

TRANSMITTAL LETTER



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Copies:

Date:
April 13, 2018

Subject:
**Livonia Transmission Plant
 Response Activity Plans**

Arcadis Project No.:
MI001322.0001

We are sending you hard copies:

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- Shop Drawings Plans Specifications Change Order
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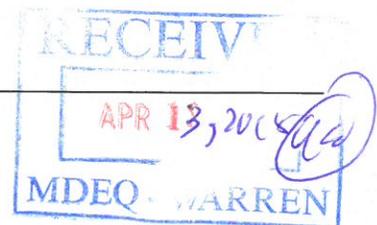
Copies	Date	Drawing No.	Rev.	Description	Action*
1	4/13/2018			Response Activity Plan – Vapor Intrusion Assessment	FA
1	4/13/2018			Response Activity Plan – Remedial Investigation	FA

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Ford Motor Company

RESPONSE ACTIVITY PLAN – VAPOR INTRUSION EVALUATION

LIVONIA TRANSMISSION PLANT

This document is a DRAFT document that has not received approval from the Michigan Department of Environmental Quality (MDEQ). This document was prepared pursuant to a court Consent Decree. The opinions, findings, and conclusions expressed are those of the authors and not those of the MDEQ.

April 13, 2018

RESPONSE ACTIVITY PLAN – VAPOR INTRUSION EVALUATION

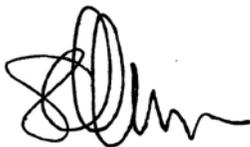
Livonia Transmission Plant Area of
Concern
Court Case: No. 2:1712372-GAD-RSW



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ACRONYMS AND ABBREVIATIONS

ATNPC	Automatic Transmission New Product Center
bgs	below ground surface
CD	Consent Decree
cDCE	cis-1,2-dichloroethen
COC	constituent of concern
CSM	conceptual site model
DCE	dichloroethene
IRA	Interim Response Activity
LTP	Livonia Transmission Plant
µg/L	microgram per liter
MDEQ	Michigan Department of Environmental Quality
ml/min	milliliters per minute
PCE	tetrachloroethene
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
RespAP	Response Activity Plan
RI	Remedial Investigation
RIASL	residential interim action screening level
SSMP	sub-slab monitoring point
SVMP	soil vapor monitoring point
TCE	trichloroethene
tDCE	trans-1,2-dichloroethene
TDL	target detection limit
TS	time sensitive
USEPA	United States Environmental Protection Agency
VAP	vertical aquifer profiling
VC	vinyl chloride
VI	vapor intrusion
VOC	volatile organic compound

1 INTRODUCTION

Arcadis of Michigan LLC (Arcadis) has prepared the following Interim Response Activities (IRA) Response Activity Plan (RespAP) on behalf of Ford Motor Company (Ford) for the Livonia Transmission Plant (LTP) site (the site). The site layout is included as **Figure 1**. This document describes the IRA activities that will be used to continue to evaluate the potential for vapor intrusion (VI) at the LTP and off-site areas in accordance with the Consent Decree (CD) effective July 27, 2017 (No: 2:1712372-GAD-RSW). This RespAP specifically satisfies section 6.6(b)(i) of the CD, which requires a RespAP to “assess VI risks to identify any unacceptable human health risks from volatilization to indoor air.”

The proposed response activities will address data gaps identified in the conceptual site model (CSM; Arcadis 2017a), address the Michigan Department of Environmental Quality's (MDEQ) comments provided in the approval letter for the CSM received on November 13, 2017, address MDEQ comments provided in the disapproval letter for the RespAP dated on March 9, 2018 and received on March 16, 2018, present items discussed with MDEQ staff during the April 5, 2018 meeting, continue to satisfy section 6.6(b)(i) of the CD, and complete other activities required for a comprehensive remedial investigation (RI) report. The proposed response activities will be completed systematically in phases to provide the appropriate data for decision making. Additional phases might be required to address data gaps that evolve with the changes in the CSM, or to collect additional information deemed vital to the RI and site remedy evaluation.

This RespAP is organized to describe on-site and off-site activities.

On-site activities will include:

- Continued evaluation of the VI pathway within the LTP, the Automatic Transmission New Product Center (ATNPC), and other on-site buildings.

Additional off-site activities include:

- Continued evaluation of potential VI pathways on residential and commercial properties
- Soil vapor monitoring to establish and evaluate spatial and temporal trends.

The constituents of concern (COCs) for the site, as defined by the CD, include:

- Trichloroethene (TCE)
- Tetrachloroethene (PCE)
- 1,1-dichloroethene (1,1-DCE)
- Cis-1,2-dichloroethene (cDCE)
- Trans-1,2-dichloroethene (tDCE)
- Vinyl chloride (VC)
- 1,4-Dioxane

The target detection limits (TDLs) for COCs in soil vapor are also defined in the CD.

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This document provides a framework for the proposed RI activities. Investigation sampling, routine monitoring, and laboratory analyses methodology to be employed during the RI are presented in two Quality Assurance Project Plans (QAPPs; Arcadis 2017b, Arcadis 2017c), prepared and submitted to the MDEQ in August 2017. QAPP addenda may be prepared and submitted to MDEQ for review and approval should an investigation method require additional description.

Schedule

The activities proposed herein will begin upon approval from the MDEQ and pending access to applicable off-site properties. The activities proposed below were discussed with the MDEQ during the April 5, 2018 meeting in Warren, MI. A schedule is provided below (in compliance with Section 6.6[c][i]), to show the approximate duration of the proposed response activities. The schedule is not linear, and various tasks may be completed in parallel. These response activities will begin upon approval of the RespAP.

Scope	Approximate Duration
Initial RespAP MDEQ Submittal	Wed 12/13/17
Initial RespAP Disapproval Comment Letter Received	Fri 3/16/18
MDEQ/Ford Review Meeting	Thu 4/5/18
Ford Response to MDEQ Disapproval Comment Letter	Fri 4/13/18
Revised VI Assessment RespAP Submitted	Fri 4/13/18
MDEQ Review of Revised VI RespAP	TBD
Public Notice of Comment Period	TBD
Public Notice of Public Meeting	TBD
Revised VI RespAP sent for Public Comment	30 days after Public Notice of Public Comment Period.
Public Meeting	June
Revised VI RespAP MDEQ Approval	June-July
Send Access Agreements to Property Owners	1 week after MDEQ notifies Ford that the revised VI RespAP is approved.
Signed Access Agreements Received From Property Owners	TBD
Sub-Slab and Indoor Air Sampling Activities - Initial Phase of Work will be conducted 2 weeks after signed access agreement is received, then weekly until completed.	Mobilize in 2 weeks, then weekly until finished if access agreements have been received.
Receive Analytical Results from Laboratory	10 business day turnaround time.
Review Sub-Slab, Indoor Air, Ambient Air, Water Sample Data	Within 5 business days of receiving lab Analytical reports.
Update and Submit Next Steps VI RespAP based on	Within 30 business days of receiving lab analytical

Scope	Approximate Duration
Data (Additional Sampling and/or Mitigation Plan) per CD 6.6bii, if necessary.	reports.

2 ON-SITE VAPOR INTRUSION INVESTIGATION OVERVIEW

The on-site RI activities completed to date have been focused on characterizing soil vapor beneath the footprint of the LTP. Initial on-site VI evaluations have successfully delineated most sub-slab impacts inside the LTP through the collection of 152 soil vapor samples. Ford has designed and is constructing a focused sub-slab depressurization system for portions of the LTP, which will become operational during the second quarter of 2018.

The focus of the RI going forward will be further delineation of vapor impacts beneath the LTP building, and evaluation of potential vapor impacts beneath the ATNPC and other on-site outbuildings.

Proposed On-site Vapor Intrusion Response Activity Plan

Additional evaluation of sub-slab soil vapor is needed in some portions of the LTP that have not been sampled, the entirety of the ATNPC, and occupied outbuildings associated with both the LTP and ATNPC. Response activities to fill these on-site VI data gaps will include installation of up to 61 sub-slab monitoring points (SSMPs) including up to 19 locations in the LTP, up to 26 locations in the ATNPC, and up to 16 locations in the outbuildings near the LTP and ATNPC. Proposed sample locations are presented on **Figures 2 and 3**. Sample point locations are subject to change based on plant approval of each location.

Proposed installation and sampling methods are consistent with those used for the original VI evaluation at LTP and are presented in the QAPP (Arcadis 2017b). Arcadis will collect sub-slab vapor samples for analysis of volatile organic compounds (VOCs) at the 61 new SSMPs installed during this response activity plus four duplicates for quality assurance/quality control (QA/QC) purposes. Carbon dioxide, oxygen, methane, and differential pressure measurements will continue from each sample point directly after each round of sample collection. Detailed sampling methods are included in the QAPP (Arcadis 2017b).

Sub-slab soil gas samples will be collected from these 61 SSMPs using sorbent tube methods and will be submitted to Eurofins Air Toxics located in Folsom, California. Samples collected from the LTP, ATNPC, and outbuildings will be analyzed for the site COCs by United States Environmental Protection Agency (USEPA) Method TO-17. USEPA Method TO-17 is proposed instead of USEPA TO-15 (which uses Summa canisters to collect sub-slab soil gas samples) due to Department of Transportation compliance issues associated with shipping methane. TO-17 laboratory detection limits are sufficiently low to provide comparison to MDEQ-provided non-residential volatilization to indoor air criteria for soil gas in non-residential slab-on-grade structures. Using sorbent tube sampling methods also provides consistency with past site data. The use of sorbent tube methods was discussed with the MDEQ during a January 22, 2018 meeting. The samples will be analyzed on a standard 10-day turnaround time.

3 OFF-SITE VI INVESTIGATION OVERVIEW

A multi-step systematic approach has been undertaken to evaluate the potential for VI in off-site locations. Data collected to date indicate a clean water lens beneath most off-site properties, and VOCs have not regularly been detected in soil vapor collected within the vadose zone. Groundwater and soil vapor are well characterized off site.

Lines of evidence used in the off-site evaluation of the VI pathway include:

- Three hundred and fifty-one groundwater samples including:
 - Two hundred and fifty vertical aquifer profiling (VAP) groundwater samples from 82 locations
 - Twenty permanent groundwater wells that have been sampled three times since installation in May 2017
- Building information in the City of Livonia Building Assessor's database
- Building information from a building owner questionnaire
- Completion of a sensitive receptor survey
- Nine temporary groundwater samples collected beneath soil vapor locations
- One hundred and thirty-one soil vapor samples including:
 - Installation of 43 permanent soil vapor sample points, which have been sampled three times since installation in June 2017 (June 8 through 19, September 18 through 21, and November 17 through 21, 2017).

These lines of evidence show: (1) the presence of a clean water lens beneath most off-site properties (**Figure 4**); (2) a lack of VOC detections in soil vapor within the vadose zone, even overlying impacted water (**Figure 5** through **8**); and (3) a lack of VOCs in groundwater beneath buildings with sumps or basements (**Figure 9** and **10**).

In late 2016, Ford began evaluating the VI pathway at properties within a 100-foot inclusion distance of the 2013 MDEQ screening value for VC of 2 micrograms per litre ($\mu\text{g/L}$; Arcadis 2017a). The investigation footprint has since been expanded to include all properties within 100 feet of groundwater where VC is present at concentrations above the MDEQ TDL for VC of 1 $\mu\text{g/L}$ at any depth. As presented on **Figure 11**, 48 commercial and 69 residential properties are located within this area. Additional properties may be added to the evaluation as needed, based on the results of site-specific evaluations conducted off site.

Proposed Off-site Vapor Intrusion Response Activity Plan

Additional site-specific VI activities are proposed to further evaluate the VI pathway at each potentially affected property per CD section 6.6(b)(i). Proposed activities are designed to build upon the groundwater and soil vapor investigations completed to date through the collection of building-specific samples as suggested in the 2013 MDEQ VI Guidance. This building-specific data collection will allow for decision making regarding the need for additional actions at each property and includes:

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- Gaining access to off-site properties via formal access agreements
- Collecting and evaluating building-specific property information
- Field verifying building details for all evaluated properties
- Completing building surveys to document chemical usage in each building
- Collecting building-specific samples including both sub-slab soil vapor and indoor air
- Continuing evaluation of groundwater quality and the potential presence or absence of a clean water lens.

Each of these response activities is discussed in the sections below.

Access Agreements

To enable additional site-specific data collection, formal access agreements will be prepared for all properties included in the off-site VI evaluation (**Figure 11**). Access agreements will be delivered to each property via certified mail. When signed access agreements are returned, additional work on these private properties will be scheduled. At properties where an access agreement is not returned within 2 weeks, Arcadis staff will hand-deliver another copy. MDEQ will be notified of properties that have not returned a signed access agreement, and Ford will take judicial action to gain access within 60 days of MDEQ approval of the RespAP in accordance with Section 7.2 of the CD. Ford proposes to initiate sampling as soon as possible following receipt of a signed access agreement at each property via coordination with each property owner. Ford will notify the MDEQ at least 10 days before any sampling activities conducted in the area of concern as described within Section 8.2 of the CD. Building evaluation and sampling at each property will take up to 5 days to complete.

Verification and Collection of Additional Building Information

The City of Livonia's online tax assessor database

(<https://www.ci.livonia.mi.us/departments/assessorsoffice/onlinepropertyinquiry.aspx>) has been used and will continue to be used for the collection of building construction information for each property.

Information generally available in the tax assessor database includes:

- Year built
- Lot size
- Dwelling square footage
- Foundation size
- Number of stories
- Details on garages and outbuildings
- Heating and cooling systems
- Building construction technique (i.e., slab-on-grade, basement, crawl space, combination)

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- Size of basement or crawl space
- Photos
- Sketches.

Additionally, Ford has sent, and will continue to send, letters to property owners requesting completion and return of a building construction survey specific to their property. In December 2016, Ford sent out an initial set of letters, and on March 1, 2017, Arcadis went door-to-door to deliver surveys to property owners who had not responded to the originally delivered surveys. To date, 23 residential surveys and ten commercial surveys were received back by Ford and evaluated.

To enable decision making, the information on each property will be verified via on-site interviews with each property owner. Sketches of building construction will be prepared documenting the lowest level of each building, the presence of sumps and other sub-grade penetrations, and the condition of the floor slab (if present). Where discrepancies are noted between the initial City of Livonia assessor's database and returned building construction surveys (four residential properties), these discrepancies will be implicitly evaluated during site visits.

If access agreements cannot be achieved initially, visual inspections will be completed from the City of Livonia right-of-way to help determine building construction by evaluating the presence of things like basement windows and elevated porches.

Additionally, an MDEQ Indoor Air Building Survey and Sampling Form (MDEQ VI Guidance 2013 Appendix F.4) will be prepared for each property to document site conditions when site visits are conducted.

Collection of Building-Specific Samples

Building-specific samples will be collected to evaluate conditions both below and within each off-site property included in the VI evaluation. Samples will be collected to allow data-driven decision making regarding the need for additional actions at each property considering all available lines of evidence. The process for building-specific sampling outlined here is aligned with the process outlined in the 2013 MDEQ VI Guidance. Sub-slab soil vapor and indoor air samples will be collected from each property located within 100 feet of VC impacts over the MDEQ TDL (**Figure 11**) following methods presented in the 2013 MDEQ VI Guidance. Ambient air samples (outside air) will be collected concurrent with all indoor air samples to build an understanding of background conditions. The general scope of work for building-specific sampling is provided below; detailed sampling methods are included in the QAPP (Arcadis 2017b). Permanent vapor pin sample points will be installed to allow for up to four sampling events as required to adequately address potential seasonal and temporal variability per Table 4-1 of the 2013 MDEQ VI Guidance. Additionally, water will be collected and sampled from any sumps present, and crawl space indoor air will be collected and sampled from crawl spaces encountered during the building-specific sampling.

Before any sub-slab sampling, Geoprobe® sounding will be installed to assess site-specific depth to groundwater relative to each structure. If conditions are such that groundwater may be in contact with the subsurface structure (i.e., floor slab, support footing, or sump), a temporary monitoring well will be installed to enable water table groundwater quality sampling.

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Additional details for building-specific sampling are provided below.

Commercial Properties

- Sub-slab and indoor air samples will be collected from the lowest level of each building (i.e., basement or first floor) with appropriate sample density selected based on Table 5-2 of the 2013 MDEQ VI Guidance following methods in Appendix F.7 of the 2013 MDEQ VI Guidance.
- Indoor air samples will be collected over a 10-hour period representative of a workday. Indoor air samples will be collected from the lowest habitable level of each building following Section 5.5 and Appendix F.4 of the 2013 MDEQ VI Guidance.
- Outdoor/ambient air samples representative of each building or group of neighboring buildings will be collected concurrent with indoor air samples following Appendix F.4 of the 2013 MDEQ VI Guidance.
- If encountered, indoor air from crawl spaces will be sampled consistent with Appendix F.4 of the 2013 MDEQ VI Guidance.
- If encountered, water from sumps will be collected and sampled.
- All sub-slab and indoor air samples will be analyzed for the site COCs by USEPA Method TO-15.
- Water samples will be analyzed using 8260B and USEPA 8260B-SIM (for 1,4-dioxane).
- Data will be compared to commercial screening values generated by MDEQ for the site.

Residential Properties

- Per Section 5.3 of the 2013 MDEQ VI Guidance, at least two sub-slab soil vapor samples will be collected from each residence regardless of the building size. In general, one sample will be collected from beneath the center of the structure, and the second from between the center of the structure and the wall nearest the source. It is understood that the sample locations may need to be adjusted to accommodate the actual site conditions, building layout, and property owner preference. Samples will be collected in accordance with the methods presented in Appendix F.7 of the 2013 MDEQ VI Guidance.
- Indoor air samples will be collected from the lowest habitable level of each residence at a rate of one sample per 1,000 square feet as suggested in the 2013 MDEQ VI Guidance.
- Indoor air samples will be collected over a 24-hour period representative of a resident from approximate breathing height. Samples will be collected in accordance with the methods presented in Appendix F.4 of the 2013 MDEQ VI Guidance.
- If encountered, indoor air from crawl spaces will be sampled consistent with Appendix F.4 of the 2013 MDEQ VI Guidance.
- Outdoor/ambient air samples representative of each building or group of neighboring buildings will be collected concurrent with indoor air samples following Appendix F.4 of the 2013 MDEQ VI Guidance.
- If encountered, water from sumps will be collected and sampled.
- Water samples will be analyzed using 8260B and USEPA 8260B-SIM (for 1,4-dioxane).

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- All sub-slab and indoor air samples will be analyzed for the site COCs via USEPA Method TO-15.
- Data will be compared to residential screening values generated by MDEQ for the site.

If sub-slab sampling cannot be completed due to the presence of water immediately beneath the floor slab, all other available lines of evidence will be relied upon to evaluate the potential for VI. Potential lines of evidence for use include the following:

- Collection of nearby groundwater samples from existing monitoring wells or temporary wells
- Collection of water analytical results if a sump is present
- Indoor air sampling
- The results of sub-slab soil gas samples collected at neighboring properties.

Results of the indoor air, ambient air, sub-slab soil vapor, groundwater, and sump sampling will be included in the RI, and a further path forward will be discussed with the MDEQ. If samples cannot be collected from any proposed location, these properties will be discussed with the MDEQ. Should an exceedance of the time sensitive (TS) residential interim action screening levels (RIASLs) be found in sub-slab soil gas or indoor air, Ford will consult with the MDEQ immediately on the appropriate course of action. Off-site data evaluation will continue considering multiple lines of evidence to determine the potential for VI at each property. Data will be presented for each specific property to allow review by all stakeholders.

All activities described above are proposed to identify unacceptable health risks from volatilization to indoor air to satisfy section 6.6 (b)(i) of the CD. If mitigation is necessary, a separate RespAP will be submitted to the MDEQ per section 6.6 (b)(ii) of the CD.

The vacant off-site parcels will be evaluated using site-specific groundwater and soil gas sampling per section 3.4.6 of the MDEQ VI Guidance.

4 ROUTINE SOIL VAPOR MONITORING OVERVIEW

Arcadis collected initial off-site soil vapor samples in June 2017 and will continue to collect soil vapor samples quarterly from all exterior soil vapor monitoring point (SVMP) locations using 1-liter Summa canisters per the QAPP (Arcadis 2017b). SVMP locations are presented on **Figure 12**. The locations and depths of samples were selected using professional judgment to best characterize the conditions at the site and include multiple depth horizons. These ideas were presented to MDEQ during a September 7, 2016 meeting and an April 20, 2017 work plan. While the 2013 MDEQ VI Guidance provides some information on soil gas sampling depth and methods, this document is strictly guidance and is not promulgated (i.e., law). In some off-site areas, the water table is shallow, and placing all samples at 5 feet below ground with at least a 2-foot separation from groundwater is not possible. Out of the 43 soil vapor monitoring points installed, 24 sample screens are at 4 feet below ground surface (bgs) or deeper (seven samples at 5 feet or deeper) and 19 locations are less than 4 feet bgs. Several technical items were employed to ensure that representative soil gas samples were collected as described below. Based on the results of the sampling, and due to the implementation of the measures described below, Ford believes that the results are representative and provide an accurate interpretation of off-site soil vapor

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conditions. These quality control items will continue during additional rounds of monitoring to ensure high data quality.

- Tracer gas testing has been conducted during the three rounds of soil gas sampling using a helium tracer at each location before sampling. Methods for tracer testing were the same as those presented in MDEQ VI Guidance Appendix F and in line with industry-accepted standards. As discussed in the MDEQ VI Guidance, a tracer gas can be used to verify that soil gas samples are from the installed point and not from leaks in the sampling train. No unacceptable helium leak test results were noted during the three rounds of soil gas sample collection to date. Samples were deemed acceptable, as all exhibited concentrations of helium in purged soil gas less than 10% of the initial shroud concentration of helium, as presented in the MDEQ VI Guidance. Helium tracer testing results from the three rounds of soil gas sampling are included in **Table 1**.
- Very small screened intervals (1-inch screen within a 3-inch sand pack) were installed to allow for a thicker bentonite seal to the ground surface at each location.
- Soil gas sampling has been conducted very slowly (i.e., 20-minute sample using a 1-liter canister) to avoid short-circuiting. This flow rate is four times slower than the maximum 200 milliliters per minute (ml/min) included in the 2013 MDEQ VI Guidance. MDEQ suggests that samples be collected at or below 200 ml/min “to minimize the potential for vacuum extraction of contaminants from the soil phase.”
- Carbon dioxide and oxygen have been measured from each sample point directly after each round of sample collection. Concentrations of oxygen are slightly depressed from atmospheric conditions (i.e., 1 to 2% below atmospheric), while concentrations of carbon dioxide are slightly elevated (i.e., 3 to 6%). This is as expected due to the influence of microbial respiration in the vadose zone, which consumes oxygen and produces carbon dioxide (USEPA 2015). Carbon dioxide and oxygen concentrations from exterior soil gas samples are presented in **Table 2**.

Proposed Routine Soil Vapor Sampling Response Activities

Soil vapor samples were and will continue to be submitted under chain-of-custody protocol to Eurofins Air Toxics (Eurofins) laboratory located in Folsom, California for analysis of the site COCs via USEPA Method TO-15. Before sampling, a helium leak test and shut-in test will be conducted to ensure no leakage in the sample points or sample train. Sample collection will continue slowly (i.e., over a period of 20 minutes) to ensure that a minimal amount of vacuum is placed on the formation, preventing leakage with ambient air. Carbon dioxide and oxygen measurements will continue from each sample point directly after each round of sample collection.

SVMP locations are presented on **Figure 12**, and construction details are presented in **Table 3**. The nine residential SVMP locations (SVMP-29 S/D, SVMP-30 to SVMP-31, SVMP-32 S/D, and SVMP-33 through SVMP-37) were not sampled in the third quarter of 2017; Ford will request access and attempt to sample these locations moving forward. SVMP-11 has been abandoned per the adjacent property owner’s request; this point will not be sampled. SVMPs will be sampled quarterly for each of the seven COCs identified in the CD. Sample results will be compared to Site-Specific Screening Levels for the COCs provided by the MDEQ.

5 REPORTING

Arcadis will communicate progress on activities detailed within the RespAP within the quarterly progress reports as required in the CD. The information provided in those reports will summarize activities and will not provide detailed data and lab reports. Detailed information will be provided in subsequent RI reports. Pursuant to section 6.6(b)(ii) of the CD, an additional Response Activity Plan will be submitted to MDEQ presenting a plan to mitigate risks found during this VI evaluation should it be necessary. This additional document will be submitted within 30 days of completion of the VI evaluation.

6 CLOSING

The goal of the RespAP outlined above is to document how Ford Motor Company will continue to evaluate conditions both on site and off site. This RespAP specifically satisfies section 6.6(b)(i) of the CD, which requires a RespAP to “assess VI risks to identify any unacceptable human health risks from volatilization to indoor air.” The activities described in this RespAP will help address data gaps identified in the CSM (Arcadis 2017a), address MDEQ comments to the CSM, address the comments included in the disapproval of the RespAP, and complete other activities that will be required for a comprehensive RI report in accordance with the CD. The work will be completed in phases to provide the appropriate data for decision making in accordance with the RI schedule contained herein and the CD. If an exceedance of the TS RIASLs is found in sub-slab soil gas or indoor air, Ford will consult with the MDEQ immediately on the appropriate course of action. Quarterly progress and RI report(s) will be submitted to MDEQ throughout the RI process.

7 REFERENCES

- Arcadis of Michigan LLC (Arcadis). 2017a. Conceptual Site Model. Livonia Transmission Plant. August.
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- Michigan Department of Environmental Quality (MDEQ). 2013. Guidance Document for the Vapor Intrusion Pathway. Remediation and Redevelopment Division. May.
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FIGURES



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CITY: Novi DIV: ENV DB: MG PIC: R. ELLIS PM: K. HINSKEY PROJECT NUMBER: M1001322.0001 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Z:\GISProjects\ENV\Novi\Brighton_MNFordLivoniaGISdocs\2017-12\RAP_RIP\figures_20171206\Investigation_Area_20171206.mxd PLOTTED: 12/6/2017 2:58:51 PM BY: mgrs



ON-SITE AREA

OFF-SITE AREA

LIVONIA TRANSMISSION PLANT

TEST TRACK

ATNPC BUILDING



LEGEND

- AREA OF CONCERN
- FORD PROPERTY BOUNDARY
- COMMERCIAL/RESIDENTIAL PROPERTY BOUNDARY

NOTES:
ATNPC - AUTOMATIC TRANSMISSION NEW PRODUCT CENTER

FORD MOTOR COMPANY
LIVONIA TRANSMISSION PLANT
LIVONIA, MICHIGAN

INVESTIGATION AREAS

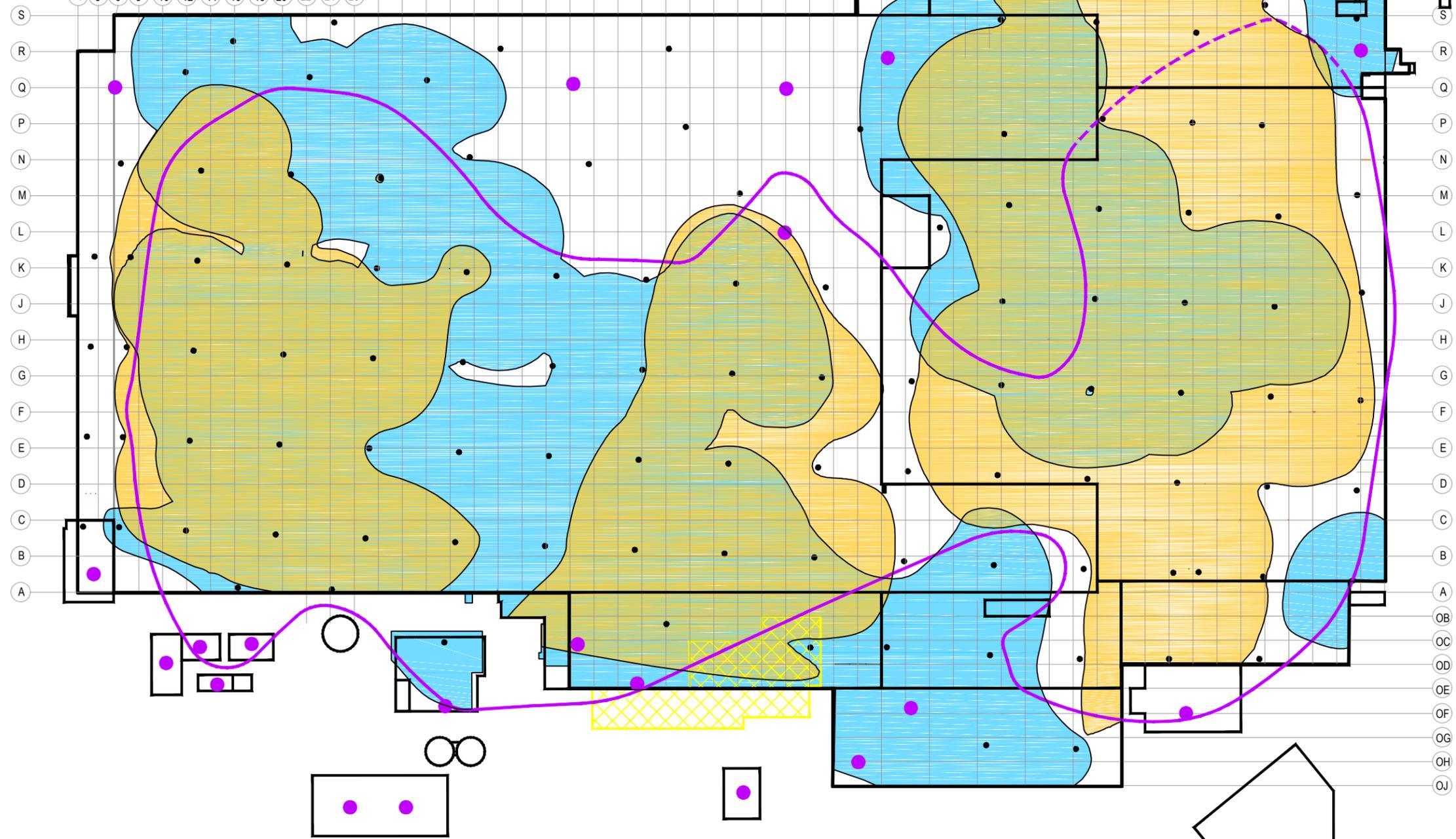
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CITY:\Redd\DIV\GROUP\Redd\DR\Redd\LD\Opt\ PIC: RELLIS PM: K HINSKEY TM: ADEGRANDIS LVR:OPION*OFF=REF C:\Users\BSS\OneDrive - ARCADIS\BIM 360 Docs\FORD MOTOR COMPANY\Ford LTP Methana Mitigation P\2017\MI001322.0001\01-DWG\LTP-Subslab-Fig8.dwg LAYOUT: 8 SAVED: 12/8/2017 4:45 PM ACADYER: 2015 (LMS TECH) PAGES SETUP: --- PLOTSTYLETABLE: ARCADIS NOVI\CTB PLOTTED: 12/8/2017 4:46 PM BY: SMALL, BRIAN

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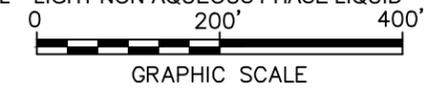


LEGEND:

- VAPOR POINTS
- METHANE CONCENTRATION ABOVE SCREENING LEVEL OF 1.25%
- VAPOR BARRIER
- APPROXIMATE LNAPL EXTENT (DASHED WHERE INFERRED)
- VOC CONCENTRATION ABOVE MDEQ VAPOR INTRUSION GUIDANCE SCREENING LEVEL FOR SHALLOW SOIL GAS, MAY 2013 (RESCINDED JUNE 2017)
- PROPOSED SUB-SLAB DELINEATION POINT

NOTES:

1. ALL METHANE CONCENTRATIONS ARE IN UNITS OF % AIR.
2. METHANE CONCENTRATIONS FIELD SCREENED USING GEM 2000 IN JULY 2016.
3. INITIAL METHANE CONCENTRATIONS BELOW THE SCREENING LEVEL WERE FIELD VERIFIED USING A GEM 2000 IN DECEMBER, 2016. THE HIGHEST CONCENTRATION IS REPORTED.
4. TCVOC = TOTAL CHLORINATED VOC (cis-DCE, TCE AND VINYL CHLORIDE). ANY EXCEEDANCE RESULTS IN SUM OF ALL DETECTIONS.
5. R-38-17 RESULTS EXCEED XYLENE SCREENING LEVELS, BUT ONLY TCVOC PRESENTED.
6. VOC = VOLATILE ORGANIC COMPOUND
7. MDEQ = MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
8. LNAPL = LIGHT NON-AQUEOUS PHASE LIQUID

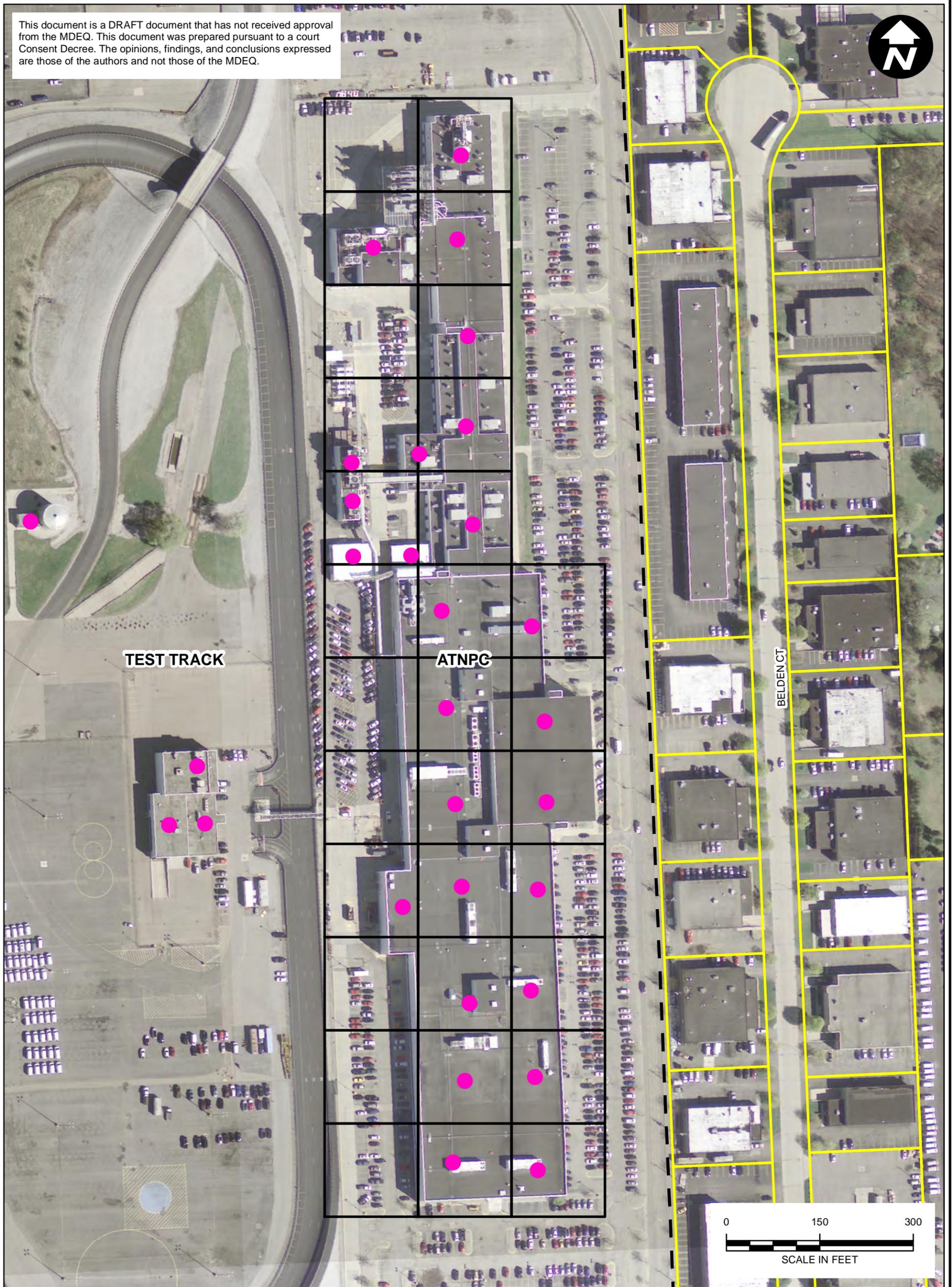


FORD MOTOR COMPANY
LIVONIA TRANSMISSION PLANT
LIVONIA, MICHIGAN

**SUB-SLAB VAPOR SAMPLING
LOCATIONS - LTP**



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LEGEND:

- PROPOSED SUB-SLAB MONITORING POINT LOCATION
- 150 FT GRID FOR ATNPC
- FORD PROPERTY BOUNDARY
- PROPERTY BOUNDARY

NOTES:

ATNPC - AUTOMATIC TRANSMISSION NEW PRODUCT CENTER

FORD MOTOR COMPANY
 LIVONIA TRANSMISSION PLANT
 LIVONIA, MICHIGAN

SUB-SLAB VAPOR SAMPLING LOCATIONS - TEST TRACK AND ATNPC



CITY: Novi; DIV: ENV; DB: MG; PIC: R. ELLIS; PM: K. HINSKEY; PROJECT NUMBER: M1001322.0001; COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet; Z:\GIS\Projects\ENV\Novi\Brighton_MilFord\Livingston\GISdocs\2018-04\Clean_Water_Thickness_20180405.mxd; PLOTTED: 4/5/2018 2:23:42 PM; BY: mgress



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LEGEND

VINYL CHLORIDE - GROUNDWATER

- ND - 2 µg/L
- 2 - 100 µg/L

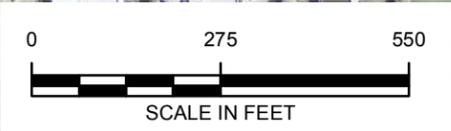
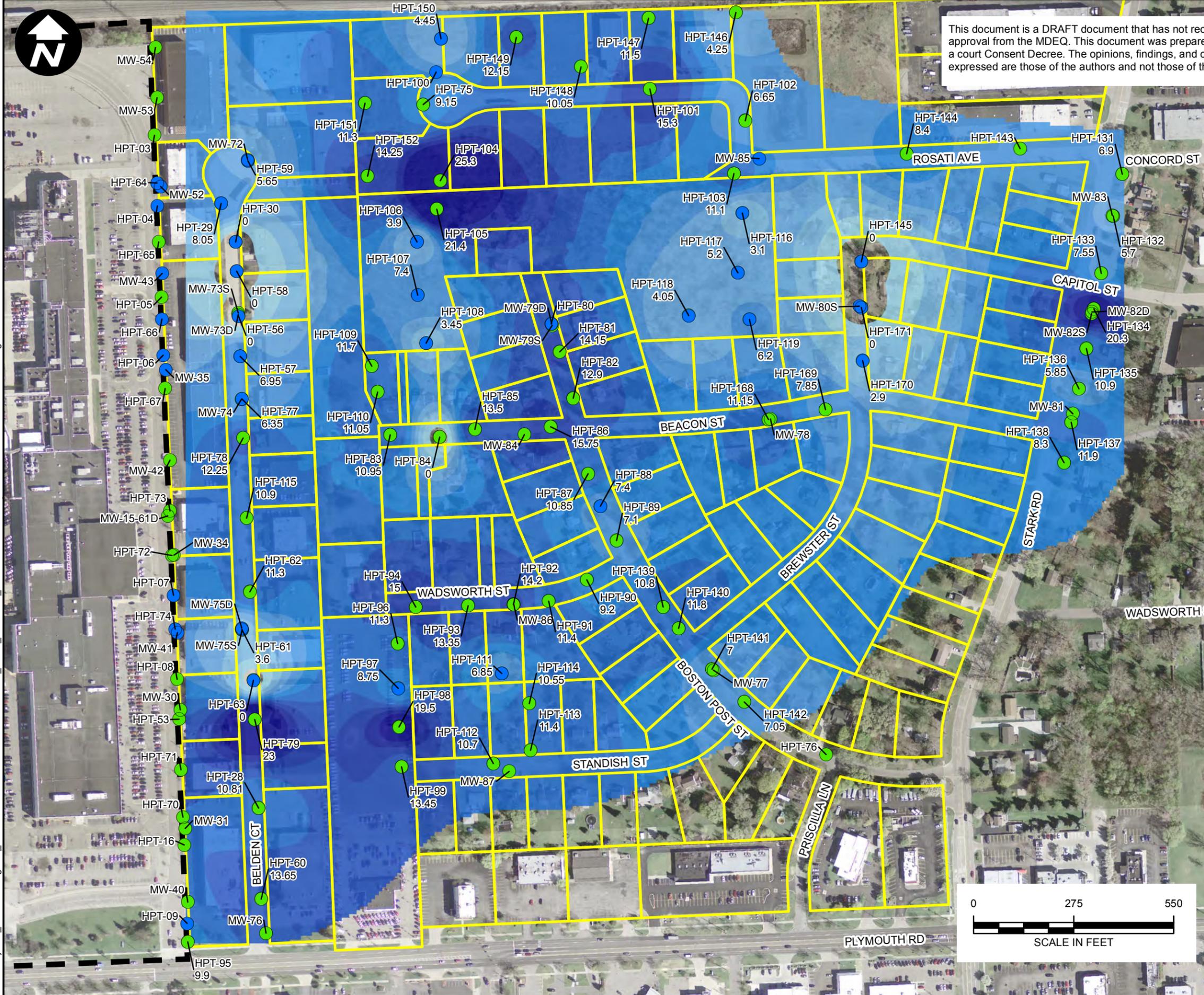
CLEAN WATER THICKNESS IN FEET

- > 18.0
- 16.1 - 18.0
- 14.1 - 16.0
- 12.1 - 14.0
- 10.1 - 12.0
- 8.1 - 10.0
- 6.1 - 8.0
- 4.1 - 6.0
- 2.1 - 4.0
- 0.5 - 2.0
- 0.0 - 0.4

PROPERTY BOUNDARY

FORD PROPERTY BOUNDARY

NOTES:
 MAP LABELS INDICATE CLEAN WATER THICKNESS IN FEET BELOW GROUND SURFACE.
 HPT - HYDRAULIC PROFILING TOOL
 MW - MONITORING WELL
 µg/L - MICROGRAMS PER LITER (PARTS PER BILLION)
 THE RESIDENTIAL DRINKING WATER CRITERIA FOR VINYL CHLORIDE 2.0 µg/L.
 THE SITE-SPECIFIC VAPOR INTRUSION SCREENING VALUE FOR THE SITE IS BELOW THE TARGET DETECTION LIMIT FOR VINYL CHLORIDE. A TARGET DETECTION LIMIT OF 1 µg/L HAS BEEN USED FOR SCREENING.
 THE GROUNDWATER-SURFACE WATER INTERFACE CRITERIA FOR VINYL CHLORIDE IS 13 µg/L.
 DATA COLLECTED DURING FEBRUARY, MAY, AND JULY 2016 SAMPLING EVENTS.



FORD MOTOR COMPANY
 LIVONIA TRANSMISSION PLANT
 LIVONIA, MICHIGAN

OFF-SITE CLEAN WATER THICKNESS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 4

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LEGEND

- PROPERTY BOUNDARIES
- FORD PROPERTY BOUNDARY
- OFF-SITE SVMP
CIS-1,2-DICHLOROETHENE < 280 µg/m³
- OFF-SITE SVMP NOT SAMPLED
FOR CIS-1,2-DICHLOROETHENE

NOTES:

µg/m³ - MICROGRAMS PER CUBIC METER

THE MDEQ PROVIDED RESIDENTIAL VOLATILIZATION TO INDOOR AIR SOIL VAPOR SCREENING LEVEL FOR CIS-1,2-DICHLOROETHENE IS 280 µg/m³

THE MDEQ PROVIDED COMMERCIAL VOLATILIZATION TO INDOOR AIR SOIL VAPOR SCREENING LEVEL FOR CIS-1,2-DICHLOROETHENE IS 410 µg/m³

MDEQ = MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

FT = FEET BELOW GROUND SURFACE

ND = NON-DETECT INDICATES VALUE IS BELOW THE LABORATORY REPORTING LIMIT, RANGING FROM 4.0 TO 5.2 µg/m³, FOR CIS-1,2-DICHLOROETHENE

SVMP = SOIL VAPOR MONITORING POINT

RESULTS COLLECTED DURING SEPTEMBER AND NOVEMBER 2017 SAMPLING EVENTS.

SVMP-29 THROUGH 37 WERE NOT SAMPLED DURING THE SEPTEMBER OR NOVEMBER 2017 SAMPLING EVENTS.

SVMP-17 AND SVMP-20 WERE NOT SAMPLED DURING THE NOVEMBER 2017 EVENT DUE TO THE SCREEN BEING SUBMERGED IN GROUNDWATER.

SVMP-11, WHICH RESIDED IN THE CITY OF LIVONIA RIGHT-OF-WAY, WAS REMOVED PER THE ADJACENT PROPERTY OWNERS REQUEST.



FORD MOTOR COMPANY
LIVONIA TRANSMISSION PLANT
LIVONIA, MICHIGAN

**OFF-SITE VAPOR INTRUSION ASSESSMENT
CIS-1,2-DICHLOROETHENE IN SOIL VAPOR**

CITY: NOVI DIV: ENV DB: MG PIC: R. ELLIS PM: K. HINSKEY TM: A. DEGRANDIS TR: P. CURRY PROJECT NUMBER: M001322.0001 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Z:\GIS\Projects\ENV\NoviBrighton_MinFordLivonia\GIS\docs\2018-01\Progress_Report_4Q2017\CIS_Offsite_SVMP_20180110.mxd PLOTTED: 1/19/2018 1:32:58 PM BY: mgress



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LEGEND

- PROPERTY BOUNDARIES
- FORD PROPERTY BOUNDARY
- OFF-SITE SVMP
TETRACHLOROETHENE < 1,400 µg/m³
- OFF-SITE SVMP NOT SAMPLED
FOR TETRACHLOROETHENE

NOTES:

µg/m³ - MICROGRAMS PER CUBIC METER

THE MDEQ PROVIDED VOLATILIZATION TO INDOOR AIR SOIL VAPOR SCREENING LEVEL (RESIDENTIAL AND COMMERCIAL) FOR TETRACHLOROETHENE IS 1,400 µg/m³

MDEQ = MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

FT = FEET BELOW GROUND SURFACE

J = REPORTED VALUE IS ESTIMATED

ND = NON-DETECT INDICATES VALUE IS BELOW THE LABORATORY REPORTING LIMIT, RANGING FROM 6.9 TO 9.0 µg/m³, FOR TETRACHLOROETHENE

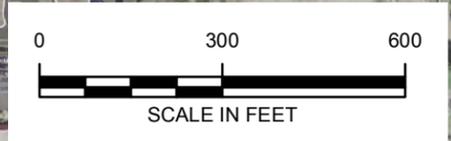
SVMP = SOIL VAPOR MONITORING POINT

RESULTS COLLECTED DURING SEPTEMBER AND NOVEMBER 2017 SAMPLING EVENTS.

SVMP-29 THROUGH 37 WERE NOT SAMPLED DURING THE SEPTEMBER OR NOVEMBER 2017 SAMPLING EVENTS.

SVMP-17 AND SVMP-20 WERE NOT SAMPLED DURING THE NOVEMBER 2017 EVENT DUE TO THE SCREEN BEING SUBMERGED IN GROUNDWATER.

SVMP-11, WHICH RESIDED IN THE CITY OF LIVONIA RIGHT-OF-WAY, WAS REMOVED PER THE ADJACENT PROPERTY OWNERS REQUEST.



FORD MOTOR COMPANY
LIVONIA TRANSMISSION PLANT
LIVONIA, MICHIGAN

**OFF-SITE VAPOR INTRUSION ASSESSMENT
TETRACHLOROETHENE IN SOIL VAPOR**

CITY: NOVI DIV: ENV DB: MG PIC: R. ELLIS PM: K. HINSKEY TM: A. DEGRANDIS TR: P. CURRY PROJECT NUMBER: M001322.0001 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Z:\GISProjects\ENV\NoviBrighton_MitFordLivonia\GISdocs\2018-01\Progress_Report_4Q2017\PE_Offsite_SVMP_20180110.mxd PLOTTED: 1/19/2018 1:35:35 PM BY: mrgress



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LEGEND

- PROPERTY BOUNDARIES
- FORD PROPERTY BOUNDARY
- OFF-SITE SVMP TRICHLOROETHENE < 67 µg/m³

NOTES:

µg/m³ - MICROGRAMS PER CUBIC METER

THE MDEQ PROVIDED VOLATILIZATION TO INDOOR AIR SOIL VAPOR SCREENING LEVEL (RESIDENTIAL AND COMMERCIAL) FOR TRICHLOROETHENE IS 67 µg/m³

MDEQ = MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

FT = FEET BELOW GROUND SURFACE

ND = NON-DETECT INDICATES VALUE IS BELOW THE LABORATORY REPORTING LIMIT, RANGING FROM 5.5 TO 7.1 µg/m³, FOR TRICHLOROETHENE

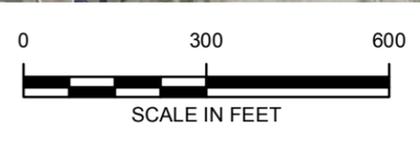
SVMP = SOIL VAPOR MONITORING POINT

RESULTS COLLECTED DURING JUNE, SEPTEMBER, AND NOVEMBER 2017 SAMPLING EVENTS.

SVMP-29 THROUGH 37 WERE NOT SAMPLED DURING THE SEPTEMBER OR NOVEMBER 2017 SAMPLING EVENTS.

SVMP-17 AND SVMP-20 WERE NOT SAMPLED DURING THE NOVEMBER 2017 EVENT DUE TO THE SCREEN BEING SUBMERGED IN GROUNDWATER.

SVMP-11, WHICH RESIDED IN THE CITY OF LIVONIA RIGHT-OF-WAY, WAS REMOVED PER THE ADJACENT PROPERTY OWNERS REQUEST.



FORD MOTOR COMPANY
LIVONIA TRANSMISSION PLANT
LIVONIA, MICHIGAN

**OFF-SITE VAPOR INTRUSION ASSESSMENT
TRICHLOROETHENE IN SOIL VAPOR**

CITY: NOVI DIV: ENV DB: MG PIC: R. ELLIS PM: K. HINSKEY TM: A. DEGRANDIS TR: P. CURRY PROJECT NUMBER: M001322.0001 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Z:\GIS\Projects\ENV\Novi\Brighton_MitFordLivonia\GIS\docs\2018-01\Progress_Report_4Q2017\ICE_Offsite_SVMP_20180110.mxd PLOTTED: 1/19/2018 1:38:24 PM BY: mgriss



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LEGEND

- PROPERTY BOUNDARIES
- FORD PROPERTY BOUNDARY
- OFF-SITE SVMP
VINYL CHLORIDE < 54 µg/m³

NOTES:

µg/m³ - MICROGRAMS PER CUBIC METER

THE MDEQ PROVIDED RESIDENTIAL VOLATILIZATION TO INDOOR AIR SOIL VAPOR SCREENING LEVEL FOR VINYL CHLORIDE IS 54 µg/m³

THE MDEQ PROVIDED COMMERCIAL VOLATILIZATION TO INDOOR AIR SOIL VAPOR SCREENING LEVEL FOR VINYL CHLORIDE IS 450 µg/m³

MDEQ = MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

FT = FEET BELOW GROUND SURFACE

ND = NON-DETECT INDICATES VALUE IS BELOW THE LABORATORY REPORTING LIMIT, RANGING FROM 2.6 TO 3.4 µg/m³, FOR VINYL CHLORIDE

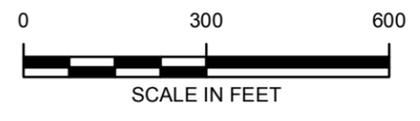
SVMP = SOIL VAPOR MONITORING POINT

RESULTS COLLECTED DURING JUNE, SEPTEMBER, AND NOVEMBER 2017 SAMPLING EVENTS.

SVMP-29 THROUGH 37 WERE NOT SAMPLED DURING THE SEPTEMBER OR NOVEMBER 2017 SAMPLING EVENTS.

SVMP-17 AND SVMP-20 WERE NOT SAMPLED DURING THE NOVEMBER 2017 EVENT DUE TO THE SCREEN BEING SUBMERGED IN GROUNDWATER.

SVMP-11, WHICH RESIDED IN THE CITY OF LIVONIA RIGHT-OF-WAY, WAS REMOVED PER THE ADJACENT PROPERTY OWNERS REQUEST.



FORD MOTOR COMPANY
LIVONIA TRANSMISSION PLANT
LIVONIA, MICHIGAN

**OFF-SITE VAPOR INTRUSION ASSESSMENT
VINYL CHLORIDE IN SOIL VAPOR**



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LEGEND

- PROPERTY BOUNDARY
- FORD PROPERTY BOUNDARY
- OFF-SITE MONITORING WELL TRICHLOROETHENE ≤ 1.0 µg/L

NOTES:

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

THE PUBLISHED 2016 MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY REMEDIATION AND REDEVELOPMENT DIVISION TARGET DETECTION LIMIT FOR TRICHLOROETHENE IS 1.0 µg/L .

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

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

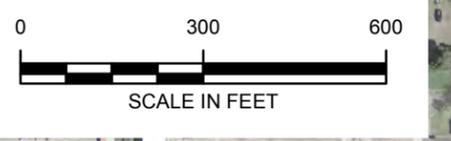
FT = FEET BELOW GROUND SURFACE

J = ESTIMATED CONCENTRATION ABOVE THE METHOD DETECTION LIMIT AND BELOW THE REPORTING LIMIT.

"ND" INDICATES VALUE IS BELOW THE LABORATORY REPORTING LIMIT OF 1.0 µg/L FOR TRICHLOROETHENE.

MW = MONITORING WELL

RESULTS COLLECTED DURING THE MAY, JULY, AND NOVEMBER 2017 SAMPLING EVENTS



FORD MOTOR COMPANY
 LIVONIA TRANSMISSION PLANT
 LIVONIA, MICHIGAN

**OFF-SITE MONITORING WELLS
 TRICHLOROETHENE IN GROUNDWATER**

MW-72 (15-20 FT)
 5/22/2017: ND (< 1.0 µg/L)
 7/26/2017: ND (< 1.0 µg/L)
 11/7/2017: ND (< 1.0 µg/L)

MW-85 (8-13 FT)
 5/25/2017: ND (< 1.0 µg/L)
 7/25/2017: ND (< 1.0 µg/L)
 11/7/2017: ND (< 1.0 µg/L)

MW-83 (8-13 FT)
 5/26/2017: ND (< 1.0 µg/L)
 7/25/2017: ND (< 1.0 µg/L)
 11/9/2017: ND (< 1.0 µg/L)

MW-73S (7-12 FT)
 5/22/2017: 0.40 J µg/L
 7/26/2017: 0.48 J µg/L
 11/7/2017: 0.48 J µg/L

MW-73D (13.5-18.5 FT)
 5/22/2017: ND (< 1.0 µg/L)
 7/26/2017: ND (< 1.0 µg/L)
 11/7/2017: ND (< 1.0 µg/L)

MW-79D (10-15 FT)
 5/24/2017: ND (< 1.0 µg/L)
 7/25/2017: ND (< 1.0 µg/L)
 11/9/2017: ND (< 1.0 µg/L)

MW-79S (5-10 FT)
 5/24/2017: ND (< 1.0 µg/L)
 7/25/2017: ND (< 1.0 µg/L)
 11/9/2017: ND (< 1.0 µg/L)

MW-80S (7-12 FT)
 5/24/2017: ND (< 1.0 µg/L)
 7/25/2017: ND (< 1.0 µg/L)
 11/8/2017: ND (< 1.0 µg/L)

MW-82D (18-23 FT)
 5/24/2017: ND (< 1.0 µg/L)
 7/25/2017: ND (< 1.0 µg/L)
 11/8/2017: ND (< 1.0 µg/L)

MW-82S (9-14 FT)
 5/24/2017: ND (< 1.0 µg/L)
 7/25/2017: ND (< 1.0 µg/L)
 11/8/2017: ND (< 1.0 µg/L)

MW-74 (14-19 FT)
 5/23/2017: ND (< 1.0 µg/L)
 7/26/2017: ND (< 1.0 µg/L)
 11/7/2017: ND (< 1.0 µg/L)

MW-84 (8-13 FT)
 5/25/2017: ND (< 1.0 µg/L)
 7/25/2017: ND (< 1.0 µg/L)
 11/9/2017: ND (< 1.0 µg/L)

MW-78 (7-12 FT)
 5/25/2017: ND (< 1.0 µg/L)
 7/25/2017: ND (< 1.0 µg/L)
 11/9/2017: ND (< 1.0 µg/L)

MW-81 (8-13 FT)
 5/26/2017: ND (< 1.0 µg/L)
 7/25/2017: ND (< 1.0 µg/L)
 11/9/2017: ND (< 1.0 µg/L)

MW-75D (12-17 FT)
 5/23/2017: ND (< 1.0 µg/L)
 7/26/2017: ND (< 1.0 µg/L)
 11/8/2017: ND (< 1.0 µg/L)

MW-75S (5-10 FT)
 5/23/2017: ND (< 1.0 µg/L)
 7/26/2017: ND (< 1.0 µg/L)
 11/8/2017: ND (< 1.0 µg/L)

MW-86 (12-17 FT)
 5/25/2017: ND (< 1.0 µg/L)
 7/26/2017: ND (< 1.0 µg/L)
 11/10/2017: ND (< 1.0 µg/L)

MW-77 (9-14 FT)
 5/25/2017: 0.87 J µg/L
 7/26/2017: ND (< 1.0 µg/L)
 11/10/2017: ND (< 1.0 µg/L)

MW-87 (14-19 FT)
 5/23/2017: ND (< 1.0 µg/L)
 7/26/2017: ND (< 1.0 µg/L)
 11/10/2017: ND (< 1.0 µg/L)

MW-76 (15-20 FT)
 5/23/2017: ND (< 1.0 µg/L)
 7/26/2017: ND (< 1.0 µg/L)
 11/8/2017: ND (< 1.0 µg/L)

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LEGEND

- PROPERTY BOUNDARY
- FORD PROPERTY BOUNDARY
- OFF-SITE MONITORING WELL
VINYL CHLORIDE ≤ 1.0 µg/L
- OFF-SITE MONITORING WELL
VINYL CHLORIDE > 1.0 µg/L
- BLUE/BOLD TEXT** EXCEEDANCE OF THE TDL FROM PAST AND PRESENT SAMPLING EVENTS.

NOTES:

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

THE PUBLISHED 2016 MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY REMEDIATION AND REDEVELOPMENT DIVISION TARGET DETECTION LIMIT FOR VINYL CHLORIDE IS 1.0 µg/L.

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

J = ESTIMATED CONCENTRATION ABOVE THE METHOD DETECTION LIMIT AND BELOW THE REPORTING LIMIT.

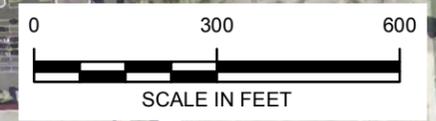
"ND" INDICATES VALUE IS BELOW THE LABORATORY REPORTING LIMIT OF 1.0 µg/L FOR VINYL CHLORIDE.

MW = MONITORING WELL

TDL = TARGET DETECTION LIMIT

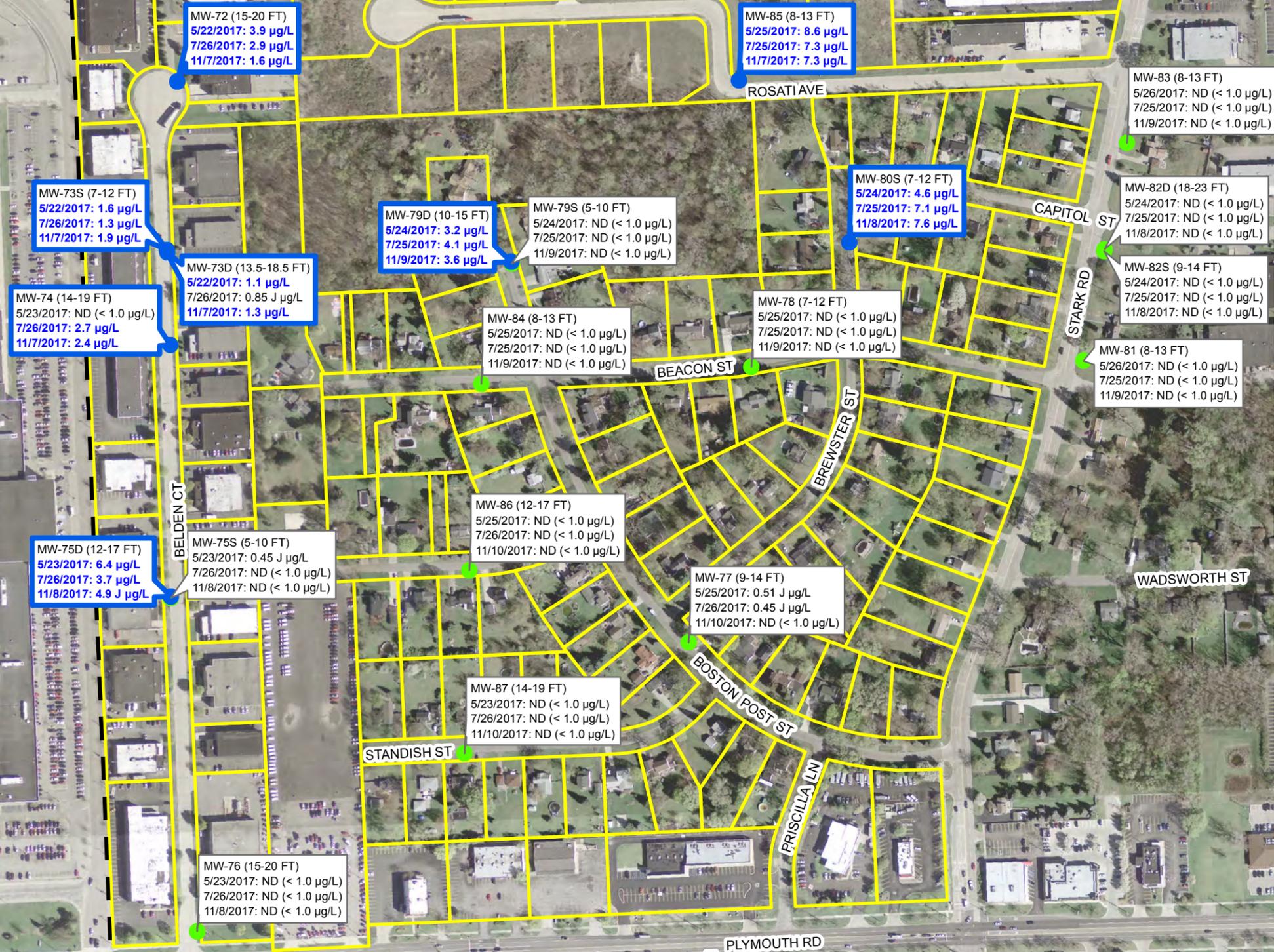
RESULTS COLLECTED DURING THE MAY, JULY, AND NOVEMBER 2017 SAMPLING EVENTS

BLUE BOX INDICATES EXCEEDANCE OF THE TARGET DETECTION LIMIT FOR VINYL CHLORIDE ASSOCIATED WITH THE MOST RECENT SAMPLING EVENT POSSIBLE



FORD MOTOR COMPANY
 LIVONIA TRANSMISSION PLANT
 LIVONIA, MICHIGAN

**OFF-SITE MONITORING WELLS
 VINYL CHLORIDE IN GROUNDWATER**



CITY: Novi DIV: ENV DB: MG PIC: R. ELLIS PM: K. HINSKEY PROJECT NUMBER: M001322.0001 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl Z:\GIS\Projects\ENV\Novi\Brighton_MtFord\Livingston\GISdocs\2017-12\RAP_RIP\Figures_20171206\Additional_VI_Leval_Areas_20171206.mxd PLOTTED: 12/6/2017 4:14:48 PM BY: mgrs



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LEGEND

- CURRENTLY UNDER EVALUATION
- ADDITIONAL EVALUATION NEEDED
- RESIDENTIAL DEVELOPED
- COMMERCIAL DEVELOPED
- UNDEVELOPED
- PROPERTY BOUNDARY
- FORD PROPERTY BOUNDARY
- VC - GROUNDWATER
- 1 - 2 µg/L
- 2 - 10 µg/L
- 10 - 100 µg/L
- >100 µg/L
- 100' PLUME OFFSET

NOTES:

VC - VINYL CHLORIDE

US EPA - UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

VOCS - VOLATILE ORGANIC COMPOUNDS

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

OUTER CONTOUR IS DASHED WHERE THE EXTENT IS INFERRED OR UNKNOWN.

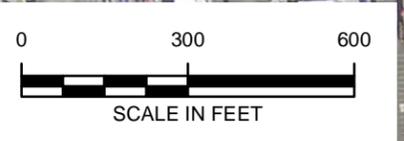
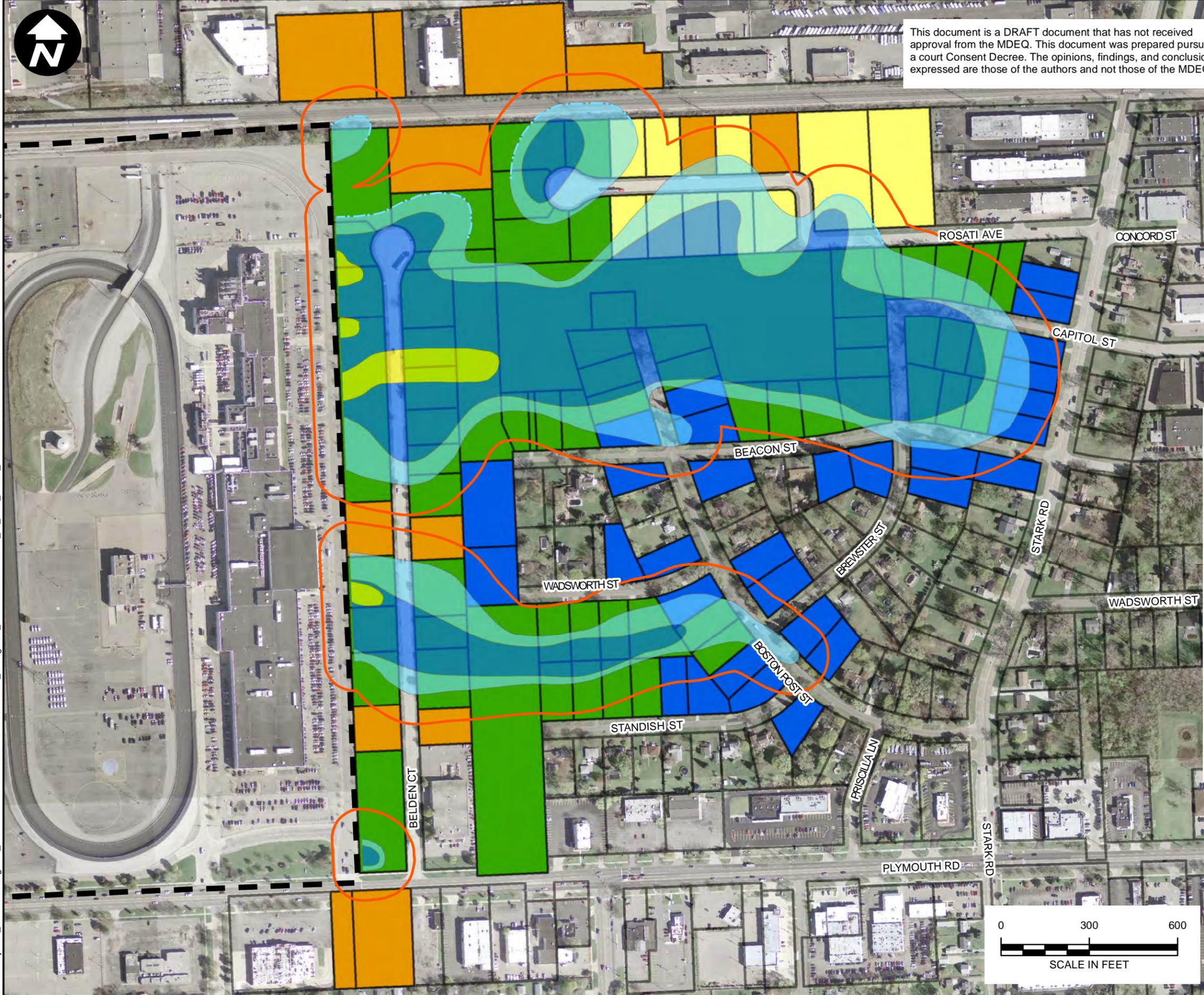
THE RESIDENTIAL AND NONRESIDENTIAL DRINKING WATER CRITERIA FOR VINYL CHLORIDE IS 2.0 µg/L.

THE SITE-SPECIFIC NON-RESIDENTIAL VOLATILIZATION TO INDOOR AIR CRITERIA (VIAC) FOR GROUNDWATER NOT IN CONTACT (GWNIC) FOR VINYL CHLORIDE IS 160 µg/L.

THE SITE-SPECIFIC RESIDENTIAL VOLATILIZATION TO INDOOR AIR CRITERIA (VIAC) FOR GROUNDWATER IN CONTACT (GWIC) FOR VINYL CHLORIDE IS 0.12 UG/L. THIS SCREENING LEVEL IS BELOW THE TARGET DETECTION LIMIT FOR VINYL CHLORIDE OF 1 µg/L. A TARGET DETECTION LIMIT OF 1 µg/L HAS BEEN USED

DATA COLLECTED FROM OCTOBER 2015 THROUGH MAY 2017.

VOCS ANALYZED USING EPA METHOD 8260 OR 8265. EPA 8265 RESULTS REPORTED AS SUM OF VINYL CHLORIDE + 1,2-DICHLOROETHANE. POSTED EPA 8265 RESULTS ASSUME CONCENTRATION IS ENTIRELY VINYL CHLORIDE.



FORD MOTOR COMPANY
LIVONIA TRANSMISSION PLANT
LIVONIA, MICHIGAN

OFF-SITE PROPERTIES FOR VAPOR INTRUSION EVALUATION

TABLES



Table 1
Soil Vapor Monitoring Point Helium Tracer Test Results
Livonia Transmission Plant
36200 Plymouth Road
Livonia, Michigan

Location ID	June 2017		September 2017		November 2017		February 2018	
	Helium Pre Sample (ppm)	Helium Post Sample (ppm)	Helium Pre Sample (ppm)	Helium Post Sample (ppm)	Helium Pre Sample (ppm)	Helium Post Sample (ppm)	Helium Pre Sample (ppm)	Helium Post Sample (ppm)
SVMP-1-3.5	0	0	0	0	0	0	0	0
SVMP-1-7	0	0	0	0	0	0	0	0
SVMP-2-4.5	0	0	0	0	0	0	0	0
SVMP-2-8.5	0	0	0	0	0	0	0	0
SVMP-3-3.5	50	75	0	0	0	0	0	0
SVMP-3-7	0	0	0	0	0	0	0	0
SVMP-4-3.5	0	0	0	0	0	0	0	0
SVMP-5-4.5	0	0	0	0	0	0	0	0
SVMP-6-4.5	0	0	0	0	0	0	0	0
SVMP-7-3.5	0	0	0	0	0	0	0	0
SVMP-8-3.5	0	0	0	0	0	0	0	0
SVMP-9-4	0	0	0	0	0	0	0	0
SVMP-10-3	0	1475	0	0	0	0	0	0
SVMP-11-3.5	0	0	NS	NS	NS	NS	NS	NS
SVMP-12-3.5	0	0	0	0	0	0	0	0
SVMP-13-2	250	4750	0	0	0	0	NS	NS
SVMP-14-2	225	0	0	0	0	0	NS	NS
SVMP-15-2	2450	3800	0	0	0	0	NS	NS
SVMP-16-2	450	1725	0	0	0	0	NS	NS
SVMP-17-2	4675	2925	0	0	0	NA	NS	NS
SVMP-18-3	0	0	0	0	0	0	0	0
SVMP-19-3	0	0	0	0	0	0	0	NA
SVMP-20-3	0	850	0	0	NS	NS	NS	NS
SVMP-21-2	0	0	0	0	0	0	NS	NS
SVMP-22-3	0	0	0	0	0	0	0	0
SVMP-23-3	0	0	0	0	0	0	0	0
SVMP-24-4	0	0	0	0	800	0	0	0
SVMP-25-3	0	0	0	0	0	0	0	0
SVMP-25-6	0	0	0	0	0	0	0	0
SVMP-26-4	0	0	0	0	0	0	0	0
SVMP-27-4.5	0	0	0	0	0	0	0	0
SVMP-28-3	0	0	0	0	0	0	0	0
SVMP-29-3.5	0	0	NS	NS	NS	NS	NS	NS
SVMP-29-7.5	0	0	NS	NS	NS	NS	NS	NS
SVMP-30-4	0	0	NS	NS	NS	NS	NS	NS
SVMP-31-5.5	0	0	NS	NS	NS	NS	NS	NS
SVMP-32-3	0	0	NS	NS	NS	NS	NS	NS
SVMP-32-6	0	0	NS	NS	NS	NS	NS	NS
SVMP-33-4	0	0	NS	NS	NS	NS	NS	NS
SVMP-34-4	0	0	NS	NS	NS	NS	NS	NS
SVMP-35-4	0	0	NS	NS	NS	NS	NS	NS
SVMP-36-4	0	0	NS	NS	NS	NS	NS	NS
SVMP-37-2.5	0	0	NS	NS	NS	NS	NS	NS

See Notes on Last Page.

Table 1
Soil Vapor Monitoring Point Helium Tracer Test Results
Livonia Transmission Plant
36200 Plymouth Road
Livonia, Michigan

Notes:

Helium tracer test readings collected using a Helium Leak Detector MGD-2002.

Shroud concentrations ranged from 30-40% helium during all four sampling events.

SVMP-11 abandoned after the initial sampling event per the adjacent property owners request.

SVMP-29 through SVMP-37 are located on residential properties and therefore only sampled during the initial sampling event.

SVMP-17 and SVMP-20 were not sampled during the November 2017 sampling event due to saturated screens.

SVMP-13 through SVMP-17, SVMP-20, and SVMP-21 were not sampled during the February 2018 sampling event due to saturated screens.

Abbreviations:

NA	Not analyzed
NS	Not sampled
ppm	parts per million
SVMP	Soil Vapor Monitoring Point

Table 2
Soil Vapor Monitoring Point Purged Air Parameter Readings
Ford Livonia Transmission Plant
36200 Plymouth Road
Livonia, Michigan

Location ID	June 2017			September 2017			November 2017			February 2018		
	CO ₂ (%)	O ₂ (%)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	CH ₄ (%)
SVMP-1-3.5	1.3	19.7	0.0	1.2	19.3	0.0	1.7	21.1	0.0	1.8	18.5	NA
SVMP-1-7.5	0.9	19.4	0.0	1.7	19.2	0.0	2.4	20.0	0.0	1.9	18.9	NA
SVMP-2-4.5	4.8	17.4	0.0	0.9	20.1	0.0	9.3	7.7	0.0	0.1	21.6	NA
SVMP-2-8.5	6.7	16.3	0.0	1.7	19.3	0.0	10.5	5.4	0.0	0.0	21.6	NA
SVMP-3-3.5	0.3	20.6	0.0	0.6	20.4	0.0	0.7	21.4	0.0	0.0	21.4	NA
SVMP-3-7	0.4	21.2	0.0	0.8	19.9	0.0	0.9	21.1	0.0	0.0	21.2	NA
SVMP-4-3.5	0.6	20.1	0.0	1.0	20.0	0.0	0.8	19.1	0.0	1.6	16.2	NA
SVMP-5-4.5	0.2	22.0	0.0	0.2	20.7	0.0	0.5	26.9	0.0	1.2	19.6	NA
SVMP-6-4.5	0.5	20.8	0.0	0.9	20.1	0.0	0.7	21.0	0.0	0.4	20.8	NA
SVMP-7-3.5	1.2	20.5	0.0	0.0	20.8	0.0	1.3	19.7	0.0	1.0	20.4	NA
SVMP-8-3.5	2.5	19.8	0.0	1.4	19.6	0.0	8.9	21.6	0.0	0.3	20.8	NA
SVMP-9-4	0.3	21.2	0.0	0.0	20.8	0.0	0.7	21.6	0.0	0.0	21.0	NA
SVMP-10-3	0.2	20.1	0.0	0.4	19.9	0.0	0.5	19.5	0.0	0.1	20.9	NA
SVMP-11-3.5	0.3	21.1	0.0	NS	NS	NS	NS	NS	NS	NS	NS	NS
SVMP-12-3.5	0.2	21.2	0.0	1.2	19.9	0.0	1.0	19.9	0.0	0.0	20.9	NA
SVMP-13-2	0.6	20.0	0.0	1.2	18.6	0.0	2.6	11.8	0.0	NS	NS	NS
SVMP-14-2	0.9	18.5	0.0	1.5	19.5	0.0	1.4	19.1	0.0	NS	NS	NS
SVMP-15-2	0.8	21.4	0.0	0.7	20.3	0.0	0.1	20.1	0.0	NS	NS	NS
SVMP-16-2	0.9	20.8	0.0	1.2	19.8	0.0	0.3	20.5	0.0	NS	NS	NS
SVMP-17-2	1.3	19.5	0.0	4.9	16.8	0.0	NS	NS	NS	NS	NS	NS
SVMP-18-3	2.6	18.6	0.0	5.2	16.8	0.0	4.3	17.6	0.0	2.7	16.6	NA
SVMP-19-3	6.4	14.8	0.0	6.4	16.3	0.0	7.0	15.0	0.0	NA	NA	NA
SVMP-20-3	6.3	15.7	0.0	6.0	16.1	0.0	NS	NS	NS	NS	NS	NS
SVMP-21-2	2.5	19.8	0.0	1.8	19.3	0.0	0.8	19.9	0.0	NS	NS	NS
SVMP-22-3	0.9	20.3	0.0	1.8	19.8	0.0	1.3	20.2	0.0	0.0	21.0	NA
SVMP-23-3	1.4	20.2	0.0	0.1	15.8	0.0	1.1	20.6	0.0	NA	NA	NA
SVMP-24-4	2.8	19.4	0.0	2.5	18.9	0.0	2.6	19.5	0.0	2.0	19.2	NA
SVMP-25-3	3.2	18.0	0.0	4.0	15.5	0.0	4.0	18.0	0.0	0.2	20.9	NA
SVMP-25-6	2.4	18.4	0.0	5.4	14.0	0.0	4.6	17.4	0.0	0.0	21.0	NA
SVMP-26-4	3.8	12.0	0.0	11.4	8.6	0.0	12.0	5.6	0.0	0.6	20.7	NA
SVMP-27-4.5	3.8	20.3	0.0	1.1	19.2	0.0	1.5	20.4	0.0	0.1	21.3	NA
SVMP-28-3	1.8	21.0	0.0	3.4	16.7	0.0	2.3	16.2	0.0	0.1	21.1	NA
SVMP-29-3.5	0.6	20.5	0.0	NS	NS	NS	NS	NS	NS	NS	NS	NS
SVMP-29-7.5	0.9	20.8	0.0	NS	NS	NS	NS	NS	NS	NS	NS	NS
SVMP-30-4	0.4	20.9	0.0	NS	NS	NS	NS	NS	NS	NS	NS	NS
SVMP-31-5.5	1.2	19.7	0.0	NS	NS	NS	NS	NS	NS	NS	NS	NS
SVMP-32-3	1.6	19.5	0.0	NS	NS	NS	NS	NS	NS	NS	NS	NS
SVMP-32-6	1.3	19.7	0.0	NS	NS	NS	NS	NS	NS	NS	NS	NS
SVMP-33-4	5.7	16.9	0.0	NS	NS	NS	NS	NS	NS	NS	NS	NS
SVMP-34-4	0.9	20.3	0.0	NS	NS	NS	NS	NS	NS	NS	NS	NS
SVMP-35-4	1.1	21.4	0.0	NS	NS	NS	NS	NS	NS	NS	NS	NS
SVMP-36-4	1.4	19.5	0.0	NS	NS	NS	NS	NS	NS	NS	NS	NS
SVMP-37-2.5	7.2	15.8	0.0	NS	NS	NS	NS	NS	NS	NS	NS	NS

See Notes on Last Page.

Table 2
Soil Vapor Monitoring Point Purged Air Parameter Readings
Ford Livonia Transmission Plant
36200 Plymouth Road
Livonia, Michigan

Notes:

Air parameter readings collected using a GEM 2000.

SVMP-11 abandoned after the initial sampling event per the adjacent property owners request.

SVMP-29 through SVMP-37 are located on residential properties and therefore only sampled during the initial sampling event.

SVMP-17 and SVMP-20 were not sampled during the November 2017 sampling event due to saturated screens.

SVMP-13 through SVMP-17, SVMP-20, and SVMP-21 were not sampled during the February 2018 sampling event due to saturated screens.

Abbreviations:

%	Percent
CH ₄	Methane
CO ₂	Carbon dioxide
NA	Not analyzed
NS	Not sampled
O ₂	Oxygen
SVMP	Soil Vapor Monitoring Point

Table 3
Off-site Soil Vapor Monitoring Point Construction Details
Ford Livonia Transmission Plant
36200 Plymouth Road
Livonia, Michigan

Location ID	Depth to Water During Installation (ft. bgs)	Screen Depth (ft. bgs)	Screen Length (inches)
SVMP-01S	8.0	3.5	1.0
SVMP-01D	8.0	7.0	1.0
SVMP-02S	10.0	4.5	1.0
SVMP-02D	10.0	8.5	1.0
SVMP-03S	9.0	3.5	1.0
SVMP-03D	9.0	7.0	1.0
SVMP-04	5.0	3.5	1.0
SVMP-05	5.0	4.5	1.0
SVMP-06	5.5	4.5	1.0
SVMP-07	4.5	3.5	1.0
SVMP-08	5.5	3.5	1.0
SVMP-09	6.0	4.0	1.0
SVMP-10	4.0	3.0	1.0
SVMP-11	5.0	3.5	1.0
SVMP-12	5.0	3.5	1.0
SVMP-13	3.0	2.0	1.0
SVMP-14	3.0	2.0	1.0
SVMP-15	3.0	2.0	1.0
SVMP-16	3.0	2.0	1.0
SVMP-17	3.5	2.0	1.0
SVMP-18	4.5	3.0	1.0
SVMP-19	4.5	3.0	1.0
SVMP-20	4.5	3.0	1.0
SVMP-21	3.5	2.0	1.0
SVMP-22	4.5	3.0	1.0
SVMP-23	4.5	3.0	1.0
SVMP-24	5.5	4.0	1.0
SVMP-25S	8.5	3.0	1.0
SVMP-25D	8.5	6.0	1.0
SVMP-26	5.5	4.0	1.0
SVMP-27	6.5	4.5	1.0
SVMP-28	5.5	3.0	1.0
SVMP-29S	9.0	3.5	1.0
SVMP-29D	9.0	7.5	1.0
SVMP-30	6.0	4.0	1.0
SVMP-31	7.0	5.5	1.0
SVMP-32S	8.0	3.0	1.0
SVMP-32D	8.0	6.0	1.0
SVMP-33	7.0	4.0	1.0
SVMP-34	7.0	4.0	1.0
SVMP-35	7.0	4.0	1.0
SVMP-36	7.0	4.0	1.0
SVMP-37	4.0	2.5	1.0

Notes:

1" Stainless Steel Screen Implant, 1/4" fitting. Part #SVPT92-SW14 from Environmental Service Products.

D Deep sample depth

ft. bgs Feet below ground surface

S Shallow sample depth

SVMP Soil vapor monitoring point

This document is a DRAFT document that has not received approval from the Michigan Department of Environmental Quality (MDEQ). This document was prepared pursuant to a court Consent Decree. The opinions, findings, and conclusions expressed are those of the authors and not those of the MDEQ.

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