

**Revitalizing Auto Communities
Environmental Response (RACER)
Trust**

**Resource Conservation and
Recovery Act Facility
Investigation (RFI) Work Plan,
Phase 2**

Plants 2, 3, & 6, Lansing, Michigan

March 12, 2012


Patrick J. Curry, CPG
Project Geologist
Nicklaus R. H. Welty
Project Geologist
Joseph A. Quinnan, PE, PG
Principal Hydrogeologist
Amy Hoeksema, CPG
Vice President/Project Manager

**Resource Conservation and
Recovery Act Facility
Investigation (RFI) Work Plan,
Phase 2**
Plants 2, 3, & 6, Lansing,
Michigan

Prepared for:
Revitalizing Auto Communities
Environmental Response (RACER) Trust

Prepared by:
ARCADIS G&M of Michigan, LLC
10559 Citation Drive
Suite 100
Brighton
Michigan 48116
Tel 810 229 8594
Fax 810 229 8837

Our Ref.:
B0064479.2012

Date:
March 16, 2012

*This document is intended only for the use
of the individual or entity for which it was
prepared and may contain information that
is privileged, confidential and exempt from
disclosure under applicable law. Any
dissemination, distribution or copying of
this document is strictly prohibited.*

1.	Introduction	1
1.1	Objectives of the Phase 2 Investigation	2
1.2	Stages of Investigation	3
1.2.1	Assessment Stage	3
1.2.2	Characterization Stage	5
1.2.3	Delineation Stage	5
1.3	Investigation Areas	5
2.	Conceptual Site Model	6
2.1	Geologic Setting	6
2.1.1	Hydrogeologic Setting	7
2.1.2	Soil and Groundwater Impacts	8
2.1.2.1	VOCs in Bedrock	9
2.1.2.2	LNAPL	9
2.1.2.3	VOCs	9
2.1.2.4	SVOCs	10
2.1.2.5	Metals	10
2.1.3	Updates to the Conceptual Site Model	12
3.	Data Quality Objectives and Investigation Methods	12
3.1	Data Quality Objectives Summary	13
3.2	Soil and Groundwater Methods	14
3.2.1	Mobile Lab	14
3.2.1.1	Mobile Lab: Data Quality Objectives Summary	15
3.2.2	Off-Site Laboratory Samples	15
3.2.2.1	Off-Site Lab: Data Quality Objectives Summary	15
3.2.3	Groundwater Colorimetric Kit	15
3.2.3.1	Groundwater Colorimetric Kit: Data Quality Objectives Summary	16
3.2.4	LNAPL Characterization – Laser-Induced Fluorescence	16

3.2.4.1	LIF: Data Quality Objectives Summary	17
3.3	Geology and Permeability Mapping	17
3.3.1	Soil Borings	17
3.3.2	Hydraulic Profiling Tool	17
3.3.2.1	HPT: Data Quality Objectives	18
3.4	Drilling Methods	18
4.	Investigation Strategy	19
4.1	Initial Approach and Rationale	19
4.1.1	Risk Assessment	21
4.2	Sequencing of Work	22
4.3	Soil Sampling Network	22
4.3.1	Adaptive Sampling Network	23
4.4	Sampling Frequency for Soil	24
4.5	Sampling Frequency for Groundwater	25
4.6	Calibration of Field-Screening Approaches	26
4.6.1	Mobile Lab for VOCs	26
4.6.2	Colorimetric Kit for Hexavalent Chromium in Groundwater	27
4.6.3	LIF	28
4.6.4	HPT	29
4.7	Data Management Plan	29
4.7.1	Sample Naming	30
4.7.2	Electronic Data Management	30
5.	Schedule	31
6.	Communication Plan	31
6.1	Assessment Stage Milestone Review	31
6.2	Characterization Stage Bi-Weekly Review	32
6.3	Characterization Stage Milestone Review	32

7. Reporting	33
8. References	33

Tables

Table 1	RFI Work Plan Phase 2 Summary Matrix
---------	--------------------------------------

Figures

Figure 1	Site Location Map
Figure 2	Plants 2 & 6: Proposed 2012 Work Plan Locations
Figure 3	Plant 3: Proposed 2012 Work Plan Locations
Figure 4	Geologic Overview
Figure 5	Investigation Area 1
Figure 6	Investigation Area 2
Figure 7	Investigation Area 3
Figure 8	Investigation Area 4
Figure 9	Investigation Area 5
Figure 10	Investigation Area 5-1
Figure 11	Investigation Area 5-2
Figure 12	Investigation Area 5-3
Figure 13	Investigation Area 5-4
Figure 14	Investigation Area 5-5
Figure 15	Investigation Area 5-6
Figure 16	Investigation Area 5-7
Figure 17	Investigation Area 5-8
Figure 18	Investigation Area 6
Figure 19	Investigation Area 7
Figure 20	Investigation Area 8

Figure 21	Investigation Area 9
Figure 22	Investigation Area 10
Figure 23	Investigation Area 11
Figure 24	Investigation Area 13
Figure 25	Investigation Area 14
Figure 26	Investigation Area 15
Figure 27	Investigation Area 16
Figure 28	Investigation Area 17
Figure 29	Investigation Area 18
Figure 30	Investigation Area 19
Figure 31	Investigation Area 20
Figure 32	Investigation Area 21
Figure 33	CSM Development Process

Appendices

A	Solid Phase Micro Extraction
B	Hexavalent Chromium Groundwater Colormetric Kit
C	Laser-Induced Fluorescence Reference
D	Geoprobe® Hydraulic Profiling Tool Reference



1. Introduction

In 2011, ARCADIS G&M of Michigan, LLC (ARCADIS) completed a Phase 1 Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) for the Revitalizing Auto Communities Environmental Response (RACER) Trust at their industrial properties located in Lansing, Michigan. The results of that investigation, documented in the *Phase 1 Activities Summary Report* (ARCADIS 2012), identified the need for additional action.

This work plan presents the investigation strategy and proposed methods for the Phase 2 investigation at the RACER Trust Plants 2, 3, and 6, located in Lansing, Michigan (the Site; Figure 1). This document includes the following sections:

Section 1, Introduction, provides an overview of the Phase 2 investigation and objectives of the work.

Section 2, Conceptual Site Model, briefly summarizes the findings of the 2011 investigation and reviews the conceptual site model (CSM) as it relates to the physical environmental setting and the Phase 2 investigation.

Section 3, Data Quality Objectives and Investigation Methods, defines the data quality objectives (DQOs) and methods for soil, groundwater, and soil type characterization.

Section 4, Investigation Strategy, outlines the investigation sequencing based on priority/real-time vs. fixed lab approach. Section 4 also describes the master investigation matrix table, which identifies the impacts in each area and the proposed investigation approach.

Section 5, Schedule, summarizes the overall project schedule.

Section 6, Communication Plan, describes the types of communication that will be used to keep stakeholders apprised of project progress, including milestone phases after major investigation stages, and bi-weekly meetings during adaptive stages.

Section 7, Reporting, outlines the deliverables following the Phase 2 activities.

Section 8 lists references cited in this work plan.



Also refer to the Field Sampling Plan (FSP; ARCADIS 2011a) and Quality Assurance Project Plan (QAPP; ARCADIS 2011b) for information on the field methods and Standard Operating Procedures (SOPs). This document will not include details on methods already covered in the FSP and QAPP, but will include any new material not covered in the FSP and QAPP (for example, information on laser-induced fluorescence).

1.1 Objectives of the Phase 2 Investigation

The results of the Phase 1 investigation indicated that areas at the Site require additional investigation. The Phase 1 sampling results indicated that some areas may have significant impacts present and may contribute to risk, while other areas likely do not. Due to the potential range in type and magnitude of soil and groundwater impacts, the Phase 2 investigation will prioritize areas by first focusing on areas that could have the most significant impact on the course of the investigation, followed by the other areas that have thus far indicated only minor impacts that do not likely pose a significant exposure risk at the Site but still require additional sampling to characterize. The objectives, starting with the highest priority, are as follows:

1. Investigation of bedrock groundwater based on the detection of vinyl chloride in on-site bedrock wells at concentrations in excess of the Michigan Part 201 Drinking Water Protection Criteria (Natural Resources and Environmental Protection Act, P.A. 451, 1994).
2. Investigation of the light non-aqueous liquid (LNAPL) at Plants 2 and 3 as well as the associated soil and groundwater impacts. The concentration of polychlorinated biphenyls (PCBs) in the Plant 2 LNAPL indicates the liquid and impacted soil will need to be handled as a Toxic Substances Control Act (TSCA) regulated waste. In addition, concentrations of chlorinated volatile organic compounds (CVOCs) in the LNAPL at Plant 2 suggest the potential for a dense non-aqueous phase liquid (DNAPL) associated with the area.
3. Investigation of hexavalent chromium in soil and groundwater at Plant 3. The high concentration of hexavalent chromium detected in perched water at well CH-15-RO needs to be defined and characterized.
4. Investigation and mapping of the site-wide groundwater conditions. Initial groundwater sampling has identified groundwater impacts, but the overall extent and magnitude of the groundwater plume has not been defined.



5. Investigation of other areas with soil and groundwater impacts, either low-level or with Part 201 criteria exceedances. As discussed in *Phase 1 Activities Summary Report*, submitted to the Michigan Department of Environmental Quality (MDEQ) on January 30, 2012, detections of compounds less than criteria require additional sampling to confirm if soil or groundwater is above criteria in these areas.
6. Following the assessment of potential source areas and characterization of the associated groundwater impacts, a focused plan will be formulated for delineation and monitoring of the Site.

1.2 Stages of Investigation

As discussed above, the 2012 Phase 2 investigation has multiple overall objectives, including mapping site-wide groundwater conditions, further evaluating potential source areas, and defining the overall extent of contamination. Due to the variability of the individual areas of the Site, including contaminants of concern (COCs), impacted media, and geology, each area will have a unique set of objectives to meet during the Phase 2 investigation. In the most general terms, the objective in each area is to assess risk to human health and the environment that may be associated with soil and groundwater impacts. To meet these objectives in a systematic way, the investigation will be divided into three general stages: assessment, characterization, and delineation.

1.2.1 Assessment Stage

The goal of the assessment stage is to evaluate the known or suspected source areas where the Phase 1 sampling identified soil or groundwater impacts. During the Phase 1 investigation, borings were advanced in the most likely location to identify a release, but only a limited number of borings were advanced in each Area of Interest (AOI). Therefore, as described in the *Phase 1 Activities Summary Report* (ARCADIS 2012), detection of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and PCBs is considered grounds for additional investigation. The detection of various metals above criteria will be addressed on an area-by-area basis. In general, in areas where metals were detected above criteria, soil and groundwater samples will be submitted for metals analysis. The issue of metals in soil and groundwater is discussed further in Section 2.1.2.5 and the approach to the metals portion of the investigation is outlined in Section 4.1.1.



The goal of the assessment stage is to characterize the known and potential source areas and provide an overall assessment of the site-wide groundwater impacts. This expanded soil and groundwater dataset will be used to plan the characterization phase, which will be more adaptive in nature. The investigation approach of the assessment stage is as follows:

- Laser-Induced Fluorescence (LIF) will be completed in areas of known LNAPL occurrence at Plants 2 and 3 to delineate the extent of LNAPL.
- If Phase 1 activities identified groundwater impacts at soil boring locations or existing monitoring wells, or if soil impacts above Part 201 Criteria were not vertically defined, ARCADIS will characterize the aquifer permeability and vertical distribution of groundwater impacts by collecting groundwater and/or saturated soils throughout the thickness of the overburden aquifer (vertical aquifer profile [VAP] borings).
- If Phase 1 results identified soil impacts, soil borings will be advanced around the location of the Phase 1 soil boring, with step-out spacing consistent with the *MDEQ Sampling Strategies and Statistical Training Materials for Part 201 Cleanup Criteria* (MDEQ 2002) recommendations for source characterization based on area size.
- Additional VAP borings will be completed around known sources (e.g., Plant 2 LNAPL, electroplating area, etc.) to better determine potential contaminant migration.

The scope of work for the assessment stage is prescriptive. A secondary objective of the assessment stage is to confirm and calibrate the field screening and field laboratory methods proposed for the adaptive characterization stage of the investigation.

Additional sampling locations will be defined based on the assessment stage results, as described in the characterization and delineation stage sections that follow. As discussed in the communication section of this work plan (Section 6), ARCADIS and RACER will meet with the MDEQ following the assessment stage to develop a strategy for areas that require additional sampling and determine areas that will require no further action.



1.2.2 Characterization Stage

The goal of the characterization stage is to focus the remaining investigation effort on areas that the assessment stage identified as source areas for COCs associated with groundwater impacts or otherwise pose a risk to human health and the environment. The characterization stage will use the same basis for step-out locations based on *MDEQ Sampling Strategies and Statistical Training Materials for Part 201 Cleanup Criteria* (MDEQ 2002). However, unlike the assessment stage, the characterization stage will be adaptive, and additional borings will be added during the investigation to fully define sources of COCs in soil. VAP borings will also be added as required to assess plume characteristics and migration pathways that may be needed to plan a potential site remedy.

1.2.3 Delineation Stage

The data collected during the assessment and characterization stages will be used to select optimum locations for monitoring wells. ARCADIS will evaluate the soil and groundwater data and determine the optimum location for monitoring wells required for long-term compliance monitoring. Similar to the other phases, the delineation stage and monitoring well placement will be discussed with the MDEQ prior to implementation.

1.3 Investigation Areas

To make the data analysis and work plan preparation as systematic as possible, the Site was divided into "investigation areas" numbered 1 through 19. Investigation area 5, which spans the central portion of Plants 2 and 6, has also been divided into eight subareas. The locations of the investigation areas are shown on Figures 2 (Plants 2 and 6) and 3 (Plant 3). A detailed summary of each investigation area (i.e., COCs, area size, number of proposed assessment borings, and description of the initial assessment approach) is provided in Table 1. Table 1 will henceforth be referred to as the "Matrix."

Each investigation area figure (Figures 5 through 30) depicts the monitoring wells, historical soil boring locations, and proposed Phase 1 borings. Symbolology is provided next to the existing soil borings and monitoring wells depicting if samples from a soil boring or monitoring well indicate a soil or groundwater COC detection or exceedance of Part 201 Criteria. For clarity, because the symbolology does not indicate which COCs exceed criteria, text boxes are included on the figures that indicate parameter



detections and exceedances. Based on the Phase 1 soil and groundwater data, additional step-out soil borings and VAP sampling were planned for each area, as appropriate. A 10-foot grid is included on each figure for reference. The grid cell names will be used to help direct additional step-outs from the office, and as part of the naming convention for each soil boring. The rationale for the proposed borings and further investigation is provided in Section 4 of this work plan.

2. Conceptual Site Model

The Site (Plants 2, 3, and 6) is located in western Lansing and, occupies a total area of approximately 250 acres, including right-of-way. The locations of Plants 2, 3, and 6 are shown on Figure 1. These three plants were constructed in the early 1900s, and operations were focused on aspects of automobile manufacturing. Decommissioning of the plants began in 2007. For additional details regarding previous site operations, refer to the *Current Conditions Report* (ARCADIS 2008). Currently, the majority of the site buildings have been demolished and the Site is secured with fencing and locked gates. Concrete slabs and asphalt parking lots remain in place at Plants 2 and 3, and approximately 60% of these surfaces have been removed at Plant 6.

2.1 Geologic Setting

The topography of the region is generally flat with gently rolling hills. The Grand River is incised into the regional topography and wraps around the Site to the south, east, and north. Surface elevations for the Site range from approximately 855 to 875 feet above mean sea level (ft msl), and the elevation of the Grand River is approximately 830 ft msl.

In general, the shallow lithology of Plants 2 and 6 consists of 5 to 10 feet of native sand or sandy fill imported to the Site during original construction activities, followed by clay and clay/sand/silt mixtures that are heavily interbedded with thin silt, sand, and occasional gravel seams. The sediments at Plant 6 tend to get coarser with depth, with the thickest, most permeable sand/silt/gravel layers encountered in the zone immediately above bedrock. Soil borings at Plant 2 have only explored the relatively shallow fill and clay and have not been advanced to bedrock.

Soil borings completed to the north at Plant 3 indicate generally coarser sediments relative to Plants 2 and 6. The stratigraphy beneath Plant 3 consists of a thin layer of native sand or sandy fill followed by 10 to 20 feet of clay/silt glacial till. Beneath the till, the sediments consist of thicker layers of silt and sand and fewer, thinner layers of



interbedded clay, especially below a depth of 50 feet. Significant sandy gravel layers are encountered above bedrock on the northern portions of Plant 3.

Bedrock beneath the Site is composed of the Grand River and Saginaw geologic formations. The Grand River formation consists primarily of sandstone that occupies erosional valleys within the Saginaw Formation. The Saginaw Formation consists of sandstone, siltstone, and shale in the Lansing area. Together, the Grand River and Saginaw Formations form a major and productive drinking water aquifer. The bedrock surface is encountered at a depth of approximately 60 feet below grade beneath the central portion of Plant 6 and a depth of 110 feet below grade beneath the western portion of Plant 3, suggesting the bedrock surface has significant topography and, beneath Plant 3, dips to the north-northwest. To date, bedrock borings have not been completed on the western portion of Plant 6 or on Plant 2.

A conceptual representation of the site geology is provided as Figure 4 and includes cross-sections that show all of the soil borings along a north-south line beginning at Plant 6 and continuing to the northern end of Plant 3. Together, these cross-sections show the geologic variation over a distance of almost 1 mile. As shown on Figure 4, the overburden transitions from primarily clay with thin interbedded sands at Plant 6 to sediments dominated by silts and sands at Plant 3.

2.1.1.1 Hydrogeologic Setting

Due to the variability of the site overburden and the transition from primarily clays at Plants 2 and 6 to primarily silts and sands at Plant 3, groundwater is encountered within multiple hydrostratigraphic units and at varying depths across the Site. Within the overburden at Plants 2 and 6, groundwater is often perched within the upper native sand or fills above the glacial till and can be encountered just below grade. These occurrences include the LNAPL at Plant 2 and groundwater within Areas 1, 6 and 7. Beneath the fill, saturated soils are encountered at a depth of 20 to 30 feet below grade within the clay and thin sand/silt interbeds. Groundwater elevation of the bedrock aquifer at Plant 6 is 30 feet lower than the groundwater elevation measured within the overburden clay wells.

Perched water also occurs above the till at Plant 3 and includes the LNAPL at Area 17 and the hexavalent chromium groundwater impacts in Area 14. Below the perched zones; however, there is often 40 to 50 feet of unsaturated soil until groundwater is encountered in the sand/gravel located immediately above the bedrock.



Groundwater flow at the Site is complex, and actual flow direction is difficult to determine within the multiple water-bearing zones at the Site. This is partly due to lack of data, but also to the nature of the saturated soils. For example, groundwater elevation data for the clay interbedded zone at Plants 2 and 6 indicate a complex groundwater elevation contour due to the low-permeability nature of the sediments. The vast majority of groundwater movement within the clay interbedded zone will occur within silt and sand interbeds following a path of least resistance not necessarily aligned with site-wide horizontal gradient. Groundwater movement at the Site will ultimately be determined by characterizing the contaminant distribution.

To date, seven monitoring wells at the Site are installed in bedrock. Groundwater elevation measurements completed in December 2011 at six of the seven bedrock wells suggest a radial groundwater flow pattern at the Site with a groundwater high located on the eastern portion of Plant 3. A plan was provided to the MDEQ in March 2011 to install four additional bedrock monitoring wells to provide monitoring points between the Site and the surrounding municipal water supply wells. The addition of bedrock wells will also help better determine the horizontal groundwater gradient in bedrock at the Site. Regional sources of information, including investigations completed at other contaminated sites in the area and a groundwater flow model completed by the United States Geologic Survey (USGS), indicate a variable to southeasterly groundwater flow direction in the West Lansing area. Groundwater flow in bedrock at the Site is heavily influenced by the pumping of the surrounding municipal water supply wells, and gradient may shift daily depending on pumping schedule.

2.1.2 Soil and Groundwater Impacts

During the Phase 1 investigation, 285 soil samples and 77 groundwater samples were collected at Plants 2, 3, and 6 from locations that were reviewed and agreed upon by the MDEQ. The vast majority of the soil sample results (85%) were below Part 201 Criteria. The groundwater results, excluding metals, indicate 90% are below criteria. However, due primarily to the site-wide distribution of manganese, 65 of the 77 groundwater samples exceed criteria for one or more metals. Additional discussion regarding the occurrence of metals in soil and groundwater at the Site is provided below. As outlined in Section 1.1, the priorities of the investigation will be based on the Phase 1 results, in particular, the presence of vinyl chloride in bedrock, the LNAPL at Plants 2 and 3, hexavalent chromium at Plant 3, the site-wide distribution of groundwater impacts, followed by other areas with low-level detections of COCs in soil and groundwater.



2.1.2.1 VOCs in Bedrock

Vinyl chloride has been detected at bedrock well MW-04-02 on the western border of Plant 3 at a concentration that exceeds the Part 201 Drinking Water Protection (DWP) Criteria. Vinyl chloride and other CVOCs have also been detected in the deep overburden, just above bedrock on the northern portion of Plant 3 at wells MW-04-03 and MW-04-04. Vinyl chloride in bedrock in the Lansing area is well documented. There are two municipal wells located to the northeast of Plant 3 that have been impacted with vinyl chloride, as well as several other regional sources of vinyl chloride located to the northeast of the Site.

2.1.2.2 LNAPL

The LNAPL identified at Plant 2 at AOI 2-52 contained elevated levels (52 milligrams per liter [mg/L]) of PCBs, as well as hundreds of mg/L chlorinated ethanes such as 1,1,1-trichloroethane and 1,1-dichloroethane. The LNAPL also contains tetrachloroethene, 1,1-dichloroethene, and methyl cyclohexane in significant concentrations. The LNAPL likely acts as a continuing source mass for soil and groundwater impacts and will need to be handled as a Toxic Substance Control Act (TSCA) waste when removed. A TSCA-compliant interim measures work plan will be provided to the U.S. Environmental Protection Agency (EPA) (or to MDEQ if determined to be appropriate by USEPA), under separate cover based on the results of this investigation.

The LNAPL at Plant 3, located at AOI 3-9, contains PCBs at a concentration of 0.7 mg/L. A sample of the LNAPL was collected in February 2012 and submitted for analysis of VOCs. Similar to the Plant 2 LNAPL, the Plant 3 LNAPL contained elevated concentrations of the chlorinated ethanes 1,1,1-trichloroethane (464 mg/L) and 1,1-dichloroethane (11 mg/L), as well as methyl cyclohexane (7 mg/L) and xylenes (8 mg/L).

2.1.2.3 VOCs

Other VOCs detected in soil and groundwater at the Site are associated with former tank vaults on Plants 2, 3, and 6 as well as various sources identified throughout the central portion of Plants 2 and 6, collectively referred to as "Area 5" (Figure 9). Area 5 is impacted with 1,4-dioxane, BTEX (benzene, toluene, ethylbenzene, and xylenes), and other CVOCs in both soil and groundwater. To date, 1,4-dioxane has not been detected in groundwater above Part 201 Criteria and criteria exceedances for BTEX and CVOCs appear to be localized around specific source areas.



2.1.2.4 SVOCs

The SVOC results for soil and groundwater indicate sporadic low-level detections of SVOCs across the Site, generally co-located with other COCs. Many of the SVOCs detected include typical degraded petroleum components such as anthracene, phenanthrene, fluoranthene, and the benzo compounds (e.g., benzo(a)anthracene, benzo(b)fluoranthene, etc.), but also various phthalates and phenols. Of the 77 groundwater samples collected as part of the Phase 1 investigation, none of them exceeded Part 201 Drinking Water (DW) Criteria and only two of them exceeded the GSI Criteria. Similarly, of the 285 soil samples collected at the Site, one exceeded the DWP Criteria, one exceeded the Direct Contact Criteria, and seven exceeded the GSI Protection Criteria. Based on these results, it does not appear that SVOCs are a significant driver of risk at the Site. SVOCs will be routinely analyzed during the assessment stage of the Phase 2 investigation and the results will be used to determine if additional SVOC sampling is required during the later stages of the investigation.

2.1.2.5 Metals

Manganese has been detected in groundwater at a concentration above the DW Criteria (50 micrograms per liter [$\mu\text{g/L}$]) in 59 of the 77 groundwater samples collected during the Phase 1 investigation. Of the 77 groundwater samples collected during the Phase 1 activities, only 4 were collected from perched zones described as saturated fill material. Of those four samples, 3 exceed criteria for manganese in groundwater. The data set for groundwater in fill is limited, but the Phase 1 data suggests that manganese occurs in both native and fill materials at the Site. Manganese (and other metals) will continue to be collected as a COC during the Phase 2 investigation. The larger dataset will be used to determine if manganese is a Site related or primarily background issue at the Site.

Other metals, primarily consisting of arsenic, lead, silver, vanadium, and antimony, also exceed criteria at the Site. Whereas manganese appears to be naturally elevated in groundwater, arsenic, lead, silver, vanadium, and antimony appear to be co-located with other COCs:

- Arsenic and lead exceed DW Criteria at over 20 locations each (20 and 22, respectively) and are primarily associated with the VOC impacts in Area 5, the former underground storage tank (UST) vault in Area 7, the electroplating processes at Area 14, and the LNAPL in Area 17.



- Silver and vanadium each exceed DW Criteria at 11 locations and are similarly located within Area 5 (subareas 5-6, 5-7, and 5-8) and the former UST vault in Area 7. Area 1, a former UST vault at Plant 2, also has silver above criteria.
- Antimony exceeds DW Criteria at 7 locations located within Area 5 (subareas 5-6, 5-7, and 5-8).
- Other metals that exceed criteria in groundwater include selenium (3), mercury (1), total chromium/hexavalent chromium (2/1), and boron (3).
- Metals that *did not* exceed Part 201 Criteria in groundwater during the Phase 1 investigation include beryllium, cobalt, nickel, thallium and zinc.

In the DEQ review of the Phase 1 Activities Summary Report for the Site, it was noted that the Generic Residential Part 201 Particulate Soil Inhalation Criteria (PSIC) Criteria was used for comparison to the site data. In addition, it was noted the non-residential PSIC should be used for comparison to Site data if it is more restrictive than the residential criteria (e.g. manganese). The more restrictive PSIC criteria, as suggested, for comparison to the Phase 2 data will be used. As the Phase 2 investigation progresses the PSIC source area modifier will be scaled to the size of the individual identified sources for metals, as appropriate.

A much smaller percentage of soil samples exceed criteria for metals. Of the 285 soil samples collected during the Phase 1 investigation, only 30 exceed Part 201 Criteria for metals. Of those, 12 exceed criteria for manganese; mostly scattered throughout the extent of Area 5. Additionally, 5 samples exceed for arsenic, no samples exceeded criteria for lead or silver, one sample exceeds for vanadium and 2 samples in Area 5-7 exceed criteria for antimony. Selenium, the most common metal exceedance, exceeds criteria in 13 soil samples scattered across all three plants.

The majority of the elevated metals in soil do not appear to be focused around a specific source area suggesting that in some cases elevated metals in groundwater (e.g. arsenic) may be related to reducing conditions created by other COCs in groundwater that liberates metals from the soil matrix. Metals that did not exceed criteria in Phase 1 soil samples include barium, beryllium, silver, lead and zinc.

During the assessment stage of the investigation, there are only a few areas where metals in soil and groundwater will actually drive the placement of soil borings (e.g. areas 14, 19 and 20). In areas where Phase 1 soil or groundwater samples have



indicated elevated metals, samples collected during Phase 2 in those areas will be submitted for metals analysis. The results of this sampling will be used to help determine if additional investigation needs to be completed for metals in some areas during the characterization phase. The Matrix provides a list of target COCs to be analyzed for each investigation area.

In the former electroplating area at Plant 3 (Area 14), hexavalent chromium was detected in perched groundwater at well CH-14-RO at a concentration of 28.4 milligrams per liter (mg/L). Historical soil borings completed in the electroplating area suggest a relatively focused hotspot in shallow soil for total chromium. Monitoring well CH-14-RO is located in the center of this hotspot. Elevated metals including arsenic, manganese and total chromium, have also been detected in the deep overburden aquifer above Part 201 Criteria. However, a groundwater sample from well MW-91-2 collected in February 2012 indicates hexavalent chromium is not present in the deep overburden aquifer.

2.1.3 Updates to the Conceptual Site Model

As the Phase 2 investigation progresses, the CSM will be continually updated as new information becomes available. The additional data will provide an improved understanding of geology/hydrogeology, potential pathways of exposure, potential receptors, and COCs. The goal is to develop the CSM through constant iteration and refinement based on the new data. During the course of the investigation, the CSM will become less qualitative and more quantitative in nature. An illustration of the CSM refinement process is provided as Figure 31.

3. Data Quality Objectives and Investigation Methods

This section defines the DQOs and methods for soil, groundwater, and soil type characterization. DQOs are a process that evaluates the goals of the investigation and identifies what methods and approaches will provide the level of data needed to make accurate decisions about the site conditions. For example, at an area where the goal is to understand the overall size of the VOC-impacted hotspot, actual concentrations are less important than reliably differentiating high concentrations from low. Therefore, hotspot mapping using the mobile lab in screening mode is appropriate for our decision-making. In contrast, delineating areas of the Site to meet Part 201 criteria requires fully quantitative methods that are appropriate for delineation, such as NELAP-certified mobile lab or fixed lab analysis. In the example, the primary

difference between screening and delineation is the measure of quality control/quality assurance (QA/QC) that accompanies the testing.

3.1 Data Quality Objectives Summary

This section summarizes the DQOs, which provide a framework for planning the Phase 2 investigation. In Section 1.1, six investigation priorities/goals were presented; each of the six investigation goals has different DQOs, as illustrated in the following table:

Objective #	Description	Screening-Level Data/Delineation-Level Data	Adaptive/Fixed Locations
1	Investigation of bedrock groundwater.	Delineation-level	Fixed network initially, adaptive network if additional work is required
2	Investigation of LNAPL and evaluation for potential DNAPL at Area 5.	Screening-level	Adaptive
3	Investigation of hexavalent chromium in soil and groundwater at Plant 3	Screening-level (GW), delineation-level (Soil) applied as needed to define edge of impacts	Adaptive
4	Investigation and mapping of the site-wide groundwater conditions.	Screening-level, delineation-level applied if needed to define edge of impacts	Fixed network initially, adaptive network if additional work is required
5	Investigation of areas with detections of compounds less than criteria. Confirmation of whether soil or groundwater is above criteria in these areas.	Delineation-level	Fixed network initially, adaptive network if additional work is required
6	Delineation of groundwater impacts at the site.	Delineation-level	Fixed

As the table illustrates, some of the investigation objectives will be met using screening-level data and other objectives will be met using delineation-level data. Similarly, some objectives will be met using a fixed sampling network, and other objectives will have an adaptive sampling approach. The remainder of Section 3 describes the field methods (screening-level and delineation-level) and the DQO associated with the application of the field method.



3.2 Soil and Groundwater Methods

Four methods will be used at the Site to evaluate soil and groundwater conditions: a mobile lab, an off-site lab, a colorimetric kit, and laser-induced fluorescence. Each one of these methods meets a different DQO:

Method	Screening-Level	Delineation-Level	Compounds
Mobile Laboratory	X	X	VOCs only
Off-site Laboratory	-	X	VOCs, SVOCs, metals, PCBs
Colorimetric Kit	X	-	Hexavalent chromium in GW only
Laser-induced fluorescence	X	-	NAPL mapping only

As demonstrated in the table above, VOCs and hexavalent chromium are the only targets that will have screening-level methods applied. All samples for SVOCs, other metals, and PCBs will be analyzed using delineation-level methods. The screening-level methods for VOCs and hexavalent chromium will only be applied to evaluate if the goal is distinguishing high concentrations from low concentrations. When the goal is establishing delineation of impacts to meet Part 201 criteria, VOCs and hexavalent chromium will be analyzed by the delineation-level method (either mobile lab or off-site lab). The following sections describe the four different methods selected for evaluating soil and groundwater conditions at the Site.

3.2.1 Mobile Lab

An on-site mobile lab will be used to analyze for VOCs in soil and groundwater using method EPA SW846 Method 8260 (gas chromatography/mass spectrometry [GC/MS]) with a solid phase micro extraction (SPME) technique. The laboratory will be operated by Stone Environmental of Montpelier, Vermont. Stone Environmental has NELAP certification for analysis of VOCs by the SPME and GC/MS method. Because the lab has NELAP certification, the data provided by the lab are quantitative and can be used for both distinguishing high concentrations from low (screening-level mode) and establishing delineation of impacts to Part 201 criteria (delineation mode). For additional information on the SPME method, refer to Appendix A.



3.2.1.1 Mobile Lab: Data Quality Objectives Summary

The mobile lab approach is applicable for *both* areas where screening-level data *and* delineation-level data are required. There is little difference between the two operation modes; the mobile lab always provides quantitative data; however, when the lab is in screening-level mode, it can run more samples per day relative to delineation mode. When the lab is in delineation-level mode, samples are run through the same GC/MS with SPME, but the lab will run additional QA/QC samples as confirmation checks during the day's analysis. Additional information on the sample splits and QA/QC of the mobile lab is provided in Section 4.5.1.

3.2.2 Off-Site Laboratory Samples

Soil and groundwater sample analysis at the off-site laboratory will use the following methods, in accordance with the QAPP:

- Target Compound List (TCL) VOCs - EPA Method 8260B
 - Including 1,4-dioxane - EPA Method 8260B SIM
- TCL SVOCs - EPA Method 8270
- TAL Metals - EPA Method 6010B/7470A
- PCBs - EPA Method 8020

3.2.2.1 Off-Site Lab: Data Quality Objectives Summary

The off-site lab will provide delineation-level data for evaluating the soil and groundwater results. Samples will also be run at the off-site lab to calibrate and assess the performance of field screening methods.

3.2.3 Groundwater Colorimetric Kit

Areas with hexavalent chromium groundwater impacts that require evaluation will be field screened using a colorimetric method. The colorimetric kit contains a compound that reacts with hexavalent chromium to form a purple color with intensity proportional to the concentration of hexavalent chromium in the sample. ARCADIS plans to use a pocket colorimeter and ChromaVer3® powder pillows developed by the Hach Company to complete the field screening.

3.2.3.1 Groundwater Colorimetric Kit: Data Quality Objectives Summary

The colorimetric kits are a field-screening approach that will provide data to determine step-out locations in real-time; every groundwater sample will also be submitted for off-site laboratory analysis. The field kits have a range of 0.01 to 0.7 mg/L. Samples with concentrations less than this range will not form a purple color. If a sample is run and has a concentration higher than 0.7 mg/L, then it will be diluted in the field with deionized water and re-run to evaluate the approximate concentration. As the colorimetric kits are a field-screening approach, they will be subjected to an initial stage of calibration to ensure they will operate correctly at the Site. See Section 4.6.2 for details on the calibration procedures for the colorimetric approach. Refer to Appendix B for details on the field procedures that will be used with the colorimetric kit.

3.2.4 LNAPL Characterization – Laser-Induced Fluorescence

The extent of LNAPL within the soils at Plants 2 and 3 will be determined using the principle of LIF. The LIF tool will be advanced into the soil using direct-push drilling techniques. LIF allows for rapid and high-resolution assessment of LNAPL impacts. LIF technology is based on fluorescent properties of polynuclear aromatic hydrocarbon (PAH) compounds, which are found in the complex hydrocarbon mixtures that make up petroleum products. When PAHs are excited by the focused energy of a pulsed laser, they release photons that can be detected using a fluorometer. The magnitude (strength) of the fluorescence is related to the LNAPL saturation within the soil/aquifer matrix. Petroleum constituents present in groundwater in dissolved-phase are not sensed by LIF. This specificity is an advantage that allows for very accurate vertical and horizontal characterization of gross contamination in source areas. LIF can be used to delineate/define the extent of a wide range of petroleum products present in the subsurface as LNAPL, including gasoline, diesel fuel, lubricating oil, hydraulic oil, jet fuel, aviation fuel, and petroleum distillates.

LIF may also provide semi-quantitative data on NAPL composition. The UVOST and ROST LIF tools developed by Dakota Technologies capture the fluorescent response of four different light wavelengths (typically 350, 400, 450, and 500 nm). The relative degree of fluorescence for each wavelength is plotted as a “waveform.” The shape of the waveform is dependent on the PAH mixture within the LNAPL. The type of LNAPL sensed by the LIF can be inferred by comparing the waveform shape to waveforms from calibration standards of typical petroleum mixtures. However, a confirmation LNAPL sample submitted for fingerprinting analysis is required for absolute NAPL identification. For an example of output from LIF, please see Appendix C.



3.2.4.1 LIF: Data Quality Objectives Summary

LIF will provide high-resolution screening-level data for LNAPL at the Site. The LIF survey is intended to determine the target footprint that defines the lateral extent of LNAPL at Plants 2 and 3. See Section 4.6.3 for details on the calibration procedures for LIF.

3.3 Geology and Permeability Mapping

The site geology and permeability will be characterized using two methods: continuously logged soil borings and the Geoprobe® Hydraulic Profiling Tool (HPT).

3.3.1 Soil Borings

To map the subsurface geology, each soil boring will be continuously cored to the total depth drilled. Following collection of samples for field screening or quantitative analyses, each core will be classified in accordance with the soil logging procedures described in the FSP (ARCADIS 2011a).

3.3.2 Hydraulic Profiling Tool

The investigation will utilize a Geoprobe® Hydraulic Profiling Tool (HPT) to map the hydrostratigraphy of the Site using relative permeability. Refer to Appendix D for the manufacturer description and SOP on HPT operation. A special tool attached to the end of a Geoprobe® drill string enables continuous metered injection of small volumes of water (50 to 300 milliliters per minute) during advancement of the probe. At the same time, the fluid backpressure caused by the injection into the formation is measured and logged continuously along with the flow data. After correcting for equipment head losses, the flow and pressure data are plotted as a relative permeability (or hydraulic conductivity) curve by recognizing that hydraulic conductivity (K) is the proportionality constant of the flow/pressure ratio. The flow and pressure data provide a relative measure of permeability that is comparable within the vertical profile of each sounding as well as between soundings at a given site.

HPT is an excellent way to locate and characterize the interbedded water-bearing silt and sand seams at Plants 2 and 6. HPT is less useful at Plant 3 where the overburden is mostly unsaturated with only 10 to 15 feet of saturated sands located immediately above bedrock. HPT will be used at Plants 2 and 6 to map the relative permeability



and target zones for groundwater sampling. Groundwater sample intervals at Plant 3 will be selected based on the soil descriptions provided by the field geologist.

3.3.2.1 HPT: Data Quality Objectives

The HPT provides relative data that identifies zones of higher and lower permeability. The HPT will be subjected to a calibration procedure to ensure it can reliably discriminate between zones of lower permeability (silts and clays) and zones of higher permeability (sands and gravels). As part of the calibration process for HPT, soil samples will be collected for sieve analysis to verify HPT is able to distinguish the zones of higher and lower relative permeability. See Section 4.6.4 for details on the calibration process for HPT.

3.4 Drilling Methods

Borings will be drilled using either a Geoprobe® 7000 series or 8040 series direct-push drilling rig operated by a state-licensed contractor. In general, all of the shallow vadose zone borings less than approximately 30 feet in depth will utilize the 7000 series Geoprobe. The HPT/VAP and deep soil borings will use the 8040 series probe.

Continuous soil cores will be collected from each boring to the total depth drilled using a dual-tube system. A dual-tube system will be employed in all areas of the Site to minimize the potential for vertical migration of any mobile fraction of COCs encountered during drilling. Dual-tube systems employ an outer 3.25 inch drive casing with separate inner rods and sample barrel containing an acetate liner for soil core collection. The outer drive casing and inner sample barrel will be simultaneously advanced into the soil column in 5-foot increments via a hydraulic ram or pneumatic hammer. Upon completion of a specific drive interval, the inner sample barrel containing the soil core will be retrieved while the outer casing is left in place to act as a temporary conductor casing to protect the integrity of the borehole. A clean sample barrel will then be lowered into place within the outer drive casing, and the process will be repeated until the total depth of the borehole is reached.

The outer casing and inner core barrel are advanced together during drilling. The outer casing remains in place and creates a seal along the total depth of the borehole. Upon completion, if the borehole is completed in unsaturated vadose soils, bentonite pellets or bentonite grout will be added to fill the outer casing. Once full, the casing will be retracted and periodically topped off with additional pellets or grout to assure a proper seal from the ground surface to the total depth of the borehole. If the boring penetrates



a perched zone or is completed to a depth extending below the water table, a tremie line will be used to deliver grout from the bottom up so as to displace any water trapped within the outer casing. Once the outer casing is full of grout, the casing will be extracted and periodically topped off with grout as needed to create a good seal.

The HPT tool is driven into the formation without an outer casing so that the tool has an uninterrupted connection with the surrounding soils. Therefore, upon completion of the HPT, an expendable drive-point and drilling rods will be driven to the total depth of the borehole. Grout will then be pumped through the rods as they are slowly retracted thereby sealing the borehole.

4. Investigation Strategy

This section of the work plan describes how the investigation will be executed to meet the investigation goals and DQOs using the field sampling methods defined in Section 3. Although several tasks will be proceeding in parallel at any given time during the investigation, the priorities of the investigation sequence will be consistent with those listed in Section 1.1. The results of the assessment phase will be reviewed with RACER and the MDEQ at regular intervals prior to proceeding with the characterization and delineation stages of the investigation. The communication plan is provided as Section 6.

4.1 Initial Approach and Rationale

During the assessment phase, additional work in each investigation area will be guided by the RFI Phase 1 data collected from soil borings and existing monitoring wells, and in part by historical work that was completed at the Site. While each area will be investigated using the methods outlined in Section 3, the approach and sequencing of work at each area will be different, as each investigation area has a unique combination of COCs, soil and/or groundwater impacts, areal extent, and relative risk related to the Site as a whole. A detailed summary of each investigation area is provided on the Matrix.

The basic goal of the RFI Phase 1 investigation was to collect a limited amount of soil and/or groundwater data from AOIs across the Site to determine if a release had occurred related to the previous site operations. Samples were submitted for VOCs, SVOCs, metals, and PCBs. The results of the Phase 1 fell into several general categories. The Matrix is color coded to indicate which of the below categories is most applicable:



- Soil sampling indicated that COCs are not present in the AOI above laboratory method detection limits. This result indicates no further action is necessary to assess the AOI.
- COCs were identified in soil or groundwater, but (with potential exception for metals) at concentrations below the most restrictive MDEQ Part 201 Criteria (indicated in green on the Matrix).
- Soil and/or groundwater impacts were identified at a concentration that exceeds applicable Part 201 Criteria (indicated in yellow on the Matrix).
- Soil and groundwater sampling, often combined with historical data, has identified a source of COCs that are likely contributing to groundwater impacts beneath the Site (indicated in red on the Matrix).

Based on the Phase 1 dataset, the Site was divided into investigation areas that encompassed one or multiple AOIs. These investigation areas are identified on the Matrix and included on Figures 2 and 3. Based on the potential results outlined above, several approaches will be taken to assess each area:

- If a soil boring identified COCs, but at a concentration below criteria, additional borings will be completed around the Phase 1 or historical boring(s) to assess if the impact is related to a potential larger source of COCs in soil. If the results of the step-out borings indicate a potential source in soil above criteria, then contingency allows for the completion of a VAP boring if appropriate from the standpoint of a site-wide assessment of groundwater.
- If Phase 1 borings or historical data indicate soil or groundwater impacts above criteria, step-out borings are planned to better define the soil impacts. If the impacts are not vertically defined or are known to impact groundwater, a VAP boring will be completed in the area to vertically define the source zone.
- If at any time perched groundwater is encountered at step-out soil boring locations, within the fill material or otherwise at shallow depths above the till, a groundwater sample will be collected prior to advancing the soil boring the remaining distance through the vadose zone.
- If an area is an obvious source of COCs such as the LNAPL areas identified at Plants 2 (Area 5-1) and Plant 3 (Area 17), or the high concentrations of hexavalent

chromium in groundwater identified at Plant 3 (Area 14), then tools such as LIF (in the case of LNAPL) or additional soil and groundwater sampling will be completed to characterize the distribution of the source mass. Groundwater in both the perched zone (if applicable) and underlying deeper groundwater zones will be sampled at high resolution (e.g., nominal 5-foot intervals) to characterize the extent of groundwater impacts.

- Additional VAP borings, not necessarily related to specific impacts identified in the Phase 1 investigation, are planned around known source areas such as the LNAPL areas and hexavalent chromium impacts to better characterize potential groundwater impacts on a site-wide scale. Additional VAP borings will also assist in defining the horizontal extent of groundwater impacts and verify contaminant migration direction.

Data collected during the assessment stage will be used to plan the characterization phase of the investigation. The expanded dataset will allow for optimization of the COC list and a focused, adaptive investigation strategy for identified source areas. Consistent with the communication plan in Section 6, the goal is to establish a consensus of the areas requiring additional work and a plan for its implementation.

The above rationale does not necessarily apply to all metals exceedances in soil and groundwater. As outlined in Section 2.1.2 there are widespread elevated levels of manganese in groundwater at the Site and step-out soil borings for every manganese exceedance would not be practical. However, as outlined in Section 2.1.2, several of the metals detected at concentrations above Part 201 Criteria (arsenic, lead, antimony, vanadium and silver) appear to be co-located with the occurrence of other COCs. Therefore, soil and groundwater samples from these areas will be submitted for metals analysis. The Matrix includes a list of the COCs to be targeted for each investigation area. Based on the expanded metals dataset, the characterization stage of the investigation will be focused to assess only those metals associated with overall risk at the Site.

4.1.1 Risk Assessment

Following the Phase 2 investigation assessment and characterization stages, a thorough risk assessment will be completed to determine the applicable exposure pathways associated with the identified soil and groundwater impacts. Exposure pathways will be dependent upon the results of the investigation and the potential use of the property; both of which are currently undetermined. Based on the risk



assessment, additional characterization may be required to assess specific exposure pathways such as soil gas migration, offsite groundwater and/or utility corridor migration. A plan for the pathway analysis investigation will be completed as part of the “pre-design” phase leading up to the Site remedy planning and implementation. The plan will be discussed with RACER and the MDEQ at that time.

4.2 Sequencing of Work

The goal of the work sequence will be to assess the potential for “game changers” (e.g., DNAPL, bedrock impacts, etc.) in known source areas first before spending undue amounts of time and effort on areas deemed a lesser priority. As discussed above, the Matrix includes a color coding (green, yellow, and red) that indicates the general categories of the Phase 1 investigation results. The color code can also be used as a general indication of investigation priority; red indicates the highest priority areas and green the lowest. In general, the work sequence will be completed as follows:

- Sentinel bedrock monitoring wells will be installed at the Site in March 2012 to help define and monitor the presence of vinyl chloride in bedrock. All other Phase 2 work completed in the overburden is either directly or indirectly related to assessing further risk to the bedrock aquifer.
- The assessment stage of the investigation will begin with the LNAPL investigation at Plants 2 and 3 (Area 5-1 and Area 17, respectively).
- Following the LNAPL investigations, the investigation will proceed to the hexavalent chromium area at Plant 3 (Area 14).
- Beyond these high priority areas, the planned VAP and soil borings will proceed in parallel across the remainder of the Site.

4.3 Soil Sampling Network

The soil sampling grid in each investigation area will be based on the general size of the area and follow the general guidelines provided by the *MDEQ Sampling Strategies and Statistical Training Materials for Part 201 Cleanup Criteria* as it applies to source area investigation. The size of each area and the grid spacing are provided on the Matrix. Figures 5 through 30 depict only the initial prescriptive step-out locations. During the characterization stage of the investigation, the grid will be used to aid in the



visualization and placement of subsequent borings. The actual spacing of borings may change based on the investigation results, as outlined below. The step-out interval is calculated based on the following equations:

$$\text{small site} \quad \frac{\sqrt{A / \pi}}{2} = GI$$

$$\text{medium site} \quad \frac{\sqrt{A / \pi}}{4} = GI$$

$$\text{large site} \quad \sqrt{\frac{A \pi}{SF}} = GI$$

Where:

A = area to be grid (ft²)

GI = grid interval

SF = Site factor, length of area to be grid

Size of the area is defined as follows:

Small: < 10,000 ft²

Medium site: 10,000 to 100,000 ft²

Large site: >100,000 ft²

4.3.1 Adaptive Sampling Network

During the characterization stage of the investigation, if step-outs are deemed necessary to fully characterize a source zone, additional borings will be completed utilizing the step-out grid spacing identified on the Matrix. Step-out locations will be based on the sampling results as follows:

- If the step-out results are greater than the applicable criteria, advance one more grid interval.
- If the step-out results are 10X greater than the applicable criteria, advance two grid intervals.



- If the step-out results are greater than 100X greater than criteria, advance three grid intervals.

Throughout the adaptive boring location process, data from surrounding investigation areas or AOIs will be evaluated to determine if impacts from adjacent areas are merging or are distinct. If impacts are merging, then additional step-out locations will be considered only if they address the impacts from a site-wide holistic perspective.

4.4 Sampling Frequency for Soil

Vertical sampling intervals within a borehole will be selected based on the RFI Phase 1 soil analytical results for each investigation area as follows:

- If an area has detections of COCs below Part 201 Criteria and no indication of groundwater impacts, initial sampling will be completed at approximately 10-foot intervals throughout the vadose zone bias toward the results of field screening, if appropriate. At a minimum, in each boring one sample will be collected from the 0- to 2-foot interval, and one will be collected just above the water table.
- If the Phase 1 soil data suggest an area may be a source of COCs or otherwise the data exceed criteria for one or more COCs, soil sampling will be completed at nominal 5-foot spacing bias toward the results of field screening, if appropriate. Similar to the above, one sample will always be collected from the 0- to 2-foot interval, and one will be collected just above the water table.
- Saturated soil collection will only be employed in areas suspected as source zones for COCs. The analytical and sampling methods used to collect and analyze the saturated soil are the same as would be used for dry vadose zone soils. However, the DQOs for saturated soils are different. Saturated soils will be utilized as a general indication of "hot or not" in source areas and corrections for relative concentration will not affect the "screening level" decision based on the data. Therefore, a correction for dry weight will not be completed on saturated soils.

The sample frequency is included on the Matrix. Each area is classified as either "normal" for nominal 10-foot spacing or "high-resolution" for nominal 5-foot spacing.



4.5 Sampling Frequency for Groundwater

VAP groundwater sampling will be completed in two types of areas: 1) in an area associated with a suspected soil source, or 2) in an area based on the site-wide groundwater characterization effort. If a permeable zone is identified during the initial HPT or soil boring, the zone will be targeted for groundwater sampling. In suspected source areas where groundwater availability is limited by the permeability of the formation (i.e., Plants 2 and 6), saturated soils will be collected in addition to the groundwater samples. This approach is best suited for source area concentrations due to soil matrix interference effects, which increase detection limits compared to groundwater; however, the method will provide reliable measure of groundwater impacts within the saturated low permeability sediments.

For investigation areas where there is an apparent source contributing to groundwater impacts, the following steps will be taken:

- At Plants 2 and 6, aquifer permeability will be mapped using an HPT sounding advanced to bedrock. At Plant 3, due to the thick vadose zone and relatively thin saturated zone, standard soil descriptions will be used in place of HPT to select groundwater sampling intervals. Selected intervals will be biased to stratigraphic breaks and high permeability zones, as appropriate.
- A second boring will be advanced adjacent to the first and groundwater and/or saturated soil samples will be collected throughout the saturated zone at approximately 5-foot intervals and submitted for laboratory analysis.

For VAP boring locations where the objective is site-wide plume characterization and there is no indication of a specific source, the following steps will be taken:

- The aquifer permeability will be mapped at an initial location using HPT at Plants 2 and 6 and soil descriptions at Plant 3.
- A second soil boring will be advanced adjacent to the first boring to collect groundwater samples from permeable intervals identified with the HPT data. Groundwater samples will be collected at nominal 10-foot intervals throughout the overburden. Sample intervals may be limited on Plants 2 and 6 by the clay-rich soils.



For each groundwater sample interval, a Geoprobe® screen point sampling device will be attached to drive rods and advanced to the target depth via a direct-push drilling methods. Once at the desired depth, the drive rods will be retracted to expose 1 to 4 feet of the screen contained within the sampling device. The exact length of screen to be exposed will be dependent upon the thickness of the targeted permeable interval.

Groundwater samples will be collected at the Site with a reciprocating Waterra pump, or equivalent. A minimum volume of water equal to the volume water within the sample tubing will be purged prior to sample collection. An effort will be made to retrieve a sample that is relatively free of fine-grained material; however, samples submitted for metals, SVOC, or PCB analysis will be field-filtered. If after 30 minutes has elapsed, there is insufficient groundwater in the drill string to collect a sample, the interval will be skipped and no groundwater sample will be collected. In this case, if the VAP is in a location suspected to be a source area, a saturated soil sample will be collected.

4.6 Calibration of Field-Screening Approaches

The investigation methods described in Section 3 will have a calibration process to confirm the method will work for the site-wide investigation. The following sections discuss the calibration procedures for the mobile lab, colorimetric, and HPT methods.

4.6.1 Mobile Lab for VOCs

The mobile lab will operate in two modes: screening-level and delineation-level (NELAP-certified). As discussed in Section 3, the mobile lab approach is applicable for **both** areas where screening-level data **and** delineation-level data are required. There is little difference between the two operation modes; the mobile lab always provides quantitative data. When the lab is in screening-level mode, it can run more samples per day. Both the screening-level and delineation-level modes will be subjected to a calibration and QA/QC process to confirm the results. A graduated split rate will be used for both modes, with a higher initial split rate that will establish a correlation, and a lower split rate once the correlation is confirmed:

- When the lab is operating in screening mode, 10% of the first 100 samples will be submitted for off-site confirmation.



- After these samples have been analyzed, ARCADIS will analyze the results and reduce the remaining split rate to 5% if the mobile lab data correlate well to the off-site lab data.
- When the lab is operating in NELAP-certified, quantitative mode, 10% of the first 100 samples will be submitted for off-site confirmation.
 - After these samples have been analyzed, ARCADIS will analyze the results and reduce the remaining split rate to 5% if the mobile lab data correlate to the off-site lab data.

To evaluate the mobile lab performance ARCADIS will assess the effectiveness of the mobile lab relative to the DQOs of the investigation. In some investigation areas the goal is to understand the overall size of the VOC-impacted hotspot, and at other areas the goal is to delineate concentrations to meet Part 201 criteria. These two goals have different DQOs. In the first example the actual concentrations are less important than reliably differentiating high concentrations from low. In the second example the results need to be appropriate for delineation of lower concentrations. Therefore, each of these data quality objectives will be evaluated independently.

To determine whether the mobile lab results are meeting the DQOs, the data will be compared with the off-site laboratory split sample results. The data sets will be subjected to a non-parametric test that focuses on whether the mobile lab data leads to the same decision as the off-site lab data. For example, consider a case where a hotspot is being delineated and additional delineation is needed when a concentration is greater than 1 part per million (ppm). If a sample has an off-site lab concentration of 3 ppm and the mobile lab has a concentration of 5 ppm, the mobile lab meets the DQOs because the same decision is made for additional sampling, even though the magnitude of the concentrations from the two methods differs. The split rate for VOC samples will be reduced to 5% if the decision regarding additional screening or delineation is in agreement 90% of the time.

4.6.2 Colorimetric Kit for Hexavalent Chromium in Groundwater

The calibration of the colorimetric approach for screening hexavalent chromium in groundwater will take place prior to implementing the full scope of work in the chromium plating area:



- During the assessment phase of the investigation, groundwater samples will be collected from monitoring well CH-14-RO and from several step out locations near monitoring well CH-14-RO in the plating area and analyzed using the colorimetric method as well as submitted for laboratory analysis.
- The off-site laboratory analysis will include the full suite of metals in addition to chromium and hexavalent chromium, to evaluate potential interferences from other metals.
- The off-site lab data and the colorimetric data will be evaluated in the context of decision endpoints. The analysis will focus on determining how often the colorimetric and off-site lab data lead to the same conclusion for stepping out or not.

If comparison of the colorimetric results to laboratory samples leads to the same decision 90% of the time, then the remaining work completed as the characterization phase in Area 14 will utilize the colorimetric kit to screen groundwater samples. If the laboratory analysis does not correlate to the colorimetric kit results, then the colorimetric kits will not be used at Area 14, and all groundwater samples from the area will be submitted for laboratory analysis of hexavalent chromium.

4.6.3 LIF

The LIF response will be confirmed in several ways:

- Samples of the LNAPL from Plants 2 and 3 were sent to Dakota Technologies in March 2012 to verify the applicability of UVOST for the target LNAPL types. This laboratory calibration verified UVOST is applicable and ideal response curves were provided for comparison to the LIF logs produced at the Site.
- Initial LIF borings at Plants 2 and 3 will be completed adjacent to monitoring wells currently impacted with LNAPL (Plant 2: SB-37, Plant 3: UNK-14). This will provide an LIF response in an area known to be impacted with LNAPL for comparison to other LIF logs.
- The LIF data can also be compared to planned step-outs in the LNAPL areas (step-out borings will be completed first). Several LIF borings will be complete adjacent to appropriate step out boring locations. Samples will be collected from



impacted zones during the step-out soil sampling to provide a basis of comparison to the LIF results.

- One LIF boring in the LNAPL area with a positive LIF response will be re-advanced directly next to the original boring to evaluate the potential for local heterogeneity of the LNAPL distribution.

If the calibration results suggest LIF is not an efficient way to characterize the LNAPL distribution, or data suggests the LIF results are misleading (i.e. false positives), then LIF will be discontinued and the LNAPL distribution will be assessed with traditional drilling, field screening and sampling methodology.

4.6.4 HPT

HPT data will be confirmed using data from adjacent soil borings to verify the utility of the instrument response to the site-specific geology. During the initial stage of work, the HPT will be calibrated by comparing the HPT flow and pressure data to adjacent soil boring logs and sieve data. 10% of the HPT soundings will have sieve data collected from the adjacent soil boring. Sieve data will be collected at nominal 5-foot vertical intervals and at significant changes in stratigraphy. The HPT data will be plotted next to the sieve data, and, if HPT can distinguish zones of higher relative permeability from zones of lower relative permeability, then HPT will continue to be applied. However, if the HPT is not able to distinguish meaningful changes in soil types that are controlling contaminant transport, then HPT will be discontinued, and other methods will be used to map the aquifer stratigraphy (e.g., cone penetrometer testing, logged borings with sieve analysis, etc.).

Based on the results and utility of HPT determined during the assessment stage of the investigation, select water-bearing zones will be targeted during the characterization stage for hydraulic conductivity testing. The hydraulic conductivity can then be compared to the HPT profile to provide confirmation of the HPT response.

4.7 Data Management Plan

This section outlines the data management plan that will be used to organize and manage the soil, groundwater, and geologic data collected during the RFI Phase 2 investigation.



4.7.1 Sample Naming

Sample naming used during the investigation will be consistent with the approach described in the FSP, with minor modification to include the grid cell from which the sample is collected. The form for all sample IDs will be as follows:

“SAMPLE TYPE”-“AREA DESIGNATION”-“GRID CELL ROW AND GRID CELL COLUMN”_“SAMPLE DEPTH”

Sample types will include:

- VAP for vertical aquifer profile groundwater samples
- SB for soil borings
- HPT for hydraulic profiling tool locations

For example, a vertical aquifer profile sample of groundwater at 50 to 52 feet below ground surface from Area 2 from grid row GGG and grid column 72 would have the sample ID “VAP-A2-GGG72_50-52.”

4.7.2 Electronic Data Management

Data will be managed in an electronic format throughout the investigation. Depending on the type of data, different data management approaches will apply:

- Data from the mobile lab and off-site lab will be provided in EDD format. The same approach for managing analytical data will be applied as in the Phase I; for additional details, please refer to the approved FSP and QAPP.
- Data from the LIF and the colorimetric kit will be emailed from the field to the office to make real-time decisions. At a minimum, data will be emailed at the end of each day.
- Geologic data (HPT logs, soil boring logs) will be emailed at the end of each day to the project team. The project team will upload these data into the project database for geologic data to allow querying, soil boring log generation, etc.



5. Schedule

ARCADIS and RACER have outlined an aggressive schedule for the completion of the Phase 2 investigation. Proposed dates for the major investigation components are identified below; please note all dates are proposed and the actual dates will depend on a number of factors, including MDEQ approval to start work, subcontractor availability, and the findings of the assessment stage of the investigation (game-changers, unexpected source mass, etc.).

- March 16, 2012: Presentation of Phase 2 investigation work plan to MDEQ
- April 15, 2012: MDEQ approval of work plan preferred on or before this date
- May 1, 2012: Assessment stage begins
- July 1 to July 15, 2012: Characterization stage begins
- August 15 to September 1, 2012: Delineation stage begins
- November 2012: Pre-design studies and Risk Assessment
- Spring 2013: Remedial Investigation Report & Focused Feasibility Study

6. Communication Plan

This section identifies a communication plan for keeping the MDEQ apprised of the project progress. Because of the aggressive schedule discussed in the previous section, a clear communication plan for evaluating results with the MDEQ is critical. ARCADIS will conduct a combination of milestone and bi-weekly reviews with the MDEQ to evaluate the status of the investigation. Milestone reviews will occur after the assessment stage and the characterization stage, and bi-weekly reviews will occur during the characterization stage. Additional work will not be completed at the Site until all parties are in agreement with the proposed path forward. Agreement from each party will be provided in the form of a response to a summary email distributed following each investigation review.

6.1 Assessment Stage Milestone Review

After completing the fixed scope of work for the assessment stage, ARCADIS will meet with the MDEQ to review the investigation results. The goal of the assessment stage is to evaluate the known or suspected source areas and areas where the Phase 1 sampling identified soil or groundwater impacts. Prior to the milestone meeting



summary figures and tables will be provided to the MDEQ for review and discussion. Summary figures will include graphical representations of contaminant distribution in soil and groundwater, as well as updated depictions of the Site geology and the overall conceptual site model. During the assessment stage milestone review, ARCADIS will present the investigation results and classify the areas sampled based on the sampling results. Areas with no detections above criteria will be proposed for no further action, while areas with detections above criteria will advance to the characterization stage. The matrix will be used to track the status of each investigation area.

6.2 Characterization Stage Bi-Weekly Review

Because the characterization stage is adaptive, more frequent meetings are needed to communicate the investigation results. The Phase 2 investigation findings, including analytical data, LIF, HPT and soil boring logs will be transmitted to the MDEQ regularly during the characterization phase of the investigation. The plan is to engage the MDEQ in the decision making process as the investigation progresses. Direct MDEQ involvement with the adaptive characterization planning will be a key to completing the delineation of each investigation area.

ARCADIS will meet with the MDEQ on a bi-weekly basis to review the current results of the characterization sampling, and confirm that the proposed adaptive strategy meets MDEQ approval. To make these meetings more efficient, ARCADIS will conduct them using a web-based video conference that interactively presents the investigation sampling results.

6.3 Characterization Stage Milestone Review

After completing the adaptive scope of work for the characterization stage, ARCADIS will meet with the MDEQ to review the investigation results and plan the delineation stage. While the bi-weekly reviews for the characterization stage focused on individual areas, the characterization stage milestone review will take a site-wide focus of conditions. As outlined above, prior to the milestone meeting, summary figures and tables will be provided to the MDEQ for review and discussion. Summary figures will include graphical representations of contaminant distribution in soil and groundwater, as well as updated depictions of the Site geology and the overall conceptual site model.



7. Reporting

At the completion of the Phase 2 investigation, ARCADIS will complete a combined RFI Summary Report, Risk Assessment and Corrective Measures Study report. The following information will be included as part of the document:

- An updated version of the Matrix that summarizes the work completed at each investigation area and the final result
- Maps showing the final results at each investigation area
- Data tables for mobile lab, off-site lab, and field screening methods
- Laboratory data reports
- Summary text outlining the findings of the Phase 1 and Phase 2 investigation. The bulk of this will be agreed upon before hand through communication with the MDEQ and RACER
- A detailed Risk Assessment and pathway analysis based on the results of the investigation
- Recommendations for Site remedy based on the result of the Corrective Measures Study.

8. References

ARCADIS. 2008. Current Conditions Report (CCR) for GM Lansing Plants 2, 3, and 6. August 1.

ARCADIS. 2011a. Field Sampling Plan, RACER Trust, Lansing, Michigan Plants 2, 3, and 6. August 26.

ARCADIS. 2011b. Quality Assurance Project Plan, RACER Trust, Lansing, Michigan Plants 2, 3, and 6. August 26.

ARCADIS. 2012. Resource Conservation and Recovery Act Facility Investigation (RFI) Phase 1 Activities Summary Report, RACER Trust, Lansing, Michigan Plants 2, 3, and 6. January 30.



**Resource Conservation
and Recovery Act Facility
Investigation (RFI) Work
Plan, Phase 2**

Plants 2, 3, & 6, Lansing,
Michigan

MDEQ RRD. 2002. Sampling Strategies and Statistical Training Materials for Part 201
Cleanup Criteria.

Tables

TABLE 1
RFI WORK PLAN PHASE 2 SUMMARY MATRIX
RACER TRUST PLANTS 2, 3, and 6, LANSING, MICHIGAN

Investigation Area	Subarea	Associated AOI	AOI Summary	Phase 1 Sample Media			COCs (Soil-S, Groundwater-G, LNAPL-L, Detected-D, >Criteria-E)*										Size of Investigation Area (ft ²)	Sampling Grid (ft) ⁽²⁾	Phase 2 Initial Target Media (Soil/GW/ LNAPL) ⁽³⁾	Number of Initial Borings	Estimated Rig Days	Target Analytes ⁽¹⁾	Sample Frequency ⁽⁴⁾	Description of Initial Approach	Associated RFI Phase 2 Work Plan Figure Number
				Soil	Groundwater	LNAPL	CVOCs	BTEX	1,4-Dioxane	Other VOCs	SVOCs	PCBs	Metals												
													T:Cr/ Cr:V	Other	Metals used in AOI? (Y/N)										
AREA 1	NA	AOI 2-16	Two 20,000-gallon tanks that stored gasoline and diesel east of Building 250. One 1,500-gallon tank that stored used oil located southeast of Building 250. One 12,000-gallon tank that stored heating oil located west of Building 250. All USTs removed in 1990 and 1991. Closure report submitted on 10/01/1996. Restrictive Covenant filed with Register of Deeds in 2003.		X					GD					GE	N	16,000	20	Soil/GW	5	3	VOCs, SVOCs, metals	Normal	I. Step-out shallow soil borings Complete step-out soil borings and sample soil at nominal 10' intervals from vadose zone based on field screening or otherwise at fixed intervals (e.g., 0-2', 10', 20', etc.) to groundwater. Submit VOC samples to onsite lab. II. Deep soil boring/HPT to bedrock adjacent to MW-1 Complete a deep soil boring/HPT to bedrock. III. VAP/WCSS adjacent to MW-1 If step-out soil borings suggest a soil source, then within vadose zone collect soil samples at nominal 5' spacing. Collect saturated soil samples from clays/silts. If soil borings do not indicate a source, sample GW only from permeable intervals continuing to bedrock. IV. Step-out VAP - Characterization (as needed) If necessary from a regional perspective, complete additional VAP (if permeable) or saturated soil sampling to define extent of groundwater impacts. Depth of samples based on initial VAP sounding. Characterization Stage: Complete additional soil boring or VAP step-outs to define source material, as appropriate, based on assessment stage data.	5
AREA 2	NA	AOI 2-12	Empty 55-gallon drums generated from facility operations.	X							SD				SE	N	2,000	15	Soil	4	1	VOCs, SVOCs, metals	Normal	I. Step-out shallow soil borings Complete step-out soil borings and sample soil at nominal 10' intervals through vadose zone based on field screening or otherwise at fixed intervals (e.g., 0-2', 10', WT) to groundwater. Submit VOC samples to onsite lab. II. Deep soil boring/HPT/VAP to bedrock (contingency) Only perform VAP if required from a regional standpoint or if shallow soil borings suggest a significant source of target analytes in soil. If shallow soil borings suggest a soil source - vadose zone: collect soil samples at surface, max PID, and above water table. Collect saturated soil samples from clays/silts. Characterization Stage: Complete additional soil boring or VAP step-outs to define source material, as appropriate, based on assessment stage data.	6
AREA 3	NA	NA	Monitoring well P2-MW-03 in northwestern corner of Plant 2 with 1,4-dioxane in groundwater		X					GD	GD				GE	N	1,000	10	GW	1	1	VOCs, metals	Normal	I. Deep soil boring/HPT/VAP to bedrock adjacent to MW-03 Complete deep boring to bedrock adjacent to MW-03. Identify permeable zones. Vadose zone: collect soil samples at nominal 10' intervals (0-2, 10, 20' etc.). Sample GW from permeable intervals. If potential source evident in vadose samples, collect saturated soil samples from clays/silts. Submit VOC samples to onsite lab.	7
AREA 4	NA	AOI 2-8	Likely stored waste paint, spent solvent, and used oils on a concrete pad.	X							SD					N	2,500	15	Soil	4	1	VOCs, SVOCs, metals	Normal	I. Step-out shallow soil borings Complete step-out soil borings and sample soil at nominal 10' intervals from vadose zone based on field screening or otherwise at fixed intervals (e.g., 0-2', 10', WT) to shallow groundwater. Submit VOC samples to onsite lab. II. Deep soil boring/HPT/VAP sounding (contingency) If step-out soil borings suggest a significant source of target analytes in soil, complete deep HPT/VAP boring to bedrock. Collect saturated soil samples from clays/silts. Collect groundwater from permeable intervals. Characterization Stage: Complete additional soil boring or VAP step-outs to define source material, as appropriate, based on assessment stage data.	8

TABLE 1
RFI WORK PLAN PHASE 2 SUMMARY MATRIX
RACER TRUST PLANTS 2, 3, and 6, LANSING, MICHIGAN

Investigation Area	Subarea	Associated AOI	AOI Summary	Phase 1 Sample Media			COCs (Soil-S, Groundwater-G, LNAPL-L, Detected-D, >Criteria-E)*								Size of Investigation Area (ft ²)	Sampling Grid (ft) ⁽²⁾	Phase 2 Initial Target Media (Soil/GW/ LNAPL) ⁽³⁾	Number of Initial Borings	Estimated Rig Days	Target Analytes ⁽¹⁾	Sample Frequency ⁽⁴⁾	Description of Initial Approach	Associated RFI Phase 2 Work Plan Figure Number	
				Soil	Groundwater	LNAPL	CVOCs	BTEX	1,4-Dioxane	Other VOCs	SVOCs	PCBs	Metals											
													T:Cr/ Cr:V	Other										Metals used in AOI? (Y/N)
AREA 5	5-1	AOI ID 2-31 ID 2-32 ID 2-33 ID 2-34 ID 2-35	Press Pit and Associated Sumps, Pits, and Trenches ID 2-31 - Two 3'x3' oil containment sumps under hydraulic presses ID 2-32 - Two oil containment sumps, 3'x3' and trench ID 2-33 - Two oily waste line manhole sumps	X	X						GD/SD			GE/SE	N	60,000	35	Soil	12	5	VOCs, SVOCs, metals, 1,4-dioxane	Normal	Presume two primary source areas - Plant 2 LNAPL Area (CVOCs,1,4-dioxane) & AOI 2-15 (CVOCs/BTEX).	9,10
	5-2	AOI 2-6 AOI 2-14 AOI ID 2-26 ID 2-36 ID 2-52	ID 2-6 - SWMU 6 - Former Oily Waste Treatment System. Three 10,000-gallon concrete tanks, two treatment tanks, two gravity separators, chemical storage tanks ID 2-14 - SWMU 14 - Former Scrap Metal Storage Areas. Stored non-hazardous scrap metal (machining chips, turnings, trimmings, and scrap parts) ID 2-26 - Quench Oil Operations, pits, tanks, and sumps ID 2-36 - Oil Separator and Sump. 10" oily waste line runs to separator ID 2-52 - Pickling Room. Concrete wall and acid-resistant floor	X	X	X	GD/SE/LE	SD/LE	GD/SD	GD/LE	SE	SD/LE	SE	GE/SE	N	120,000	50	Soil/GW	31	11	VOCs, LNAPL, SVOCs, PCBs, metals, 1,4-dioxane	Higher Resolution	I. Complete LIF survey Complete LIF survey on approximately 40' grid in LNAPL area around P2-SB-27, step-out or step-in as necessary to delineate LNAPL plume. II. Step-out shallow soil borings in Area 5-2 Complete step-out soil borings from known Phase 1 impacted soil boring locations and sample soil at nominal 5' intervals in vadose zone based on field screening or otherwise at fixed intervals (e.g., 0-2', 5', 10', etc.) to shallow groundwater. Submit VOC samples to onsite lab. III. Deep soil borings/HPT/VAP soundings Complete Four deep HPT/VAP borings to bedrock outside of LNAPL area to assess groundwater impact distribution and potential for DNAPL. Vadose zone: sample soil at nominal 5' intervals based on field screening or otherwise at fixed intervals (e.g., 0-2', 5', 10', etc.). Sample groundwater from permeable intervals and saturated soil samples from clays/silts at nominal 5' spacing to bedrock. Submit VOC samples to onsite lab. IV. Initial soil sampling step-outs from impacted borings in other subareas Complete step-out soil borings from known Phase 1 impacted soil boring locations. Complete appropriate step-outs in each subarea with appropriate soil sample intervals in vadose zone (5' intervals if suspected source, 10' intervals if not a suspected source). Submit VOC samples to onsite lab. V. Initial deep soil boring/HPT/VAP to bedrock in subareas Complete one VAP to bedrock in each area with groundwater detections (including existing monitoring wells) to define vertical extent of groundwater impacts related to AOI or upgradient sources. If shallow soil borings suggest a soil source in an area - sample soil at VAP location at nominal 5' intervals based on field screening or otherwise at fixed intervals (e.g., 0-2', 5', 10', etc.). Collect groundwater from permeable intervals and saturated soil samples from silts/clays. If no soil source is evident and data suggest a groundwater plume only, collect groundwater samples from permeable intervals only.	9,11
	5-3	AOI ID 2-59	Press Pits - 8' - 4" deep, 21' by 35', and 67" by 25'	X			SE	SD	SD	SD	SE			SE	N	100,000	45	Soil/GW	18	6	VOCs, SVOCs, metals, 1,4-dioxane	Normal		9,12
	5-4	AOI ID 2-39	Fuel Oil Pump House and Tank Farm - Eight oil storage tanks, 10.5' diameter. Trenching associated with tanks. Three truck unloading stations associated with tanks.	X			SD								N	1,500	10	Soil	4	1	VOCs, SVOCs, 1,4-dioxane	Normal		9,13
	5-5	AOI 2-15	AOC 1 - Building 225 UST Farm - Two 20,000-gallon tanks that stored gasoline and diesel east of Building 250. One 1,500-gallon tank that stored used oil located southeast of Building 250. One 12,000-gallon tank that stored heating oil located west of Building 250. All USTs removed in 1990 and 1991. Closure report submitted on 10/01/1996. Restrictive Covenant filed with Register of Deeds in 2003.	X	X			SE	GD	SD	SE	SD		GE/SE	N	20,000	20	Soil/GW	9	4	VOCs, PCBs, SVOCs, 1,4-dioxane, metals	Higher Resolution	Characterization Stage: Complete additional soil boring or VAP step-outs to define source material, as appropriate, based on assessment stage data. VI. Flux Transects (contingency) Based on overall groundwater results, if appropriate given presumptive remedy or overall data gaps, complete N-S "Transect A" presumably east of LNAPL area and west of AOI 2-15. Complete at approximately 100' spacing utilizing surrounding HPT/VAP borings as appropriate. Vadose zone: sample soil at nominal 10' intervals based on field screening or otherwise at fixed intervals (e.g., 0-2', 10', 20', etc.). Sample groundwater from permeable intervals. If no soil source is evident and data suggest a groundwater plume only, collect groundwater samples from permeable intervals only.	9,14
	5-6	AOI 6-18	AOC 1 - Building 225 UST Farm - Eight former 30,000-gallon tanks. Removed 1989. Closure report submitted 10/1/96.	X	X		GE	GE/SD	GD	GD/SD	GD/SD			GE/SE	N	90,000	40	Soil/GW	22	11	VOCs, SVOCs, 1,4-dioxane	Select Higher Resolution & Normal		9,15
	5-7	AOI 6-43 AOI 6-88	ID 6-43 - Stormceptor - Includes stormceptor oil and sediment separator ID 6-88 - Parking Lot Exceedance	X	X			GE/SE		GE/SD	GE/SD			GE/SE	N	(6-88) 8,500 Area 5-7 100,000	(6-88) 25 (Area 5-7) 45	Soil/GW	8	5	VOCs, SVOCs, 1,4-dioxane	Higher Resolution	VII. Flux Transects B, C, & D (contingency) Based on results of Transect A, and if appropriate given presumptive remedy or for delineation, shift/shorten/adapt additional downgradient transects to delineate plume to criteria.	9,16
	5-8	AOI 6-81	Former Paint Shop Area	X	X		GD			GD				GE	N	85,000	40	Soil/GW	2	2.4	VOCs, Metals, 1,4-dioxane	Normal		9,17

TABLE 1
RFI WORK PLAN PHASE 2 SUMMARY MATRIX
RACER TRUST PLANTS 2, 3, and 6, LANSING, MICHIGAN

Investigation Area	Subarea	Associated AOI	AOI Summary	Phase 1 Sample Media			COCs (Soil-S, Groundwater-G, LNAPL-L, Detected-D, >Criteria-E)*										Size of Investigation Area (ft ²)	Sampling Grid (ft) ⁽²⁾	Phase 2 Initial Target Media (Soil/GW/ LNAPL) ⁽³⁾	Number of Initial Borings	Estimated Rig Days	Target Analytes ⁽¹⁾	Sample Frequency ⁽⁴⁾	Description of Initial Approach	Associated RFI Phase 2 Work Plan Figure Number
				Soil	Groundwater	LNAPL	CVOCs	BTEX	1,4-Dioxane	Other VOCs	SVOCs	PCBs	Metals												
													T:Cr/ Cr:V	Other	Metals used in AOI? (Y/N)										
AREA 6	NA	AOI 6-16/6-33	AOC 1 - Tanks 5 and 6 - Tank 5: 4,000-gallon steel diesel fuel storage tank; Tank 6: 15,000-gallon steel gasoline storage tank 16' bgs; stores purge thinner/diesel fuel; double-walled tank with leak detection system; Installed in the same location as AOI 6-16	X	X				GD	GD					GE	N	25,000	20	Soil/GW	5	3	VOCs, SVOCs, 1,4-dioxane	Normal	I. Step-out shallow soil borings Complete step-out soil borings and sample soil at nominal 10' intervals from vadose zone based on field screening or otherwise at fixed intervals (e.g., 0-2', 10, 20', etc.) to shallow groundwater. Submit VOC samples to onsite lab. II. Deep soil boring/VAP/HPT to bedrock adjacent to MWBP12-UST5-6 Vadose zone: sample soil at nominal 10' intervals based on field screening or otherwise at fixed intervals (e.g., 0-2',10', 20', etc.). Sample groundwater from permeable intervals and saturated soil samples from clays/silts at nominal 5' spacing to bedrock. If no soil source is evident and data suggest a groundwater plume only, collect groundwater samples from permeable intervals only. Submit VOC samples to onsite lab. Characterization Stage: Complete additional soil boring or VAP step-outs to define source material, as appropriate, based on assessment stage data.	18
AREA 7	NA	AOI 6-17 AOI 6-47	ID 6-17 - AOC 2 - Tanks 1 (SWMU 4) and 3 (SWMU 8) - Tank 1: 7,500-gallon carbon steel virgin thinner storage tank; Tank 3: 12,000-gallon carbon steel virgin thinner storage tank ID 6-47 - Leaking Industrial Waste Line	X	X		GE	GE/S E		GD/ SD	GD/ SD				GE	N	50,000	30	Soil/GW	7	3	VOCs, SVOCs, 1,4-dioxane	Higher Resolution	I. Step-out shallow soil borings Complete step-out soil borings and sample soil at nominal 5' intervals from vadose zone based on field screening or otherwise at fixed intervals (e.g., 0-2', 5, 10', etc.) to water table. II. Deep soil boring/HPT/VAP sounding adjacent to MWBP12-UST5-6 Vadose zone: sample soil at nominal 5' intervals based on field screening or otherwise at fixed intervals (e.g., 0-2', 5', 10', etc.). Sample groundwater from permeable intervals and saturated soil samples from clays/silts at nominal 5' intervals to bedrock. If no soil source is evident and data suggest a groundwater plume only, collect groundwater samples from permeable intervals only. Submit VOC samples to onsite lab. Characterization Stage: Complete additional soil boring or VAP step-outs to define source material, as appropriate, based on assessment stage data.	19
AREA 8	NA	AOI 2-7 AOI ID 2-37 AOI ID 2-38	ID 2-7 - Paint Shop Sumps and Trenches - Three sumps are 3'x3'x3' each ID 2-37 - Press Pits. Concrete press pits. One sump associated with presses. ID 2-38 - Scrap Steel Operations Pits. Scrap Steel Pits, 8' Deep. Scrap Pit oily waste sump	X			SD			SD	SE	SD				Y	30,000	25	Soil	8	2	VOCs, SVOCs, PCBs, metals	Normal	I. Shallow soil borings to delineate VOCs at SB-17. SB-17 is vertically delineated, result <criteria present at 10'. Advance step-out borings to a depth of 10'. Collect 3 soil samples based on field screening or otherwise at fixed intervals (0-2', 5', 10'). II. Shallow soil borings to delineate VOCs at SB-23. SB-23 is vertically delineated, result <criteria at 20'. Advance step-out borings to a depth of 20'. Collect 3 soil samples based on field screening or otherwise at a nominal 10' interval (e.g., 0-2', 10', 20'). III. Deep soil boring/HPT/VAP sounding (contingency) If step-out soil borings suggest a significant source of target analytes in soil, complete deep HPT/VAP boring at hotspot to bedrock. Sample at nominal 5' interval, collect saturated soil samples from clays/silts. Collect groundwater from permeable intervals. Characterization Stage: Complete additional soil boring or VAP step-outs to define source material, as appropriate, based on assessment stage data.	20
AREA 9	NA	AOI 6-60	Paint Mix Room	X	X		SE	GE/S E		GE/ SE						N	8,000	25	Soil/GW	11	3.2	VOCs, SVOCs, 1,4-dioxane	Higher Resolution	I. Step-out soil borings at AOI 6-60 Complete step-out soil borings and sample soil at nominal 5' intervals based on field screening or otherwise at fixed intervals (e.g., 0-2', 5', 10', etc.). Submit VOC samples to onsite lab. II. Deep soil boring/HPT/VAP Sample perched water if encountered. If perched groundwater present, double case soil boring, continue VAP/HPT to bedrock. Vadose zone: sample soil at nominal 5' intervals based on field screening or otherwise at fixed intervals (e.g., 0-2', 5', 10', etc.). Sample groundwater from permeable intervals and saturated soil samples from clays/silts at nominal 5' spacing to bedrock. III. Step-out VAP (contingency) If necessary from a regional perspective, complete additional VAP (if permeable) or saturated soil sampling to define extent of groundwater impacts at appropriate grid spacing. Target depth of groundwater samples based on initial VAP sounding. IV. Shallow soil borings to delineate at soil boring SB-05 Step-out soil borings through fill to till, log geology. Depth of step-out borings is based on depth of ND sample at SB-05 from 27-28'. Sample soil at nominal 10' intervals from vadose zone based on field screening or otherwise at fixed intervals (e.g., 0-2', 10', 28'). Characterization Stage: Complete additional soil boring or VAP step-outs to define source material, as appropriate, based on assessment stage data.	21

TABLE 1
RFI WORK PLAN PHASE 2 SUMMARY MATRIX
RACER TRUST PLANTS 2, 3, and 6, LANSING, MICHIGAN

Investigation Area	Subarea	Associated AOI	AOI Summary	Phase 1 Sample Media			COCs (Soil-S, Groundwater-G, LNAPL-L, Detected-D, >Criteria-E)*										Size of Investigation Area (ft ²)	Sampling Grid (ft) ⁽²⁾	Phase 2 Initial Target Media (Soil/GW/ LNAPL) ⁽³⁾	Number of Initial Borings	Estimated Rig Days	Target Analytes ⁽¹⁾	Sample Frequency ⁽⁴⁾	Description of Initial Approach	Associated RFI Phase 2 Work Plan Figure Number
				Soil	Groundwater	LNAPL	CVOCs	BTEX	1,4-Dioxane	Other VOCs	SVOCs	PCBs	Metals												
													T.Cr/ CrVI	Other	Metals used in AOI? (Y/N)										
AREA 10	NA	AOI 6-48 AOI 6-82 AOI 6-19	ID 6-48 - Former Coal Pile ID 6-82 - Former Coal Chute Building. Basement filled with water at the time of the site walkthrough ID 6-19 - Process Waste Tunnel. Runs underneath Buildings 28 and 21; exits Site to the west and continues to GM Lansing Plant 2	X											N	2,000	15	Soil	6	2.2	VOCs, metals. 1,4-dioxane	Normal	I. Initial shallow soil boring Initial soil boring adjacent to SA20-04 to confirm extent of soil impacts. Sample soil at nominal 10' intervals though vadose zone based on field screening or otherwise at fixed intervals (e.g., 0-2', 10', 20', etc.) to groundwater. Submit VOC samples to onsite lab. II. Step out borings (contingency) If soil impacts are confirmed, step-out soil borings to depth based on vertical extent of impacts in initial boring. If a potential source of target analytes is identified in soil, sample soil at nominal 5' intervals in vadose zone based on field screening or otherwise at fixed intervals (e.g., 0-2', 5', 10', etc.) to max depth of impacts noted at initial boring. If source is not indicated, sample at 10' interval. III. Deep soil boring/HPT/VAP sounding (contingency) If soil borings suggest a significant source of target analytes in soil, complete deep HPT/VAP boring at hotspot to bedrock. Sample at nominal 5' interval, collect saturated soil samples from clays/silts. Collect groundwater from permeable intervals. Characterization Stage: Complete additional soil boring or VAP step-outs to define source material, as appropriate, based on assessment stage data.	22	
AREA 11	NA	AOI 3-54	Sump - Sump pit with sump pump, unknown use	X			SE		SD						N	2,000	15	Soil/GW	9	3	VOCs, 1,4-dioxane, SVOCs, metals	Normal	I. Initial soil boring/VAP at 3-54 Initial soil boring to bedrock adjacent to SB-20 to define vertical extent of soil impacts. Vadose zone: sample soil at nominal 10' intervals based on field screening or otherwise at fixed intervals (e.g., 0-2', 10', 20, etc.). Sample groundwater from permeable intervals and saturated soil samples from clays/silts at nominal 5' spacing to bedrock. II. Step-out soil borings at 3-54 Based on the depth of impacts at the initial boring, complete stepout soil borings and sample soil at nominal 10' intervals to a depth consistent with the initial boring based on field screening or otherwise at fixed intervals (e.g., 0-2', 10', etc.). III. Shallow soil borings at 3-51 Step-out soil borings to depth of 26' consistent with SB-19 ND sample interval and sample soil at nominal 10' intervals through vadose zone based on field screening or otherwise at fixed intervals (e.g., 0-2', 10', 20', etc.) to the max depth of 26'. IV. Deep soil boring/HPT/VAP sounding (contingency) If soil borings at 3-51 suggest a significant source of target analytes in soil, complete a deep HPT/VAP boring at hotspot to bedrock. Sample at nominal 5' interval, collect saturated soil samples from clays/silts. Collect groundwater from permeable intervals. Characterization Stage: Complete additional soil boring or VAP step-outs to define source material, as appropriate, based on assessment stage data.	23	
AREA 12	NA	MW-04-02 (TD=132.7') MW-04-03 (TD=88.25')	Vinyl chloride detected above DW Criteria in deep overburden and bedrock		X		GE								GE	-	-	GW	0	7	VOCs	Higher Resolution	I. Bedrock well installtion Four bedrock wells installed as sentinel wells in March 2012. Sentinel wells will be used to help assess risk to municipal water supply and better evaluate site bedrock groundwater conditions. II. Regional bedrock conditions research Review of regional bedrock information sources. Evaluation of regional groundwater conditions and other known sources of VOCs in bedrock.	1	
AREA 13	NA	Background Sample	PCBs detected at P3-SB-3 @ 15'-16'	X								SD				2,000	15	Soil	4	1	PCBs	Normal	I. Shallow soil borings. Complete step-out soil borings and sample soil at nominal 10' intervals through fill to till. Submit samples for analysis of PCBs to offsite lab as needed. Complete additional step-outs based laboratory PCB results to delineate PCBs in soil.	24	

TABLE 1
RFI WORK PLAN PHASE 2 SUMMARY MATRIX
RACER TRUST PLANTS 2, 3, and 6, LANSING, MICHIGAN

Investigation Area	Subarea	Associated AOI	AOI Summary	Phase 1 Sample Media			COCs (Soil-S, Groundwater-G, LNAPL-L, Detected-D, >Criteria-E)*										Size of Investigation Area (ft ²)	Sampling Grid (ft) ⁽²⁾	Phase 2 Initial Target Media (Soil/GW/ LNAPL) ⁽³⁾	Number of Initial Borings	Estimated Rig Days	Target Analytes ⁽¹⁾	Sample Frequency ⁽⁴⁾	Description of Initial Approach	Associated RFI Phase 2 Work Plan Figure Number
				Soil	Groundwater	LNAPL	CVOCs	BTEX	1,4-Dioxane	Other VOCs	SVOCs	PCBs	Metals												
													T:Cr/ CrVI	Other	Metals used in AOI? (Y/N)										
AREA 14	NA	AOI 3-10	AOC 4 - Former Electroplating Area - (1) Electroplating operations (2) New and Reworked Storage Tanks, Chromic Acid Reclaim, 7' diameter by 9' tall (3) 17 Acid Copper Plating Tanks (4) Sludge Sump Under Nickel Storage Tank, 1,350 Gallons (5) 3 Washwater Tanks (1,900-gallons each) in Plating Area (6) Nickel Plating Tanks 1, 2, 3, 4, 6, 7, 8, and 9 (7) Copper Buffing Wash and Rinse Tanks (8) Bumper Plating Sumps (9) Dur'ni Nickel Operations Area, Tanks, Sumps, and Drain Deck	X	X					GD/SD		GE/SE	GE	Y	150,000	55	Soil/GW	19	6	Chromium Metals	Higher Resolution	I. Hotspot characterization Step-out soil borings around CH-14-RO to evaluate magnitude of CrVI hotspot in fill. If perched groundwater is encountered, collect groundwater sample (shallow VAP). Groundwater samples will be screened with a Hach kit (DL~0.01 PPM, criteria = 0.1 PPM). Submit laboratory splits for samples below Hach range. Speciate for CrVI. II. Outer ring of shallow soil borings. Step-out soil borings through fill to till. Step-out spacing will be 50' from the historical borings, which exceeded criteria for CRV1. Soils will be sampled at nominal 10' intervals (0-2', 10', 20', etc.). III. Deep soil borings/VAP to bedrock Complete deep VAP to the north, south, and west of the chromium hotspot to determine if chromium impacts extend to regional water table. If perched water present, sample perched water, screen with Hach Kit, and complete deep VAP boring with double casing. Characterization Stage: Complete additional soil boring or VAP step-outs or step-ins to define source material, as appropriate, based on assessment stage data.	25		
AREA 15	NA	AOI 3-15	Oil Sump for Crank Shaft Operations	X			SD				SD	SD		SE	N	1,000	10	Soil	4	1	VOCs, SVOCs, PCBs, Metals	Normal	I. Step-out shallow soil borings Soil impacts defined vertically by SB-26 at 20'. Complete step-out soil borings to 20' and sample soil at nominal 10' fixed intervals (e.g., 0-2', 10', 20') II. Deep soil boring/VAP to bedrock (contingency) If concentrations in soil suggest a source, complete deep VAP boring - vadose zone: sample soil at nominal 5' intervals based on field screening or otherwise at fixed intervals (e.g., 0-2', 5, 10', etc.) Sample groundwater from permeable intervals and saturated soil samples from clays/silts at nominal 5' spacing to bedrock. Characterization Stage: Complete additional soil boring or VAP step-outs to define source material, as appropriate, based on assessment stage data.	26	
AREA 16	NA	AOI 3-11	SWMU 14 - Former Scrap Metal Storage Areas	X							SD				Y	40,000	30	Soil	8	2	SVOCs, Metals	Normal	I. Step-out shallow soil borings Complete step-out soil borings and sample soil at nominal 10' intervals through fill and till (e.g., 0-2', 10', 20', etc.). II. Deep soil boring/VAP to bedrock (contingency) If concentrations in soil suggest a source of target analytes, complete deep VAP boring - vadose zone: sample soil at nominal 5' intervals based on field screening or otherwise at fixed intervals (e.g., 0-2', 5, 10', etc.) Sample groundwater from permeable intervals and saturated soil samples from clays/silts at nominal 5' spacing to bedrock. Characterization Stage: Complete additional soil boring or VAP step-outs to define source material, as appropriate, based on assessment stage data.	27	
AREA 17	NA	AOI 3-4 AOI 3-9	ID 3-4 - SWMU 18 - Machining Residue Storage Area. 20 cubic yard roll-off box located. ID 3-9 - AOC 2 - Building 301 UST Farm. Six USTs, stored polymer, sulfuric acid, soluble oil, gasoline, hydraulic oil, and APCO cleaner; were removed in 1989.	X	X	X	GD/LE			LE	GD/SD	LD		GE	Y	5,000	20	Soil/GW	9	4	VOCs, SVOCs, Metals, PCBs 1,4-dioxane	Higher Resolution	I. LIF survey Complete LIF survey on approximate 20' grid in LNAPL area around UNK-14, step-out or step-in as necessary to delineate impacted area. II. Deep soil boring/VAP sounding Complete deep soil boring/VAP to the north, south, and east of LNAPL area. Vadose zone: sample soil at nominal 5' intervals based on field screening or otherwise at fixed intervals (e.g., 0-2', 5', 10', etc.). Sample groundwater from permeable intervals and saturated soil samples from clays/silts at nominal 5' spacing to bedrock. If no soil source is evident or data suggest a groundwater plume only, collect groundwater samples from permeable intervals only. Submit VOC samples to onsite lab. III. Step-out soil borings Complete step-out soil borings and sample soil at nominal 5' intervals from vadose zone based on field screening or otherwise at fixed intervals (e.g., 0-2', 5', 10') to depth consistent with results from initial VAP boring detects. Characterization Stage: Complete additional soil boring or VAP step-outs to define source material, as appropriate, based on assessment stage data.	28	

TABLE 1
RFI WORK PLAN PHASE 2 SUMMARY MATRIX
RACER TRUST PLANTS 2, 3, and 6, LANSING, MICHIGAN

Investigation Area	Subarea	Associated AOI	AOI Summary	Phase 1 Sample Media			COCs (Soil-S, Groundwater-G, LNAPL-L, Detected-D, >Criteria-E)*									Size of Investigation Area (ft ²)	Sampling Grid (ft) ⁽²⁾	Phase 2 Initial Target Media (Soil/GW/ LNAPL) ⁽³⁾	Number of Initial Borings	Estimated Rig Days	Target Analytes ⁽¹⁾	Sample Frequency ⁽⁴⁾	Description of Initial Approach	Associated RFI Phase 2 Work Plan Figure Number	
				Soil	Groundwater	LNAPL	CVOCs	BTEX	1,4-Dioxane	Other VOCs	SVOCs	PCBs	Metals												
													T:Cr/ CrVI	Other	Metals used in AOI? (Y/N)										
AREA 18	NA	AOI 3-2 AOI 3-6	ID 3-2 - SWMU 16 - Oily Waste Treatment System. Treated oily wastewater; Two concrete used oil holding tanks, Two concrete oily sludge tanks. ID 3-6 - SWMU 20 - Former Electroplating Waste Treatment System. Treated electroplating wastes (copper, nickel, and chromium). Included an Acid Wash Tank, Sludge Storage Tank, Waste Acid Storage Tank.	X			SD								Y	20,000	20	Soil	8	2	VOCs, SVOCs, Metals 1,4-dioxane	Normal	I. Shallow soil borings to investigate 3-2 (not investigated during Phase 1) Soil borings to the water table at 20' spacing. Collect soil samples at nominal 10' spacing throughout vadose. If concentrations all <criteria, NFA. II. Deep soil boring/VAP to bedrock in 3-2 (contingency) If concentrations in soil suggest a source area, complete a deep VAP boring - vadose zone: sample soil at nominal 5' intervals based on field screening or otherwise at fixed intervals (e.g., 0-2', 5, 10', etc.). Sample groundwater from permeable intervals and saturated soil samples from clays/silts at nominal 5' spacing to bedrock. I. Step-out soil borings to delineate VOCs at SB-06 Vadose zone: sample soil at nominal 5' intervals based on field screening or otherwise at fixed intervals (e.g., 0-2', 5, 10', etc.) II. Deep soil boring/VAP to bedrock (contingency) If concentrations in soil suggest a source, complete deep VAP boring - vadose zone: sample soil at nominal 5' intervals based on field screening or otherwise at fixed intervals (e.g. 0-2', 5, 10', etc.). Sample groundwater from permeable intervals and saturated soil samples from clays/silts at nominal 5' spacing to bedrock. Characterization Stage: Complete additional soil boring or VAP step-outs to define source material, as appropriate, based on assessment stage data.	29	
AREA 19	NA	AOI 3-17	Broach Machine Filter Pit - 9' by 20' by 9' pit	X										SE	SE	Y	5,000	20	Soil/GW	5	2	SVOCs, Metals	Higher Resolution	I. Deep soil borings/VAP sounding at SB-25 Collect soil samples at nominal 5' interval to bedrock. Collect groundwater sample from permeable zone at nominal 5' spacing. II. Step-out soil borings. Complete step-out soil borings and sample vadose zone soil at nominal 5' intervals. Depth of samples at step-out boring locations will be consistent with initial boring sample results.	30
AREA 20	NA	AOI 3-51	Building 304 and 305 Press Pit Operations	X							X				SE	Y	100,000	45	Soil	11	3	SVOCs, Metals	Normal	I. Step-out shallow soil borings Complete step-out soil borings and sample soil at nominal 10' intervals through fill and till (e.g., 0-2', 10', 20', etc.). II. Deep soil boring/VAP to bedrock (contingency) If concentrations in soil suggest a source of target analytes, complete deep VAP boring - vadose zone: sample soil at nominal 5' intervals based on field screening or otherwise at fixed intervals (e.g., 0-2', 5, 10', etc.) Sample groundwater from permeable intervals and saturated soil samples from clays/silts at nominal 5' spacing to bedrock. Characterization Stage: Complete additional soil boring or VAP step-outs to define source material, as appropriate, based on assessment stage data.	31
AREA 21	NA	AOI 3-51	Building 304 and 305 Press Pit Operations	X											SE	Y	13,000	32	Soil	5	2	SVOCs, Metals	Higher Resolution	I. Step-out soil borings. Complete step-out soil borings and sample vadose zone soil at nominal 5' intervals (0-2', 5', 10' etc) to a depth of 15' consistent with the depth of clean sample interval at soil boring P3-SB-27.	32

Notes:

* - COCs indicate soil and groundwater exceedances detected during the RFI Phase 1 activities or during previous historical soil investigations.

(1) - Target analytes based on analytes detected during the RFI Phase 1 sampling activities and take into consideration the past use of the Area Of Interest, prior sampling density (i.e., assesement vs. characterization) and analytes detected upgradient and/or in surrounding AOIs.

(2) - Sampling step-out grid based on the size of the Investigation Area or AOI and the recommendations provided by the MDEQ Sampling Strategies and Statistical Training Manual (MDEQ RRD 2002); Small Area = (√A/π)/2, Large Area = (√A/π)/4 (results rounded to the nearest 5 feet)

(3) - Target media based on Phase 1 and historical results for soil and groundwater. For example, if soil impacts are defined vertically, the Phase 2 initial assessment will focus on horizontal delineation in soil first to determine if there is a viable source of target analytes before investigating groundwater.

(4) - Sample density is based on the amount of data available and the soil/groundwater analytical results for an area collected during the RFI Phase 1. For example, if an area has low-level detections of SVOCs in one or two borings and no indication of groundwater impacts, initial sampling will be completed based on field screening or otherwise at approximately 10-foot intervals ("normal") throughout the vadose zone. If soil and groundwater data suggest the area may be a source of COCs, soil and groundwater sampling will be completed at nominal 5-foot spacing ("higher resolution").

Colors - general indication of area category as defined in Section 4.1 and indication of the general priority: Green: COCs were identified in soil or groundwater, but (with the possible exception of metals) at concentrations below the most restrictive MDEQ Part 201 Criteria - low priority.

Yellow: Soil and/or groundwater impacts were identified at a concentration that exceeds applicable Part 201 Criteria - medium priority. Red: Soil and groundwater sampling, often combined with historical data, has identified a source of COCs that are likely

contributing to groundwater impacts beneath the Site - high priority

Abbreviations -

VOC - volatile organic compounds

SVOCs - semi-volatile organic compounds

PCBs - poly-chlorinated biphenyls

LNAPL - light non-aqueous phase liquid

DNAPL - dense non-aqueous phase liquid

DW Criteria - Residential Drinking Water Criteria

UST - underground storage tank

BTEX - benzene, toluene, ethylbenzene, xylenes

Cr - chromium

CrVI - hexavalent chromium

NFA - no further action

HPT - Geoprobe® Hydraulic Profiling Tool

VAP - vertical aquifer profile sample

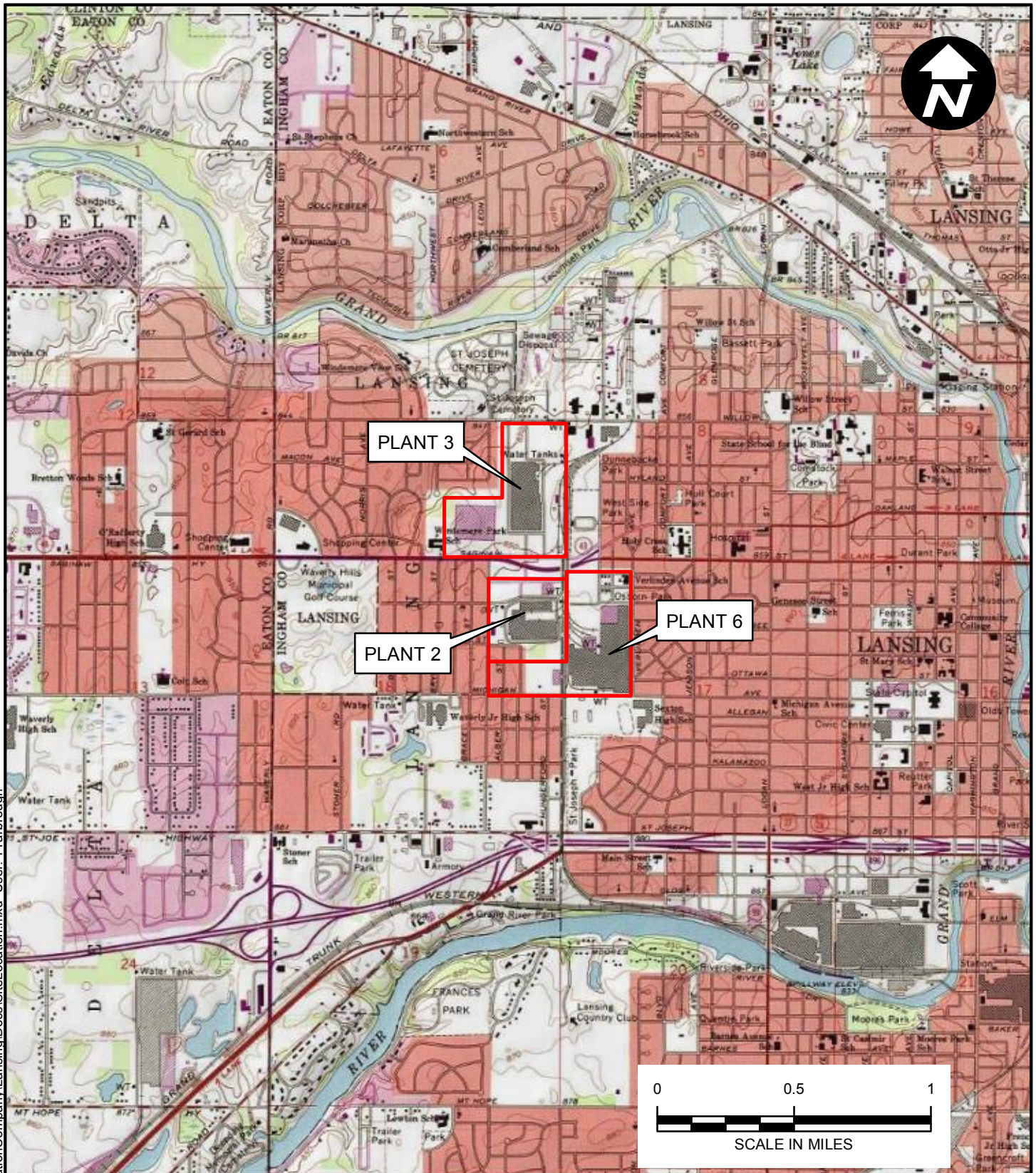
WCSS - whole core soil sampling

PID - photoionization detector

LIF - laser induced fluorescence

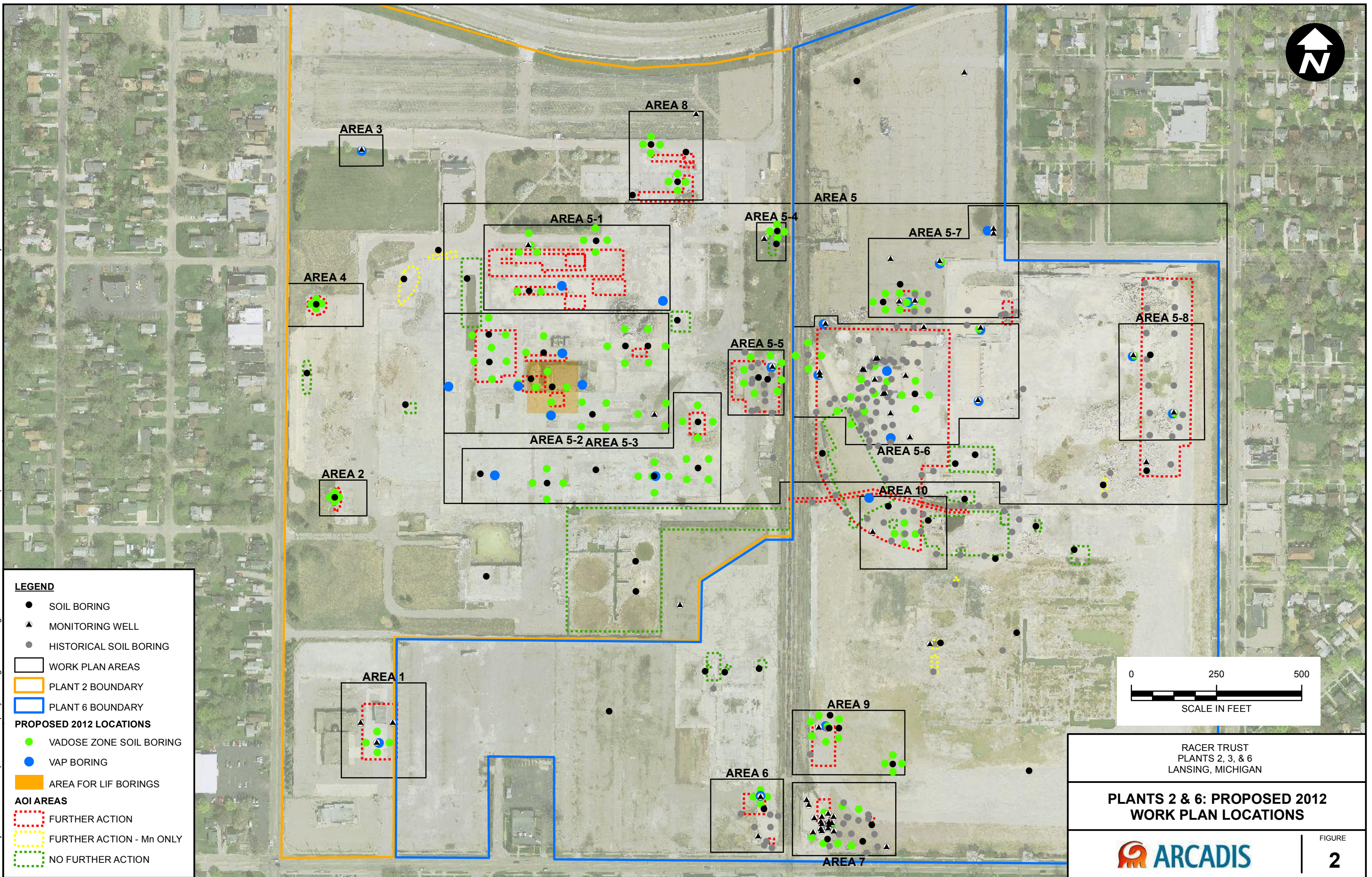
COC - contaminants of concern

Figures

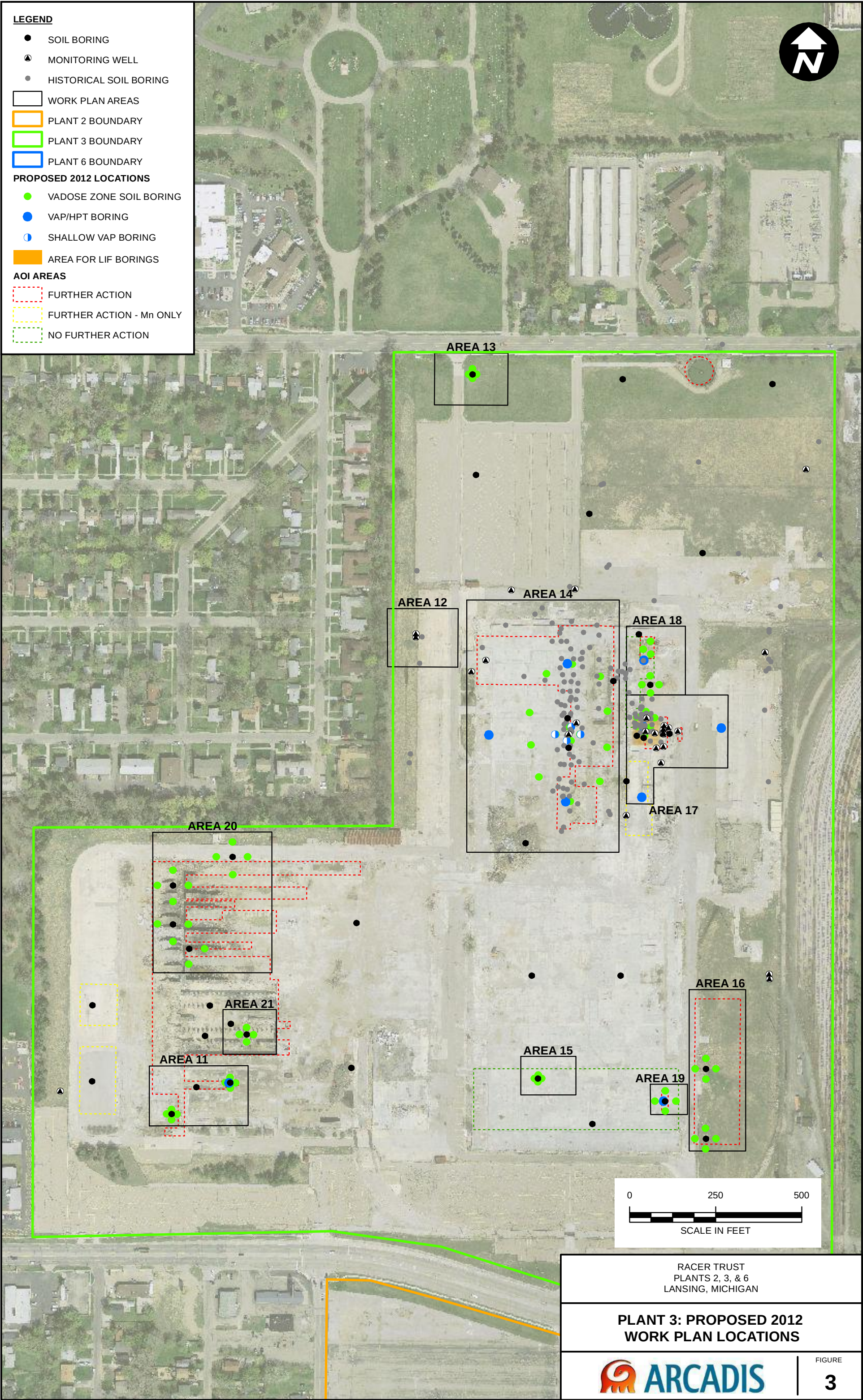


MOTORS LIQUIDATION COMPANY LANSING, MICHIGAN	
SITE LOCATION MAP	
	FIGURE 1.1

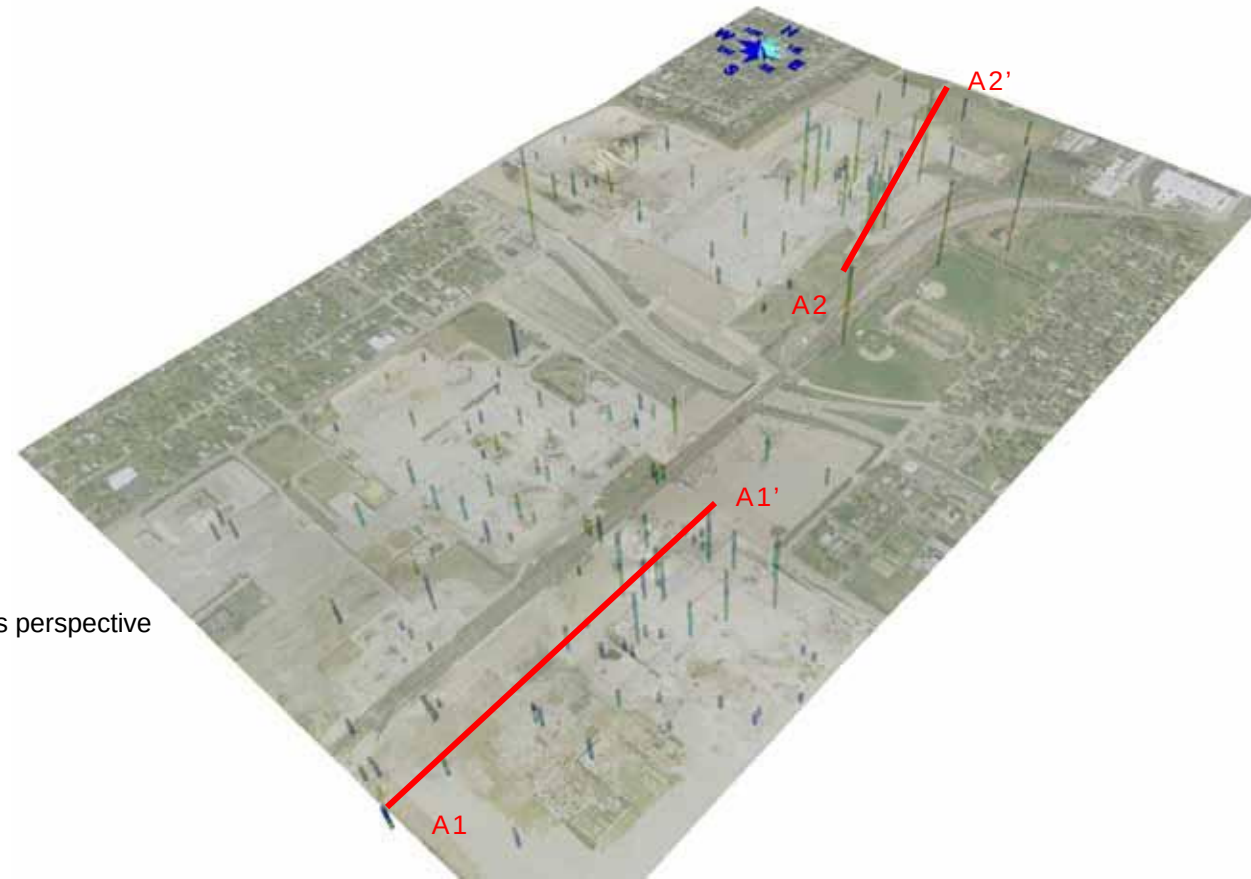
CITY: Novi DIV: ENV DB: TRY PIC: PM: TR: PROJECT NUMBER: COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl G:\GIS\Project Files\MotorsLiquidationCompany\Lansing\Working\WORKPLAN FIGURES\RFI Workplan Plant 2-6.mxd PLOTTED: 3/12/2012 12:44:22 PM BY: ayanites



CITY: Novi DIV: ENV DB: TRY PIC: PM: TR: PROJECT NUMBER: COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\MotorsLiquidationCompany\Lansing\Docs\Working\WORKPLAN FIGURES\RFI Workplan Plant 3 B.mxd PLOTTED: 3/12/2012 12:45:20 PM BY: PCurry



Scale varies in this perspective



STRATIGRAPHY



Groundwater Elevation
795.85
October 5, 2011

Cross-Section Location

Cross-sections:

0 250 ft

Vertical Exaggeration: 5.0X

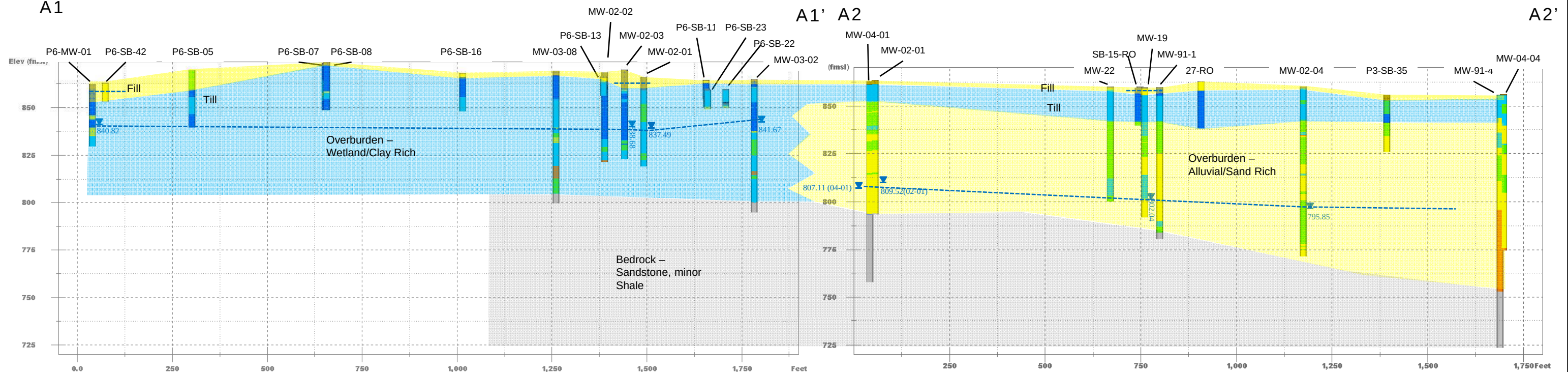
SOUTH

NORTH

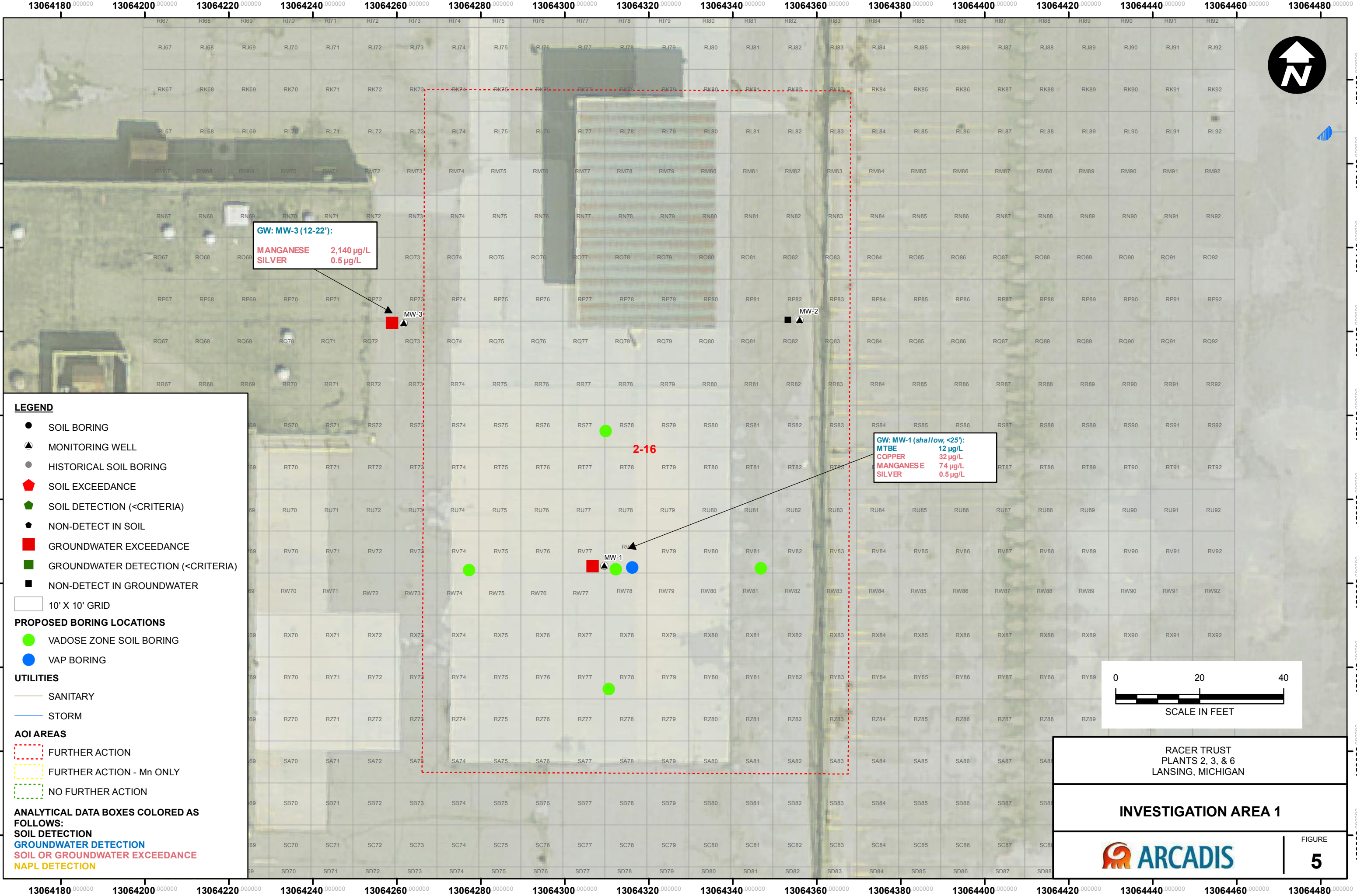
A1

A1' A2

A2'



CITY: BRIGHTON DIV: ENV DB: A. YANITES PIC: PM: TR: PROJECT NUMBER: B0064479.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\MotorsLiquidationCompany\Lansing\Working\WORKPLAN FIGURES\DB AREA_1.mxd PLOTTED: 3/12/2012 12:52:40 PM BY: ayanites



LEGEND

- SOIL BORING
- ▲ MONITORING WELL
- HISTORICAL SOIL BORING
- ◆ SOIL EXCEEDANCE
- ◆ SOIL DETECTION (<CRITERIA)
- ◆ NON-DETECT IN SOIL
- GROUNDWATER EXCEEDANCE
- GROUNDWATER DETECTION (<CRITERIA)
- NON-DETECT IN GROUNDWATER

10' X 10' GRID

PROPOSED BORING LOCATIONS

- VADOSE ZONE SOIL BORING
- VAP BORING

UTILITIES

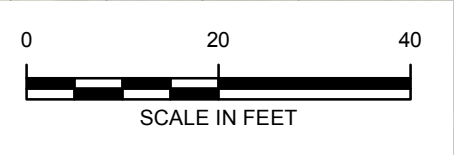
- SANITARY
- STORM

AOI AREAS

- FURTHER ACTION
- FURTHER ACTION - Mn ONLY
- NO FURTHER ACTION

ANALYTICAL DATA BOXES COLORED AS FOLLOWS:

- SOIL DETECTION
- GROUNDWATER DETECTION
- SOIL OR GROUNDWATER EXCEEDANCE
- NAPL DETECTION



RACER TRUST
PLANTS 2, 3, & 6
LANSING, MICHIGAN

INVESTIGATION AREA 1



FIGURE

5

CITY: BRIGHTON DIV: ENV DB: A. YANITES PIC: PM: TR: PROJECT NUMBER: B0064479.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\MotorsLiquidationCompany\Lansing\Documents\WORKPLAN FIGURES\DB_AREA_2b.mxd PLOTTED: 3/12/2012 2:51:40 PM BY: ayanites

LEGEND

- SOIL BORING
- ▲ MONITORING WELL
- HISTORICAL SOIL BORING
- ◆ SOIL EXCEEDANCE
- ◆ SOIL DETECTION (<CRITERIA)
- ◆ NON-DETECT IN SOIL
- GROUNDWATER EXCEEDANCE
- GROUNDWATER DETECTION (<CRITERIA)
- NON-DETECT IN GROUNDWATER
- 10' X 10' GRID

PROPOSED BORING LOCATIONS

- VADOSE ZONE SOIL BORING
- VAP BORING

UTILITIES

- SANITARY
- STORM

AOI AREAS

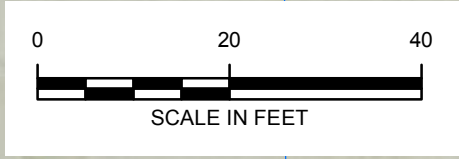
- FURTHER ACTION
- FURTHER ACTION - Mn ONLY
- NO FURTHER ACTION

ANALYTICAL DATA BOXES COLORED AS FOLLOWS:

- SOIL DETECTION
- GROUNDWATER DETECTION
- SOIL OR GROUNDWATER EXCEEDANCE
- NAPL DETECTION

SB-31 Soil (1-2'):
T. SVOCs 570 µg/kg
COBALT 10,300 µg/kg
MANGANESE 696,000 µg/kg
SB-31 Soil (9-10'):
COBALT 7,290 µg/kg

2-12

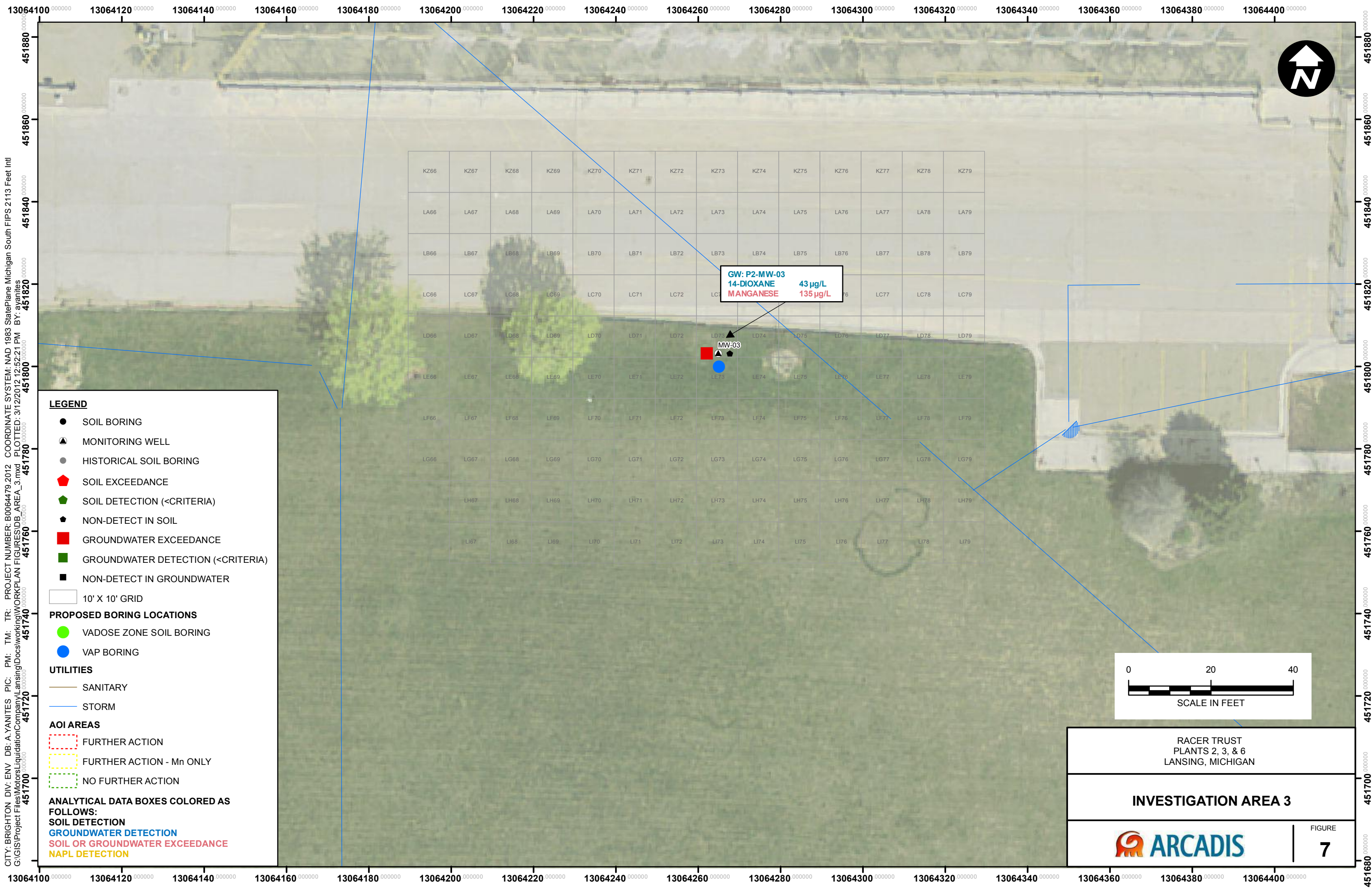


RACER TRUST
PLANTS 2, 3, & 6
LANSING, MICHIGAN

INVESTIGATION AREA 2

ARCADIS

FIGURE
6



CITY: BRIGHTON DIV: ENV DB: A. YANITES PIC: PM: TR: PROJECT NUMBER: B0064479.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\MotorsLiquidation\Company\Lansing\Working\WORKPLAN FIGURES\DB_AREA_3.mxd PLOTTED: 3/12/2012 12:52:21 PM BY: ayanites

LEGEND

- SOIL BORING
- ▲ MONITORING WELL
- HISTORICAL SOIL BORING
- ◆ SOIL EXCEEDANCE
- ◆ SOIL DETECTION (<CRITERIA)
- ◆ NON-DETECT IN SOIL
- GROUNDWATER EXCEEDANCE
- GROUNDWATER DETECTION (<CRITERIA)
- NON-DETECT IN GROUNDWATER
- 10' X 10' GRID

PROPOSED BORING LOCATIONS

- VADOSE ZONE SOIL BORING
- VAP BORING

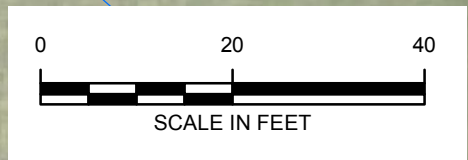
UTILITIES

- SANITARY
- STORM

AOI AREAS

- FURTHER ACTION
- FURTHER ACTION - Mn ONLY
- NO FURTHER ACTION

ANALYTICAL DATA BOXES COLORED AS FOLLOWS:
SOIL DETECTION
GROUNDWATER DETECTION
SOIL OR GROUNDWATER EXCEEDANCE
NAPL DETECTION

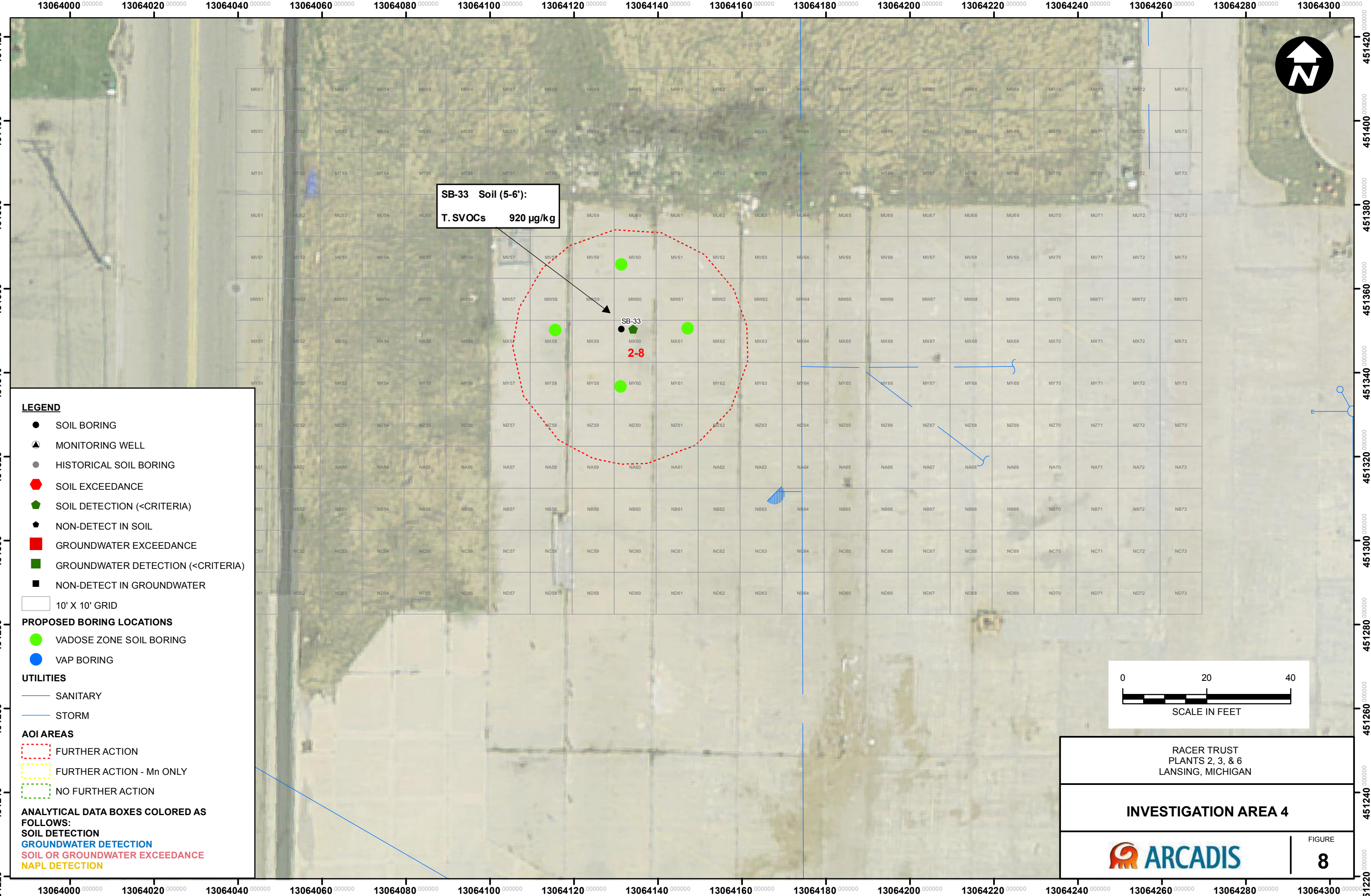


RACER TRUST
PLANTS 2, 3, & 6
LANSING, MICHIGAN

INVESTIGATION AREA 3



CITY: BRIGHTON DIV: ENV DB: A. YANITES PIC: PM: TR: PROJECT NUMBER: B0064479.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\MotorsLiquidationCompany\Lansing\WORKPLAN FIGURES\DB_AREA_4.mxd PLOTTED: 3/12/2012 12:52:03 PM BY: ayanites



LEGEND

- SOIL BORING
- ▲ MONITORING WELL
- HISTORICAL SOIL BORING
- ◆ SOIL EXCEEDANCE
- ◆ SOIL DETECTION (<CRITERIA)
- ◆ NON-DETECT IN SOIL
- GROUNDWATER EXCEEDANCE
- GROUNDWATER DETECTION (<CRITERIA)
- NON-DETECT IN GROUNDWATER
- 10' X 10' GRID

PROPOSED BORING LOCATIONS

- VADOSE ZONE SOIL BORING
- VAP BORING

UTILITIES

- SANITARY
- STORM

AOI AREAS

- FURTHER ACTION
- FURTHER ACTION - Mn ONLY
- NO FURTHER ACTION

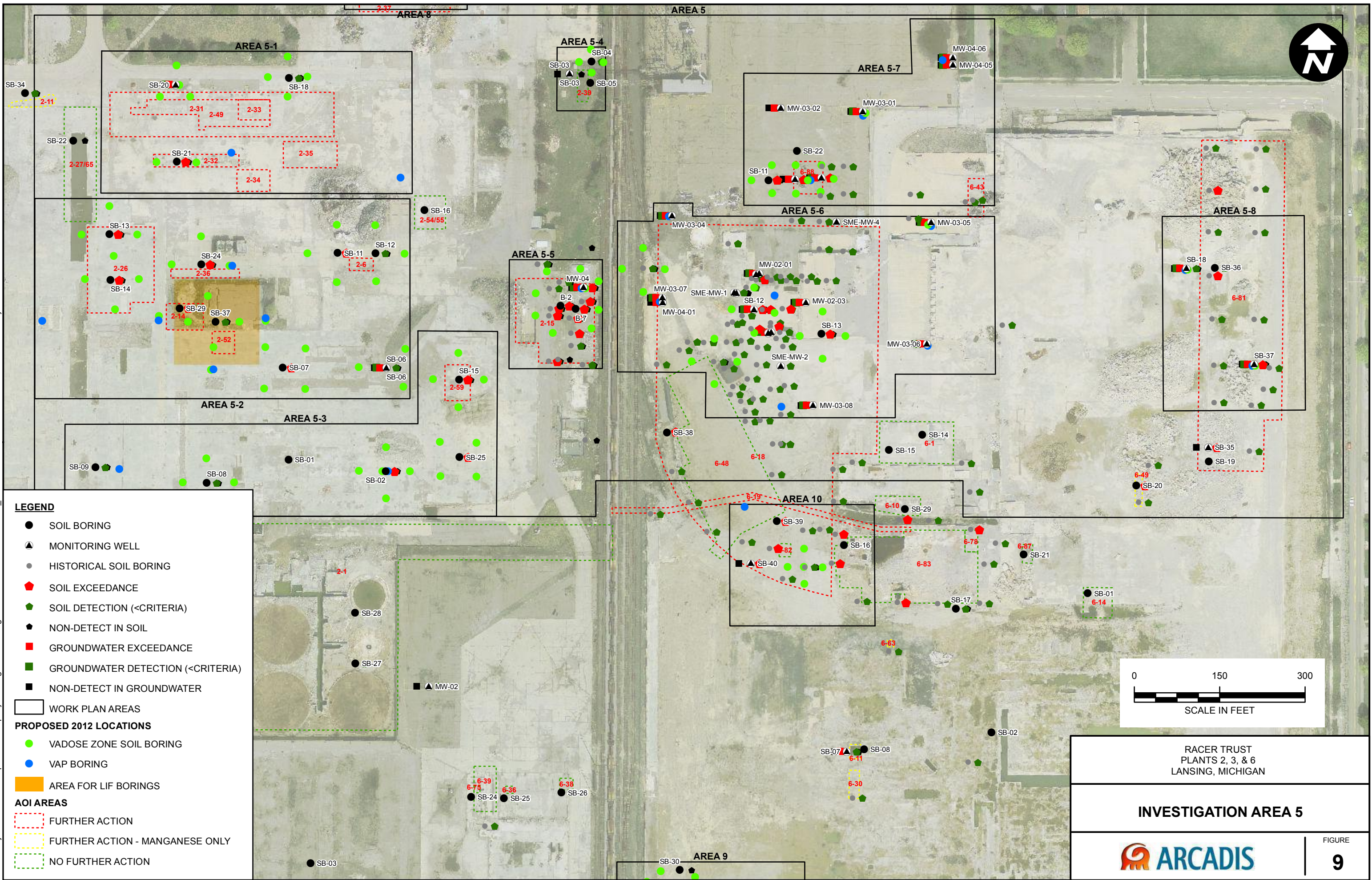
ANALYTICAL DATA BOXES COLORED AS FOLLOWS:
SOIL DETECTION
GROUNDWATER DETECTION
SOIL OR GROUNDWATER EXCEEDANCE
NAPL DETECTION



RACER TRUST
PLANTS 2, 3, & 6
LANSING, MICHIGAN

INVESTIGATION AREA 4





LEGEND

- SOIL BORING
- ▲ MONITORING WELL
- HISTORICAL SOIL BORING
- ◆ SOIL EXCEEDANCE
- ◆ SOIL DETECTION (<CRITERIA)
- ◆ NON-DETECT IN SOIL
- ◆ GROUNDWATER EXCEEDANCE
- ◆ GROUNDWATER DETECTION (<CRITERIA)
- ◆ NON-DETECT IN GROUNDWATER

WORK PLAN AREAS

PROPOSED 2012 LOCATIONS

- VADOSE ZONE SOIL BORING
- VAP BORING
- AREA FOR LIF BORINGS

AOI AREAS

- FURTHER ACTION
- FURTHER ACTION - MANGANESE ONLY
- NO FURTHER ACTION

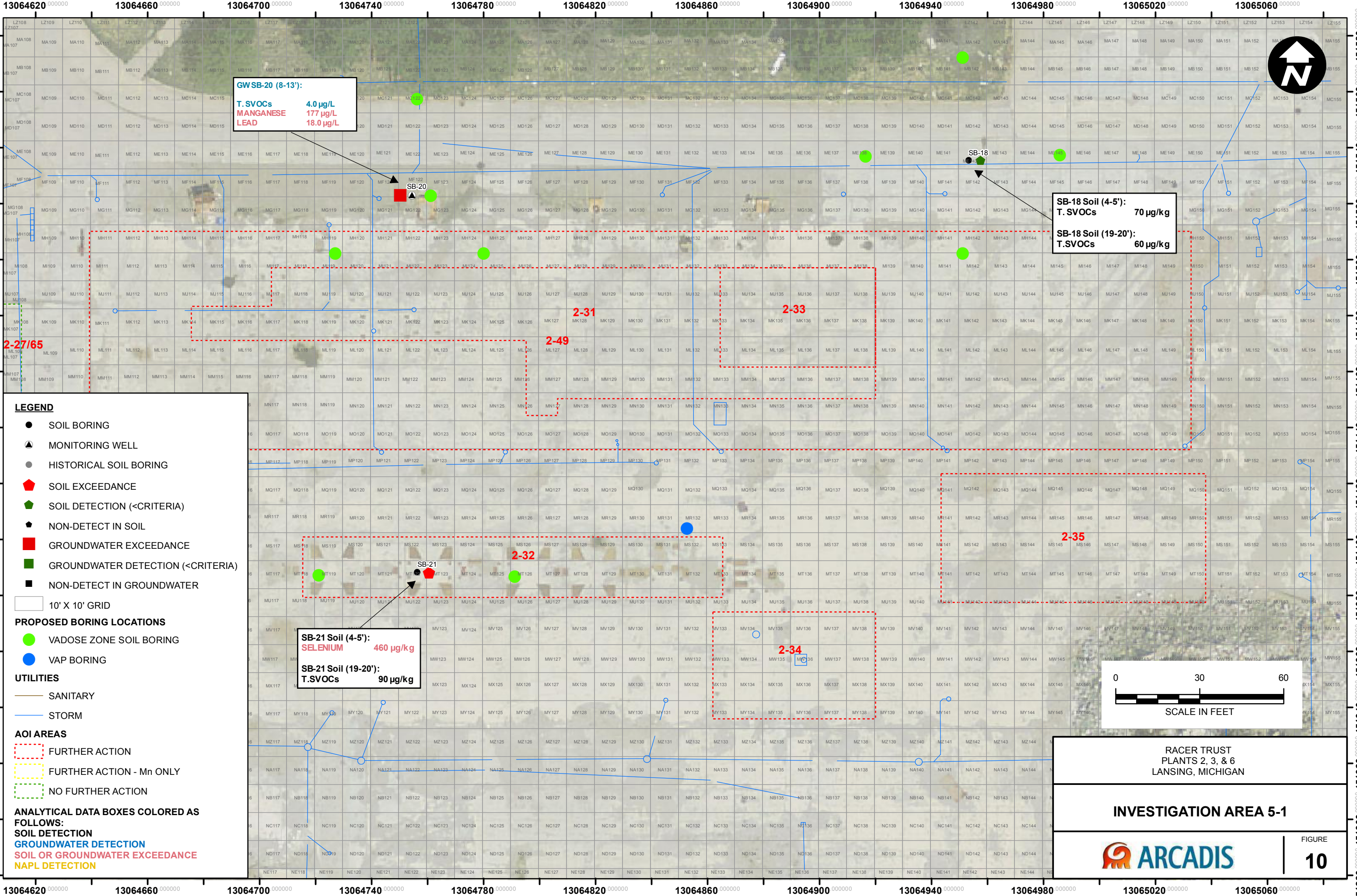
0 150 300
SCALE IN FEET

RACER TRUST
PLANTS 2, 3, & 6
LANSING, MICHIGAN

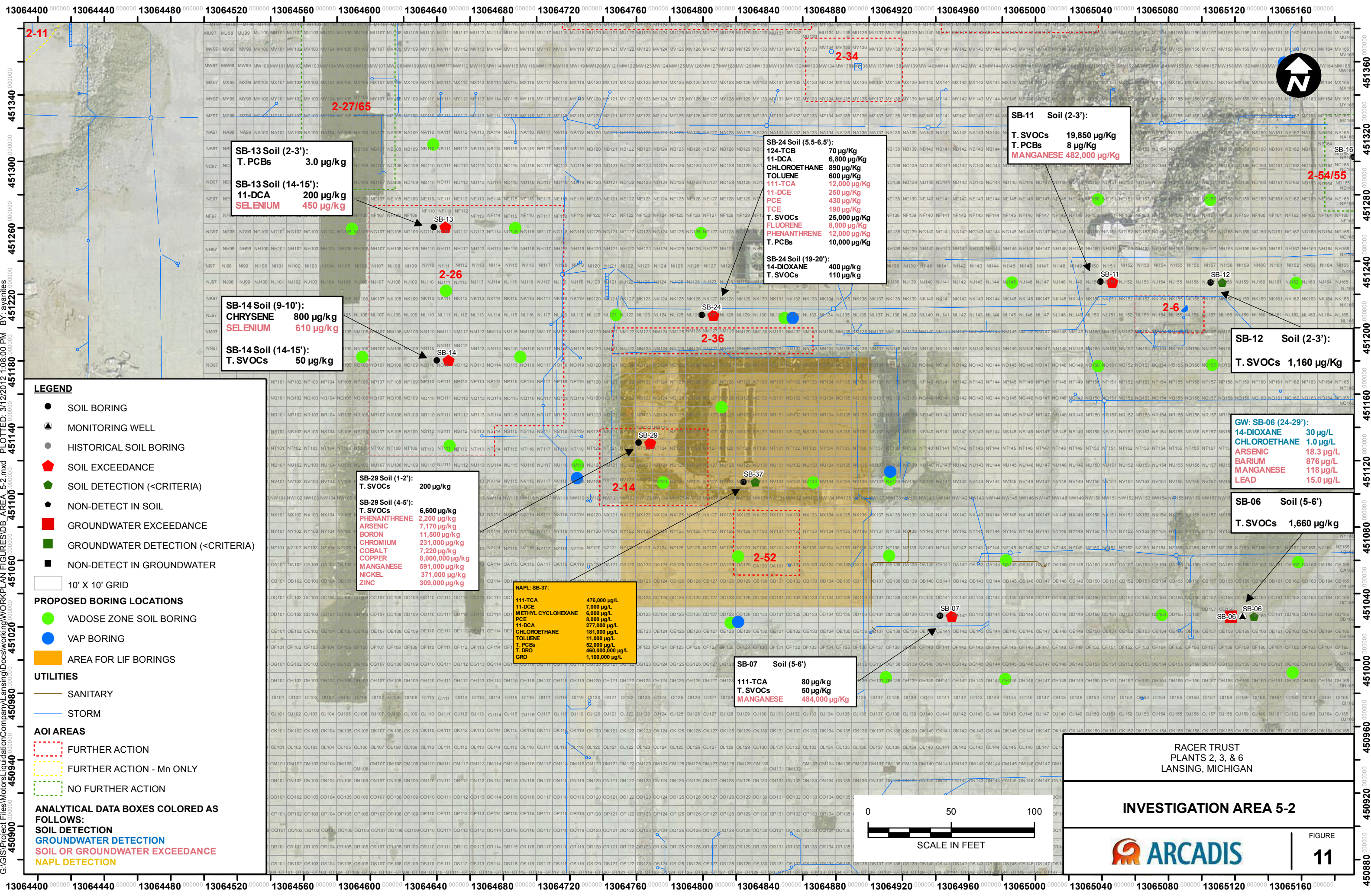
INVESTIGATION AREA 5



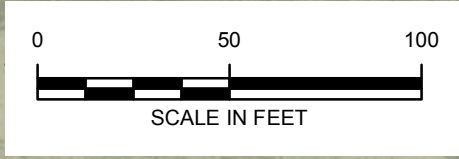
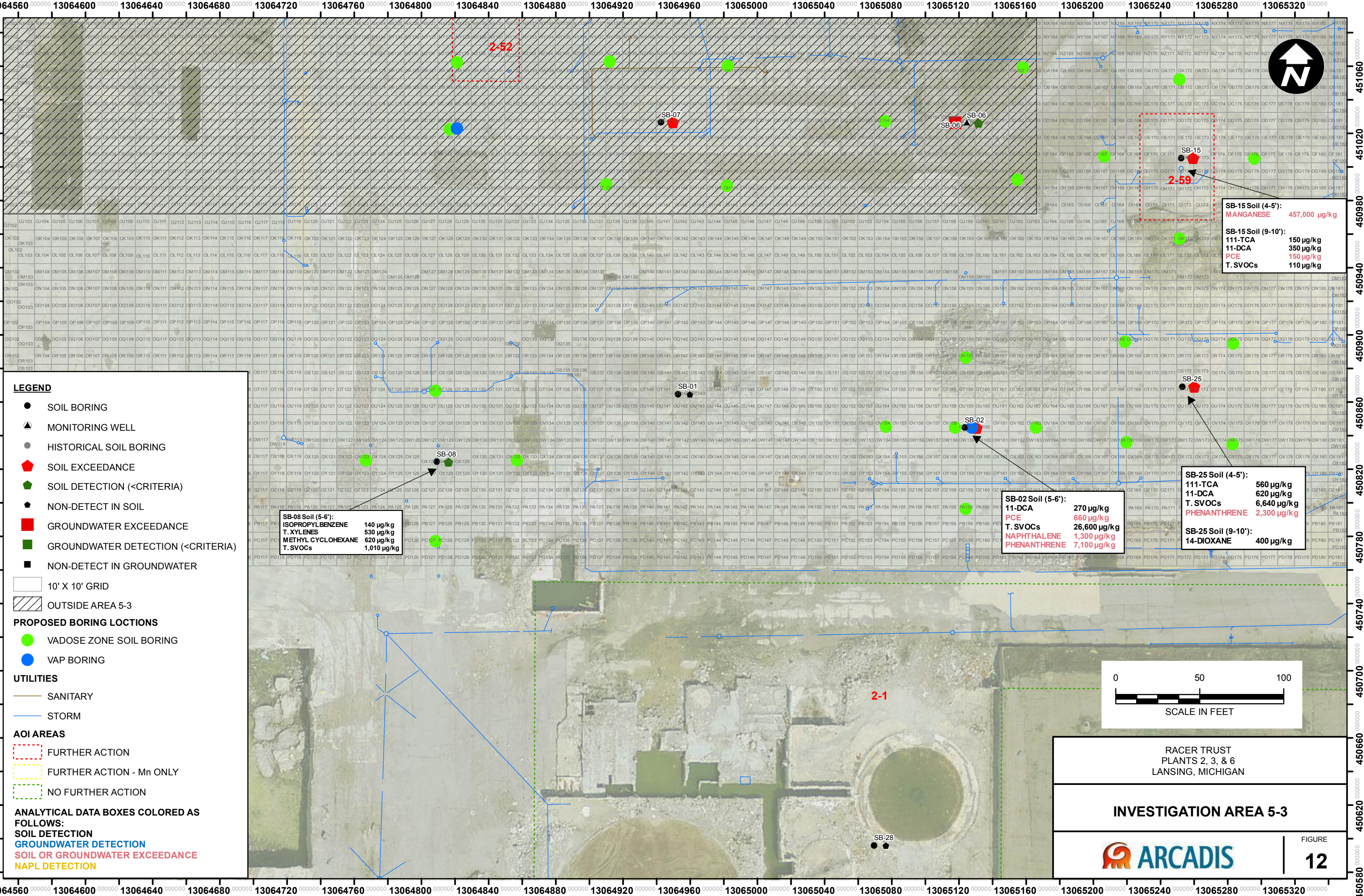
CITY: BRIGHTON DIV: ENV DB: A. YANITES PIC: PM: TR: PROJECT NUMBER: B0064479.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\MotorsLiquidationCompany\Lansing\WORKPLAN FIGURES\DB_AREA_5-1.mxd PLOTTED: 3/12/2012 1:03:52 PM BY: ayanites



CITY: BRIGHTON DIV: ENV DB: A.YANITES PIC: PM: TR: PROJECT NUMBER: B0064479.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl G:\GIS\Project Files\MotorsLiquor\Company\Land\Working\W\WORKPLAN FIGURES\DB_AREA_52.mxd PLOTTED: 3/12/2012 1:08:00 PM BY: ayanites



CITY: BRIGHTON DIV: ENV DB: A. YANITES PIC: PM: TR: PROJECT NUMBER: B0064479.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\MotorsLiquidation\Company\Lansing\Working\WORKPLAN FIGURES\DB_AREA_5-3.mxd PLOTTED: 3/12/2012 1:08:39 PM BY: ayanites

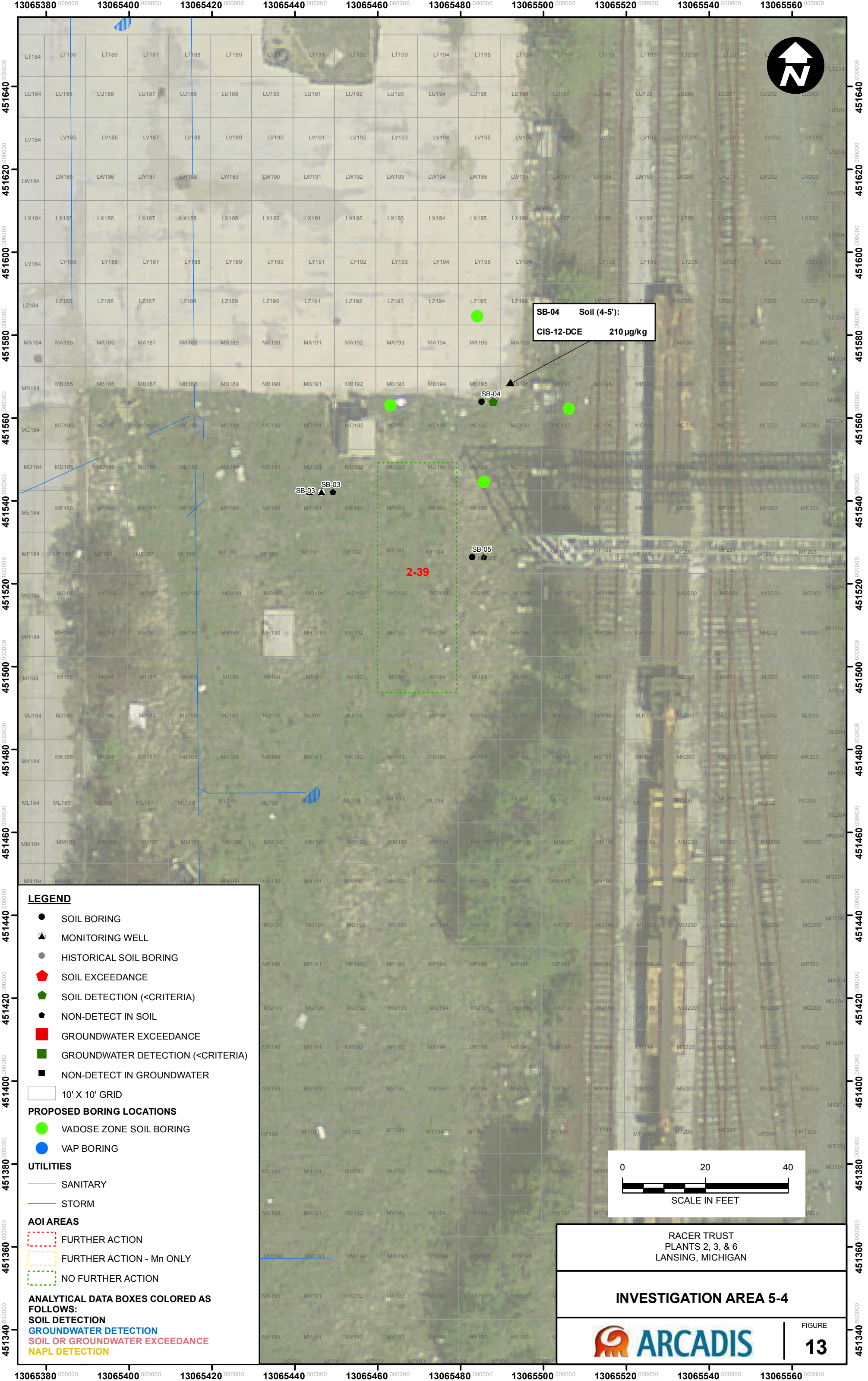


RACER TRUST
PLANTS 2, 3, & 6
LANSING, MICHIGAN

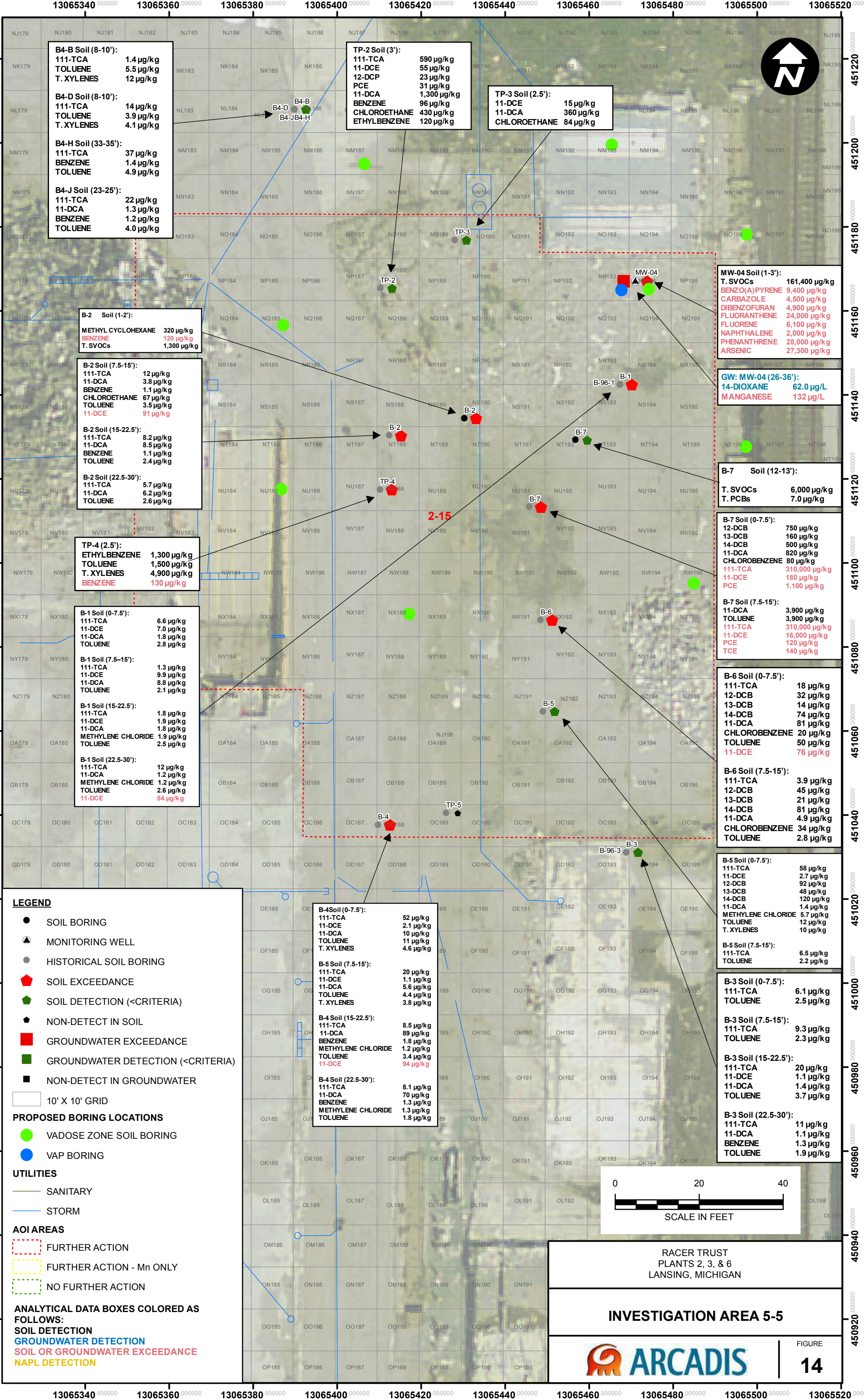
INVESTIGATION AREA 5-3

FIGURE
12

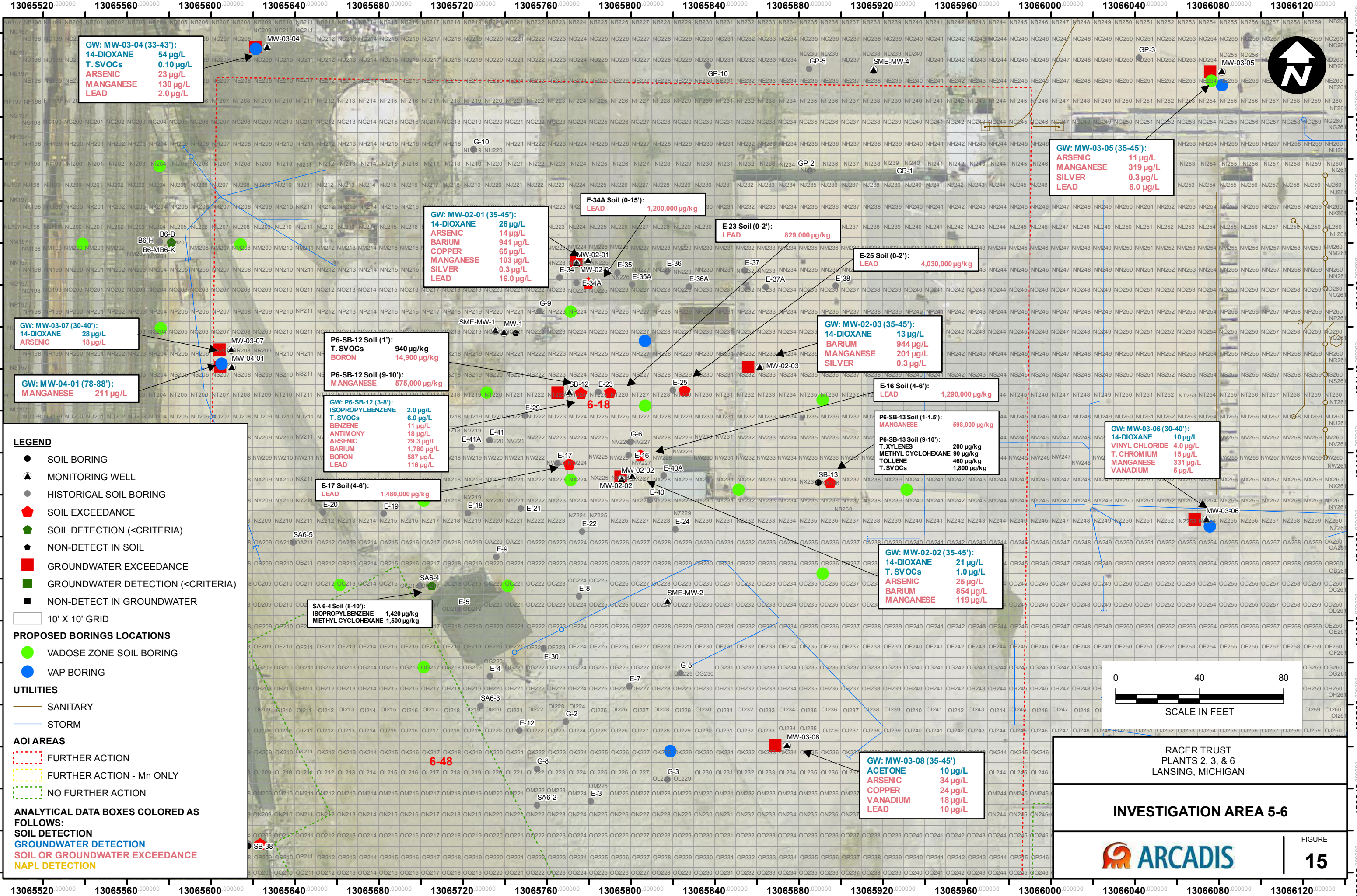
CITY: BRIGHTON DIV: ENV DB: A.YANITES PIC: PM: TM: TR: PROJECT NUMBER: B0064479.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl G:\GIS\Project Files\MotorsLiquidation\Company\Lansing\WORKPLAN FIGURES\DB_AREA_5-4.mxd PLOTTED: 3/12/2012 1:09:06 PM BY: ayanites



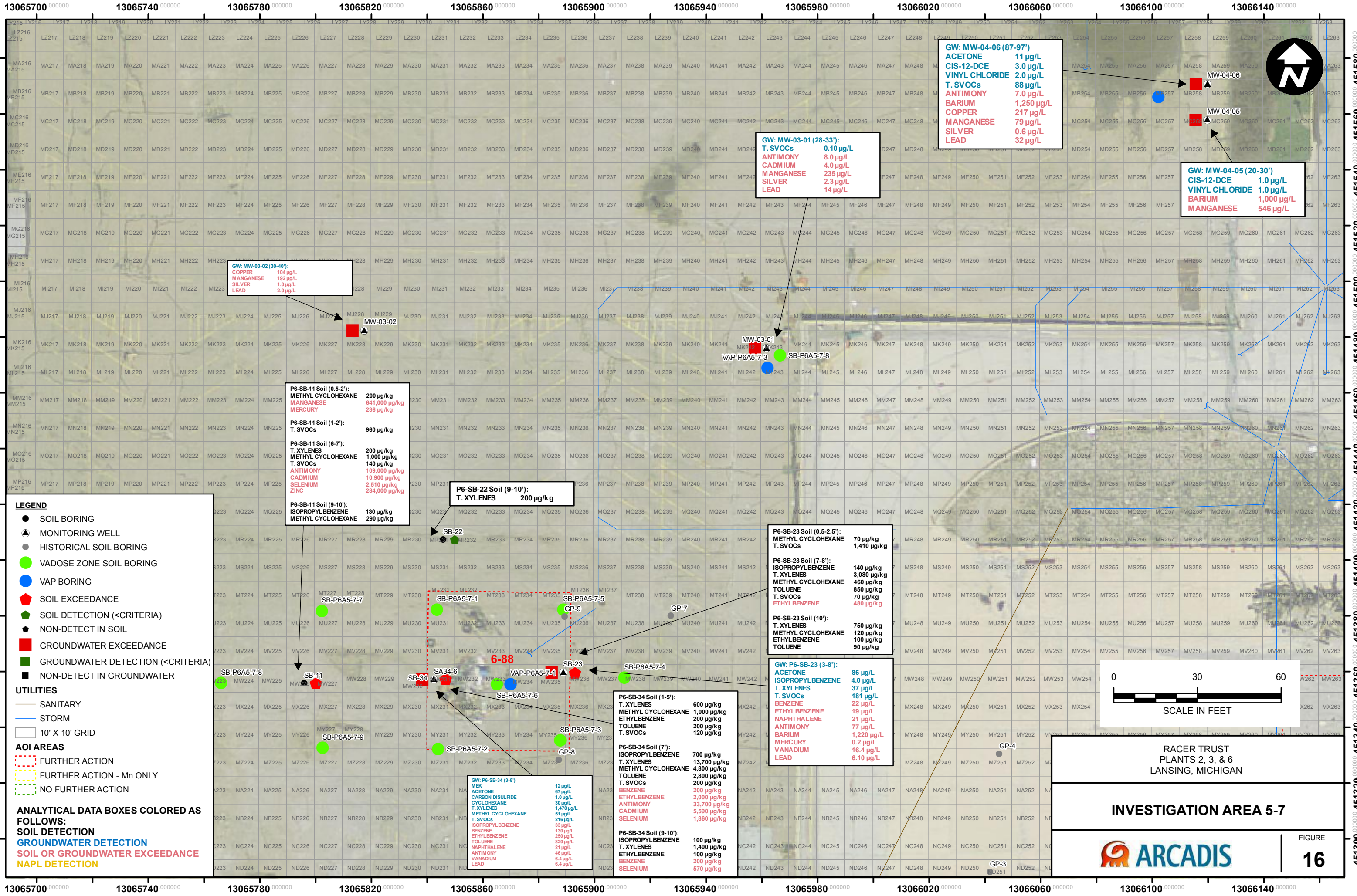
CITY: BRIGHTON DIV: ENV DB: A.YANITES PIC: PM: TM: TR: PROJECT NUMBER: B0064479.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl G:\GIS\Project Files\Motors\Liquidation\Company\Lansing\WORKPLAN FIGURES\IDB_AREA_5-5.mxd PLOTTED: 3/12/2012 1:12:14 PM BY: ayanites



CITY: BRIGHTON DIV: ENV DB: A.YANITES PIC: PM: TR: PROJECT NUMBER: B0064481.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\MotorsLiquidationCompany\Lansing\WORKPLAN FIGURES\DB_AREA_56.mxd PLOTTED: 3/12/2017 1:13:07 PM BY: ayanites



CITY: BRIGHTON DIV: ENV DB: A.YANITES PIC: TM: TR: PROJECT NUMBER: B0064481.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\MotorsLiqudationCompany\Lansing\WORKING\FIGURES\FIGURES\DB_AREA_57.mxd PLOTTED: 3/12/2012 1:13:39 PM BY: ayanites

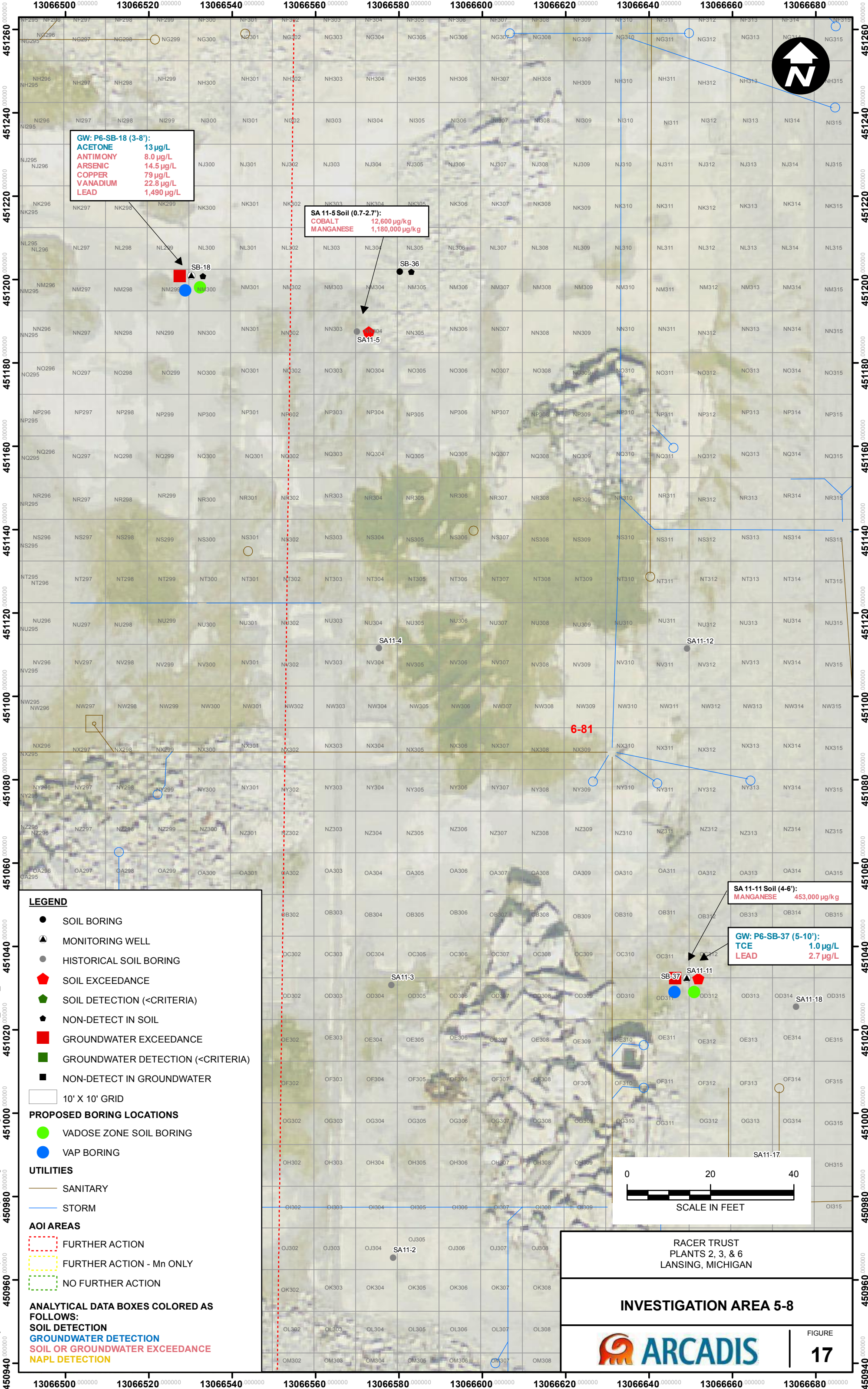


RACER TRUST
PLANTS 2, 3, & 6
LANSING, MICHIGAN

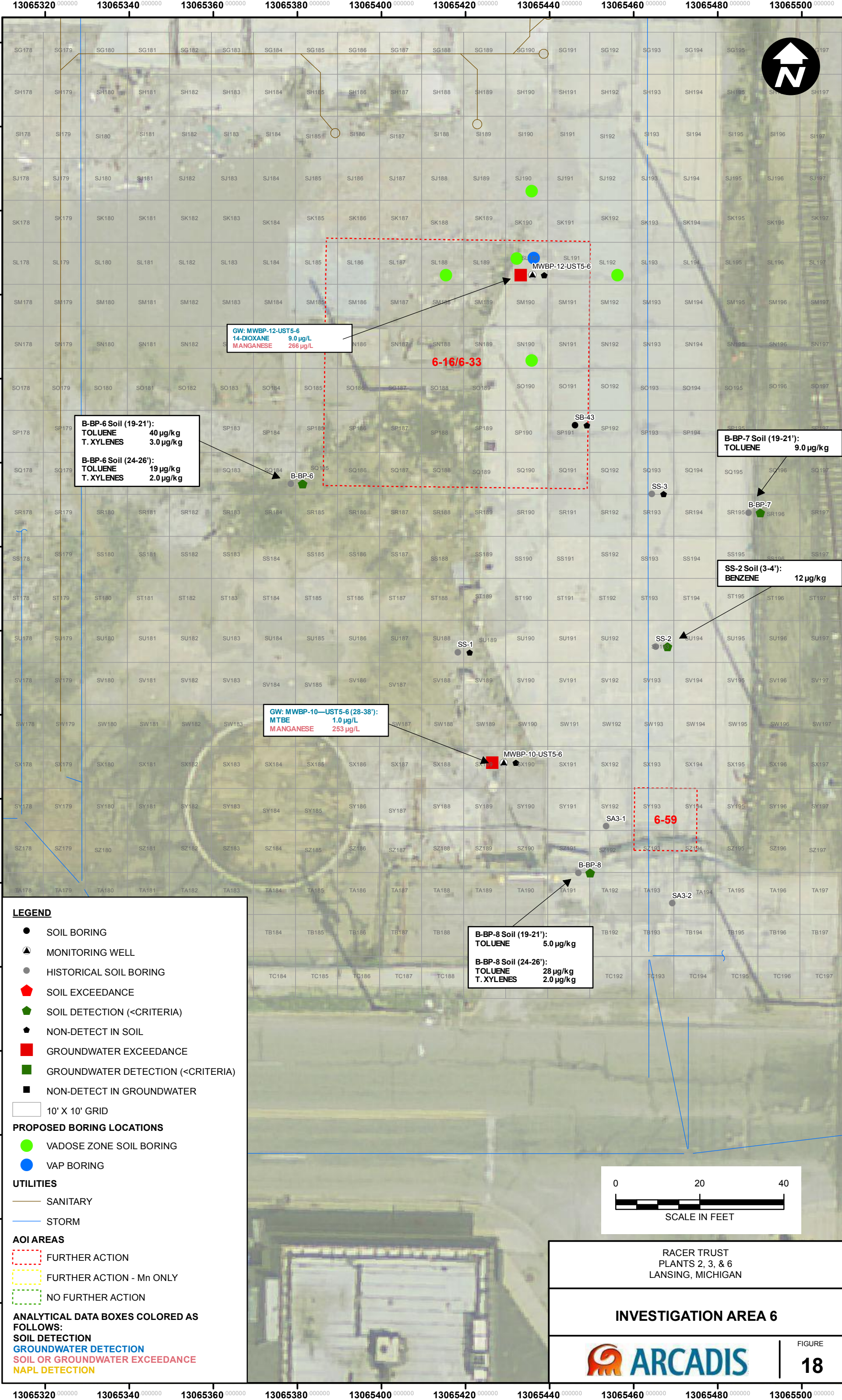
INVESTIGATION AREA 5-7



CITY: BRIGHTON DIV: ENV DB: A.YANITES PIC: PM: TM: TR: PROJECT NUMBER: B0064481.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\MotorsLiquidationCompany\Lansing\Working\WORKPLAN FIGURES\IDB_AREA_5-8.mxd PLOTTED: 3/12/2012 1:14:03 PM BY: ayanites



CITY: BRIGHTON DIV: ENV DB: A.YANITES PIC: PM: TM: TR: PROJECT NUMBER: B0064481.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl G:\GIS\Project Files\MotorsLiquidation\Company\Lansing\WORKPLAN FIGURES\IDB_AREA_6.mxd PLOTTED: 3/12/2012 2:20:27 PM BY: ayanites



LEGEND

- SOIL BORING
- ▲ MONITORING WELL
- HISTORICAL SOIL BORING
- ⬠ SOIL EXCEEDANCE
- ⬠ SOIL DETECTION (<CRITERIA)
- ⬠ NON-DETECT IN SOIL
- GROUNDWATER EXCEEDANCE
- GROUNDWATER DETECTION (<CRITERIA)
- NON-DETECT IN GROUNDWATER
- 10' X 10' GRID

PROPOSED BORING LOCATIONS

- VADOSE ZONE SOIL BORING
- VAP BORING

UTILITIES

- SANITARY
- STORM

AOI AREAS

- ⬠ FURTHER ACTION
- ⬠ FURTHER ACTION - Mn ONLY
- ⬠ NO FURTHER ACTION

ANALYTICAL DATA BOXES COLORED AS FOLLOWS:

- SOIL DETECTION
- GROUNDWATER DETECTION
- SOIL OR GROUNDWATER EXCEEDANCE
- NAPL DETECTION

RACER TRUST
PLANTS 2, 3, & 6
LANSING, MICHIGAN

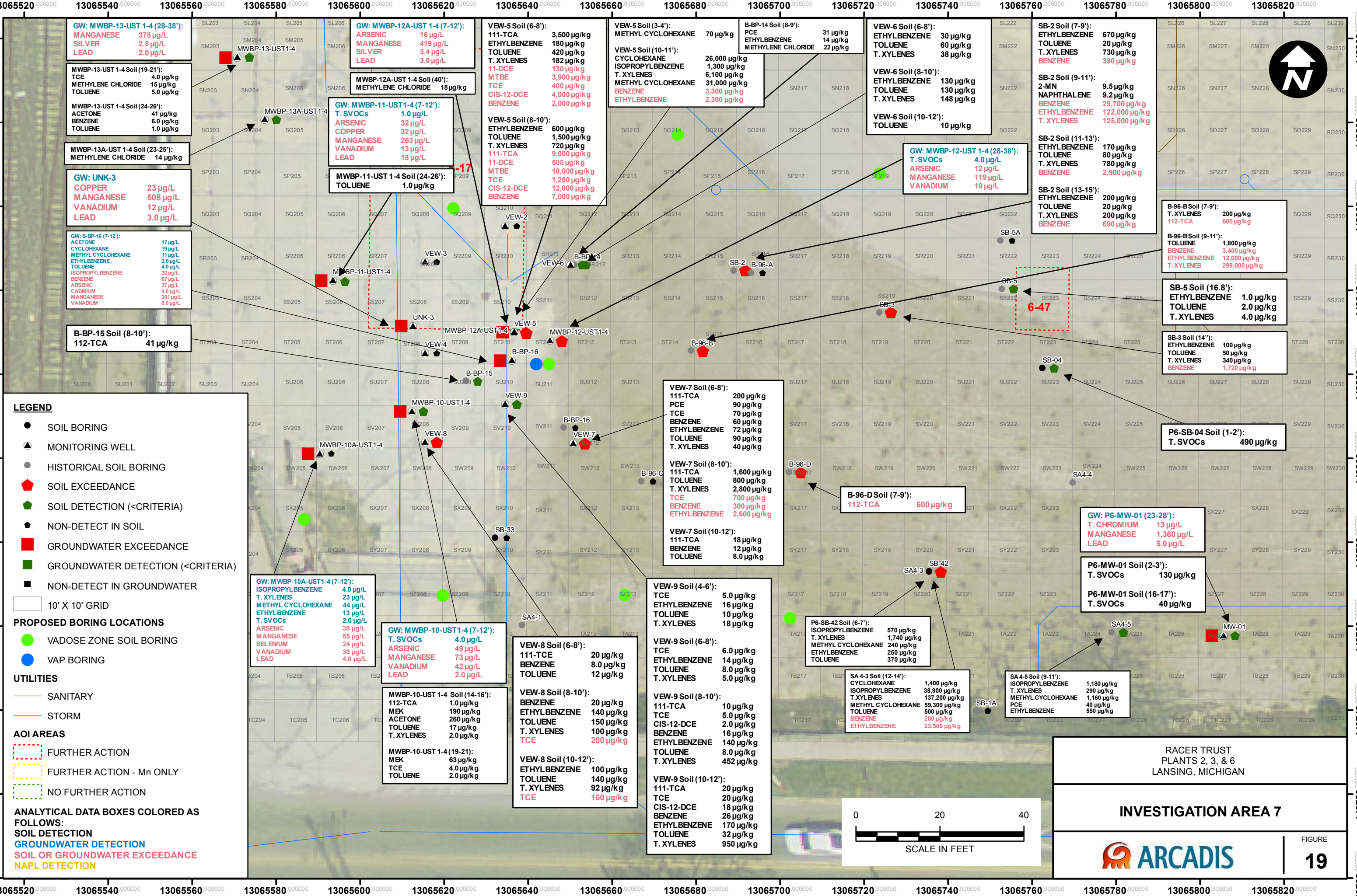
INVESTIGATION AREA 6



FIGURE

18

CITY: BRIGHTON DIV: ENV DB: A. YANITES PIC: PM: TR: PROJECT NUMBER: B0064481.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl G:\GIS\Project Files\MotorsLiquidation\Company\ Lansing\Working\WORKPLAN FIGURES\DB AREA_7.mxd PLOTTED: 4/12/2012 4:56:59 PM BY: ayanites



GW: MWBP-13-UST 1-4 (28-38'):
MANGANESE 378 µg/L
SILVER 2.8 µg/L
LEAD 2.0 µg/L

MWBP-13-UST 1-4 Soil (19-21'):
TCE 4.0 µg/kg
METHYLENE CHLORIDE 15 µg/kg
TOLUENE 5.0 µg/kg

MWBP-13-UST 1-4 Soil (24-26'):
ACETONE 41 µg/kg
BENZENE 6.0 µg/kg
TOLUENE 1.0 µg/kg

MWBP-13A-UST 1-4 Soil (23-25'):
METHYLENE CHLORIDE 14 µg/kg

GW: UNK-3
COPPER 23 µg/L
MANGANESE 508 µg/L
VANADIUM 12 µg/L
LEAD 3.0 µg/L

GW: B-BP-16 (7-12'):
ACETONE 17 µg/L
CYCLOHEXANE 19 µg/L
METHYL CYCLOHEXANE 11 µg/L
ETHYLBENZENE 2.0 µg/L
TOLUENE 4.0 µg/L
ISOPROPYLBENZENE 67 µg/L
BENZENE 37 µg/L
ARSENIC 4.0 µg/L
CADMIUM 301 µg/L
MANGANESE 8.0 µg/L
VANADIUM

B-BP-15 Soil (8-10'):
112-TCA 41 µg/kg

GW: MWBP-12A-UST 1-4 (7-12'):
ARSENIC 16 µg/L
MANGANESE 419 µg/L
SILVER 3.4 µg/L
LEAD 3.0 µg/L

MWBP-12A-UST 1-4 Soil (40'):
METHYLENE CHLORIDE 18 µg/kg

GW: MWBP-11-UST1-4 (7-12'):
T. SVOCs 1.0 µg/L
ARSENIC 32 µg/L
COPPER 263 µg/L
MANGANESE 13 µg/L
VANADIUM 18 µg/L
LEAD

MWBP-11-UST 1-4 Soil (24-26'):
TOLUENE 1.0 µg/kg

VEW-5 Soil (6-8'):
111-TCA 3,500 µg/kg
ETHYLBENZENE 180 µg/kg
TOLUENE 420 µg/kg
T. XYLENES 182 µg/kg
11-DCE 130 µg/kg
MTBE 3,900 µg/kg
TCE 400 µg/kg
CIS-12-DCE 4,000 µg/kg
BENZENE 2,000 µg/kg

VEW-5 Soil (8-10'):
ETHYLBENZENE 600 µg/kg
TOLUENE 1,500 µg/kg
T. XYLENES 720 µg/kg
111-TCA 9,000 µg/kg
11-DCE 500 µg/kg
MTBE 10,000 µg/kg
TCE 1,200 µg/kg
CIS-12-DCE 12,000 µg/kg
BENZENE 7,000 µg/kg

VEW-5 Soil (3-4'):
METHYL CYCLOHEXANE 70 µg/kg

VEW-5 Soil (10-11'):
CYCLOHEXANE 26,000 µg/kg
ISOPROPYLBENZENE 1,300 µg/kg
T. XYLENES 6,100 µg/kg
METHYL CYCLOHEXANE 31,000 µg/kg
BENZENE 3,300 µg/kg
ETHYLBENZENE 2,300 µg/kg

B-BP-14 Soil (8-9'):
PCE 31 µg/kg
ETHYLBENZENE 14 µg/kg
METHYLENE CHLORIDE 22 µg/kg

VEW-6 Soil (6-8'):
ETHYLBENZENE 30 µg/kg
TOLUENE 60 µg/kg
T. XYLENES 38 µg/kg

VEW-6 Soil (8-10'):
ETHYLBENZENE 130 µg/kg
TOLUENE 130 µg/kg
T. XYLENES 148 µg/kg

VEW-6 Soil (10-12'):
TOLUENE 10 µg/kg

SB-2 Soil (7-9'):
ETHYLBENZENE 670 µg/kg
TOLUENE 20 µg/kg
T. XYLENES 730 µg/kg
BENZENE 390 µg/kg

SB-2 Soil (9-11'):
2-MN 9.5 µg/kg
NAPHTHALENE 9.2 µg/kg
BENZENE 29,700 µg/kg
ETHYLBENZENE 122,000 µg/kg
T. XYLENES 125,000 µg/kg

SB-2 Soil (11-13'):
ETHYLBENZENE 170 µg/kg
TOLUENE 80 µg/kg
T. XYLENES 780 µg/kg
BENZENE 2,900 µg/kg

SB-2 Soil (13-15'):
ETHYLBENZENE 200 µg/kg
TOLUENE 20 µg/kg
T. XYLENES 200 µg/kg
BENZENE 690 µg/kg

B-96-B Soil (7-9'):
T. XYLENES 200 µg/kg
112-TCA 600 µg/kg

B-96-B Soil (9-11'):
TOLUENE 1,800 µg/kg
BENZENE 3,400 µg/kg
ETHYLBENZENE 12,000 µg/kg
T. XYLENES 299,000 µg/kg

SB-5 Soil (16.8'):
ETHYLBENZENE 1.0 µg/kg
TOLUENE 2.0 µg/kg
T. XYLENES 4.0 µg/kg

SB-3 Soil (14'):
ETHYLBENZENE 100 µg/kg
TOLUENE 50 µg/kg
T. XYLENES 340 µg/kg
BENZENE 1,720 µg/kg

P6-SB-04 Soil (1-2'):
T. SVOCs 490 µg/kg

VEW-7 Soil (6-8'):
111-TCA 200 µg/kg
PCE 90 µg/kg
TCE 70 µg/kg
BENZENE 60 µg/kg
ETHYLBENZENE 72 µg/kg
TOLUENE 90 µg/kg
T. XYLENES 40 µg/kg

VEW-7 Soil (8-10'):
111-TCA 1,600 µg/kg
TOLUENE 800 µg/kg
T. XYLENES 2,800 µg/kg
TCE 700 µg/kg
BENZENE 300 µg/kg
ETHYLBENZENE 2,600 µg/kg

VEW-7 Soil (10-12'):
111-TCA 18 µg/kg
BENZENE 12 µg/kg
TOLUENE 8.0 µg/kg

B-96-D Soil (7-9'):
112-TCA 600 µg/kg

VEW-9 Soil (4-6'):
TCE 5.0 µg/kg
ETHYLBENZENE 16 µg/kg
TOLUENE 10 µg/kg
T. XYLENES 18 µg/kg

VEW-9 Soil (6-8'):
TCE 6.0 µg/kg
ETHYLBENZENE 14 µg/kg
TOLUENE 8.0 µg/kg
T. XYLENES 5.0 µg/kg

VEW-9 Soil (8-10'):
111-TCA 10 µg/kg
TCE 5.0 µg/kg
CIS-12-DCE 2.0 µg/kg
BENZENE 16 µg/kg
ETHYLBENZENE 140 µg/kg
TOLUENE 8.0 µg/kg
T. XYLENES 452 µg/kg

VEW-9 Soil (10-12'):
111-TCA 20 µg/kg
TCE 20 µg/kg
CIS-12-DCE 18 µg/kg
BENZENE 26 µg/kg
ETHYLBENZENE 170 µg/kg
TOLUENE 32 µg/kg
T. XYLENES 950 µg/kg

GW: MWBP-10-UST1-4 (7-12'):
T. SVOCs 4.0 µg/L
ARSENIC 49 µg/L
MANGANESE 73 µg/L
VANADIUM 42 µg/L
LEAD 2.0 µg/L

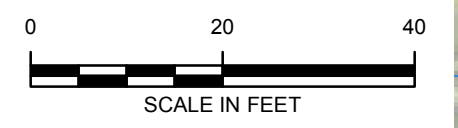
MWBP-10-UST 1-4 Soil (14-16'):
112-TCA 1.0 µg/kg
MEK 190 µg/kg
ACETONE 260 µg/kg
TOLUENE 17 µg/kg
T. XYLENES 2.0 µg/kg

MWBP-10-UST 1-4 (19-21'):
MEK 63 µg/kg
TCE 4.0 µg/kg
TOLUENE 2.0 µg/kg

VEW-8 Soil (6-8'):
111-TCE 20 µg/kg
BENZENE 8.0 µg/kg
TOLUENE 12 µg/kg

VEW-8 Soil (8-10'):
111-TCE 20 µg/kg
ETHYLBENZENE 140 µg/kg
TOLUENE 150 µg/kg
T. XYLENES 100 µg/kg
TCE 200 µg/kg

VEW-8 Soil (10-12'):
ETHYLBENZENE 100 µg/kg
TOLUENE 140 µg/kg
T. XYLENES 92 µg/kg
TCE 160 µg/kg



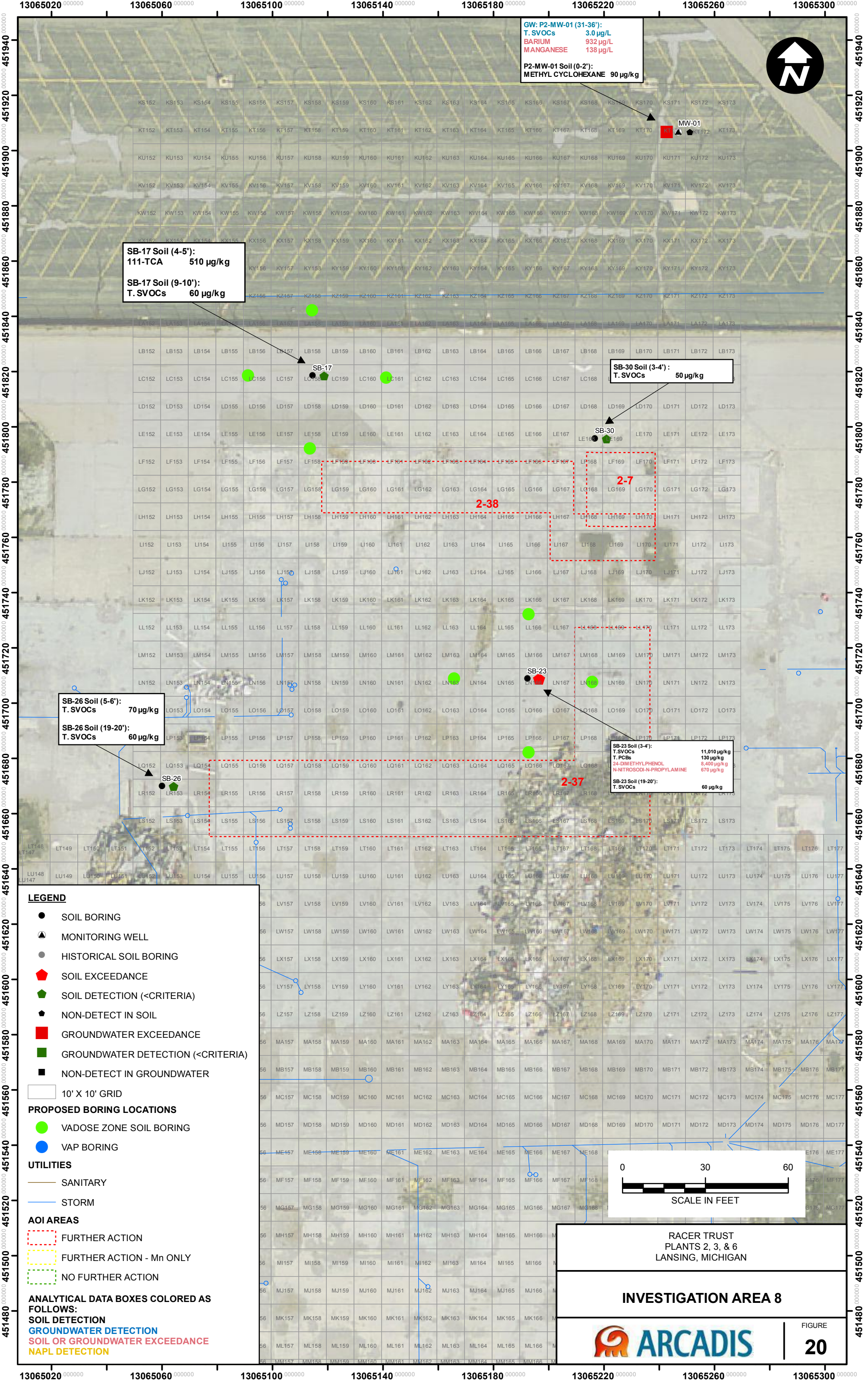
RACER TRUST
PLANTS 2, 3, & 6
LANSING, MICHIGAN

INVESTIGATION AREA 7

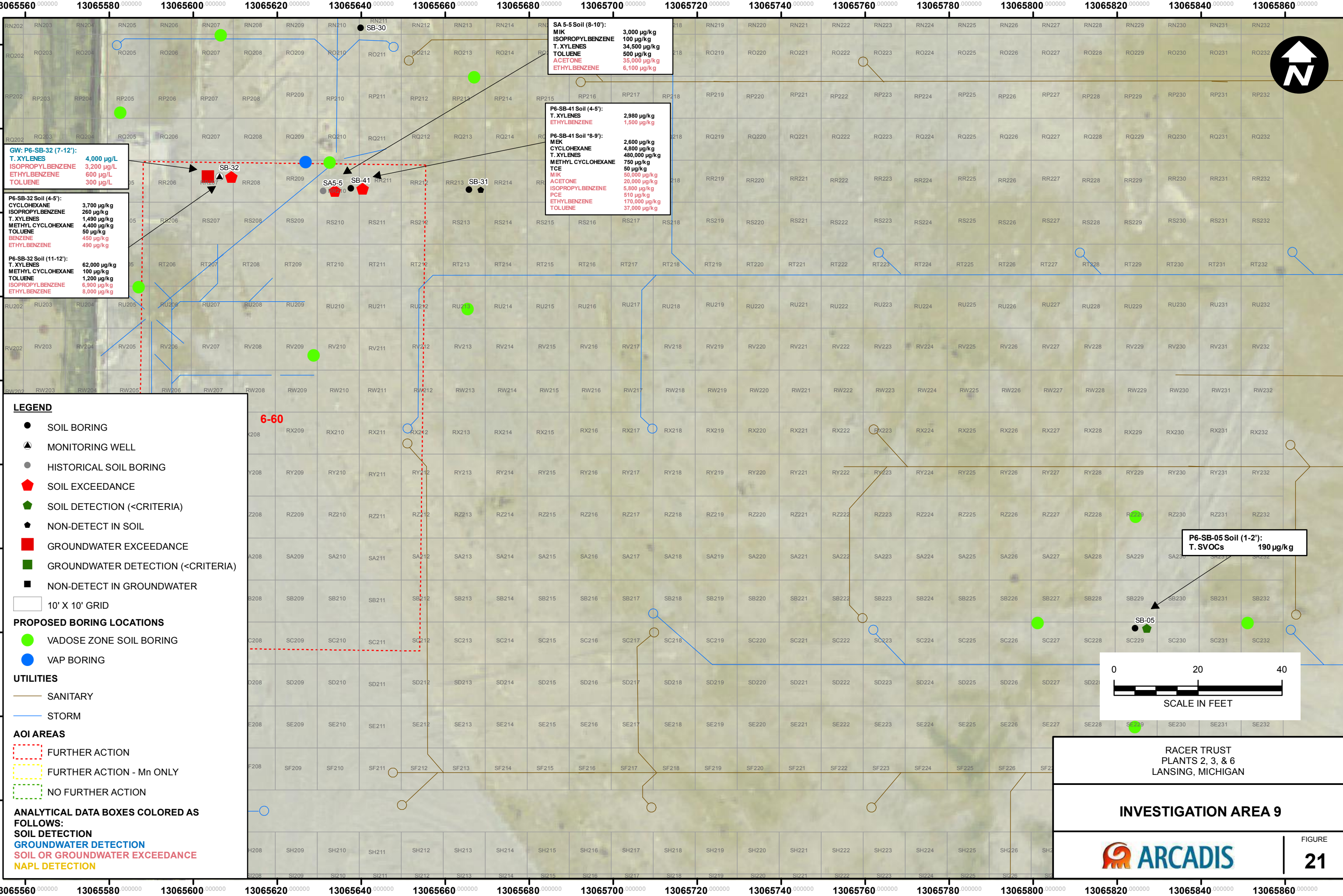


FIGURE
19

CITY: BRIGHTON DIV: ENV DB: A.YANITES PIC: PM: TM: TR: PROJECT NUMBER: B0064481.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl G:\GIS\Project Files\MotorsLiquidation\Company\Lansing\WORKPLAN FIGURES\DB_AREA_8.mxd PLOTTED: 3/12/2012 1:19:15 PM BY: ayanites



CITY: BRIGHTON DIV: ENV DB: A. YANITES PIC: PM: TR: PROJECT NUMBER: B0064481.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl G:\GIS\Project Files\MotorsLiquidation\Company\Lansing\WORKPLAN FIGURES\DB AREA 9.mxd PLOTTED: 3/12/2012 1:20:36 PM BY: ayanites

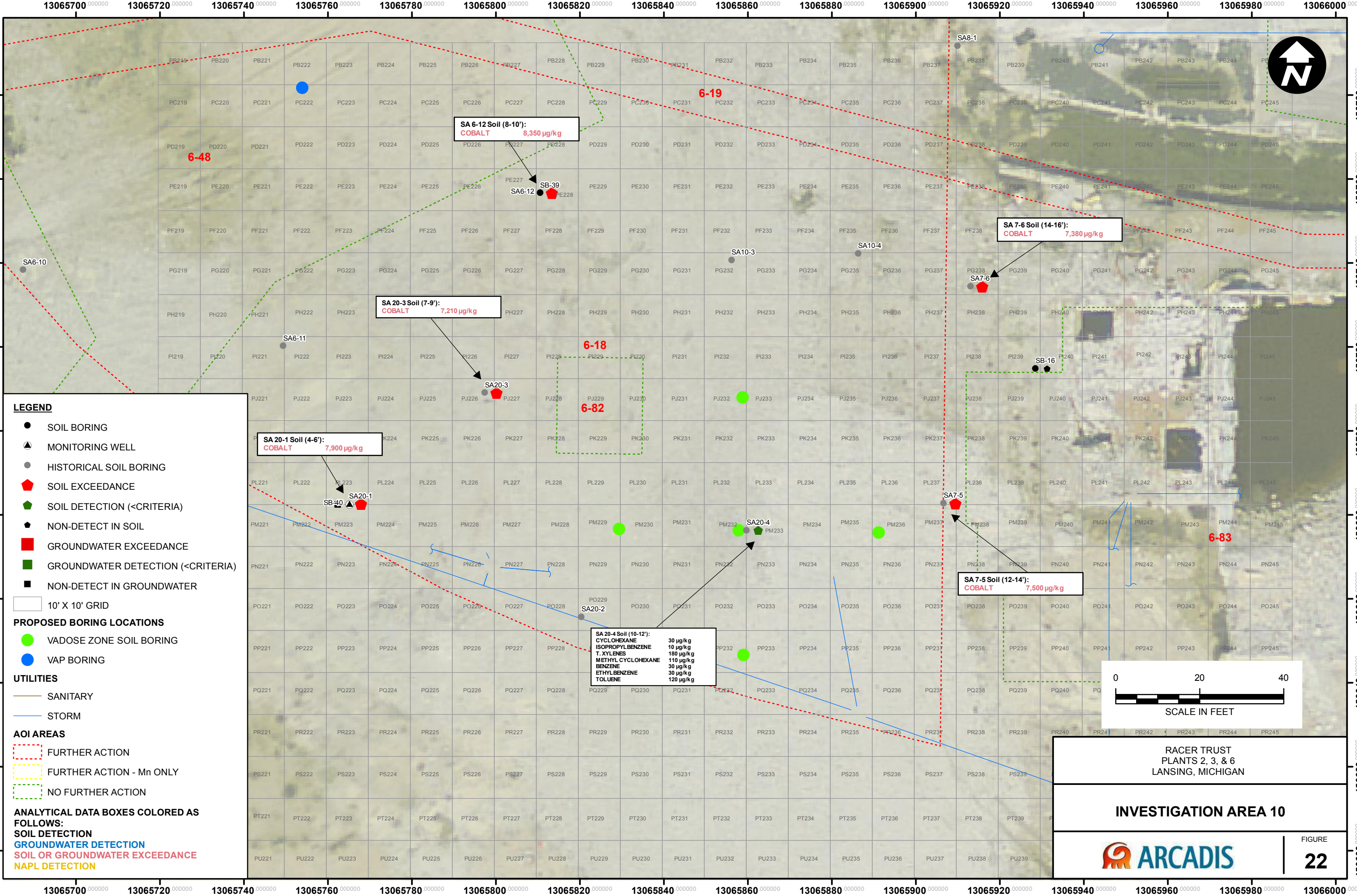


RACER TRUST
PLANTS 2, 3, & 6
LANSING, MICHIGAN

INVESTIGATION AREA 9

FIGURE
21

CITY: BRIGHTON DIV: ENV DB: A. YANITES PIC: PM: TR: PROJECT NUMBER: B0064481.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\MotorsLiqu道ationCompany\Lansing\Working\WORKPLAN FIGURES\DB_AREA_10.mxd PLOTTED: 3/12/2012 1:21:28 PM BY: ayanites



LEGEND

- SOIL BORING
- ▲ MONITORING WELL
- HISTORICAL SOIL BORING
- ⬠ SOIL EXCEEDANCE
- ⬠ SOIL DETECTION (<CRITERIA)
- ⬠ NON-DETECT IN SOIL
- GROUNDWATER EXCEEDANCE
- GROUNDWATER DETECTION (<CRITERIA)
- NON-DETECT IN GROUNDWATER

10' X 10' GRID

PROPOSED BORING LOCATIONS

- VADOSE ZONE SOIL BORING
- VAP BORING

UTILITIES

- SANITARY
- STORM

AOI AREAS

- ⬠ FURTHER ACTION
- ⬠ FURTHER ACTION - Mn ONLY
- ⬠ NO FURTHER ACTION

ANALYTICAL DATA BOXES COLORED AS FOLLOWS:

- SOIL DETECTION
- GROUNDWATER DETECTION
- SOIL OR GROUNDWATER EXCEEDANCE
- NAPL DETECTION

SA 20-1 Soil (4-6'):
COBALT 7,900 µg/kg

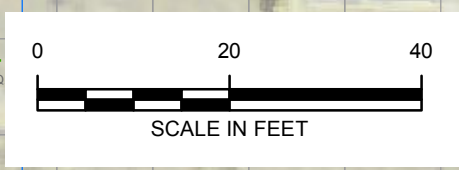
SA 20-3 Soil (7-9'):
COBALT 7,210 µg/kg

SA 6-12 Soil (8-10'):
COBALT 8,350 µg/kg

SA 7-6 Soil (14-16'):
COBALT 7,380 µg/kg

SA 7-5 Soil (12-14'):
COBALT 7,500 µg/kg

SA 20-4 Soil (10-12'):
CYCLOHEXANE 30 µg/kg
ISOPROPYL BENZENE 10 µg/kg
T. XYLENES 180 µg/kg
METHYL CYCLOHEXANE 110 µg/kg
BENZENE 30 µg/kg
ETHYL BENZENE 30 µg/kg
TOLUENE 120 µg/kg

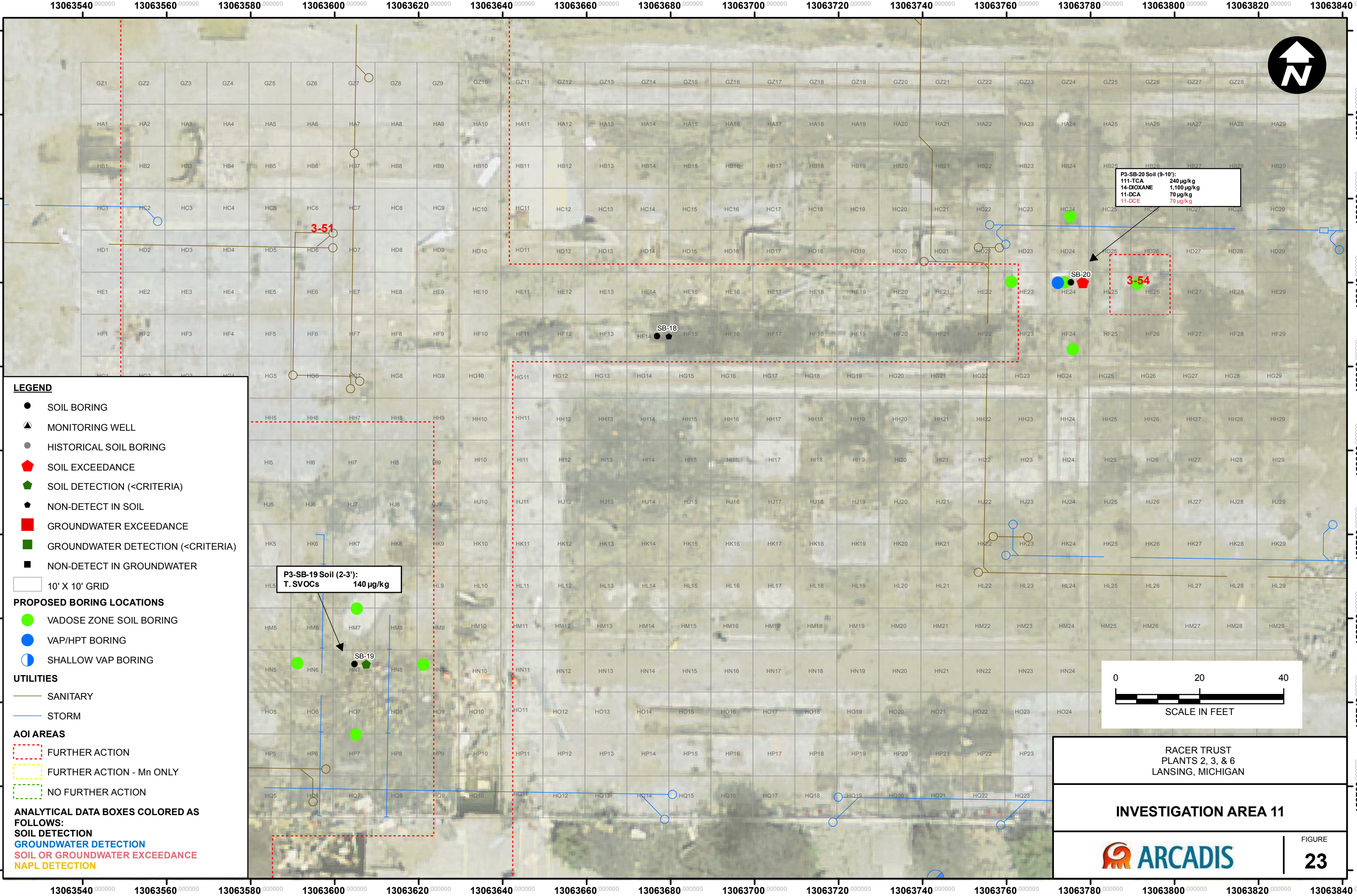


RACER TRUST
PLANTS 2, 3, & 6
LANSING, MICHIGAN

INVESTIGATION AREA 10

FIGURE
22

CITY: BRIGHTON DIV: ENV DB: A. YANITES PIC: PM: TR: PROJECT NUMBER: B0064480.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\MotorsLiquidationCompany\Lansing\WORKPLAN FIGURES\DB_AREA_11.mxd PLOTTED: 3/12/2012 1:21:40 PM BY: ayanites



LEGEND

- SOIL BORING
- ▲ MONITORING WELL
- HISTORICAL SOIL BORING
- ◆ SOIL EXCEEDANCE
- ◆ SOIL DETECTION (<CRITERIA)
- ◆ NON-DETECT IN SOIL
- GROUNDWATER EXCEEDANCE
- GROUNDWATER DETECTION (<CRITERIA)
- NON-DETECT IN GROUNDWATER
- 10' X 10' GRID

PROPOSED BORING LOCATIONS

- VADOSE ZONE SOIL BORING
- VAP/HPT BORING
- SHALLOW VAP BORING

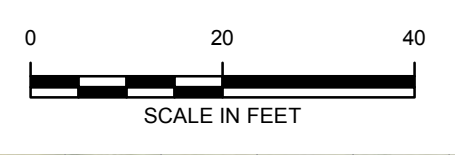
UTILITIES

- SANITARY
- STORM

AOI AREAS

- Further Action
- Further Action - Mn ONLY
- NO FURTHER ACTION

ANALYTICAL DATA BOXES COLORED AS FOLLOWS:
SOIL DETECTION
GROUNDWATER DETECTION
SOIL OR GROUNDWATER EXCEEDANCE
NAPL DETECTION

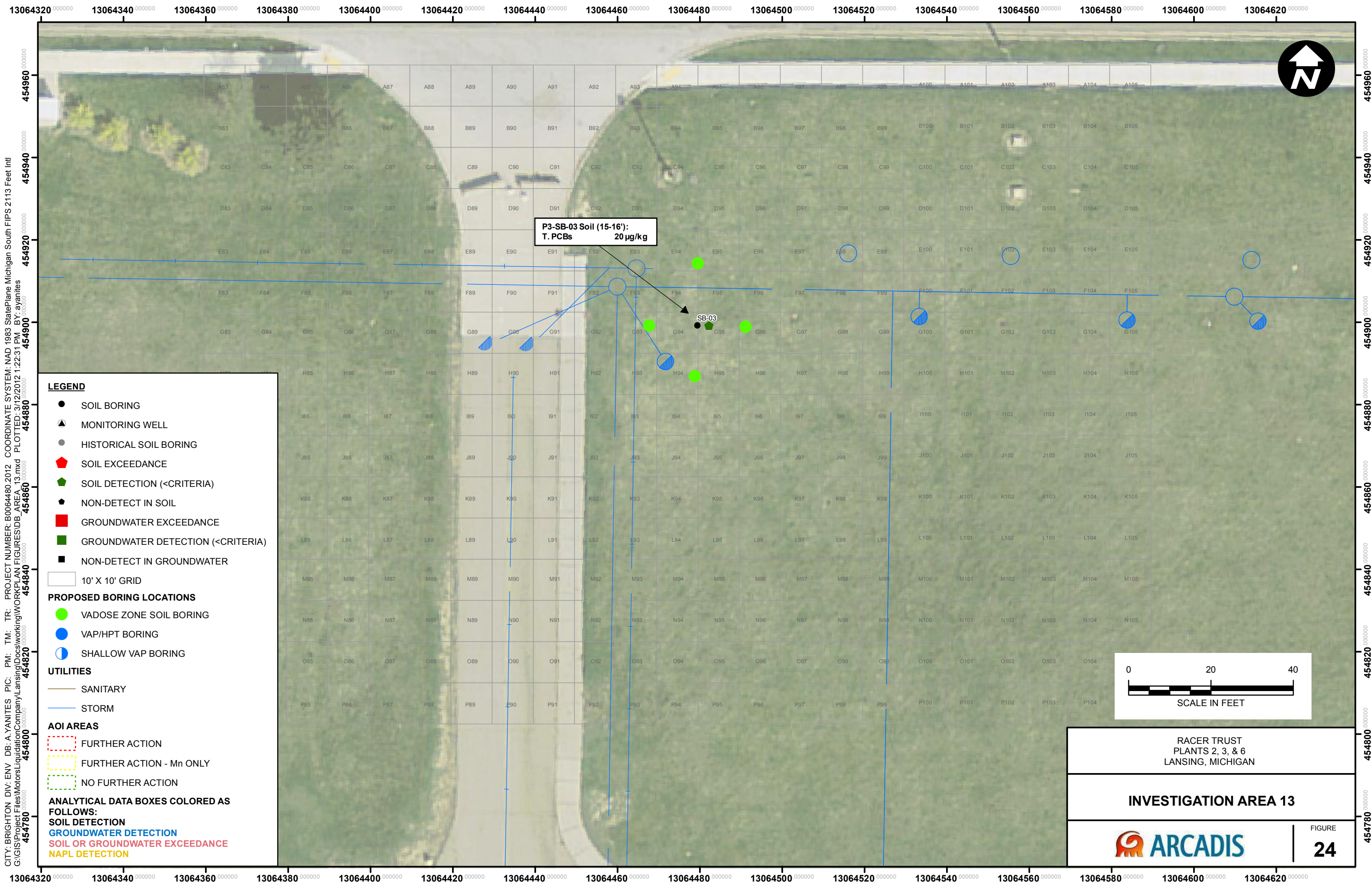


RACER TRUST
PLANTS 2, 3, & 6
LANSING, MICHIGAN

INVESTIGATION AREA 11

ARCADIS

FIGURE
23



CITY: BRIGHTON DIV: ENV DB: A. YANITES PIC: PM: TR: PROJECT NUMBER: B0064480.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\MotorsLiquidationCompany\Lansing\Working\WORKPLAN FIGURES\DB_AREA_13.mxd PLOTTED: 3/12/2012 1:22:31 PM BY: ayanites

LEGEND

- SOIL BORING
- ▲ MONITORING WELL
- HISTORICAL SOIL BORING
- ◆ SOIL EXCEEDANCE
- ◆ SOIL DETECTION (<CRITERIA)
- ◆ NON-DETECT IN SOIL
- GROUNDWATER EXCEEDANCE
- GROUNDWATER DETECTION (<CRITERIA)
- NON-DETECT IN GROUNDWATER
- 10' X 10' GRID

PROPOSED BORING LOCATIONS

- VADOSE ZONE SOIL BORING
- VAP/HPT BORING
- SHALLOW VAP BORING

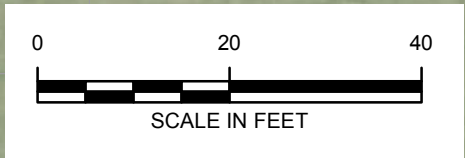
UTILITIES

- SANITARY
- STORM

AOI AREAS

- Further Action
- Further Action - Mn ONLY
- NO FURTHER ACTION

ANALYTICAL DATA BOXES COLORED AS FOLLOWS:
SOIL DETECTION
GROUNDWATER DETECTION
SOIL OR GROUNDWATER EXCEEDANCE
NAPL DETECTION



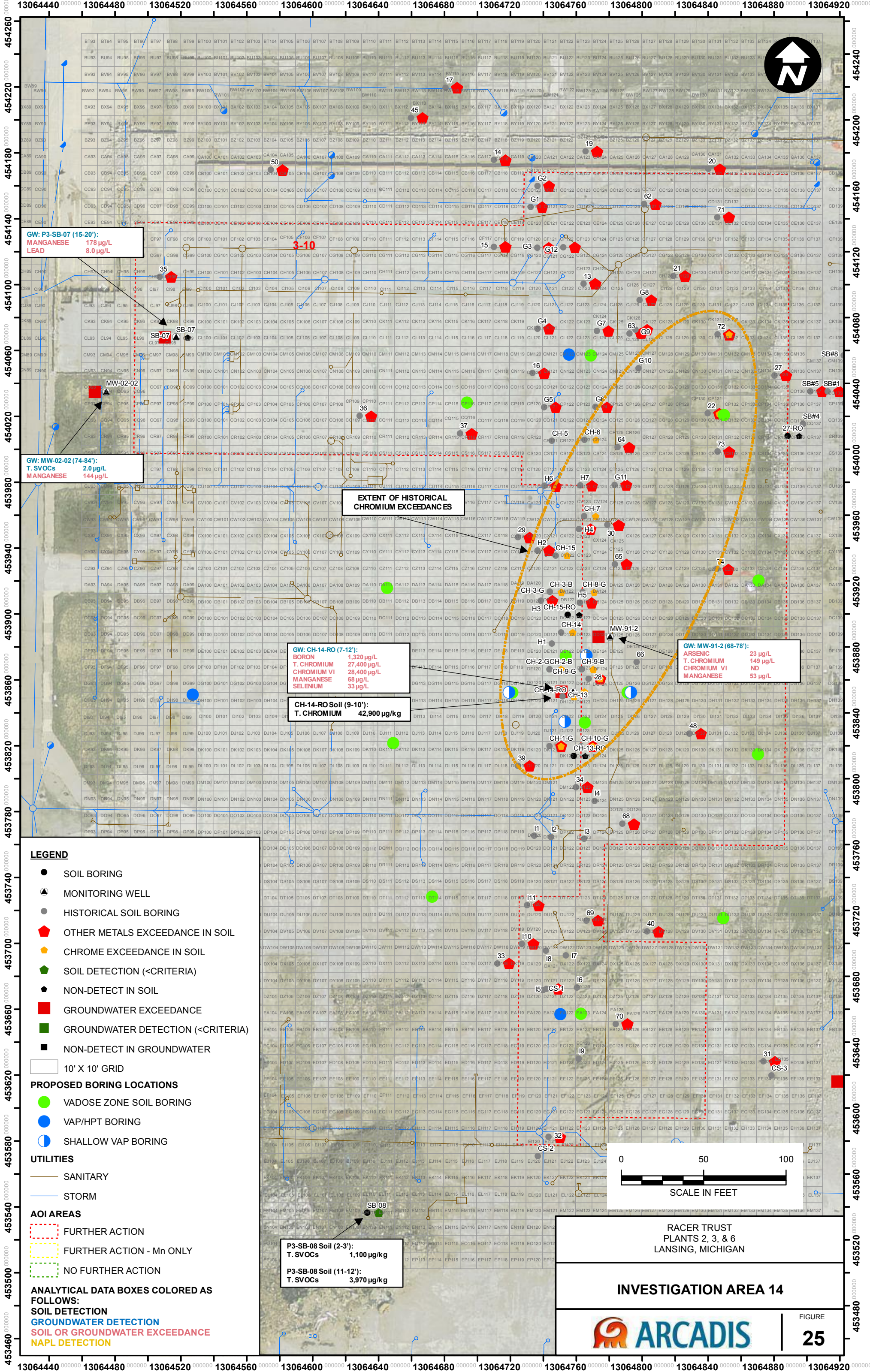
RACER TRUST
PLANTS 2, 3, & 6
LANSING, MICHIGAN

INVESTIGATION AREA 13

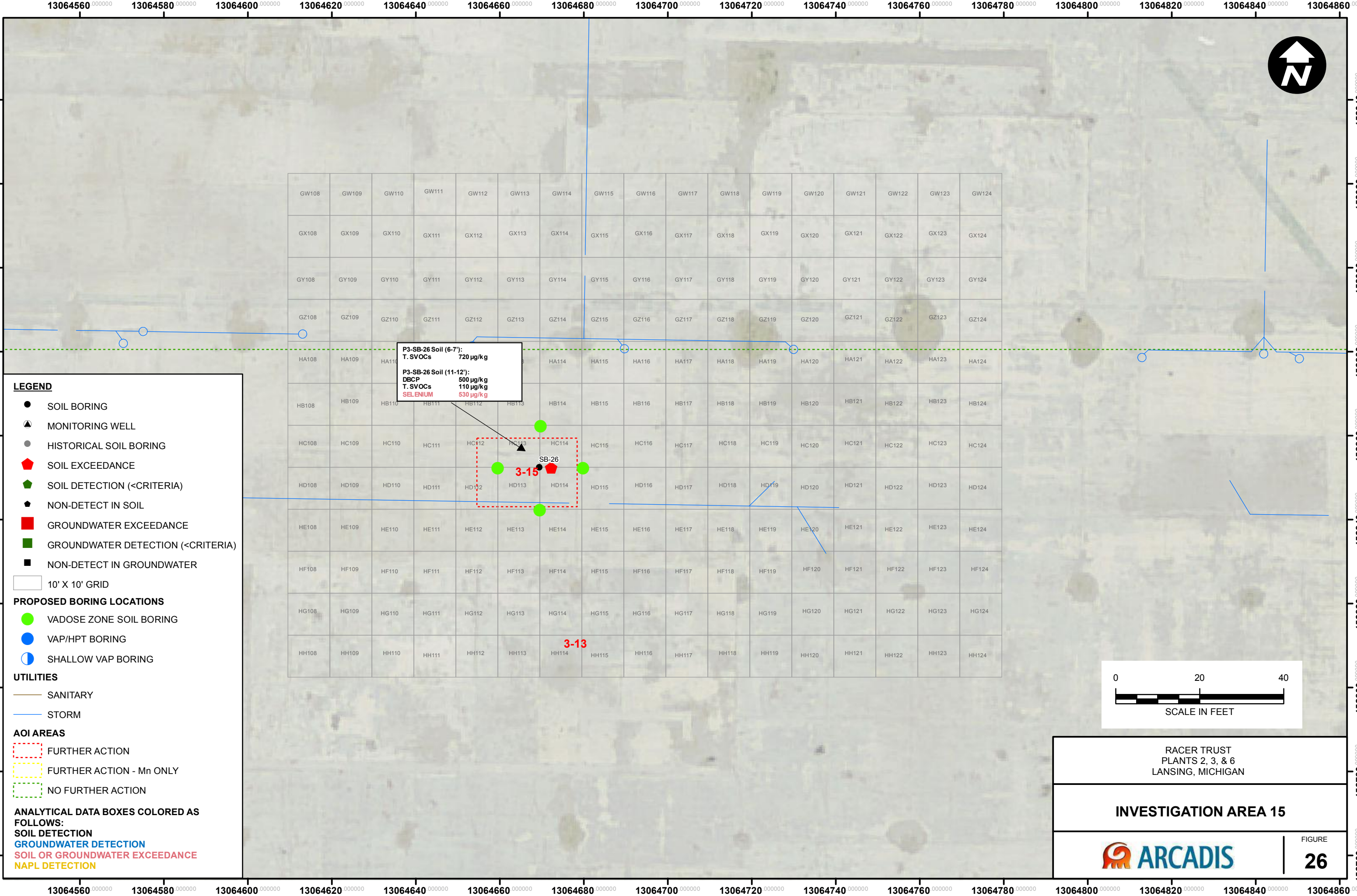


FIGURE

24



CITY: BRIGHTON DIV: ENV DB: A. YANITES PIC: PM: TM: TR: PROJECT NUMBER: B0064480.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\MotorsLiquidationCompany\Lansing\WORKPLAN FIGURES\DB_AREA_15.mxd PLOTTED: 3/12/2012 1:25:54 PM BY: ayanites



LEGEND

- SOIL BORING
- ▲ MONITORING WELL
- HISTORICAL SOIL BORING
- ◆ SOIL EXCEEDANCE
- ◆ SOIL DETECTION (<CRITERIA)
- ◆ NON-DETECT IN SOIL
- GROUNDWATER EXCEEDANCE
- GROUNDWATER DETECTION (<CRITERIA)
- NON-DETECT IN GROUNDWATER
- 10' X 10' GRID

PROPOSED BORING LOCATIONS

- VADOSE ZONE SOIL BORING
- VAP/HPT BORING
- SHALLOW VAP BORING

UTILITIES

- SANITARY
- STORM

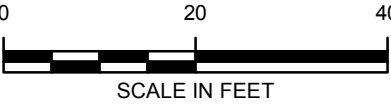
AOI AREAS

- FURTHER ACTION
- FURTHER ACTION - Mn ONLY
- NO FURTHER ACTION

ANALYTICAL DATA BOXES COLORED AS FOLLOWS:

- SOIL DETECTION
- GROUNDWATER DETECTION
- SOIL OR GROUNDWATER EXCEEDANCE
- NAPL DETECTION

P3-SB-26 Soil (6-7):
T. SVOCs 720 µg/kg
P3-SB-26 Soil (11-12):
DBCP 500 µg/kg
T. SVOCs 110 µg/kg
SELENIUM 530 µg/kg



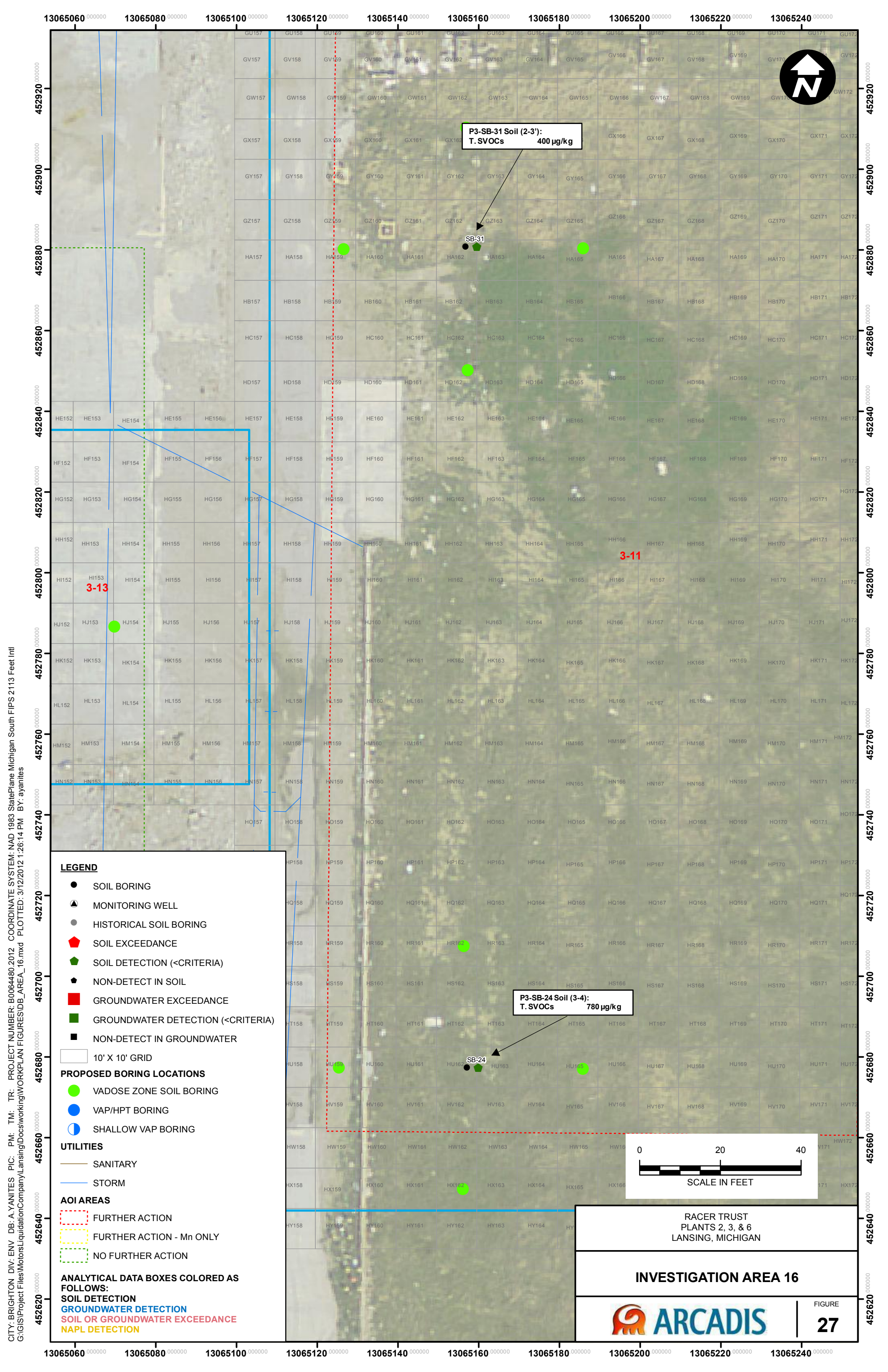
RACER TRUST
PLANTS 2, 3, & 6
LANSING, MICHIGAN

INVESTIGATION AREA 15

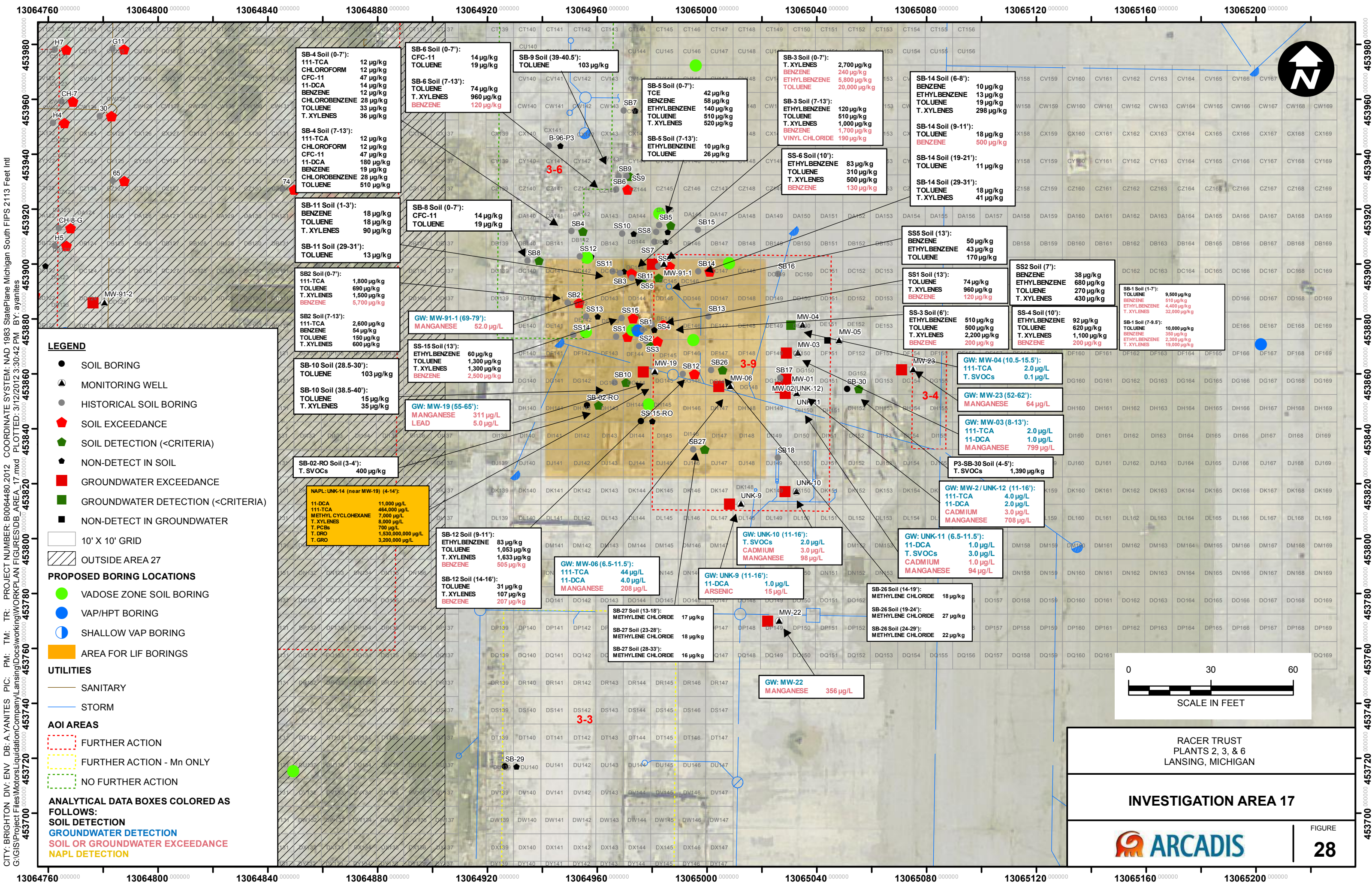


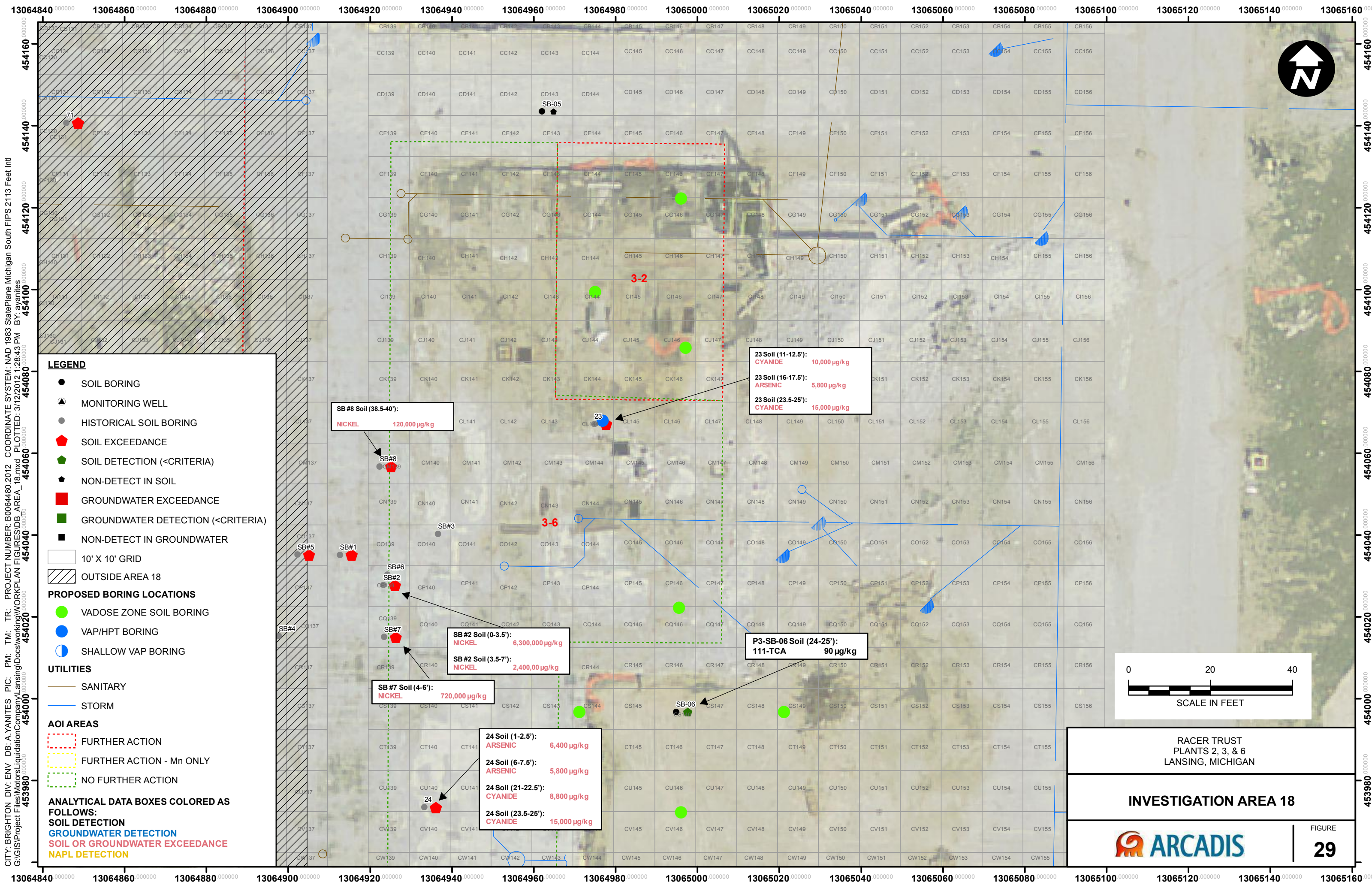
FIGURE

26



CITY: BRIGHTON DIV: ENV DB: A.YANITES PIC: PM: TR: PROJECT NUMBER: B0064480.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\MotorsLiquidation\Company\ Lansing\WORKING\FIGURES\DB_AREA_17.mxd PLOTTED: 3/12/2012 3:30:42 PM BY: ayanites





CITY: BRIGHTON DIV: ENV DB: A.YANITES PIC: PM: TR: PROJECT NUMBER: B0064480.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl G:\GIS\Project Files\Motors\Liquidation\Company\Lansing\Working\WORKPLAN FIGURES\DB_AREA_19.mxd PLOTTED: 3/12/2012 1:31:43 PM BY: ayanites

LEGEND

- SOIL BORING
- ▲ MONITORING WELL
- HISTORICAL SOIL BORING
- ◆ SOIL EXCEEDANCE
- ◆ SOIL DETECTION (<CRITERIA)
- ◆ NON-DETECT IN SOIL
- GROUNDWATER EXCEEDANCE
- GROUNDWATER DETECTION (<CRITERIA)
- NON-DETECT IN GROUNDWATER
- 10' X 10' GRID

PROPOSED BOING LOCATIONS

- VADOSE ZONE SOIL BORING
- VAP/HPT BORING
- SHALLOW VAP BORING

UTILITIES

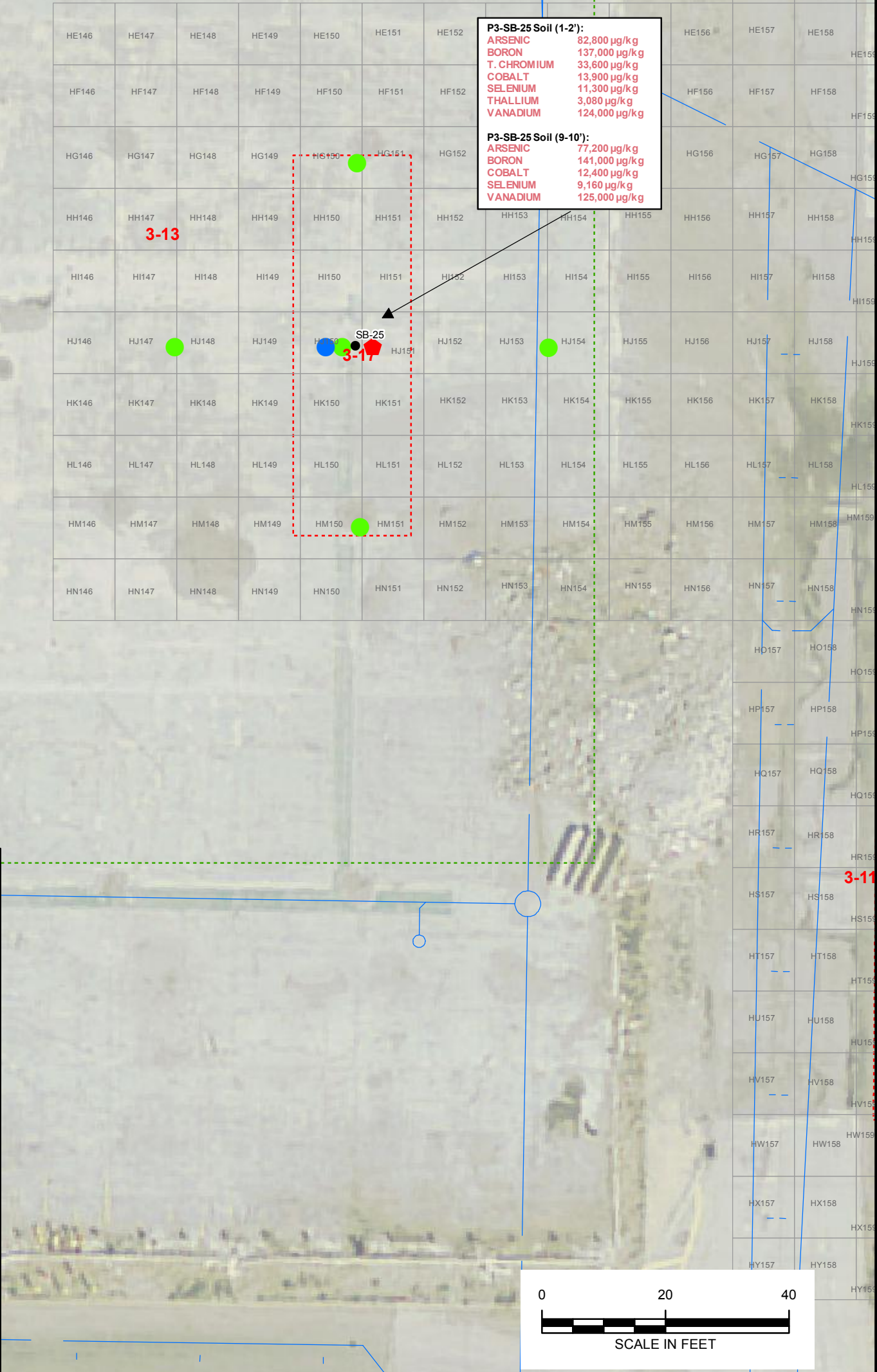
- SANITARY
- STORM

AOI AREAS

- Further Action
- Further Action - Mn ONLY
- NO FURTHER ACTION

ANALYTICAL DATA BOXES COLORED AS FOLLOWS:

- SOIL DETECTION
- GROUNDWATER DETECTION
- SOIL OR GROUNDWATER EXCEEDANCE
- NAPL DETECTION



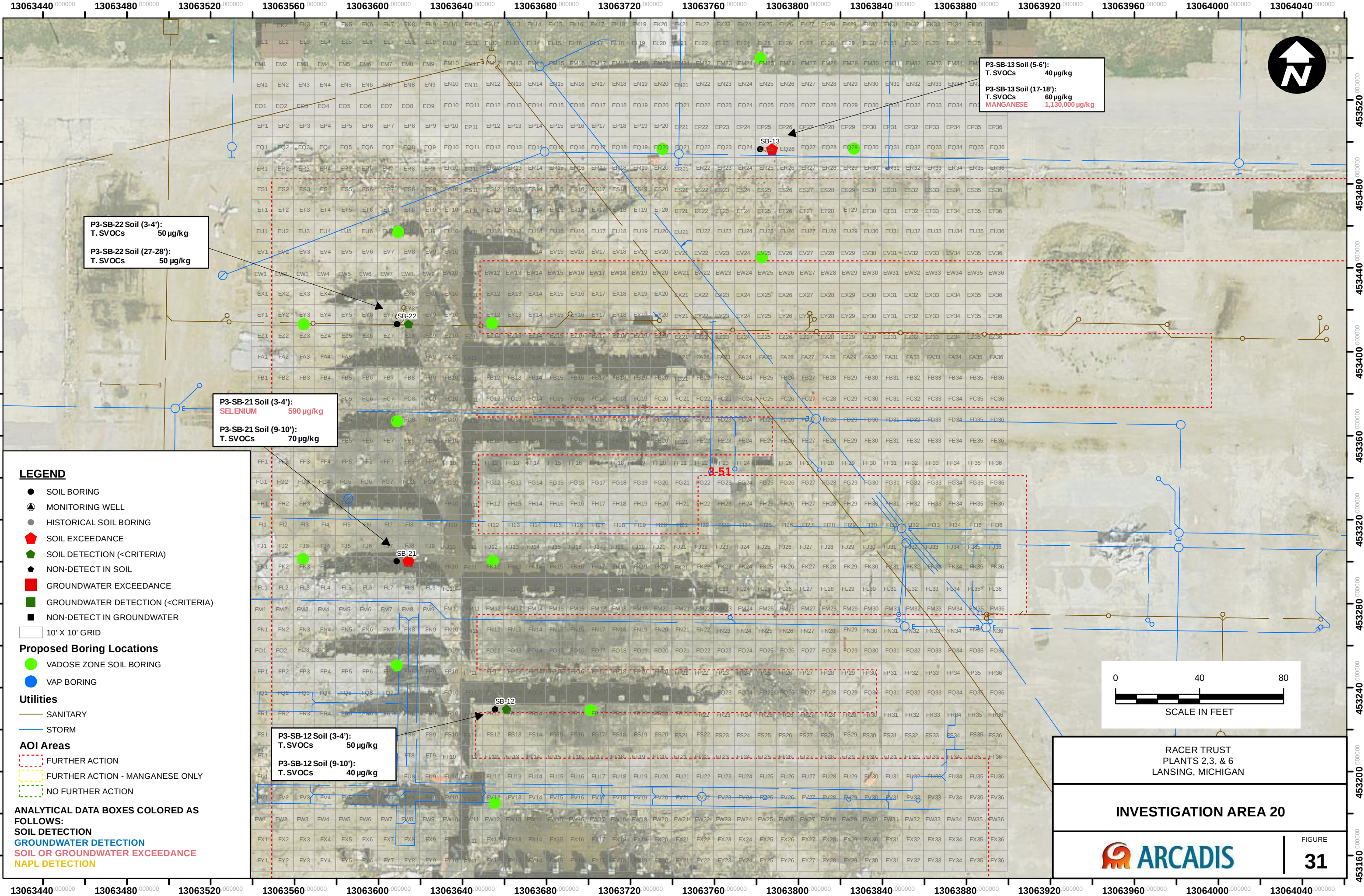
RACER TRUST
PLANTS 2, 3, & 6
LANSING, MICHIGAN

INVESTIGATION AREA 19

ARCADIS

FIGURE
30

CITY: BRIGHTON DIV: ENV DB: A. YANITES PIC: PM: TM: TR: PROJECT NUMBER: B0064479.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\MotorsLiquidation\Company\A\arising\Docs\working\WORKPLAN FIGURES\DB AREA_20.mxd PLOTTED: 4/12/2012 5:49:51 PM BY: PCurry



P3-SB-22 Soil (3-4'):
T. SVOCs 50 µg/kg
P3-SB-22 Soil (27-28'):
T. SVOCs 50 µg/kg

P3-SB-21 Soil (3-4'):
SELENIUM 590 µg/kg
P3-SB-21 Soil (9-10'):
T. SVOCs 70 µg/kg

P3-SB-13 Soil (5-6'):
T. SVOCs 40 µg/kg
P3-SB-13 Soil (17-18'):
T. SVOCs 60 µg/kg
MANGANESE 1,130,000 µg/kg

P3-SB-12 Soil (3-4'):
T. SVOCs 50 µg/kg
P3-SB-12 Soil (9-10'):
T. SVOCs 40 µg/kg

LEGEND

- SOIL BORING
- MONITORING WELL
- HISTORICAL SOIL BORING
- SOIL EXCEEDANCE
- SOIL DETECTION (<CRITERIA)
- NON-DETECT IN SOIL
- GROUNDWATER EXCEEDANCE
- GROUNDWATER DETECTION (<CRITERIA)
- NON-DETECT IN GROUNDWATER
- 10' X 10' GRID

Proposed Boring Locations

- VADOSE ZONE SOIL BORING
- VAP BORING

Utilities

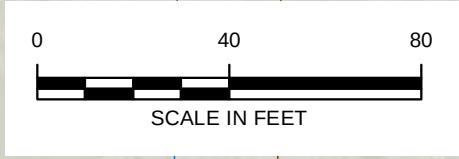
- SANITARY
- STORM

AOI Areas

- FURTHER ACTION
- FURTHER ACTION - MANGANESE ONLY
- NO FURTHER ACTION

ANALYTICAL DATA BOXES COLORED AS FOLLOWS:

- SOIL DETECTION
- GROUNDWATER DETECTION
- SOIL OR GROUNDWATER EXCEEDANCE
- NAPL DETECTION



RACER TRUST
PLANTS 2,3, & 6
LANSING, MICHIGAN

INVESTIGATION AREA 20



FIGURE

31

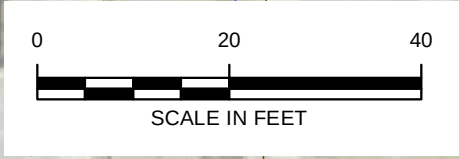
CITY: BRIGHTON DIV: ENV DB: A. YANITES PIC: PM: TR: PROJECT NUMBER: B0064479.2012 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
G:\GIS\Project Files\MotorsLiquida\Company\A\arising\Documents\Working\WORKPLAN FIGURES\DB AREA 21.mxd PLOTTED: 4/12/2012 5:45:36 PM BY: PCurry



- LEGEND**
- SOIL BORING
 - ▲ MONITORING WELL
 - HISTORICAL SOIL BORING
 - ◆ SOIL EXCEEDANCE
 - ◆ SOIL DETECTION (<CRITERIA)
 - ◆ NON-DETECT IN SOIL
 - GROUNDWATER EXCEEDANCE
 - GROUNDWATER DETECTION (<CRITERIA)
 - NON-DETECT IN GROUNDWATER
 - 10' X 10' GRID
- Proposed Boring Locations**
- VADOSE ZONE SOIL BORING
 - VAP BORING
- Utilities**
- SANITARY
 - STORM
- AOI Areas**
- FURTHER ACTION
 - FURTHER ACTION - MANGANESE ONLY
 - NO FURTHER ACTION

ANALYTICAL DATA BOXES COLORED AS FOLLOWS:
SOIL DETECTION
GROUNDWATER DETECTION
SOIL OR GROUNDWATER EXCEEDANCE
NAPL DETECTION

P3-SB-27 Soil (4-5'):
ARSENIC 37,500 µg/kg
BORON 17,100 µg/kg
COBALT 16,400 µg/kg
SELENIUM 5,410 µg/kg
VANADIUM 83,400 µg/kg
P3-SB-27 Soil (14-15'):
No exceedances



RACER TRUST
PLANTS 2, 3, & 6
LANSING, MICHIGAN

INVESTIGATION AREA 21

FIGURE
32

FIGURE 33
CSM DEVELOPMENT
PROCESS

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

