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Motors Liquidation Company

Corrective Measures Implementation (CMI) Work Plan

–Southend of the Former General Motors Corporation North American Operations Facility (Otherwise known as Buick City)

Flint, Michigan

August 13, 2010

ARCADIS

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CMI Work Plan

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City Site– Southend
Flint, Michigan

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Table of Contents

List of Acronyms, Abbreviations, and Units of Measurement **v**

1. Introduction **7**

1.1 Background 7

1.1.1 Site History 8

1.1.2 Overview of Historical Investigations (RFI Activities, Interim Measures, Etc). 8

2. Corrective Measures **10**

2.1 Summary 10

2.2 LNAPL 10

2.3 Groundwater Monitoring 11

2.4 Soil 12

2.5 Site Wide Use Restrictions 12

3. LNAPL Recovery and Treatment Design and Construction Technologies **13**

3.1 LNAPL Recovery and Treatment Technologies 13

3.1.1 Physical LNAPL Recovery 13

3.1.2 Surfactants 13

3.1.3 Thermal Remediation 14

3.1.4 *In-Situ* Chemical Oxidation 14

3.1.5 Surfactant/Cosolvent Enhanced ISCO 15

3.2 Bench-Scale Studies 16

3.3 Field Testing 17

4. Laser Induced Fluorescence (LIF) Technology for LNAPL Characterization **18**

4.1 Description of LIF Technology 18

4.2 LIF Investigation Area and Approach 19

5. Soil and Groundwater Quality **20**

5.1 Contaminants of Concern 20

5.2 Extent of Contamination 20

5.3 Proposed Pilot-Test Objectives 21

5.4 Technology Description 21

5.5 Soil-Vapor Extraction 21

5.6 Multi-Phase Extraction 22

5.7 Pilot Test Well Design 22

5.7.1 Extraction Wells 22

5.7.2 Monitoring Wells 23

5.8 Pilot Test Procedures 23

5.8.1 Test Equipment 23

5.9 Field Test Procedures/Data Collection 24

5.10 Proposed Pilot Test Well Network 24

5.11 Soil-Vapor Extraction Test 24

5.12 Multi-Phase Extraction Test 25

5.13 Sampling 26

5.13.1 Groundwater Extraction 26

5.13.2 Soil-Vapor Extraction 27

5.14 Waste Collection, Characterization and Disposal 28

5.15 Groundwater Extraction 28

5.15.1 Storage and Disposal 28

5.15.2 Sampling 28

5.16 Soil-Vapor Extraction 28

5.16.1 Treatment and Direct Discharge 28

6. Groundwater Monitoring Plan and Contingent Remedies 29

6.1 Groundwater and LNAPL Elevation Monitoring Program 29

6.2 Groundwater Quality Monitoring Program 29

6.2.1 Groundwater Sample Locations 29

6.2.2 Laboratory Analysis 30

6.2.3 Monitoring Network Inspection and Maintenance 31

6.2.4 Reporting 31

6.2.5 Contingency Plan 32

6.3 NPDES Plus Monitoring Program 32

6.3.1 NPMP Monitoring Points 32

6.3.2 Storm Sewer Outfall Sampling Parameters and Frequency 33

6.3.3 Analytical Methods 34

6.3.4 Reporting 34

6.3.5 Contingency Plan 35

7. Soil 36

7.1 AOI 09-A Soil Removal Action 36

7.1.1 Objective 36

7.1.2 Lead Soil Impact Delineation Activities 36

7.2 Maintenance of Select Surface Covers 38

8. Site Wide Use Restrictions 39

8.1 Groundwater Use Restrictions 39

8.2 Site Restrictions 39

9. Field Sampling Plan/Quality Assurance Project Plan 42

10. Schedule 43

11. References 44

Tables

Table 1	Conceptual AOI-Specific Bench and Field-Scale Testing Program
Table 2	Extraction and Monitoring Well Combinations
Table 3	Groundwater and LNAPL Elevation Monitoring Locations - Northend
Table 4	Groundwater and LNAPL Elevation Monitoring Locations – Southend
Table 5	CMI Groundwater Quality Monitoring Locations
Table 6	NPMP Monitoring Points and Analyses

Figures

Figure 1	Site Location Map
Figure 2	LNAPL Thickness Contours - Southend
Figure 3	LIF Investigation – Area 1
Figure 4	LIF Investigation - Area 2
Figure 5	LIF Investigation – Area 3
Figure 6	Pilot Test Well Layout – AOI-9B
Figure 7	Hydrogeologic Cross-Section A-A
Figure 8	MPE and Observation Well Details
Figure 9	CMI Groundwater Monitoring Locations - Northend
Figure 10	CMI Groundwater Monitoring Locations - Southend
Figure 11	NPDES Plus Monitoring Program Sampling Locations
Figure 12	Areas of Soil Impact - Southend
Figure 13	Restrictive Covenants - Southend

Appendices

Appendix A	MPE/SVE Field Test Log
Appendix B	Inspection Log Sheet (Maintenance of Select Surface Covers)

List of Acronyms, Abbreviations, and Units of Measurement

AOC	Administrative Order on Consent
AOI	Area of Interest
AST	Aboveground Storage Tank
BGL	Below Grade Level
CMI	Corrective Measures Implementation
CMP	Corrective Measures Plan
COC	Constituents of Concern
CSX	CSX Corporation
DPT	Direct Push Technology
FSP	Field Sampling Plan
GMC	General Motors Corporation
GM LLC	General Motors LLC
GRO	Gasoline Range Organics
GSI	Groundwater/Surface Water Interface
HSWA	Hazardous and Solid Waste Amendments
ISCO	In-Situ Chemical Oxidation
LIF	Laser Induced Fluorescence
LGAC	Liquid Granular Activated Carbon
LNAPL	Light Non-Aqueous Phase Liquid
MDNRE	Michigan Department of Natural Resources and Environment
MPE	Multiphase Extraction
MLC	Motors Liquidation Company
mg/kg	Milligrams Per Kilogram
NPDES	National Pollutant Discharge Elimination System
NPMP	NPDES Plus Monitoring Program
NREPA	Natural Resources and Environmental Protection Act
NTU	Nephelometric Turbidity Units
PAH	Poly Aromatic Hydrocarbon
PAL	Project Analyte List
PCBs	Polychlorinated Biphenyls
PID	Photoionization detector
PPM	Parts Per Million
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
ROST	Rapid Optical Sensing Tool
QAPP	Quality Assurance Project Plan

SVE	Soil Vapor Extraction
SVOC	Semi-volatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
UVOST	Ultraviolet Optical Sensing Tool
VOC	Volatile Organic Compound
XRF	X-Ray Florescence

1. Introduction

This Corrective Measures Implementation (CMI) Work Plan was prepared by ARCADIS on behalf of the Motors Liquidation Company (MLC), formerly known as General Motors Corporation (GMC), for the southern portion of the former GMC North American Operations facility (otherwise known as Buick City) (the Site), located in Flint, Michigan. On June 1, 2009, GMC filed for Chapter 11 protection under U.S. bankruptcy code. On July 10, 2009, GMC was renamed Motors Liquidation Company (MLC) and on the same day some of the operating assets of GMC were sold to a newly formed company, "General Motors Company". General Motors Company changed its name to General Motors LLC (GM LLC) on October 16, 2009. Assets not sold to GM LLC remain the property of the MLC, in its capacity as a debtor-in-possession in the bankruptcy case. Currently, GM LLC manufactures automotive components at the Powertrain Flint North facility, located in the northern portion of the Site under a lease with MLC. MLC and GM LLC environmental program requirements and responsibilities have been separated for the Site.

The CMI Work Plan has been prepared to comply with requirements of the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976 (RCRA) and the Hazardous and Solid Waste Amendments of 1984 (HSWA), 42 U.S.C. § 6901 et seq., and United States Environmental Protection Agency (USEPA) regulations at 40 C.F.R. Parts 260-271 and Part 124.

1.1 Background

The Site is located at 902 East Leith Street in Flint, Michigan, in Genesee County and encompasses approximately 452 acres of land. It is generally bounded to the north by Stewart Avenue and Pierson Road, to the south by Harriet Street, to the east by James P. Cole Boulevard and CSX Railroad, and to the west by Industrial Avenue and North Street. Current operations are all conducted in the portion of the property located north of Leith Street that is referred to as the Northend. Building demolition has been completed in the portion of the property located south of Leith Street which is referred to as the Southend. Limited historical demolition has been performed in portions of the Northend. A Site Location map is included as Figure 1.

A plastics recycling facility is located on the northeast corner of James P. Cole Boulevard and Garfield Avenue, and a Consumers Power Building is located on the southeast corner of James P. Cole Boulevard, between the Site and the Flint River. An idle DuPont facility is located south of Hamilton Avenue, east of the Site. The CSX Railroad and Interstate I-475 are located to the east, between the Site and the Flint

River, as well as several other companies, including Bell's Produce, PPG Industries, Kasle Steel/Auto Blankers, Flint Coatings, and Lockhart Chemicals. Flint Plating occupies a corner just north of the Site's industrial wastewater treatment plant. The remaining areas surrounding the Site are generally occupied by residential neighborhoods and other companies including Unit Terminal, Universal Systems, and Associated Truck.

1.1.1 Site History

Portions of the Site were originally developed in the late 1800s to produce the "horseless carriage." In 1898, Billy Durant and J. Dallas Dort purchased the Imperial Wheel Company, making it a subsidiary of the Durant/Dort Carriage Company. After Durant/Dort Carriage Company purchased the Imperial Wheel Company, manufacturing operations were relocated to the intersection of Hamilton Avenue and St. John Street (currently James P. Cole Boulevard). The Buick Motor Company was first established in Flint when Flint Wagon Works purchased the company from David Buick in September 1903. In 1903, the Buick Motor Company was relocated from Detroit to the Site, on Hamilton Avenue between Industrial Avenue and St. John Street (now James P. Cole Boulevard).

In addition to the manufacturing of automobiles, in response to World War I, the Buick Motor Company began producing the Liberty Aircraft engine in 1918. Similarly, in response to World War II, the production of automobiles was stopped in 1942, and the Buick complex was converted for the production of military equipment. Current Site operations include machining of ferrous and nonferrous metals, torque converter manufacturing, transmission components manufacturing, and industrial wastewater treatment.

1.1.2 Overview of Historical Investigations (RFI Activities, Interim Measures, Etc.)

Numerous historical investigations have been performed at the Site to assess potential soil and/or groundwater impacts. The primary contaminants of concern consist of free-phase petroleum products (i.e., light non-aqueous phase liquid [LNAPL]), chlorinated solvents, lead, and/or manganese.

On March 2, 2000, the USEPA and GMC (now known as MLC) entered into a RCRA Section 3008(h) Administrative Order on Consent (AOC) R8H-5-00-02 for the Site (modified November 8, 2001). This Consent Order served to address the corrective action requirements of the RCRA of 1976, as amended by the HSWA of 1984. In

general, this Consent Order required the completion of a comprehensive investigation of the Site, which is referred as the RCRA Facility Investigation (RFI).

The RFI included an investigation of 80 Areas of Interest (AOIs), in addition to the Site storm sewer systems. Milestone documents which have been submitted to the Michigan Department of Natural Resources and Environment (MDNRE) and USEPA for reporting the results of the RFI and overall RCRA Corrective Action Program include the following:

- *Description of Current Conditions for Areas South of Leith Street* (BBL, 2000a)
- *Description of Current Conditions for Areas North of Leith Street* (BBL, 2000b)
- *RCRA Facility Investigation Work Plan* (BBL, 2001)
- *Resource Conservation and Recovery Act Facility Investigation Phase I Report* (BBL, 2002a)
- *Resource Conservation and Recovery Act Facility Investigation Phase II Report* (BBL, 2004 & BBL, 2006)
- *Resource Conservation and Recovery Act Environmental Indicator CA 750 Report Determination of Migration of Contaminated Groundwater Under Control (ENVIRON International Corporation, September 2005)*
- *Resource Conservation and Recovery Act Corrective Measures Proposal* (ARCADIS, 2006)
- *Resource Conservation and Recovery Act Revised Corrective Measures* Proposal (ARCADIS, 2008)
- *Resource Conservation and Recovery Act Revised Corrective Measures Proposal Addendum #1* (ARCADIS, 2009).

In response to the *Revised Corrective Measures* Proposal (ARCADIS, 2008) (Revised CMP) and the *Revised Corrective Measures Proposal Addendum #1* (ARCADIS, 2009) (Revised CMP Addendum #1), the USEPA issued a *Statement of Basis* in January 2010 (Statement of Basis). Based upon public comments received and a public meeting convened in February 2010, the USEPA issued a *Final Decision and Response to Comments* (Final Decision) in May 2010. The corrective measures proposed in this CMI Work Plan responds to the Final Decision documents.

2. Corrective Measures

2.1 Summary

Considering the reasonable anticipated future use of the property, the goals of the chosen corrective measures for the Southend are the following: 1) to protect human health and the environment now and in the future and, 2) to clean up groundwater to the maximum beneficial use in order to protect the groundwater resource in the area.

2.2 LNAPL

The RFI performed at the Site identified 15 LNAPL areas (four of which are located in the Southend). MDNRE regulations require that LNAPL be removed from the ground to the extent practicable. Some of the LNAPL plumes contain polychlorinated biphenyls (PCBs). In addition, some of the LNAPL plumes pose the following risks:

- Potential source area for dissolved phase organic plumes in groundwater
- Potential source area for organic vapors, which could migrate into enclosed buildings

For the areas with free LNAPL still remaining, treatment will be evaluated and performed as defined in the Final Decision. There are several different types of LNAPL present at the Site, each having unique physical and chemical properties, and several soil types are impacted. These factors influence LNAPL remedial technology performance and selection. As such, the final LNAPL remedy will include AOI-specific remediation approaches that may incorporate the following remediation technologies:

- Physical LNAPL recovery (recovery trenches and multi-phase extraction [MPE])
- Surfactants
- Thermal remediation
- In-situ chemical oxidation
- Enhanced bioremediation

These technologies are described in more detail in Section 3. It is anticipated that the majority of LNAPL will be removed by physical means (LNAPL recovery trenches and/or MPE technologies). Bench and field pilot testing will be performed on selected technologies prior to full-scale implementation, as discussed in Section 3.2. As required by the Final Decision, bench scale testing of five different technologies will be

performed. From the five technologies, three will be field pilot tested based on the results of the bench scale tests.

The basis for the selected LNAPL recovery technology(s) will be provided to EPA for review on completion of the pilot testing. Where the LNAPL is contributing to groundwater plumes, reducing the volume of LNAPL present in the subsurface will help restore the aquifer in the shortest amount of time and furthermore provide protection to the Flint River. A conceptual design for remedy construction will be prepared and technology-based cleanup objectives for LNAPL established following LNAPL recovery technology selection.

As part of the LNAPL remedy, a long-term monitoring program will also be developed in order to monitor its effectiveness and the stability of the residual product remaining.

2.3 **Groundwater Monitoring**

As documented in the RFI Phase I and II Reports, an extensive groundwater characterization program was implemented as part of the RFI. The focus of the groundwater characterization in these documents was the impacts Site activities may have had on groundwater relative to drinking water criteria. The RFI identified several groundwater plumes based on comparing groundwater concentrations to the Michigan Natural Resources and Environmental Protection Act, PA 451, Michigan Part 201Industrial and Commercial II, II, and IV Drinking Water Criteria (Michigan Part 201 IDW). Subsequent to the RFI investigations, a Site-wide groundwater monitoring program was implemented to determine whether the identified groundwater plumes were expanding. The analytical data from the groundwater monitoring has indicated that the plumes are stable and not expanding. The monitoring groundwater data were evaluated against Michigan Part 201 IDW as documented in the RFI Phase II Report.

As proposed in the Revised CMP, the human health risks posed by the above groundwater impacts will be controlled by institutional controls (restrictive covenants) on the property to prohibit the use of groundwater for drinking purposes. However, as a prudent and conservative measure, MLC will continue monitoring groundwater elevations, analytical concentrations, and LNAPL presence/absence, and thickness at select monitoring wells as described in more detail in Sections 6.1 and 6.2.

Since the *Revised Corrective Measures Proposal* (ARCADIS, 2008) (Revised CMP) was prepared, the focus of the groundwater characterization has expanded to include impacts related to the Michigan Part 201 groundwater-surface water interface (GSI) criteria. The GSI criteria are particularly relevant at the Site because it is traversed by

multiple storm sewers that interface with the water table in some locations. The storm sewers, which discharge to the Flint River, have poor integrity and thus are expected to have points of localized infiltration for Site groundwater. As such, impacted groundwater entering the sewers has the potential to affect surface water quality.

In summary, the purpose of the groundwater monitoring will be 1) to measure the effectiveness of the LNAPL remedy; 2) monitor the long-term stability of contaminants in the groundwater; 3) document continued compliance with the MDNRE GSI criteria.

2.4 Soil

Corrective measures will include excavation of lead contaminated soil at AOI -9A, as described in Section 7, plus the use of institutional controls to limit excavation and engineering controls in the form of concrete slabs to protect workers from being directly exposed to areas on the Southend of the property with lead contaminated soil. Since the use of the land will remain industrial via the facility-wide deed restriction, this will be protective by preventing worker exposure to the lead underneath the concrete slabs and preventing workers from digging without the proper safety precautions.

2.5 Site Wide Use Restrictions

Corrective measures will include institutional controls to restrict the land use of the entire MLC property to Michigan Part 201 Industrial/Commercial II, III and IV and to prohibit the use of all onsite groundwater for any purpose beyond sampling and other related investigatory testing.

3. LNAPL Recovery and Treatment Design and Construction Technologies

Previous investigations identified five general areas where LNAPL was present: AOI 12-A/B/C; AOI-2B; AOI-40-A/B and AOI-16C; and AOI-9B (Figure 2). LNAPL design and construction cannot be completed until additional field investigation of LNAPL nature extent and bench and field-scale testing are completed. The field investigation of the LNAPL in the Southend will be completed in the Summer of 2010 and bench and field-scale testing are expected to begin in the Fall of 2010.

3.1 LNAPL Recovery and Treatment Technologies

MLC is evaluating remedial technologies for addressing LNAPL impacts at the Site. The purpose of this section is to present a brief summary of prevalent LNAPL remediation technologies.

3.1.1 Physical LNAPL Recovery

LNAPL recovery trench and MPE technologies were identified in the Statement of Basis for use at the Site. LNAPL recovery trenches collect LNAPL from surrounding soils through the installation of trench media that is more permeable than the surrounding formation. MPE systems recover soil gas, groundwater, and LNAPL from the subsurface. These technologies recover drainable LNAPL by inducing a gradient to drive LNAPL to the extraction system via liquid (MPE and recovery trench) and soil-gas (MPE) extraction.

Physical pumping of the LNAPL by recovery trenches and MPE can reduce LNAPL saturation to residual saturation. However, achievement of true residual saturation conditions at field scale may be limited by heterogeneous soil properties that may influence vertical and horizontal movement of LNAPL. The soil gas extract component of MPE can reduce volatile and semi-volatile LNAPLs to less than residual saturation. This is a result of LNAPL volatilization into and subsequent extraction of soil gas.

3.1.2 Surfactants

Surface acting agents (surfactants) have been employed for LNAPL remediation. Residual phase LNAPL is retained in porous media by capillary forces. The volume of LNAPL retained by capillary forces is in part dependent on the interfacial tension between groundwater and LNAPL.

Surfactants reduce the interfacial tension between groundwater and LNAPL. Small interfacial tension reductions (less than an order of magnitude) will not substantially increase recoverability of LNAPL. However, as the interfacial tension approaches zero (LNAPL and water become miscible) LNAPL can be mobilized and recovered. A surfactant approach is typically coupled with an LNAPL and groundwater-removal system to recover the mobilized LNAPL.

3.1.3 Thermal Remediation

Thermal remediation techniques have been used to enhance recovery of LNAPL at environmental remediation sites. Steam is typically used for volatile and semi-volatile LNAPLs and hot water flooding for semi-volatile and non-volatile LNAPLs. There are a number of mechanisms for LNAPL removal via thermal application:

- LNAPL Boiling: LNAPLs with boiling points at or below that of water are converted from liquid to gaseous form. The gaseous LNAPLs condense back to liquid at the steam condensation front and are removed via liquid recovery.

- Increased LNAPL Volatilization: The LNAPL vapor pressure is increased with heat application. The vapor pressure increase can lead to partitioning of LNAPL to soil gas, which would allow for recovery of semi-volatile LNAPLs via soil vapor extraction (SVE) that are not amenable to SVE treatment under typical subsurface temperatures. Increased volatilization related to elevated temperatures will vary for the various constituents that make up the LNAPL. For example, volatilization of low carbon aliphatic petroleum compounds will be substantially greater than volatilization of heat-stable constituents such as polychlorinated biphenyls.

- LNAPL Volume Expansion: LNAPLs and groundwater expand in volume with heat application. The LNAPL volume expansion may reduce the LNAPL residual saturation allowing for additional LNAPL recovery.

- Reduction in LNAPL Viscosity: LNAPL viscosity is inversely related to temperature. A reduction in LNAPL viscosity facilitates more rapid LNAPL recovery, and will result in increased LNAPL recovery volume.

3.1.4 *In-Situ* Chemical Oxidation

In-*situ* chemical oxidation (ISCO) destroys contaminants in place via chemical reactions. The ISCO reactions are aqueous-based, therefore only dissolved-phase constituents are treated. Destruction of the dissolved-phase mass will increase the

LNAPL dissolution rate and depletion of the LNAPL plume due to fundamental chemical diffusion mechanics that result in increased partitioning rates with establishment of an increased chemical gradient. Complimentary compounds such as sodium hydroxide used to increase the effectiveness of (activate) the oxidant can increase dissolution of organic compounds from the LNAPL (-internal ARCADIS research). However, the increased LNAPL dissolution rates are temporary and cease once the oxidant and activator compounds are exhausted and dissolved-phase concentrations return to equilibrium. ISCO treatment chemicals include permanganate and persulfate salts and hydrogen peroxide.

Chemical oxidants are also known to destroy naturally-occurring organic matter in aquifers. The naturally-occurring organic matter serves as sorption sites for compounds with high sorption coefficients and an increase in dissolved phase concentrations can occur following ISCO treatment due to this phenomenon. However, it is not known how prevalent this treatment mechanism may be early in an ISCO treatment program for addressing LNAPL-containing soil.

ISCO treatment chemicals are typically delivered in a dilute liquid form via injection into groundwater. Common chemical oxidants used for liquid injection include permanganate and persulfate salts and hydrogen peroxide. Oxidant can also be delivered in gaseous form though injection of ozone gas. The ozone gas dissolves into groundwater as the gas moves upwards due to buoyancy forces. Dissolution of the ozone creates a short-lived radical that can chemically break down contaminants. However, ozone is not a preferred technology for the Buick City site due to limited effective zone of influence for ozone sparge wells (typically five feet or less) and the large footprint of the impact areas, which together would require installation of hundreds or thousands of ozone sparge points.

3.1.5 Surfactant/Cosolvent Enhanced ISCO

As discussed above, chemical oxidation only occurs in the aqueous phase on dissolved NAPL constituents. Because of this, ISCO destruction of minimally soluble compounds may be rate limited by dissolution of the target contaminants into the aqueous phase. Injection of the oxidant and complimentary compounds may fortuitously increase contaminant solubility. However, even with the solubility increase the chemical oxidation treatment may still be limited by contaminant dissolution.

An innovative means to address this rate limitation is to introduce a surfactant and/or cosolvent that will increase contaminant solubility. Surfactant applications for solubility enhancement are at higher concentrations to promote micellar solubilization in contrast

to a surfactant application for NAPL mobilization discussed above. Alcohols such as ethanol are commonly used as petroleum cosolvents. However, while the surfactants and cosolvents increase contaminant solubility, these chemicals also represent significant oxidant demands within the aquifer that result in higher oxidant dosing requirements. The surfactant/cosolvent and chemical oxidants may be selected and applied sequentially or together. Proprietary surfactant-enhanced ISCO solutions such as VeruSOLVE-HP™ (developed by VeruTek) are also available.

3.2 **Bench-Scale Studies**

The purpose of this section is to present a conceptual bench and field-scale testing plan for assessment of the relative effectiveness and cost of applicable LNAPL remediation technologies. Multiple bench-scale studies will be conducted to assess LNAPL remediation technology performance on the variable soil types and oil types present at the Site. A conceptual plan for AOI-specific bench scale studies is presented in Table 1.

- Physical LNAPL recovery via MPE/Recovery Trench: Collect undisturbed soil cores for analysis of soil properties that control LNAPL movement and retention in the porous media that comprises the aquifer. These soil properties are referred to as petrophysical properties. Determine field and residual LNAPL saturations via water-flood drive to assess the volume of LNAPL that can be recovered via hydraulic recovery methods. The water drive test involves displacing LNAPL in a soil core by pumping through a subsample of the undisturbed soil core. Effluent water and LNAPL are collected and volumes recorded to determine if and how much LNAPL was displaced. This test is analogous to displacement that can be achieved under groundwater pumping conditions where a gradient is established towards an extraction well. Multiple soil core subsamples will be tested to factor out soil heterogeneities that may result in over-optimistic results.

- Surfactants: Perform laboratory studies to evaluate surfactant/LNAPL interaction and determine interfacial tension reduction as a function of applied concentration. Collect undisturbed soil cores for petrophysical analysis. Determine field LNAPL saturation and residual LNAPL saturation via water-flood drive. Apply surfactant solution following water flushing of the soil cores to determine the incremental volume of LNAPL displaced using surfactant.

- Thermal: Collect LNAPL and submit for viscosity and interfacial tension analyses at elevated temperatures and LNAPL boiling point determination. LNAPL boiling point data will be used to evaluate what in-situ temperatures would be required to

result in LNAPL volatilization and the reasonableness of achieving those temperatures. Collect undisturbed soil cores for petrophysical analysis. Determine field LNAPL saturation and residual LNAPL saturation via water-flood drive. Flush soil core subsamples with high temperature water to determine incremental LNAPL displacement. Subject soil core subsamples to elevated temperatures above 100 degree Celsius with induced airflow to evaluate potential mass recovery associated with increased volatilization.

- ISCO: Collect LNAPL-impacted soils. Submit soil samples for analysis to determine the oil saturation/contaminant concentration. Perform soil and contaminant oxidant demand studies on soil samples to determine oxidant demand as a function of oil saturation. Chemical oxidants that will be tested include non-activated sodium persulfate, chemically-activated sodium persulfate comparing chelated iron activation and alkaline activation, and iron-activated hydrogen peroxide, otherwise known as Fenton's Reagent.

- Surfactant/Cosolvent Enhanced ISCO: Collect LNAPL-impacted soils. Submit soil samples for analysis to determine the oil saturation/contaminant concentration. Amend soil with surfactant and/or cosolvent mixture and sodium persulfate at varying concentrations to assess increased dissolution and oxidant demand. Evaluate proprietary surfactant/oxidant blends for potential inclusion in the testing program.

3.3 Field Testing

As indicated in the Statement of Basis, MLC will field test three LNAPL remediation technologies based on the bench-scale study results. However, certain field tests can be initiated prior to complete of the bench-scale work. Injectability testing will be performed in areas where surfactant, thermal, and ISCO technologies may be considered to assess the hydraulic capacity of the aquifer to accept water. An understanding of physical capacity of the aquifer to accept injection liquids will guide remediation technology selection and facilitate design of future field tests.

Due to the low volatility of gasoline present in AOI-9B and favorable geology in that area, MLC intends to implement physical removal of the LNAPL via MPE. MPE field testing will be conducted expeditiously at AOI 09-B to collect design data to facilitate implementation of a full-scale MPE system in that area in late 2010. MPE testing will be contemplated for other areas (primarily AOI-2B) following completion of the bench-scale testing. The conceptual field-scale testing program is presented in Table 1.

4. Laser Induced Fluorescence (LIF) Technology for LNAPL Characterization

This section outlines the technology and approach that will be used to further refine the current understanding of LNAPL soil impacts. Previous investigations identified five general areas where LNAPL was present: AOI 12-A/B/C; AOI-2B; AOI-40-A/B and AOI-16C; and AOI-9B (Figure 2). The LNAPL delineation in these five areas was based on observations of LNAPL accumulation in monitoring wells indicating that LNAPL was present in excess of residual LNAPL saturation. However, boring logs and soil tests conducted in these areas suggested that residual LNAPL impacts should be refined. LIF, which provides high-resolution, real-time data that identifies LNAPL impacts in the subsurface, will be used to refine the full extent of LNAPL impacts as a basis for bench-scale pilot test sample collection and remedial system design and implementation.

4.1 Description of LIF Technology

A LIF investigation is conducted by advancing an ultraviolet optical sensing tool (UVOST®) or rapid optical sensing tool (ROST™) probe in areas of known or suspected LNAPL impact. The probes emit an ultraviolet excitation light to the soil and captures returning fluorescence. Polycyclic aromatic hydrocarbon (PAH) compounds, which are a component of common petroleum fuels, readily fluoresce when exposed to ultraviolet light. The magnitude of fluorescence is proportional to the LNAPL saturation within the soil. The probes detect four distinct fluorescent light wavelengths in each pulse; the relative returns of each wavelength at a given depth are collectively referred to as a waveform. Differences in waveform patterns may indicate differences in the subsurface environment or in LNAPL composition. Naturally-occurring fluorescent compounds are present in most soils. However, the degree of background fluorescence typically does not interfere with LNAPL detection.

The return (fluorescent) light signals are analyzed in real time by onsite equipment. As the probe is advanced downward, the fluorescence data form a vertical profile of LNAPL impact present at the soil boring location. Results are reviewed after completing each boring and considered when selecting subsequent boring locations.

Compared to conventional LNAPL investigation methods (e.g., soil borings, monitoring well installation), LIF has several advantages, including a higher production rate (250-500 ft/day), high vertical resolution (10-12 readings per foot), less investigation derived waste, the ability to differentiate between distinct LNAPL types (e.g. gasoline, diesel) and real-time data evaluation allowing for less overall mobilizations and increased delineation efficiency.

4.2 LIF Investigation Area and Approach

Areas illustrated on Figures 3 through 5 will be assessed using LIF. LIF borings will initially be advanced in the vicinity of positively identified LNAPL. The borings will extend to approximately 20 to 30 feet below grade or until the real-time data indicates that the probe has passed below the impacted zone. The areal extent of impacts will be refined by advancing LIF borings from the center of known impacts outward until background fluorescence is observed (indicative of no LNAPL). Because LIF provides a real-time data on LNAPL impacts, the final network of LIF borings will be based on field observations. Because of this, the LIF borings could extend beyond the current limits shown on the attached figures. The intent of this work plan is to provide a general investigation approach with the understanding that data collected in the field will demand the ability to make field adjustment.

Following the LIF investigation, conventional soil borings will be completed in selected areas to collect soil samples containing LNAPL for use in the bench scale studies. A work plan will be prepared upon completion of the LIF investigation to describe this soil boring program in more detail.

5. Soil and Groundwater Quality

This section describes the objectives, approach, and procedures to be used in conducting MPE and SVE pilot tests in the AOI 09-B (Hamilton Avenue Tank Farm) of the Site, an area affected by LNAPL. The pilot-test activities will include extraction of groundwater, LNAPL, and soil-gas from up to three newly installed extraction wells. Data collected during the pilot test will be used to assess the relationship between fluid extraction rate and the corresponding capture zone dimensions in support of an engineered treatment system design for remediation of LNAPL. The pilot-test area (AOI-09-B) is located within the Southend at the southeast corner of Hamilton Avenue and Industrial Avenue (Figure 6).

5.1 Contaminants of Concern

The COCs in the soil for AOI-09-B are petroleum-based volatile organic compounds (VOCs), in addition to benzo(a)pyrene, lead, and manganese, which were all detected above applicable screening criteria. The COCs in the groundwater for AOI-09-B include LNAPL, petroleum-based VOCs, total polychlorinated biphenyls (PCBs), and dissolved metals. The VOCs detected above applicable screening criteria include benzene, ethylbenzene, total xylenes, and methylene chloride. The metals detected above applicable screening criteria are antimony, arsenic, barium, lead, and selenium.

5.2 Extent of Contamination

The majority of the LNAPL impacts are located in an area approximately 100-feet in diameter adjacent to Hamilton Avenue and approximately 200-feet north of Industrial Avenue (Figure 6). LNAPL impacts in the soil are observed beginning at 2-feet bgs to a depth of approximately 6 to 9-feet bgs, which corresponds to observed water table fluctuations. Historical observed LNAPL thicknesses have ranged from 0.01 to 3.12-feet within the AOI-09-B plume area. LNAPL impacts in groundwater impacts do not extend below the glacial silty clay till unit. Refinement of MLC' understanding of the areal and vertical extent of the LNAPL in both soil and groundwater will be accomplished using a laser-induced fluorescence (LIF) investigation. A geological cross-section of the pilot-test area is provided as Figure 7.

5.3 Proposed Pilot-Test Objectives

The purpose of the pilot testing is to determine the feasibility of the proposed full-scale remedy and collect the data necessary to facilitate design of the full-scale extraction and treatment system. The pilot-test will be performed to quantify the following parameters:

- Groundwater, LNAPL, and soil vapor flow rates;
- COC concentrations in groundwater (dissolved phase) and soil vapor recovered during the test; and
- Aquifer response, as determined by water table drawdown and observed vacuum radius of influence.

Groundwater, LNAPL, and soil-vapor flow rates will be used in the full-scale design for specification of the equipment, instrumentation, conveyance piping, and LNAPL storage requirements. Soil and groundwater COC concentrations will determine the water and soil vapor treatment requirements and appropriate treatment technologies. Monitoring the physical response of the aquifer to the groundwater extraction will determine the density of extraction and monitoring wells required for the full-scale system.

5.4 Technology Description

The pilot test proposed by MLC will collect data from the existing and proposed extraction and monitoring wells to facilitate design of a full-scale treatment system. Multi-phase and soil vapor extraction technologies will be tested on Site during the four-day pilot test. The technologies and equipment to be utilized are described below.

5.5 Soil-Vapor Extraction

SVE is a treatment process whereby airflow is induced in the unsaturated soil by applying a pressure gradient via air withdrawal from an extraction well on Site. Through mass transfer processes, VOCs absorbed to the unsaturated soil particles are mitigated. SVE system operation also introduces oxygen into the vadose zone, which supports aerobic biological uptake of soil contaminants. Extracting soil vapors will also remove contaminant mass from the subsurface as dissolved phase contaminants volatilize into the soil gas. Vapor extraction blowers will be utilized in conjunction with a vapor/liquid separator (VLS) to conduct the pilot test. The SVE pilot test will determine vacuum flow rates, pressure, vacuum requirements, and vapor treatment requirements for the full-scale treatment system.

5.6 **Multi-Phase Extraction**

The MPE technology will utilize the mobile trailer system to simultaneously extract groundwater and LNAPL from an extraction well on Site using a single high-vacuum blower. Single-pump MPE is a treatment process where vacuum is applied to the subsurface via a drop tube terminating below the groundwater table to collect groundwater and/or LNAPL. Vacuum applied to the subsurface via drop tube effectively dewaters the extraction well and creates hydraulic and vacuum gradients to move LNAPL, groundwater, and soil-gas to the extraction well for recovery. The higher the applied vacuum, the larger the gradients, thus the greater the vapor and liquid recovery rates. Additionally, application of vacuum will move air through the dewatered zone, which facilitates volatilization of LNAPL as well as supporting aerobic biological uptake of contaminants through the introduction of oxygen to the subsurface.

Data will be collected during operation of the MPE pilot-test from the extraction wells, monitoring wells, and system piping to determine flow rates, drawdown, hydraulic capture, and contaminant concentrations to facilitate the full-scale system design. LNAPL will be separated from the extracted groundwater by an oil/water separator (or similar) unit. Any LNAPL generated will be collected in one or more 55-gallon drums, profiled, and disposed of in accordance with state and federal regulations. Groundwater extracted during the testing activities will be treated, as needed, and disposed to the sanitary sewer system under an appropriate permit or collected and disposed off-site.

5.7 **Pilot Test Well Design**

5.7.1 Extraction Wells

Three extraction wells (MPE-09-1, MPE-09-2, and MPE-09-3) will be installed within the LNAPL plume footprint in the AOI-09-B area of the Site (Figure 6). The extraction wells will be constructed of 4-inch diameter, carbon steel casing to a total depth of approximately 15-feet bgs. The extraction wells will be installed with a 4-inch diameter, 10-foot length, Type 316 stainless steel 10-slot vee-wire wrapped well screen. The extraction well screen will be installed across the observed LNAPL smear zone, which will be determined during investigation activities performed immediately prior to installation of the wells. A Global #5 sand filter pack will be installed in the annular space around the screen to approximately 2-feet above the top of screen. The remaining annular space will be filled with neat cement to a depth of 6-inches below ground surface (Figure 8).

5.7.2 Monitoring Wells

Five pilot-test monitoring wells (MW-09-1, MW-09-2, MW-09-3, MW-09-4, and MW-09-5) will be installed within the LNAPL plume footprint in the AOI-09-B area of the Site (Figure 6). The monitoring wells will be constructed of 2-inch diameter, carbon steel casing to a total depth of approximately 15-feet bgs. The monitoring wells will be installed with a 2-inch diameter, 10-foot length, Type 316 stainless steel 10-slot vee-wire wrapped well screen. The monitoring well screen will be installed across the observed water table to facilitate monitoring of both hydraulic and pneumatic response to pilot-test activities. A Global #5 sand filter pack will be installed in the annular space around the screen to approximately 2-feet above the top of screen. The remaining annular space will be filled with neat cement to a depth of 6-inches below ground surface (Figure 8).

Seven existing monitoring wells (RFI-09-11, RFI-09-11D, RFI-09-12, RFI-09-40R, RFI-09-47, 31-7, and 31-8) will additionally be used as pilot-test monitoring points. Ideally, all existing monitoring wells will be screened across the water table to facilitate monitoring of both hydraulic and pneumatic response to pilot-test activities. If existing monitoring well screens are completely submerged based on observed water table elevation, and dewatering does not expose the well screen, the monitoring well will serve to monitor hydraulic response only. To the extent practical, all monitoring points, proposed and existing, will be located within the observed LNAPL plume, as defined by ongoing investigation activities.

5.8 **Pilot Test Procedures**

5.8.1 Test Equipment

A mobile trailer system will be utilized for the four-day pilot test on Site. The mobile trailer will contain the necessary blowers, piping, instrumentation, and monitoring equipment to perform the testing activities for the MPE and SVE treatment technologies. The trailer-mounted system will be equipped with a gas flow meter with pressure and temperature indicators to facilitate volumetric gas flow rate corrections. Additional test equipment will include conveyance piping and pipe fittings (extraction/discharge hose), electronic oil-water interface probes, Magnehelic® vacuum gauges (multiple scales), extraction well head vacuum gauges (0 to 29 inches of mercury), a photoionization detector (PID), and necessary supplies for collecting groundwater, soil vapor, and LNAPL samples. An electrical generator, sized to operate all necessary equipment is included with the mobile trailer system.

5.9 Field Test Procedures/Data Collection

The MPE and SVE pilot-testing will be performed within the AOI-09-B plume footprint where LNAPL is observed from existing and proposed extraction and monitoring wells. MPE and SVE testing will be performed at all the extraction wells (MPE-09-1, MPE-09-2, and MPE-09-3).

5.10 Proposed Pilot Test Well Network

Proposed extraction wells and existing and proposed monitoring wells will be used for MPE and SVE pilot-test activities. Table 2 presents the extraction and monitoring well combinations. Note that the extraction/monitoring well networks proposed are subject to modification based on field observations. Groundwater and LNAPL elevations from Site extraction and monitoring wells will be measured prior to initiation of the pilot test and at the beginning of each day.

5.11 Soil-Vapor Extraction Test

The SVE pilot-test will be conducted using an SVE blower provided in the mobile trailer system. A data logging absolute pressure transducer will be installed at the base of the extraction well screen. As previously discussed, the extraction well screen will be installed across the observed LNAPL smear zone, as determined by ongoing investigation activities. Additionally, data logging absolute pressure transducers will be installed in each of the surrounding monitoring wells, and one transducer will be exposed to the atmosphere to record barometric pressure fluctuations during the test. All data loggers and other devices that measure time will be synchronized to a common clock (the clock on the computer used to program the tests in each transducer) prior to installation, and will be programmed to record pressure in one-minute intervals prior to beginning the test.

With piezometric head in the extraction and monitoring wells in static equilibrium with the surrounding formation, the SVE blower will be engaged with air dilution/makeup air valve on the inlet side of the blower/vacuum pump in the fully open position. The makeup air valve will then be closed slowly in “steps” to apply vacuum in increments to the extraction well. Vacuum at the extraction wellhead and each of the monitoring wells, assuming the monitoring well screen intersects the water table, will be measured and recorded. Additionally, soil-gas effluent PID readings, soil-gas extraction rates, temperature, and pressure will be recorded on the MPE/SVE Field Test Log included as Appendix A. Field log parameters are to be collected at each step when extraction well vacuum has stabilized following makeup air valve adjustment. Data loggers will be

downloaded at the completion of the test. The step test will continue until the makeup air valve is fully closed and full blower flow/vacuum is applied to the extraction well or groundwater table mounding is observed to have blinded the extraction well screen.

Following completion of the step test, a longer duration static-vacuum SVE test will be conducted. The static-vacuum test is performed to simulate more long-term operating conditions and allow the system to reach pseudo-equilibrium. The static-vacuum test will be conducted at the vacuum where the vacuum/air flow relationship become non-linear (as determined by field observations and analysis), or at the maximum achievable vacuum (i.e., makeup air valve completely closed), whichever is lower. Data described in the step test will be collected every 15 minutes during the test. The static-vacuum test will be conducted for a minimum duration of 4 hours and will continue until three consecutive data collection events produce similar data.

5.12 Multi-Phase Extraction Test

The MPE pilot-test will be conducted immediately following the SVE testing using a high-vacuum blower provided in the mobile trailer system. A drop tube (minimum 1-inch in diameter) will be inserted into the extraction well with the end of the drop tube terminated at the LNAPL/water interface. The drop tube will be connected to the VLS upstream of the blower to facilitate extraction of LNAPL, groundwater, and soil-gas. Additionally, a data logging absolute pressure transducer will be installed at the base of the extraction well screen. As previously discussed, the extraction well screen will be installed across the observed LNAPL smear zone, as determined by ongoing investigation activities.

Data logging absolute pressure transducers will be installed in each of the surrounding monitoring wells, and one transducer will be exposed to the atmosphere to record barometric pressure fluctuations during the test. All data loggers and other devices that measure time will be synchronized to a common clock (the clock on the computer used to program the tests in each transducer) prior to installation, and will be programmed to record pressure in one-minute intervals prior to beginning the specific capacity test.

With piezometric head in the extraction and monitoring wells in static equilibrium with the surrounding formation, the high-vacuum blower will be engaged with air dilution/makeup air valve on the inlet side of the blower/vacuum pump in the fully open position. The makeup air valve will then be closed slowly in “steps” to apply vacuum in increments to the extraction well. Vacuum at the extraction wellhead and each of the monitoring wells, assuming the monitoring well screen intersects the water table, will be

measured and recorded with an appropriately sized vacuum or Magnehelic® gauge. Additionally, soil-gas effluent PID readings, soil-gas and LNAPL/groundwater extraction rates, temperature, and pressure will be measured and recorded on the MPE/SVE Field Test Log included as Appendix A. Field log parameters are to be collected at each step when extraction well vacuum has stabilized following makeup air valve adjustment. Data loggers will be downloaded at the completion of the test. The step test will continue until the makeup air valve is fully closed and full blower flow/vacuum is applied to the extraction well.

During the step-test, piezometric head elevation in the extraction and monitoring wells will be continuously monitored using the data logging pressure transducers. In addition, groundwater and LNAPL levels within the recovery and monitoring wells will be periodically gauged using an electronic oil-water interface. An example field test log sheet to be filled out while conducting the step test is included as Appendix A. Field log parameters are to be collected at each step when extraction well vacuum has stabilized following makeup air valve adjustment.

Following completion of the step test, a longer duration static-vacuum test will be conducted with the makeup air valve fully closed. The static-vacuum test is performed to simulate more long-term operating conditions and allow the system to reach pseudo-equilibrium. Data described in the step test will be collected every 15 minutes during the static-vacuum test. The static-vacuum test will be conducted for a minimum duration of 4 hours and will continue until three consecutive data collection events produce similar data.

5.13 **Sampling**

5.13.1 Groundwater Extraction

Groundwater samples will be collected at the end of the MPE pilot test for each extraction well. Samples will be collected upstream of treatment processes (i.e., from the oil-water separator storage tank) to evaluate groundwater discharge treatment requirements for design of the full-scale extraction system. Groundwater samples are collected at the end of the pilot-test to more closely resemble long-term, steady-state operation. Samples collected before steady-state is achieved may not appropriately represent operation of the full-scale system, resulting in improper sizing of the treatment equipment. Groundwater samples will be submitted for analysis of VOCs (United States Environmental Protection Agency [USEPA] SW-846 8260B), gasoline range organics (GRO) (USEPA Modified 8015), and Resource Conservation and Recovery Act (RCRA) metals (USEPA 6010B).

Groundwater extraction samples will be collected, analyzed, and verified/validated using methods and procedures that are consistent with those described in the Site's *Field Sampling Plan and Quality Assurance Project Plan* (FSP/QAPP) (Appendix C of the *RCRA Facility Investigation Work Plan* [BBL, 2001]) (RFI Work Plan), with the exception of the following laboratory data reporting and data verification/validation approach.

To support the MPE pilot test sample analyses will be reported by the laboratory at Level 3 (see Section 9 for the definition of laboratory reporting levels). The data will undergo verification/validation as described in the FSP/QAPP based on *USEPA Region III Innovative Approaches for Validation of Organic and Inorganic Data* (USEPA, 1995) for data review; that is, one sample delivery group (SDG) at a Tier II verification/validation and the remainder at Tier I.

5.13.2 Soil-Vapor Extraction

Exhaust samples will be collected with Summa canisters during the MPE and SVE pilot tests in order to evaluate the vapor phase treatment requirements for the full-scale system. Exhaust samples will be submitted to Test America Laboratories, Inc. for analysis of VOCs (USEPA method TO-15). One exhaust sample will be collected from each extraction well at the end of the SVE pilot-test and one exhaust sample will be collected from each extraction well for the MPE pilot-test when the maximum PID reading is observed. MLC' experience indicates that the PID readings may increase throughout the 4-hour (minimum) static-vacuum portion of the MPE pilot-test. If this is the case, the exhaust sample will be collected immediately prior to shutdown of the MPE pilot-test.

Soil-vapor samples will be analyzed, reported and verified/validated using methods and procedures that are consistent with those described in the Site's *Field Sampling Plan and Quality Assurance Project Plan* (Appendix C of the RFI Work Plan), with the exception of the following laboratory data reporting and data verification/validation approach.

To support the soil-vapor analyses these samples will be reported by the laboratory at Level 3 as defined in Section 9. The data will undergo verification/validation as described in the FSP/QAPP based on the USEPA (1995) approach for data review using Tier II verification/validation procedures.

5.14 **Waste Collection, Characterization and Disposal**

5.15 **Groundwater Extraction**

5.15.1 Storage and Disposal

LNAPL extracted during the pilot-test will be separated from the groundwater, stored in 55-gallon drums, sampled and disposed at a permitted facility. Extracted groundwater will be stored in an appropriately-sized frac tank prior to off-site disposal.

5.15.2 Sampling

MLC will work with the disposal facilities to determine the analyses required for off-site LNAPL and groundwater disposal.

5.16 **Soil-Vapor Extraction**

5.16.1 Treatment and Direct Discharge

Per the Michigan Department of Natural Resources and Environment Air Quality Division's *Permit to Install Exemption Handbook,* dated May 2010, treatment of pilot-test exhaust gas is not required during pilot-testing activities under R 336.1283, Rule 283. However, due to environmental sensibilities around the Site, the exhaust gas will be treated using up to two vapor-phase carbon vessels to remove volatile constituents prior to atmospheric discharge. The spent vapor-phase carbon will be disposed off-site as a non-hazardous waste.

6. Groundwater Monitoring Plan and Contingent Remedies

A groundwater monitoring program that includes the following components will be implemented:

- annual monitoring of groundwater and LNAPL elevations; and,
- annual groundwater quality monitoring.

The purpose of the groundwater and LNAPL elevation monitoring will be to monitor for possible shifts in the groundwater flow pattern or in the distribution of LNAPL at the Site. The groundwater quality monitoring will provide groundwater quality data, primarily at the down-gradient edge of the Site.

The LNAPL monitoring program should be considered preliminary at this time. Additional LNAPL monitoring wells may be installed in support of remedial measures and future monitoring.

6.1 Groundwater and LNAPL Elevation Monitoring Program

Groundwater level and LNAPL presence and thickness measurements will be made annually. On a one-time basis, an attempt will be made to collect measurements at each of the 147 locations listed in Table 3 (Northend) and 131 locations listed in Table 4 (Southend). The monitoring well locations for the Northend and Southend are shown on Figures 9 and 10, respectively. A reduced list of wells will be selected in future years. It is recognized that some wells may not be accessible due to well damage or loss, and the need to replace or substitute an alternate location will be evaluated on an annual basis. Water level and LNAPL measurements will be compiled for inclusion in the annual report (see below) to document groundwater flow directions and the extent and thickness of the LNAPL. The monitoring wells included in the program specifically to monitor for the presence and/or thickness of LNAPL are identified on Figures 9 and 10. This portion of the monitoring program will be revised in the future as remedial actions are completed.

6.2 Groundwater Quality Monitoring Program

6.2.1 Groundwater Sample Locations

Forty-six (46) monitoring wells have been selected for inclusion in the groundwater monitoring program (Table 5). The monitoring locations included in the groundwater

quality monitoring program and the specific analyses to be completed at each sampled location are shown in Table 5. Table 5 also includes justification for the inclusion of each monitoring well in the sampling program. Monitoring wells have been included in the sampling program based on analytical data generated as part of the Phase I and II RFI reports, the CA 750 Groundwater Monitoring Program, and the Revised CMP.

The following considerations were used to develop this groundwater sampling program:

- Samples will be collected near the down-gradient edge of areas previously found to be associated with concentrations above the pertinent generic MDNRE PA 451, Part 201 screening criteria. For example, if a plume exhibiting elevated benzene concentrations was identified during a previous sampling event at a series of wells, the well or wells located close to the down-gradient extent of the benzene-impacted area will be sampled.

- Samples will be collected along the edge of the Site, down-gradient of areas previously associated with concentrations above the pertinent generic MDNRE criteria, and at down-gradient offsite locations.

- Samples will be collected at locations in proximity to the Flint River with historical detections above the GSI criteria.

- Three monitoring wells have been included in the monitoring program to monitor possible discharges to the storm sewers in the MP010 drainage area. Cyanide was detected above GSI criteria in the grab samples collected from MP010 and MP013 in March 2010. Cyanide was not detected above GSI criteria in monitoring wells in the MP013 drainage area; however it was detected above GSI in the monitoring wells in the MP010 drainage area.

6.2.2 Laboratory Analysis

Groundwater samples will be collected, analyzed, and validated using methods and procedures that are consistent with those employed previously at the Site, as described in the Site's Field Sampling Plan and Quality Assurance Project Plan (Appendix C of the RFI Work Plan).

Laboratory analyses will be completed for the organic constituent group(s) or individual inorganic constituents of interest at each selected sampling location. This approach

was taken to avoid the unnecessary expense of analyzing each sample for the entire Project Analyte List (PAL), while still providing monitoring data.

To support the groundwater analyses one sample delivery group (SDG) of these samples will be reported by the laboratory at Level 3 and the remainder at Level 2 as defined in Section 9. The data will undergo verification/validation as described in the FSP/QAPP based on USEPA (1995) approach for data review on one SDG at a Tier II and the remainder at Tier I.

To maintain consistency with prior sampling efforts, the samples collected for inorganic and PCB analyses will be submitted for dissolved and/or total inorganic and dissolved and/or total PCBs analyses based on the turbidity of the sample. If the turbidity is less than 10 nephelometric turbidity units (NTUs), the sample will be submitted for total inorganic or total PCBs analyses only. If sample turbidity is above 10 NTUs, samples will be filtered. Both unfiltered and filtered aliquots will be submitted for total and dissolved inorganic and PCB analyses, respectively. Monitoring wells will be sampled using low-flow purge and sampling methods in an effort to reduce turbidity in the samples.

6.2.3 Monitoring Network Inspection and Maintenance

Monitoring wells included in the CMI groundwater monitoring program will be inspected annually. The inspection will include an assessment of the physical condition of the monitoring well protective casing, j-plug and lock, and confirmation of the total depth of the monitoring well. Repairs will be completed in a timely manner as needed.

6.2.4 Reporting

An annual report will be prepared to document the monitoring program results. The report will describe the objectives and scope of the sampling event, and will summarize the procedures used to complete the sampling. Results will be presented in summary tables and also on analytical data box figures to show the data distribution. The annual report will also provide any recommendations regarding changes to the number of wells being monitored, frequency of measurements and analytical sampling, and the analytical parameters. The annual report will present recommendations regarding changes to optimize the cost-effective operation of the recovery systems based on the monitoring data. The annual report will also include proposed well substitutions and replacements, necessitated by site redevelopment activities. Substantial modifications to the monitoring program will be presented to the USEPA for approval prior to implementation.

6.2.5 Contingency Plan

If constituents of concern show a statistically significant increasing trend in concentrations for two consecutive monitoring events and concentrations are approaching criteria, a response plan will be developed for submittal to the USEPA. The response plan may include the sampling or installation of down-gradient monitoring wells or increased sampling frequency.

6.3 NPDES Plus Monitoring Program

The "NPDES Plus" monitoring program (NPMP) will be implemented at the Site to ensure compliance with Michigan Part 201 GSI criteria for the long-term protection of the Flint River. The USEPA and MDNRE have agreed to the approach of sampling of the storm sewers as a means to address GSI potential GSI impacts. As discussed in further detail below, the NPMP will consist of collecting monthly samples from 11 Site storm sewers to ensure that groundwater infiltrating into the Site storm sewers does not impact the Flint River.

To achieve the program objectives the storm sewer samples will be collected as grab samples during dry weather flow conditions. Sampling during dry weather flow conditions will provide the most accurate assessment of the condition of the groundwater infiltrating the storm sewers.

6.3.1 NPMP Monitoring Points

Storm sewers associated with the following National Pollutant Discharge Elimination System (NPDES) outfalls are included in the NPMP: Outfalls 001, 002, 003, 004, 005, 006, 007, 009, 010, 011, and 013. Outfalls 008 and 012 are not included in the NPMP. The Outfall 008 storm sewer has been permanently bulkheaded immediately downstream of Monitoring Point 008. The bulkhead was installed because of a no flow condition due to the collapsed storm sewer line. Outfall 008 no longer receives drainage from the Site; therefore, it is not included in the NPMP. During a previous dry weather sampling activity an attempt was made to collect a sample from Monitoring Point 012, located on the Outfall 012 storm sewer. However, there was only a small puddle of water in the storm sewer at the time of sampling indicating that significant groundwater infiltration to Outfall 012 is unlikely; therefore, Outfall 012 is not included in the NPMP.

Samples will be collected from the monitoring point locations identified for each of the storm sewers as shown on Figure 11. The NPMP monitoring points are co-located

with the monitoring points which have been identified in the current and previous Site NPDES permits, with the exception of Outfall 011. Due to access issues the monitoring point for Outfall 011 is the discharge point of the outfall to the Flint River.

The sampling locations will be reevaluated at the end of each year. If storm sewers are permanently bulkheaded thereby eliminating the GSI pathway into the sewers, the respective monitoring points will be removed from the NPMP.

6.3.2 Storm Sewer Outfall Sampling Parameters and Frequency

The monitoring points included in the NPMP; the specific analyses to be completed at each monitoring point; and the rationale used to determine the analyses are presented on Table 6. The following considerations were used to define this sampling program:

- Historical Site groundwater data were compared to criteria to identify potential sources of impacted groundwater in the NPMP drainage areas. Storm sewer samples collected in support of the 2010 NPDES permit renewal application were analyzed for the analytical suites of compounds (metals, volatile organic compounds [VOCs] and semi-volatile organic compounds [SVOCs]) that were detected in nearby groundwater samples at concentrations exceeding criteria.

- Storm sewer samples collected in support of the 2010 NPDES permit renewal application collected from sewers whose drainage areas contained LNAPL were analyzed for oil and grease and samples collected from sewers whose drainage areas contained PCB -impacted LNAPL were analyzed for PCBs.

- Storm sewers with contributions from off-site will be sampled at the sewer headwaters to determine if any constituents of concern originate from off-site sources.

- The analytical results from the samples collected from the NPMP monitoring points in support of the 2010 NPDES permit renewal application were reviewed.

NPMP sampling activities will be conducted at the Site on a monthly basis for the first year. After the first quarter of monitoring, the monitoring locations, analytical parameters, and frequencies will be re-evaluated to determine if modifications to the plan are warranted. Proposed modifications to the plan will be included in the annual report and implemented following USEPA approval.

Although SVOCs were not detected in any of the samples collected in support of the 2010 NPDES permit renewal, the NPMP will include analyzing one round of samples for SVOCs during each of the first three years of the program. The purpose of these samples is to monitor the storm sewers for possible infiltration of SVOC impacted groundwater and to confirm that SVOC concentrations (if detected) are below GSI criteria in the storm sewers.

6.3.3 Analytical Methods

The NPMP samples will be collected during dry weather flow as either grab or 24-hour composite samples as indicated on Table 6. The samples will be collected and analyzed using the procedures described in the Site Field Sampling Plan and Quality Assurance Project Plan (Appendix C of the RFI Work Plan). The storm sewer samples will be submitted for laboratory analysis of Target Compound List (TCL) VOCs, SVOCs, PCBs, cyanide, and/or select metals as summarized in Table 6. Samples will be analyzed using the following methods:

- VOCs - EPA Method 8260B (MDNRE List)
- SVOCs – EPA Method 8270C (MDNRE List)
- PCBs – EPA method 608
- Total Metals - EPA Method 200.8
- Mercury – EPA Method 1631 E
- Cyanide - EPA Method 335.4/4500-CN-E

To support the NPMP sample analyses will be reported by the laboratory at Level 2, as defined in Section 9. These data will not be subjected to any verification/validation.

6.3.4 Reporting

An annual report will be prepared to document the NPMP sampling results. The first annual report will summarize NPMP sampling activities completed in 2009 and will be submitted to the USEPA by April 1, 2011. Subsequent annual reports will be completed and submitted to the USEPA by April 1 of the following calendar year.

The annual report will describe the objectives and scope of the sampling event, and will summarize the procedures used to complete the sampling. Analytical results will be presented in summary tables including a comparison to GSI criteria. Figures and graphs monitoring constituents of concern (COC) concentrations will be included as appropriate.

The annual report will also provide recommendations regarding changes to the outfalls being monitored, the frequency of analytical sampling, and/or the analytical parameters. Substantial modifications to the NPMP will be presented in the annual report and will be implemented following USEPA approval.

6.3.5 Contingency Plan

In the event that a COC, which historically has been detected below GSI criteria, is detected at a concentration that exceeds GSI criteria, the result will be confirmed by re-sampling for that constituent. If the re-sampling confirms the exceedance the USEPA will be notified to discuss potential actions to address the exceedance.

If COCs show a statistically significant increasing trend in concentrations for two consecutive monitoring events or exceed GSI criteria, a response plan will be developed for submittal to the USEPA. The response plan may include, but not necessarily limited to, some or all of the following:

- Increased sampling frequency or additional sampling locations to further evaluate potential impacts.
- Additional monitoring well sampling and analysis in the identified area(s) of impact.
- Development of plans to address the identified impacts.

7. Soil

7.1 AOI 09-A Soil Removal Action

7.1.1 Objective

The primary objective of the proposed removal action is to protect public health, welfare, and the environment. As indicated in the Revised CMP, the COCs identified at AOI 09-A are lead and benzo(a)pyrene in soil. The original source of the impact was not determined; however, former Building 09 contained a floor trench and underground storage tank (UST) system and a vehicle wash area which discharged to the process wastewater system, former aboveground storage tank (AST) storage areas, and a former UST. The CMP indicates the lead impact was detected in shallow soils on the Site east and southeast of the Building 09 footprint and on the adjacent CSX Corporation (CSX) property in excess of 120,000 milligrams per kilogram (mg/kg). Additionally, benzo(a)pyrene was detected in shallow soils in excess of 56 mg/kg on MLC property southeast of Building 09 footprint. The methods and results of this evaluation were presented in the Revised CMP.

The anticipated future use of the Site is commercial and industrial; therefore, the remedial action objectives (RAO) for lead in soil of 900 mg/kg at the Site (MDNRE Industrial and Commercial II Direct Contact Criteria) and 400 mg/kg on the CSX property (MDNRE Residential and Commercial I Direct Contact Criteria) have been selected. In addition, for the benzo(a)pyrene exceedance detected on Site an RAO of 2 mg/kg has been selected based on MDNRE Residential and Commercial I Direct Contact Criteria. The area in which impact exists in excess of these criteria will be further delineated both horizontally and vertically. Based on the delineation findings, a work plan to remove and dispose of impacted soils will be developed and submitted to the USEPA.

7.1.2 Lead Soil Impact Delineation Activities

This field sampling program was established to refine the delineation of the impacted areas identified in the RFI documents. The sampling program includes a rectangular sample grid system with grid intervals and sample locations based on the area to be investigated and the distribution of lead concentrations in soil exceeding the above-listed RAOs. The proposed grid will have approximate intervals of 20 feet by 20 feet. In previously identified areas of high lead and benzo(a)pyrene concentrations, a subgrid will be added to refine the delineations. The approximate boundaries of the grid area were determined by extending the grid to the nearest soil boring location

where lead impact was detected below the MDNRE Residential and Commercial I Direct Contact Criteria.

Upon obtaining access to CSX property, and prior to any drilling activities, a one call will be placed to the Michigan Utility Locate One Call center to identify subsurface public utilities, and a review of client-provided maps of subsurface private utilities will be performed. Additionally, a geophysical survey will be conducted to clear boring locations.

Up to a total of 50 boring locations will be completed at select node locations in the grid using direct push technology (DPT), biased towards the areas with highest reported lead concentrations. Soils will be scanned over the length of the boring in the field with an x-ray florescence (XRF) device to determine sample locations for analysis of total lead and Toxicity Characteristic Leaching Procedure (TCLP) concentrations. The total lead concentration analyses will establish a correlation between XRF field readings and lead content in the impacted area. This correlation will be used to delineate excavation boundaries during excavation activities. One soil boring will be advanced to approximately 10 feet below grade surface (bgs) at each identified location. Should XRF readings indicate impact may exist deeper than 10 feet bgs, the boring will be completed until XRF readings indicate the concentration of lead is below MDNRE Direct Contact Criteria.

TCLP analysis will be performed over a range of total lead concentrations. This will help establish a correlation between leaching and total lead concentrations and therefore determine waste disposal classifications for the lead-impacted soil. Depending on the volume of soil classified as TCLP hazardous, onsite treatment to render the lead-impacted soil non-hazardous may be considered. The primary consideration will be the cost of disposal. For example, if there is only a small percentage of the soil that is determined to be TCLP hazardous, treatment may not be justified. On the other hand, if a significant volume of soil is determined to be TCLP hazardous, onsite treatment would be cost-effective. If this is the case, this work plan will be amended to include a plan for treatment of the lead-impacted soil.

Boring locations may be altered in the field based on field observations. Protocols for the completion of sampling and analysis activities were presented in the FSP/QAPP (provided as Appendix C of the RFI Work Plan) and in the *Health and Safety Plan* (provided as Appendix E of the RFI Work Plan).

Soil samples will be analyzed, reported and verification/validation using methods and procedures that are consistent with those employed previously at the Site. These

procedures are described in the Site's FSP/QAPP (Appendix C of the RFI Work Plan), with the exception of the following laboratory data reporting and data verification/validation approach.

To support the soil analyses these samples will be reported by the laboratory at level 3 as outline above. The data will be undergo verification/validation as described in the FSP/QAPP based on USEPA (1995) approach for data review of one sample delivery group (SDG) at a Tier II and the remainder at Tier I.

7.2 Maintenance of Select Surface Covers

This section addresses the engineering controls that will protect future Site users from near surface soils that exceed direct contact criteria. The engineering controls will include maintaining the surface cover consistent with existing conditions at four AOIs located in the Southend of the Site. In the areas where a concrete slab or asphalt pavement already exists, these areas will be maintained, as necessary, to ensure that the surface cover remains as a barrier for potential direct contact and/or particulate inhalation exposure. In areas where an asphalt or concrete cover does not currently exist; the area will be covered and maintained. Areas will be photographed as a baseline and thereafter visually inspected on a quarterly basis. Inspections will be documented using the Inspection Log Sheet included in Appendix B.

The four AOIs discussed below contain five areas where surface cover will be inspected and maintained. The locations of these areas are depicted on Figure 12 and include:

- **AOI Group 02-C**: This AOI (one area) is associated with former Building 02, and relates to a former sump in the former Materials Laboratory.

- **AOI Group 12-A:** This AOI (one area) is associated with former Building 12, and relates primarily to several press pits and associated sumps, pits, trenches, and traps.

- **AOI Group 29-A**: This AOI (one area) is associated with the former Building 29, and relates to a pit for a cable-operated elevator and former work pads with oil staining.

- **AOI Group 09-B:** This AOI includes two separate areas, one of which is associated with the Former Building 31/Hamilton Avenue Tank Farm, and the other is in the general vicinity of this former tank farm.

8. Site Wide Use Restrictions

Corrective measures were evaluated with the consideration that certain baseline Site-wide use restrictions would be applied as part of the overall final corrective action for the Site as discussed in further detail below. MLC intends to establish a restriction in the property deed (restrictive covenant) to limit future use of the Site to Industrial/Commercial II, III, and IV activities only.

8.1 Groundwater Use Restrictions

Baseline restrictions for groundwater at the Site will consist of a restrictive covenant that will be established to prohibit the use of groundwater for any purpose, beyond sampling and other related investigatory testing

Based on information included in the RFI Phase II Report and the supplemental human health risk assessment (HHRA) included in the Revised CMP, the identified potential for unacceptable exposure to groundwater at down-gradient off-property areas relates solely to drinking water use. Thus, MLC will establish a restrictive covenant for down-gradient offsite property that will prohibit the use of corresponding groundwater for potable uses. City of Flint Ordinance 9, Code of Ordinances, Chapter 46-25 already restricts the installation of drinking water wells in the City of Flint, and Michigan Department of Community Health Rules (Act 368, Part 127) also prohibit the use of groundwater at a depth of less than 25 feet below ground surface within all of Genesee County.

8.2 Site Restrictions

Following a legal survey, restrictive covenants will be established for the AOIs listed below and will include specific restrictions regarding excavation and/or notification of the presence of hazardous constituents in soil in these areas. The restrictive covenants will be prepared using MDNRE Form EQP 3854 and filed with the local county register of deeds in accordance with Section 1 of the Recording Requirements Act, 1937 PA 103, as amended (Act 103), MCL 565.201.

- **AOI Group 12-A:** This AOI is associated with former Building 12, and relates primarily to several press pits and associated sumps, pits, trenches, and traps. The RFI soil data from this AOI indicate that screening criteria were exceeded for lead.

Based on the human health risk assessment for AOI Group 12-A documented in the RFI Phase II Report, lead concentrations in surface and deep soil exceed 900 mg/kg (i.e., MDNRE industrial direct contact criterion). The restrictive covenant will limit excavations within the area of soil exceeding 900 mg/kg for lead. This restriction will run with the property in perpetuity, or until soil containing concentrations above 900 mg/kg have been remediated.

- **AOI Group 02-C:** This AOI is associated with former Building 02, and relates to a former sump in the former Materials Laboratory. The RFI soil data from this AOI indicate that the industrial screening criterion was exceeded for lead in near-surface soil sample results.

  Based on the human health risk assessment for AOI Group 02-C documented in the RFI Phase II Report, mean lead concentrations in surface soil exceed 900 mg/kg (i.e., MDNRE industrial direct contact criterion).

  The restrictive covenant will limit excavations within the area of soil exceeding 900 mg/kg for lead. This restriction will run with the property in perpetuity, or until soil containing concentrations above 900 mg/kg have been remediated.

- **AOI Group 29-A**: This AOI is associated with former Building 29, and relates to a pit for a cable-operated elevator and former work pads with oil staining. The RFI soil data from this AOI indicate that the industrial screening criterion was exceeded for lead in surface soil.

  Based on the human health risk assessment for AOI Group 29-A documented in the RFI Phase II Report, potential exposure to surface soil in this area exceeds 900 mg/kg for lead (i.e., MDNRE industrial direct contact criterion).

  The restrictive covenant will limit excavations within the area of soil exceeding 900 mg/kg for lead. This restriction will run with the property in perpetuity, or until soil containing concentrations above 900 mg/kg have been remediated.

- **AOI Group 09-B:** This AOI is associated with or in the general vicinity of Former Building 31/Hamilton Avenue Tank Farm. An LNAPL plume consisting primarily of gasoline has been identified and delineated in this area and is approximately 75 feet in diameter (AOI Group 09-B LNAPL). The RFI soil data from AOI Group 09-B indicate that industrial screening criteria were exceeded for benzo(a)pyrene and lead.

Based on the human health risk assessment for AOI Group 09-B documented in the RFI Phase II Report potential exposure to near-surface soil in this area exceeds 900 mg/kg for lead (i.e., MDNRE industrial direct contact criterion).

The restrictive covenant will limit excavations within the area of soil exceeding 900 mg/kg for lead. This restriction will run with the property in perpetuity, or until soil containing concentrations above 900 mg/kg have been remediated.

- **AOI 40-D:** This AOI is associated with the Former Building 40 and relates to basement/tunnel area flooded with water. The report titled *Cleanup and Disposal of PCB Remediation Waste, Building 40 Tunnel and Basement* (BBL, 2004) describes work completed to investigate the tunnel and presents a plan for remediation. This report was submitted to the USEPA on January 7, 2004, and conditionally approved by USEPA via letter dated September 13, 2005. The basement and tunnel area were filled in accordance with the remediation plan in May 2006. The only remaining actions planned to address this area include the implementation of institutional controls (e.g., restrictive covenant).

  As required by the USEPA in their September 13, 2005 letter - MLC shall record, in accordance with state law, a notation on the deed to the property, or on some other instrument which is normally examined during a title search, that will notify any potential purchaser of the property of the residual PCBs and of the industrial land use restrictions for the property.

The preceding AOIs are presented on Figure 13.

9. Field Sampling Plan/Quality Assurance Project Plan

Samples collected during CMI activities will be collected, analyzed, and verified/validated in accordance with protocols presented in the FSP/QAPP provided as Appendix C of the RFI Work Plan and in the *Health and Safety Plan* (HASP) provided as Appendix E of the RFI Work Plan, except as described in Sections 5.13 (groundwater and vapor from the MPE pilot test, 6.2.2 (groundwater from annual groundwater sampling), 6.3.3 (storm water), and 7.1.2 (soil).

The three levels of laboratory data reporting have been defined as follows:

Level 1 – Minimal Reporting: Minimal or "results only" reporting is used for analyses that, either due to their nature (i.e., field monitoring) or the intended data use (i.e., preliminary screening), do not generate or require extensive supporting documentation.

Level 2 – Modified Reporting: Modified reporting is used for analyses that are performed following standard USEPA-approved methods and QA/QC protocols and that, based on the intended data use, require some supporting documentation but not, however, full "Contract Laboratory Program-type" (CLP-type) reporting. These reports will include but on limited to forms that summarizes the following quality control/quality assurance: method blanks, laboratory control samples (LCSs) and laboratory control sample duplicates (LCSDs) percent recoveries (%R) / relative percent difference (RPD), matrix spikes (MS)/matrix spike duplicates (MSDs) results as %R and RPD (as method appropriate), laboratory duplicates, and surrogate recoveries as %R.

Level 3 – Full Reporting: Full "CLP-type" reporting is used for those analyses that, based on intended data use, require full documentation. These laboratory reports will include but not limited to the forms stated in Level 2 reporting in addition they will include supporting raw instrument data are sufficient to meet the requirements to support full data validation.

10. Schedule

Consistent with the streamlined manner in which the phases of corrective action for this Site have been conducted, MLC is proceeding with the corrective measures implementations outlined in the preceding sections of this work plan. Specifically, MLC plans to begin implementing the related activities later this year, as follows:

- LNAPL Design, Construction and Technology Based Cleanup – August 2010
- Groundwater Monitoring Plan, September/October 2010
- NPMP Plan, September 2010
- Maintaining Select Surface Covers, August 2010
- Lead Contaminated Soil Removal, August 2010 (assuming CSX access to excavation areas)
- Restrictive Covenants, December 2010

MLC will continue to report project updates, including changes to the above schedule of activities to USEPA via quarterly reports that are submitted by the 15th day of every month following a quarter.

11. References

ARCADIS, 2006. *Resource Conservation and Recovery Act Corrective Measures Proposal.*

ARCADIS, 2008. *Resource Conservation and Recovery Act Revised Corrective Measures Proposal.*

ARCADIS, 2009. *Resource Conservation and Recovery Act Revised Corrective Measures Proposal Addendum #1*.

BBL, 2000a. *Description of Current Conditions for Areas South of Leith Street.*

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BBL. 2001. *RCRA Facility Investigation Work Plan*. March 30, 2001.

BBL. 2002. *Resource Conservation and Recovery Act Facility Investigation Phase I Report*. June 28, 2002BBL. 2004. Resource Conservation and Recovery Act Facility Investigation Phase II Report. March 16, 2004.

BBL, 2006. *Resource Conservation and Recovery Act Facility Investigation Phase II Report*.

ENVIRON International Corporation, 2005. *Resource Conservation and Recovery Act Environmental Indicator CA 750 Report Determination of Migration of Contaminated Groundwater Under Control,* September, 2005.

US Environmental Protection Agency, 1995. *USEPA Region III Innovative Approaches for Validation of Organic and Inorganic Data.* USEPA Document 1995-06-01.

ARCADIS

Tables

Table 1. Conceptual AOI-Specific Bench and Field-Scale Testing Program, MLC, NAO Flint Operations Site, Flint, Michigan

Area	NAPL Type	Soil Type	Bench-Scale Studies					Field Testing	
			Phys	Surf	Therm	ISCO	Enh ISCO	MPE	Inject
AOIs 12-A, B, & C	Hydraulic Oil	silty lean clay	X	X	X	X	X	*	X
AOI 02-B	Hydraulic Oil	silty sand	X	X	X	X	X	*	X
AOI 40-A, B & 16-C	Fuel Oil	clay and silt	X	X	X	X	X	*	X
AOI 09-B	Gasoline	silty sand	X					*	

Notes:

Phys: Physical LNAPL Recovery
Surf: Surfactant
Therm: Thermal
Enh ISCO: Surfactant/Cosolvent Enhanced In-Situ Chemical Oxidation
Inject: Injectability testing
*: MPE and/or other field testing will be assessed following completion of the bench-scale testing.

Table 2. Extraction and Monitoring Well Combinations, MLC, NAO Flint Operations Site, Flint, Michigan

Proposed Extraction Well	Proposed Observation Wells	Approximate Distance from Extraction Well (ft)
MPE1	RFI-09-40R	10
	RFI-09-47	20
	31-7	30
	OBS2-2	45
	OBS2-1	60
	MPE2	80
MPE2	31-8	10
	OBS2-1	22
	OBS2-2	35
	RFI-09-47	70
	RFI-09-12	80
	MPE1	80
MPE3	OBS3-2	10
	OBS3-3	22
	OBS3-1	30
	MPE1	64
	RFI-09-11	70
	RFI-09-11D	70

Table 3. Groundwater and LNAPL Elevation Monitoring Locations, MLC, NAO Flint Operations Site Northend, Flint, Michigan

Area of Interest (AOI)	Location	Comments
03-1	03-03R	LNAPL Monitoring Program Location
03-1	03-105R3	LNAPL Monitoring Program Location
03-1	RFI-03-02	LNAPL Monitoring Program Location
03-1	RFI-03-03	Groundwater Elevation Monitoring Location
03-1	70-109	Groundwater Elevation Monitoring Location
03-1	70-100	Groundwater Elevation Monitoring Location
05-1	43-161	LNAPL Monitoring Program Location
05-1	43-165	LNAPL Monitoring Program Location
05-1	43-166	LNAPL Monitoring Program Location
05-1	43-167	LNAPL Monitoring Program Location
05-1	RFI-05-13	LNAPL Monitoring Program Location
05-1	RFI-05-14	LNAPL Monitoring Program Location
05-4	43-103	Groundwater Elevation Monitoring Location
05-5	RFI-05-06	LNAPL Monitoring Program Location
05-5	RFI-05-08	Groundwater Elevation Monitoring Location
05-5	RW-05 North	LNAPL Monitoring Program Location
05-6	43-140	Groundwater Elevation Monitoring Location
05-6	43-242	Groundwater Elevation Monitoring Location
07-1	RFI-07-03	Groundwater Elevation Monitoring Location
07-1	OW-3D	Groundwater Elevation Monitoring Location
07-1	OW-3S	Groundwater Elevation Monitoring Location
07-1	OW-5	Groundwater Elevation Monitoring Location
07-1	OW-40	Groundwater Elevation Monitoring Location
07-1	GM-2	Groundwater Elevation Monitoring Location
07-1	GM-3	Groundwater Elevation Monitoring Location
07-1	GM-4	Groundwater Elevation Monitoring Location
07-1	GM-5	Groundwater Elevation Monitoring Location
07-1	GM-6	Groundwater Elevation Monitoring Location
07-1	GM-7	Groundwater Elevation Monitoring Location
07-1	GM-8	Groundwater Elevation Monitoring Location
07-1	GM-9	Groundwater Elevation Monitoring Location
07-1	GM-10	Groundwater Elevation Monitoring Location
07-1	GM-11	Groundwater Elevation Monitoring Location
07-1	GM-12	Groundwater Elevation Monitoring Location
07-3	07-01	Groundwater Elevation Monitoring Location
07-3	RFI-07-08	Groundwater Elevation Monitoring Location
07-3	RFI-85-14	Groundwater Elevation Monitoring Location
10-1	20-144	Groundwater Elevation Monitoring Location
10-2	RFI-10-24	Groundwater Elevation Monitoring Location
10-2	RFI-10-26	Groundwater Elevation Monitoring Location
10-2	RFI-10-29	Groundwater Elevation Monitoring Location
10-2	RFI-10-33	Groundwater Elevation Monitoring Location
10-2	RFI-10-35	Groundwater Elevation Monitoring Location
10-2	RFI-10-36	Groundwater Elevation Monitoring Location
10-3	RFI-10-07	Groundwater Elevation Monitoring Location
10-3	RFI-10-28	Groundwater Elevation Monitoring Location
10-4	20-145	Groundwater Elevation Monitoring Location
10-4	20-160	LNAPL Monitoring Program Location
10-4	20-162	LNAPL Monitoring Program Location
10-4	20-163R	LNAPL Monitoring Program Location
10-4	20-168	LNAPL Monitoring Program Location
10-4	20-FP10R	Groundwater Elevation Monitoring Location
10-4	20-FP11R	LNAPL Monitoring Program Location
10-4	20-FP8	LNAPL Monitoring Program Location
10-4	20-FP9R	LNAPL Monitoring Program Location
10-4	RFI-03-04	LNAPL Monitoring Program Location

See Notes on Page 3.

Table 3. Groundwater and LNAPL Elevation Monitoring Locations, MLC, NAO Flint Operations Site Northend, Flint, Michigan

Area of Interest (AOI)	Location	Comments
36-1	36-FP2	LNAPL Monitoring Program Location
36-1	36-FP3	LNAPL Monitoring Program Location
36-1	36-FP4	LNAPL Monitoring Program Location
36-1	36-FP6	LNAPL Monitoring Program Location
36-1	36-FP7	LNAPL Monitoring Program Location
36-1	36-FP8	LNAPL Monitoring Program Location
36-1	RFI-36-04	LNAPL Monitoring Program Location
36-1	RFI-36-05	LNAPL Monitoring Program Location
36-1	RFI-36-06	LNAPL Monitoring Program Location
36-1	RFI-36-07	LNAPL Monitoring Program Location
36-1	RFI-36-20	Groundwater Elevation Monitoring Location
36-1	RFI-36-25R	Groundwater Elevation Monitoring Location
36-1	RFI-36-29R	LNAPL Monitoring Program Location
36-1	RFI-36-46	Groundwater Elevation Monitoring Location
36-1	RFI-36-47	Groundwater Elevation Monitoring Location
36-1	RFI-36-48	Groundwater Elevation Monitoring Location
36-1	RFI-36-49	LNAPL Monitoring Program Location
36-1	RFI-36-55	Groundwater Elevation Monitoring Location
36-1	RFI-36-56	Groundwater Elevation Monitoring Location
36-1	RW-1	LNAPL Monitoring Program Location
36-1	RW-3	LNAPL Monitoring Program Location
36-2	RFI-36-19	Groundwater Elevation Monitoring Location
36-2	RFI-36-37	Groundwater Elevation Monitoring Location
36-4	RFI-36-12	Groundwater Elevation Monitoring Location
36-5	20-500R	Groundwater Elevation Monitoring Location
36-5	20-502	LNAPL Monitoring Program Location
36-5	20-503	LNAPL Monitoring Program Location
36-5	20-506	LNAPL Monitoring Program Location
36-5	37-RW-NORTH	LNAPL Monitoring Program Location
36-5	37-RW-SOUTH	LNAPL Monitoring Program Location
36-5	RFI-36-13	LNAPL Monitoring Program Location
36-5	RFI-36-14	Groundwater Elevation Monitoring Location
38-1	RFI-38-04	Groundwater Elevation Monitoring Location
38-1	RFI-38-05	Groundwater Elevation Monitoring Location
38-1	36-101	Groundwater Elevation Monitoring Location
38-1	38-120	Groundwater Elevation Monitoring Location
38-1	36-121	Groundwater Elevation Monitoring Location
55-1	55-1	Groundwater Elevation Monitoring Location
55-1	55-2	Groundwater Elevation Monitoring Location
55-1	RFI-55-01	Groundwater Elevation Monitoring Location
55-1	RFI-55-02	Groundwater Elevation Monitoring Location
55-1	RFI-55-12	Groundwater Elevation Monitoring Location
65-1	43-141	Groundwater Elevation Monitoring Location
81-1	RFI-81-02	Groundwater Elevation Monitoring Location
81-1	RFI-81-35	Groundwater Elevation Monitoring Location
81-1	RFI-81-43	LNAPL Monitoring Program Location
81-2	70-101	LNAPL Monitoring Program Location
81-2	70-103	LNAPL Monitoring Program Location
81-2	70-105	LNAPL Monitoring Program Location
81-2	70-107	LNAPL Monitoring Program Location
81-2	70-107R	LNAPL Monitoring Program Location
81-2	70-108R	LNAPL Monitoring Program Location
81-2	70-163	Groundwater Elevation Monitoring Location
81-2	70-164	LNAPL Monitoring Program Location
81-2	70-165	Groundwater Elevation Monitoring Location
81-2	RFI-81-03	Groundwater Elevation Monitoring Location
81-2	RFI-81-21	Groundwater Elevation Monitoring Location
81-2	RFI-81-45	Groundwater Elevation Monitoring Location

See Notes on Page 3.

Table 3. Groundwater and LNAPL Elevation Monitoring Locations, MLC, NAO Flint Operations Site Northend, Flint, Michigan

Area of Interest (AOI)	Location	Comments
81-2	RFI-81-49	LNAPL Monitoring Program Location
81-2	RFI-81-50	Groundwater Elevation Monitoring Location
81-3	RFI-81-07	Groundwater Elevation Monitoring Location
81-3	RFI-81-08	Groundwater Elevation Monitoring Location
81-3	RFI-81-33	Groundwater Elevation Monitoring Location
81-3	RFI-81-51	Groundwater Elevation Monitoring Location
83/84-1	RFI-83/84-01	Groundwater Elevation Monitoring Location
83/84-1	RFI-83/84-03	LNAPL Monitoring Program Location
83/84-1	RFI-83/84-07	LNAPL Monitoring Program Location
83/84-1	RFI-83/84-29	Groundwater Elevation Monitoring Location
83/84-2	RFI-83/84-04	LNAPL Monitoring Program Location
83/84-2	RFI-83/84-05	LNAPL Monitoring Program Location
83/84-2	RFI-83/84-23	LNAPL Monitoring Program Location
83/84-2	RFI-83/84-28	LNAPL Monitoring Program Location
83/84-2	RFI-83/84-38	LNAPL Monitoring Program Location
83/84-2	RFI-83/84-53	Groundwater Elevation Monitoring Location
83/84-4	RFI-83/84-54	Groundwater Elevation Monitoring Location
83/84-7	88-7	Groundwater Elevation Monitoring Location
83/84-7	RFI-83/84-11	Groundwater Elevation Monitoring Location
85-1	RFI-85-02R	LNAPL Monitoring Program Location
85-1	RFI-85-04R	Groundwater Elevation Monitoring Location
85-1	RFI-85-05	Groundwater Elevation Monitoring Location
86-1	87-FP1	LNAPL Monitoring Program Location
86-1	87-FPD2	Groundwater Elevation Monitoring Location
86-1	87-FPD3	Groundwater Elevation Monitoring Location
86-1	MW-00-FP6	LNAPL Monitoring Program Location
86-1	RFI-86-02	LNAPL Monitoring Program Location
86-1	RFI-86-03	LNAPL Monitoring Program Location
86-1	RFI-86-06D	LNAPL Monitoring Program Location
86-1	RFI-86-06S	LNAPL Monitoring Program Location
86-1	RFI-86-08R	Groundwater Elevation Monitoring Location
86-1	RFI-86-16R	Groundwater Elevation Monitoring Location

Note:
Measurements will be collected on an annual basis.

Table 4. Groundwater and LNAPL Elevation Monitoring Locations, MLC, NAO Flint Operations Site Southend, Flint, Michigan

Area of Interest (AOI)	Location	Comments
02-B	RFI-02-12	Groundwater Elevation Monitoring Location
02-B	RFI-02-14	LNAPL Monitoring Program Location
02-B	RFI-02-15	LNAPL Monitoring Program Location
02-B	RFI-02-16	LNAPL Monitoring Program Location
02-B	RFI-02-17	LNAPL Monitoring Program Location
02-B	RFI-02-18	LNAPL Monitoring Program Location
02-B	RFI-02-19	LNAPL Monitoring Program Location
02-B	RFI-02-23	LNAPL Monitoring Program Location
02-B	RFI-02-24	Groundwater Elevation Monitoring Location
02-E	RFI-02-05	Groundwater Elevation Monitoring Location
02-F	RFI-02-07	Groundwater Elevation Monitoring Location
02-F	RFI-02-13	Groundwater Elevation Monitoring Location
02-F	RFI-86-01R	Groundwater Elevation Monitoring Location
04-D	04-1	Groundwater Elevation Monitoring Location
04-D	04-3	Groundwater Elevation Monitoring Location
04-D	04-4	Groundwater Elevation Monitoring Location
09-A	MW-16	Groundwater Elevation Monitoring Location
09-A	MW-17	Groundwater Elevation Monitoring Location
09-A	MW-18	Groundwater Elevation Monitoring Location
09-A	MW-19	Groundwater Elevation Monitoring Location
09-A	MW-25	Groundwater Elevation Monitoring Location
09-A	RFI-09-04R	Groundwater Elevation Monitoring Location
09-A	RFI-09-49R	Groundwater Elevation Monitoring Location
09-A	RFI-09-53	Groundwater Elevation Monitoring Location
09-A	RFI-09-56	Groundwater Elevation Monitoring Location
09-A	RFI-09-57	Groundwater Elevation Monitoring Location
09-A	RFI-09-58	Groundwater Elevation Monitoring Location
09-A	MW-26	Groundwater Elevation Monitoring Location
09-B	RFI-9-46	Groundwater Elevation Monitoring Location
09-B	11-6-2	Groundwater Elevation Monitoring Location
09-B	31-1	Groundwater Elevation Monitoring Location
09-B	31-3	Groundwater Elevation Monitoring Location
09-B	31-4D	Groundwater Elevation Monitoring Location
09-B	31-4S	Groundwater Elevation Monitoring Location
09-B	31-5	Groundwater Elevation Monitoring Location
09-B	31-8	LNAPL Monitoring Program Location
09-B	MW-23	Groundwater Elevation Monitoring Location
09-B	RFI-09-14	Groundwater Elevation Monitoring Location
09-B	RFI-09-40R	LNAPL Monitoring Program Location
09-B	RFI-09-44	LNAPL Monitoring Program Location
09-B	RFI-09-45R	LNAPL Monitoring Program Location
09-B	RFI-09-46	Groundwater Elevation Monitoring Location
09-B	RFI-09-48	Groundwater Elevation Monitoring Location
09-B	RFI-09-52	LNAPL Monitoring Program Location
12-A	RFI-12-01R	LNAPL Monitoring Program Location
12-A	RFI-12-02/02R	LNAPL Monitoring Program Location
12-A	RFI-12-07R2	LNAPL Monitoring Program Location
12-A	RFI-12-08R	LNAPL Monitoring Program Location

See Notes on Page 3.

Table 4. Groundwater and LNAPL Elevation Monitoring Locations, MLC, NAO Flint Operations Site Southend, Flint, Michigan

Area of Interest (AOI)	Location	Comments
12-A	RFI-12-09R	LNAPL Monitoring Program Location
12-A	RFI-12-15	LNAPL Monitoring Program Location
12-A	RFI-12-21	Groundwater Elevation Monitoring Location
12-A	RFI-12-22R	LNAPL Monitoring Program Location
12-A	RFI-12-24	Groundwater Elevation Monitoring Location
12-A	RFI-12-25	Groundwater Elevation Monitoring Location
12-A	RFI-12-26	LNAPL Monitoring Program Location
12-A	RFI-12-27	LNAPL Monitoring Program Location
12-C	RFI-12-11D	LNAPL Monitoring Program Location
12-C	RFI-12-11S	LNAPL Monitoring Program Location
12-C	RFI-12-14R	LNAPL Monitoring Program Location
12-C	RFI-12-23	LNAPL Monitoring Program Location
12-C	RFI-12-33	Groundwater Elevation Monitoring Location
12-C	RFI-12-34	Groundwater Elevation Monitoring Location
12-C	RFI-12-35	Groundwater Elevation Monitoring Location
12-C	RFI-12-36	Groundwater Elevation Monitoring Location
12-C	RFI-12-38	LNAPL Monitoring Program Location
12-C	RFI-12-40	LNAPL Monitoring Program Location
12-C	RFI-12-41	LNAPL Monitoring Program Location
16-A	RFI-16-01	Groundwater Elevation Monitoring Location
16-C	40-302	LNAPL Monitoring Program Location
16-C	RFI-16-04R	LNAPL Monitoring Program Location
16-C	RFI-16-07	LNAPL Monitoring Program Location
16-C	RFI-16-08	LNAPL Monitoring Program Location
16-C	RFI-16-09	LNAPL Monitoring Program Location
16-C	RFI-16-10	LNAPL Monitoring Program Location
16-C	RFI-16-12	Groundwater Elevation Monitoring Location
16-C	RFI-16-20	LNAPL Monitoring Program Location
16-C	RFI-16-24	Groundwater Elevation Monitoring Location
17-A	RFI-17-02	Groundwater Elevation Monitoring Location
23-A	RFI-23-02R	Groundwater Elevation Monitoring Location
44-A	RFI-44-05	Groundwater Elevation Monitoring Location
40-A	40-3	Groundwater Elevation Monitoring Location
40-A	40-6R	Groundwater Elevation Monitoring Location
40-A	RFI-40-01R2	Groundwater Elevation Monitoring Location
40-A	RFI-40-07	Groundwater Elevation Monitoring Location
40-A	RFI-40-09	Groundwater Elevation Monitoring Location
40-A	RFI-40-15	Groundwater Elevation Monitoring Location
40-B	40-07R2	LNAPL Monitoring Program Location
40-B	RFI-40-02R	LNAPL Monitoring Program Location
40-B	RFI-40-10R	LNAPL Monitoring Program Location
40-B	RFI-40-12R	LNAPL Monitoring Program Location
40-B	RFI-40-13	Groundwater Elevation Monitoring Location
40-B	RFI-40-14R	LNAPL Monitoring Program Location
40-B	RFI-40-20	LNAPL Monitoring Program Location
40-B	RFI-40-25	LNAPL Monitoring Program Location
40-B	RFI-40-26	LNAPL Monitoring Program Location
40-C	RFI-40-03	Groundwater Elevation Monitoring Location
40-D	40-303R	Groundwater Elevation Monitoring Location
40-D	40-304	Groundwater Elevation Monitoring Location

Notes on Page 3.

Table 4. Groundwater and LNAPL Elevation Monitoring Locations, MLC, NAO Flint Operations Site Southend, Flint, Michigan

Area of Interest (AOI)	Location	Comments
40-D	40-305	Groundwater Elevation Monitoring Location
40-D	RFI-40-04	Groundwater Elevation Monitoring Location
44-A	04-120	Groundwater Elevation Monitoring Location
44-A	04-140	Groundwater Elevation Monitoring Location
44-A	04-160	Groundwater Elevation Monitoring Location
84-A	RFI-84-06R	Groundwater Elevation Monitoring Location
84-A	MW-23	Groundwater Elevation Monitoring Location
84-D	84-6R2D	Groundwater Elevation Monitoring Location
84-D	84-7D	Groundwater Elevation Monitoring Location
84-D	RFI-17-02D	Groundwater Elevation Monitoring Location
84-D	RFI-84-03S	Groundwater Elevation Monitoring Location
84-D	RFI-84-04D	Groundwater Elevation Monitoring Location
84-D	RFI-84-04I	Groundwater Elevation Monitoring Location
84-D	RFI-84-05	Groundwater Elevation Monitoring Location
84-D	RFI-84-06RD	Groundwater Elevation Monitoring Location
84-D	RFI-84-07S	Groundwater Elevation Monitoring Location
84-D	RFI-84-09D	Groundwater Elevation Monitoring Location
84-D	RFI-84-09S	Groundwater Elevation Monitoring Location
84-D	RFI-84-11S	Groundwater Elevation Monitoring Location
84-D	RFI-84-12	Groundwater Elevation Monitoring Location
84-D	RFI-84-8S	Groundwater Elevation Monitoring Location
84-D	RFI-40-11	Groundwater Elevation Monitoring Location
86-1	RFI-02-08R	Groundwater Elevation Monitoring Location
86-1	RFI-86-01R	Groundwater Elevation Monitoring Location
94-B	RFI-94-08	Groundwater Elevation Monitoring Location
94-B	RFI-94-11	Groundwater Elevation Monitoring Location
94-B	94-100	Groundwater Elevation Monitoring Location
94-D	RFI-02-22	Groundwater Elevation Monitoring Location
94-D	RFI-94-05	Groundwater Elevation Monitoring Location
BD01	BD01-01	Groundwater Elevation Monitoring Location
BD01	BD01-02R	Groundwater Elevation Monitoring Location
BD01	BD01-03	Groundwater Elevation Monitoring Location
BD01	BD01-04	Groundwater Elevation Monitoring Location
Harriet Street	ACSP-B2AR	Groundwater Elevation Monitoring Location

Note:
Measurements will be collected on an annual basis.

Table 5. CMI Groundwater Quality Monitoring Locations, MLC, NAO Flint Operations Site, Flint, Michigan

Area of Interest (AOI)	Sampling Location	Groundwater Analytical Parameters	Sampling Rationale
North of Leith Street			
7-03	07-01	VOCs	Sentinel location downgradient of LNAPL plume.
10-2	RFI-10-24	VOCs	Off-site; sentinel location at downgradient edge of VOC impacted area
10-2	RFI-10-29	VOCs	Off-site; sentinel location at downgradient edge of VOC impacted area
10-2	RFI-10-33	VOCs	Off-site; sentinel location at downgradient edge of VOC impacted area
10-2	RFI-10-35	VOCs	Off-site; sentinel location at downgradient edge of VOC impacted area
10-2	RFI-10-36	VOCs	Off-site; sentinel location at downgradient edge of VOC impacted area
10-3	20-500R	VOCs	Sentinel location at downgradient edge of VOC impacted area
10-3	RFI-10-28	VOCs	Off-site; sentinel location at downgradient edge of VOC impacted area
10-4	20-FP10R	VOCs	Sentinel location at downgradient edge of VOC impacted area
10-4	RFI-10-26	VOCs	Sentinel location at downgradient edge of VOC impacted area
36-1	RFI-36-04	VOCs	Monitoring VOCs downgradient of LNAPL plume.
36-1	RFI-36-19	VOCs	Off-site; sentinel location at downgradient edge of VOC impacted area
36-1	RFI-36-37	VOCs	Off-site; sentinel location at downgradient edge of VOC impacted area
36-1	RFI-36-47	VOCs	Off-site; sentinel location at downgradient edge of VOC impacted area
36-1	RFI-36-48	VOCs	Off-site; sentinel location at downgradient edge of VOC impacted area
36-1	RFI-36-55	VOCs	Off-site; sentinel location at downgradient edge of VOC impacted area
36-1	RFI-36-56	VOCs	Off-site; sentinel location at downgradient edge of VOC impacted area
36-1	RFI-36-20	VOCs	Sentinel location at downgradient edge of VOC impacted area
36-5	RFI-36-14	VOCs	Sentinel location downgradient of LNAPL plume.
81-2	70-165	VOCs and lead	Sentinel location downgradient of LNAPL plume and historical lead exceedance.
81-2	RFI-81-50	VOCs	Sentinel location downgradient of LNAPL plume.
81-3	RFI-81-08	VOCs	Sentinel location at downgradient edge of VOC plume
86-1	RFI-86-16R	VOCs	Off-site; sentinel location at downgradient edge of VOC impacted area
86-1	RFI-86-01R	VOCs, lead, and manganese	Sentinel location at downgradient edge of VOC and inorganic impacted area
South of Leith Street			
02-E	RFI-02-05	VOCs	Sentinel location at downgradient edge of VOC impacted area
04-D	04-4	Cyanide	Sentinel location upgradient of storm sewer
04-D	04-3	Cyanide	Sentinel location upgradient of storm sewer
09-A	RFI-09-04R	VOCs	Monitoring TCE to confirm stable concentrations.
09-A	RFI-09-53	VOCs	Monitoring to confirm stable concentrations of VOCs.
09-A	MW-26	VOCs	Off-site; sentinel location to confirm VOC plume has not migrated
09-B	RFI-09-14	VOCs	Off-site; sentinel location at downgradient edge of VOC impacted area
09-B	RFI-09-48	VOCs	Sentinel location at downgradient edge of VOC impacted area.
09-B	RFI-09-46	VOCs	Monitoring benzene concentrations to confirm stable concentrations
17-A	RFI-17-02	VOCs and selenium	Sentinel location at downgradient edge of VOC impacted area and GSI monitoring point
40-D	40-304	VOCs and PCBs	Sentinel location downgradient of building 40 Tunnel (PCBs required by 9/13/2005 EPA letter)
44-A	RFI-44-05	Cyanide	Sentinel location upgradient of storm sewer
84-A	MW-23	VOCs	Off-site; downgradient of VOC impacted area
84-D	RFI-17-02D	VOCs and selenium	Monitoring vinyl chloride to confirm stable concentrations and GSI monitoring point
84-D	RFI-84-06R	VOCs, cyanide, selenium, and silver	Sentinel location at downgradient edge of VOC impacted area and GSI monitoring point
84-D	RFI-84-06RD	VOCs	Sentinel location at downgradient edge of VOC impacted area

Table 5. CMI Groundwater Quality Monitoring Locations, MLC, NAO Flint Operations Site, Flint, Michigan

Area of Interest (AOI)	Sampling Location	Groundwater Analytical Parameters	Sampling Rationale
84-D	RFI-84-09D	VOCs	Sentinel location at downgradient edge of VOC impacted area
84-D	RFI-84-09S	VOCs	Sentinel location at downgradient edge of VOC impacted area
84-D	RFI-84-11S	VOCs	Sentinel location at downgradient edge of VOC impacted area
84-D	RFI-84-12	VOCs and selenium	Sentinel location at downgradient edge of VOC impacted area and GSI monitoring point
94-B	RFI-94-11	VOCs	Off-site; sentinel location at downgradient edge of VOC impacted area
94-D	RFI-02-22	VOCs	Sentinel locations, downgradient of LNAPL plumes

Note:

VOCs = Volatile Organic Compounds.

LNAPL = light non-aqueous phase liquid.

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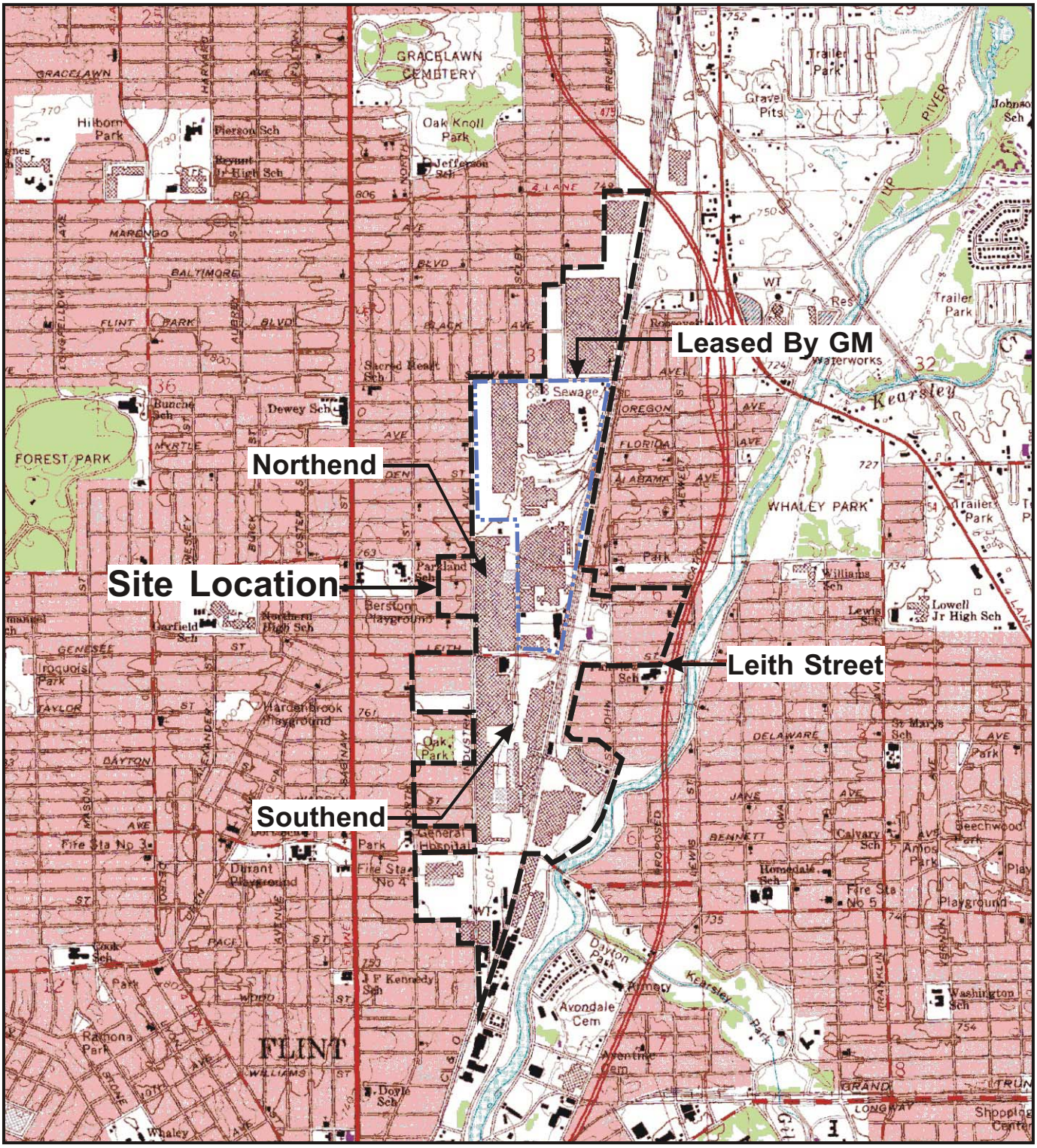
Figures



REFERENCE: Base Map Source: USGS 7.5 Min. Topo. Quad., Flint North, Mich. (1969, Photorevised 1975).

2000' 0 2000'

Approximate Scale: 1" = 2000'

Area Location

MOTORS LIQUIDATIONS COMPANY
SOUTHEND OF FORMER GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS FACILITY
FLINT, MICHIGAN
CMI WORK PLAN

SITE LOCATION MAP

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FIGURE
1

07/20/2010 SYRACUSE, NY-ENV/CAD-141-DJHOWES
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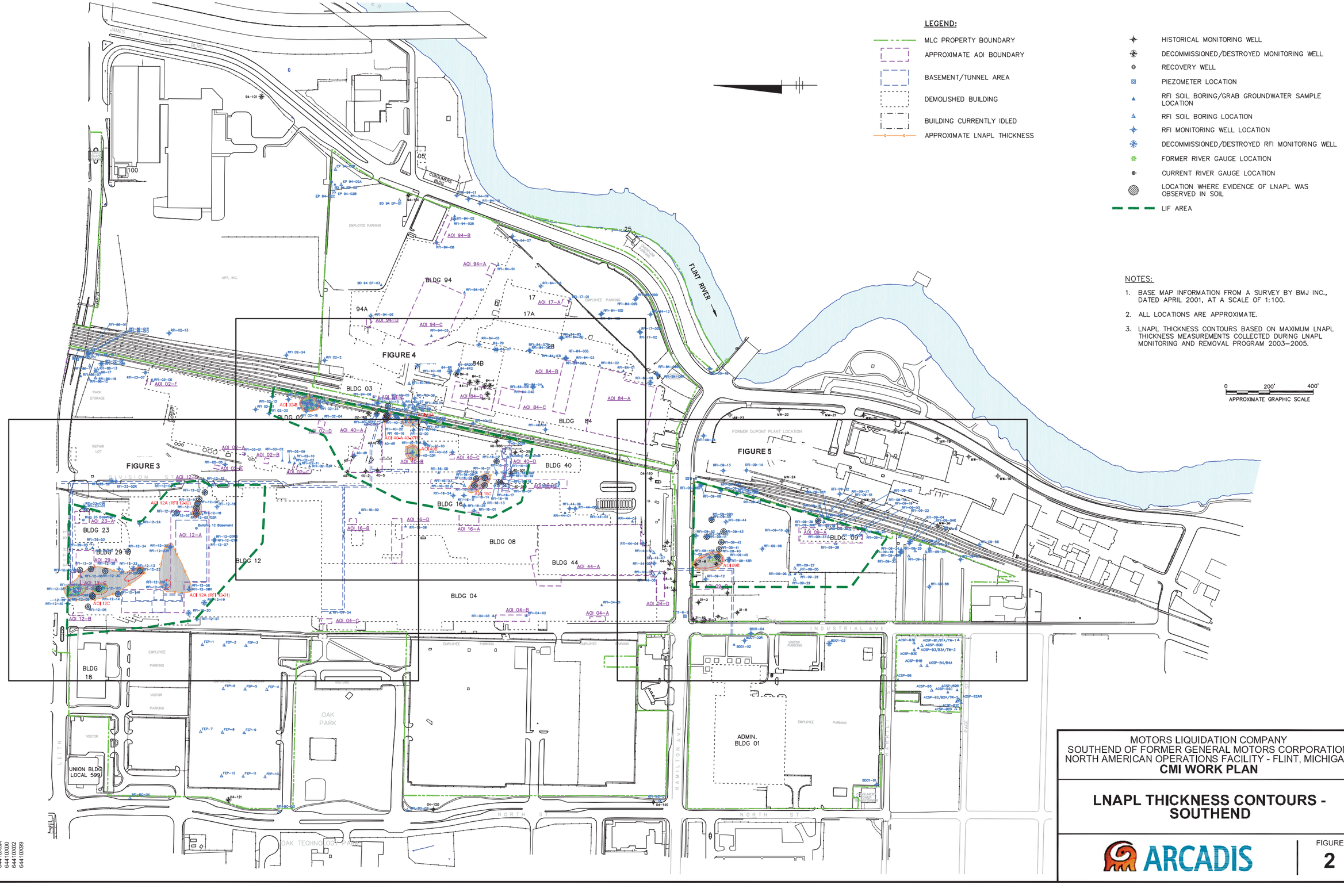

MOTORS LIQUIDATION COMPANY
SOUTHEND OF FORMER GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS FACILITY - FLINT, MICHIGAN
CMI WORK PLAN

LNAPL THICKNESS CONTOURS - SOUTHEND

ARCADIS

FIGURE 2

CITY:SYRACUSE DIV/GROUP:141 DB:G.STOWELL L.FORAKER LD:GMS PM:L.McBURNEY LY*R:ON(=OFF=REF*,*|*HST_SB*,*RFI_SS_PEZ,|HY_LAKE_POND-FILLED,|PROPERTY;|SHD-BUILDNG,;NAPL_EVID,|NAPL_OBS,|NAPL_OBS-HST,|LNAPL-SHD
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IMAGES: PROJECTNAME: ---

LIF INVESTIGATION - AREA 1

AOI 12A (RFI 12-02)

AOI 12A (RFI 12-01)

AOI 12C

BLDG 23

BLDG 29

BLDG 12

BLDG 18

REPAIR LOT

SEMI LOT

EMPLOYEE PARKING

Bldg 23 Basement

Building 12 Basement

D I V I S I O N S T.

S M I T H S T.

LEGEND:

- MLC PROPERTY BOUNDARY
- APPROXIMATE AOI BOUNDARY
- BASEMENT/TUNNEL AREA
- DEMOLISHED BUILDING
- BUILDING CURRENTLY IDLED
- APPROXIMATE LNAPL THICKNESS
- HISTORICAL MONITORING WELL
- DECOMMISSIONED/DESTROYED MONITORING WELL
- RECOVERY WELL
- PIEZOMETER LOCATION
- RFI SOIL BORING/GRAB GROUNDWATER SAMPLE LOCATION
- RFI SOIL BORING LOCATION
- RFI MONITORING WELL LOCATION
- DECOMMISSIONED/DESTROYED RFI MONITORING WELL
- FORMER RIVER GAUGE LOCATION
- CURRENT RIVER GAUGE LOCATION
- LOCATION WHERE EVIDENCE OF LNAPL WAS OBSERVED IN SOIL
- LIF INVESTIGATION AREA

NOTES:

1. BASE MAP INFORMATION FROM A SURVEY BY BMJ INC., DATED APRIL 2001, AT A SCALE OF 1:100.
2. ALL LOCATIONS ARE APPROXIMATE.
3. LNAPL THICKNESS CONTOURS BASED ON MAXIMUM LNAPL THICKNESS MEASUREMENTS COLLECTED DURING LNAPL MONITORING AND REMOVAL PROGRAM 2003–2005.

0 60' 120'
GRAPHIC SCALE

MOTORS LIQUIDATION COMPANY
SOUTHEND OF FORMER GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS FACILITY - FLINT, MICHIGAN
CMI WORK PLAN

LIF INVESTIGATION - AREA 1

ARCADIS

FIGURE 3

LIF INVESTIGATION - AREA 2

BLDG 02
BLDG 03
BLDG 08
BLDG 12
BLDG 16
Building 40 Tunnel

AOI 02-B
AOI 40A
AOI 40-A 40-07R2
AOI 40B
AOI 16C

LEGEND:

- MLC PROPERTY BOUNDARY
- APPROXIMATE AOI BOUNDARY
- BASEMENT/TUNNEL AREA
- DEMOLISHED BUILDING
- BUILDING CURRENTLY IDLED
- APPROXIMATE LNAPL THICKNESS
- HISTORICAL MONITORING WELL
- DECOMMISSIONED/DESTROYED MONITORING WELL
- RECOVERY WELL
- PIEZOMETER LOCATION
- RFI SOIL BORING/GRAB GROUNDWATER SAMPLE LOCATION
- RFI SOIL BORING LOCATION
- RFI MONITORING WELL LOCATION
- DECOMMISSIONED/DESTROYED RFI MONITORING WELL
- FORMER RIVER GAUGE LOCATION
- CURRENT RIVER GAUGE LOCATION
- LOCATION WHERE EVIDENCE OF LNAPL WAS OBSERVED IN SOIL
- LIF INVESTIGATION AREA

NOTES:

1. BASE MAP INFORMATION FROM A SURVEY BY BMJ INC., DATED APRIL 2001, AT A SCALE OF 1:100.
2. ALL LOCATIONS ARE APPROXIMATE.
3. LNAPL THICKNESS CONTOURS BASED ON MAXIMUM LNAPL THICKNESS MEASUREMENTS COLLECTED DURING LNAPL MONITORING AND REMOVAL PROGRAM 2003-2005.

0 60' 120'
GRAPHIC SCALE

MOTORS LIQUIDATION COMPANY
SOUTHEND OF FORMER GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS FACILITY - FLINT, MICHIGAN
CMI WORK PLAN

LIF INVESTIGATION - AREA 2

ARCADIS

FIGURE
4

CITY:SYRACUSE DIV/GROUP:141 DB:G.STOWELL L.FORAKER LD:GMS PM:L.McBURNEY LYR:ON=*;OFF=*REF*;*|HIST_SB*;*RFI_SS_PIEZ,|HY_LAKE_POND-FILLED,|PROPERTY,|SHD-BUILDNG,|NAPL_EVID,|NAPL_OBS,|NAPL_OBS-HIST,|LNAPLS-ID
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LIF INVESTIGATION - AREA 3

FORMER DUPONT PLANT LOCATION

INDUSTRIAL AVE.

BLDG. 09

VISITOR PARKING

AOI 09-A

AOI 09B

AOI 09-B

AOI 04-D

RFI-09-46
RFI-09-13
RFI-09-14
MW-19
MW-24
MW-25
04-160
11-6
RFI-09-08D
RFI-09-54D
RFI-09-54S
RFI-09-55S
RFI-09-55D
RFI-09-08
RFI-09-07
RFI-09-01R
RFI-09-32
RFI-09-17
RFI-09-51
RFI-09-02
RFI-09-18
RFI-09-19
RFI-09-03
RFI-09-22
RFI-09-16
RFI-09-50
RFI-09-01
RFI-09-36
RFI-09-36R
RFI-09-01D
RFI-09-39
RFI-08-03R
RFI-09-20
RFI-09-21
RFI-09-37
RFI-09-38
RFI-09-10
RFI-09-09D
RFI-09-09
RFI-09-44
RFI-09-52
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RFI-09-11
RFI-09-42
RFI-09-41
RFI-09-40R
RFI-09-40
RFI-09-45
RFI-09-45R
RFI-09-06
RFI-09-24
RFI-09-49
RFI-09-49R
RFI-09-33
RFI-09-25
RFI-09-34
RFI-09-27
RFI-09-05
RFI-09-26
RFI-09-28
RFI-09-29
RFI-09-12
RFI-44-03
RFI-44-04
RFI-44-10
RFI-44-07
RFI-44-05
RFI-44-06
RFI-44-08
04-4
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BD01-02
BD01-03
ACSP-B3K
ACSP-B1
ACSP-B3/
ACSP-B3E
ACSP-B4B
ACSP-B6

LEGEND:

- MLC PROPERTY BOUNDARY
- APPROXIMATE AOI BOUNDARY
- BASEMENT/TUNNEL AREA
- DEMOLISHED BUILDING
- BUILDING CURRENTLY IDLED
- APPROXIMATE LNAPL THICKNESS
- HISTORICAL MONITORING WELL
- DECOMMISSIONED/DESTROYED MONITORING WELL
- RECOVERY WELL
- PIEZOMETER LOCATION
- RFI SOIL BORING/GRAB GROUNDWATER SAMPLE LOCATION
- RFI SOIL BORING LOCATION
- RFI MONITORING WELL LOCATION
- DECOMMISSIONED/DESTROYED RFI MONITORING WELL
- FORMER RIVER GAUGE LOCATION
- CURRENT RIVER GAUGE LOCATION
- LOCATION WHERE EVIDENCE OF LNAPL WAS OBSERVED IN SOIL
- LIF INVESTIGATION AREA

NOTES:

1. BASE MAP INFORMATION FROM A SURVEY BY BMJ INC., DATED APRIL 2001, AT A SCALE OF 1:100.
2. ALL LOCATIONS ARE APPROXIMATE.
3. LNAPL THICKNESS CONTOURS BASED ON MAXIMUM LNAPL THICKNESS MEASUREMENTS COLLECTED DURING LNAPL MONITORING AND REMOVAL PROGRAM 2003–2005.

0 60' 120'
GRAPHIC SCALE

MOTORS LIQUIDATION COMPANY
SOUTHEND OF FORMER GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS FACILITY - FLINT, MICHIGAN
CMI WORK PLAN

LIF INVESTIGATION - AREA 3

ARCADIS

FIGURE
5

CITY:SYRACUSE DIVGROUP:141 DB:G.STOWELL L.FORAKER LD:GMS PM:L.McBURNEY LYR:ON=*;OFF=*REF*;"IHST_SB";"IRFI_SS_PIEZ_I;HY_LAKE_POND-FILLED_I;PROPERTY_IS;HD-BUILDING_;NAPL_EVID_I;NAPL_OBS_I;NAPL_OBS-HIST_I;LNAPL-S;HD
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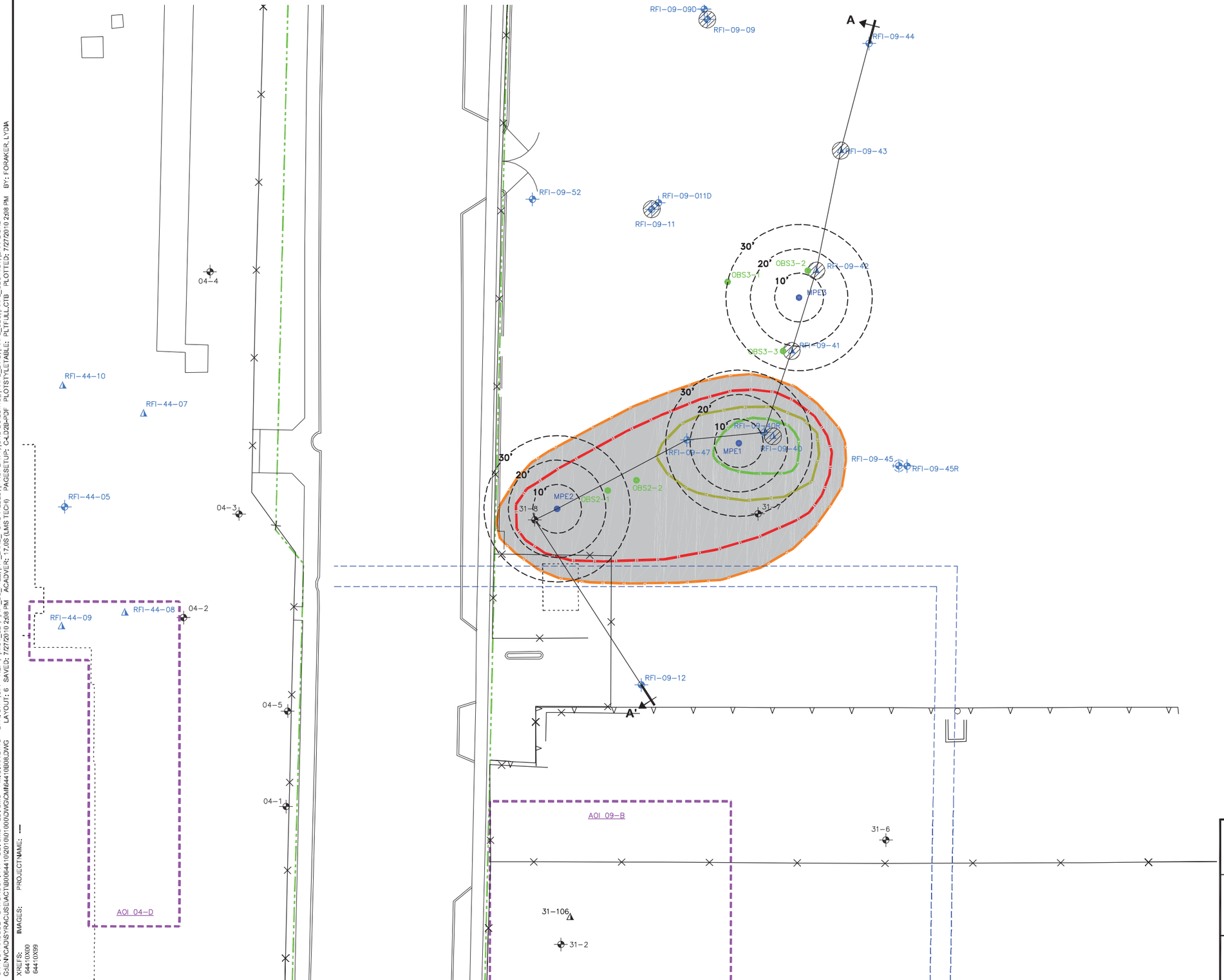

LEGEND:

- MLC PROPERTY BOUNDARY
- APPROXIMATE AOI BOUNDARY
- BASEMENT/TUNNEL AREA
- DEMOLISHED BUILDING
- BUILDING CURRENTLY IDLED
- APPROXIMATE LNAPL THICKNESS
- HISTORICAL MONITORING WELL
- RFI SOIL BORING LOCATION
- RFI MONITORING WELL LOCATION
- DECOMMISSIONED/DESTROYED RFI MONITORING WELL
- LOCATION WHERE EVIDENCE OF LNAPL WAS OBSERVED IN SOIL
- PROPOSED MONITORING/OBSERVATION WELL
- PROPOSED EXTRACTION WELL

NOTES:

1. BASE MAP INFORMATION FROM A SURVEY BY BMJ INC., DATED APRIL 2001, AT A SCALE OF 1:100.
2. ALL LOCATIONS ARE APPROXIMATE.
3. LNAPL THICKNESS CONTOURS BASED ON MAXIMUM LNAPL THICKNESS MEASUREMENTS COLLECTED DURING LNAPL MONITORING AND REMOVAL PROGRAM 2003–2005.

0 20' 40'
GRAPHIC SCALE

MOTORS LIQUIDATION COMPANY
SOUTHEND OF FORMER GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS FACILITY - FLINT, MICHIGAN
CMI WORK PLAN

PILOT TEST WELL LAYOUT - AOI 09B

ARCADIS

FIGURE 6

CITY:SYRACUSE DIV/GROUP:141 DB:GMS LD:GMS PM:D.KAIDING LYR:ON=*;OFF=*REF*,*HIST_SB*,*RFI_SS_PIEZ,|H*Y_LAKE_POND-FILLED,|PROPERTY,|SHDBUILDING,|NAPL_EVID,|NAPL_OBS,|NAPL_OBS-HIST,|LNAPLSHD
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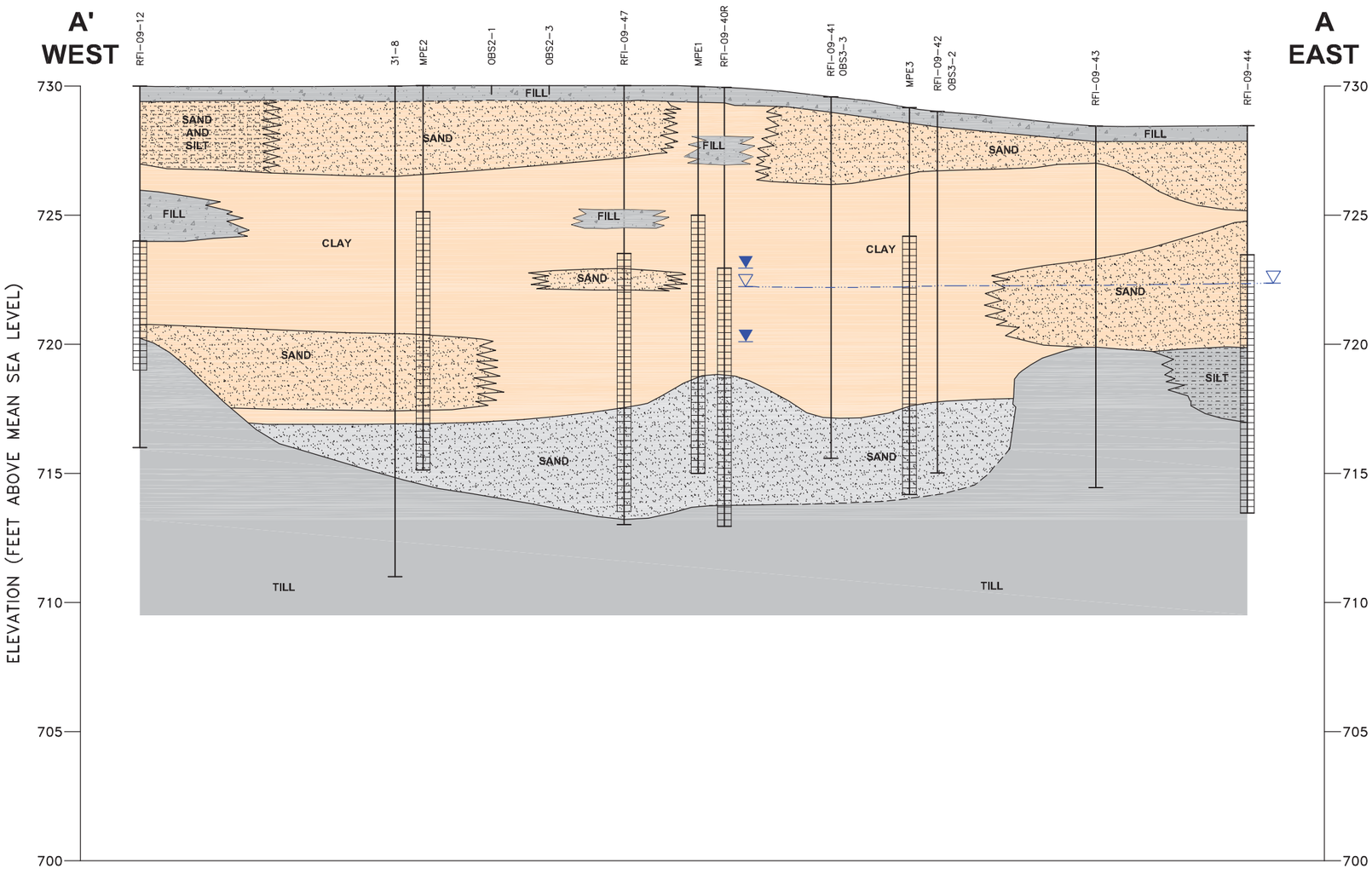

LEGEND:

RFI-09-44

- MONITORING WELL RISER
- MONITORING WELL SCREEN
- BOTTOM OF WELL, END OF BORING
- PRODUCT AND WATER LEVELS SEPTEMBER 2008
- CORRECTED WATER LEVEL SEPTEMBER 2008
- ESTIMATED POTENTIOMETRIC SURFACE
- CLAY
- SAND
- SAND AND SILT
- SILT
- TILL
- FILL (CONCRETE/ASPHALT)

NOTES:

1. LITHOLOGIC CONTACTS DASHED WHERE INFERRED.
2. WATER LEVEL FLUCTUATES 4–9 FT BG.
3. VERTICAL EXAGGERATION IS 12.

0 20' 40'
HORIZONTAL GRAPHIC SCALE
0 2.5' 5'
VERTICAL GRAPHIC SCALE

MOTORS LIQUIDATION COMPANY
SOUTHEND OF FORMER GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS FACILITY - FLINT, MICHIGAN
CMI WORK PLAN

HYDROGEOLOGIC CROSS-SECTION A-A'

ARCADIS

FIGURE
7

CITY:SYRACUSE DIV/GROUP:141 DB:GMS LD:GMS PM:D.KADING LYR:ON=*;OFF=*REF* *|HST_SB* *|RFI_SS_PIEZ_|HY_LAKE_POND-FILLED_|PROPERTY_|SHED-BUILDING_|NAPL_EVID_|NAPL_OBS_|NAPL_OBS-HIST_|LNAPL-SHD
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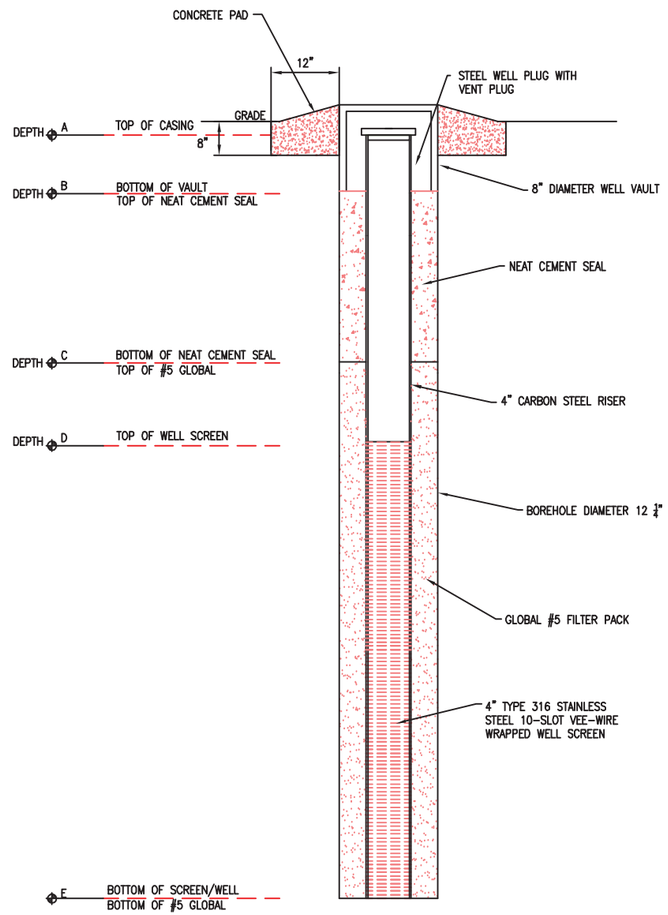
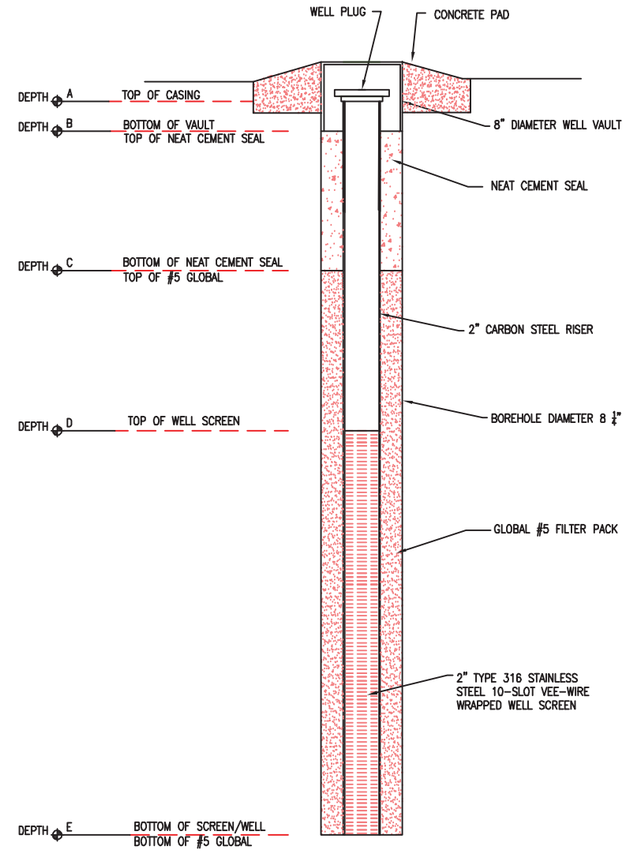
WELL CONSTRUCTION SCHEDULE (DEPTHS ARE BELOW GRADE)					
WELL TYPE	A	B	C	D	E
MPE WELL	4"	0.5'	3'	5'	15'
OBSERVATION WELL	4"	0.5'	3'	5'	15'



MULTI-PHASE EXTRACTION WELL DETAIL
NOT TO SCALE



OBSERVATION WELL DETAIL
NOT TO SCALE

NOTE: OBSERVATION WELL PAD TO BE COMPLETED SAME AS MULTI-PHASE EXTRACTION WELL PAD

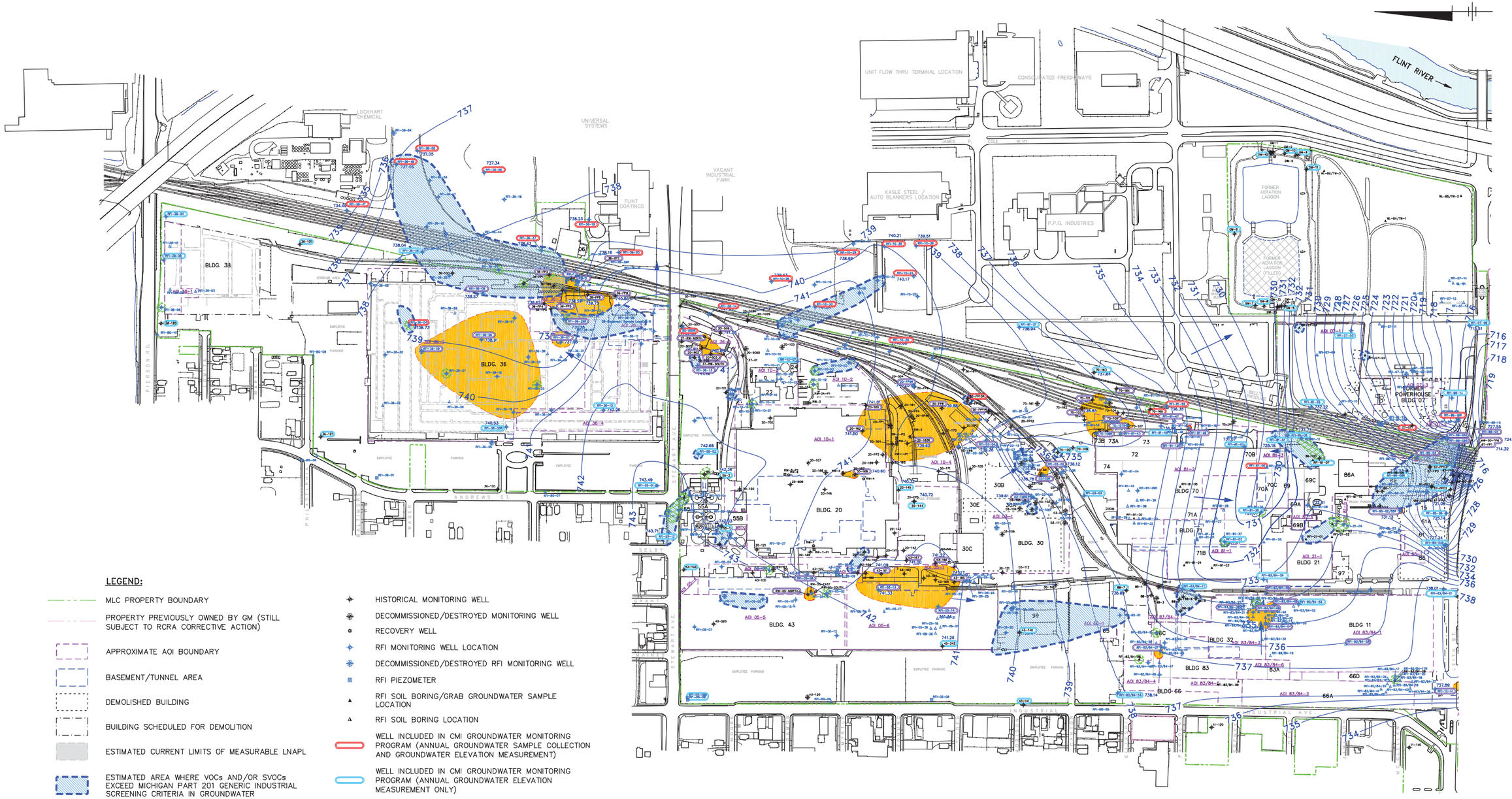
DEPTHS OF EACH WELL WILL VARY DEPENDING ON DEPTH OF TILL UNIT ENCOUNTERED

MOTORS LIQUIDATION COMPANY
SOUTHEND OF FORMER GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS FACILITY - FLINT, MICHIGAN

MPE AND OBSERVATION WELL DETAILS

ARCADIS

FIGURE
8



LEGEND:

- MLC PROPERTY BOUNDARY
- PROPERTY PREVIOUSLY OWNED BY GM (STILL SUBJECT TO RCRA CORRECTIVE ACTION)
- APPROXIMATE AOI BOUNDARY
- BASEMENT/TUNNEL AREA
- DEMOLISHED BUILDING
- BUILDING SCHEDULED FOR DEMOLITION
- ESTIMATED CURRENT LIMITS OF MEASURABLE LNAPL
- ESTIMATED AREA WHERE VOCs AND/OR SVOCs EXCEED MICHIGAN PART 201 GENERIC INDUSTRIAL SCREENING CRITERIA IN GROUNDWATER
- ESTIMATED AREA WHERE INORGANICS EXCEED MICHIGAN PART 201 GENERIC INDUSTRIAL SCREENING CRITERIA IN GROUNDWATER

- HISTORICAL MONITORING WELL
- DECOMMISSIONED/DESTROYED MONITORING WELL
- RECOVERY WELL
- RFI MONITORING WELL LOCATION
- DECOMMISSIONED/DESTROYED RFI MONITORING WELL
- RFI PIEZOMETER
- RFI SOIL BORING/GRAB GROUNDWATER SAMPLE LOCATION
- RFI SOIL BORING LOCATION
- WELL INCLUDED IN CMI GROUNDWATER MONITORING PROGRAM (ANNUAL GROUNDWATER SAMPLE COLLECTION AND GROUNDWATER ELEVATION MEASUREMENT)
- WELL INCLUDED IN CMI GROUNDWATER MONITORING PROGRAM (ANNUAL GROUNDWATER ELEVATION MEASUREMENT ONLY)
- WELL INCLUDED IN LNAPL MONITORING PROGRAM (ANNUAL LNAPL AND/OR GROUNDWATER ELEVATION MEASUREMENT ONLY)
- 742.03 GROUNDWATER ELEVATION (IN FEET)
- 726 GROUNDWATER ELEVATION CONTOUR (IN FEET)
- GENERALIZED FLOW DIRECTION

0 250' 500'
APPROXIMATE GRAPHIC SCALE

NOTES:

1. BASE MAP INFORMATION FROM A SURVEY BY BMJ INC., DATED APRIL 2001, AT A SCALE OF 1:100.
2. ALL LOCATIONS ARE APPROXIMATE.
3. ESTIMATED LIMITS OF MEASURABLE LNAPL BASED ON MEASUREMENTS FROM MARCH 2004 TO JULY 2005.

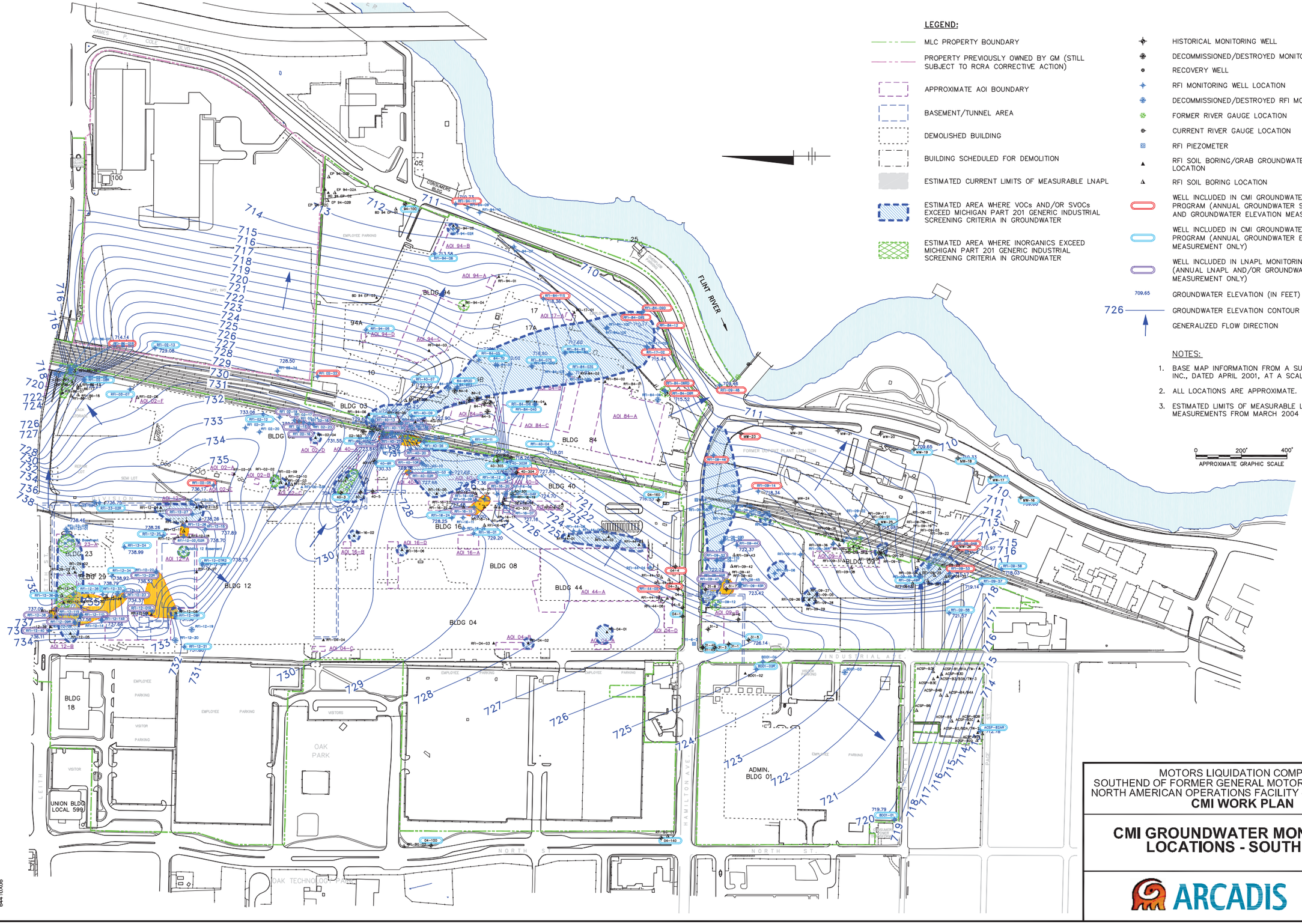
MOTORS LIQUIDATION COMPANY
SOUTHEND OF FORMER GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS FACILITY - FLINT, MICHIGAN
CMI WORK PLAN

CMI GROUNDWATER MONITORING LOCATIONS - NORTH END

ARCADIS

FIGURE 9

CITY:SYRACUSE DIV/GROUP:141 DB:G.STOWELL L.FORAKER LD:GMS PM:L.McBURNEY LYR:ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIVE\00644\102010\01207\DWG\CMI\64410W01.DWG LAYOUT: 9 SAVED: 8/5/2010 10:25 AM ACADVER: 18.0S (LMS TECH) PAGESETUP: CL02B-PDF PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 8/5/2010 10:25 AM BY: FORAKER, LYDIA
XREFS: 64410X02 64410X01 64410X3A 64410X00 64410X06
IMAGES: PROJECTNAME: ---



NOTES:

1. BASE MAP INFORMATION FROM A SURVEY BY BMJ INC., DATED APRIL 2001, AT A SCALE OF 1:100.
2. ALL LOCATIONS ARE APPROXIMATE.
3. ESTIMATED LIMITS OF MEASURABLE LNAPL BASED MEASUREMENTS FROM MARCH 2004 TO JULY 2005.

MOTORS LIQUIDATION COMPANY
SOUTHEND OF FORMER GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS FACILITY - FLINT, MICHIGAN
CMI WORK PLAN

CMI GROUNDWATER MONITORING LOCATIONS - SOUTH END

ARCADIS

FIGURE
10

CITY:SYRACUSE DIV/GROUP:141 DB:G.STOWELL L.FORAKER LD:GMS PM:L.McBURNEY LYR:ON=*;OFF=*REF* ACADVER: 18.0S (LMS TECH) PAGESETUP: C4-D2B-PDF PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 8/6/2010 12:39 PM BY: FORAKER, LYDIA
G:\ENV\CAD\SYRACUSE\ACTIVE\00644\102010\01207\DWG\CMI\64410WX02.DWG LAYOUT: 10 SAVED: 8/6/2010 12:39 PM
XREFS: IMAGES: PROJECTNAME: ---
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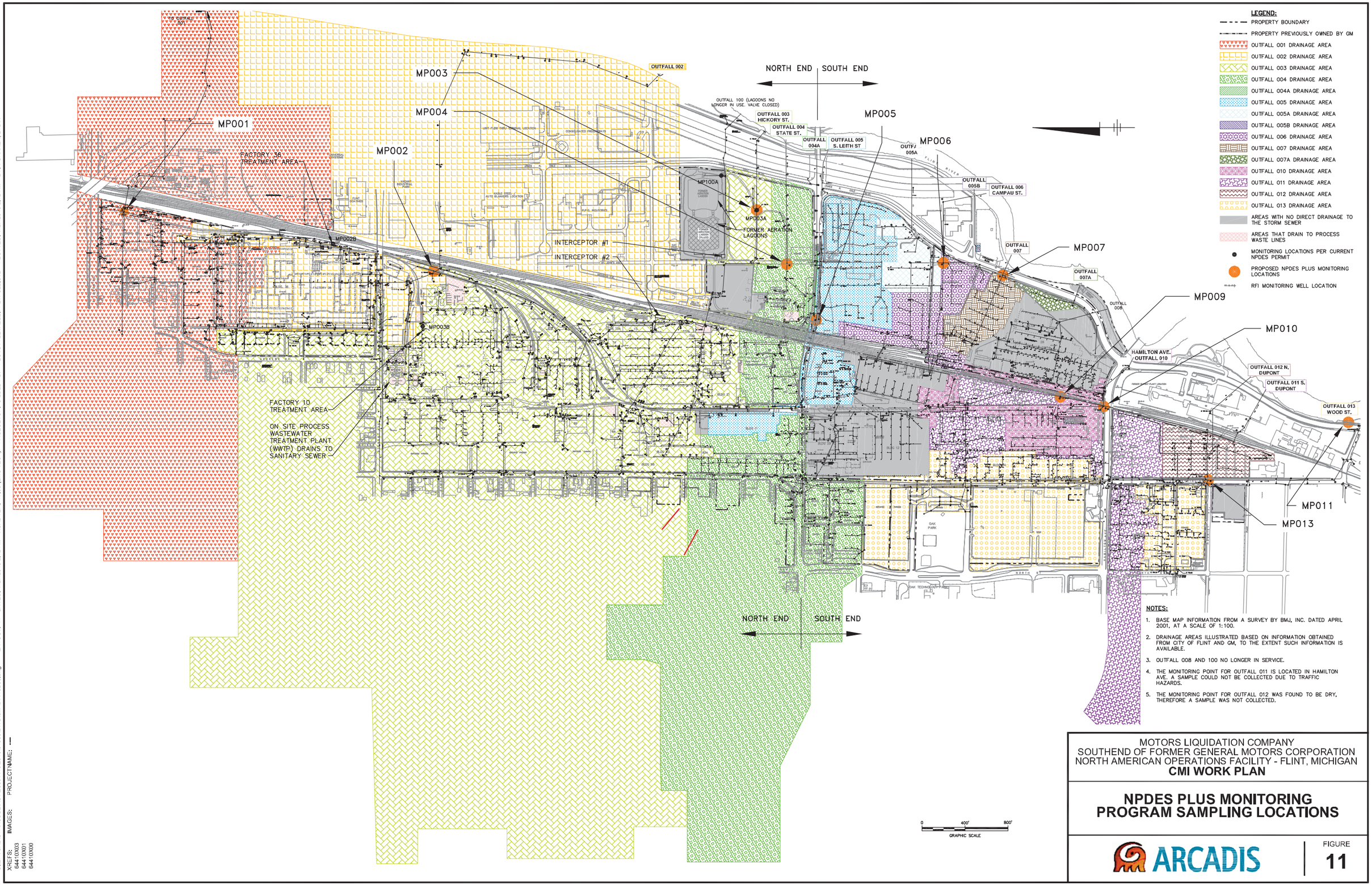
64410X3A
64410X02
64410X00
64410X06



NOTES:

1. BASE MAP INFORMATION FROM A SURVEY BY BMJ, INC. DATED APRIL 2001, AT A SCALE OF 1:100.
2. DRAINAGE AREAS ILLUSTRATED BASED ON INFORMATION OBTAINED FROM CITY OF FLINT AND GM, TO THE EXTENT SUCH INFORMATION IS AVAILABLE.
3. OUTFALL 008 AND 100 NO LONGER IN SERVICE.
4. THE MONITORING POINT FOR OUTFALL 011 IS LOCATED IN HAMILTON AVE. A SAMPLE COULD NOT BE COLLECTED DUE TO TRAFFIC HAZARDS.
5. THE MONITORING POINT FOR OUTFALL 012 WAS FOUND TO BE DRY, THEREFORE A SAMPLE WAS NOT COLLECTED.

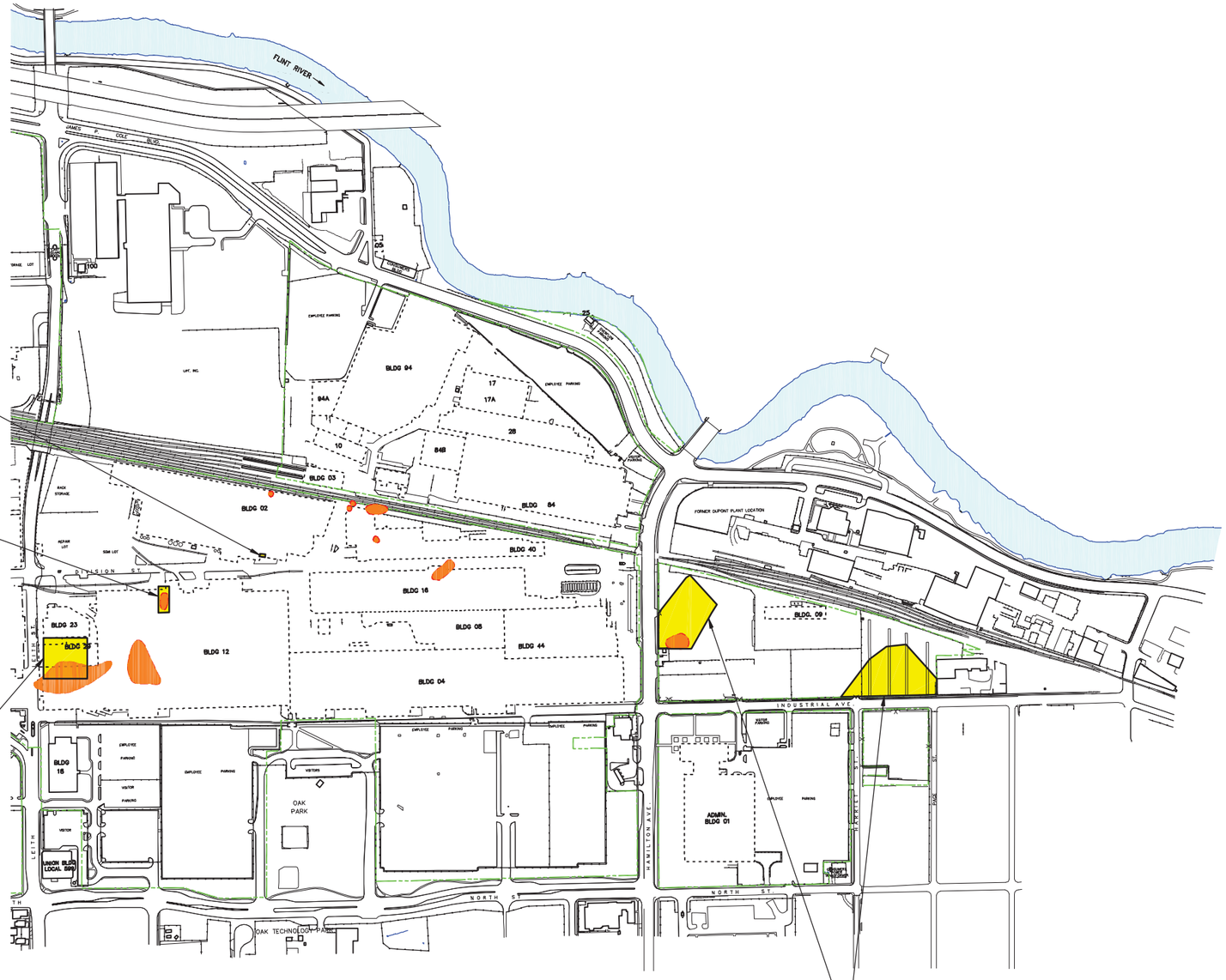
MOTORS LIQUIDATION COMPANY
SOUTHEND OF FORMER GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS FACILITY - FLINT, MICHIGAN
CMI WORK PLAN

NPDES PLUS MONITORING PROGRAM SAMPLING LOCATIONS

ARCADIS

FIGURE
11

CITY:SYRACUSE DIV/GROUP:141 DB:G.STOWELL L.FORAKER LD:GMS PM:L.McBURNEY LYR:ON=*;OFF=*REF* PAGESETUP: C4D2B=PDF PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 7/27/2010 2:12 PM BY: FORAKER, LYDIA
G:\ENVCAD\SYRACUSE\ACTIVE\60064410\2010\01000\DWG\CMI\64410B05.dwg LAYOUT: 11 SAVED: 7/27/2010 2:12 PM ACADVER: 17.0S (LMS TECH)
XREFS: IMAGES: PROJECTNAME: ---
64410X03
64410X01
64410X00



AOI GROUP 02–C
ENGINEERING AND ADDITIONAL INSTITUTIONAL CONTROLS ABOVE BASELINE – MAINTAIN A SURFACE COVER CONSISTENT WITH EXISTING CONDITIONS

AOI GROUP 12–A
ENGINEERING AND ADDITIONAL INSTITUTIONAL CONTROLS ABOVE BASELINE – MAINTAIN A SURFACE COVER CONSISTENT WITH EXISTING CONDITIONS

AOI GROUP 29–A
ENGINEERING AND ADDITIONAL INSTITUTIONAL CONTROLS ABOVE BASELINE – MAINTAIN A SURFACE COVER CONSISTENT WITH EXISTING CONDITIONS

AOI GROUP 09–B
ENGINEERING AND ADDITIONAL INSTITUTIONAL CONTROLS ABOVE BASELINE – MAINTAIN A SURFACE COVER CONSISTENT WITH EXISTING CONDITIONS

LEGEND:

- PROPERTY BOUNDARY
- DEMOLISHED BUILDING
- ESTIMATED CURRENT LIMITS OF MEASUREABLE LNAPL PLUMES
- AREAS OF IMPACTED SOIL

NOTES:

1. BASE MAP INFORMATION FROM A SURVEY BY BMJ INC., DATED APRIL 2001, AT A SCALE OF 1:100.
2. ALL LOCATIONS ARE APPROXIMATE.
3. BASELINE INSTITUTIONAL CONTROL FOR ENTIRE SITE INCLUDES DEED RESTRICTION LIMITING GROUNDWATER AND PROPERTY USE.

0 300' 600'
GRAPHIC SCALE

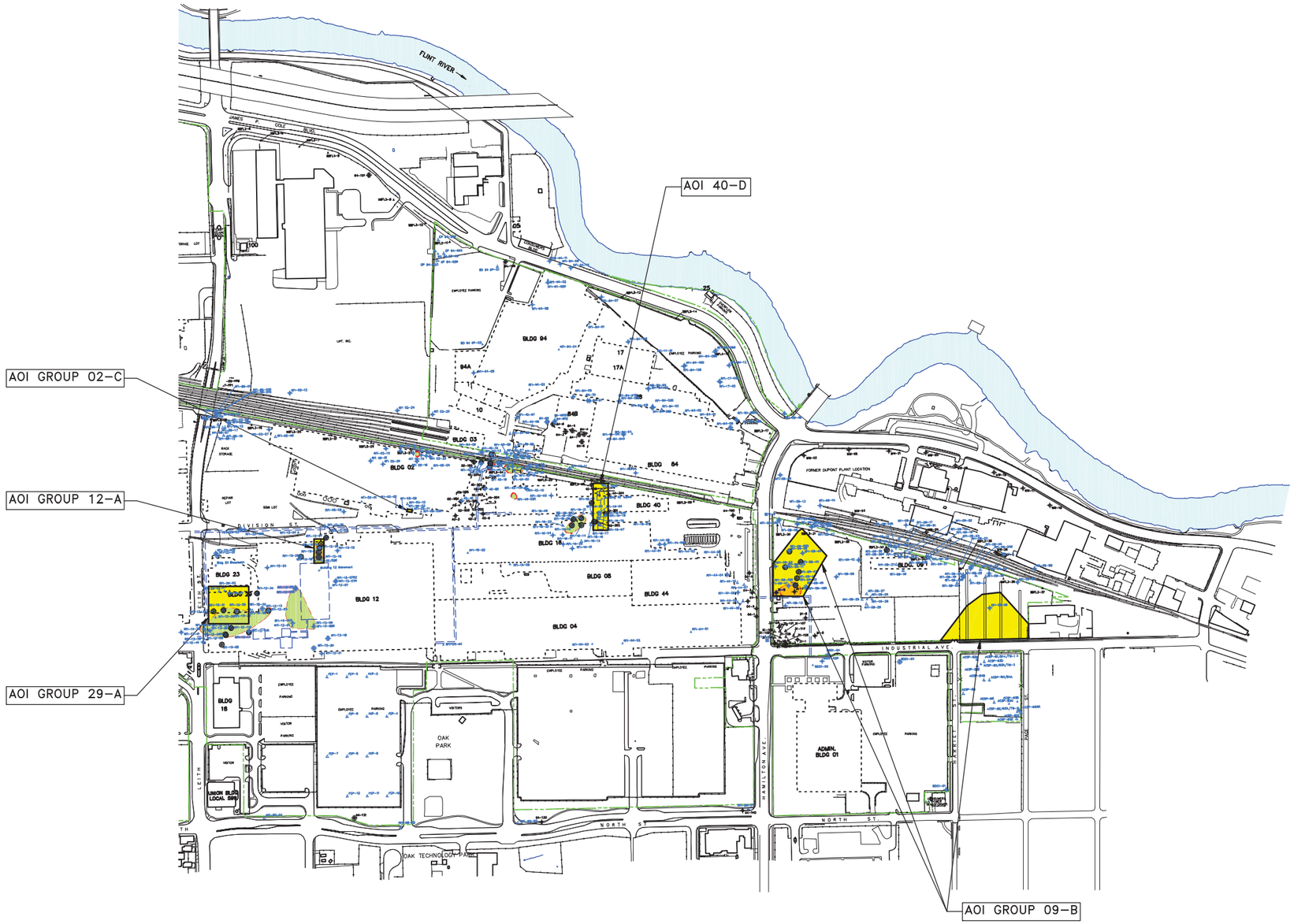
MOTORS LIQUIDATION COMPANY
SOUTHEND OF FORMER GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS FACILITY - FLINT, MICHIGAN
CMI WORK PLAN

AREAS OF SOIL IMPACT - SOUTHEND

ARCADIS

FIGURE
12

CITY: SYRACUSE DIV/GROUP: 141 DB: G. STOWELL L. FORAKER LD: GMS PM: L. McBURNEY LYR: ON=*;OFF=*REF* G:\ENVCADD\SYRACUSE\ACTIVE\00644101\2010\01000\DWG\CMI\64410B06.DWG LAYOUT: 12 SAVED: 8/12/2010 8:25 AM ACADVER: 18.0S (LMS TECH) PAGESETUP: C4_02B-PDF PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 8/12/2010 8:25 AM BY: FORAKER, LYDIA
XREFS: 64410X01 64410X00 IMAGES: PROJECTNAME: ---



LEGEND:

- PROPERTY BOUNDARY
- DEMOLISHED BUILDING
- BUILDING CURRENTLY IDLED
- ESTIMATED CURRENT LIMITS OF MEASUREABLE LNAPL PLUMES THAT REQUIRE FURTHER ACTION ABOVE BASELINE RESTRICTIONS BASED ON THE RFI
- ESTIMATED CURRENT LIMITS OF MEASURABLE LNAPL PLUMES THAT DO NOT REQUIRE FURTHER ACTION ABOVE BASELINE RESTRICTIONS BASED ON THE RFI
- MONITORING WELL
- DECOMMISSIONED/DESTROYED MONITORING WELL
- RECOVERY WELL
- PIEZOMETER LOCATION
- IDENTIFIED FOR AREAS WITH RESTRICTIVE COVENANTS
- PROPOSED LNAPL RECOVERY WELL LOCATION

NOTES:

1. BASE MAP INFORMATION FROM A SURVEY BY BMJ INC., DATED APRIL 2001, AT A SCALE OF 1:100.
2. ALL LOCATIONS ARE APPROXIMATE.
3. BASELINE INSTITUTIONAL CONTROL FOR ENTIRE SITE INCLUDES DEED RESTRICTION LIMITING GROUNDWATER AND PROPERTY USE.

0 300' 600'
GRAPHIC SCALE

MOTORS LIQUIDATION COMPANY
SOUTHEND OF FORMER GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS FACILITY - FLINT, MICHIGAN
CMI WORK PLAN

RESTRICTIVE COVENANTS - SOUTHEND

ARCADIS

FIGURE
13

CITY: SYRACUSE DIV/GROUP: 141 DB: G. STOWELL, L. FORAKER LD: GMS PM: L. McBURNEY LYR: ON=*;OFF=*REF*
G:\ENV\CAD\SYRACUSE\ACT\B0\64410\20100710000\DWG\CMI64410B07.DWG LAYOUT: 13 SAVED: 8/11/2010 7:45 AM ACADVER: 18.0S (LMS TECH) PAGESETUP: C4-D2B-PDF PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 8/11/2010 7:45 AM BY: FORAKER, LYDIA
XREFS:
64410X01
64410X3A
64410X00
IMAGES:
PROJECTNAME: --

ARCADIS

Appendix A

MPE/SVE Field Test Log

Table 2: MPE/SVE Pilot Test Field Data - Air
MLC Buick City (AOI-09-B Plume)
Flint, Michigan

Date: _____

Personnel: _____

										Extraction Well		Observation Wellhead Vacuum					
Time	Elapsed Time (min)	Extraction Wellhead Vacuum (in H_2O)	Blower Vacuum (in H_2O)	Flow Meter Vacuum (in H_2O)	Flow Meter Temperature °F	Air Flow Rate (CFM)	Blower PID (ppm)	Blower Temperature °F	Effluent Carbon Dioxide (ppm)	DTP (ft)	DTW (ft)	(in H_2O)	(in H_2O)	(in H_2O)	(in H_2O)	(in H_2O)	(in H_2O)

Moisture Accumulation: _____

Notes: _____

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Appendix B

Inspection Log Sheet
(Maintenance of Select Surface Covers)

MAINTENANCE OF SELECT SURFACE COVERS
INSPECTION LOG SHEET

NAO FLINT NORTH (OTHERWISE KNOWN AS BUICK CITY) – SOUTHEND
FLINT, MICHIGAN

DATE: _____ TIME: _____

Quarterly Inspection		
Is the Surface Cover Consistent with Existing Conditions?		
Item	**Condition Satisfactory (X)**	**Condition Unsatisfactory (X)**
AOI Group 12-A	☐	☐
AOI Group 2-C	☐	☐
AOI-Group 29-A	☐	☐
AOI Group 09-B (Area 1)	☐	☐
AOI Group 09-B (Area 2)	☐	☐

Comments*

_____

_____

_____

_____

Print Name (Inspector): _____

Inspector's Signature: _____

*** Comments and photos required is condition is unsatisfactory**