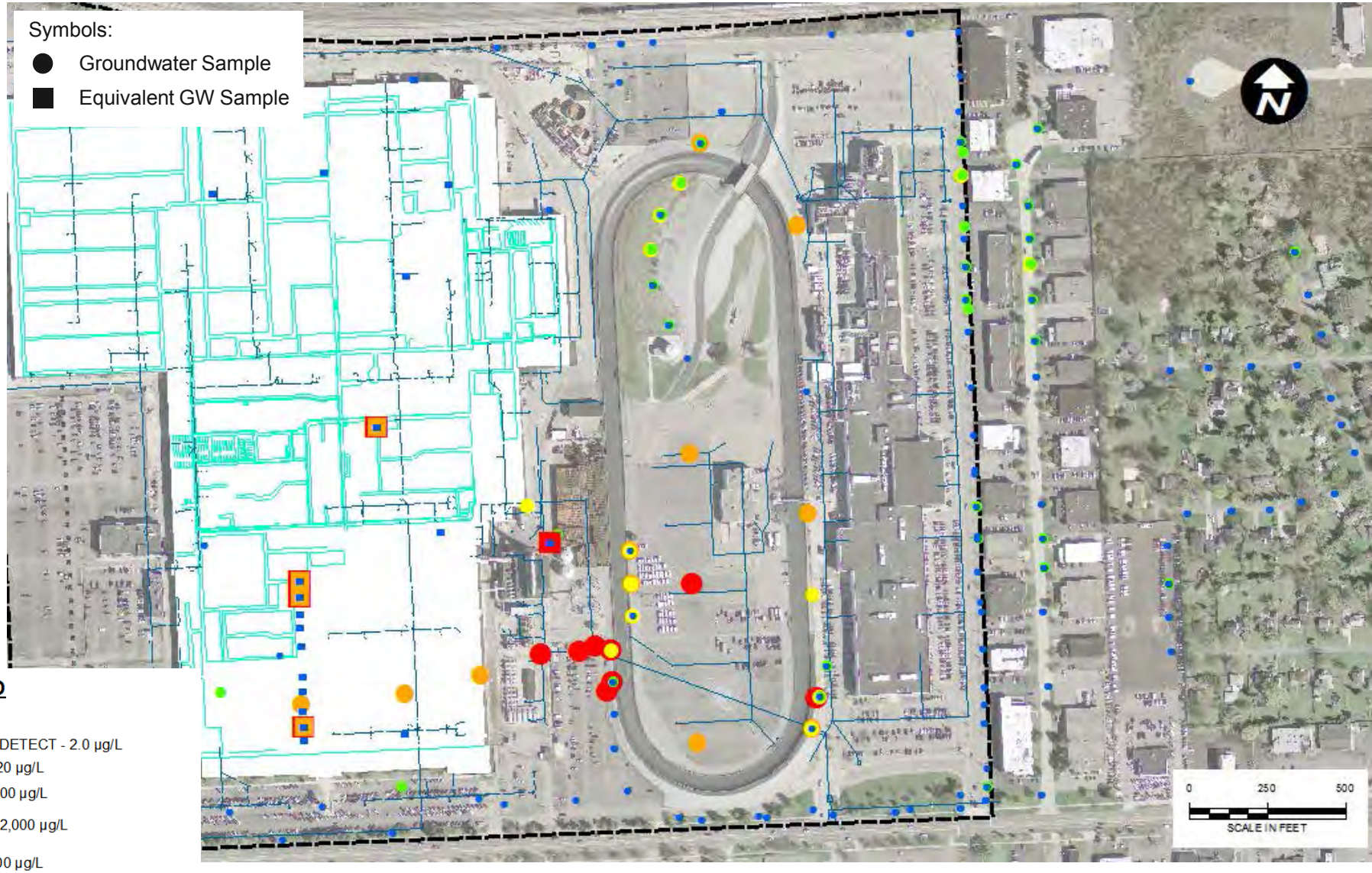
TCE


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

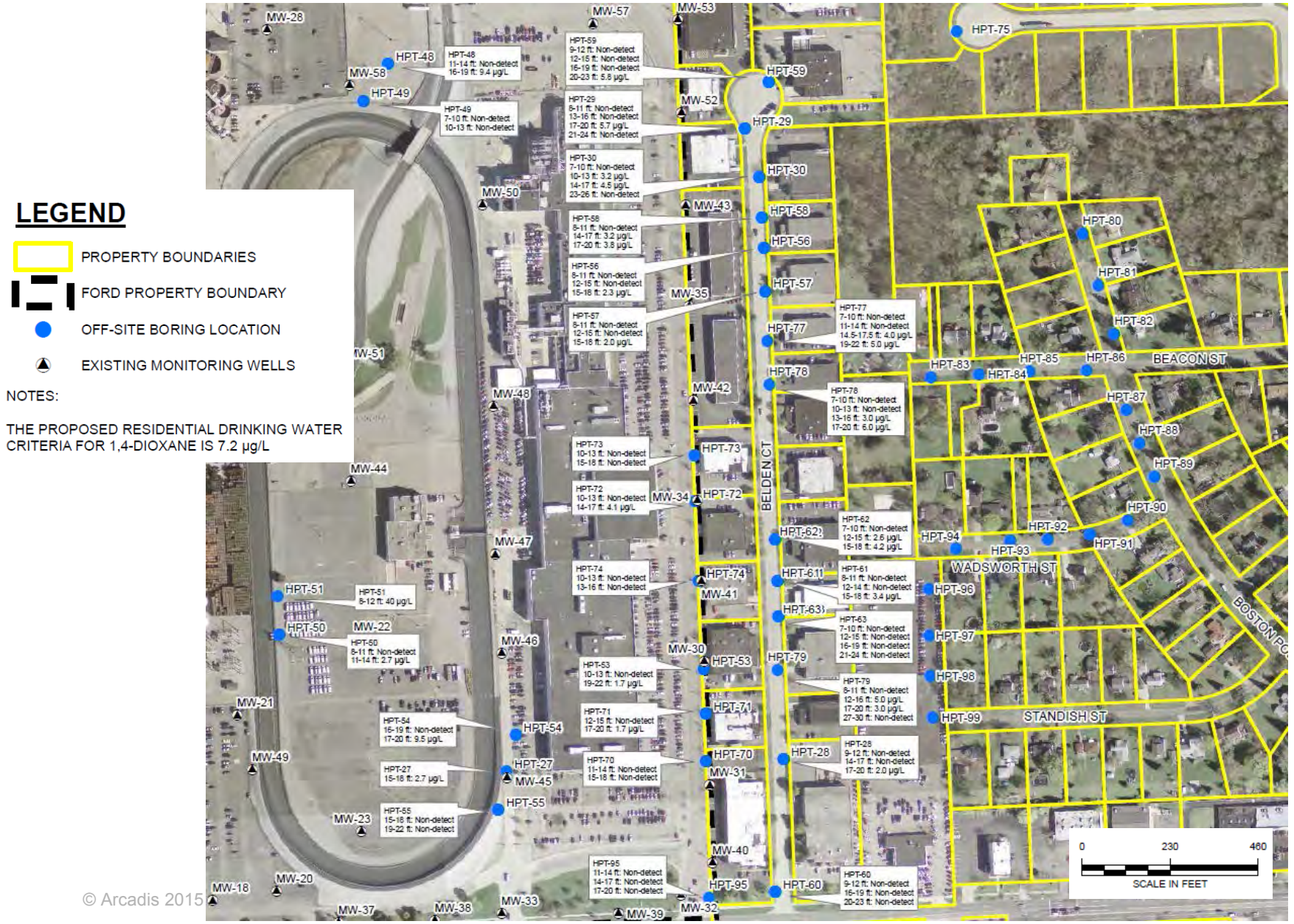
- NON-DETECT - 2.0 µg/L
- 2.0 - 20 µg/L
- 20 - 200 µg/L
- 200 - 2,000 µg/L
- > 2,000 µg/L

STORM SEWER

BUILDING AISLE

APPROXIMATE PROPERTY BOUNDARY

1,4-Dioxane



LIF-HP Data

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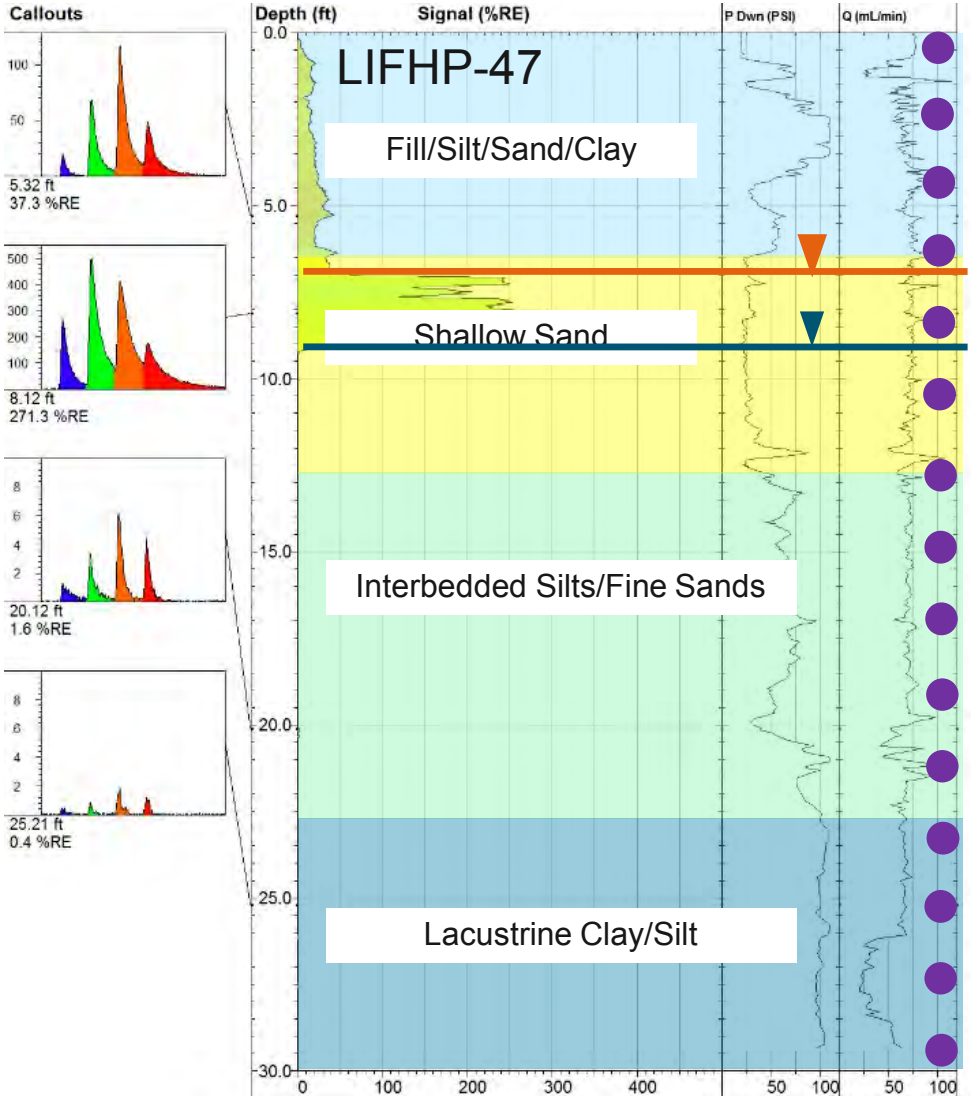
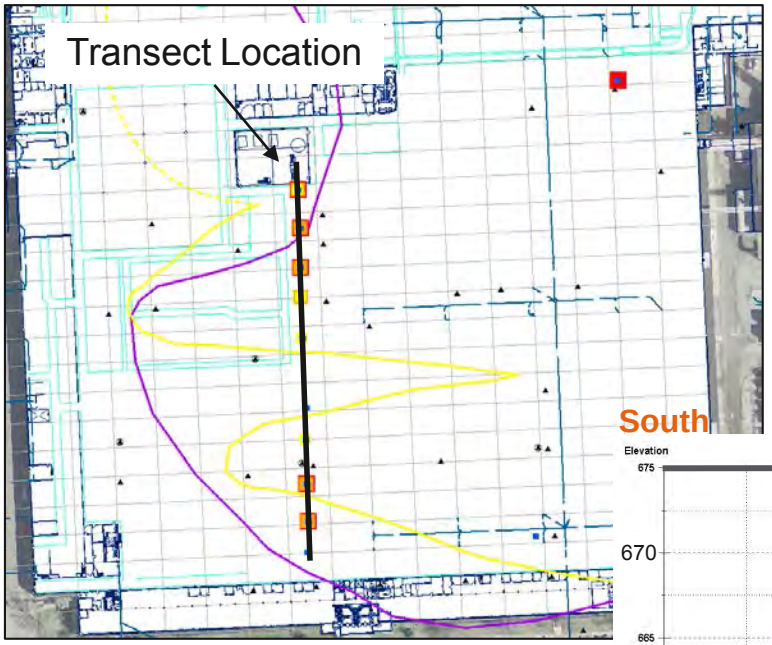
Example Soil Sampling Intervals

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.



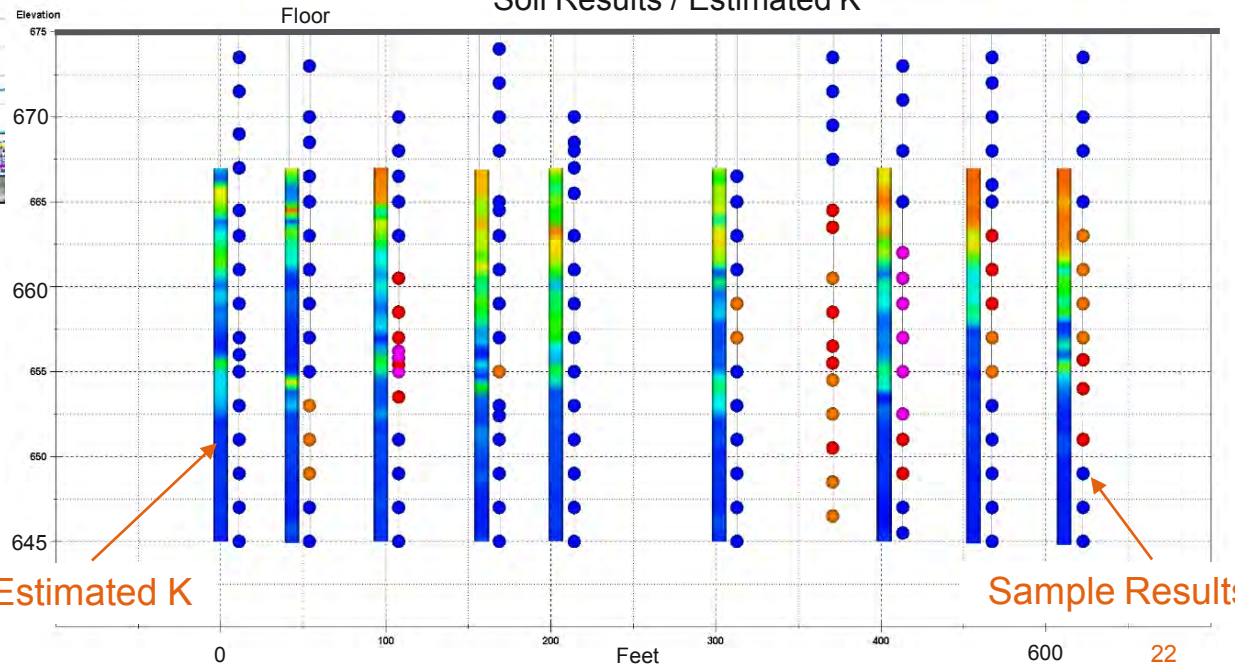
Interior Soil Sampling – Transect 1



South

Soil Results / Estimated K

North



Vertical Exaggeration: 10X

Transect 1

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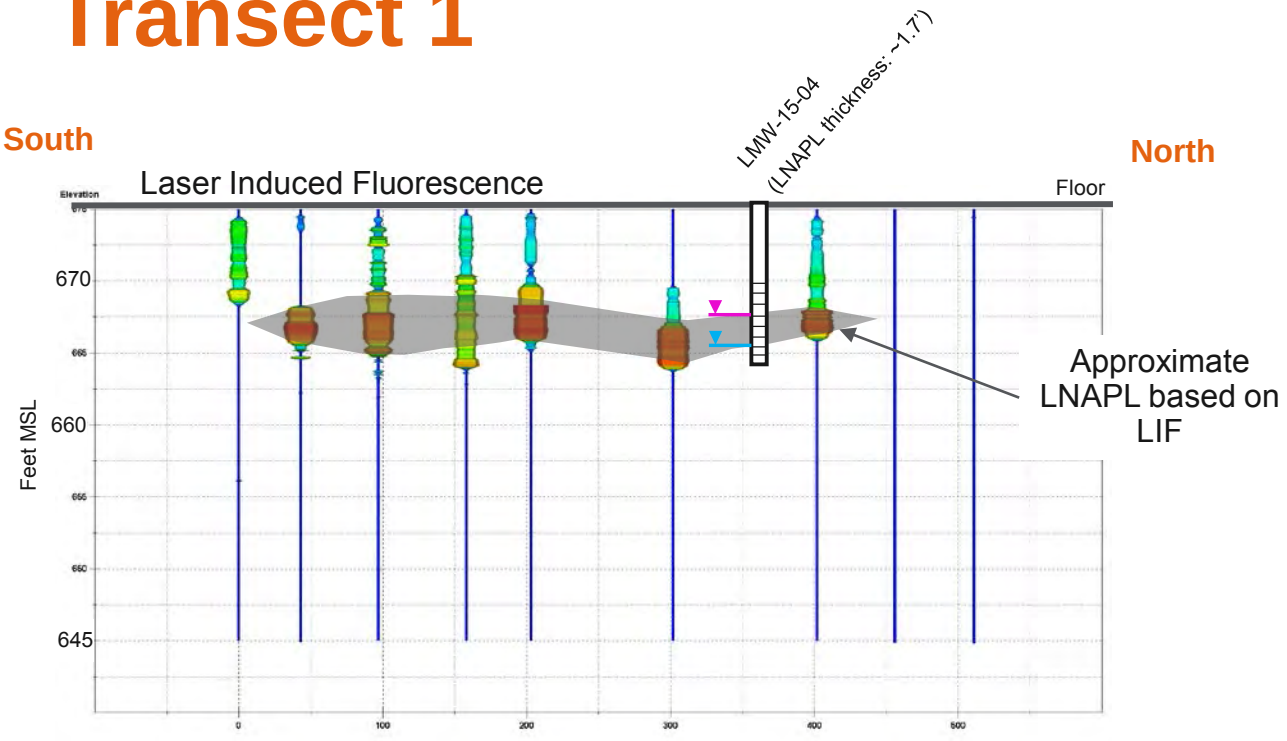
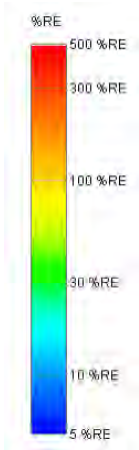
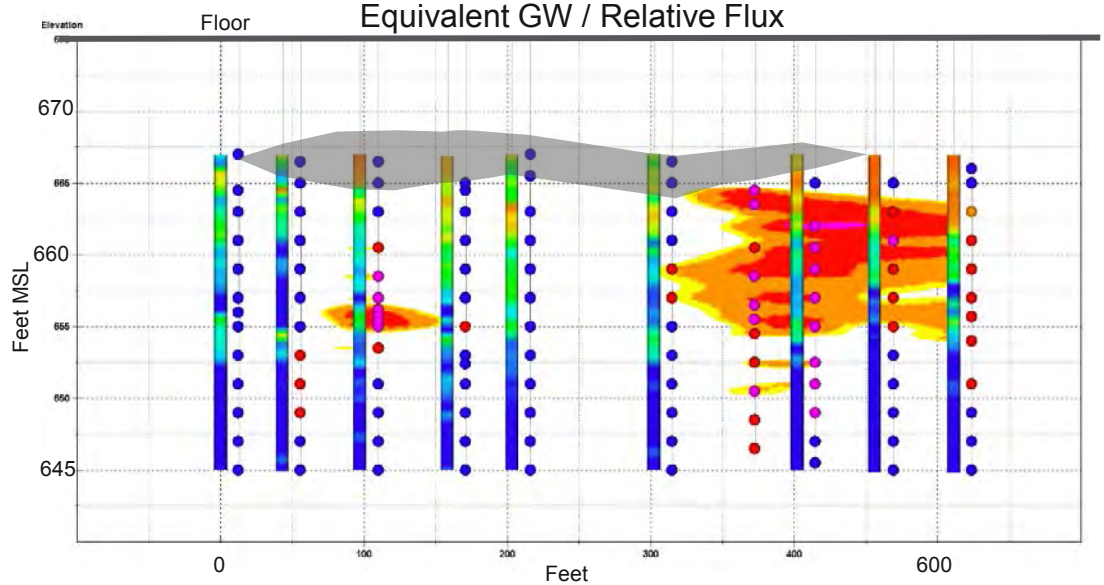
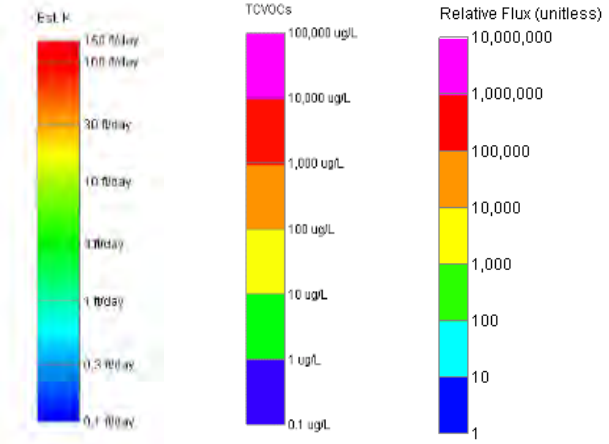
South **North**



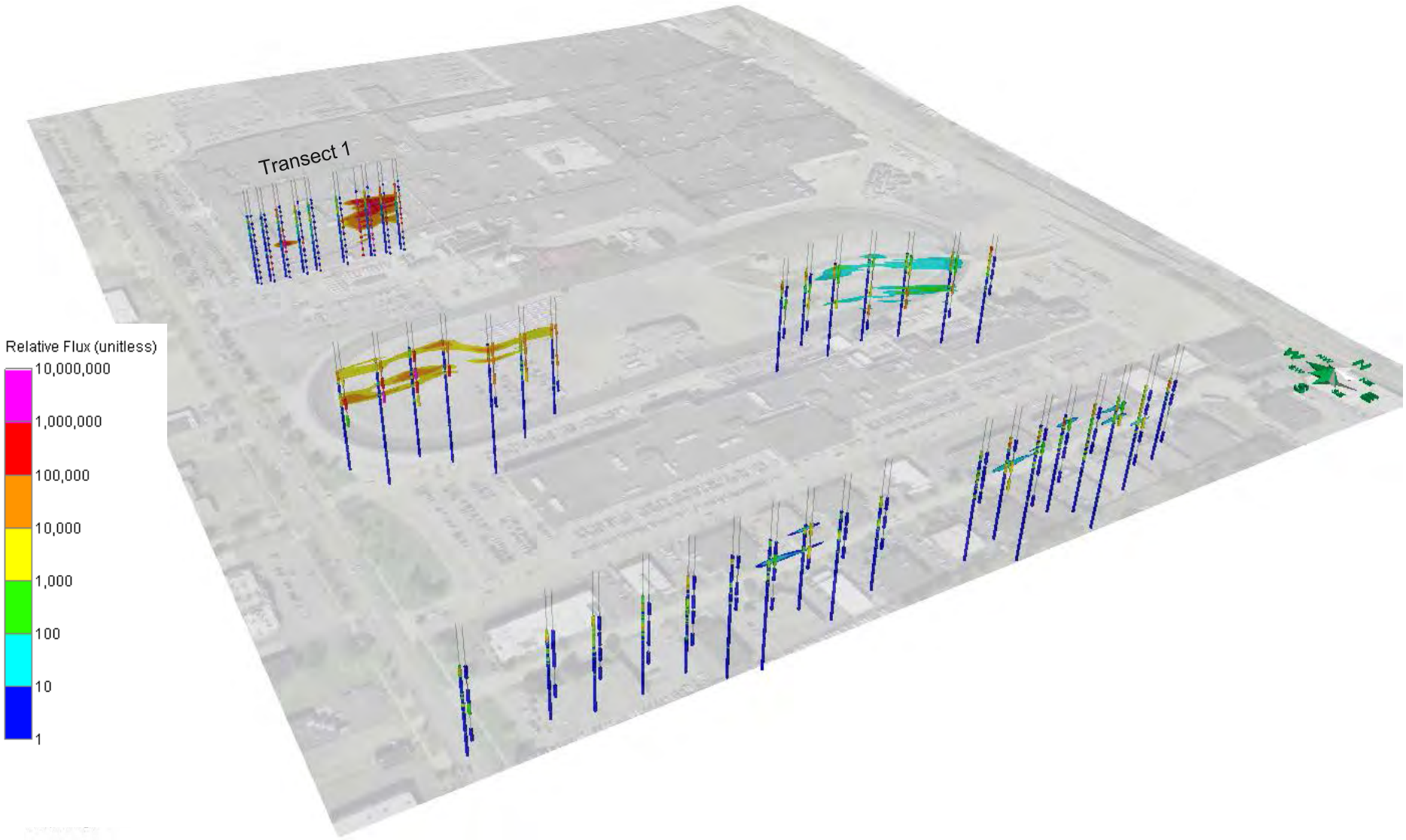


Vertical Exaggeration: 10X



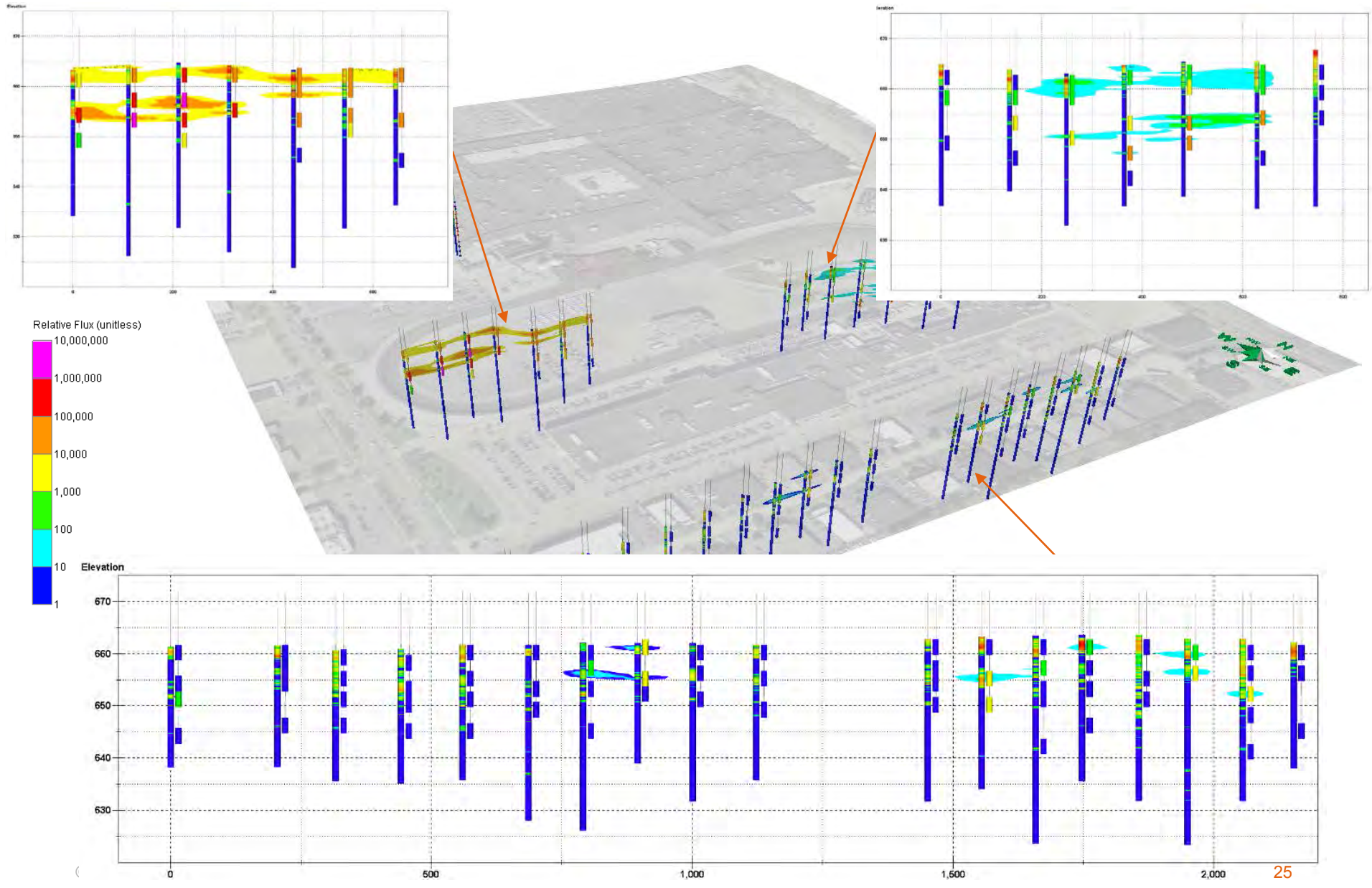


Stratigraphic Flux Model



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)

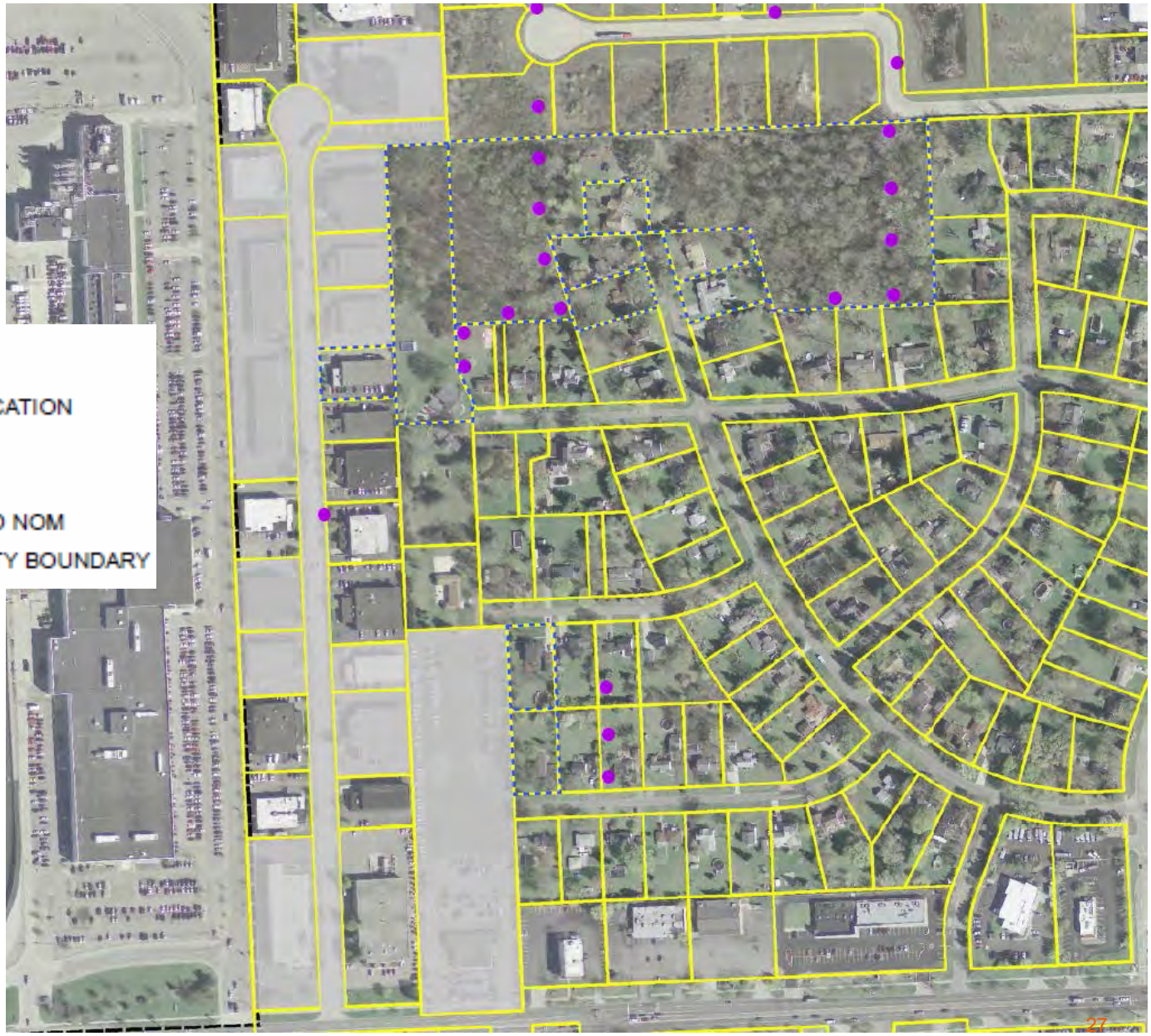
THE RESIDENTIAL DRINKING WATER CRITERIA FOR VINYL CHLORIDE 2.0 µg/L.

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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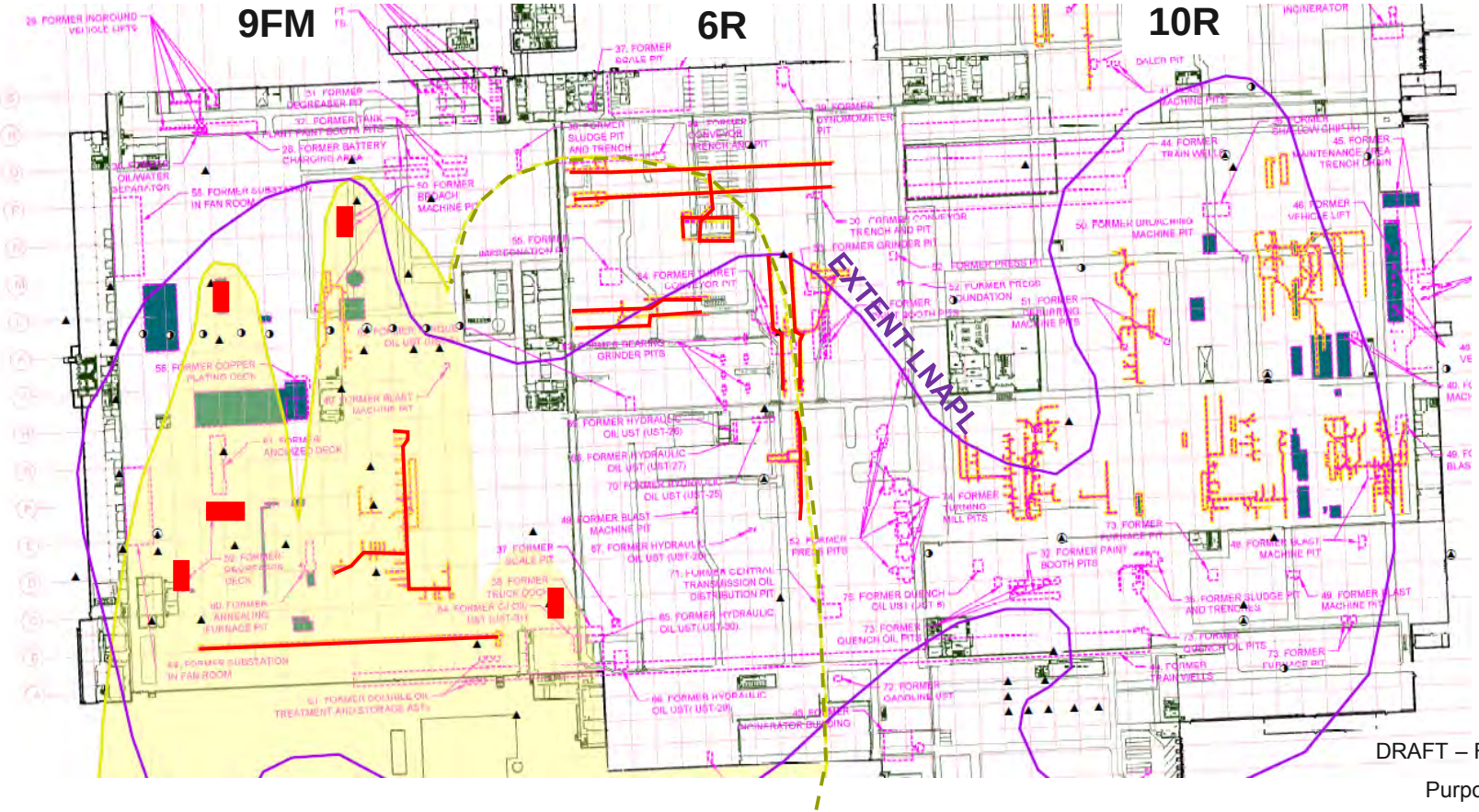
Numerous possible sources in 9FM/6R:

- 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

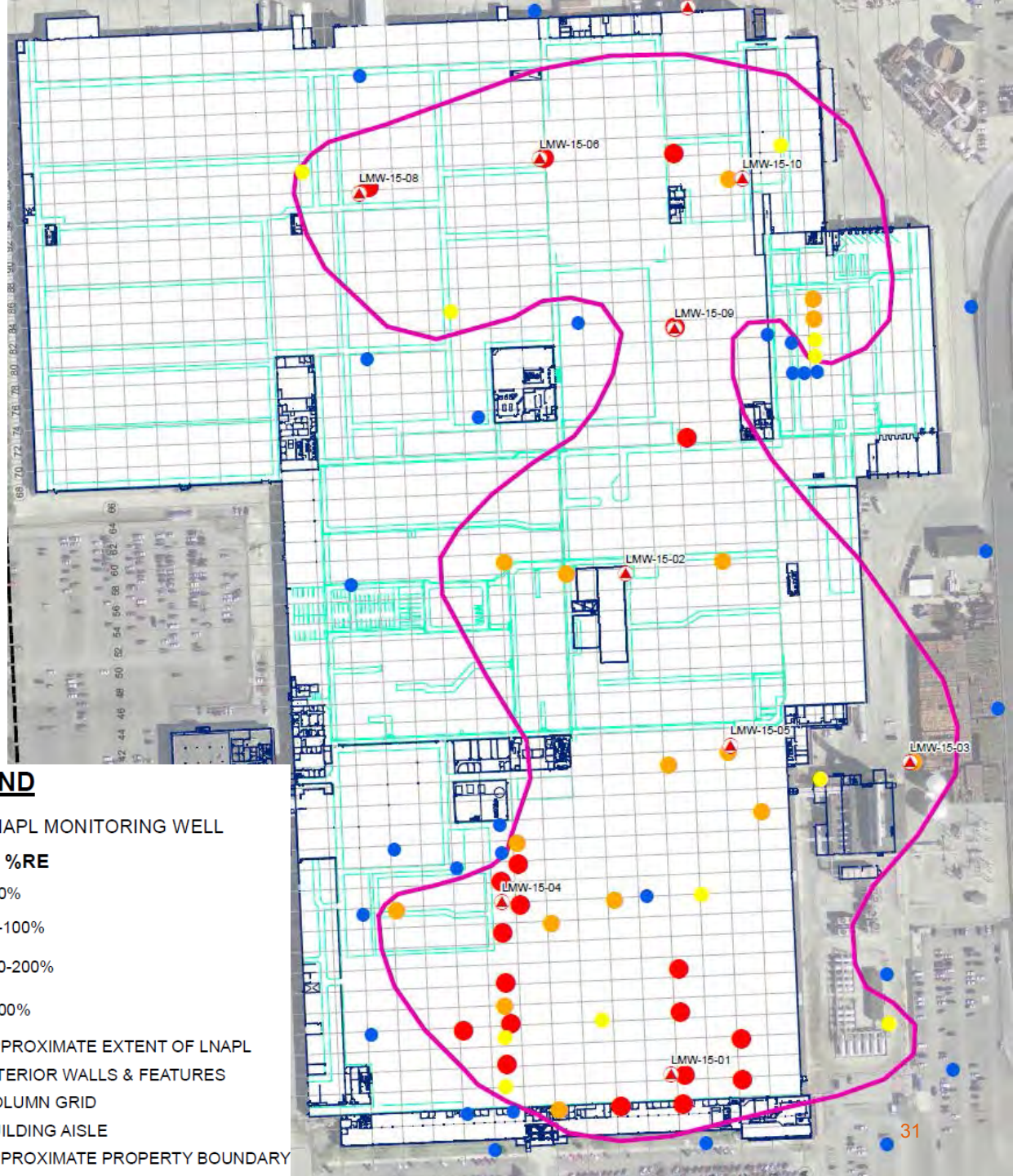
- LNAPL transmissivity testing
- Perimeter monitoring

Based on LNAPL characteristics, evaluate appropriate remedy

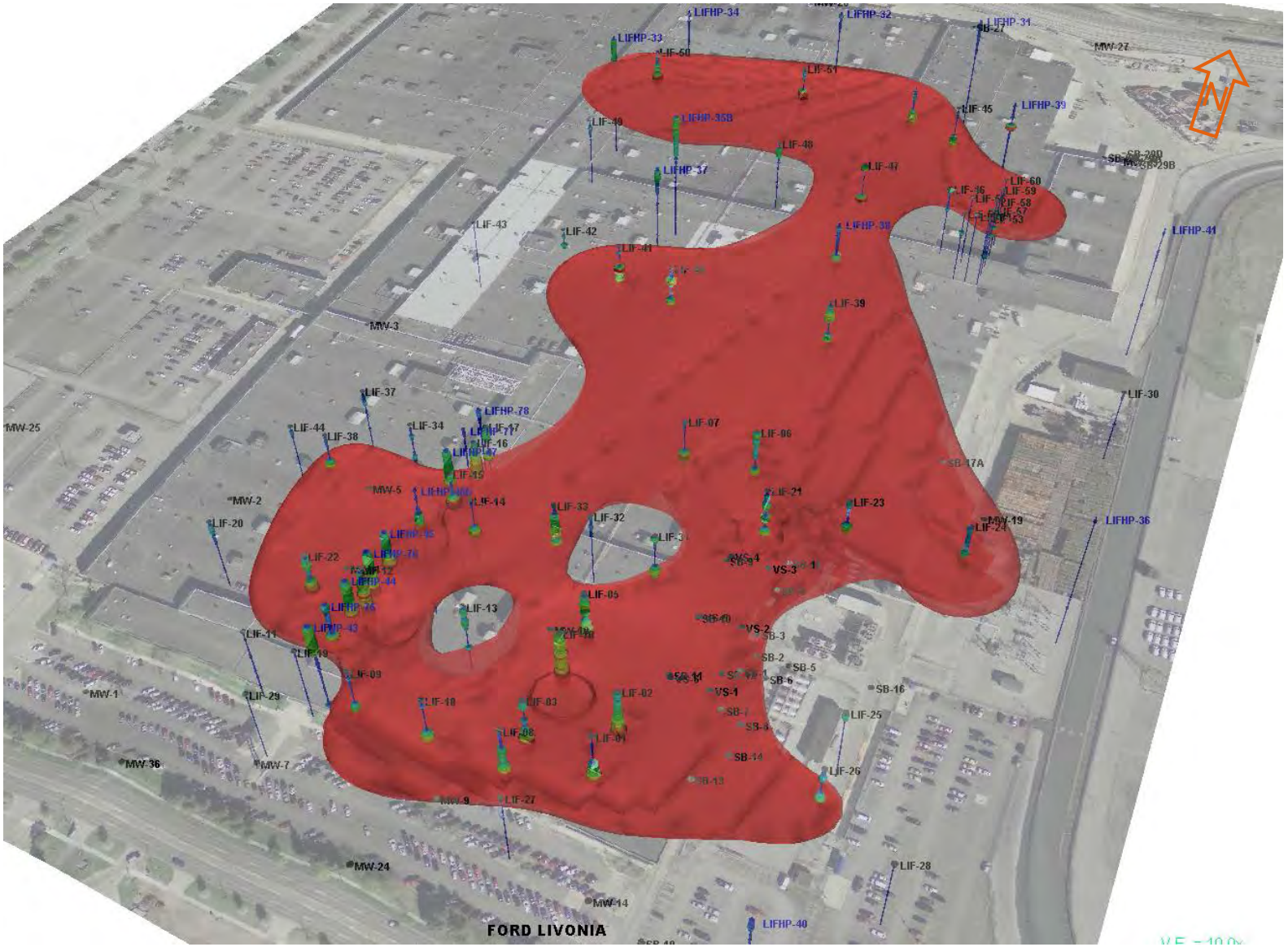
LNAPL Delination

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

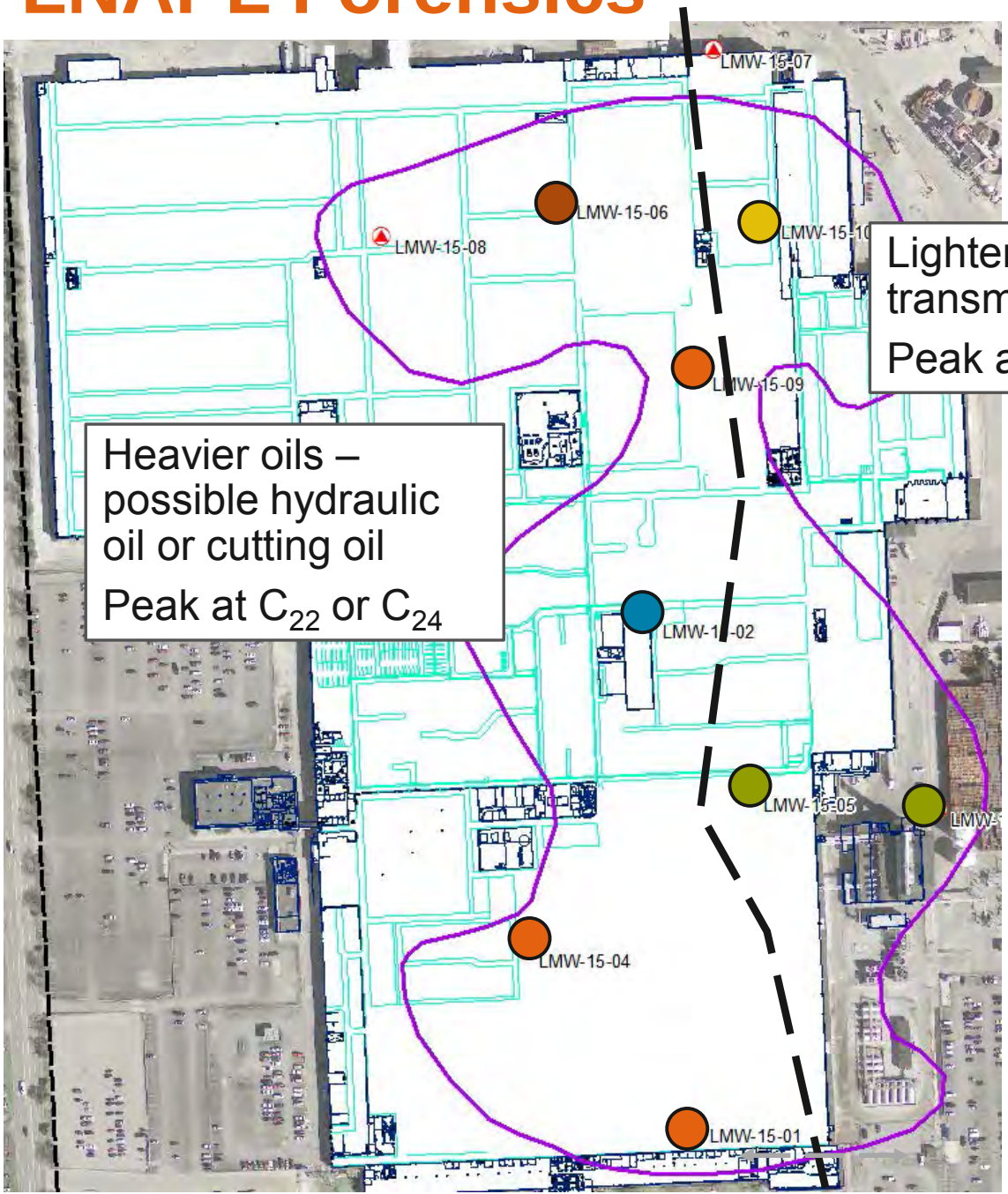


LNAPL Delineation



Link-3D Model

LNAPL Forensics



Lighter oils – possible transmission oil

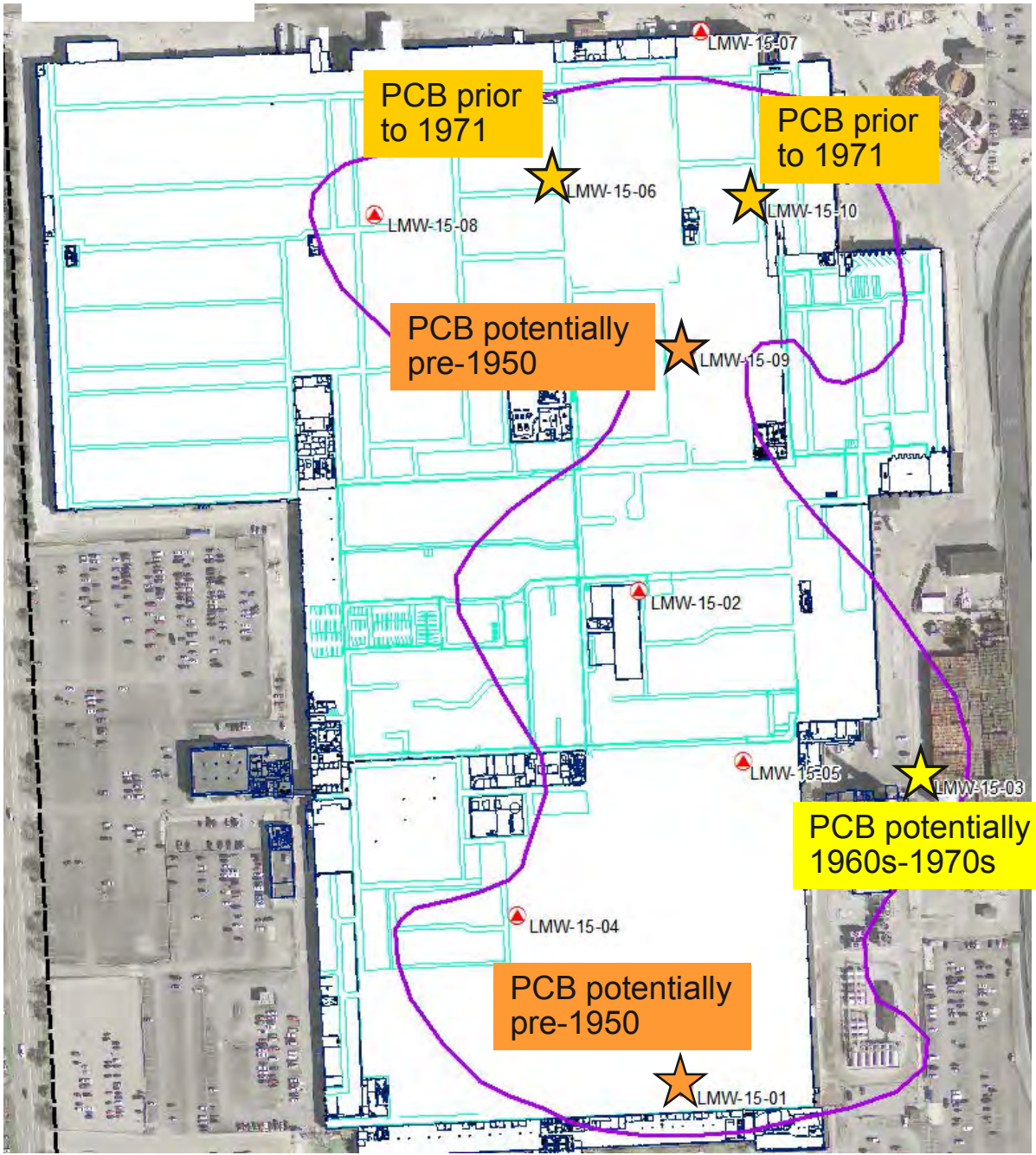
Peak at C_{18} or C_{19}

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

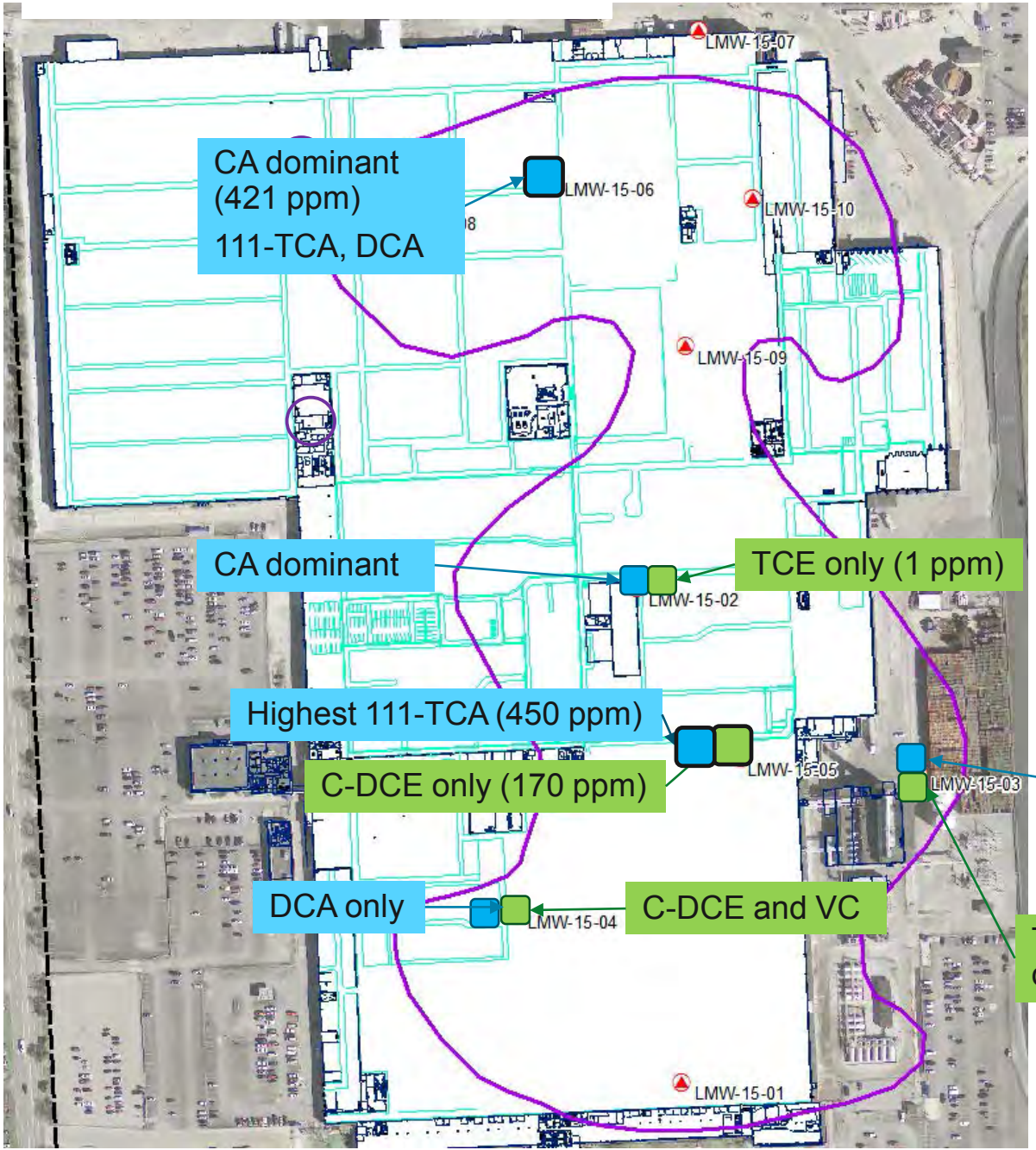
PCBs



- 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

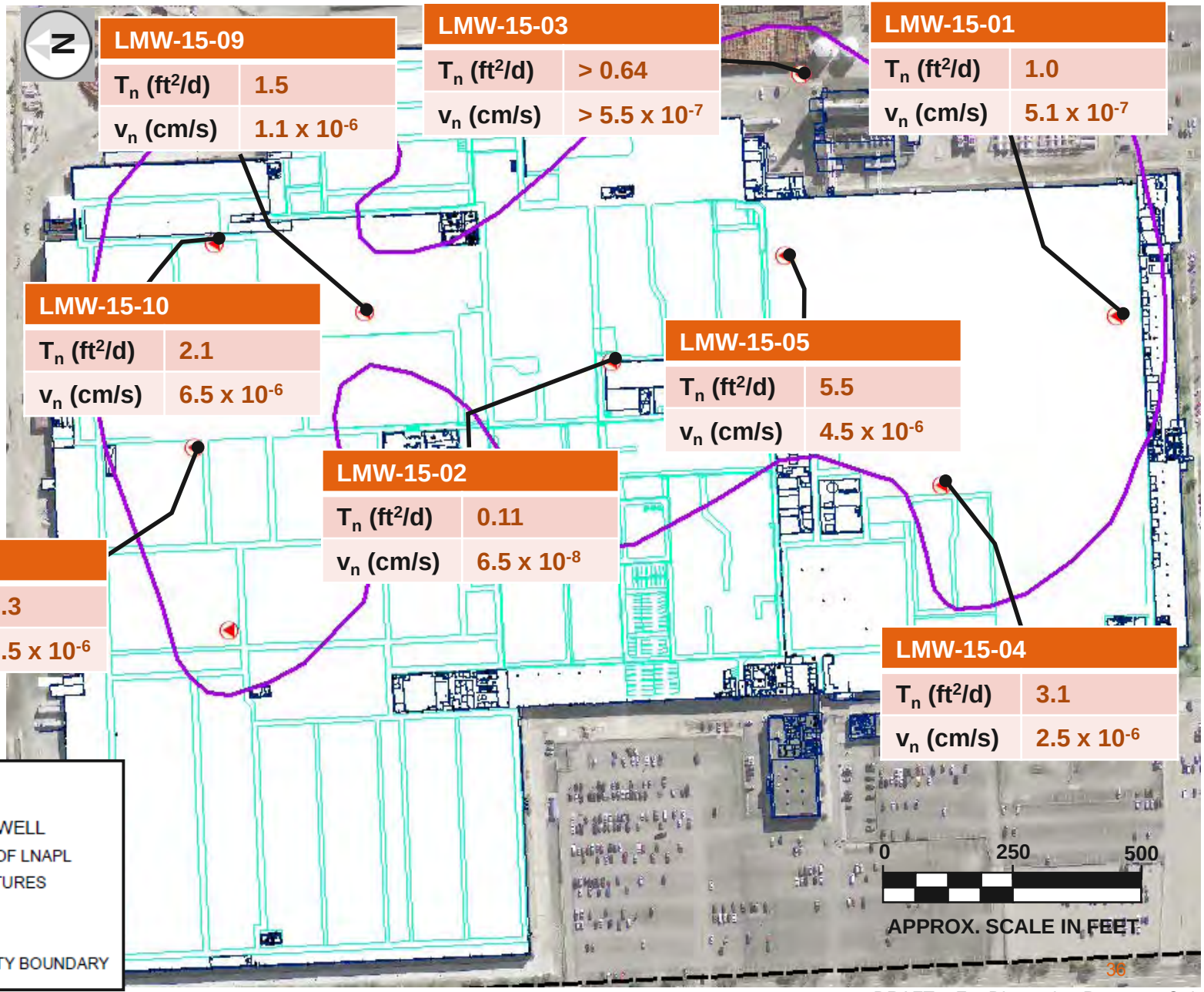
Chlorinated Ethanes

Chlorinated Ethenes

LNAPL Mobility / Transmissivity

MDEQ threshold for LNAPL recoverability:

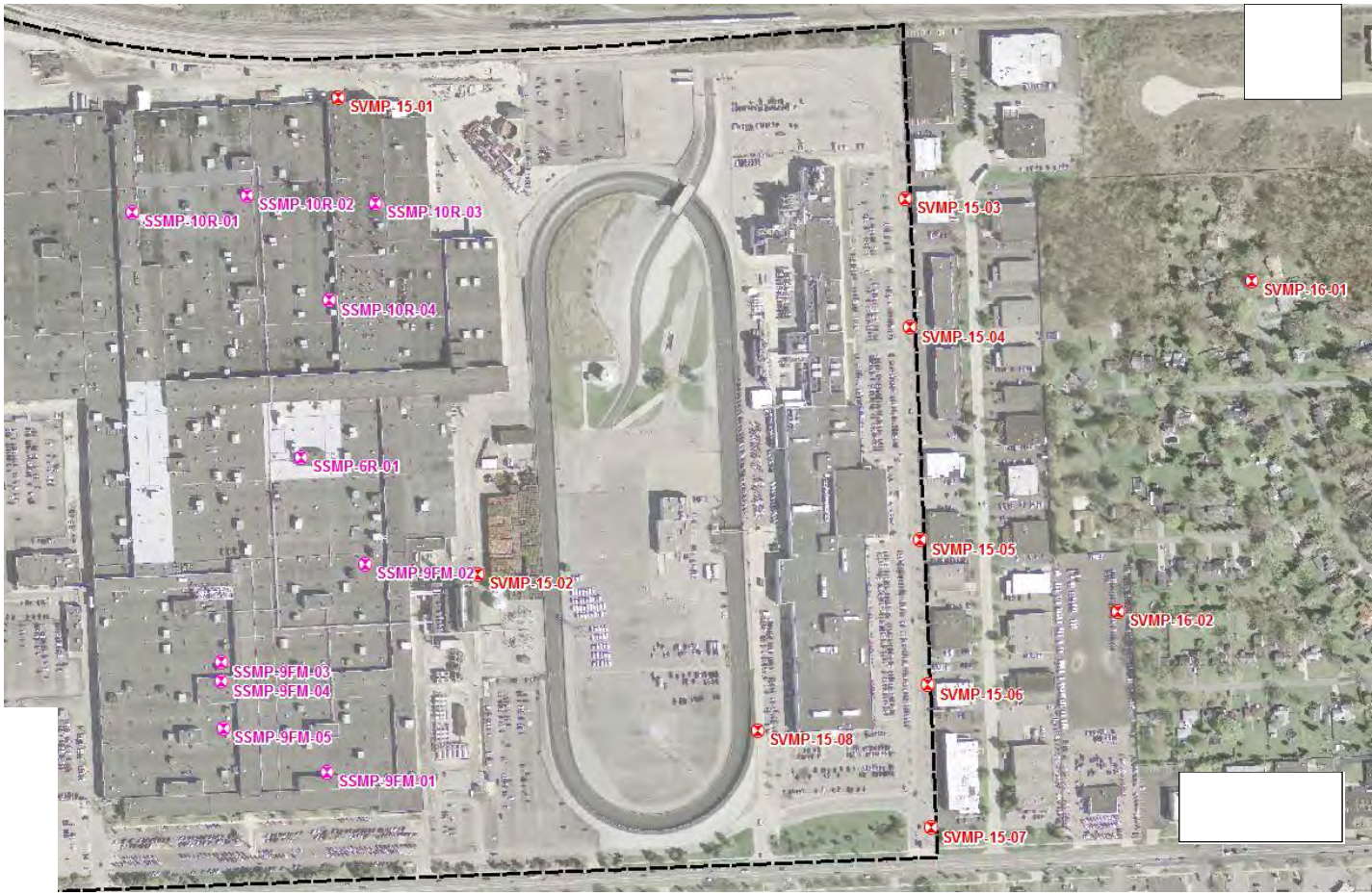
T_n > 0.5 ft^2/day



Soil Gas

Soil Vapor Sampling

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

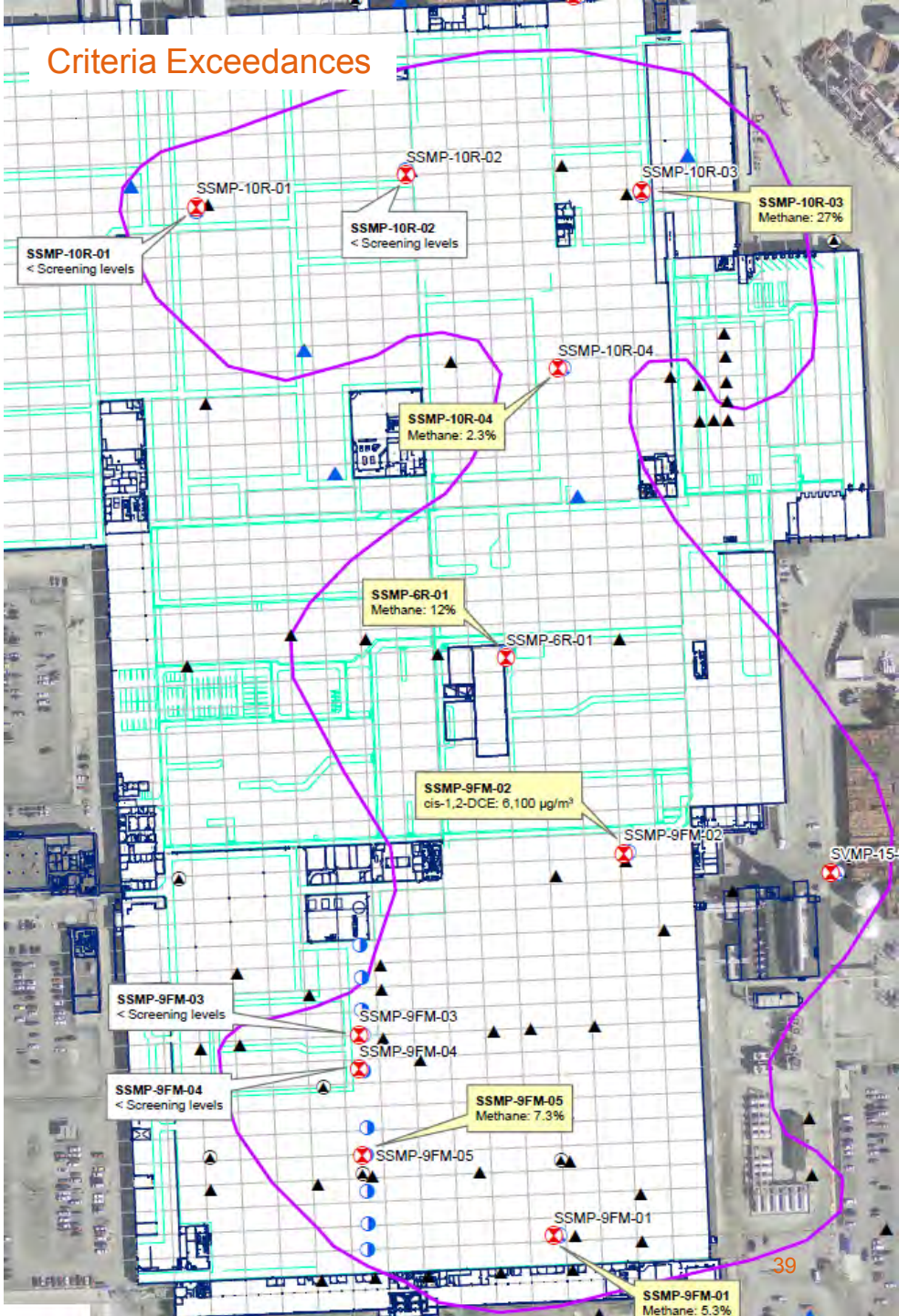


LEGEND

- 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

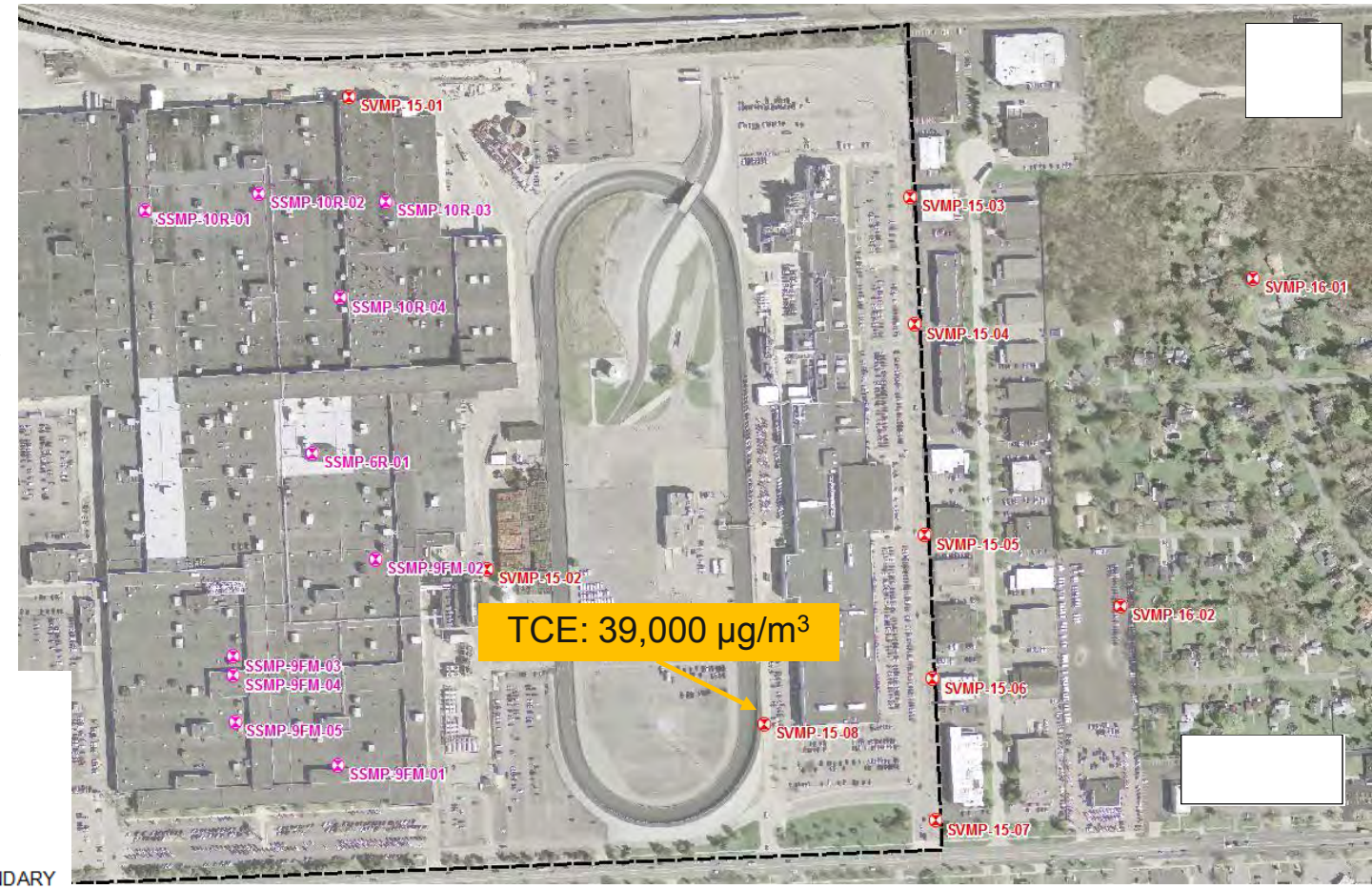
- SOIL VAPOR SAMPLING
- HPT-VAP BORING
- LIF-HP-WCSS BORING
- LNAPL MONITORING WELL BORING
- LIF-HP BORING

PREVIOUSLY INSTALLED

- MONITORING WELLS
- LIF BORING
- APPROXIMATE EXTENT OF LNAPL

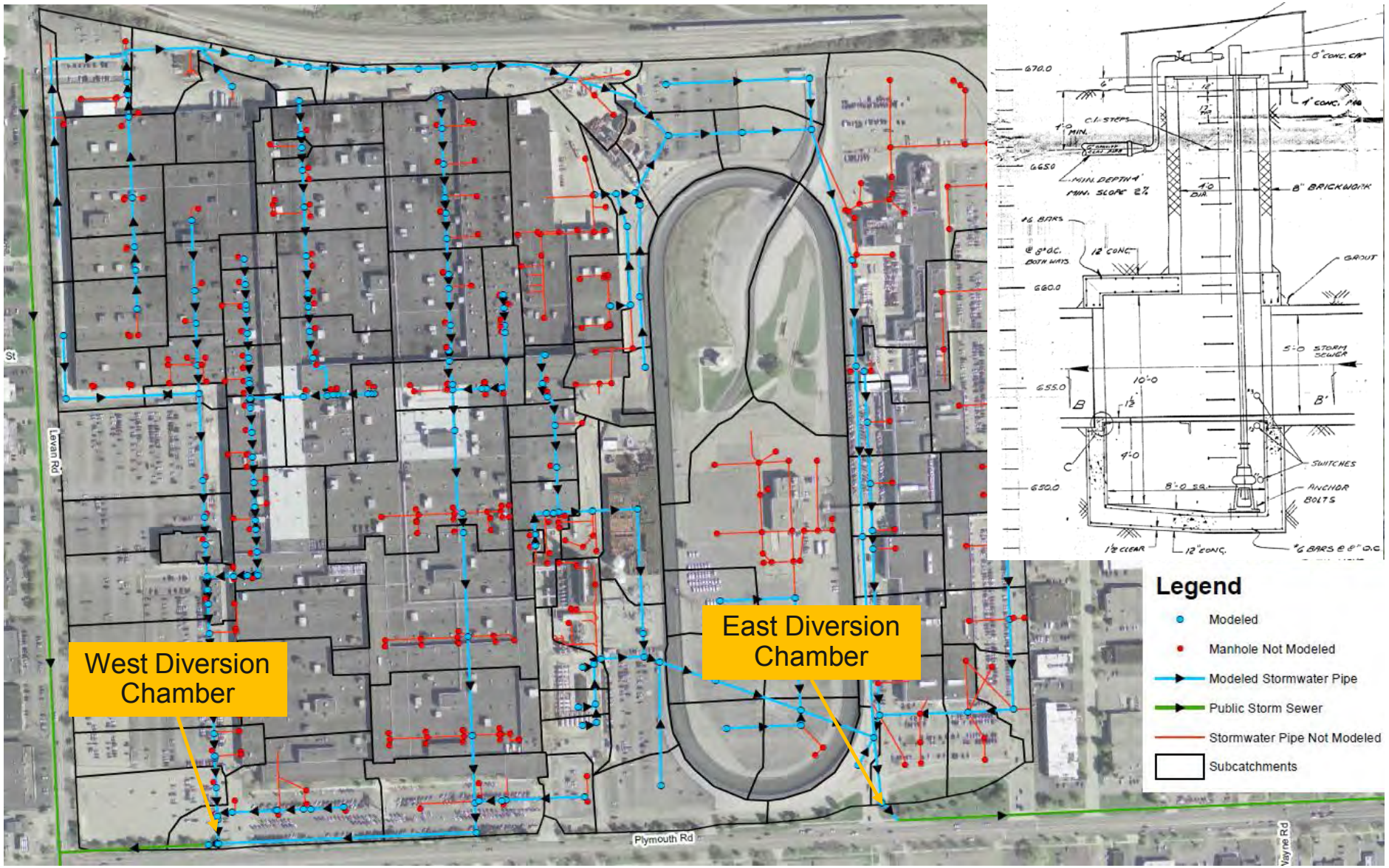
Exterior Soil Gas Exceedance

- 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



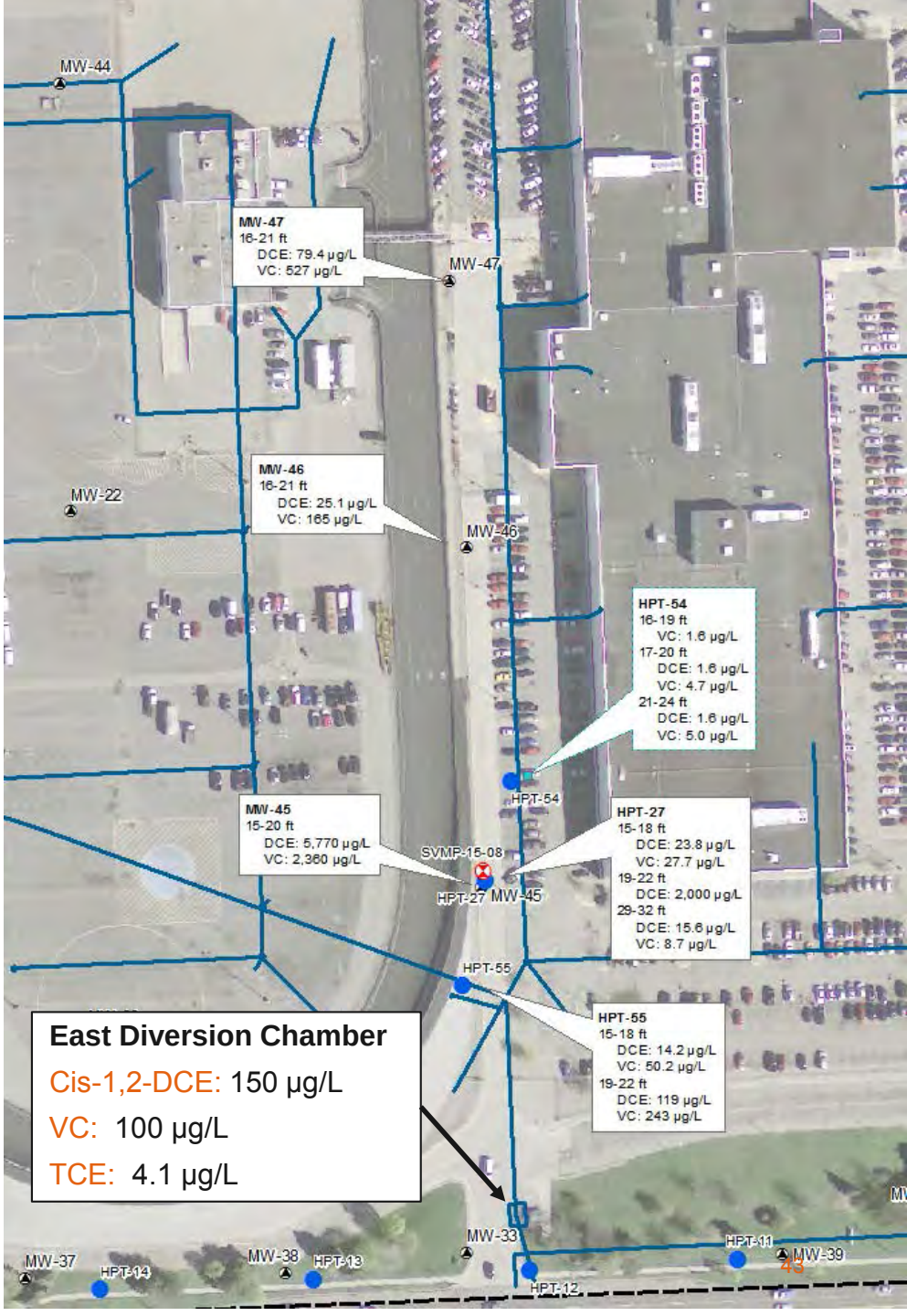
Storm Sewers

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

To:

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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.