May 25, 2012

The Dow Chemical Company
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HAND DELIVERY

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Subject: REVISED INTERIM RESPONSE ACTIVITY PLAN
DESIGNED TO MEET CRITERIA
MIDLAND AREA SOILS
MID 000 724 724

Pursuant to Operating License Condition XI.G.1, please find the revised *Interim Response Activity Plan Designed to Meet Criteria* for the Midland Area Soils. The attached report has been revised to reflect review comments provided by Michigan Department of Environmental Quality (MDEQ). A summary of revisions made is provided in the supplemental table included with the revised Work Plan. An additional copy has been provided to MDEQ in the event you request EPA staff review.

If you have any comments or questions related to the attached Work Plan, please contact me.

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Enclosure
mdc

The Dow Chemical Company
Interim Response Activity Plan Designed to Meet Criteria

March 2012

Revised
May 2012
Prepared by URS Corporation

Tables

Figures

Attachments

Executive Summary

Pursuant to its Part 111 Hazardous Waste Management Facility Operating License (License), The Dow Chemical Company (Dow), with oversight from the Michigan Department of Environmental Quality (MDEQ), has investigated the City of Midland area soils. The purpose of this Interim Response Activity Plan Designed to Meet Criteria Work Plan (Work Plan) is to provide an overview of the investigation activities to date; summarize how the analytical data from those investigations was screened; identify the exposure pathways and contaminants of concern; propose a sampling plan; and describe the response activities that will be presumptively applied to Midland Area Soils. This Work Plan presents a waiver request of the requirement to develop and implement a Feasibility Study (FS) to evaluate response activity alternatives. The presumptive remedy described in this Work Plan was designed to address dioxins and furans in soil protective of the direct contact exposure pathway, and is the most effective means of doing so.

An evaluation of the analytical data from the investigations performed to date was completed to identify exposure pathways and contaminants of concern. Dioxins and furans were identified as a contaminant of concern (COC) in soil for the direct contact exposure pathway. The presence of dioxins and furans is due to airborne emissions from historic waste management practices at the Michigan Operations facility.

This work plan proposes the following to address this COC and pathway:

- A site-specific action level (SSAL) of 250 ppt TEQ;
- Identifies the Midland Resolution Area which includes properties to the north and east of the facility;
- A sampling plan based on incremental composite sampling;
- A presumptive remedy that includes removing and replacing the top twelve (12) inches of soil for residential properties that exceed the SSAL and returning the yard to same or better conditions;
- The establishment of a trust fund to address any properties where owners do not wish to participate at this time; and

- A schedule for completion of this work and all Midland Area Soils Corrective Action related to the historic airborne releases from The Dow Chemical Company.

Implementation of the presumptive remedy activities will begin during 2012. Annual progress reports will be prepared and provided to MDEQ, summarizing activities performed through each year.

1.0 Introduction

Pursuant to its Part 111 Hazardous Waste Management Facility Operating License (License), The Dow Chemical Company (Dow), with oversight from the Michigan Department of Environmental Quality (MDEQ), has investigated the City of Midland area soils. The purpose of this Interim Response Activity Plan Designed to Meet Criteria Work Plan (Work Plan) is to provide an overview of the investigation activities to date; summarize how the analytical data from those investigations was screened; identify the exposure pathways and contaminants of concern; propose a sampling plan; and describe the response activities that will be presumptively applied to Midland Area Soils and as appropriate, indoor dust. This Work Plan details substantial corrective actions which are intended to be the final remedy for the soil direct contact exposure pathway. The final Remedial Action Plan (RAP), and associated Completion Report will describe how each of the exposure pathways have been addressed for current and reasonably anticipated future use; thereby fulfilling Dow's obligations with respect to the historic airborne releases from the Michigan Operations Facility. Additional information on schedule and future report submittals for the project are provided in Section 10 and Attachment A.

1.1 Summary of Report

This Work Plan summarizes and presents the following information for the Midland Area Soils:

- Site history;
- Summary of prior investigations and studies;
- Exposure pathways;
- Data evaluation and identification of contaminants of concern (COCs);
- Site-specific action level;
- Presumptive remedy;
- Implementation of presumptive remedy; and
- Schedule.

Annual summary reports that summarize both the implementation of the presumptive remedy for the prior construction season and future work plans will be submitted to MDEQ. Additional deliverables are summarized in the next section. The schedule is summarized below.

Schedule Summary

Year 1 of the presumptive remedy activities will be implemented during the field season of 2012 (considered from approval of Work Plan through October). The summary report for Year 1, along with a description of Year 2 implementation of the presumptive remedy will be submitted by December 15, 2012. This schedule is dependent upon receiving MDEQ approval of this Work Plan prior to June 1, 2012. Further schedule details are presented in Section 8 of this Work Plan.

1.2 License Procedure

This Work Plan has been prepared to meet the requirements of the License for the implementation of corrective action in Midland Area Soils. “Corrective action” is action that is necessary to protect public health or the environment, including the investigation and cleanup of contaminants. A more detailed discussion of the License and Michigan law is found in Attachment A. Condition IX.B of the License requires corrective action for releases of contaminants that have migrated beyond the boundary of the licensed facility. “Midland Area Soils” is specified as one such area. Condition XI.B.2. Under the terms of the License and as allowed by Michigan law, site-specific cleanup criteria can be proposed for use in connection with corrective action. Condition IX.B.3(b)(iv). Site-specific cleanup criteria are criteria that use site-specific information and updated science, as appropriate, to revise state-wide generic cleanup criteria. The License and Michigan law also allow for the use of an “interim response activity” (IRA) “designed to meet cleanup criteria,” which is an action that is undertaken before the final remedial action is undertaken, but, nevertheless, is stringent enough that no further remedial action will be required. In accordance with License Condition XI.I, Dow is requesting that MDEQ grant a waiver of the requirement to develop and implement a Feasibility Study (FS) to evaluate response activity alternatives. The presumptive remedy described in this Work Plan was designed to address dioxins and furans in soil protective of the direct contact exposure pathway, and is the most effective means of doing so. This Work Plan is an “IRA Work Plan” pursuant to Condition XI.G.1 of the License. The annual summary reports discussed later in this Work Plan are meant to fulfill the requirement to submit “IRA Reports” upon the completion of response activities.

2.0 Site History

2.1 Historical Plant Operations

The Dow Chemical Company's Michigan Operations began operations in 1897. Expansion in production operations during the past century resulted in growth of Michigan Operations from 25 to approximately 1,900 acres. The majority of Michigan Operations is located on the east side of the Tittabawassee River in the southern portion of the City of Midland. The plant location and layout are depicted in Figure 2-1.

Initially, manufacturing involved extracting brine from groundwater pumped from production wells ranging in depth from 1,300 to 5,000 feet below ground surface, and using the brine to make various chemicals. Over the time of its operation, Michigan Operations has produced over 1,000 different inorganic and organic chemicals in varying quantities ranging from experimental batches to full commercial scale production.

Currently, Michigan Operations consists of approximately 30 production plants and a centralized Research & Development campus that serves Dow's global operations. Michigan Operations has been and remains a major research and development center for Dow.

2.2 Dioxin and Furan Emissions

Dioxins and furans are by-products of incineration, uncontrolled burning and certain industrial processes, such as the manufacture of chlorinated organics. Dow has examined the history of these potential sources at Michigan Operations in order to inform the investigation and guide the response action for Midland Area Soils.

Historic waste burning and waste incineration appear to be the primary source of elevated dioxins and furans found in surface soil in the Midland Area Soils, as reported in "Point Sources and Environmental Levels of 2,3,7,8-TCDD (2,3,7,8–tetrachlorodibenzo-p-dioxin) on the Midland Plant Site of The Dow Chemical Company of Midland, Michigan, November 5, 1984" (1984 Agin Study) (Agin et al., 1984). This study conducted by Dow was "a comprehensive search for all critical point sources of 2,3,7,8-TCDD to the air, soil, and water in the Midland area." The results of the study were submitted to federal, state, and local governmental agencies.

The 1984 Agin Study contains details about historic manufacturing processes and waste management practices, focusing on 2,3,7,8-TCDD.

2.3 Historic Air Emissions Management

2.3.1 Process Emissions

Historically, waste process gases were vented to the atmosphere. Dow chemists and engineers viewed waste materials as process inefficiencies. As a result, over time, efforts have been focused on recovering wastes for reclamation and reuse (Agin et al., 1984; Haynes, 1945a; Haynes, 1945b; Haynes, 1948; Haynes, 1949; Haynes, 1954a: Haynes 1954b). Beginning in the late 1960s, Dow aggressively pursued reduction in emissions from its process vents through process changes or elimination, implementation of material recovery and reuse (Agin et al., 1984; Dow, 2006a). More recently, changes in environmental regulations and more stringent emission standards resulted in installation of air pollution control technologies and have further driven efforts to successfully achieve and demonstrate significant emission reductions. As a whole, dioxin and furan emissions from process vents were likely relatively minor sources compared to waste incineration emissions.

Coal combustion is another potential source of dioxins and furans. Due to Michigan Operations' high demand for electrical power, Dow has historically supplied its own power needs using onsite power generation plants. As of 1984, the onsite 60 megawatt 2 million pound per hour steam cogeneration plant burned 2,000 tons of coal per day. Non-halogenated liquid process waste (tars) were also periodically burned for energy recovery. Exhaust gases and particulates were directed through an economizer prior to stack exhaust to the atmosphere. The powerhouse was retrofitted with baghouse filters in October 1982 to remove 99 percent of the flyash previously discharged to the environment (Agin et al., 1984).

2.3.2 Early Combustion of Liquid Waste Tars

As early as 1930, Michigan Operations disposed of organic liquid tars by incineration. Burning liquid tars can generate dioxins and furans. Two basic types of incineration were used: liquid tar burners (in several different configurations) and rotary kiln solid waste incineration. Improvements in burn efficiency and environmental controls have been consistently made over time. In 2003, Dow completed upgrades to its incinerator to meet USEPA Maximum Achievable

Control Technology (MACT) standards for industrial incineration devices (Agin et al., 1984; Dow, 2006a).

In the mid 1930s, two tar burners were installed northwest of the present Michigan Operations waste incinerator. Liquid tars were burned inside vertical brick lined towers with combustion exhaust gases and particulates vented directly to the atmosphere. Fuel oil was used to assist in start-up and maintenance of the burner flame (Agin et al., 1984).

In 1951, a new vertical tar burner replaced these two units. Within the new 15-foot-diameter by 50-foot-tall brick-lined tower, four tangential feed nozzles dispersed process wastes in the unit, blended with supplemental fuel oil, for incineration. Combustion exhaust gases and particulates were vented directly to the atmosphere. This unit was removed from service in 1974 and demolished in the late 1970s (Agin et al., 1984).

In 1957, the 707 Building tar burner was constructed just east of the present Dow Michigan Operations waste incinerator. This unit provided air exhaust scrubbing equipment to reduce hydrogen chloride emissions when burning chlorinated tars. Depending on the materials undergoing incineration, the vent emissions could be diverted directly to a 125-foot stack or to a water quench chamber prior to venting to the atmosphere. This unit was removed from service in 1975 (Agin et al., 1984).

High temperature (approximately 1,000 degrees Celsius [°C], or higher) combustion of organic liquid tars began in 1968 with construction of the 830 Building tar burner. This unit operated at a temperature of 900 to 1,000°C with a tar feed rate of 10 gallons per minute (gpm). Combustion exhaust gases and particulates (30,000 cubic feet per minute [cfm]) were directed through a water quench system, venturi scrubber, and demister before stack discharge.

In 1975, chlorinated waste tars were directed to the afterburner of the rotary kiln incinerator (discussed below). In 1981, this unit was placed in standby mode to be used only for tar inventory control. The unit has not operated since December 1982 (Agin et al., 1984).

2.3.3 Combustion of Solid Wastes

Prior to 1948, solid wastes were either landfilled on the Michigan Operations site or stockpiled for open air burning. In 1948, a rotary kiln incinerator was placed in service to burn rubbish, waste solids, packs, and liquid tars. Solids were manually shoveled into the feed chute and various liquids were sprayed into the front of the kiln. Combustion exhaust gases and particulates were vented directly to the atmosphere (Agin et al., 1984).

In 1958, this original rotary kiln was replaced with a new dual rotary kiln system (703 Building Kiln No. 1 and Kiln No. 2) to burn paper and wood trash, solid chemical waste, chemically contaminated waste equipment, and a variety of liquid wastes. From 1958 to 1975, only Kiln No. 1 was used. This unit provided increased capacity and improved burner control. The operating temperatures in the rotary kiln ranged between 500 and 900°C with a 30-to 45-minute bulk solid residence time. Combustion exhaust gases and particulates were directed through a water-spray quench system before discharge to the atmosphere. In 1970, to reduce stack particulate emissions, a secondary combustion unit afterburner (using natural gas for supplemental fuel) was installed between the kiln and the quench chamber.

In 1975, Kiln No. 2 was placed into service and Kiln No. 1 was shut down. The Kiln No. 2 system included a rotary kiln, an improved afterburner and an air pollution control system consisting of a water quench system, venturi scrubber, and demister. Beginning in 1978, in response to research studies indicating that a higher temperature was needed to minimize formation of chlorinated dibenzo-p-dioxins and to assure their efficient destruction, natural gas was added to the afterburner to increase the temperature control point to approximately 1,000°C. In 1981, the addition of a wet electrostatic precipitator to the Kiln No. 2 system resulted in further reduction of particulate emissions to the atmosphere. By 1984, further improvements, including process computer control, increased the afterburner operating temperatures between 1,000 and 1,100°C with a residence time of a few seconds. Liquid wastes and tars were atomized either directly into the kiln or directed to the afterburner, with higher British thermal unit (BTU) liquid feeds and dichlorophenol distillation wastes sent directly to the afterburner and higher ash-containing feed directed first to the kiln. Mass flow measurements of 2,3,7,8-TCDD levels in the incinerator system in 1984 showed that the incinerator ash captured about one-half of the 2,3,7,8-TCDD and the exhaust scrubber equipment captured 95 percent of the remaining half (Agin et al., 1984).

Historically, wet kiln ash was lifted from the ash trough by conveyor belt to dump trucks for transport to onsite landfill disposal. In 1982, a building was constructed around the ash transfer operation to totally enclose the conveyor and truck loading operation. Ash handling methods were also implemented to prevent drying and dusting of kiln ash at all stages of loading, transport, and landfilling (Agin et al., 1984).

Prior to 1985, liquid waste being fed to the secondary combustion chamber burner of the kiln was atomized through the use of an air fan. The type of burner nozzle was changed to employ the use of steam atomization, which was more efficient, thereby lowering the amount of 2,3,7,8-TCDD that was formed. To lessen the amount of particulates, several improvements were added to the 703 incinerator in the 1987-1988 timeframe. The venturi scrubber was modified to employ a variable throat, which created a greater pressure drop. A series of high-efficiency water nozzles were added to the entrance into the quench tower. This greatly improved the efficiency of the venturi scrubber (Dow, 2006b).

In 1988, the secondary combustion chamber of the 703 incinerator was reconfigured. A high-efficiency vortex burner was installed just after the rotary kiln. This installation increased the secondary combustion zone residence time significantly and employed a highly efficient burner. These changes yielded 99.99 to 99.999 percent destruction and removal efficiencies (Dow, 2006b).

In 1990, another rotary kiln incinerator, 830, replaced the existing 830 tar burner. This unit had a 60-foot-long rotary kiln with two 30 million BTU per hour (BTU/hr) burners, and a large secondary combustion chamber with over 2 seconds residence time. This chamber was fitted with two 30 million BTU/hr vortex burners. From the combustion chamber, gases flowed through the following units: a rapid quench chamber, a hydrochloride (HCl) absorber, a variable throat venturi scrubber, a demister, an initial fan, four ionizing wet scrubbers, a second fan, and then to the stack. The air permit for this unit required 99.999 percent destruction and removal efficiency (Dow, 2006b).

Planning for the new, state-of-the-art 32 Building rotary kiln began in the late 1990s. The kiln was designed to burn both solid and liquid wastes. The kiln, which had two 35 million BTU/hr burners, was outfitted with carbon seals on both ends to greatly minimize the possible occurrence of fugitive emissions. Where older kilns often had less than 0.25 inch of water vacuum on the combustion chamber, the new kiln was designed to run at greater than 1 inch of water vacuum (Dow, 2006b).

By 2003, Dow had completed upgrades to its 32 Building rotary kiln incinerator to meet the USEPA MACT standard for industrial incineration devices. Exhaust gases from the rotary kiln pass into a large circular secondary combustion chamber having a 3.5 second retention time where three 30 million BTU/hr burners fire tangentially into the chamber. After the secondary combustion chamber, the gasses pass into a nitrogen oxides (NOx) reduction system then into a rapid quench designed to minimize dioxin formation. From the quench chamber, the flue gases pass into a packed condenser tower which removes most of the hydrochloric acid that is formed in the combustion process. The condenser tower also aids with the pre-treatment of particulates prior to entering the high-energy venturi scrubber. After the venturi, which removes the bulk of particulates in the gas stream, the flue gases pass into a packed tower chlorine scrubber. Sodium hydroxide is used to react with any remaining residual chlorine in the gas stream. After the chlorine scrubber, the gases are pulled through the first induced draft fan. From the fan, the gases pass through nine ionizing wet scrubber (IWS) units, which remove the last of the fine particulates from the gas stream. From the IWSs, the gases pass through a second induced draft fan and then up a 200-foot stack. At the stack, oxygen, carbon monoxide, sulfur oxides (SOx) and NOx are continuously monitored (Dow, 2006b).

Operation of the 32 Incinerator is required, through its current hazardous waste management facility operating permit (Condition VII.A.6), to comply with its Air Quality Division Renewable Operating Permit Number MI-ROP-A4033 and 40 CFR Part 63, subpart EEE, hazardous waste combustor MACT. Comprehensive Performance Tests of the 32 Building incinerator are required to demonstrate performance every 61 months of operation (roughly every 5 years). Dow completed Comprehensive Performance Tests for the 32 Building incinerator in 2003 and again in 2009. Both tests successfully demonstrated dioxin and furan emissions from the incinerator are substantially below federal and state emission requirements.

Since 1995, Dow has reduced dioxin emissions to the air by over 95 percent (Dow, 2006a). Accordingly, there is no material risk of further contamination or, after cleanup, of re-contamination via airborne emissions from Michigan Operations to Midland Area Soils.

After starting up the 32 Building kiln in 2003, the 703 Building and 830 Building incinerators were closed pursuant to Part 111 of NREPA. Whereas the older units were permitted to process 85 million BTU/hr and 60 million BTU/hr, the new 32 Building kiln was permitted to operate at 130 million BTU/hr. This reduction in capacity was possible because Dow had implemented new technologies to recycle wastes as useful raw materials (Dow, 2006b).

2.3.4 Airborne Deposition and Fugitive Dust Emissions

Exhaust constituents from process vents, power generation, and thermal incineration processes may have deposited onto plant soils. During dry periods, these soils may have been disturbed by equipment or vehicles and blown by the wind, resulting in fugitive dust emissions. Samples of Michigan Operations soils at the facility fence line generally show higher levels of dioxins than soils located further away in the City of Midland. Current information indicates that concentrations in Michigan Operations soils decrease radially from inside the plant outward, evidencing a windborne mechanism of dispersion. The Michigan Operations soils with the highest concentrations of dioxin were located near historic chlorophenolic production areas, the waste incinerator, and combustion ash handling facilities.

Fugitive dust control has been in progress at the Midland Facility since 1986. Dow is currently required by its Hazardous Waste Management Facility Operating License and its Renewable Operating Permit (Section 1, IX.4) to provide and regularly update an operating program to control fugitive dust sources or emissions. The current fugitive dust control program requires semi-annual review and updates. In addition, fugitive dust emissions from Michigan Operations are monitored on an ongoing basis along the plant perimeter pursuant to the “Soil Box Data

Evaluation Plan," approved by MDEQ on September 23, 2011. Monitoring began in 2004 and continues to show the fugitive dust control program for the facility is effective.

3.0 Summary of Investigations and Studies

The understanding of hazardous substances in Midland Area Soils prior to the current License was based largely on studies conducted by Dow in 1984 (Agin et al., 1984) and 1998 (Dow, 2000), U.S. Environmental Protection Agency (USEPA) in 1983-1984 (USEPA, 1985), and MDEQ in 1996 (MDEQ, 1997). Although these studies focused primarily on dioxins and furans, the 1985 USEPA study also analyzed samples for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and polychlorinated biphenyls (PCBs). Another study conducted by USEPA in 1987 provided limited data on concentrations of dioxins and furans in garden vegetables. More recent soil investigations, which focused on target analyte list (TAL) development (discussed in Section 4.0), include the 2005/2006 Dow on-site (DOS) samples, the 2006 CH2M Hill samples and the 2010 Dow and MDEQ split sample results. Soil and household dust sampling results have been provided by the University of Michigan Dioxin Exposure Study (UMDES). Each of these investigations/studies are summarized below.

The studies conducted prior to 1996 by Dow, USEPA, and MDEQ focused on sampling and analysis for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) as the main dioxin congener. More recent studies report dioxin and furan data as toxic equivalent (TEQ) concentrations. Dioxin and furan sample results from the laboratory are typically reported on an individual congener basis. TEQ concentrations are calculated according to a toxicity weighting scale. The measured concentration of each TEQ dioxin and furan congener is multiplied by a corresponding toxic equivalency factor (TEF), and the products are summed to determine the TEQ concentration.

TEQ concentrations are typically reported in concentrations of parts per trillion (ppt). The mammalian TEFs developed by the World Health Organization (WHO) are provided in Table 3-1. TEFs are developed by the WHO based on the best available information at the time. Some previous investigations utilized TEFs from pre-1998 and 1998. Dow has recalculated these TEQ concentrations using the 2005 WHO TEFs so that prior and more recent TEQs can be directly compared. All TEQs discussed below use the 2005 WHO TEFs (Van den Berg et al, 2006, see Table 3-1).

1984 Dow study—The primary objective of the 1984 Dow study was to identify point sources of dioxins and furans at Michigan Operations (Agin et al., 1984). As part of the study, 11 samples also were collected within the offsite Study Area. At the time this study was published, the Public Health Service Center for Disease Control had indicated that 2,3,7,8-TCDD concentrations below the concern level of 1 part per billion (ppb) were sufficiently low that there was "no medical reason to warrant concern or suggest remedial action" (Agin et al., 1984). Concentrations of 2,3,7,8-TCDD in the offsite samples ranged from 0.6 to 450 ppt. The study concluded that the levels of 2,3,7,8-TCDD were "significantly below the 1 ppb concern level established by the Centers for Disease Control and Prevention for residential areas" (Agin et al., 1984).

1985 USEPA study—The primary objective of the 1985 USEPA study was to determine whether concentrations of dioxins and other substances present in the offsite Study Area might pose an unacceptable public health risk (USEPA, 1985). Approximately 40 samples were collected in the offsite Study Area and analyzed for 2,3,7,8-TCDD. Concentrations of 2,3,7,8-TCDD in the offsite samples ranged from 3 to 310 ppt. Thirteen samples were also analyzed for VOCs, SVOCs, pesticides, and PCBs. Several polynuclear aromatic hydrocarbons (PAHs), chlordane, and PCB-1254 were detected in this sample group. USEPA concluded that "data obtained from this study do not suggest widespread environmental contamination by 2,3,7,8-TCDD, and other PCDDs [polychlorinated dibenzo-p-dioxins] and PCDFs [polychlorinated dibenzofurans] at significant levels with respect to public health or adverse environmental impacts" and that other sampled substances "do not pose an unacceptable health risk" (USEPA, 1985).

1987 USEPA garden vegetable study—In addition to the above studies, in 1987, USEPA Region 5 conducted preliminary screening of homegrown vegetables from two gardens in Midland and a control garden in Eagle, Michigan (USEPA, 1988). Fresh or frozen vegetables (carrots, beets, onions, and lettuce) and garden soil samples were collected and analyzed for dioxins and furans. Although dioxins and furans were present in the soils of both gardens, they were not detected in any vegetable tissue samples (USEPA, 1988).

1988 USEPA risk management recommendations for Dioxin contamination—This study completed evaluation of risk from dioxin sources at Michigan Operations. The report acknowledges actions undertaken by Dow at that time and specifically recommends further actions:

1. Additional incinerator emissions testing

Incinerators that existed at the time have been closed. A modern incinerator was constructed and permitted in 2003. As noted above, the current hazardous waste management facility operating license requires testing to demonstrate on-going compliance with the hazardous waste combustor MACT. This testing was completed in 2003 and again in 2009. Dow will continue to complete emissions testing in accordance with their current permit.

2. Dust suppression program

Risks for the site were determined to result from soils impacted by historical incineration activities and not due to current incineration emissions. Paving or applying clean cover over contaminated areas on site was recommended and on site areas remaining unpaved or covered should be managed through an updated and ongoing program. Beginning in 2001, significant portions of the greenbelt and facility have had covered with new soil and vegetation. Dow began implementing a fugitive dust suppression control program in 1986. As described above, Dow is currently required to control fugitive dust sources and emissions through periodic dust suppression application and to provide an operating program to control fugitive dust sources or emissions that is regularly updated (every six months).

3. Point source and environmental monitoring programs

A limited ambient air monitoring program was recommended to determine particulate levels and current concentrations of dioxins and furans. Dow's current hazardous waste management facility operating permit requires monitoring for possible releases to ambient air (Condition X.K) and migration via windblown soil (Condition X.L). A study of dioxin and furan concentrations in ambient air was conducted in 1997 and 1998. The results of the study indicated that detected dioxin and furan concentrations were within the range reported for rural rather than urban or industrial areas, and that the incinerators and surface soils were not major contributors to the detected levels. Follow-up soil sampling both on the main plant and in the community was also recommended. This was conducted in 1996 and 1998, as described below. In addition, soil monitoring has been on-going at the plant perimeter since 2002, and the data evaluation plan was formally approved by MDEQ September 23, 2011.

1996 MDEQ study—The objective of the 1996 MDEQ study was to evaluate the distribution of dioxin and furan concentrations in the Midland community and Michigan Operations and to compare these results to those of the 1984 Dow and 1985 USEPA studies (MDEQ, 1997). The study reported results for 17 individual dioxin and furan congeners, as well as calculated TEQs using pre-1998 TEFs. Approximately 35 samples were collected in the offsite Study Area. 2,3,7,8-TCDD concentrations in the sample group ranged from 3 to 288 ppt, and TEQ concentrations ranged from 9 to 602 ppt. The study concluded that "the 1996 data suggests a decline in the concentrations of 2,3,7,8-TCDD from the 1984 and 1985 results" (MDEQ, 1997).

1998 Dow study—Approximately 45 soil samples were collected in the offsite Study Area during the 1998 Dow study (Dow, 2000). Most samples were collected from Dow owned property (on and between Michigan Operations and the Dow Corporate Center). The objective of this study was to determine descriptive statistics (mean, median, geometric mean, standard deviation, variance, and normality check) for sample groups from the Dow Corporate Center and Saginaw/Salzburg/Rockwell roads site. One area was identified with a concentration of 2,200 ppt TEQ (I-TEFs). This area was addressed in an interim measure. Range of detected TEQ concentrations (based on I-TEFs) in the data set ranged from 8.0 to 660 ppt TEQ (Dow, 2000).

2006 UMDES—The objective of the UMDES was to evaluate human exposure to the dioxins, furans, and dioxin-like PCBs in Midland and along the Tittabawassee River (University of Michigan, 2006). Soil and household dust samples were collected from 32 locations in the Midland area (referred to as the "Midland Plume" in the study) as well as in other areas. Mean and median TEQ concentrations (based on 2005 TEFs and data for 17 dioxin and furan congeners) were lowest in household dust samples (32 and 27 ppt, respectively), and highest in soil samples collected from the perimeters of houses (approximately 110 and 58 ppt, respectively). TEQ concentrations in the City of Midland Soils data set ranged from 4.5 to 850 ppt.

2005/2006 Dow On-Site (DOS) Data Set—In September 2005 and June 2006, surface (0 to 1 inch below ground surface [bgs]) soil samples were collected inside the Dow's plant site from 23 locations for non-dioxin constituents and from 28 locations for dioxin constituents. The location/sample identification for these samples began with "DOS" (such as DOS-1, DOS-2, etc.), and hence, they were sometimes referred as the "DOS" data. These samples were analyzed for metals, polychlorinated biphenyls (PCBs), pesticides, semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs), and dioxins and furans.

2006 CH2M Hill samples—In November 2006, Dow's contractor, CH2M Hill, collected surface (0 to 1 inch bgs) soil samples from the City of Midland, and subsequently, in March 2007, CH2M Hill prepared a report titled Data Evaluation Report in Support of Bioavailability Study, Midland Area Soils. In this study, 136 stations were designated and located on 21 radial transects extending from the Michigan Operations site into the surrounding community. Thirty percent of the sampling locations, corresponding to the two samples closest to the Michigan Operations site along each transect, included collection of subsurface (1 to 6 inches bgs) soil samples and testing for additional compounds of concern. There were between one and twelve stations in each transect, and each station was approximately 300 feet by 300 feet and included one or more property parcels. One to five parcels were sampled from each station.

Surface soil samples were collected at all locations, and subsurface soil samples were collected at selected stations near Dow's plant. At the time the samples were analyzed, sample results for dioxins and furans and other chemicals were "blinded" to maintain the anonymity of the property owners, and hence, the geographic locations of sample results were not known. Thus, this data set was sometimes referred to as the "COM Blind" data. More recently, Dow obtained the location information for samples collected from properties where Dow was the sole owner. In addition, if the sample location was owned by multiple property owners, a "centroid" of the sampling station was established and TEQ concentration results were made available to Dow and

MDEQ for decision-making purposes. An updated data package was provided to MDEQ on December 11, 2009 with this location information.

2010 Dow and MDEQ Split samples—In December 2010, eleven parcels, ranging from one to several acres, owned by Dow (near Michigan Operations) were selected to conduct the Field Pilot Characterization study. This data set consists of 588 surface and subsurface soil sample locations for dioxin constituents, and 132 surface and subsurface soil sample locations for non-dioxin constituents. Non-dioxin constituents analyzed for included metals, PCBs, pesticides, herbicides, SVOCs, and VOCs. The laboratory analytical testing effort was split between Dow and MDEQ.

Data from the 2005/2006 Dow On-Site (DOS), 2006 CH2M Hill, and 2010 Dow and MDEQ split sample data sets were used to inform the Work Plan. The cumulative sampling completed from 2005 through 2010 yielded a thorough investigation of the nature of the release and was used to inform the presumptive remedy.

4.0 General Site Setting, Land Use and Exposure Pathways

This section summarizes information on the general site setting, current land use, and human health exposure pathways.

4.1 General Site Setting

4.1.1 Land Development

In the early 1900s, the area surrounding Michigan Operations and the City of Midland was primarily composed of land used for agricultural and recreational purposes. Beginning in 1916, a marked increase in land development for residential and industrial purposes occurred. By the 1960s, residential properties were distributed throughout the Midland area and the rate of increase had stabilized; however, industrial and commercial land development continued to occur to the east, southeast, and southwest of Midland over the years. From the late 1800s to 2000, the population of the City increased from 1,160 to 41,685 (U.S. Department of Agriculture, 1997; Dee, 2005). The city currently encompasses approximately 28 square miles.

4.1.2 Climate and Meteorology

The area is characterized by a continental climate regime, with winter temperatures cold enough to sustain stable snow cover and relatively warm summer temperatures. The mean annual temperature for the area is 48.4 degrees Fahrenheit (°F). The minimum average temperature is 30.8°F (with the coldest month being January), and the maximum average temperature is 83.33°F (with the warmest month being July). Between 1981 and 2010, the Midland area average monthly precipitation ranged between 1.6 inches (February) and 3.7 inches (September), with a monthly average of 2.7 inches and an annual average of 32 inches (NOAA, 2010 and MSU, 2010).

According to annual measurements recorded in Midland from 1981-2010, the average seasonal snowfall between October and April was 32 inches. During the period of 2005-2009, approximately 90 days had either snow cover (e.g., > 1 inch) or frozen soils (e.g., maximum soil temp < 32°F) (NOAA, 2010 and MSU, 2010). This would result in 275 days when the soil is not frozen or there is less than an inch of snow cover.

Wind direction is predominantly from the west-southwest (that is, toward the east-northeast), regardless of season. Wind velocity peaks during February and March and is lowest during July. A wind rose depicting predominant wind direction and velocity for the area is included as Figure 4-1. The data used to develop the wind rose were obtained for the years 1987 through 1991 from a meteorological station located at Michigan Operations.

4.1.3 Hydrology and Surface Water

The primary natural surface water feature in the area is the Tittabawassee River, which drains approximately 2,600 square miles of land in the Saginaw River watershed (Michigan Department of Natural Resources [MDNR], 1988). The river begins in Roscommon and Ogemaw counties, which are approximately 26 miles north of the City of Midland and Saginaw County. The Tittabawassee River flows south and southeast for approximately 80 miles to its confluence with the Saginaw River, located approximately 22 miles southeast of Midland. Most of the Tittabawassee River watershed upstream of Midland is forested or agricultural land. The Pine and Chippewa rivers are tributaries to the Tittabawassee River and have similar drainage areas and flow contributions to the Tittabawassee River. Together, the Pine and Chippewa rivers contribute approximately 40 percent of the Tittabawassee River flow at Midland (MDNR, 1988).

Other secondary surface water features include small permanent and intermittent streams flowing into tributaries of the Tittabawassee River, small natural and constructed ponds, and constructed ditches used to store and convey storm water from developed properties. These ditches discharge water to the Tittabawassee River and associated tributaries. The regional topography indicates that surficial drainage patterns in the area are generally toward the Tittabawassee River. However, natural drainage patterns in developed portions of the area have likely been altered and might direct surface water away from the Tittabawassee River, toward drainage basins and other storm water collection units.

Natural watercourses other than the Tittabawassee River remaining in the area are concentrated northeast of Michigan Operations and the City. The flows from these creeks and drains enter the Tittabawassee River immediately upstream of Michigan Operations. A small tributary enters the Tittabawassee River downstream of Michigan Operations.

Small, natural ponds (less than 5 acres) and constructed retention and detention ponds are scattered throughout the area. Figure 4-2 depicts surface water bodies and the general topography in and around the area.

4.1.4 Geomorphology and Geology

Michigan Operations lies in the Eastern Lowlands Physiographic Region of Michigan's Lower Peninsula. This region has very flat topography of lacustrine origin and is found along coastal areas in the southeastern part of the state, extending north from the Saginaw Bay area, along Lake Huron to the tip of the Lower Peninsula. Soil types are typically derived from glacial and post-glacial fluvial processes and generally are composed of coarse-grained material deposited in ancient beach and near-shore environments and clay-rich lacustrine deposits (MDNR, 1988).

Because the area near Michigan Operations offsite is urban, the near-surface soil has been disturbed by excavation, filling, and grading activities since land development began in the area. The uppermost stratum is the "surface sand" (0 to 20 feet). The surface sand has often been removed or augmented with fill of similar geologic characteristics, making it difficult to determine the boundary between the surface sand and overlying fill.

The surface sand is underlain by a discontinuous layer of lacustrine (former lakebed) clay with varying thicknesses (approximately 2 to 20 feet), generally at a depth of about 5 to 15 feet. Although thin, discontinuous silt layers are interbedded with the clay, this clay serves as an effective subsurface barrier to the underlying glacial till.

Glacial till typically underlies the lacustrine clay layer. The glacial till consists of an unstratified mixture of rocks, gravel, sands, silts, and clays; however, soil in the glacial till is typically rich in clay. Permeability in the glacial till is typically low because of the silts and clays present and the high degree of compaction resulting from deposition. Fractures are common in the upper regions of the till. Some areas of sand, highly variable in length, thickness, and depth from surface, have been encountered in the glacial till unit. These areas of sand exhibit a significantly higher permeability than the clay and silty areas in the glacial till.

A sand layer underlies much of the area the glacial till; it consists of well-sorted sands and gravels interlayered with silt and clay seams largely located within bedrock valleys. The regional sand is encountered at approximately 150 to 400 feet below ground surface.

4.1.5 Hydrogeology

Hydrogeologic units, from deepest to shallowest, are as follows: bedrock, the regional aquifer, glacial till, lakebed clay, and surface sands. Groundwater contained in bedrock occurs primarily in sandstone layers. The potentiometric head in the bedrock aquifer is higher than the head in the regional aquifer, resulting in an upward hydraulic gradient. The regional aquifer overlies bedrock in some areas and consists of well-sorted sands and gravels interlayered with silt and clay seams. The low permeability of the overlying glacial till causes the regional aquifer to behave as a confined aquifer with an artesian head.

Groundwater is present throughout the glacial till at saturation, although the extreme compaction of this unit has reduced effective porosity and permeability. Sand bodies of significant size, generally referred to as glacial till sands, occur in the glacial till. Glacial till sands are highly variable in length, thickness, and vertical location in the glacial till, and are relatively more permeable. Glacial till sands are the sole sources of significant quantities of groundwater in the glacial till. Within Midland County, outside the City of Midland Limits, glacial till sands are utilized as a source of drinking water. Within the Midland Resolution Area, groundwater is not used as a drinking water source.

The lakebed clay is generally considered an aquitard, although some water is contained in thin, discontinuous silt layers interbedded within the clay. The lakebed clay significantly limits downward movement of groundwater. The surface sands contain an unconfined aquifer that varies in both quantity and quality.

4.2 Midland Land Use

The current land use within the study area was based on general knowledge of local conditions, evaluated by touring the area and reviewing aerial photographs and GIS Land Use Land Classification (LULC) map layers for the Midland area. High-resolution aerial photographs taken in April 2010 were available for review along with the 2009 LULC information.

Other sources of information, such as local knowledge and local zoning, were used as needed to help establish and refine the classifications.

The study area is called the Midland Resolution Area. The Midland Resolution Area covers a total of approximately 1,700 acres. Land uses within the Midland Resolution Area include residential land use and non-residential land use. Figure 4-3 shows the land use areas within the Midland Resolution Area. The predominant land uses are defined and described further in the following subsections. The Midland Resolution Area is also described in further detail in Section 7.0.

The concentration of dioxin in the soil in the remainder of the City of Midland beyond the Midland Resolution Area is, based on current data, below the residential site-specific action level (see Section 6) and so will likely not require any work under this Work Plan. However, as explained in Section 9, the final boundary for the Midland Resolution Area will be adjusted, as necessary, based on soils data generated during implementation of the work and the physical features of the area.

4.2.1 Non-Residential Land Use

The area in the Midland Resolution Area that is contiguous to the north and east with Michigan Operations site boundary and downwind of on-site historic waste incineration, is primarily industrial and commercial land, some of which is owned by Dow. This is the area with the highest measured dioxin concentrations, although the concentrations are almost all below the generic non-residential direct contact criteria (DCC).

Properties with industrial or commercial land use within the Midland Resolution Area cover approximately 1,275 acres. The aerial extent of these areas with predominantly industrial and commercial uses is shown on Figure 4-3.

4.2.2 Residential Land Use

Residential land use is the predominant land use type for the properties located north and east of the industrial / commercial land use areas described above. These areas encompass several residential neighborhoods within the City of Midland.

In addition to residential properties, there are additional property types that have aspects that are similar to residential uses, or are "residential-like," including daycare centers, schools for children, and parks with playgrounds and therefore these properties will be managed as a residential use under this Work Plan. To be considered "residential-like," properties generally need to service sensitive populations (e.g., children or the elderly), a significant amount of time is spent there, and their use results in contact with soil. When considering a property to determine if the use is residential-like, the actual land use will be evaluated against the residential and non-residential exposure assumptions of Part 201. Specifically, the following property uses will be managed as residential uses for purposes of this Work Plan:

- Child or day care centers.
- Nursing homes.
- Schools for children.
- Parks with grassy areas adjacent to residential property or play grounds.
- Outdoor maintained public recreation areas, such as ball fields.
- Campgrounds.
- Juvenile service facilities.

The following uses, although having some aspects similar to residential uses, do not involve long term residency or exposure to soils that are equivalent with residential uses, instead, exposure is similar to commercial uses. Therefore, these uses will be managed as non-residential for purposes of this Work Plan:

- Colleges, universities, business, vocational, technical, and trade schools (that do not have housing).
- Places of worship (that do not have day or child care facilities).
- Sports stadiums and arenas.
- Community Centers and Civic Centers.
- Fire stations.
- Day shelters (facilities that provide temporary daytime shelter exclusively for adults, such as homeless shelters, but do not involve overnight stays).

- Public spaces used primarily for paved bike/walking trails and do not contain children's play grounds.

Of the total 1,700 acres of the Midland Resolution Area, approximately 425 acres is residential land use. The aerial extent of the Midland Resolution Area is shown on Figure 4-4.

4.2.3 Outlier Areas

Three outliers have been identified where elevated discrete sample results have been measured that are inconsistent with adjoining results. All three areas were identified from the results of the 2006 blinded sampling activities. The first area (designated E-007) falls outside of the currently defined Midland Resolution area to the North, shown in Figure 4-5. It is generally located in a residential area southwest of the intersection of Washington St. and Ashman with a TEQ of 320 ppt. The second outlier (designated I-008) is located within, but along the northeast boundary of the Midland Resolution Area, shown on Figure 4-6. It is located within a wooded area owned by The Dow Chemical Company along the western side of Waldo Rd., across from Ridgecrest Rd., with a TEQ of 360 ppt. The final outlier (designated I-010) falls outside of the currently defined Midland Resolution Area to the northeast, shown in Figure 4-6. It is an undeveloped wooded area owned by The Dow Chemical Company, roughly ¼-mile east of Waldo Rd, north of Eagle Ridge Technology Park, with a TEQ of 290 ppt.

4.2.3.1 Zoning

The Midland Resolution Area contains the following zoning districts as defined in the City of Midland Zoning Ordinance. In each district some uses are permitted as of right, and, therefore, these uses are typically predominant in the district. Other uses are permitted only if permission is granted by the City Council after receiving a recommendation from the Planning Commission (i.e., "conditional land uses").

Zoning District	Summary
RA-3 – Residential.	This district allows single family dwellings, day care centers, schools and similar residential or residential-like uses as of right.
RA-4 – Residential.	Single and double family dwellings and other residential uses are permitted as of right.
RB – Residential.	Multiple family dwellings are permitted with conditions; fire stations, schools, parks and social service agencies are permitted as of right.
RC – Regional Commercial.	The purpose of this district is to offer an area for a diversity of retail, service, entertainment, office, finance and related businesses. Traditional residential uses are not permitted in this district. Aside from traditional commercial uses, the district also allows child care centers, colleges, day shelters, residential treatment facilities, transitional housing, campgrounds, and outdoor recreational facilities.
OS – Office Services.	The intent of this district is to accommodate administrative and professional offices, personal service businesses, and supporting retail. The only residential uses that are permitted as of right are dwelling units on the upper floors above business establishments. Other uses permitted as of right include schools, parks, child care centers and residential inpatient treatment facilities. Nursing homes are permitted with special conditions. Single and multiple family housing is permitted with the approval of the City Council as a conditional land use.
COM – Community.	This district provides for public and private uses with community significance, such as civic centers, museums, stadiums and parks. Residences are not allowed, however, schools, transitional housing, and residential treatment centers are authorized. Juvenile service facilities and correctional facilities are permitted with the approval of the City Council as conditional land uses.
LCMR – Limited Commercial, Manufacturing and Research.	This district provides for mixed use office and industrial uses in a campus like setting. Although office and industrial uses are the focus, child/day care centers are allowed as of right, and colleges, residential treatment centers, transitional housing and day shelters are permitted with conditions.
IA – Industrial.	Industrial uses with limited off-site impacts. Residential uses are not allowed.
IB – Industrial.	Intensive industrial activities, to be separated from residential and commercial areas. Residential uses are not allowed.

The zoning map for Midland is included as Attachment K to this Work Plan and current maps can be accessed online at:

http://www.midland-mi.org/government/departments/planning/planning/Zoningordinance.htm.

As further discussed in Section 7, the response actions discussed in this Work Plan have been selected to be consistent with and appropriate for the uses and zoning of property in the Midland Resolution Area.

4.3 Human Health Exposure Pathways

The primary source of hazardous substances from The Dow Chemical Company in the nearby Midland Area Soils is airborne deposition of particulates (USEPA, 1985). This section discusses the conceptual site model and human health soil exposure pathways.

4.3.1 Conceptual Site Model

A conceptual site model (CSM) describes the network of relationships between COCs present at a site and the human receptors that may be exposed to those COCs through various pathways leading from the site and ending with exposure through ingestion, inhalation, or dermal contact. The CSM incorporates the range of potential exposure pathways and identifies those that are present and may be material and relevant for human receptors. The CSM helps to identify the main pathways and eliminates those pathways that were evaluated to determine that COC concentrations do not exceed pathway criteria and therefore do not require further evaluation.

Exposure pathways consist of the following four elements: (1) a source of hazardous substances or COCs; (2) a transport mechanism and medium (such as air, water, or soil); (3) a point of human contact with the medium (that is, an exposure point); and (4) a route of exposure at the point of contact (for example, inhalation, ingestion, or dermal contact). The sources and transport and fate mechanisms are described below. The exposure pathways relevant for human exposure are depicted in the conceptual site model on Figure 4-6. The exposure pathway model reflects emphasis on dioxins/furans, which have been identified as the COC for this Work Plan. If determined to be necessary through on-going evaluation, other pathways and/or COCs will be addressed according to the proposed schedule presented in Section 10.2.

4.3.1.1 Potential Sources and Dioxin and Furan Distribution

The primary source of hazardous substances from Michigan Operations is airborne particulate deposition from historical waste handling and disposal operations. Surface and near-surface soils are the media affected by air emissions and subsequent deposition of dioxins and furans. Elevated dioxin and furan TEQ concentrations are predominantly found to the northeast (downwind) of Michigan Operations.

As part of developing the sampling strategy for the UMDES, geostatistical methods were used to combine existing TEQ concentration data for soils and predictions from a dispersion model for incinerator emissions to estimate the probability of exceeding 90 ppt TEQ in the Midland Area Soils (Adriaens et al., 2006). This analysis indicated the predominant impact was predicted to be to the north and east, downwind of Michigan Operations. The data from the 2006 bioavailability sampling support this model prediction (CH2M Hill, 2007). Areas to the north, northeast and east of the facility, which were predicted by the modeling effort to have higher concentrations and had measured concentrations, have been included in the Midland Resolution Area.

4.3.1.2 Fate and Transport Mechanisms

The primary mechanism for transfer of dioxins and furans is historical wind dispersion. Emission sources fall into two categories: fugitive and combustion. The fate (vapor phase and half-life) and transport mechanisms associated with these categories potentially influence the distribution of dioxins and furans.

Fugitive dust emission sources originate from the air suspension of particulates from surface soil, either by wind or mechanical disturbance (driving over surfaces, excavating, or grading). Fugitive dust particle concentrations in air are highest close to the emission source and decrease rapidly with downwind distance, generally within a few hundred feet, because of a combination of vertical mixing in air and particle deposition (USEPA, 1995; Etyemezian et al., 2003; Countess, 2003). Dispersion of emissions from combustion sources is influenced by exhaust gas temperature and plume release height (that is, stack height), in addition to meteorological conditions. Higher exhaust temperatures and higher stacks result in greater plume rise and more, but more dilute, downwind dispersion (USEPA, 1992). Therefore, fugitive dust sources at Michigan Operations (such as landfills or affected surface soil) are associated with deposition relatively close to the Michigan Operations, and deposition from combustion sources is likely to have occurred relatively farther away.

Contaminants are emitted to the air either in vapor or particle form. Generally, most metals, and organic compounds with very low vapor pressures, such as dioxins and furans, adhere to particles that can then be deposited on soil. Compounds with high vapor pressures (such as VOCs) occur only in the vapor phase; concentrations of VOCs in air typically do not have an effect on surface soil. SVOCs partition between vapor and particle phases, depending on their vapor pressure and the particle concentration in the air (USEPA, 2005).

Another chemical-specific property that affects the presence of a chemical in soil after it has been deposited is its half-life in soil. The half-life in soil reflects the persistence of a chemical, taking into account degradation through microbial and abiotic transformations. Abiotic transformation processes include photolysis and hydrolysis. USEPA has defined criteria for persistence, for which chemicals with a half-life in soil greater than 60 days are considered persistent, and chemicals with a half-life in soil greater than 180 days are considered very persistent (USEPA, 1999). Dioxins and furans are considered very persistent.

After deposition on soils, particle-bound hazardous substances such as dioxins and furans have the potential to be redistributed through surface water runoff and construction and grading activities (secondary transfer mechanisms). In the case of surface water runoff, the particle-bound substances may be mixed with solids that accumulate in ditches and drainage basins. In the case of construction and grading, particle-bound substances in surface soil may be transferred to and mixed with subsurface soil.

4.3.2 Exposure Pathways

Given the above-described source and transport mechanisms, the following are the potentially relevant soil exposure pathways for consideration at the site:

- Ingestion and dermal contact with soil (direct contact protection).
- Soil volatilization to indoor air inhalation.
- Soil-to-ambient air inhalation of volatiles and particulates.
- Soil-to-groundwater leaching (drinking water protection).
- Soil-to-groundwater leaching to surface water (surface water interface protection).
- Soil-to-groundwater leaching dermal contact (groundwater contact protection).

Soil exposure is evaluated by comparing the soil analytical data to the appropriate residential or non-residential Part 201 generic cleanup criteria (March 25, 2011) (MDEQ, 2011), or by comparing to site-specific cleanup criteria developed for particular contaminants. Because dioxins and furans do not volatilize and do not leach in material amounts into ground or surface water, only the first pathway described above (direct contact protection) is considered relevant for this Work Plan.

The groundwater medium is not included in this report since surface and near-surface soils are the media affected by air emissions and subsequent deposition. Soil-to-groundwater leaching is being evaluated for non-dioxin analytes. Section 5.0 of this report discusses the evaluation for potential non-dioxin COCs.

The formal evaluation of other pathways and/or COCs is on-going. Documentation of the conclusions and recommendations for additional measures or controls, if necessary, will be completed in accordance with the proposed schedule presented in Section 10.2.

5.0 Data Evaluation and Identification of Contaminants of Concern

5.1 Purpose

A significant effort has been undertaken to identify potential contaminants of concern (COCs) in relation to Midland Area Soils. The purpose was to develop a broad Target Analyte List (TAL) of potential COCs, and then narrow that list, through further evaluation and study, to the COCs for the Midland Area Soils. As part of this task, Dow evaluated and took into consideration its raw materials, products, byproducts, and wastes; its material handling and waste management practices; government agency contaminant screening lists; contaminant fate and transport information; historical records reaching back more than 100 years; and extensive on and off-site sampling results for over 200 compounds. This information has been previously reviewed with MDEQ in a series of collaborative meetings. In addition, a December 2010 investigation and follow up studies and analysis conducted by Dow will provide additional data to help determine if potential COCs other than dioxins and furans have the potential to leach to groundwater above applicable criteria. If the potential is demonstrated to exist, an additional corrective action to address to soil-to-groundwater leaching pathways may be required.

The following steps were completed as part of this task:

- Target Analyte List (TAL) development;
- Initial evaluation of TAL based on fate and transport and similar information;
- Determine if TAL compounds, in addition to dioxins and furans, are present at sampling areas adjacent to the Michigan Operations site at levels that require further investigation;
- Analyze for contaminants other than dioxins and furans in Midland Area Soils;
- Screen TAL according to screening criteria; and
- Review and further reduce remaining TAL categories through collaborative meetings with MDEQ and U.S. EPA.

In addition, an evaluation of the dioxin/furan TEQ results was performed during this process.

5.2 TAL Evaluation

5.2.1 Data Sets

Over 858 samples were submitted from more than 400 locations for dioxin and furan analysis during soil sampling work in 2005, 2006 and 2010. A subset of this data, representing over 200 samples, also included analysis for over two hundred compounds other than dioxins and furans, including VOCs, SVOCs, metals, herbicides, pesticides, and PCBs.

Overall, the data sets evaluated included historical and current non-dioxin and dioxin data. Three sets of surface and subsurface soil data were compiled, as follows:

- 2005/2006 Dow On-Site (DOS) data set (sample locations are shown in Figure 5-1).
- 2006 CH2M Hill data set (locations of the grid cells are shown in Figure 5-2).
- 2010 Dow and MDEQ split sample data set (sample locations are shown in Figure 5-3).

These three sets of data were combined and formed the basis for statistical evaluation of the results (the data sets were discussed in more detail in Section 3.0). See the *2010 Field Pilot Characterization Summary Report* dated 29 August 2011 for the final data set, laboratory QA/QC data, and the details on how the data was processed and compiled (URS, 2011).

5.2.2 Development of Summary Statistics

The calculation of summary statistics was part of an Exploratory Data Analysis (EDA) effort, which is the first step of statistical evaluation. The objective of EDA was to discover trends and patterns in the data so that appropriate approaches and limitations in using the data sets could be identified.

A table of basic summary statistics was prepared for non-dioxin data of the combined data set, and similarly, a separate table was prepared for dioxin data. These tables included common statistical parameters, such as mean, standard deviation, minimum and maximum detected values, and minimum and maximum reporting limits (RLs) of nondetects. These statistics were used to make inferences concerning the population from which the sample data were drawn. The number of samples and detection rate (i.e., determining the percentage of the data set that was detected/un-censored) were also included to provide information regarding sample size and detection frequency.

The results of summary statistics are provided in Table 5-1 (metals), Table 5-2 (metals and all other non-dioxin constituents), and Table 5-3 (dioxin congeners and TEQs using the 2005 WHO TEFs) (Van den Berg et al, 2006, see Table 3-1).

5.2.3 TAL Screening Criteria

The purpose of the TAL data screening effort was to determine if there are non-dioxin analytes that are potential chemicals of interest, in comparison to the established screening criteria. This section discusses the screening criteria used to determine if a constituent was eliminated from the TAL or retained for additional consideration.

5.2.3.1 MDEQ Screening Levels

A screening-level evaluation of the available data was performed by comparing each data point to pathway-specific screening criteria for soil. MDEQ Part 201 residential soil criteria were selected whenever available (MDEQ, 2011). USEPA Regional Screening Levels (RSLs) for residential soil were selected whenever MDEQ screening criteria were not available (document release date: June 2011) (USEPA, 2011).

5.2.3.2 Background

MDEQ State-wide default background values were used as an initial screen for metals, when available. MDEQ also developed and provided a regional background for some metals, which was used as a secondary screen (see Table 5-1).

5.2.3.3 Screening of Chemical Groupings

Certain classes of analytes were present in several isomer forms. The isomer-specific concentrations were summed into a total before being compared to the appropriate screening criteria. These classes of analytes included chlordanes, endosulfans, methylphenols (cresols), PAHs, and xylenes and are discussed further below. If a sample result was not detected, one half the reporting limit was assumed in the total value. Tables that show the total results for each class of analytes were provided in the *2010 Field Pilot Characterization Study Report* dated 29 August 2011 (URS, 2011).

5.3 TAL Data Screening Categories/Rules and Results

5.3.1 Screening Categories

Screening categories ("Groups") were developed as part of the screening effort to group and organize the non-dioxin constituents to facilitate the data review process. The screening categories are briefly described below, and each constituent, through the screening process, was placed into one of the "Groups." The full screening process and the hierarchy of each step are illustrated in the flowchart shown in Figure 5-4.

Below Background (for metals only; compare to background values when available):

- Group A1 – Analytes with all detected concentrations and reporting limits of nondetects below the Statewide Default Background level.
- Group A2 – Analytes with all detected concentrations and reporting limits of nondetects below the regional background screening level.

Nondetect Evaluation (for analytes not detected in all collected samples):

- Group B1 – Analytes that were 100% non-detected and all reporting limits met the MDEQ target detection limits.
- Group B2 – Analytes that were 100% non-detected and all off-site sample reporting limits met the MDEQ target detection levels.
- Group B3 – Analytes that were 100% non-detected and all reporting limits were less than or equal to all Part 201 criteria and EPA criteria for the given analyte.

Identify Criteria (for detected analytes without Part 201 Criteria and EPA Criteria):

- Group C1 – Analytes that were detected at a frequency less than or equal to 5%, with no Part 201 criteria and EPA criteria.
- Group C2 – Analytes that were detected at a frequency greater than 5%, with no Part 201 criteria and EPA criteria.

Criteria Comparison (for detected analytes with Part 201 Criteria or EPA Criteria):

- Group D1 – Analytes that were screened-out based on pathway-specific or other evaluation (no analytes were grouped into this category).
- Group D2 – Analytes that were detected at a frequency of less than or equal to 5%, and all detected concentrations and reporting limits of nondetects were less than or equal to Part 201 criteria and/or EPA criteria.
- Group D3 – Analytes that were detected at a frequency greater than 5%, and all detected concentrations and reporting limits of nondetects were less than or equal to Part 201 criteria and/or EPA criteria.
- Group D4 – Analytes that were not detected at concentrations greater than Part 201 criteria and/or EPA criteria, but some reporting limits of nondetects exceeded the criteria.
- Group D5 – Analytes that were detected at a frequency of less than or equal to 5%, and 1 or more detected concentrations were greater than one or more of the Part 201 criteria and/or EPA criteria.
- Group D6 – Analytes that were detected at a frequency of greater than 5%, and 1 or more detected concentrations were greater than one or more of Part 201 criteria and/or EPA criteria.

As shown in Figure 5-4, Groups D4, D5 and D6 underwent further evaluation. Some analytes in these categories were eliminated as follows:

- Group E1 – Analytes that were eliminated through a spatial (map) review of the data (e.g., the sample results were isolated and/or not spatially connected to Michigan Operations, evidencing that the source is something other than Dow).
- Group E2 – Pending – Analytes that may be evaluated and eliminated based on leach testing results (i.e., the analyte only exceeded leach-based cleanup criteria, but site-specific analysis showed that the analyte was not actually leaching in material amounts). The findings for Group E2 will be concluded in the RI Final Report.

- Group E3 – If this evaluation is necessary, an analyte may be eliminated if it is determined that it was not sourced by Dow. The findings for Group E3 will be concluded in the RI Final Report.

Each analyte was categorized and screened as discussed above and the results are shown in Table 5-4. The details of the screening process can be found in Table 5-1 (metals) and Table 5-2 (metals and all other non-dioxin constituents).

5.3.2 Results of Category Discussions

Screening categories C1, C2, D4, D5, and D6 were retained for further consideration and each of the analytes were evaluated through a series of meetings and conference calls that were attended by various MDEQ staff, EPA staff, Dow staff and their consultants. During these meetings, analytes were eliminated from the TAL based on a review of the following information:

- Statewide and/or regional background concentrations reported by MDEQ, supplemented by USGS and ATSDR;
- Fate and transport parameters;
- Spatial distribution; and
- Consideration of reported NOAEL values.

The resulting status of each analyte, and all of the supporting documentation, was provided in the *2010 Field Pilot Characterization Summary Report* (URS, 2011).

5.4 Findings of TAL Screening

The TAL evaluation confirmed that dioxins and furans are the COCs driving the presumptive remedy for the Midland Area Soils to address the direct contact pathway. Aside from dioxins and furans, arsenic is the only TAL analyte that has any sample results that exceed the residential direct contact pathway. Therefore, arsenic has been retained as a COC. A statistical evaluation was performed to determine if the locations of the arsenic direct contact exceedances correlate with dioxin/furan TEQ exceedances, and a correlation was found. Refer to Table 5-5, which provides a statistical demonstration of the correlation found between the dioxin/furan TEQ and arsenic. This evaluation demonstrates that soil that may exceed the generic DCC for arsenic also exceeds the proposed site-specific action level for dioxin/furan TEQ. This relationship was further confirmed by DEQ analysis of retained Midland soil samples for arsenic. No soil samples with TEQ less than the site-specific action level contained arsenic at levels above the generic DCC. Based on the correlation between the two analytes, any location that indicates that a presumptive remedy is necessary based on a dioxin/furan TEQ concentration, would also address the potential presence of arsenic. Therefore, samples will only require analysis for dioxin/furan TEQ to determine the need for a presumptive remedy.

The TAL analysis also ruled out a number of potential exposure pathways, including volatilization pathways. The conclusions for the remaining pathway (e.g., soil-to-groundwater leaching) for non-dioxin analytes will be presented in the RI Final Report.

5.5 Evaluation of Dioxin TEQ Results

Seventeen dioxin and furan congeners were analyzed for the three data sets (2005/2006 Dow On-Site [DOS] data set, 2006 CH2M Hill data set, and 2010 Dow and MDEQ data set), and the results for these congeners were used to calculate dioxin TEQ for each individual sample using the 2005 WHO TEFs (Van den Berg et al, 2006, see Table 3-1). The calculated dioxin TEQs were then used for subsequent data and statistical evaluation.

A table of summary statistics for dioxin TEQs by depth and by data set is presented in Table 5-6. The majority of the dioxin TEQ data were originated from the 2006 CH2M Hill set, and 2010 Dow and MDEQ set. The number of samples from the 2005/2006 Dow On-Site (DOS) set was very small (n=28), and it was evident that the dioxin TEQs were as much as two orders of magnitude higher than the other two sets. Thus, the 2005/2006 Dow On-Site (DOS) set (i.e., inside the Dow's plant) was deemed to be non-representative of the dioxin concentrations existing in the City of Midland soils (i.e., outside the Dow's plant). The following evaluation and discussion excluded the dioxin TEQs obtained from the 2005/2006 Dow On-Site (DOS) sampling event.

5.5.1 Determination of Depth of Dioxin and Furan Impacts

Table 5-7 shows the summary statistics of the combined 2006 CH2M Hill data set and 2010 Dow and MDEQ data set by depth for dioxin TEQs, and Figure 5-5 shows the box-and-whisker plot of this combined data set. Data from 0 to 1 inch bgs had the largest number of samples (n=361), followed by 1 to 6 inch bgs (n=173) and 6 to 12 inch bgs (n=138). The number of samples collected from greater than 1 foot bgs was also large (n=154), with the deepest depth at 4 feet bgs. It should be noted that data from the two deeper levels were exclusively collected from the 2010 event.

As shown in Figure 5-5, the highest dioxin TEQs appeared to be observed in the 1 to 6 inch bgs level, with a mean of 303 ppt and a median of 155 ppt. Given the data were positive skewed and not normally distributed, a non-parametric multiple comparison test using the Steel-Dwass method at a 5 percent significance level was performed to compare the four depth levels. The Steel-Dwass test is a non-parametric version of Tukey multiple comparison test, for which the alpha is sized for all differences among the means of different groups. The statistical outputs and results of this test are also shown in Figure 5-5.

The result of the multiple comparison test showed that the top two depth levels (0 to 1 inch bgs and 1 to 6 inch bgs) were not significantly different from each other. However, concentrations decreased in the third depth level (6 to 12 inch bgs), which appeared to be different and lower in concentration from the top two depth levels. A continued decrease in concentration was identified in the fourth depth level (>1 foot bgs).

Table 5-7 also shows percentage of dioxin TEQs exceeding 250 ppt and exceeding 300 ppt. Based on the percentage of exceedance, it appeared that the top three depths levels (i.e., from 0 to 12 inches bgs) have some exceedances. The fourth depth level, >1 foot bgs, had very limited exceedances. All the locations with samples >250 ppt at a depth >1 foot bgs have identified historic surface disturbances from industrial activity and possible filling based on a review of historical aerials (see Attachment 1 of the 2010 Field Pilot Characterization Summary Report [URS, August 2010]). Two locations are specifically known to have had filling take place, where cleaner materials have been placed over historic land surfaces. Based on the observed distribution of contaminants and what is known about the history of these areas, concentrations of dioxins and furans above 250 ppt are not evidenced or expected to be present in the deeper Midland Area Soils (greater than one foot from surface).

5.5.2 Determination of Small Scale Variability of Dioxins and Furans

Variograms were developed to evaluate the pattern and scale of spatial variability in dioxin TEQ concentrations. A variogram provides a means of quantifying the commonly observed relationship that samples close together tend to have more similar (correlated) values than samples far apart. The pattern of spatial correlation exhibited in a variogram helps to understand how homogeneous or heterogeneous the field of measurements (i.e., data set) is.

The *2010 Field Characterization Pilot Study Summary Report* provides a discussion of key components of a variogram, the data used to develop variograms for this study, and the actual variograms that were developed. The main findings are discussed below.

5.5.2.1 Findings of Variogram Analysis

The calculated points on the variograms in Figures 5-6 through 5-8 show a large degree of scatter around a fitted model. This is a reflection of significant random variability or noise (including potential measurement errors) between samples located close together (short-scale variability).

A nugget in a variogram is a measure of short-scale spatial variability, including random measurement error. Discrete points for a variogram plat are calculated using available sample data. A “best-fit” line is then drawn to fit these points. The nugget is estimated by the intercept of this line on the y-axis.

The nugget estimated for this study accounted for some 40% of the total variability in the long-range variogram. This is a further indication of sample measurements with significant short-scale variability. Given this significant short-scale variability in Midland Area Soils, measuring concentrations at individual sample locations would be highly variable. Measuring average concentrations over a larger area such as a property would help reduce the influence of the short-scale variability and hence would be more reliable.

5.5.2.2 Spatial Trend Discussion of the 2006 Transect Data

In 2006, CH2M Hill collected surface soil samples from the communities within the City of Midland on 21 transects radiating from Michigan Operations (but outside the plant’s boundary). These transects were labeled from A to W (Transect P and Q had no data), with the majority of them radiating to the northerly and easterly directions to reflect prevailing winds. There were between one and twelve stations in each transect, and each station was approximately 300 feet by 300 feet. The sampling locations of these transects are shown in Figure 5-2. Because the exact locations for a number of samples were "blinded," the number of available data points was actually less than what is shown in Figure 5-2.

Although a strong spatial continuity was not shown by the variogram evaluation discussed above, a qualitative inspection of the dioxin TEQ values for surface samples along each transect indicated a general downward spatial trend when the sample locations were moving further away from Michigan Operations. This general observation appeared to be more prominent for Transects B, C, E, I, and M. For example, for Transect B, the dioxin TEQ concentration for Station B-001 was reported to be 379 ppt. The dioxin TEQ concentration continued an apparent monotonic decline along Transect B until it reached 75 ppt at Station B-009. (Note: Stations B-010 and B-011 were "blinded.") For Transect M, if one excluded the first station (Station M-001), the dioxin TEQ concentration declined from 915 ppt at Station M-002 to 44 ppt at Station M-011.

6.0 Summary of the Basis for the Residential Site-Specific Action Level

This section presents the basis for the residential property site-specific soil direct contact action level (SSAL) developed and proposed for dioxin/furan TEQ. The SSAL will serve as the threshold trigger level for requiring presumptive response activities at a particular residential property. The proposed SSAL is 250 ppt TEQ. For the City of Midland, a SSAL for dioxin/furan TEQ of 250 ppt TEQ (based on the 2005 WHO TEFs [Van den Berg et al, 2006]) is protective of the public health, safety and welfare and appropriately takes certain updated and site-specific information into account while leaving a protective margin of safety. This action level will serve as a “site-specific cleanup criterion” as described in Part 201 of Michigan’s Natural Resources and Environmental Protection Act.

The SSAL is a site-specific criterion that applies in lieu of the MDEQ’s default generic direct contact criterion for dioxin/furan TEQ of 90 ppt. The default and site-specific parameter inputs and equations are shown below:

Parameter Inputs		MDEQ Default	Site-Specific
TR	target risk (unitless)	1.00E-05	1.00E-05
AT	averaging time (days)	25550	25550
CF	conversion factor (ng/kg)	1.00E+12	1.00E+12
SF	cancer slope (mg/kg-day)-1	7.50E+04	7.50E+04
EFi	ingestion exposure frequency for soil and dust (days/yr)	350	260
IF	age-adjusted soil ingestion factor (mg-yr/kg-day)	114	114
AEi	ingestion absorption efficiency (unitless)	0.5	0.38
EFd	dermal exposure frequency for soil and dust (days/yr)	245	260
DF	age-adjusted soil dermal factor (mg-yr/kg-day)	353[a]	353
AEd	dermal absorption efficiency (unitless)	0.03	0.032
SDCF	soil and dust contribution factor (unitless)	--	0.5
EFi-dust only	ingestion exposure frequency for dust only (days/yr)	--	90
EFd-dust only	dermal exposure frequency for dust only (days/yr)	--	90
RDSF	relative dust:soil concentration factor (unitless)	--	0.5
Parts per trillion (ppt) TEQ[b]		**9.0E+01**	**2.6E+02**

Note:
[a] MDEQ originally used an age-adjusted DF of 2,442 mg-yr/kg-day when the generic direct contact criterion of 90 ppt TEQ was developed. However, MDEQ has since adopted and promulgated an updated DF of 353 mg-yr/kg-day.
[b] TEQ is calculated based on the 2005 WHO TEFs ([Van den Berg et al, 2006], see Table 3-1).

$$MDEQ\_Algorithm = \frac{TR \times AT \times CF}{SF \times \left[\left(EF_i \times IF \times AE_i \right) + \left(EF_d \times DF \times AE_d \right) \right]}$$

$$Site - Specific\_Algorithm = \frac{TR \times AT \times CF}{SF \times \left[\begin{array}{l} SDCF\left(EF_i \times IF \times AE_i \right) + SDCF\left(EF_i \times IF \times AE_i \times RDSF \right) + \left(EF_{i-dustonly} \times IF \times AE_i \times RDSF \right) \\ + SDCF\left(EF_d \times DF \times AE_d \right) + SDCF\left(EF_d \times DF \times AE_d \times RDSF \right) + \left(EF_{d-dustonly} \times DF \times AE_d \times RDSF \right) \end{array} \right]}$$

The SSAL is based on the following modifications to the exposure variables that MDEQ used to calculate the state-wide generic cleanup criterion in order to better reflect the best available information.

- ***Relative Dust:Soil Concentration Factor (RDSF)***
  Based on data from the University of Michigan's Dioxin Exposure Study, concentrations of dioxins in house dust in the City of Midland are consistently lower than in composited outdoor soil samples surrounding the house. Specifically, the UMDES linear regression model indicates that indoor house dust dioxin concentrations are between 19% and 35% of the outdoor soil concentrations. Paired dust and soil TEQ values from the UMDES study are not available at this time. An evaluation of unpaired summary statistics indicates that the dust:soil concentration ranges up to approximately 50% (fractional TEQ concentration 0.30 - 0.54). Therefore, the default dust:soil concentration ratio of 1 is too high. The fractional concentration of TEQ for dust from soil in the site-specific equation is 0.5, to better represent site-specific information.

- ***Exposure Frequency (EF) and Soil:Dust Contribution Factor (SDCF)***
  The MDEQ generic direct contact calculation assumes incidental ingestion of contaminated soil 350 days per year based on the rationale that incidental ingestion of indoor dust can occur on "indoor" weather days, replacing the outdoor soil ingestion assumed for those days. This value also assumes that dioxin concentrations in outdoor soil and indoor dust are the same. It is appropriate to adjust for the site-specific relationship between indoor dust and outdoor soil in Midland, taking into consideration site-specific weather data. Based on local weather data, soil exposure frequency (incidental ingestion and dermal contact) of 260

outdoor days per year and a dust exposure frequency of 350 days per year are appropriate. Soil and dust exposure each contribute half of the soil/dust exposure for the 260 outdoor days (hence a soil and dust contribution factor [SDCF] of 0.5), and the other 90 days (indoor days) are 100% dust exposure. Therefore, Midland-specific weather data is being used to adjust the EFi (for soil and dust) from 350 to 260 days per year with the addition of an "indoor" EFi (dust only) of 90 days per year. The EFd (for soil and dust) is being adjusted from 245 days to 260 days per year with the addition of an "indoor" EFd (dust only) of 90 days per year.

- ***Ingestion Absorption Efficiency (AEi)***

  The current generic AE_i for dioxin is set at 50%. Dow has conducted site-specific rat and juvenile swine studies to determine the relative bioavailability (RBA) of dioxin in Midland soil. MDEQ's evaluation of the studies determined that both animal studies appear equally valid, and therefore has suggested that a midpoint value of the studies be used. Accordingly, the AE_i is reduced from the default of 50% to 38%.

- ***Age-Adjusted Soil Dermal Factor (DF)***

  When MDEQ calculated the generic direct contact criterion of 90 ppt TEQ, MDEQ used an age-adjusted soil dermal factor (DF) of 2,442 mg-yr/kg-day, which was the default value at that time. Subsequently, MDEQ has adopted an updated default DF of 353 mg-yr/kg-day, which it has used for all subsequent direct contact criterion calculations for many compounds. This updated DF is based primarily on MDEQ's adoption of lower soil adherence factors (AF) for the DF calculation, from an AF of 1.0 mg/cm^2 for both children and adults, to new values of 0.2 mg/ cm^2 for children and 0.07 mg/ cm^2 for adults. These changes are consistent with the recommendations of U.S. EPA in its dermal risk assessment guidance. The updated DF of 353 mg-yr/kg-day is used for this site-specific calculation.

- ***Dermal Absorption Efficiency from Soil (AE_d)***

  The AEd represents the fraction of the contaminant that is assumed to penetrate the skin after contact. For dioxin, the generic value is currently set at the compound-based value of 3%, representing an upper bound value of two study approaches supporting values of 0.95 and 2.5%. MDEQ has previously recognized that both approaches appear equally valid, and therefore has suggested that a midpoint value of 1.75% be used in place of 3%. Dow has provided information showing the relatively high percentage of organic content in Midland soil, which further supports using a value less than the upper bound value of 3%, and lends additional site-specific support to MDEQ's earlier suggestion to use 1.75%. However, the EPA dermal guidance recommends the soil dermal absorption rate be divided by the feed absolute bioavailability value (EPA, 2004). Therefore, the value recommended as the best available information for dermal absorption efficiency is the 0.0175 soil dermal absorption rate divided by the feed absolute bioavailability value (ABS_{GI}) of 0.55, which results in a relative bioavailability rate of 0.032. The ABS_{GI} value of 0.55 was derived from the rat feed results from the pilot bioavailability study (Dow, 2005).

Adoption of all of the above changes results in a calculated dioxin action level of >250 ppt TEQ. The SSAL that is proposed for the City of Midland is 250 ppt TEQ. A SSAL of 250 ppt TEQ is protective of the public health, safety, and welfare and appropriately takes updated and site-specific information into account, while leaving a margin of safety. The SSAL will only apply to residential properties (and "residential-like" properties, such as daycare centers). For non-residential properties within the Resolution Area, the State's generic soil direct contact criterion for non-residential properties of 990 ppt TEQ will be applied.

7.0 Exposure Management and Response Action Summary

Response actions will be applied for specific areas in proximity to Michigan Operations that have elevated concentrations of dioxins and furans TEQ or a presumptive remedy described below. Land uses in these specific areas include residential, commercial/industrial, retail commercial, public/semi-public, and parks and recreation. Requirements for management of exposure to surface soil contamination are dependent on current and reasonably anticipated future land use. Response actions will be performed to address direct contact exposure to dioxins and furans in soils and as necessary, dust accumulated in dwelling(s) ducts where soil is demonstrated to be above the action level relevant to land use, as described below. In conjunction with the response actions, institutional controls such as zoning and land use changes will be incorporated.

Figure 7-1 presents an overview of the area that has been initially identified as the Midland Resolution Area (described below). The boundaries of this area will be refined based on data collected during the design sampling work. This area has been initially defined based on previous soil sampling results and an analysis of fate and transport information, which indicate that areas outside the Resolution Area are unlikely to be contaminated above action levels. Design sampling will verify this and adjustments will be made to the area as new data are collected, as described in Section 9. Outlier areas, which have the potential for concentrations of dioxins and furans above the SSAL, have also been identified and will be managed as described in this Work Plan. If additional outlier areas are identified from new information, they will be addressed in the same manner.

7.1 Midland Resolution Area

The Midland Resolution Area covers approximately 1,700 total acres. Of the 1,700 acres, approximately 425 acres are in residential or residential-like land use. Approximately 1,275 acres are in industrial/commercial land use. The Midland Resolution Area includes portions of the City of Midland where land use is primarily residential and others near Michigan Operations where a limited number of residential properties (some not conforming with existing zoning) are intermixed among predominantly commercial or industrial uses. The predominantly residential areas are in large part located to the north of the facility, in addition to a second smaller area to the east of the facility. Figures 7-2 and 7-3 present an overview of the two predominantly residential areas within the Midland Resolution Area. Figure 7-4 presents an overview of the area with predominantly industrial/commercial land use within the Midland Resolution Area. The Midland Resolution Area is largely contiguous to Michigan Operations to the north and east of the fenceline. The boundaries of the Midland Resolution Area are generally:

- Bound to the north by East Nelson Rd. and East Lawn Rd.;
- Bound to the west by Rodd St.;
- Bound to the east by Waldo Ave; and
- Bound to the south by East Patrick Rd and East Indian St.

Implementation of the presumptive remedy will begin in areas that are the closest to Michigan Operations and then progress outwards in bands across the Midland Resolution Area in subsequent years. Some residential properties close to the plant site will be addressed during the second year of work rather than the first year (note that these properties previously received or were offered interim response activities [IRAs] to control exposure in 2005).

The Midland Resolution Area will be subdivided into large property grouping, based on the number of properties that may be reasonably addressed based on current knowledge of the area within one construction season (April-October). The intent is for all field activities – from sampling and analysis to implementation of the remedy – for the property grouping to be addressed within one construction season. Changes to the schedule through the Adaptive Management Process (Section 9) may be made during the project; if improvements or efficiencies can be made; or if other factors make it appropriate to do so.

Figure 7-5 shows the proposed property groupings designated by current block designation for implementation (A, B, C, etc.). The property groupings presented in this Plan were selected based on distance from the site. The plan for Year 1 implementation is discussed in detail in Section 8.0, and is shown on Figure 7-5 as the “A” property grouping. As the implementation proceeds farther away from the Michigan Operations facility, adjustments may be made to the schedule or property groupings. The boundaries of the Midland Resolution Area may be adjusted in consultation with oversight and approval from MDEQ as necessary to meet work plan objectives. The table below presents details for each property grouping, including the total number of properties, number of residential properties, and acreage.

Property Group	Total Number of Parcels	Residential Parcels	Total Area (acres)	Residential Acres
A	113	106	38.6	Housing = 28.3 Parks & Rec = 3.75
B	336	299	78.5	Housing = 59.6 Parks & Rec = 6.9 Public/semi-public = 0.8
C	302	268	80.5	Housing = 57 Parks & Rec = 3.2 Public/semi-public = 8.6
D	347	330	100.5	Housing = 80.7 Parks & Rec = 10.8
E	184	178	58.2	Housing = 42.3 Parks & Rec = 0.9 Public/semi-public = 14.8
F	121	115	89.4	Housing = 34.9 Parks & Rec = 3.7 Public/semi-public = 50.1

7.2 Outlier Areas

During the 2006 blinded transect sampling activities, transect sampling areas E-007, I-008 and I-010 were sampled and each exhibited a detected concentration of dioxin and furan TEQ at a level greater than 250 ppt in a discrete sample. E-007 is located north of the currently defined Midland Resolution Area. The specific location of this area is identified in Figure 4-5. I-008 is located along the east boundary of the currently defined Midland Resolution Area, and I-010 is roughly ¼-mile to the east of the boundary, as shown in Figure 4-6.

The outlier areas will be assessed following the same decision rules as presented in Section 7.4.4. For the properties in E-007, if results of composite sample testing are less than the SSAL, no further action is required beyond notification to the property owners of the results of testing. If a composite sample testing result from a property in E-007 is greater than the SSAL, the following actions will occur:

- Remedy will be implemented consistent with that described in Section 7.3; and
- Composite samples from adjoining properties will be obtained and tested for dioxin and furan TEQ.

Outlier areas I-008 and I-010 are each owned by The Dow Chemical Company. Each will be evaluated as a single 2-acre DU (per Section 7.4.3.1) for the purposes of confirmation sampling. If results of composite sample testing from the I-008 or I-010 DUs are less than the SSAL, no further action is required. No further sampling will be required when the available information indicates that the outliers either are shown to be less than 250 ppt TEQ or have been bounded. For E-007, this will include a buffer of at least three properties that have a consistent pattern (based on analytical results) of concentrations below 250 ppt TEQ, contiguous to any property above 250 ppt TEQ. Any recommendation for no further sampling or adjustments to the outlier boundary area will be based on trends identified by the analytical results, as well as the physical features and age of property development of each area.

If a composite sample result from either I-008 or I-010 DU is greater than the SSAL, a workplan will be submitted for MDEQ review and approval to complete the definition of the Midland Resolution Area boundary in this area, including a schedule for implementation.

7.3 Current Land Use

The Midland Resolution Area includes approximately 1,750 total properties that are broken generally into the following land uses:

- 1,330 residential properties.
- 40 residential-like properties (park, school).
- 380 non-residential (commercial, industrial, public).

The properties designated as residential-like properties include daycares, schools for children, and parks with playgrounds (see Section 4.2.2). These properties are being addressed as residential based on the assumption that exposures are similar to or consistent with those at residential properties. All remaining areas are classified as “non-residential.” Figure 4-3 shows general land use areas within the Midland Resolution Area.

7.4 Response Action Addressing Residential Land Use

The remedial objective for the Midland Resolution Area for residential and residential-like properties is to reduce the dioxin and furan TEQ in impacted areas to a concentration that is below the SSAL. The objective will be achieved by implementing a presumptive remedy for any area that has dioxin and furan TEQ concentrations greater than the SSAL in the top six inches of soil as determined by incremental composite sampling. A phased approach that involves sampling and analysis to identify properties where a presumptive remedy will be implemented will be used to methodically work through the properties located within the Midland Resolution Area. The sampling and analysis will be accomplished through incremental composite sampling, following methods that were optimized by the results of a pilot study documented in the *Incremental Composite Sampling Pilot Study Report* (January 2012). The samples collected will be analyzed for dioxins and furans. Decision rules establish standards for determining whether or not the presumptive remedy may be warranted for a property and are discussed in further detail later in this section. The Decision Rules will guide the use of analytical results to identify properties that are either below or equal to the SSAL or require implementation of the presumptive remedy.

In general, the presumptive remedy for residential and residential-like properties would consist of removal of soil to a minimum depth of one foot and replacement with clean soil. This remedy is appropriate, based on the understanding of depth of dioxin and furans and the effectiveness of the remedy. Confirmation sampling will not be implemented as part of the remedy. The presumptive remedy removes soil to a depth where SSAL exceedances could occur and replaces soil with clean fill. Therefore, confirmation sampling is not necessary. Lawns and landscaping will be restored to existing conditions. Implementation and other special conditions, are described in detail in the following sections.

For those properties where remedy is determined to be necessary, an evaluation of whether the presumptive remedy needs to include additional action to address dust accumulated in the duct work of the dwelling(s) will be performed. If necessary, the presumptive remedy for addressing accumulated dust is duct cleaning. This is further discussed in Section 7.4.7.1.

To address where property owners decline to provide access for the sampling or remedial work, Dow will establish a trust to fund the performance of the remedial work in the future. The trust fund is described in Section 7.5.1.

7.4.1 Decision Unit

A decision unit (DU) is an area for which an individual remedial decision is made. A DU is equivalent to an exposure area or may represent an agglomeration of exposure areas with similar characteristics. Typically, a DU will consist of one residence. A DU will extend to the farther of the property line, an adjoining fence, curb line, pavement edge, or the top edge of a drainage ditch or creek, including outlawns associated with the property that are not owned by the property owner but are functional parts of the owner's property, provided that separate sampling access for these areas is obtained. Wooded areas above a specified size (as defined in Section 7.4.3.1) will not be included as part of the residential use DU and will be managed as a separate DU. Decision rules will be utilized to compare the results of soil testing at each DU to determine if the presumptive remedy will be implemented at that DU.

7.4.2 Obtaining Access from Current Property Owners

Dow will use best efforts to obtain appropriate access from property owners to conduct sampling on their property. For the purposes of this presumptive remedy, best efforts are defined as follows: an initial letter, a first and second follow-up telephone call, certified letter, and an in-person visit. A meeting will be requested with the current property owner to review the proposed actions and to obtain an access agreement and permission to permit Dow to conduct sampling activities and the remedial work (if applicable) specified in this Work Plan. An example agreement form (Midland Soils Sampling Agreement Form) is presented in Attachment D. Dow and its contractors will work closely with property owners to inform them of the planned process, the implications of the field implementation, in addition to providing the results of the sample analysis.

7.4.3 Soil Testing

This section describes how information is gathered for the remedy determination. Sampling is based on current land use, physical attributes of the property and DU area size. Individual DUs that are in residential use include both single and multi-family dwellings. Properties that are being treated as residential-like include such categories as parks, schools for children, daycare centers, and playground areas, as discussed in Section 4.2.2, and other public areas on a case-by-case basis.

7.4.3.1 Sample Collection

Samples obtained from an individual DU are collected from a number of locations (increments) and combined into a single sample (composite) representative of the entire DU. This technique is commonly referred to as incremental composite sampling (IS). The increment collection locations within each DU are generated using a systematic random approach. In the systematic-random pattern, a random starting point is generated and then subsequent increment locations are established on an even spacing within the remainder of the DU. The increment collection locations are created in Geographic Information System (GIS) in advance of the sampling activity. The planned sampling locations for a DU are loaded into handheld global positioning system (GPS) units for use by field teams to identify sampling locations. In the field, each increment collection location will be clearly identified by a member of the field team with a survey flag prior to the sample collection. After a soil core has been collected at a location, the survey flag will be removed to help verify all planned increments have been collected.

At each DU, actual conditions may differ from those understood during sample plan generation. The field team will make best efforts to sample at the planned locations, but will necessarily use the following guidelines in the field to adjust increment locations on an as-needed basis:

- Increments will not be located under or within paved or impervious areas or stationary structures (e.g., decks, porches, pools).
- Increment locations shall be no closer than three feet (3') from existing structures or wooden utility poles.
- Increment locations will be selected no closer than twelve inches (12") from existing roads and paved parking lots and paved driveways.
- Increment samples will not be collected in areas visually observed to be impacted by oil or other petroleum products.
- Increment locations will be no closer than three feet (3') from in-yard garbage/compost piles, burn containers, vehicles in repair or abandoned, or other "junked" items.
- Increment locations will be offset from identified utility or sprinkler locations.

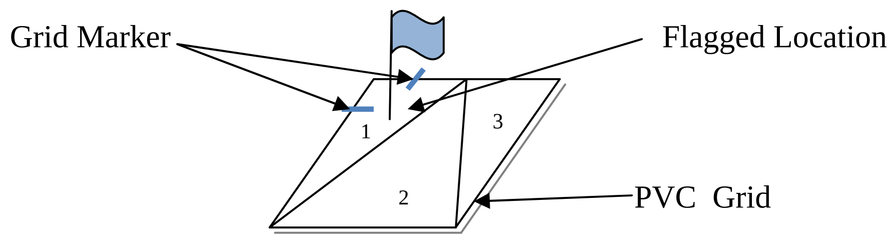
- Increment locations will not be within drainage ditches and creeks.
- Increment locations will not be taken immediately adjacent to tree trunks or large bushes.
- Increment locations will be offset from raised bed gardens.
- Increment locations will be offset from other possible interferences which may prevent the collection of a representative sample.
- Increments will be offset from areas where access has not been granted.

Before field teams collect any sample, polyethylene sample collection bags and a sample collection log are labeled with:

- Unique Sample Identification;
- Field sampler's initials;
- Date (mm/dd/yy); and
- Time of sample collection (military format).

Soil cores (increments) will be collected using stainless steel push samplers or an Enterprise Venture Corporation (EVS) Incremental Sampling tool (or equivalent) to ensure that each increment is collected at the same depth and volume. Each increment is collected from 1" diameter cores to a depth of 6" below ground surface. For properties where the property owner provides information establishing that the existing lawn has been significantly landscaped or fill placed across much of the property, a second set of increments to a depth of 12" below ground surface will be collected. The individual increments are field composited.

Increments will be collected at consistently off-set positions from the flagged increment collection location using a custom made polyvinylchloride (PVC) grid, divided equally into a flag placement location and three (3) cells (equal to the number of increments to be collected for replicate samples for each location within a sampling unit). One corner of the grid is marked as the placement location and each cell within the grid is labeled consecutively with a number from 1 to 3 (see sketch below). Field replicates for incremental samples are not field splits; they are independently collected incremental samples from the same decision unit.



At each increment collection location the placement corner marked on the grid will be lined up with the increment collection flag. Then an increment will be collected from the approximate center of each cell in the grid and added to the composite while in the field. Increment collection will not be biased to avoid vegetation. However, vegetation will not be included in the analysis of the soil sample. Increments from each location will be obtained as field teams move their way across the decision unit, removing the increment location flags as samples are collected.

After field collection, increment samples will be brought back to a clean designated workspace for further processing before compositing and delivery to the laboratory. At a minimum, each sample will be sieved before packaging for laboratory delivery. During this step the vegetation will be broken in smaller pieces to release trapped particles and then will be extracted from the soil sample. The majority of vegetation (mostly grass and roots) typically does not pass through the sieve and therefore is not part of the subsample extracted for analysis.

The following procedures will be employed when processing samples:

1. ¼” sieves and bowls will be decontaminated prior to use, and in-between each composite sample.
2. The field sample (or portion of the field sample) will be carefully emptied onto the sieve placed on the large stainless steel or aluminum bowl. If the entire sample cannot be placed on the sieve at once, portions of the sample will be sieved into the large stainless steel or aluminum bowl.

3. The soil material will be pushed around the sieve and the sieve will be agitated to move the soil through the sieve and retain the vegetation on the sieve. A clean pair of nitrile gloves will be worn by the field technician. The retained vegetation will be disposed.

Once the samples are processed, all samples will be packed for delivery to the Dow laboratory. Processed samples will be returned to the original polyethylene sampling bag if possible or into a new clean polyethylene sampling bag. All samples will be double bagged by placing the sample in an outer polyethylene sampling bag, labeled as described above. Samples will be placed in coolers with chain-of-custody forms and delivered to the laboratory for login and storage.

Three replicate incremental composite samples will be obtained from each DU, with the number of increments based on its area. The area for a DU is determined as the area not covered by buildings, large immovable features (decks or pools) and paved areas. A single composite will be obtained from ten (10) increment locations for DUs less than or equal 1/4-acre. A single composite from twenty (20) increment locations will be obtained for DUs greater than 1/4-acre, but less than 1 acre.

Specific sample plans will be developed for DUs that are larger than one acre on a case-by-case basis prior to sampling each year. Properties may be divided and sampled separately as multiple decision units (where splitting the DU is logical) or individually with >30 increments per DU.

Some properties within the Midland Resolution Area have densely wooded areas within the property boundaries. Exposure and land use are different for wooded areas than exposure and land use for mowed and maintained lawns and may require separate evaluation as described below.

The minimum lot size that can be developed by building a structure as a residence within the City of Midland is 7,200 square feet. Wooded areas less than 7,200 square feet on active residential lots are considered de minimis and will be sampled as part of the residential DU. Wooded areas comprising an entire parcel (or nearly so), with no active residential use will be identified as non-residential, and will be addressed according to Section 7.4.6.

Wooded areas larger than 7,200 square feet on an individual parcel with a current land use of residential or residential-like are considered non-residential areas, due to their limited use for the purposes of this project; and will be addressed as a separate DU. Samples will be collected from this area upon approval of the property owner.

A property owner may provide permission for sampling for the residential DU, woodland DU or both at their discretion. These options for sampling will be discussed with the owner during individual meetings, as described in Section 7.4.2.

Quality assurance for soil testing (including replicate and split sampling procedures) is used to validate analytical methods, but is not included in remedial decisions. Specific procedures are outlined within the Quality Assurance Project Plan (QAPP, Attachment C).

7.4.3.2 Laboratory Sub-Sampling

When the soil samples are delivered to the laboratory, the compounds of interest must be extracted from the soil and transferred to a liquid for injection into a gas chromatogram (GC). For this study, up to 3kg samples may be delivered to the laboratory, and an extraction performed on a 30g subsample. Sub-sampling in the laboratory will be accomplished by taking the entire 3kg sample as delivered in the polyethylene bag, and mixing in the bag. Individual ~1g subsamples will be obtained using a lab spatula, mixing the bag between subsamples. This will be repeated until a total of ~30g are obtained for extraction. Recent field pilot studies have confirmed the effectiveness of this technique (URS, January 2012).

7.4.3.3 Analytical Methods

A method has been developed by Dow analytical chemists by adaptation of existing EPA Method 8280 for rapid determination of polychlorinated dibenzo-p-dioxins (PCDDS) and dibenzofurans (PCDFs) in soil by high resolution gas chromatography/high or low resolution mass spectrometry (HRGC/HRMS or HRGC/LRMS). It is specific to the Midland Area Soils (MAS). This method was developed to decrease the time necessary for each laboratory analysis. The Standard Operating Procedure (SOP) for Method 8280 was submitted to MDEQ and EPA on June 29, 2011 and was approved for use on October 21, 2011. A copy of the SOP is included as Attachment B.

This is referred to as the Method 8280 Midland Area Soils (MAS) Site-Specific Fast Analysis method and it will be the principal means used for laboratory analyses. Additional methods, such as EPA Method 1613b with additional chromatographic column confirmation, will be performed as required. In cases where interferences are identified, analytical options and performance criteria are discussed in detail in the Method 8280 MAS Site-Specific Fast Analysis Method Quality Assurance Project Plan (QAPP). The QAPP is contained in Attachment C, a draft of which was previously submitted for review on September 6, 2011.

7.4.4 Decision Rules for Residential Land Use

This section sets forth the decision rules for the response actions and how the information obtained will be used to inform them. At the scale of the DU, soil testing results will be used to determine if the presumptive remedy is warranted.

As shown on Figure 7-6, the first of the three composites collected in a single DU will be tested at the laboratory by Method 8280 MAS. If the result indicates that a concentration less than or equal to 220 ppt TEQ (30 ppt less than action level), soil testing is complete and cleanup of the property will not be necessary. If the result determines a concentration greater than 280 ppt TEQ (30 ppt above the action level), soil testing is complete and the presumptive remedy will be performed at the DU as specified in the Work Plan. Concentrations measured greater than 220 ppt TEQ and less than or equal to 280 ppt TEQ will result in testing of all three replicates by EPA Method 1613b with additional column confirmation analyses. A 95% Upper Confidence Limit (UCL) will be developed from the three analytical results. The 95% UCL will be compared to the SSAL of 250 ppt TEQ. If the 95% UCL is less than or equal to 250 ppt TEQ, performance of the presumptive remedy at the property will not be necessary. If the 95% UCL is greater than 250 ppt TEQ, performance of the presumptive remedy will be implemented as specified in this Work Plan at that DU.

As shown on Figure 7-7, for properties where the property owner provides information establishing that the existing lawn has been significantly landscaped or fill placed across much of the property, the standard decision rules established above are supplemented to verify that impacted soils are not present in the upper 12” of soil. Additional evaluation is necessary if the upper 6" is less than 280 ppt TEQ. In that case, one of the 0-12" samples (Section 7.4.3.1) will be tested at the laboratory by Method 8280 MAS, and a concentration for the 6-12" interval will be determined (see Note 1 on Figure 7-7). If the result indicates that concentrations of the 0-6" and 6-12" intervals are less than or equal to 220 ppt TEQ (30 ppt less than action level), soil testing is complete and cleanup of the property will not be necessary. If the result determines a concentration greater than 280 ppt TEQ (30 ppt above the action level), soil testing is complete and the presumptive remedy will be performed at the DU as specified in the Work Plan. Concentrations of either interval determined to be greater than 220 ppt TEQ and less than or equal to 280 ppt TEQ will result in testing of all three replicates for the interval with the highest concentration by EPA Method 1613b with additional column confirmation analyses, and subsequent derivation of a 95% UCL (see Note 2 on Figure 7-7). If the 95% UCL is greater than 250 ppt TEQ, performance of the presumptive remedy will be implemented as specified in this Work Plan at that DU. If the detected concentration at the DU is less than or equal to the SSAL, dust accumulated in the dwelling(s) duct work will not require a remedy. If the detected concentration at the DU is greater than the SSAL, further evaluation of exposure to dust accumulated in the dwelling(s) duct work will be performed as per Section 7.4.7.1.

7.4.5 Communication of Results to Property Owner

Dow will provide written notification of the results of soil testing to the individual property owners in a timely manner. The written communication will briefly describe the next steps for the property owner based on the testing results. Written notification will include contact information for both MDEQ and Dow representatives who will be available to discuss the information reported to the property owners. Example letters that may be used to communicate results to the property owners are presented in Attachment E.

7.4.6 Property-Specific Plan for Presumptive Remedy

The presumptive remedy for each residential or residential-like property undergoing remediation will include removal of the upper twelve inches (12") of existing landscaping and soil, followed by replacement with new soil, lawn, and landscaping. Adjustments to this default plan will be made for properties as required to preserve non-replaceable plants and mature trees.

Wooded areas as defined in Section 7.4.3.1 will not have a presumptive remedy applied until land use is changed by an owner from wooded area to residential use. Discernible, accessible and maintained trails, fire pits, and other actively used portions of wooded areas will receive targeted exposure control measures (such as placement of groundcover or replacement of soils in play areas or fire pits) where the wooded area or the maintained portion of the residential property are determined to be above the action level. Funding for future remedy will be addressed through the Trust (discussed in Section 7.6.1). In the unlikely event that a wooded area as defined in Section 7.4.3.1 is determined to be greater than generic non-residential direct contact criteria, the property will be addressed as defined for non-residential properties (Section 7.5.1).

For properties where the presumptive remedy is required, Dow will make best efforts to obtain appropriate access from the property owners for implementation of the property-specific presumptive remedy. During a property visit, Dow will communicate details regarding the presumptive remedy sampling effort and possible implications based on analytical results. Dow, along with the property owner, will develop and document property-specific remedy plans that meet the work plan objectives and address special concerns of the property owner. At this time, the property owner will have the opportunity to communicate specific concerns regarding unique features of their property. These unique features will be documented on the agreement form (see Midland Soils Cleanup Agreement Form in Attachment D).

During the property visit and after the site-specific plans are identified, Dow or its contractors will ask the property owners to grant access to Dow, MDEQ and the implementation contractor to implement the presumptive remedy activities. Approval to access the property to implement actions and complete follow-up activities will be documented on the agreement form (see Midland Soils Cleanup Agreement Form in Attachment D).

A schedule of field activities will be provided to the property owner. Coordination of field activities will be planned in a manner to minimize impact to property owners and to complete work in the same construction season in which the samples were collected, to the best of Dow's ability.

7.4.7 Completion of Presumptive Remedy

Remedy implementation will include utility identification, erosion control, soil removal and management, backfill and site restoration and vegetation replacement. In addition, duct cleaning will be offered as specified in this plan.

Prior to conducting any excavation, Dow's contractors will notify Michigan's One-Call Utility Notification Organization (MISS DIG) that fieldwork has been scheduled. MISS DIG will be notified of the impending site work via phone (800-482-7171, or 811) or through the MISS DIG website (http://www.missdig.net/). MISS DIG will mark public underground utilities. Property owners will be asked to identify any additional underground features that they are aware of that may not be identified by MISS DIG.

Storm water protection will be implemented throughout the project as necessary, in accordance with permits and the Project Soil Erosion and Sedimentation Control Plan, included as Attachment I. A Soil Erosion and Sedimentation Control (SE\SC) permit will be obtained for the approximately 1,700 acres that make up the Midland Resolution Area in accordance with Part 91 of the Natural Resources and Environmental Protection Act (NREPA), 1994 PA 451, as amended. A Notice of Coverage will be obtained for the Midland Resolution Area, to meet the requirements of Part 31 of the NREPA, 1994 PA 451, as amended.

When using heavy equipment during excavation and/or construction, diesel emissions will be minimized, to the extent practicable (see Attachment L). Where feasible, soils will be removed by hand digging and/or mechanical excavation to a minimum depth of 12 inches. Several homes include decks, above ground pools, or similar structures that cover soil. These structures are considered part of the foot print of the homes and therefore, no excavation of surface soils will be conducted beneath these structures. In the cases where decks are elevated to the degree that they reasonably allow for use of the ground beneath them, excavation will be completed to the extent necessary and practical. In some cases, new cover and/or a barrier may be placed to reduce contact to the existing soils. Soils adjacent to other structures (e.g., sidewalks, garages, slab foundations and homes) will be excavated at a slope that will not undermine the structures. Surface soils adjacent to mature trees will be removed in a "cone" method to prevent damage to the root system. Soils will be removed to the extent possible between the trunk and the drip line (approximate extent of canopy) which will not cause an adverse effect to the tree. A temporary construction barricade (orange safety fencing) will be placed around the excavation to prevent unpermitted entry, while construction crews are not present.

The excavated soils will be placed into trucks for transport to the Michigan Operation plant site for re-use or to an appropriate disposal facility. After loading, the trucks will be tarped for transport. Restoration of disturbed areas will include backfilling and replacing vegetation. New topsoil and backfill will be imported by the contracting firm from a borrow location that is outside the area possibly impacted by releases from the Dow Michigan Operations Facility, transported to the site and placed by mechanical equipment and hand tools. To ensure backfill and topsoils are suitable for use, topsoil from borrow sources will be tested for the presence of dioxins and furans as well as metals, and/or index properties such as organic content and grain size as a measure of topsoil quality. The final four to six inches of surface backfill materials will be topsoil. Deeper replacement soils may be clean fill soil. Excavated areas will be re-vegetated with sod or seed, as appropriate for the area. Previously landscaped areas will be replanted with similar plants (flower gardens, etc.) and all structures (swing sets, etc.) displaced during the removal process will be replaced, consistent with the property-specific plan developed with the property owner.

Dust management and trackout control measures will be performed for the duration of the project on all areas involved in the soil removal work. Dust will be managed with water and/or dust palliatives. Trackout will be managed by removing all visible soil from vehicles and equipment prior to exiting the work site. Soil removal will be performed with brooms, brushes, shovels, etc., but no water will be used. All soil removed during this process will be placed in trucks and sent to Michigan Operations for reuse or properly disposed of. A wet vacuum street sweeper will be utilized to clean the roadway in the event of observable trackout.

Workers will be provided with hand wash stations and restroom facilities. Rubber boots or project-specific footwear and/or disposable track mats will be used by workers to prevent track-out of impacted soils into vehicles. Typical construction clothing (work clothing and leather or fabric gloves) is adequate to protect workers, as noted in the project Health and Safety Plan, included for reference as Attachment J.

7.4.7.1 Construction Quality Assurance

Construction activities will be documented by property to record the details of construction, ensure they are consistent with the presumptive remedy, and note exceptions. Documentation will take the form of a log that is kept for each DU. An example log is included as Attachment F. The area of soil removal will be recorded on the log. The depth of removal will be measured and recorded at approximately three (3) to nine (9) locations per DU, depending on size and geometry of the excavation. The number of truck loads of soil removed from each property will be recorded. CQA documentation will be maintained throughout the project for MDEQ review.

Portions of each DU will remain undisturbed by any necessary cleanup activities (such as soil remaining beneath appurtenant structures such as decks and pools). However, the average concentration of dioxin and furan TEQ on the property after clean up will be less than the SSAL. A demonstration of DU weighted average concentration will be provided in the annual report for each DU where excavation and replacement is done. The total undisturbed and/or inaccessible areas will be assumed to be equal to the concentration determined for the DU prior to cleanup. Remedy areas will be assumed to have the concentrations from the borrow source. Land under permanent in ground structures such as houses and driveways will not be considered in the calculation. This evaluation will also confirm the percentage of undisturbed remaining soil post-remedy and will identify if remedy is required for accumulated dust, as described below.

If the undisturbed limited-use wooded areas (as defined in 7.4.3.1) were sampled, the evaluation will be made using the known concentration for the wooded areas. If the wooded areas were not sampled, the evaluation will use the concentration measured for the maintained portion of that parcel prior to cleanup.

Upon completion of the remedy, an evaluation of possible exposure to dust accumulated within dwelling(s) ducts will be completed by utilizing the analytical result for the DU (soil concentration) and the percent undisturbed remaining soil. These site-specific parameters and the same assumptions defined in Section 6, will be used in the site-specific algorithm equation to solve for target risk (TR). Duct cleaning will be offered for all DUs with calculated TR values greater than 1E-05. If remedy of accumulated dust is warranted, Dow will provide the property owner with a voucher and a list of vendors that conduct duct cleaning. The owner may schedule the duct cleaning service at their convenience at any time during the six months following issuance of the voucher. Dow will receive an invoice and pay for the service. This invoice will be provided in the Annual Report to document completion of dust remedy.

7.4.7.2 Post Remedy Care and Maintenance

During construction activities, vegetation and landscaping will be replaced in disturbed areas. Maintenance activities including post construction watering will be completed by Dow to allow the new vegetation to become established. Periodic inspection of the new vegetation will occur until the end of the growing season. Replacement of plants or trees that do not survive until the next construction season will be performed, as described in the site-specific remediation plan for each DU. Watering services will be provided at Dow's expense after construction and will continue into the fall of the construction year in which the planting was performed. A final communication will be provided to the property owner when the post remedy maintenance has ended.

7.5 Response Actions Addressing Non-Residential Land Use

Measured concentrations of dioxin and furan TEQ beyond the Dow Plant site within the Midland Resolution Area are below MDEQ generic non-residential Direct Contact Criteria (990 ppt TEQ). With a limited exception described below concentrations of dioxins and furans TEQ on non-residential property in the Resolution Area will not require additional evaluation under this work plan. Current delineation of non-residential land use is based on a preliminary review of the properties. As the work progresses, site visits or surveys will be conducted as necessary to verify that non-residential properties (e.g., businesses) are not currently also used as a residence or in a manner which constitutes residential-like use (as described in Section 4.2.2). Additionally, non-residential properties bordering residential properties will be evaluated for the potential for soil and sediment erosion and transport by surface water runoff. Figure 7-8 presents the approximate schedule during which a more thorough evaluation of site use will be conducted. A non-residential property will be addressed as a residential property under this Work Plan, if it is used as a residence or in a residential-like manner.

Property that is currently used for non-residential purposes but is located in a zoning district that allows residential uses will take potential future use into consideration, and will be addressed in one of the following ways, as appropriate to the circumstances, in most cases, appropriate institutional controls or use restrictions will be applied to limit future use to non-residential uses (as described in Section 7.6). In limited cases, the property may be sampled and addressed as a residential property or be included in the Trust Fund to provide for sampling and remediation if the property is converted to residential use in the future. Limited sampling of some non-residential property may occur to more clearly define and limit appropriate boundaries for application of institutional controls, or to define the boundary of the Midland Resolution Area.

Discrete samples from three Dow-owned properties that fall within the land use area that is predominantly industrial/commercial exhibited detected concentrations of dioxin and furan TEQ that exceeded the MDEQ generic non-residential Direct Contact Criteria of 990 ppt TEQ. Figure 7-9 presents the sample locations that were collected in 2010. All are located near the Michigan Operations Facility. A sample location at Site 1 exhibited a detected concentration greater than 990 ppt TEQ (1,150 ppt TEQ). However, the 95% UCL for the analytical results in the 0-6" depth range at this site is 558 ppt TEQ. Therefore, no further action is necessary to address this sample. Site F1 had two detected concentrations that were greater than 990 ppt TEQ (1,770 and 1,130 ppt TEQ). However, the 95% UCL for the analytical results in the 0-6" depth range at this site was 575 ppt TEQ. Therefore, no further action is necessary to address this sample location.

In an area that was formerly a rail track spur, a discrete sample from location B1-03R10_1"-6", obtained from Site B-01 on 11/12/2010 had a measured concentration of roughly 10,600 ppt TEQ. A number of additional discrete soil samples were obtained from Site B-001 in July 2011, with a resulting 95% upper confidence level (UCL) of 1,384 µg/Kg. Dow submitted the *Work Plan for Site B-001 Remediation Project to* MDEQ for review on September 27, 2011. This work plan proposed targeted remedial activities for this site where the 95% UCL exceeded 990 ppt TEQ. Response Actions were implemented per that Work Plan beginning on October 5 and were completed November 11, 2011. Dow submitted the *Work Plan Addendum for Site B-001*

Remediation Project on November 9, 2011 to address the MDEQ approval stipulation that Dow must propose a plan and schedule to investigate concentrations of dioxins and furans along the former rail spur to the north of Austin Street to determine if additional remediation is necessary. The Addendum is incorporated with this Work Plan as Attachment H. As indicated, the work identified in the Attachment H will be implemented on the same schedule as the Year 1 Midland Area Soils activities.

7.5.1 Decision Rules for Non-Residential Property

As discussed above, current data indicate that non-residential property in the Resolution Area, with two exceptions described below where more data is needed, is below the non-residential DCC and, therefore, no further evaluation or remedial action is necessary. This section sets forth remedial decisions for two exceptions: 1) the rail track spur area discussed above, and 2) densely wooded areas greater than 7,200 square feet (based on zoning code, see Section 7.4.3.1) with no active residential use. At the scale of the DU, soil testing results will be used to determine if the presumptive remedy is warranted at such properties.

One composite sample and two replicates will be collected from these non-residential properties and will be tested at the laboratory by Method 8280 MAS. If results of testing indicate that a concentration greater than 990 ppt TEQ for the DU, either the DU will be demonstrated to be below an appropriate action level for non-residential use incorporating appropriate site-specific exposure assumptions or a presumptive remedy will be implemented as specified in this Work Plan (Section 7.4.7).

7.6 Presumptive Remedy Addressing Future Land Use

Throughout this project and into the future, changes in land use may be expected. The remedy within the Midland Resolution Area must also address reasonably anticipated future use. The mechanisms to address this include institutional controls/land use restrictions or, in limited cases, sampling and remediation as a residential property and the funding of a trust to provide for the remedy at such a time as land use changes. For properties that are not addressed as set forth above, identification of changes in land use will be accomplished through appropriate monitoring.

7.6.1 Trust Fund

As described above, some property owners may decline to allow the presumptive remedy to be implemented at their property, or may wish to defer the remedy for a period of time. In such cases, the property owner, or future owners, will retain the option to have the presumptive remedy performed at a later date of the owner's choosing. In addition, heavily wooded lots that have not been sampled or where remedy was declined or deferred and are zoned to allow residential-like use will be included in the Trust. Dow will establish a trust fund to assure that funds are available to carry out the presumptive remedy work in the future (Trust Fund). The Trust Fund will be funded by Dow in an amount equal to the average cost of performing the presumptive remedy at residential properties (as determined in the first construction season) multiplied by the number of properties that deferred or declined to have the remedy implemented (including wooded properties, as discussed below). Dow will fund the Trust pursuant to the schedule in Section 10 of this Work Plan.

In addition to the properties described above, the remedy will automatically be deferred to heavily wooded areas. However, as long as they remain wooded, property owners or future owners may desire to remove the timber to facilitate residential development. In such a case, Dow will perform the presumptive remedy after the owner has removed the timber for further residential development. In some cases, non-residential property that is located in a zoning district that allows residential uses may also be included in the Trust Fund so that such property can be converted to residential use in the future. In such a case, the Trust Fund will be funded with an additional amount equal to the average cost of performing the presumptive remedy at residential properties.

7.6.2 Institutional Controls

Institutional controls and use restrictions impose land or resource restrictions to: (1) limit or prohibit activities that interfere with the integrity or effectiveness of response action activities; (2) limit or prohibit activities that may result in exposure to a hazardous substance at a site; (3) provide notice about the presence of a hazardous substance at a site (MDEQ, 2007). Typically, institutional controls and use restrictions take the form of ordinances and restrictive covenants (RCs), respectively.

The remedy is designed to be consistent with zoning ordinances in the City of Midland. Areas that are zoned “industrial,” “commercial” and “residential” will be able to maintain industrial, commercial, and current residential uses, respectively. See Section 4.2.3 for a discussion of zoning districts in the City. However, some potential future uses may need to be prohibited through the implementation of zoning or the recording of restrictive covenants (RCs). For example, some residential-like uses that are currently authorized in commercial districts in the Midland Resolution Area may have to be prohibited in the future.

If the final remedy for a property relies on the property being restricted to non-residential uses, and all residential or residential-like uses are not already prohibited by City ordinance, then the property will be restricted in one of two ways: 1) a RC will be filed for the property which prohibits residential and residential-like use; or 2) the applicable City ordinance will be amended to prohibit residential and residential-like uses for the area where that property is located. The details of each will be approved by MDEQ prior to implementation.

7.6.3 Monitoring

Properties which are classified non-residential will not be sampled. However, some businesses are located in areas that may allow for conversion to residential or residential like use in the future. Institutional controls are planned for implementation to prevent residential or residential like use of these properties. Prior to that time, it is possible some businesses could be converted to residential use. To address this possibility, non-residential properties within the Resolution Area will be identified and monitored for changes to residential or residential like land use until appropriate institutional controls prohibiting this use are in place. Wooded areas also may be converted by the owner in the future into residential use. These areas will also be identified and monitored for changes in land use. Properties identified for duct-cleaning that did not utilize the voucher provided by Dow (e.g., Dow did not receive an invoice for the duct cleaning services) will be added to the list for monitoring. In conjunction with the evaluation of non-residential land use described in Section 7.5, monitoring during the project may consist of:

- An initial site visit and interview with property owner to verify use is non-residential;
- An annual review of tax records to identify ownership changes;

- Communication to new property owners to verify use is non-residential; and
- Add a deed notice on the property.

Properties where owners decline participation in the program and wooded areas with limited current use properties will have the remedy deferred and funding placed into a Trust. These properties will be monitored for change in ownership and/or changes in use. If changes in ownership or use are identified the owners will be advised of options for cleanup. A Monitoring Plan for these properties will be submitted prior to completion of the project which will identify specific properties subject to monitoring and provide methods and details of monitoring.

7.7 Final Delineation of Midland Resolution Area

The outer extent of the Midland Resolution Area has been described based on existing data and evaluations. A significant amount of new dioxin and furan TEQ concentration data will be generated during the implementation process. An assessment of this data will be used to establish the final boundary of the Area (see Section 9).

Because of the release mechanism (aerial dispersion and deposition), data for each DU sampled are anticipated to reflect the pattern of a typical air deposition "plume." Concentrations close to the source are relatively higher, with concentrations decreasing with distance away from the source. At some distance from the source, concentrations in the soils should be consistently below the action level. The final boundary will be defined when the available incremental compositing data show that areas beyond the proposed boundary will be less than 250 ppt TEQ. This will generally be accomplished where three properties in a row, moving outward from the Michigan Operations plant, are determined to be below the SSAL (taking physical features and age of property development into account). Roadways will not be counted as a "property" for this purpose, but may be used to delineate the final boundary if clean properties are on either side. The final boundary will be proposed by Dow and will be subject to MDEQ approval. Results of all sampling completed during the construction year will be reviewed at the end of the season when evaluating the outer boundary.

A significant portion of the current northeast boundary of the Midland Resolution Area does not contain residential property. Because widespread sampling that will otherwise take place within residential areas is not anticipated here, this portion of the current boundary is further considered as described below. Properties directly north and east of the current Midland Resolution Area, shown on Figure 7-10, will be proposed for sampling to verify the boundary under either of the following circumstances:

- Either I-008 or I-010 to the northeast are confirmed to be greater than the SSAL (section 7.2); or
- Remedy is required for the properties outlined in Figure 7-10, located generally between Sweede Rd and Carolina and Iowa Streets.

The final boundaries will be designed based on the results of sampling and evaluation through an Adaptive Management process, described further in Sections 7.2 and 9, Outliers and Adaptive Management, respectively.

8.0 Project Implementation for Year 1

Year 1 implementation is currently scheduled to begin in 2012 upon approval of the Work Plan. Work in Year 1 will be implemented on a DU-by-DU basis. Year 1 focuses on the properties that are within the closest distance from the Michigan Operations facility within the Midland Resolution Area. The Year 1 implementation plan addresses approximately 30 acres with a total of 113 properties. This initial year focuses on a smaller area than what is currently anticipated for the following years of implementation, to allow for a shorter than normal field season and make provision for lessons experienced in the field during initial implementation. The results of the implementation of Year 1 field work will serve to further refine and improve the methods and plans for the following years, as described in Section 9.

Year 1 encompasses the areas described below, totaling approximately 30 acres of property that is in residential (25 acres) or residential-like (3 acres) use. Roughly 2 acres in this area are in non-residential use. The aerial extent of the Year 1 implementation area to the northwest of the Midland Facility is:

- Bound to the north by Grove St. and Pine St.;
- Bound to the west by Cronkright St., George St., and Mill St.;
- Bound to the east by East Patrick St and State St.; and
- Bound to the south by E. Indian St. and Buttles St.

The aerial extent of the Year 1 implementation area to the east of Michigan Operations is:

- Bound to the north by Bay City Road;
- Bound to the west by Kent Street;
- Bound to the east by Walter Street and a fenceline observed between Walter and Sam St.; and
- Bound to the south by Mark Putnam Rd.

Table 8-1 presents the properties included in the Year 1 Implementation activities. These areas are also shown on Figures 8-1 and 8-2.

8.1 Sampling Plans

For the purposes of the Year 1 work, a DU is defined as an individual limited use woodland greater than 7200 square feet or an individual residential property. The following sections present the specific details for those DUs in the area described above. The preliminary sampling information is provided in Table 8-2, including property size and the number of increments. Attachment G presents drawings showing the planned increment sample locations for each individual DU.

8.1.1 Residential DUs < 1 Acre

There are 103 DUs in the Year 1 Area (Group A) that are less than one (1) acre in size. Of these, there are approximately 79 DUs that are ¼-acre or smaller, where ten (10) increments will be collected. There are 24 DUs remaining that are greater than ¼-acre, where twenty (20) increments will be collected, as listed in Table 8-2.

Not listed on Table 8-2 is an unclaimed parcel in this area that resulted from abandonment from Grove Street. For purposes of sampling, this abandoned land will be combined with adjacent parcel 14-21-10-344. All parcels adjacent to this abandoned land are owned by the City of Midland.

8.1.2 Residential DUs > 1 Acre

There are 2 Residential DUs in the Year 1 Area (Group A) that are greater in size than one (1) acre. Parcels 14-21-10-308 (1.2 acres) and 14-21-10-410 (1.3 acres) are grassed lots that are currently zoned for Residential B and Community, along the Business 10 corridor. Samples will be obtained using thirty (30 increments) from each area.

8.1.3 Properties with Woodland Areas

There are twelve (12) DUs in the Year 1 Area (Group A) that have tentatively been identified to contain wooded areas with limited current use greater than 7,200 square feet, as shown in Table 8-2. Final confirmation will be made during a site visit.

8.1.4 Non-Residential DUs

In the Year 1 Area (Group A), there are five (5) non-residential properties which will be addressed under the Monitoring Program (Section 7.6.3). Parcel 14-23-50-060 (2.05 acres) is a vacant wooded lot and fenced-in pump station currently zoned Industrial at the south end of Kent

Court owned by the City of Midland. Residential use is not currently allowable under current zoning nor is the property residential like in nature; therefore sampling will not be conducted at this property. Parcel 14-23-60-160 (1.58 acres) is grassed land with some commercial operations currently zoned both Regional Commercial and Residential B. The property is owned by a local contracting firm, and is not in current residential use nor is it residential like in nature. Sampling will not be conducted at this property. Parcel 14-21-10-344 is an office building currently zoned Office Service (OS). Parcel 14-21-80-499 is currently a paved parking lot, currently zoned OS. Parcel 14-21-10-398 is a local business building, currently zoned Residential B. These properties are not currently being used as a residence, nor are they residential-like in nature; therefore, they will be included in the Monitoring Program (Section 7.6.3).

9.0 Adaptive Management

Due to the significant extent of the area in scope for this project and the large number of individual property owners involved, completion of the sampling and presumptive remedy phases are projected to be implemented over several years. To address uncertainties in soil concentrations or variability in the residential properties themselves, an iterative approach to planning and implementation will be utilized to maximize efficiencies to the greatest extent practicable. This effort involves utilizing an adaptive management approach for the project which provides the opportunity for improvement throughout the life of the implementation effort however the depth of remediation (12 inches) and SSAL will not change. There are a number of aspects of the work that may be proposed and submitted for approval, depending on the results of previous or on-going work, such as:

- Property owner communication methods;
- Specific properties scheduled for evaluation including modifications to property groupings;
- Decision Unit definitions;
- Means and methods to conduct the remedy;
- Decision Rules (not action level);
- Number of increments in a composite sample;
- Number of sample replicates;
- Sample processing techniques;
- Sampling of non-residential properties;
- Monitoring and management of undisturbed and limited use woodland properties;
- Boundary of Resolution Area; and
- Annual schedule.

9.1 Rationale for Changes

A number of aspects of this project have been designed to manage the uncertainty related to the distribution of dioxin and furan TEQ in soils within the Resolution Area. During this project, a large amount of soil concentration data will be obtained from residential areas, beginning nearest the plant and working outward. As the data set grows, the uncertainties will diminish, allowing changes to the design and plans that are no longer necessary or appropriate. As an example, non-residential properties will not have soil testing performed early in the project, because surrounding residential properties will. In some cases, property use restrictions are necessary for non-residential land (to prevent it from becoming residential in the future). It may be possible to infer which non-residential properties would require restriction based on the surrounding residential data obtained over the next few years. Some areas may be able to be eliminated, based on the soil data obtained, while others may require sampling. The data collected early on will inform how to manage long-term use of non-residential areas.

Similarly, replicate data obtained in early phases of the project will inform our current understanding of spatial variability and sampling techniques. Future years may be able to reduce the number of replicate analyses, alter the decision rules related to further testing, or agglomerate properties into larger DUs, rather than a single DU per property.

The current multi-year property groupings (Group A thru F) are largely based on distance from Dow's Midland Plant. Soil dioxin and furan TEQ distribution data obtained in early years may support focusing during subsequent years on those areas most likely to require remedy, which would result in a modification of the groupings shown in Figure 7-4.

9.2 Incorporation of Findings into Implementation Plans

A summary of work completed, data evaluation and findings from each field season will be compiled and submitted to the regulatory agencies at the end of each year. A review of the summary report for each field season will inform understanding of the scope of work required to meet the objectives of this project, and will enable the project team to streamline implementation to focus on the work that is necessary as well as avoid delays, minimize cost, and maximize positive impact to the community. Specific changes or adaptations identified during data evaluation from previous efforts will be incorporated into updated implementation plans for each year of the project. Although these findings will be presented in the annual summary report, communication with MDEQ will be frequent throughout the implementation of the project. If necessary, more frequent updates to the plans will be coordinated with MDEQ to resolve issues that require more timely adaptation.

9.3 Midland Resolution Area Boundary

As described in Section 7.7, the boundary of the Midland Resolution Area has been established based on current data. The boundary may change, using data collected during this project. Each year, the study areas designated for sampling (A thru F, see Section 7.1) will be fully investigated. All available data will be reviewed annually to determine if the boundary needs to be modified. Each year, the area designated for sampling will be fully implemented. In the summary report, changes to the boundary will be effectively made according to the following example.

The purpose of the boundary is to definitively establish an area beyond which no remedy is offered. The final boundary will be defined when the available incremental compositing data show that areas beyond the proposed boundary will be less than 250 ppt TEQ. This will generally be accomplished where three properties in a row, moving outward from the Michigan Operations plant, and determined to be below the SSAL (taking physical features and age of property development into account). Roadways will not be counted as a “property” for this purpose, but may be used to delineate the final boundary if clean properties are on either side. Along the currently defined northeastern boundary, where limited residential property is available, additional consideration will be made, as described in Section 7.7. The final boundary will be proposed by Dow and will be subject to MDEQ approval.

10.0 Reporting and Schedule

Properties within the Resolution Area have been divided into property groups for Years 1 through 6 of remedy implementation. Each year of implementation includes sampling, analysis, a review of analytical data results and determination of the necessity for implementing the remedy, and implementation of any necessary remedy, all within a seasonal window that allows for this effort to take place, roughly from late spring to early fall.

10.1 Reporting

For Interim Response Activities, Operating License Condition XI.G.6 specifies submittal of monthly written progress reports to the MDEQ Division Chief. For this project, an alternate communication strategy is proposed. Due to the collaborative nature of the project, periodic project coordination meetings will take place between Dow and MDEQ approximately every two weeks during the field season. To facilitate the exchange of information, a progress tracking log that is frequently updated will be made available to MDEQ on a continual basis. Access to the tracking log is being provided in lieu of a monthly written progress report. An annual written report will be prepared and submitted, summarizing the activities that took place during that year.

10.2 Schedule

Year 1 is scheduled for implementation beginning upon approval of the Work Plan. Approval is currently anticipated prior to June 1, 2012. If approval occurs after that date the proposed Year 1 schedule may require adjustment. Additional implementation activities are scheduled for subsequent calendar years. At the conclusion of the field implementation each year, an annual Remedial Implementation Summary Report will be prepared to document the findings of the implementation effort and to describe implementation plans for the next year.

Proposed Schedule of Remedial Implementation

Year of Implementation	Activity	Months of Activity/Report Submittal Date
Year 1	Best Efforts to Obtain Access Sampling & Data Evaluation Remedy and Post Remedy Care Begin Interim Monitoring*	April – July 2012 June – August 2012 August – October 2012 October – November 2012
	Year 1 Summary Report (documentation of findings)	December 2012
	Year 2 Adaptive Management and Implementation Plan	January 2013
Year 2	Best Efforts to Obtain Access Sampling & Data Evaluation Remedy and Post Remedy Care	March – June 2013 May – August 2013 August – October 2013
	Year 2 Summary Report (documentation of findings)	December 2013
	Year 3 Adaptive Management and Implementation Plan	January 2014
Year 3	Best Efforts to Obtain Access Sampling & Data Evaluation Remedy and Post Remedy Care	March – June 2014 May – August 2014 August – October 2014
	Year 3 Summary Report (documentation of findings)	December 2014
	Year 4 Adaptive Management and Implementation Plan	January 2015
Year 4	Best Efforts to Obtain Access Sampling & Data Evaluation Remedy and Post Remedy Care	March – June 2015 May – August 2015 August – October 2015
	Year 4 Summary Report (documentation of findings)	December 2015
	Year 5 Adaptive Management and Implementation Plan	January 2016
Year 5	Best Efforts to Obtain Access Sampling & Data Evaluation Remedy and Post Remedy Care	March – June 2016 May – August 2016 August – October 2016
	Year 5 Summary Report (documentation of findings)	December 2016
	Year 6 Adaptive Management and Implementation Plan	January 2017
Year 6	Best Efforts to Obtain Access Sampling & Data Evaluation Remedy and Post Remedy Care	March – June 2017 May – August 2017 August – October 2017
	Year 6 Summary Report (documentation of findings)	December 2017
Year 7	Trust Funding	March 2018
	Long Term Monitoring Plan	March 2018
	Institutional Control Proposal	March 2018

* For non-residential properties and those properties where property owners declined participation or remedy.

Additional years of work may be necessary if the boundary of the Midland Resolution Area is expanded. As mentioned in Section 1 and discussed further in Attachment A, additional regulatory deliverables are necessary to meet the requirements of the License. A schedule for submittal of those documents is provided below:

Proposed Regulatory Deliverable Schedule

Task	Timeframe/Duration
Midland Area Soils Leachability Testing Study	June 1, 2012
Revised SOW and RI Work Plan	December 2013
RI Final Report	December 2013
Provide a schedule for both RAP and RAP completion report	December 2013

11.0 References

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Table 3-1
World Health Organization Mammalian Toxic Equivalency Factors

Congener	1998 TEF	2005 TEF
2,3,7,8-TCDD	1	1
1,2,3,7,8-PeCDD	1	1
1,2,3,4,7,8-HxCDD	0.1	0.1
1,2,3,6,7,8-HxCDD	0.1	0.1
1,2,3,7,8,9-HxCDD	0.1	0.1
1,2,3,4,6,7,8-HpCDD	0.01	0.01
OCDD	0.0001	0.0003
2,3,7,8-TCDF	0.1	0.1
1,2,3,7,8-PeCDF	0.05	0.03
2,3,4,7,8-PeCDF	0.5	0.3
1,2,3,4,7,8-HxCDF	0.1	0.1
1,2,3,6,7,8-HxCDF	0.1	0.1
1,2,3,7,8,9-HxCDF	0.1	0.1
2,3,4,6,7,8-HxCDF	0.1	0.1
1,2,3,4,6,7,8-HpCDF	0.01	0.01
1,2,3,4,7,8,9-HpCDF	0.01	0.01
OCDF	0.0001	0.0003

Sources: Van den Berg et al., 1998; Van den Berg et al., 2006

Notes:
PeCDD = pentachlorodibenzo-p-dioxin
HxCDD = hexachlorodibenzo-p-dioxin
HpCDD = heptachlorodibenzo-p-dioxin
OCDD = octachlorodibenzo-p-dioxin
TCDF = tetrachlorodibenzofuran
PeCDF = pentachlorodibenzofuran
HxCDF = hexachlorodibenzofuran
HpCDF = heptachlorodibenzofuran
OCDF = octachlorodibenzofuran

Table 5-1
Summary Statistics for Metals

				Number of Samples					Summary Statistics on Site Samples							(A) Background Screen		(A1) Statewide Default Background [1]			(A2) Modified Urban Background [2]		
Analyte Group	**Analyte**	**CAS**	**Unit**	**No. of Samples from 2005/6 Dow On-Site**	**No. of Samples from 2006 COM Blind**	**No. of Samples from 2010 Dow**	**No. of Samples from 2010 MDEQ**	**Total No. of Samples**	**Detection Rate**	**Mean**	**Std Dev**	**Min Detected Value**	**Max Detected Value**	**Min RL of NDs**	**Max RL of NDs**	**Screen Out? (all data < one or more background)**	**Meets Screening Criteria**	**Mean + 1 Std Dev**	**Percent Exceed (Detect)**	**Percent Exceed (Non-detect)**	**Mean + 2 Std Dev**	**Percent Exceed (Detect)**	**Percent Exceed (Non-detect)**
Mercury	Mercury	7439-97-6	ug/kg	23	72	99	33	**227**	89%	73.0	245.4	5.71	3,440	16	62.4	**No**	--	130	6%	0%	180	4%	0%
Metals	Aluminum	7429-90-5	ug/kg	23	0	99	33	**155**	100%	3,091,331	2,486,965	416,874	14,200,000	--	--	**No**	--	6,900,000	10%	0%	11,673,000	1%	0%
Metals	Antimony	7440-36-0	ug/kg	0	72	99	33	**204**	38%	498	791	14	4,530	150	5,600								
Metals	Arsenic	7440-38-2	ug/kg	23	72	99	33	**227**	99%	4,628	5,637	195	59,200	1,190	2,270	**No**	--	5,800	21%	0%	11,290	7%	0%
Metals	Barium	7440-39-3	ug/kg	23	72	0	33	**128**	100%	38,856	22,224	7,620	137,000	--	--	**Yes**	A2	75,000	6%	0%	178,000	0%	0%
Metals	Beryllium	7440-41-7	ug/kg	23	72	0	33	**128**	93%	298	195	47	1,170	101	1,170	**No**	--				430	18%	5%
Metals	Boron	7440-42-8	ug/kg	0	0	99	33	**132**	99%	8,986	3,728	970	22,627	9,200	9,200								
Metals	Cadmium	7440-43-9	ug/kg	23	72	0	33	**128**	92%	321	284	20.5	1,570	103	1,170	**Yes**	A2	1,200	2%	0%	2,000	0%	0%
Metals	Calcium	7440-70-2	ug/kg	23	0	0	0	**23**	100%	97,044,130	80,734,405	4,140,000	269,000,000	--	--								
Metals	Chromium	7440-47-3	ug/kg	23	72	99	33	**227**	100%	9,614	7,351	783	60,700	--	--	**No**	--	18,000	6%	0%	21,930	4%	0%
Metals	Chromium VI	18540-29-9	ug/kg	23	0	0	0	**23**	13%	711	889	863	4,610	810	1,100								
Metals	Cobalt	7440-48-4	ug/kg	23	72	99	33	**227**	100%	2,385	1,190	402	7,420	--	--	**No**	--	6,800	0.9%	0%	5,900	2%	0%
Metals	Copper	7440-50-8	ug/kg	23	72	0	33	**128**	100%	18,330	19,492	2,000	183,000	--	--	**No**	--	32,000	13%	0%	38,080	8%	0%
Metals	Iron	7439-89-6	ug/kg	23	0	0	33	**56**	100%	8,036,518	5,803,437	2,100,000	30,200,000	--	--	**No**	--	12,000,000	13%	0%	21,916,000	5%	0%
Metals	Lead	7439-92-1	ug/kg	23	72	99	33	**227**	100%	29,563	53,681	1,483	666,000	--	--	**No**	--	21,000	34%	0%	114,220	5%	0%
Metals	Lithium	7439-93-2	ug/kg	23	0	99	33	**155**	100%	6,075	3,423	1,040	16,570	--	--	**No**	--	9,800	16%	0%	12,500	5%	0%
Metals	Magnesium	7439-95-4	ug/kg	23	0	99	33	**155**	100%	3,142,780	2,943,442	177,576	15,521,500	--	--	**Yes**	A2				29,875,000	0%	0%
Metals	Manganese	7439-96-5	ug/kg	23	0	99	33	**155**	100%	88,932	69,842	10,091	547,757	--	--	**Yes**	A2	440,000	0.6%	0%	1,298,000	0%	0%
Metals	Molybdenum	7439-98-7	ug/kg	23	0	0	33	**56**	61%	2,284	3,409	96	2,000	4,055	23,200								
Metals	Nickel	7440-02-0	ug/kg	23	72	99	0	**194**	99%	9,465	15,219	1,670	209,000	350	350	**No**	--	20,000	3%	0%			
Metals	Potassium	7440-09-7	ug/kg	23	0	0	0	**23**	91%	784,707	436,782	235,500	1,830,000	496,500	580,000								
Metals	Selenium	7782-49-2	ug/kg	23	72	99	33	**227**	33%	390	577	120	5,720	80	1,400	**No**	--	410	24%	32%	770	11%	3%
Metals	Silver	7440-22-4	ug/kg	23	72	99	33	**227**	14%	131	159	25	1,680	90	1,120	**No**	--	1,000	0.4%	0.4%			
Metals	Sodium	7440-23-5	ug/kg	23	0	0	33	**56**	61%	203,987	290,770	42,000	1,940,000	101,000	600,000								
Metals	Strontium	7440-24-6	ug/kg	23	0	99	33	**155**	100%	32,451	39,291	2,100	201,919	--	--								
Metals	Thallium	7440-28-0	ug/kg	23	72	99	33	**227**	15%	303	276	35	230	101	4,670								
Metals	Thorium	7440-29-1	ug/kg	0	0	0	33	**33**	94%	2,072	1,926	440	3,300	17,000	19,000								
Metals	Tin	7440-31-5	ug/kg	0	72	99	0	**171**	6%	2,433	12,259	532	158,000	760	23,300								
Metals	Titanium	7440-32-6	ug/kg	23	0	0	0	**23**	100%	129,535	75,383	48,700	427,000	--	--								
Metals	Vanadium	7440-62-2	ug/kg	23	72	0	33	**128**	100%	11,856	7,319	2,250	74,000	--	--	**No**	--				21,980	3.1%	0%
Metals	Zinc	7440-66-6	ug/kg	23	72	0	33	**128**	100%	67,227	94,389	4,800	798,500	--	--	**No**	--	47,000	40%	0%	139,650	11%	0%

Notes:
If duplicates exist, the average of the duplicate results was used as a single data point.
Nondetects were substituted by half of reporting limit (RL) for the computation of summary statistics.
Laboratory QAQC results are not included.

Sources:
(1) Michigan Statewide Default Background Levels.
(2) Communication with Al Taylor, MDEQ (August 12, 2011)

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				Number of Samples					Summary Statistics								(A) Background Screen	
Analyte Group	**Analyte**	**CAS Number**	**Unit**	**No. of Samples from 2005/6 Dow On-Site**	**No. of Samples from 2006 COM Blind**	**No. of Samples from 2010 Dow**	**No. of Samples from 2010 MDEQ**	**Total No. of Samples**	**Detection Rate**	**Mean**	**Std Dev**	**Min Detected Value**	**Max Detected Value**	**Min RL of NDs**	**Max RL of NDs**	**Max RL of NDs (Off-site)**	**Group A?**	**MDEQ Target Detection Levels**
Cyanide	Cyanide, Total	57-12-5	ug/kg	0	72	99	33	**204**	86%	156	151	12	863	40	610	610	--	100
Herbicides	2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	ug/kg	0	72	0	0	**72**	1%	10.5	1.9	17.3	17.3	18.4	47.2	47.2	--	500
Herbicides	2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	ug/kg	0	72	0	0	**72**	15%	13.9	13.2	8.39	83.8	18.4	47.2	47.2	--	200
Herbicides	Silvex (2,4,5-TP)	93-72-1	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	18.4	47.2	47.2	--	300
Mercury	Mercury	7439-97-6	ug/kg	23	72	99	33	**227**	89%	73.0	245.4	5.71	3,440	16	62.4	50	--	50
Metals	Aluminum	7429-90-5	ug/kg	23	0	99	33	**155**	100%	3,091,331	2,486,965	416,874	14,200,000	--	--	--	--	1000
Metals	Antimony	7440-36-0	ug/kg	0	72	99	33	**204**	38%	498	791	14	4,530	150	5,600	5,600	--	300
Metals	Arsenic	7440-38-2	ug/kg	23	72	99	33	**227**	99%	4,628	5,637	195	59,200	1,190	2,270	2,270	--	100
Metals	Barium	7440-39-3	ug/kg	23	72	0	33	**128**	100%	38,856	22,224	7,620	137,000	--	--	--	A2	1000
Metals	Beryllium	7440-41-7	ug/kg	23	72	0	33	**128**	93%	298	195	47	1,170	101	1,170	1,170	--	500
Metals	Boron	7440-42-8	ug/kg	0	0	99	33	**132**	99%	8,986	3,728	970	22,627	9,200	9,200	9,200	--	8000
Metals	Cadmium	7440-43-9	ug/kg	23	72	0	33	**128**	92%	321	284	20.5	1,570	103	1,170	1,170	A2	200
Metals	Calcium	7440-70-2	ug/kg	23	0	0	0	**23**	100%	97,044,130	80,734,405	4,140,000	269,000,000	--	--	--	--	--
Metals	Chromium	7440-47-3	ug/kg	23	72	99	33	**227**	100%	9,614	7,351	783	60,700	--	--	--	--	2000
Metals	Chromium VI	18540-29-9	ug/kg	23	0	0	0	**23**	13%	711	889	863	4,610	810	1,100	--	--	2000
Metals	Cobalt	7440-48-4	ug/kg	23	72	99	33	**227**	100%	2,385	1,190	402	7,420	--	--	--	--	500
Metals	Copper	7440-50-8	ug/kg	23	72	0	33	**128**	100%	18,330	19,492	2,000	183,000	--	--	--	--	1000
Metals	Iron	7439-89-6	ug/kg	23	0	0	33	**56**	100%	8,036,518	5,803,437	2,100,000	30,200,000	--	--	--	--	5000
Metals	Lead	7439-92-1	ug/kg	23	72	99	33	**227**	100%	29,563	53,681	1,483	666,000	--	--	--	--	1000
Metals	Lithium	7439-93-2	ug/kg	23	0	99	33	**155**	100%	6,075	3,423	1,040	16,570	--	--	--	--	400
Metals	Magnesium	7439-95-4	ug/kg	23	0	99	33	**155**	100%	3,142,780	2,943,442	177,576	15,521,500	--	--	--	A2	4000
Metals	Manganese	7439-96-5	ug/kg	23	0	99	33	**155**	100%	88,932	69,842	10,091	547,757	--	--	--	A2	1000
Metals	Molybdenum	7439-98-7	ug/kg	23	0	0	33	**56**	61%	2,284	3,409	96	2,000	4,055	23,200	--	--	1000
Metals	Nickel	7440-02-0	ug/kg	23	72	99	0	**194**	99%	9,465	15,219	1,670	209,000	350	350	350	--	1000
Metals	Potassium	7440-09-7	ug/kg	23	0	0	0	**23**	91%	784,707	436,782	235,500	1,830,000	496,500	580,000	--	--	--
Metals	Selenium	7782-49-2	ug/kg	23	72	99	33	**227**	33%	390	577	120	5,720	80	1,400	1,400	--	200
Metals	Silver	7440-22-4	ug/kg	23	72	99	33	**227**	14%	131	159	25	1,680	90	1,120	1,120	--	100
Metals	Sodium	7440-23-5	ug/kg	23	0	0	33	**56**	61%	203,987	290,770	42,000	1,940,000	101,000	600,000	600,000	--	10000
Metals	Strontium	7440-24-6	ug/kg	23	0	99	33	**155**	100%	32,451	39,291	2,100	201,919	--	--	--	--	5000
Metals	Thallium	7440-28-0	ug/kg	23	72	99	33	**227**	15%	303	276	35	230	101	4,670	4,670	--	500
Metals	Thorium	7440-29-1	ug/kg	0	0	0	33	**33**	94%	2,072	1,926	440	3,300	17,000	19,000	19,000	--	1000
Metals	Tin	7440-31-5	ug/kg	0	72	99	0	**171**	6%	2,433	12,259	532	158,000	760	23,300	23,300	--	--
Metals	Titanium	7440-32-6	ug/kg	23	0	0	0	**23**	100%	129,535	75,383	48,700	427,000	--	--	--	--	--
Metals	Vanadium	7440-62-2	ug/kg	23	72	0	33	**128**	100%	11,856	7,319	2,250	74,000	--	--	--	--	1000
Metals	Zinc	7440-66-6	ug/kg	23	72	0	33	**128**	100%	67,227	94,389	4,800	798,500	--	--	--	--	1000
PCBs	PCBs, Total	1336-36-3	ug/kg	23	72	0	33	**128**	6%	113	369	60.4	973	33	8,000	1,121	--	330
Pesticides	4,4'-DDD	72-54-8	ug/kg	23	72	0	33	**128**	30%	15.0	38.8	0.858	345	8.9	180	180	--	20
Pesticides	4,4'-DDE	72-55-9	ug/kg	23	72	0	33	**128**	57%	54.8	237.5	1.115	2,400	8.9	115	115	--	20
Pesticides	4,4'-DDT	50-29-3	ug/kg	23	72	0	33	**128**	52%	49.0	212.6	1.04	1,741	8.9	115	115	--	20
Pesticides	Aldrin	309-00-2	ug/kg	23	72	0	33	**128**	3%	21.5	65.9	0.799	3.04	8.9	1,301	1,301	--	20
Pesticides	alpha-BHC	319-84-6	ug/kg	23	72	99	33	**227**	5%	14.5	51.2	0.909	150	7	1,301	1,301	--	10
Pesticides	Beta BHC	319-85-7	ug/kg	23	72	0	33	**128**	4%	21.9	65.8	1.55	29.7	8.9	1,301	1,301	--	20

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				(B) Target Detection Level Screen				(C) Identify Criteria											
Analyte Group	Analyte	CAS Number	Unit	Max RL of NDs < TDL	Max RL of NDs (Off-site) < TDL	Max RL of NDs < All Criteria	Group B?	Have Criteria?	Minimum Criteria	Group C?	Residential Drinking Water Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Groundwater Surface Water Interface Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Groundwater Contact Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)
Cyanide	Cyanide, Total	57-12-5	ug/kg	No	No	No	--	Yes	100	--	4000	0%	0%	100	46%	7%	250000	0%	0%
Herbicides	2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	ug/kg	Yes	Yes	Yes	--	Yes	150	--	--	--	--	--	--	--	--	--	--
Herbicides	2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	ug/kg	Yes	Yes	Yes	--	Yes	1400	--	1400	0%	0%	4400	0%	0%	2400000	0%	0%
Herbicides	Silvex (2,4,5-TP)	93-72-1	ug/kg	Yes	Yes	Yes	B1	Yes	2200	--	3600	0%	0%	2200	0%	0%	3100000	0%	0%
Mercury	Mercury	7439-97-6	ug/kg	No	No	No	--	Yes	50	--	1700	0.4%	0%	50	29%	2%	47000	0%	0%
Metals	Aluminum	7429-90-5	ug/kg	Yes	Yes	Yes	--	Yes	1000	--	1000	100%	0%	--	--	--	1E+09	0%	0%
Metals	Antimony	7440-36-0	ug/kg	No	No	No	--	Yes	4300	--	4300	0.5%	1.0%	94000	0%	0%	49000000	0%	0%
Metals	Arsenic	7440-38-2	ug/kg	No	No	Yes	--	Yes	4600	--	4600	33%	0%	4600	33%	0%	2000000	0%	0%
Metals	Barium	7440-39-3	ug/kg	Yes	Yes	Yes	--	Yes	300000	--	1300000	0%	0%	300000	0%	0%	1E+09	0%	0%
Metals	Beryllium	7440-41-7	ug/kg	No	No	Yes	--	Yes	33000	--	51000	0%	0%	33000	0%	0%	1E+09	0%	0%
Metals	Boron	7440-42-8	ug/kg	No	No	Yes	--	Yes	10000	--	10000	38%	0%	100000	0%	0%	1E+09	0%	0%
Metals	Cadmium	7440-43-9	ug/kg	No	No	Yes	--	Yes	2800	--	6000	0%	0%	2800	0%	0%	2.3E+08	0%	0%
Metals	Calcium	7440-70-2	ug/kg	No	No	Yes	--	No	--	C2	--	--	--	--	--	--	--	--	--
Metals	Chromium	7440-47-3	ug/kg	Yes	Yes	Yes	--	Yes	3300	--	30000	2%	0%	3300	94%	0%	1.4E+08	0%	0%
Metals	Chromium VI	18540-29-9	ug/kg	Yes	Yes	Yes	--	Yes	3300	--	30000	0%	0%	3300	4%	0%	1.4E+08	0%	0%
Metals	Cobalt	7440-48-4	ug/kg	Yes	Yes	Yes	--	Yes	800	--	800	96%	0%	2000	53%	0%	48000000	0%	0%
Metals	Copper	7440-50-8	ug/kg	Yes	Yes	Yes	--	Yes	54000	--	5800000	0%	0%	54000	3%	0%	1E+09	0%	0%
Metals	Iron	7439-89-6	ug/kg	Yes	Yes	Yes	--	Yes	6000	--	6000	100%	0%	--	--	--	1E+09	0%	0%
Metals	Lead	7439-92-1	ug/kg	Yes	Yes	Yes	--	Yes	400000	--	700000	0%	0%	1900000	0%	0%	--	--	--
Metals	Lithium	7439-93-2	ug/kg	Yes	Yes	Yes	--	Yes	3400	--	3400	72%	0%	8800	23%	0%	1.1E+08	0%	0%
Metals	Magnesium	7439-95-4	ug/kg	Yes	Yes	Yes	--	Yes	8000000	--	8000000	8%	0%	--	--	--	1E+09	0%	0%
Metals	Manganese	7439-96-5	ug/kg	Yes	Yes	Yes	--	Yes	1000	--	1000	100%	0%	26000	92%	0%	1.8E+08	0%	0%
Metals	Molybdenum	7439-98-7	ug/kg	No	Yes	No	--	Yes	1500	--	1500	2%	39%	64000	0%	0%	19000000	0%	0%
Metals	Nickel	7440-02-0	ug/kg	Yes	Yes	Yes	--	Yes	56000	--	100000	0.5%	0%	56000	0.5%	0%	1E+09	0%	0%
Metals	Potassium	7440-09-7	ug/kg	No	No	Yes	--	No	--	C2	--	--	--	--	--	--	--	--	--
Metals	Selenium	7782-49-2	ug/kg	No	No	No	--	Yes	400	--	4000	0.4%	0%	400	25%	32%	78000000	0%	0%
Metals	Silver	7440-22-4	ug/kg	No	No	No	--	Yes	100	--	4500	0%	0%	100	3%	41%	2E+08	0%	0%
Metals	Sodium	7440-23-5	ug/kg	No	No	Yes	--	Yes	2500000	--	2500000	0%	0%	--	--	--	1E+09	0%	0%
Metals	Strontium	7440-24-6	ug/kg	Yes	Yes	Yes	--	Yes	92000	--	92000	8%	0%	420000	0%	0%	1E+09	0%	0%
Metals	Thallium	7440-28-0	ug/kg	No	No	No	--	Yes	2300	--	2300	0%	2%	4200	0%	0.9%	15000000	0%	0%
Metals	Thorium	7440-29-1	ug/kg	No	No	Yes	--	No	--	C2	--	--	--	--	--	--	--	--	--
Metals	Tin	7440-31-5	ug/kg	No	No	Yes	--	Yes	5500000	--	--	--	--	--	--	--	--	--	--
Metals	Titanium	7440-32-6	ug/kg	No	No	Yes	--	No	--	C2	--	--	--	--	--	--	--	--	--
Metals	Vanadium	7440-62-2	ug/kg	Yes	Yes	Yes	--	Yes	72000	--	72000	0.8%	0%	190000	0%	0%	1E+09	0%	0%
Metals	Zinc	7440-66-6	ug/kg	Yes	Yes	Yes	--	Yes	120000	--	2400000	0%	0%	120000	12%	0%	1E+09	0%	0%
PCBs	PCBs, Total	1336-36-3	ug/kg	No	No	No	--	Yes	1000	--	--	--	--	--	--	--	--	--	--
Pesticides	4,4'-DDD	72-54-8	ug/kg	No	No	Yes	--	Yes	95000	--	--	--	--	--	--	--	--	--	--
Pesticides	4,4'-DDE	72-55-9	ug/kg	No	No	Yes	--	Yes	45000	--	--	--	--	--	--	--	--	--	--
Pesticides	4,4'-DDT	50-29-3	ug/kg	No	No	Yes	--	Yes	57000	--	--	--	--	--	--	--	--	--	--
Pesticides	Aldrin	309-00-2	ug/kg	No	No	No	--	Yes	1000	--	--	--	--	--	--	--	--	--	--
Pesticides	alpha-BHC	319-84-6	ug/kg	No	No	No	--	Yes	18	--	18	1%	30%	--	--	--	2500	0%	0%
Pesticides	Beta BHC	319-85-7	ug/kg	No	No	No	--	Yes	37	--	37	0%	9%	--	--	--	5100	0%	0%

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	Residential Soil Volatilization to Indoor Air Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air1	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air2	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Particulate Soil Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Direct Contact
Cyanide	Cyanide, Total	57-12-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	250000	0%	0%	12000
Herbicides	2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Herbicides	2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	6.7E+09	0%	0%	2500000
Herbicides	Silvex (2,4,5-TP)	93-72-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1700000
Mercury	Mercury	7439-97-6	ug/kg	48000	0%	0%	52000	0%	0%	52000	0%	0%	52000	0%	0%	20000000	0%	0%	160000
Metals	Aluminum	7429-90-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50000000
Metals	Antimony	7440-36-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	13000000	0%	0%	180000
Metals	Arsenic	7440-38-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	720000	0%	0%	7600
Metals	Barium	7440-39-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	3.3E+08	0%	0%	37000000
Metals	Beryllium	7440-41-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	1300000	0%	0%	410000
Metals	Boron	7440-42-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	48000000
Metals	Cadmium	7440-43-9	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	1700000	0%	0%	550000
Metals	Calcium	7440-70-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals	Chromium	7440-47-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	260000	0%	0%	2500000
Metals	Chromium VI	18540-29-9	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	260000	0%	0%	2500000
Metals	Cobalt	7440-48-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	13000000	0%	0%	2600000
Metals	Copper	7440-50-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	1.3E+08	0%	0%	20000000
Metals	Iron	7439-89-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.6E+08
Metals	Lead	7439-92-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	1E+08	0%	0%	400000
Metals	Lithium	7439-93-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4200000
Metals	Magnesium	7439-95-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	6.7E+09	0%	0%	1E+09
Metals	Manganese	7439-96-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	3300000	0%	0%	25000000
Metals	Molybdenum	7439-98-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2600000
Metals	Nickel	7440-02-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	13000000	0%	0%	40000000
Metals	Potassium	7440-09-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals	Selenium	7782-49-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	1.3E+08	0%	0%	2600000
Metals	Silver	7440-22-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	6700000	0%	0%	2500000
Metals	Sodium	7440-23-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1E+09
Metals	Strontium	7440-24-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.3E+08
Metals	Thallium	7440-28-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	13000000	0%	0%	35000
Metals	Thorium	7440-29-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals	Tin	7440-31-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals	Titanium	7440-32-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals	Vanadium	7440-62-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	750000
Metals	Zinc	7440-66-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.7E+08
PCBs	PCBs, Total	1336-36-3	ug/kg	3000000	0%	0%	240000	0%	0%	7900000	0%	0%	7900000	0%	0%	5200000	0%	0%	1000
Pesticides	4,4'-DDD	72-54-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	44000000	0%	0%	95000
Pesticides	4,4'-DDE	72-55-9	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	32000000	0%	0%	45000
Pesticides	4,4'-DDT	50-29-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	32000000	0%	0%	57000
Pesticides	Aldrin	309-00-2	ug/kg	1300000	0%	0%	58000	0%	0%	58000	0%	0%	58000	0%	0%	640000	0%	0%	1000
Pesticides	alpha-BHC	319-84-6	ug/kg	30000	0%	0%	12000	0%	0%	22000	0%	0%	25000	0%	0%	1700000	0%	0%	2600
Pesticides	Beta BHC	319-85-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	5900000	0%	0%	5400

Table 5-2
Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				(D) Pathway-Specific Toxicity Screening Criteria															
Analyte Group	Analyte	CAS Number	Unit	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Soil Saturation Screening Levels	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential Drinking Water Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential GW Contact Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Soil Volatilization to Indoor Air Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air	Percent Exceed (Detect)
Cyanide	Cyanide, Total	57-12-5	ug/kg	0%	0%	--	--	--	4000	0%	0%	250000	0%	0%	--	--	--	--	--
Herbicides	2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Herbicides	2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	ug/kg	0%	0%	--	--	--	1400	0%	0%	2400000	0%	0%	--	--	--	--	--
Herbicides	Silvex (2,4,5-TP)	93-72-1	ug/kg	0%	0%	--	--	--	3600	0%	0%	3100000	0%	0%	--	--	--	--	--
Mercury	Mercury	7439-97-6	ug/kg	0%	0%	--	--	--	1700	0.4%	0%	47000	0%	0%	89000	0%	0%	62000	0%
Metals	Aluminum	7429-90-5	ug/kg	0%	0%	--	--	--	1000	100%	0%	1E+09	0%	0%	--	--	--	--	--
Metals	Antimony	7440-36-0	ug/kg	0%	0%	--	--	--	4300	0.5%	1.0%	49000000	0%	0%	--	--	--	--	--
Metals	Arsenic	7440-38-2	ug/kg	15%	0%	--	--	--	4600	33%	0%	2000000	0%	0%	--	--	--	--	--
Metals	Barium	7440-39-3	ug/kg	0%	0%	--	--	--	1300000	0%	0%	1E+09	0%	0%	--	--	--	--	--
Metals	Beryllium	7440-41-7	ug/kg	0%	0%	--	--	--	51000	0%	0%	1E+09	0%	0%	--	--	--	--	--
Metals	Boron	7440-42-8	ug/kg	0%	0%	--	--	--	10000	38%	0%	1E+09	0%	0%	--	--	--	--	--
Metals	Cadmium	7440-43-9	ug/kg	0%	0%	--	--	--	6000	0%	0%	2.3E+08	0%	0%	--	--	--	--	--
Metals	Calcium	7440-70-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals	Chromium	7440-47-3	ug/kg	0%	0%	--	--	--	30000	2%	0%	1.4E+08	0%	0%	--	--	--	--	--
Metals	Chromium VI	18540-29-9	ug/kg	0%	0%	--	--	--	30000	0%	0%	1.4E+08	0%	0%	--	--	--	--	--
Metals	Cobalt	7440-48-4	ug/kg	0%	0%	--	--	--	2000	53%	0%	48000000	0%	0%	--	--	--	--	--
Metals	Copper	7440-50-8	ug/kg	0%	0%	--	--	--	5800000	0%	0%	1E+09	0%	0%	--	--	--	--	--
Metals	Iron	7439-89-6	ug/kg	0%	0%	--	--	--	6000	100%	0%	1E+09	0%	0%	--	--	--	--	--
Metals	Lead	7439-92-1	ug/kg	0.4%	0%	--	--	--	700000	0%	0%	--	--	--	--	--	--	--	--
Metals	Lithium	7439-93-2	ug/kg	0%	0%	--	--	--	7000	35%	0%	1.1E+08	0%	0%	--	--	--	--	--
Metals	Magnesium	7439-95-4	ug/kg	0%	0%	--	--	--	22000000	0%	0%	1E+09	0%	0%	--	--	--	--	--
Metals	Manganese	7439-96-5	ug/kg	0%	0%	--	--	--	1000	100%	0%	1.8E+08	0%	0%	--	--	--	--	--
Metals	Molybdenum	7439-98-7	ug/kg	0%	0%	--	--	--	4200	0%	34%	19000000	0%	0%	--	--	--	--	--
Metals	Nickel	7440-02-0	ug/kg	0%	0%	--	--	--	100000	0.5%	0%	1E+09	0%	0%	--	--	--	--	--
Metals	Potassium	7440-09-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals	Selenium	7782-49-2	ug/kg	0%	0%	--	--	--	4000	0.4%	0%	78000000	0%	0%	--	--	--	--	--
Metals	Silver	7440-22-4	ug/kg	0%	0%	--	--	--	13000	0%	0%	2E+08	0%	0%	--	--	--	--	--
Metals	Sodium	7440-23-5	ug/kg	0%	0%	--	--	--	7000000	0%	0%	1E+09	0%	0%	--	--	--	--	--
Metals	Strontium	7440-24-6	ug/kg	0%	0%	--	--	--	260000	0%	0%	1E+09	0%	0%	--	--	--	--	--
Metals	Thallium	7440-28-0	ug/kg	0%	0%	--	--	--	2300	0%	2%	15000000	0%	0%	--	--	--	--	--
Metals	Thorium	7440-29-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals	Tin	7440-31-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals	Titanium	7440-32-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals	Vanadium	7440-62-2	ug/kg	0%	0%	--	--	--	990000	0%	0%	1E+09	0%	0%	--	--	--	--	--
Metals	Zinc	7440-66-6	ug/kg	0%	0%	--	--	--	5000000	0%	0%	1E+09	0%	0%	--	--	--	--	--
PCBs	PCBs, Total	1336-36-3	ug/kg	0%	2%	--	--	--	--	--	--	--	--	--	16000000	0%	0%	810000	0%
Pesticides	4,4'-DDD	72-54-8	ug/kg	0%	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	4,4'-DDE	72-55-9	ug/kg	0%	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	4,4'-DDT	50-29-3	ug/kg	0%	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	Aldrin	309-00-2	ug/kg	0%	0.8%	--	--	--	--	--	--	--	--	--	7100000	0%	0%	200000	0%
Pesticides	alpha-BHC	319-84-6	ug/kg	0%	0%	--	--	--	71	0.9%	4%	2500	0%	0%	160000	0%	0%	41000	0%
Pesticides	Beta BHC	319-85-7	ug/kg	0%	0%	--	--	--	150	0%	5%	5100	0%	0%	--	--	--	--	--

Table 5-2
Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air1	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air2	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Particulate Soil Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential Soil Direct Contact	Percent Exceed (Detect)	Percent Exceed (Non-detect)	EPA Residential Soil	Percent Exceed (Detect)	Percent Exceed (Non-detect)
Cyanide	Cyanide, Total	57-12-5	ug/kg	--	--	--	--	--	--	--	250000	0%	0%	250000	0%	0%	--	--	--
Herbicides	2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	610000	0%	0%
Herbicides	2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	ug/kg	--	--	--	--	--	--	--	2.9E+09	0%	0%	8600000	0%	0%	--	--	--
Herbicides	Silvex (2,4,5-TP)	93-72-1	ug/kg	--	--	--	--	--	--	--	--	--	--	5500000	0%	0%	--	--	--
Mercury	Mercury	7439-97-6	ug/kg	0%	62000	0%	0%	62000	0%	0%	8800000	0%	0%	580000	0%	0%	--	--	--
Metals	Aluminum	7429-90-5	ug/kg	--	--	--	--	--	--	--	--	--	--	3.7E+08	0%	0%	--	--	--
Metals	Antimony	7440-36-0	ug/kg	--	--	--	--	--	--	--	5900000	0%	0%	670000	0%	0%	--	--	--
Metals	Arsenic	7440-38-2	ug/kg	--	--	--	--	--	--	--	910000	0%	0%	37000	0.9%	0%	--	--	--
Metals	Barium	7440-39-3	ug/kg	--	--	--	--	--	--	--	1.5E+08	0%	0%	1.3E+08	0%	0%	--	--	--
Metals	Beryllium	7440-41-7	ug/kg	--	--	--	--	--	--	--	590000	0%	0%	1600000	0%	0%	--	--	--
Metals	Boron	7440-42-8	ug/kg	--	--	--	--	--	--	--	--	--	--	3.5E+08	0%	0%	--	--	--
Metals	Cadmium	7440-43-9	ug/kg	--	--	--	--	--	--	--	2200000	0%	0%	2100000	0%	0%	--	--	--
Metals	Calcium	7440-70-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals	Chromium	7440-47-3	ug/kg	--	--	--	--	--	--	--	240000	0%	0%	9200000	0%	0%	--	--	--
Metals	Chromium VI	18540-29-9	ug/kg	--	--	--	--	--	--	--	240000	0%	0%	9200000	0%	0%	--	--	--
Metals	Cobalt	7440-48-4	ug/kg	--	--	--	--	--	--	--	5900000	0%	0%	9000000	0%	0%	--	--	--
Metals	Copper	7440-50-8	ug/kg	--	--	--	--	--	--	--	59000000	0%	0%	73000000	0%	0%	--	--	--
Metals	Iron	7439-89-6	ug/kg	--	--	--	--	--	--	--	--	--	--	5.8E+08	0%	0%	--	--	--
Metals	Lead	7439-92-1	ug/kg	--	--	--	--	--	--	--	44000000	0%	0%	900000	0%	0%	--	--	--
Metals	Lithium	7439-93-2	ug/kg	--	--	--	--	--	--	--	--	--	--	31000000	0%	0%	--	--	--
Metals	Magnesium	7439-95-4	ug/kg	--	--	--	--	--	--	--	2.9E+09	0%	0%	1E+09	0%	0%	--	--	--
Metals	Manganese	7439-96-5	ug/kg	--	--	--	--	--	--	--	1500000	0%	0%	90000000	0%	0%	--	--	--
Metals	Molybdenum	7439-98-7	ug/kg	--	--	--	--	--	--	--	--	--	--	9600000	0%	0%	--	--	--
Metals	Nickel	7440-02-0	ug/kg	--	--	--	--	--	--	--	16000000	0%	0%	1.5E+08	0%	0%	--	--	--
Metals	Potassium	7440-09-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals	Selenium	7782-49-2	ug/kg	--	--	--	--	--	--	--	59000000	0%	0%	9600000	0%	0%	--	--	--
Metals	Silver	7440-22-4	ug/kg	--	--	--	--	--	--	--	2900000	0%	0%	9000000	0%	0%	--	--	--
Metals	Sodium	7440-23-5	ug/kg	--	--	--	--	--	--	--	--	--	--	1E+09	0%	0%	--	--	--
Metals	Strontium	7440-24-6	ug/kg	--	--	--	--	--	--	--	--	--	--	1E+09	0%	0%	--	--	--
Metals	Thallium	7440-28-0	ug/kg	--	--	--	--	--	--	--	5900000	0%	0%	130000	0%	0%	--	--	--
Metals	Thorium	7440-29-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals	Tin	7440-31-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	47000000	0%	0%
Metals	Titanium	7440-32-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals	Vanadium	7440-62-2	ug/kg	--	--	--	--	--	--	--	--	--	--	5500000	0%	0%	--	--	--
Metals	Zinc	7440-66-6	ug/kg	--	--	--	--	--	--	--	--	--	--	6.3E+08	0%	0%	--	--	--
PCBs	PCBs, Total	1336-36-3	ug/kg	0%	28000000	0%	0%	28000000	0%	0%	6500000	0%	0%	1000	0%	2%	--	--	--
Pesticides	4,4'-DDD	72-54-8	ug/kg	--	--	--	--	--	--	--	56000000	0%	0%	400000	0%	0%	--	--	--
Pesticides	4,4'-DDE	72-55-9	ug/kg	--	--	--	--	--	--	--	40000000	0%	0%	190000	0%	0%	--	--	--
Pesticides	4,4'-DDT	50-29-3	ug/kg	--	--	--	--	--	--	--	40000000	0%	0%	280000	0%	0%	--	--	--
Pesticides	Aldrin	309-00-2	ug/kg	0%	200000	0%	0%	200000	0%	0%	800000	0%	0%	4300	0%	0%	--	--	--
Pesticides	alpha-BHC	319-84-6	ug/kg	0%	86000	0%	0%	86000	0%	0%	2100000	0%	0%	12000	0%	0%	--	--	--
Pesticides	Beta BHC	319-85-7	ug/kg	--	--	--	--	--	--	--	7400000	0%	0%	25000	0%	0%	--	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	EPA Industrial Soil	Percent Exceed (Detect)	Percent Exceed (Non-detect)	EPA Risk-Based SSL	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Group D2 and D3?	Group D4?	Group D5 and D6?
Cyanide	Cyanide, Total	57-12-5	ug/kg	--	--	--	--	--	--	--	--	D6
Herbicides	2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	ug/kg	6200000	0%	0%	150	0%	0%	D2	--	--
Herbicides	2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	ug/kg	--	--	--	--	--	--	D3	--	--
Herbicides	Silvex (2,4,5-TP)	93-72-1	ug/kg	--	--	--	--	--	--	--	--	--
Mercury	Mercury	7439-97-6	ug/kg	--	--	--	--	--	--	--	--	D6
Metals	Aluminum	7429-90-5	ug/kg	--	--	--	--	--	--	--	--	D6
Metals	Antimony	7440-36-0	ug/kg	--	--	--	--	--	--	--	--	D6
Metals	Arsenic	7440-38-2	ug/kg	--	--	--	--	--	--	--	--	D6
Metals	Barium	7440-39-3	ug/kg	--	--	--	--	--	--	--	--	--
Metals	Beryllium	7440-41-7	ug/kg	--	--	--	--	--	--	D3	--	--
Metals	Boron	7440-42-8	ug/kg	--	--	--	--	--	--	--	--	D6
Metals	Cadmium	7440-43-9	ug/kg	--	--	--	--	--	--	--	--	--
Metals	Calcium	7440-70-2	ug/kg	--	--	--	--	--	--	--	--	--
Metals	Chromium	7440-47-3	ug/kg	--	--	--	--	--	--	--	--	D6
Metals	Chromium VI	18540-29-9	ug/kg	--	--	--	--	--	--	--	--	D6
Metals	Cobalt	7440-48-4	ug/kg	--	--	--	--	--	--	--	--	D6
Metals	Copper	7440-50-8	ug/kg	--	--	--	--	--	--	--	--	D6
Metals	Iron	7439-89-6	ug/kg	--	--	--	--	--	--	--	--	D6
Metals	Lead	7439-92-1	ug/kg	--	--	--	--	--	--	--	--	D6
Metals	Lithium	7439-93-2	ug/kg	--	--	--	--	--	--	--	--	D6
Metals	Magnesium	7439-95-4	ug/kg	--	--	--	--	--	--	--	--	--
Metals	Manganese	7439-96-5	ug/kg	--	--	--	--	--	--	--	--	--
Metals	Molybdenum	7439-98-7	ug/kg	--	--	--	--	--	--	--	--	D6
Metals	Nickel	7440-02-0	ug/kg	--	--	--	--	--	--	--	--	D6
Metals	Potassium	7440-09-7	ug/kg	--	--	--	--	--	--	--	--	--
Metals	Selenium	7782-49-2	ug/kg	--	--	--	--	--	--	--	--	D6
Metals	Silver	7440-22-4	ug/kg	--	--	--	--	--	--	--	--	D6
Metals	Sodium	7440-23-5	ug/kg	--	--	--	--	--	--	D3	--	--
Metals	Strontium	7440-24-6	ug/kg	--	--	--	--	--	--	--	--	D6
Metals	Thallium	7440-28-0	ug/kg	--	--	--	--	--	--	--	D4	--
Metals	Thorium	7440-29-1	ug/kg	--	--	--	--	--	--	--	--	--
Metals	Tin	7440-31-5	ug/kg	6.1E+08	0%	0%	5500000	0%	0%	D3	--	--
Metals	Titanium	7440-32-6	ug/kg	--	--	--	--	--	--	--	--	--
Metals	Vanadium	7440-62-2	ug/kg	--	--	--	--	--	--	--	--	D6
Metals	Zinc	7440-66-6	ug/kg	--	--	--	--	--	--	--	--	D6
PCBs	PCBs, Total	1336-36-3	ug/kg	--	--	--	--	--	--	--	D4	--
Pesticides	4,4'-DDD	72-54-8	ug/kg	--	--	--	--	--	--	D3	--	--
Pesticides	4,4'-DDE	72-55-9	ug/kg	--	--	--	--	--	--	D3	--	--
Pesticides	4,4'-DDT	50-29-3	ug/kg	--	--	--	--	--	--	D3	--	--
Pesticides	Aldrin	309-00-2	ug/kg	--	--	--	--	--	--	--	D4	--
Pesticides	alpha-BHC	319-84-6	ug/kg	--	--	--	--	--	--	--	--	D5
Pesticides	Beta BHC	319-85-7	ug/kg	--	--	--	--	--	--	--	D4	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				Number of Samples					Summary Statistics								(A) Background Screen	
Analyte Group	Analyte	CAS Number	Unit	No. of Samples from 2005/6 Dow On-Site	No. of Samples from 2006 COM Blind	No. of Samples from 2010 Dow	No. of Samples from 2010 MDEQ	Total No. of Samples	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	Min RL of NDs	Max RL of NDs	Max RL of NDs (Off-site)	Group A?	MDEQ Target Detection Levels
Pesticides	Chlordane, Total	57-74-9	ug/kg	23	72	99	33	**227**	6%	30.2	70.5	2.49	327	8.9	1,625	1,625	--	30
Pesticides	Delta BHC	319-86-8	ug/kg	23	72	0	33	**128**	5%	23.0	67.5	0.995	190	8.9	1,301	1,301	--	20
Pesticides	Dieldrin	60-57-1	ug/kg	23	72	0	33	**128**	10%	20.9	66.0	1.01	21.3	8.9	1,301	1,301	--	20
Pesticides	Endosulfan sulfate	1031-07-8	ug/kg	23	72	0	33	**128**	8%	22.2	65.8	1.8	46.6	8.9	1,301	1,301	--	20
Pesticides	Endosulfan, Total	115-29-7	ug/kg	23	72	0	33	**128**	16%	39.8	131.4	1.8	54.8	8.9	2,602	2,602	--	20
Pesticides	Endrin	72-20-8	ug/kg	23	72	0	33	**128**	2%	21.8	65.8	7.1	12.1	8.9	1,301	1,301	--	20
Pesticides	Endrin aldehyde	7421-93-4	ug/kg	23	72	0	33	**128**	2%	21.6	65.9	1.51	9.88	8.9	1,301	1,301	--	20
Pesticides	Endrin ketone	53494-70-5	ug/kg	23	0	0	33	**56**	0%	--	--	--	--	8.9	180	180	--	20
Pesticides	Gamma BHC (Lindane)	58-89-9	ug/kg	23	72	0	33	**128**	2%	21.9	65.8	3.2	33	8.9	1,301	1,301	--	20
Pesticides	Heptachlor	76-44-8	ug/kg	23	72	0	33	**128**	0%	--	--	--	--	8.9	1,301	1,301	--	20
Pesticides	Heptachlor epoxide	1024-57-3	ug/kg	23	72	0	33	**128**	16%	19.6	59.0	1.02	556	8.9	241	241	--	20
Pesticides	Methoxychlor	72-43-5	ug/kg	23	72	0	33	**128**	10%	50.4	163.6	2.94	159	17	3,255	3,255	--	50
Pesticides	Mirex	2385-85-5	ug/kg	23	0	0	33	**56**	4%	14.6	16.0	37	53	8.9	180	180	--	50
Pesticides	Toxaphene	8001-35-2	ug/kg	23	72	0	33	**128**	0%	--	--	--	--	170	11,085	11,085	--	170
Pesticides	Tris(2,3-dibromopropyl)phosphate	126-72-7	ug/kg	0	0	0	33	**33**	0%	--	--	--	--	730	15,000	15,000	--	330
Sulfide	Sulfide	18496-25-8	ug/kg	0	72	0	0	**72**	6%	52,740	18,882	79,250	157,750	86,000	226,000	226,000	--	1000
SVOCs	(E)-alpha,beta-2,3,4,5,6-Heptachlorostyrene	29086-38-2	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	30	60	60	--	--
SVOCs	(E)-beta-2,3,4,5,6-Hexachlorostyrene	90301-92-1	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	30	60	60	--	--
SVOCs	(Z)-alpha,beta-2,3,4,5,6-Heptachlorostyrene	29086-39-3	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	30	60	60	--	--
SVOCs	(Z)-beta-2,3,4,5,6-Hexachlorostyrene	90301-93-2	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	30	60	60	--	--
SVOCs	1,2,3,4-Tetrachlorobenzene	634-66-2	ug/kg	0	0	99	0	**99**	11%	11.7	4.4	10	30	19.8	39.6	39.6	--	330
SVOCs	1,2,3-Trichlorobenzene	87-61-6	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	26.4	52.8	52.8	--	--
SVOCs	1,2,4,5-Tetrachlorobenzene	95-94-3	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	330
SVOCs	1,2,4-Trichlorobenzene	120-82-1	ug/kg	23	0	99	28	**150**	4%	127	254	24.5	3,000	157	2,067	480	--	330
SVOCs	1,2-Diphenyl-hydrazine	122-66-7	ug/kg	0	0	0	33	**33**	0%	--	--	--	--	330	470	470	--	330
SVOCs	1,3-Dinitrobenzene	99-65-0	ug/kg	0	72	99	33	**204**	0%	--	--	--	--	39.996	919	919	--	330
SVOCs	1,4-Naphthoquinone	130-15-4	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	704	1,840	1,840	--	--
SVOCs	1-Naphthylamine	134-32-7	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	2,2'-Oxybis(1-Chloropropane)	108-60-1	ug/kg	0	72	0	33	**105**	0%	--	--	--	--	330	919	919	--	--
SVOCs	2,3,4,5,6-Pentachlorostyrene	14992-81-5	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	30	60	60	--	--
SVOCs	2,3,4,6-Tetrachlorophenol	58-90-2	ug/kg	0	72	0	0	**72**	8%	202	70	16	450	352	919	919	--	--
SVOCs	2,4,5-Trichlorophenol	95-95-4	ug/kg	23	72	0	33	**128**	4%	213	189	20	140	330	4,100	919	--	330
SVOCs	2,4,6-Trichlorophenol	88-06-2	ug/kg	23	72	0	33	**128**	2%	215	189	17	29	330	4,100	919	--	330
SVOCs	2,4-Dichlorophenol	120-83-2	ug/kg	23	72	0	0	**95**	0%	--	--	--	--	330	4,100	919	--	330
SVOCs	2,4-Dimethylphenol	105-67-9	ug/kg	23	72	0	33	**128**	0%	--	--	--	--	330	4,100	919	--	330
SVOCs	2,4-Dinitrophenol	51-28-5	ug/kg	23	72	0	33	**128**	0%	--	--	--	--	330	21,000	4,650	--	830
SVOCs	2,4-Dinitrotoluene	121-14-2	ug/kg	23	72	0	33	**128**	0%	--	--	--	--	330	4,100	919	--	330
SVOCs	2,6-Dichlorophenol	87-65-0	ug/kg	0	72	0	33	**105**	0%	--	--	--	--	330	919	919	--	330
SVOCs	2,6-Dimethylphenol	576-26-1	ug/kg	0	0	0	33	**33**	0%	--	--	--	--	330	470	470	--	330

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				(B) Target Detection Level Screen				(C) Identify Criteria											
Analyte Group	Analyte	CAS Number	Unit	Max RL of NDs < TDL	Max RL of NDs (Off-site) < TDL	Max RL of NDs < All Criteria	Group B?	Have Criteria?	Minimum Criteria	Group C?	Residential Drinking Water Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Groundwater Surface Water Interface Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Groundwater Contact Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)
Pesticides	Chlordane, Total	57-74-9	ug/kg	No	No	Yes	--	Yes	31000	--	--	--	--	--	--	--	--	--	--
Pesticides	Delta BHC	319-86-8	ug/kg	No	No	Yes	--	No	--	C1	--	--	--	--	--	--	--	--	--
Pesticides	Dieldrin	60-57-1	ug/kg	No	No	No	--	Yes	1100	--	--	--	--	--	--	--	--	--	--
Pesticides	Endosulfan sulfate	1031-07-8	ug/kg	No	No	Yes	--	No	--	C2	--	--	--	--	--	--	--	--	--
Pesticides	Endosulfan, Total	115-29-7	ug/kg	No	No	Yes	--	Yes	1400000	--	--	--	--	--	--	--	--	--	--
Pesticides	Endrin	72-20-8	ug/kg	No	No	Yes	--	Yes	65000	--	--	--	--	--	--	--	--	--	--
Pesticides	Endrin aldehyde	7421-93-4	ug/kg	No	No	Yes	--	No	--	C1	--	--	--	--	--	--	--	--	--
Pesticides	Endrin ketone	53494-70-5	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
Pesticides	Gamma BHC (Lindane)	58-89-9	ug/kg	No	No	No	--	Yes	20	--	20	0.8%	67%	20	0.8%	67%	7100	0%	0%
Pesticides	Heptachlor	76-44-8	ug/kg	No	No	Yes	B3	Yes	5600	--	--	--	--	--	--	--	--	--	--
Pesticides	Heptachlor epoxide	1024-57-3	ug/kg	No	No	Yes	--	Yes	3100	--	--	--	--	--	--	--	--	--	--
Pesticides	Methoxychlor	72-43-5	ug/kg	No	No	Yes	--	Yes	16000	--	16000	0%	0%	--	--	--	18000	0%	0%
Pesticides	Mirex	2385-85-5	ug/kg	No	No	Yes	--	Yes	9600	--	--	--	--	--	--	--	--	--	--
Pesticides	Toxaphene	8001-35-2	ug/kg	No	No	No	--	Yes	8200	--	24000	0%	0%	8200	0%	0.8%	360000	0%	0%
Pesticides	Tris(2,3-dibromopropyl)phosphate	126-72-7	ug/kg	No	No	No	--	Yes	930	--	930	0%	18%	--	--	--	27000	0%	0%
Sulfide	Sulfide	18496-25-8	ug/kg	No	No	Yes	--	No	--	C2	--	--	--	--	--	--	--	--	--
SVOCs	(E)-alpha,beta-2,3,4,5,6-Heptachlorostyrene	29086-38-2	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	(E)-beta-2,3,4,5,6-Hexachlorostyrene	90301-92-1	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	(Z)-alpha,beta-2,3,4,5,6-Heptachlorostyrene	29086-39-3	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	(Z)-beta-2,3,4,5,6-Hexachlorostyrene	90301-93-2	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	1,2,3,4-Tetrachlorobenzene	634-66-2	ug/kg	Yes	Yes	Yes	--	No	--	C2	--	--	--	--	--	--	--	--	--
SVOCs	1,2,3-Trichlorobenzene	87-61-6	ug/kg	No	No	Yes	B3	Yes	87	--	--	--	--	--	--	--	--	--	--
SVOCs	1,2,4,5-Tetrachlorobenzene	95-94-3	ug/kg	No	No	Yes	B3	Yes	3400	--	1500000	0%	0%	3400	0%	0%	1500000	0%	0%
SVOCs	1,2,4-Trichlorobenzene	120-82-1	ug/kg	No	No	Yes	--	Yes	4200	--	4200	0%	0%	5900	0%	0%	1100000	0%	0%
SVOCs	1,2-Diphenyl-hydrazine	122-66-7	ug/kg	No	No	No	--	Yes	0.27	--	--	--	--	--	--	--	--	--	--
SVOCs	1,3-Dinitrobenzene	99-65-0	ug/kg	No	No	No	--	Yes	3.3	--	--	--	--	--	--	--	--	--	--
SVOCs	1,4-Naphthoquinone	130-15-4	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	1-Naphthylamine	134-32-7	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2,2'-Oxybis(1-Chloropropane)	108-60-1	ug/kg	No	No	No	--	Yes	0.12	--	--	--	--	--	--	--	--	--	--
SVOCs	2,3,4,5,6-Pentachlorostyrene	14992-81-5	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2,3,4,6-Tetrachlorophenol	58-90-2	ug/kg	No	No	Yes	--	Yes	6700	--	--	--	--	--	--	--	--	--	--
SVOCs	2,4,5-Trichlorophenol	95-95-4	ug/kg	No	No	Yes	--	Yes	39000	--	39000	0%	0%	--	--	--	9100000	0%	0%
SVOCs	2,4,6-Trichlorophenol	88-06-2	ug/kg	No	No	No	--	Yes	330	--	2400	0%	0.8%	330	0%	90%	200000	0%	0%
SVOCs	2,4-Dichlorophenol	120-83-2	ug/kg	No	No	No	--	Yes	330	--	1500	0%	2%	330	0%	91%	960000	0%	0%
SVOCs	2,4-Dimethylphenol	105-67-9	ug/kg	No	No	Yes	B3	Yes	7400	--	7400	0%	0%	7600	0%	0%	10000000	0%	0%
SVOCs	2,4-Dinitrophenol	51-28-5	ug/kg	No	No	No	--	Yes	82	--	--	--	--	--	--	--	--	--	--
SVOCs	2,4-Dinitrotoluene	121-14-2	ug/kg	No	No	No	--	Yes	430	--	430	0%	12%	--	--	--	170000	0%	0%
SVOCs	2,6-Dichlorophenol	87-65-0	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2,6-Dimethylphenol	576-26-1	ug/kg	No	No	No	--	Yes	330	--	330	0%	97%	--	--	--	130000	0%	0%

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	Residential Soil Volatilization to Indoor Air Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air1	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air2	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Particulate Soil Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Direct Contact
Pesticides	Chlordane, Total	57-74-9	ug/kg	11000000	0%	0%	1200000	0%	0%	1200000	0%	0%	1200000	0%	0%	31000000	0%	0%	31000
Pesticides	Delta BHC	319-86-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	Dieldrin	60-57-1	ug/kg	140000	0%	0%	19000	0%	0%	19000	0%	0%	19000	0%	0%	680000	0%	0%	1100
Pesticides	Endosulfan sulfate	1031-07-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	Endosulfan, Total	115-29-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1400000
Pesticides	Endrin	72-20-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	65000
Pesticides	Endrin aldehyde	7421-93-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	Endrin ketone	53494-70-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	Gamma BHC (Lindane)	58-89-9	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8300
Pesticides	Heptachlor	76-44-8	ug/kg	350000	0%	0%	62000	0%	0%	62000	0%	0%	62000	0%	0%	2400000	0%	0%	5600
Pesticides	Heptachlor epoxide	1024-57-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	1200000	0%	0%	3100
Pesticides	Methoxychlor	72-43-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1900000
Pesticides	Mirex	2385-85-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9600
Pesticides	Toxaphene	8001-35-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	9700000	0%	0%	20000
Pesticides	Tris(2,3-dibromopropyl)phosphate	126-72-7	ug/kg	27000	0%	0%	18000	0%	0%	18000	0%	0%	18000	0%	0%	5900000	0%	0%	4400
Sulfide	Sulfide	18496-25-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	(E)-alpha,beta-2,3,4,5,6-Heptachlorostyrene	29086-38-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	(E)-beta-2,3,4,5,6-Hexachlorostyrene	90301-92-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	(Z)-alpha,beta-2,3,4,5,6-Heptachlorostyrene	29086-39-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	(Z)-beta-2,3,4,5,6-Hexachlorostyrene	90301-93-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	1,2,3,4-Tetrachlorobenzene	634-66-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	1,2,3-Trichlorobenzene	87-61-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	1,2,4,5-Tetrachlorobenzene	95-94-3	ug/kg	580000	0%	0%	230000	0%	0%	230000	0%	0%	230000	0%	0%	67000000	0%	0%	77000000
SVOCs	1,2,4-Trichlorobenzene	120-82-1	ug/kg	1100000	0%	0%	28000000	0%	0%	28000000	0%	0%	28000000	0%	0%	2.5E+10	0%	0%	990000
SVOCs	1,2-Diphenyl-hydrazine	122-66-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	1,3-Dinitrobenzene	99-65-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	1,4-Naphthoquinone	130-15-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	1-Naphthylamine	134-32-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2,2'-Oxybis(1-Chloropropane)	108-60-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2,3,4,5,6-Pentachlorostyrene	14992-81-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2,3,4,6-Tetrachlorophenol	58-90-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2,4,5-Trichlorophenol	95-95-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	2.3E+10	0%	0%	23000000
SVOCs	2,4,6-Trichlorophenol	88-06-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	1E+09	0%	0%	710000
SVOCs	2,4-Dichlorophenol	120-83-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	5.1E+09	0%	0%	660000
SVOCs	2,4-Dimethylphenol	105-67-9	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	4.7E+09	0%	0%	11000000
SVOCs	2,4-Dinitrophenol	51-28-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2,4-Dinitrotoluene	121-14-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	16000000	0%	0%	48000
SVOCs	2,6-Dichlorophenol	87-65-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2,6-Dimethylphenol	576-26-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	1.3E+08	0%	0%	140000

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				(D) Pathway-Specific Toxicity Screening Criteria															
Analyte Group	Analyte	CAS Number	Unit	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Soil Saturation Screening Levels	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential Drinking Water Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential GW Contact Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Soil Volatilization to Indoor Air Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air	Percent Exceed (Detect)
Pesticides	Chlordane, Total	57-74-9	ug/kg	0%	0%	--	--	--	--	--	--	--	--	--	59000000	0%	0%	4200000	0%
Pesticides	Delta BHC	319-86-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	Dieldrin	60-57-1	ug/kg	0%	0.8%	--	--	--	--	--	--	--	--	--	720000	0%	0%	64000	0%
Pesticides	Endosulfan sulfate	1031-07-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	Endosulfan, Total	115-29-7	ug/kg	0%	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	Endrin	72-20-8	ug/kg	0%	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	Endrin aldehyde	7421-93-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	Endrin ketone	53494-70-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	Gamma BHC (Lindane)	58-89-9	ug/kg	0%	0%	--	--	--	20	0.8%	67%	7100	0%	0%	--	--	--	--	--
Pesticides	Heptachlor	76-44-8	ug/kg	0%	0%	--	--	--	--	--	--	--	--	--	1900000	0%	0%	210000	0%
Pesticides	Heptachlor epoxide	1024-57-3	ug/kg	0%	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	Methoxychlor	72-43-5	ug/kg	0%	0%	--	--	--	16000	0%	0%	18000	0%	0%	--	--	--	--	--
Pesticides	Mirex	2385-85-5	ug/kg	0%	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	Toxaphene	8001-35-2	ug/kg	0%	0%	--	--	--	24000	0%	0%	360000	0%	0%	--	--	--	--	--
Pesticides	Tris(2,3-dibromopropyl)phosphate	126-72-7	ug/kg	0%	3%	27000	0%	0%	930	0%	18%	27000	0%	0%	27000	0%	0%	60000	0%
Sulfide	Sulfide	18496-25-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	(E)-alpha,beta-2,3,4,5,6-Heptachlorostyrene	29086-38-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	(E)-beta-2,3,4,5,6-Hexachlorostyrene	90301-92-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	(Z)-alpha,beta-2,3,4,5,6-Heptachlorostyrene	29086-39-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	(Z)-beta-2,3,4,5,6-Hexachlorostyrene	90301-93-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	1,2,3,4-Tetrachlorobenzene	634-66-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	1,2,3-Trichlorobenzene	87-61-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	1,2,4,5-Tetrachlorobenzene	95-94-3	ug/kg	0%	0%	--	--	--	1500000	0%	0%	1500000	0%	0%	1100000	0%	0%	270000	0%
SVOCs	1,2,4-Trichlorobenzene	120-82-1	ug/kg	0%	0%	1100000	0%	0%	4200	0%	0%	1100000	0%	0%	1100000	0%	0%	34000000	0%
SVOCs	1,2-Diphenyl-hydrazine	122-66-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	1,3-Dinitrobenzene	99-65-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	1,4-Naphthoquinone	130-15-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	1-Naphthylamine	134-32-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2,2'-Oxybis(1-Chloropropane)	108-60-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2,3,4,5,6-Pentachlorostyrene	14992-81-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2,3,4,6-Tetrachlorophenol	58-90-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2,4,5-Trichlorophenol	95-95-4	ug/kg	0%	0%	--	--	--	110000	0%	0%	9100000	0%	0%	--	--	--	--	--
SVOCs	2,4,6-Trichlorophenol	88-06-2	ug/kg	0%	0%	--	--	--	9400	0%	0%	200000	0%	0%	--	--	--	--	--
SVOCs	2,4-Dichlorophenol	120-83-2	ug/kg	0%	0%	1800000	0%	0%	4200	0%	0%	960000	0%	0%	--	--	--	--	--
SVOCs	2,4-Dimethylphenol	105-67-9	ug/kg	0%	0%	--	--	--	20000	0%	0%	10000000	0%	0%	--	--	--	--	--
SVOCs	2,4-Dinitrophenol	51-28-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2,4-Dinitrotoluene	121-14-2	ug/kg	0%	0%	--	--	--	640	0%	3%	170000	0%	0%	--	--	--	--	--
SVOCs	2,6-Dichlorophenol	87-65-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2,6-Dimethylphenol	576-26-1	ug/kg	0%	0%	--	--	--	330	0%	97%	130000	0%	0%	--	--	--	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air1	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air2	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Particulate Soil Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential Soil Direct Contact	Percent Exceed (Detect)	Percent Exceed (Non-detect)	EPA Residential Soil	Percent Exceed (Detect)	Percent Exceed (Non-detect)
Pesticides	Chlordane, Total	57-74-9	ug/kg	0%	4200000	0%	0%	4200000	0%	0%	21000000	0%	0%	150000	0%	0%	--	--	--
Pesticides	Delta BHC	319-86-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	Dieldrin	60-57-1	ug/kg	0%	64000	0%	0%	64000	0%	0%	850000	0%	0%	4700	0%	0%	--	--	--
Pesticides	Endosulfan sulfate	1031-07-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	Endosulfan, Total	115-29-7	ug/kg	--	--	--	--	--	--	--	--	--	--	4400000	0%	0%	--	--	--
Pesticides	Endrin	72-20-8	ug/kg	--	--	--	--	--	--	--	--	--	--	190000	0%	0%	--	--	--
Pesticides	Endrin aldehyde	7421-93-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	Endrin ketone	53494-70-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides	Gamma BHC (Lindane)	58-89-9	ug/kg	--	--	--	--	--	--	--	--	--	--	42000	0%	0%	--	--	--
Pesticides	Heptachlor	76-44-8	ug/kg	0%	210000	0%	0%	210000	0%	0%	3000000	0%	0%	23000	0%	0%	--	--	--
Pesticides	Heptachlor epoxide	1024-57-3	ug/kg	--	--	--	--	--	--	--	1500000	0%	0%	9500	0%	0%	--	--	--
Pesticides	Methoxychlor	72-43-5	ug/kg	--	--	--	--	--	--	--	--	--	--	5600000	0%	0%	--	--	--
Pesticides	Mirex	2385-85-5	ug/kg	--	--	--	--	--	--	--	--	--	--	40000	0%	0%	--	--	--
Pesticides	Toxaphene	8001-35-2	ug/kg	--	--	--	--	--	--	--	12000000	0%	0%	85000	0%	0%	--	--	--
Pesticides	Tris(2,3-dibromopropyl)phosphate	126-72-7	ug/kg	0%	60000	0%	0%	60000	0%	0%	7400000	0%	0%	20000	0%	0%	--	--	--
Sulfide	Sulfide	18496-25-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	(E)-alpha,beta-2,3,4,5,6-Heptachlorostyrene	29086-38-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	(E)-beta-2,3,4,5,6-Hexachlorostyrene	90301-92-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	(Z)-alpha,beta-2,3,4,5,6-Heptachlorostyrene	29086-39-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	(Z)-beta-2,3,4,5,6-Hexachlorostyrene	90301-93-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	1,2,3,4-Tetrachlorobenzene	634-66-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	1,2,3-Trichlorobenzene	87-61-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	49000	0%	0%
SVOCs	1,2,4,5-Tetrachlorobenzene	95-94-3	ug/kg	0%	270000	0%	0%	270000	0%	0%	29000000	0%	0%	2.5E+08	0%	0%	--	--	--
SVOCs	1,2,4-Trichlorobenzene	120-82-1	ug/kg	0%	34000000	0%	0%	34000000	0%	0%	1.1E+10	0%	0%	1100000	0%	0%	--	--	--
SVOCs	1,2-Diphenyl-hydrazine	122-66-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	610	0%	0%
SVOCs	1,3-Dinitrobenzene	99-65-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	6100	0%	0%
SVOCs	1,4-Naphthoquinone	130-15-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	1-Naphthylamine	134-32-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2,2'-Oxybis(1-Chloropropane)	108-60-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	4600	0%	0%
SVOCs	2,3,4,5,6-Pentachlorostyrene	14992-81-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2,3,4,6-Tetrachlorophenol	58-90-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	1800000	0%	0%
SVOCs	2,4,5-Trichlorophenol	95-95-4	ug/kg	--	--	--	--	--	--	--	1E+10	0%	0%	73000000	0%	0%	--	--	--
SVOCs	2,4,6-Trichlorophenol	88-06-2	ug/kg	--	--	--	--	--	--	--	1.3E+09	0%	0%	3300000	0%	0%	--	--	--
SVOCs	2,4-Dichlorophenol	120-83-2	ug/kg	--	--	--	--	--	--	--	2.3E+09	0%	0%	1800000	0%	0%	--	--	--
SVOCs	2,4-Dimethylphenol	105-67-9	ug/kg	--	--	--	--	--	--	--	2.1E+09	0%	0%	36000000	0%	0%	--	--	--
SVOCs	2,4-Dinitrophenol	51-28-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	120000	0%	0%
SVOCs	2,4-Dinitrotoluene	121-14-2	ug/kg	--	--	--	--	--	--	--	20000000	0%	0%	220000	0%	0%	--	--	--
SVOCs	2,6-Dichlorophenol	87-65-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2,6-Dimethylphenol	576-26-1	ug/kg	--	--	--	--	--	--	--	59000000	0%	0%	440000	0%	0%	--	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	EPA Industrial Soil	Percent Exceed (Detect)	Percent Exceed (Non-detect)	EPA Risk-Based SSL	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Group D2 and D3?	Group D4?	Group D5 and D6?
Pesticides	Chlordane, Total	57-74-9	ug/kg	--	--	--	--	--	--	D3	--	--
Pesticides	Delta BHC	319-86-8	ug/kg	--	--	--	--	--	--	--	--	--
Pesticides	Dieldrin	60-57-1	ug/kg	--	--	--	--	--	--	--	D4	--
Pesticides	Endosulfan sulfate	1031-07-8	ug/kg	--	--	--	--	--	--	--	--	--
Pesticides	Endosulfan, Total	115-29-7	ug/kg	--	--	--	--	--	--	D3	--	--
Pesticides	Endrin	72-20-8	ug/kg	--	--	--	--	--	--	D2	--	--
Pesticides	Endrin aldehyde	7421-93-4	ug/kg	--	--	--	--	--	--	--	--	--
Pesticides	Endrin ketone	53494-70-5	ug/kg	--	--	--	--	--	--	--	--	--
Pesticides	Gamma BHC (Lindane)	58-89-9	ug/kg	--	--	--	--	--	--	--	--	D5
Pesticides	Heptachlor	76-44-8	ug/kg	--	--	--	--	--	--	--	--	--
Pesticides	Heptachlor epoxide	1024-57-3	ug/kg	--	--	--	--	--	--	D3	--	--
Pesticides	Methoxychlor	72-43-5	ug/kg	--	--	--	--	--	--	D3	--	--
Pesticides	Mirex	2385-85-5	ug/kg	--	--	--	--	--	--	D2	--	--
Pesticides	Toxaphene	8001-35-2	ug/kg	--	--	--	--	--	--	--	D4	--
Pesticides	Tris(2,3-dibromopropyl)phosphate	126-72-7	ug/kg	--	--	--	--	--	--	--	D4	--
Sulfide	Sulfide	18496-25-8	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	(E)-alpha,beta-2,3,4,5,6-Heptachlorostyrene	29086-38-2	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	(E)-beta-2,3,4,5,6-Hexachlorostyrene	90301-92-1	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	(Z)-alpha,beta-2,3,4,5,6-Heptachlorostyrene	29086-39-3	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	(Z)-beta-2,3,4,5,6-Hexachlorostyrene	90301-93-2	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	1,2,3,4-Tetrachlorobenzene	634-66-2	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	1,2,3-Trichlorobenzene	87-61-6	ug/kg	490000	0%	0%	87	0%	0%	--	--	--
SVOCs	1,2,4,5-Tetrachlorobenzene	95-94-3	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	1,2,4-Trichlorobenzene	120-82-1	ug/kg	--	--	--	--	--	--	D2	--	--
SVOCs	1,2-Diphenyl-hydrazine	122-66-7	ug/kg	2200	0%	0%	0.27	0%	100%	--	D4	--
SVOCs	1,3-Dinitrobenzene	99-65-0	ug/kg	62000	0%	0%	3.3	0%	100%	--	D4	--
SVOCs	1,4-Naphthoquinone	130-15-4	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	1-Naphthylamine	134-32-7	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	2,2'-Oxybis(1-Chloropropane)	108-60-1	ug/kg	22000	0%	0%	0.12	0%	100%	--	D4	--
SVOCs	2,3,4,5,6-Pentachlorostyrene	14992-81-5	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	2,3,4,6-Tetrachlorophenol	58-90-2	ug/kg	18000000	0%	0%	6700	0%	0%	D3	--	--
SVOCs	2,4,5-Trichlorophenol	95-95-4	ug/kg	--	--	--	--	--	--	D2	--	--
SVOCs	2,4,6-Trichlorophenol	88-06-2	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	2,4-Dichlorophenol	120-83-2	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	2,4-Dimethylphenol	105-67-9	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	2,4-Dinitrophenol	51-28-5	ug/kg	1200000	0%	0%	82	0%	100%	--	D4	--
SVOCs	2,4-Dinitrotoluene	121-14-2	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	2,6-Dichlorophenol	87-65-0	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	2,6-Dimethylphenol	576-26-1	ug/kg	--	--	--	--	--	--	--	D4	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				Number of Samples					Summary Statistics								(A) Background Screen	
Analyte Group	Analyte	CAS Number	Unit	No. of Samples from 2005/6 Dow On-Site	No. of Samples from 2006 COM Blind	No. of Samples from 2010 Dow	No. of Samples from 2010 MDEQ	Total No. of Samples	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	Min RL of NDs	Max RL of NDs	Max RL of NDs (Off-site)	Group A?	MDEQ Target Detection Levels
SVOCs	2,6-Dinitrotoluene	606-20-2	ug/kg	23	72	99	33	**227**	0%	--	--	--	--	43.329	4,100	919	--	330
SVOCs	2-Acetylaminofluorene	53-96-3	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	2-Chloronaphthalene	91-58-7	ug/kg	23	72	0	33	**128**	0%	--	--	--	--	330	4,100	919	--	330
SVOCs	2-Chlorophenol	95-57-8	ug/kg	23	72	0	33	**128**	0%	--	--	--	--	330	4,100	919	--	330
SVOCs	2-Methylnaphthalene	91-57-6	ug/kg	23	72	0	33	**128**	33%	169	131	8.63	1,066	178	745	745	--	330
SVOCs	2-Naphthylamine	91-59-8	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	2-Nitroaniline	88-74-4	ug/kg	23	72	0	33	**128**	0%	--	--	--	--	330	4,650	4,650	--	830
SVOCs	2-Nitrophenol	88-75-5	ug/kg	0	72	0	33	**105**	0%	--	--	--	--	330	919	919	--	330
SVOCs	3,3'-Dichlorobenzidine	91-94-1	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	704	1,840	1,840	--	2000
SVOCs	3,3'-Dimethylbenzidine	119-93-7	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	3-Methylcholanthrene	56-49-5	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	3-Nitroaniline	99-09-2	ug/kg	23	72	0	33	**128**	0%	--	--	--	--	330	4,650	4,650	--	830
SVOCs	4,4'-Methylene bis(2-chloroaniline)	101-14-4	ug/kg	0	0	0	33	**33**	0%	--	--	--	--	330	470	470	--	500
SVOCs	4,6-Dinitro-2-methylphenol	534-52-1	ug/kg	23	72	0	33	**128**	0%	--	--	--	--	330	21,000	4,650	--	830
SVOCs	4-Aminobiphenyl	92-67-1	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	4-Bromophenyl phenyl ether	101-55-3	ug/kg	23	72	0	33	**128**	0.8%	217	187	45	45	330	4,100	919	--	330
SVOCs	4-Chloro-3-methylphenol	59-50-7	ug/kg	0	72	0	33	**105**	0%	--	--	--	--	330	919	919	--	280
SVOCs	4-Chloroaniline	106-47-8	ug/kg	0	72	0	33	**105**	0%	--	--	--	--	330	919	919	--	330
SVOCs	4-Chlorophenyl phenyl ether	7005-72-3	ug/kg	23	72	0	33	**128**	0.8%	218	187	131	131	330	4,100	919	--	330
SVOCs	4-Nitroaniline	100-01-6	ug/kg	23	72	0	33	**128**	0%	--	--	--	--	330	4,650	4,650	--	830
SVOCs	4-Nitrophenol	100-02-7	ug/kg	23	72	0	33	**128**	0%	--	--	--	--	330	21,000	4,650	--	830
SVOCs	4-Nitroquinoline-1-oxide	56-57-5	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	4-tert-Butylphenol	98-54-4	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	86.658	173	173	--	--
SVOCs	5-Nitro-o-toluidine	99-55-8	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	7,12-Dimethylbenz(a)anthracene	57-97-6	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	Acenaphthene	83-32-9	ug/kg	23	72	0	33	**128**	13%	187	104	11	290	330	2,300	919	--	330
SVOCs	Acenaphthylene	208-96-8	ug/kg	23	72	0	33	**128**	22%	210	226	10	1,600	330	4,100	517	--	330
SVOCs	Acetophenone	98-86-2	ug/kg	0	72	0	33	**105**	19%	212	87	30	560	330	919	919	--	330
SVOCs	Alpha, Alpha Dimethylphenethylamine	122-09-8	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	alpha-2,3,4,5,6-Hexachlorostyrene	68705-15-7	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	30	60	60	--	--
SVOCs	Aniline	62-53-3	ug/kg	0	72	0	33	**105**	0%	--	--	--	--	330	919	919	--	330
SVOCs	Anthracene	120-12-7	ug/kg	23	72	0	33	**128**	48%	159	141	7.8	810	330	517	517	--	330
SVOCs	Aramite (Total)	140-57-8	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	Azobenzene	103-33-3	ug/kg	23	0	0	33	**56**	4%	246	292	18	860	330	4,100	470	--	200
SVOCs	Benzidine	92-87-5	ug/kg	0	0	99	0	**99**	7%	427	134	239	936	770	1,540	1,540	--	1000
SVOCs	Benzo(a)anthracene	56-55-3	ug/kg	23	72	0	33	**128**	38%	261	398	19	3,105	330	919	919	--	330
SVOCs	Benzo(b)fluoranthene	205-99-2	ug/kg	23	72	0	33	**128**	88%	254	553	20	4,300	330	410	410	--	330
SVOCs	Benzo(g,h,i)perylene	191-24-2	ug/kg	23	72	0	33	**128**	80%	208	336	20	2,490	330	4,100	424	--	330
SVOCs	Benzo(k)fluoranthene	207-08-9	ug/kg	23	72	0	33	**128**	54%	187	330	13	2,600	330	470	470	--	330
SVOCs	Benzo[a]pyrene	50-32-8	ug/kg	23	72	99	33	**227**	52%	231	464	8.1	3,661	190	444	444	--	330

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				(B) Target Detection Level Screen				(C) Identify Criteria											
Analyte Group	Analyte	CAS Number	Unit	Max RL of NDs < TDL	Max RL of NDs (Off-site) < TDL	Max RL of NDs < All Criteria	Group B?	Have Criteria?	Minimum Criteria	Group C?	Residential Drinking Water Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Groundwater Surface Water Interface Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Groundwater Contact Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)
SVOCs	2,6-Dinitrotoluene	606-20-2	ug/kg	No	No	No	--	Yes	50	--	--	--	--	--	--	--	--	--	--
SVOCs	2-Acetylaminofluorene	53-96-3	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2-Chloronaphthalene	91-58-7	ug/kg	No	No	Yes	B3	Yes	620000	--	620000	0%	0%	--	--	--	2300000	0%	0%
SVOCs	2-Chlorophenol	95-57-8	ug/kg	No	No	No	--	Yes	360	--	900	0%	2%	360	0%	76%	1900000	0%	0%
SVOCs	2-Methylnaphthalene	91-57-6	ug/kg	No	No	Yes	--	Yes	4200	--	57000	0%	0%	4200	0%	0%	5500000	0%	0%
SVOCs	2-Naphthylamine	91-59-8	ug/kg	No	No	No	--	Yes	0.19	--	--	--	--	--	--	--	--	--	--
SVOCs	2-Nitroaniline	88-74-4	ug/kg	No	No	No	--	Yes	150	--	--	--	--	--	--	--	--	--	--
SVOCs	2-Nitrophenol	88-75-5	ug/kg	No	No	No	--	Yes	400	--	400	0%	32%	--	--	--	1600000	0%	0%
SVOCs	3,3'-Dichlorobenzidine	91-94-1	ug/kg	Yes	Yes	Yes	B1	Yes	2000	--	2000	0%	0%	2000	0%	0%	4600	0%	0%
SVOCs	3,3'-Dimethylbenzidine	119-93-7	ug/kg	No	No	No	--	Yes	0.04	--	--	--	--	--	--	--	--	--	--
SVOCs	3-Methylcholanthrene	56-49-5	ug/kg	No	No	No	--	Yes	5.9	--	--	--	--	--	--	--	--	--	--
SVOCs	3-Nitroaniline	99-09-2	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4,4'-Methylene bis(2-chloroaniline)	101-14-4	ug/kg	Yes	Yes	Yes	B1	Yes	6800	--	--	--	--	--	--	--	--	--	--
SVOCs	4,6-Dinitro-2-methylphenol	534-52-1	ug/kg	No	No	No	--	Yes	830	--	830	0%	94%	--	--	--	190000	0%	0%
SVOCs	4-Aminobiphenyl	92-67-1	ug/kg	No	No	No	--	Yes	0.016	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Bromophenyl phenyl ether	101-55-3	ug/kg	No	No	Yes	--	No	--	C1	--	--	--	--	--	--	--	--	--
SVOCs	4-Chloro-3-methylphenol	59-50-7	ug/kg	No	No	No	--	Yes	280	--	5800	0%	0%	280	0%	100%	3000000	0%	0%
SVOCs	4-Chloroaniline	106-47-8	ug/kg	No	No	No	--	Yes	0.14	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Chlorophenyl phenyl ether	7005-72-3	ug/kg	No	No	Yes	--	No	--	C1	--	--	--	--	--	--	--	--	--
SVOCs	4-Nitroaniline	100-01-6	ug/kg	No	No	No	--	Yes	1.4	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Nitrophenol	100-02-7	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Nitroquinoline-1-oxide	56-57-5	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-tert-Butylphenol	98-54-4	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	5-Nitro-o-toluidine	99-55-8	ug/kg	No	No	No	--	Yes	1.1	--	--	--	--	--	--	--	--	--	--
SVOCs	7,12-Dimethylbenz(a)anthracene	57-97-6	ug/kg	No	No	No	--	Yes	0.27	--	--	--	--	--	--	--	--	--	--
SVOCs	Acenaphthene	83-32-9	ug/kg	No	No	Yes	--	Yes	8700	--	300000	0%	0%	8700	0%	0%	970000	0%	0%
SVOCs	Acenaphthylene	208-96-8	ug/kg	No	No	Yes	--	Yes	5900	--	5900	0%	0%	--	--	--	440000	0%	0%
SVOCs	Acetophenone	98-86-2	ug/kg	No	No	Yes	--	Yes	30000	--	30000	0%	0%	--	--	--	1100000	0%	0%
SVOCs	Alpha, Alpha Dimethylphenethylamine	122-09-8	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	alpha-2,3,4,5,6-Hexachlorostyrene	68705-15-7	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Aniline	62-53-3	ug/kg	No	No	No	--	Yes	330	--	1100	0%	0%	330	0%	99%	2800000	0%	0%
SVOCs	Anthracene	120-12-7	ug/kg	No	No	Yes	--	Yes	41000	--	41000	0%	0%	--	--	--	41000	0%	0%
SVOCs	Aramite (Total)	140-57-8	ug/kg	No	No	No	--	Yes	30	--	--	--	--	--	--	--	--	--	--
SVOCs	Azobenzene	103-33-3	ug/kg	No	No	Yes	--	Yes	4200	--	4200	0%	0%	--	--	--	300000	0%	0%
SVOCs	Benzidine	92-87-5	ug/kg	No	No	No	--	Yes	1000	--	1000	0%	9%	1000	0%	9%	1000	0%	9%
SVOCs	Benzo(a)anthracene	56-55-3	ug/kg	No	No	Yes	--	Yes	20000	--	--	--	--	--	--	--	--	--	--
SVOCs	Benzo(b)fluoranthene	205-99-2	ug/kg	No	No	Yes	--	Yes	20000	--	--	--	--	--	--	--	--	--	--
SVOCs	Benzo(g,h,i)perylene	191-24-2	ug/kg	No	No	Yes	--	Yes	2500000	--	--	--	--	--	--	--	--	--	--
SVOCs	Benzo(k)fluoranthene	207-08-9	ug/kg	No	No	Yes	--	Yes	200000	--	--	--	--	--	--	--	--	--	--
SVOCs	Benzo[a]pyrene	50-32-8	ug/kg	No	No	Yes	--	Yes	2000	--	--	--	--	--	--	--	--	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	Residential Soil Volatilization to Indoor Air Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air1	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air2	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Particulate Soil Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Direct Contact
SVOCs	2,6-Dinitrotoluene	606-20-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2-Acetylaminofluorene	53-96-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2-Chloronaphthalene	91-58-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	56000000
SVOCs	2-Chlorophenol	95-57-8	ug/kg	430000	0%	0%	960000	0%	0%	960000	0%	0%	960000	0%	0%	1.2E+09	0%	0%	1400000
SVOCs	2-Methylnaphthalene	91-57-6	ug/kg	2700000	0%	0%	1500000	0%	0%	1500000	0%	0%	1500000	0%	0%	6.7E+08	0%	0%	8100000
SVOCs	2-Naphthylamine	91-59-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2-Nitroaniline	88-74-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2-Nitrophenol	88-75-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	630000
SVOCs	3,3'-Dichlorobenzidine	91-94-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	6500000	0%	0%	6600
SVOCs	3,3'-Dimethylbenzidine	119-93-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	3-Methylcholanthrene	56-49-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	3-Nitroaniline	99-09-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4,4'-Methylene bis(2-chloroaniline)	101-14-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	84000000	0%	0%	6800
SVOCs	4,6-Dinitro-2-methylphenol	534-52-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	79000
SVOCs	4-Aminobiphenyl	92-67-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Bromophenyl phenyl ether	101-55-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Chloro-3-methylphenol	59-50-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4500000
SVOCs	4-Chloroaniline	106-47-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Chlorophenyl phenyl ether	7005-72-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Nitroaniline	100-01-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Nitrophenol	100-02-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Nitroquinoline-1-oxide	56-57-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-tert-Butylphenol	98-54-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	5-Nitro-o-toluidine	99-55-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	7,12-Dimethylbenz(a)anthracene	57-97-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Acenaphthene	83-32-9	ug/kg	1.9E+08	0%	0%	81000000	0%	0%	81000000	0%	0%	81000000	0%	0%	1.4E+10	0%	0%	41000000
SVOCs	Acenaphthylene	208-96-8	ug/kg	1600000	0%	0%	2200000	0%	0%	2200000	0%	0%	2200000	0%	0%	2.3E+09	0%	0%	1600000
SVOCs	Acetophenone	98-86-2	ug/kg	1100000	0%	0%	44000000	0%	0%	44000000	0%	0%	44000000	0%	0%	3.3E+10	0%	0%	1100000
SVOCs	Alpha, Alpha Dimethylphenethylamine	122-09-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	alpha-2,3,4,5,6-Hexachlorostyrene	68705-15-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Aniline	62-53-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	67000000	0%	0%	330000
SVOCs	Anthracene	120-12-7	ug/kg	1E+09	0%	0%	1.4E+09	0%	0%	1.4E+09	0%	0%	1.4E+09	0%	0%	6.7E+10	0%	0%	2.3E+08
SVOCs	Aramite (Total)	140-57-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Azobenzene	103-33-3	ug/kg	6100000	0%	0%	630000	0%	0%	630000	0%	0%	630000	0%	0%	1E+08	0%	0%	140000
SVOCs	Benzidine	92-87-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	46000	0%	0%	1000
SVOCs	Benzo(a)anthracene	56-55-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	20000
SVOCs	Benzo(b)fluoranthene	205-99-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	20000
SVOCs	Benzo(g,h,i)perylene	191-24-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	8E+08	0%	0%	2500000
SVOCs	Benzo(k)fluoranthene	207-08-9	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	200000
SVOCs	Benzo[a]pyrene	50-32-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	1500000	0%	0%	2000

Table 5-2
Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				(D) Pathway-Specific Toxicity Screening Criteria															
Analyte Group	Analyte	CAS Number	Unit	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Soil Saturation Screening Levels	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential Drinking Water Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential GW Contact Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Soil Volatilization to Indoor Air Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air	Percent Exceed (Detect)
SVOCs	2,6-Dinitrotoluene	606-20-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2-Acetylaminofluorene	53-96-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2-Chloronaphthalene	91-58-7	ug/kg	0%	0%	--	--	--	1800000	0%	0%	2300000	0%	0%	--	--	--	--	--
SVOCs	2-Chlorophenol	95-57-8	ug/kg	0%	0%	19000000	0%	0%	2600	0%	0.8%	1900000	0%	0%	800000	0%	0%	1100000	0%
SVOCs	2-Methylnaphthalene	91-57-6	ug/kg	0%	0%	--	--	--	170000	0%	0%	5500000	0%	0%	4900000	0%	0%	1800000	0%
SVOCs	2-Naphthylamine	91-59-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2-Nitroaniline	88-74-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2-Nitrophenol	88-75-5	ug/kg	0%	0%	--	--	--	1200	0%	0%	1600000	0%	0%	--	--	--	--	--
SVOCs	3,3'-Dichlorobenzidine	91-94-1	ug/kg	0%	0%	--	--	--	2000	0%	0%	4600	0%	0%	--	--	--	--	--
SVOCs	3,3'-Dimethylbenzidine	119-93-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	3-Methylcholanthrene	56-49-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	3-Nitroaniline	99-09-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4,4'-Methylene bis(2-chloroaniline)	101-14-4	ug/kg	0%	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4,6-Dinitro-2-methylphenol	534-52-1	ug/kg	0%	0%	--	--	--	830	0%	94%	190000	0%	0%	--	--	--	--	--
SVOCs	4-Aminobiphenyl	92-67-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Bromophenyl phenyl ether	101-55-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Chloro-3-methylphenol	59-50-7	ug/kg	0%	0%	--	--	--	16000	0%	0%	3000000	0%	0%	--	--	--	--	--
SVOCs	4-Chloroaniline	106-47-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Chlorophenyl phenyl ether	7005-72-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Nitroaniline	100-01-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Nitrophenol	100-02-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Nitroquinoline-1-oxide	56-57-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-tert-Butylphenol	98-54-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	5-Nitro-o-toluidine	99-55-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	7,12-Dimethylbenz(a)anthracene	57-97-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Acenaphthene	83-32-9	ug/kg	0%	0%	--	--	--	880000	0%	0%	970000	0%	0%	3.5E+08	0%	0%	97000000	0%
SVOCs	Acenaphthylene	208-96-8	ug/kg	0%	0%	--	--	--	17000	0%	0%	440000	0%	0%	3000000	0%	0%	2700000	0%
SVOCs	Acetophenone	98-86-2	ug/kg	0%	0%	1100000	0%	0%	88000	0%	0%	1100000	0%	0%	1100000	0%	0%	52000000	0%
SVOCs	Alpha, Alpha Dimethylphenethylamine	122-09-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	alpha-2,3,4,5,6-Hexachlorostyrene	68705-15-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Aniline	62-53-3	ug/kg	0%	0%	4500000	0%	0%	4400	0%	0%	2800000	0%	0%	--	--	--	--	--
SVOCs	Anthracene	120-12-7	ug/kg	0%	0%	--	--	--	41000	0%	0%	41000	0%	0%	1E+09	0%	0%	1.6E+09	0%
SVOCs	Aramite (Total)	140-57-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Azobenzene	103-33-3	ug/kg	0%	0%	--	--	--	17000	0%	0%	300000	0%	0%	32000000	0%	0%	2100000	0%
SVOCs	Benzidine	92-87-5	ug/kg	0%	9%	--	--	--	1000	0%	9%	1000	0%	9%	--	--	--	--	--
SVOCs	Benzo(a)anthracene	56-55-3	ug/kg	0%	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Benzo(b)fluoranthene	205-99-2	ug/kg	0%	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Benzo(g,h,i)perylene	191-24-2	ug/kg	0%	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Benzo(k)fluoranthene	207-08-9	ug/kg	0%	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Benzo[a]pyrene	50-32-8	ug/kg	2%	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 5-2
Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air1	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air2	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Particulate Soil Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential Soil Direct Contact	Percent Exceed (Detect)	Percent Exceed (Non-detect)	EPA Residential Soil	Percent Exceed (Detect)	Percent Exceed (Non-detect)
SVOCs	2,6-Dinitrotoluene	606-20-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	61000	0%	0%
SVOCs	2-Acetylaminofluorene	53-96-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	2-Chloronaphthalene	91-58-7	ug/kg	--	--	--	--	--	--	--	--	--	--	1.8E+08	0%	0%	--	--	--
SVOCs	2-Chlorophenol	95-57-8	ug/kg	0%	1100000	0%	0%	1100000	0%	0%	5.3E+08	0%	0%	4500000	0%	0%	--	--	--
SVOCs	2-Methylnaphthalene	91-57-6	ug/kg	0%	1800000	0%	0%	1800000	0%	0%	2.9E+08	0%	0%	26000000	0%	0%	--	--	--
SVOCs	2-Naphthylamine	91-59-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	270	0%	100%
SVOCs	2-Nitroaniline	88-74-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	610000	0%	0%
SVOCs	2-Nitrophenol	88-75-5	ug/kg	--	--	--	--	--	--	--	--	--	--	2000000	0%	0%	--	--	--
SVOCs	3,3'-Dichlorobenzidine	91-94-1	ug/kg	--	--	--	--	--	--	--	8200000	0%	0%	30000	0%	0%	--	--	--
SVOCs	3,3'-Dimethylbenzidine	119-93-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	44	0%	100%
SVOCs	3-Methylcholanthrene	56-49-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	22	0%	100%
SVOCs	3-Nitroaniline	99-09-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4,4'-Methylene bis(2-chloroaniline)	101-14-4	ug/kg	--	--	--	--	--	--	--	1.1E+08	0%	0%	32000	0%	0%	--	--	--
SVOCs	4,6-Dinitro-2-methylphenol	534-52-1	ug/kg	--	--	--	--	--	--	--	--	--	--	260000	0%	0%	--	--	--
SVOCs	4-Aminobiphenyl	92-67-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	23	0%	100%
SVOCs	4-Bromophenyl phenyl ether	101-55-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Chloro-3-methylphenol	59-50-7	ug/kg	--	--	--	--	--	--	--	--	--	--	15000000	0%	0%	--	--	--
SVOCs	4-Chloroaniline	106-47-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	2400	0%	0%
SVOCs	4-Chlorophenyl phenyl ether	7005-72-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Nitroaniline	100-01-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	24000	0%	0%
SVOCs	4-Nitrophenol	100-02-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-Nitroquinoline-1-oxide	56-57-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	4-tert-Butylphenol	98-54-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	5-Nitro-o-toluidine	99-55-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	15000	0%	0%
SVOCs	7,12-Dimethylbenz(a)anthracene	57-97-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	1.8	0%	100%
SVOCs	Acenaphthene	83-32-9	ug/kg	0%	97000000	0%	0%	97000000	0%	0%	6.2E+09	0%	0%	1.3E+08	0%	0%	--	--	--
SVOCs	Acenaphthylene	208-96-8	ug/kg	0%	2700000	0%	0%	2700000	0%	0%	1E+09	0%	0%	5200000	0%	0%	--	--	--
SVOCs	Acetophenone	98-86-2	ug/kg	0%	52000000	0%	0%	52000000	0%	0%	1.4E+10	0%	0%	1100000	0%	0%	--	--	--
SVOCs	Alpha, Alpha Dimethylphenethylamine	122-09-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	alpha-2,3,4,5,6-Hexachlorostyrene	68705-15-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Aniline	62-53-3	ug/kg	--	--	--	--	--	--	--	29000000	0%	0%	1500000	0%	0%	--	--	--
SVOCs	Anthracene	120-12-7	ug/kg	0%	1.6E+09	0%	0%	1.6E+09	0%	0%	2.9E+10	0%	0%	7.3E+08	0%	0%	--	--	--
SVOCs	Aramite (Total)	140-57-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	19000	0%	0%
SVOCs	Azobenzene	103-33-3	ug/kg	0%	2100000	0%	0%	2100000	0%	0%	1.3E+08	0%	0%	660000	0%	0%	--	--	--
SVOCs	Benzidine	92-87-5	ug/kg	--	--	--	--	--	--	--	59000	0%	0%	1000	0%	9%	--	--	--
SVOCs	Benzo(a)anthracene	56-55-3	ug/kg	--	--	--	--	--	--	--	--	--	--	80000	0%	0%	--	--	--
SVOCs	Benzo(b)fluoranthene	205-99-2	ug/kg	--	--	--	--	--	--	--	--	--	--	80000	0%	0%	--	--	--
SVOCs	Benzo(g,h,i)perylene	191-24-2	ug/kg	--	--	--	--	--	--	--	3.5E+08	0%	0%	7000000	0%	0%	--	--	--
SVOCs	Benzo(k)fluoranthene	207-08-9	ug/kg	--	--	--	--	--	--	--	--	--	--	800000	0%	0%	--	--	--
SVOCs	Benzo[a]pyrene	50-32-8	ug/kg	--	--	--	--	--	--	--	1900000	0%	0%	8000	0%	0%	--	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	EPA Industrial Soil	Percent Exceed (Detect)	Percent Exceed (Non-detect)	EPA Risk-Based SSL	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Group D2 and D3?	Group D4?	Group D5 and D6?
SVOCs	2,6-Dinitrotoluene	606-20-2	ug/kg	620000	0%	0%	50	0%	61%	--	D4	--
SVOCs	2-Acetylaminofluorene	53-96-3	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	2-Chloronaphthalene	91-58-7	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	2-Chlorophenol	95-57-8	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	2-Methylnaphthalene	91-57-6	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	2-Naphthylamine	91-59-8	ug/kg	960	0%	0%	0.19	0%	100%	--	D4	--
SVOCs	2-Nitroaniline	88-74-4	ug/kg	6000000	0%	0%	150	0%	100%	--	D4	--
SVOCs	2-Nitrophenol	88-75-5	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	3,3'-Dichlorobenzidine	91-94-1	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	3,3'-Dimethylbenzidine	119-93-7	ug/kg	160	0%	100%	0.04	0%	100%	--	D4	--
SVOCs	3-Methylcholanthrene	56-49-5	ug/kg	78	0%	100%	5.9	0%	100%	--	D4	--
SVOCs	3-Nitroaniline	99-09-2	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	4,4'-Methylene bis(2-chloroaniline)	101-14-4	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	4,6-Dinitro-2-methylphenol	534-52-1	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	4-Aminobiphenyl	92-67-1	ug/kg	82	0%	100%	0.016	0%	100%	--	D4	--
SVOCs	4-Bromophenyl phenyl ether	101-55-3	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	4-Chloro-3-methylphenol	59-50-7	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	4-Chloroaniline	106-47-8	ug/kg	8600	0%	0%	0.14	0%	100%	--	D4	--
SVOCs	4-Chlorophenyl phenyl ether	7005-72-3	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	4-Nitroaniline	100-01-6	ug/kg	86000	0%	0%	1.4	0%	100%	--	D4	--
SVOCs	4-Nitrophenol	100-02-7	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	4-Nitroquinoline-1-oxide	56-57-5	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	4-tert-Butylphenol	98-54-4	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	5-Nitro-o-toluidine	99-55-8	ug/kg	52000	0%	0%	1.1	0%	100%	--	D4	--
SVOCs	7,12-Dimethylbenz(a)anthracene	57-97-6	ug/kg	6.2	0%	100%	0.27	0%	100%	--	D4	--
SVOCs	Acenaphthene	83-32-9	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	Acenaphthylene	208-96-8	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	Acetophenone	98-86-2	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	Alpha, Alpha Dimethylphenethylamine	122-09-8	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	alpha-2,3,4,5,6-Hexachlorostyrene	68705-15-7	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	Aniline	62-53-3	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	Anthracene	120-12-7	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	Aramite (Total)	140-57-8	ug/kg	69000	0%	0%	30	0%	100%	--	D4	--
SVOCs	Azobenzene	103-33-3	ug/kg	--	--	--	--	--	--	D2	--	--
SVOCs	Benzidine	92-87-5	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	Benzo(a)anthracene	56-55-3	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	Benzo(b)fluoranthene	205-99-2	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	Benzo(g,h,i)perylene	191-24-2	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	Benzo(k)fluoranthene	207-08-9	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	Benzo[a]pyrene	50-32-8	ug/kg	--	--	--	--	--	--	--	--	D6

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				Number of Samples					Summary Statistics								(A) Background Screen	
Analyte Group	Analyte	CAS Number	Unit	No. of Samples from 2005/6 Dow On-Site	No. of Samples from 2006 COM Blind	No. of Samples from 2010 Dow	No. of Samples from 2010 MDEQ	Total No. of Samples	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	Min RL of NDs	Max RL of NDs	Max RL of NDs (Off-site)	Group A?	MDEQ Target Detection Levels
SVOCs	Benzoic acid	65-85-0	ug/kg	0	0	0	33	**33**	15%	895	184	430	1,500	1,600	2,300	2,300	--	3300
SVOCs	Benzyl alcohol	100-51-6	ug/kg	0	72	0	33	**105**	2%	197	41	22	50	330	919	919	--	3300
SVOCs	Benzyl Butyl Phthalate	85-68-7	ug/kg	23	72	0	33	**128**	16%	203	184	9.59	815	330	4,100	919	--	330
SVOCs	Benzyl dichloride	98-87-3	ug/kg	0	0	0	33	**33**	0%	--	--	--	--	2,700	3,800	3,800	--	330
SVOCs	beta,beta-2,3,4,5,6-Heptachlorostyrene	29082-75-5	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	30	60	60	--	--
SVOCs	Bis(2-Chloroethoxy) methane	111-91-1	ug/kg	23	72	0	33	**128**	0%	--	--	--	--	330	4,100	919	--	330
SVOCs	Bis(2-Chloroethyl) ether	111-44-4	ug/kg	23	72	0	33	**128**	0%	--	--	--	--	330	4,100	919	--	100
SVOCs	bis(2-Chloroisopropyl)ether	39638-32-9	ug/kg	23	0	0	0	**23**	0%	--	--	--	--	330	4,100	--	--	330
SVOCs	bis(2-ethylhexyl) phthalate	117-81-7	ug/kg	23	72	0	33	**128**	78%	457	1,302	23.5	11,000	350	424	424	--	330
SVOCs	Bisphenol-A	80-05-7	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	160	320	320	--	--
SVOCs	Caprolactam	105-60-2	ug/kg	0	0	0	33	**33**	0%	--	--	--	--	1,600	2,300	2,300	--	330
SVOCs	Carbazole	86-74-8	ug/kg	0	0	99	33	**132**	17%	61.5	82.3	8	343	19.998	470	470	--	330
SVOCs	Chlorobenzilate	510-15-6	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	Chlorpyrifos	2921-88-2	ug/kg	0	0	99	33	**132**	0%	--	--	--	--	8.9	180	180	--	100
SVOCs	Chrysene	218-01-9	ug/kg	23	72	0	33	**128**	71%	272	532	17.3	3,905	330	517	517	--	330
SVOCs	cis-Nonachlor	5103-73-1	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	16.665	33.33	33.33	--	--
SVOCs	Cresol, Total	MEPH1314	ug/kg	23	72	99	33	**227**	1%	325	337	158	237	210	8,200	1,838	--	660
SVOCs	Diallate (total of cis and trans isomers)	2303-16-4	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	20
SVOCs	Dibenz(a,h)anthracene	53-70-3	ug/kg	23	72	0	33	**128**	18%	203	200	15	745	330	4,100	517	--	330
SVOCs	Dibenzofuran	132-64-9	ug/kg	23	72	99	33	**227**	11%	146	148	8.47	1,800	133	2,300	517	--	330
SVOCs	Diethyl phthalate	84-66-2	ug/kg	23	72	0	33	**128**	2%	268	199	13.2	250	330	4,100	930	--	330
SVOCs	Dimethoate	60-51-5	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	704	1,840	1,840	--	--
SVOCs	Dimethyl phthalate	131-11-3	ug/kg	23	72	0	33	**128**	0.8%	218	187	66	66	330	4,100	919	--	330
SVOCs	Di-n-butyl phthalate	84-74-2	ug/kg	23	72	0	33	**128**	27%	216	216	8.26	750	330	4,100	919	--	330
SVOCs	Di-n-octylphthalate	117-84-0	ug/kg	23	72	0	0	**95**	0%	--	--	--	--	330	4,100	919	--	330
SVOCs	Dinoseb	88-85-7	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	200
SVOCs	Diphenylamine	122-39-4	ug/kg	15	72	0	0	**87**	0%	--	--	--	--	330	4,100	919	--	--
SVOCs	Disulfoton	298-04-4	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	704	1,840	1,840	--	--
SVOCs	Ethyl methanesulfonate	62-50-0	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	Famphur	52-85-7	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	704	1,840	1,840	--	--
SVOCs	Fluoranthene	206-44-0	ug/kg	23	72	99	33	**227**	82%	414	1,072	13.7	9,270	130	432	432	--	330
SVOCs	Fluorene	86-73-7	ug/kg	23	72	0	33	**128**	16%	191	101	14.5	320	330	2,300	517	--	330
SVOCs	Hexabromobenzene	87-82-1	ug/kg	8	0	0	0	**8**	0%	--	--	--	--	330	330	--	--	100
SVOCs	Hexabromobiphenyl	HEX - varies	ug/kg	8	0	0	0	**8**	0%	--	--	--	--	330	330	--	--	50
SVOCs	Hexachlorobenzene	118-74-1	ug/kg	23	72	99	33	**227**	15%	290	2,152	10	32,000	29.997	2,300	919	--	330
SVOCs	Hexachlorobutadiene	87-68-3	ug/kg	23	72	99	33	**227**	1%	137	173	29	640	46.662	4,100	919	--	50
SVOCs	Hexachlorocyclopentadiene	77-47-4	ug/kg	23	72	0	33	**128**	0%	--	--	--	--	330	21,000	2,300	--	330
SVOCs	Hexachloroethane	67-72-1	ug/kg	23	72	0	33	**128**	0%	--	--	--	--	330	4,100	919	--	300
SVOCs	Hexachlorophene	70-30-4	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	704	1,840	1,840	--	--
SVOCs	Hexachloropropene	1888-71-7	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	Indeno(1,2,3-c,d)Pyrene	193-39-5	ug/kg	23	72	0	33	**128**	52%	232	354	20	3,110	330	2,300	517	--	330
SVOCs	Isodrin	465-73-6	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				(B) Target Detection Level Screen				(C) Identify Criteria											
Analyte Group	Analyte	CAS Number	Unit	Max RL of NDs < TDL	Max RL of NDs (Off-site) < TDL	Max RL of NDs < All Criteria	Group B?	Have Criteria?	Minimum Criteria	Group C?	Residential Drinking Water Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Groundwater Surface Water Interface Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Groundwater Contact Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)
SVOCs	Benzoic acid	65-85-0	ug/kg	Yes	Yes	Yes	--	Yes	640000	--	640000	0%	0%	--	--	--	70000000	0%	0%
SVOCs	Benzyl alcohol	100-51-6	ug/kg	Yes	Yes	Yes	--	Yes	200000	--	200000	0%	0%	--	--	--	5800000	0%	0%
SVOCs	Benzyl Butyl Phthalate	85-68-7	ug/kg	No	No	Yes	--	Yes	120000	--	310000	0%	0%	120000	0%	0%	310000	0%	0%
SVOCs	Benzyl dichloride	98-87-3	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	beta,beta-2,3,4,5,6-Heptachlorostyrene	29082-75-5	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Bis(2-Chloroethoxy) methane	111-91-1	ug/kg	No	No	No	--	Yes	25	--	--	--	--	--	--	--	--	--	--
SVOCs	Bis(2-Chloroethyl) ether	111-44-4	ug/kg	No	No	No	--	Yes	100	--	100	0%	100%	100	0%	100%	110000	0%	0%
SVOCs	bis(2-Chloroisopropyl)ether	39638-32-9	ug/kg	No	Yes	Yes	B2	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	bis(2-ethylhexyl) phthalate	117-81-7	ug/kg	No	No	Yes	--	Yes	2800000	--	--	--	--	--	--	--	--	--	--
SVOCs	Bisphenol-A	80-05-7	ug/kg	No	No	Yes	B3	Yes	140000	--	--	--	--	--	--	--	--	--	--
SVOCs	Caprolactam	105-60-2	ug/kg	No	No	Yes	B3	Yes	120000	--	120000	0%	0%	--	--	--	1E+09	0%	0%
SVOCs	Carbazole	86-74-8	ug/kg	No	No	Yes	--	Yes	1100	--	9400	0%	0%	1100	0%	0%	820000	0%	0%
SVOCs	Chlorobenzilate	510-15-6	ug/kg	No	No	No	--	Yes	2	--	--	--	--	--	--	--	--	--	--
SVOCs	Chlorpyrifos	2921-88-2	ug/kg	No	No	No	--	Yes	130	--	17000	0%	0%	1500	0%	0%	840000	0%	0%
SVOCs	Chrysene	218-01-9	ug/kg	No	No	Yes	--	Yes	2000000	--	--	--	--	--	--	--	--	--	--
SVOCs	cis-Nonachlor	5103-73-1	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Cresol, Total	MEPH1314	ug/kg	No	No	No	--	Yes	1000	--	7400	0%	0.4%	1000	0%	16%	16000000	0%	0%
SVOCs	Diallate (total of cis and trans isomers)	2303-16-4	ug/kg	No	No	No	--	Yes	1.6	--	--	--	--	--	--	--	--	--	--
SVOCs	Dibenz(a,h)anthracene	53-70-3	ug/kg	No	No	No	--	Yes	2000	--	--	--	--	--	--	--	--	--	--
SVOCs	Dibenzofuran	132-64-9	ug/kg	No	No	No	--	Yes	1700	--	--	--	--	1700	0.4%	0.4%	--	--	--
SVOCs	Diethyl phthalate	84-66-2	ug/kg	No	No	No	--	Yes	2200	--	110000	0%	0%	2200	0%	2%	740000	0%	0%
SVOCs	Dimethoate	60-51-5	ug/kg	No	No	No	--	Yes	1.6	--	--	--	--	--	--	--	--	--	--
SVOCs	Dimethyl phthalate	131-11-3	ug/kg	No	No	Yes	--	Yes	790000	--	790000	0%	0%	--	--	--	790000	0%	0%
SVOCs	Di-n-butyl phthalate	84-74-2	ug/kg	No	No	Yes	--	Yes	11000	--	760000	0%	0%	11000	0%	0%	760000	0%	0%
SVOCs	Di-n-octylphthalate	117-84-0	ug/kg	No	No	Yes	B3	Yes	6900000	--	1E+08	0%	0%	--	--	--	1.4E+08	0%	0%
SVOCs	Dinoseb	88-85-7	ug/kg	No	No	No	--	Yes	200	--	300	0%	100%	200	0%	100%	140000	0%	0%
SVOCs	Diphenylamine	122-39-4	ug/kg	No	No	No	--	Yes	1700	--	--	--	--	--	--	--	--	--	--
SVOCs	Disulfoton	298-04-4	ug/kg	No	No	No	--	Yes	2.7	--	--	--	--	--	--	--	--	--	--
SVOCs	Ethyl methanesulfonate	62-50-0	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Famphur	52-85-7	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Fluoranthene	206-44-0	ug/kg	No	No	Yes	--	Yes	5500	--	730000	0%	0%	5500	0.9%	0%	730000	0%	0%
SVOCs	Fluorene	86-73-7	ug/kg	No	No	Yes	--	Yes	5300	--	390000	0%	0%	5300	0%	0%	890000	0%	0%
SVOCs	Hexabromobenzene	87-82-1	ug/kg	No	Yes	Yes	B2	Yes	5400	--	5400	0%	0%	--	--	--	5400	0%	0%
SVOCs	Hexabromobiphenyl	HEX - varies	ug/kg	No	Yes	Yes	B2	Yes	1200	--	--	--	--	--	--	--	--	--	--
SVOCs	Hexachlorobenzene	118-74-1	ug/kg	No	No	No	--	Yes	350	--	1800	0.9%	0.4%	350	2%	42%	8200	0.4%	0%
SVOCs	Hexachlorobutadiene	87-68-3	ug/kg	No	No	No	--	Yes	91	--	26000	0%	0%	91	0.9%	60%	350000	0%	0%
SVOCs	Hexachlorocyclopentadiene	77-47-4	ug/kg	No	No	Yes	B3	Yes	30000	--	320000	0%	0%	--	--	--	720000	0%	0%
SVOCs	Hexachloroethane	67-72-1	ug/kg	No	No	No	--	Yes	430	--	430	0%	12%	1800	0%	2%	110000	0%	0%
SVOCs	Hexachlorophene	70-30-4	ug/kg	No	No	Yes	B3	Yes	15000	--	--	--	--	--	--	--	--	--	--
SVOCs	Hexachloropropene	1888-71-7	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Indeno(1,2,3-c,d)Pyrene	193-39-5	ug/kg	No	No	Yes	--	Yes	20000	--	--	--	--	--	--	--	--	--	--
SVOCs	Isodrin	465-73-6	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	Residential Soil Volatilization to Indoor Air Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air1	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air2	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Particulate Soil Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Direct Contact
SVOCs	Benzoic acid	65-85-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9.9E+08
SVOCs	Benzyl alcohol	100-51-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	3.3E+11	0%	0%	58000000
SVOCs	Benzyl Butyl Phthalate	85-68-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	4.7E+10	0%	0%	310000
SVOCs	Benzyl dichloride	98-87-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	beta,beta-2,3,4,5,6-Heptachlorostyrene	29082-75-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Bis(2-Chloroethoxy) methane	111-91-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Bis(2-Chloroethyl) ether	111-44-4	ug/kg	8300	0%	0%	3800	0%	0.8%	3800	0%	0.8%	3800	0%	0.8%	9400000	0%	0%	13000
SVOCs	bis(2-Chloroisopropyl)ether	39638-32-9	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	bis(2-ethylhexyl) phthalate	117-81-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	7E+08	0%	0%	2800000
SVOCs	Bisphenol-A	80-05-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Caprolactam	105-60-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	6.7E+08	0%	0%	53000000
SVOCs	Carbazole	86-74-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	62000000	0%	0%	530000
SVOCs	Chlorobenzilate	510-15-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Chlorpyrifos	2921-88-2	ug/kg	130	0%	0.8%	4600	0%	0%	23000	0%	0%	55000	0%	0%	1.3E+08	0%	0%	11000000
SVOCs	Chrysene	218-01-9	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2000000
SVOCs	cis-Nonachlor	5103-73-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Cresol, Total	MEPH1314	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	6.7E+09	0%	0%	11000000
SVOCs	Diallate (total of cis and trans isomers)	2303-16-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Dibenz(a,h)anthracene	53-70-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2000
SVOCs	Dibenzofuran	132-64-9	ug/kg	2000000	0%	0%	130000	0%	0%	130000	0%	0%	130000	0%	0%	6700000	0%	0%	--
SVOCs	Diethyl phthalate	84-66-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	3.3E+09	0%	0%	740000
SVOCs	Dimethoate	60-51-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Dimethyl phthalate	131-11-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	3.3E+09	0%	0%	790000
SVOCs	Di-n-butyl phthalate	84-74-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	3.3E+09	0%	0%	760000
SVOCs	Di-n-octylphthalate	117-84-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	3.1E+10	0%	0%	6900000
SVOCs	Dinoseb	88-85-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	2.7E+08	0%	0%	66000
SVOCs	Diphenylamine	122-39-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Disulfoton	298-04-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Ethyl methanesulfonate	62-50-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Famphur	52-85-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Fluoranthene	206-44-0	ug/kg	1E+09	0%	0%	7.4E+08	0%	0%	7.4E+08	0%	0%	7.4E+08	0%	0%	9.3E+09	0%	0%	46000000
SVOCs	Fluorene	86-73-7	ug/kg	5.8E+08	0%	0%	1.3E+08	0%	0%	1.3E+08	0%	0%	1.3E+08	0%	0%	9.3E+09	0%	0%	27000000
SVOCs	Hexabromobenzene	87-82-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1100000
SVOCs	Hexabromobiphenyl	HEX - varies	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1200
SVOCs	Hexachlorobenzene	118-74-1	ug/kg	41000	0%	0%	17000	0.4%	0%	17000	0.4%	0%	17000	0.4%	0%	6800000	0%	0%	8900
SVOCs	Hexachlorobutadiene	87-68-3	ug/kg	130000	0%	0%	130000	0%	0%	130000	0%	0%	130000	0%	0%	1.4E+08	0%	0%	100000
SVOCs	Hexachlorocyclopentadiene	77-47-4	ug/kg	30000	0%	0%	50000	0%	0%	50000	0%	0%	50000	0%	0%	13000000	0%	0%	720000
SVOCs	Hexachloroethane	67-72-1	ug/kg	40000	0%	0%	550000	0%	0%	930000	0%	0%	930000	0%	0%	2.3E+08	0%	0%	230000
SVOCs	Hexachlorophene	70-30-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Hexachloropropene	1888-71-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Indeno(1,2,3-c,d)Pyrene	193-39-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	20000
SVOCs	Isodrin	465-73-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				(D) Pathway-Specific Toxicity Screening Criteria															
Analyte Group	Analyte	CAS Number	Unit	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Soil Saturation Screening Levels	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential Drinking Water Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential GW Contact Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Soil Volatilization to Indoor Air Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air	Percent Exceed (Detect)
SVOCs	Benzoic acid	65-85-0	ug/kg	0%	0%	--	--	--	1800000	0%	0%	70000000	0%	0%	--	--	--	--	--
SVOCs	Benzyl alcohol	100-51-6	ug/kg	0%	0%	5800000	0%	0%	580000	0%	0%	5800000	0%	0%	--	--	--	--	--
SVOCs	Benzyl Butyl Phthalate	85-68-7	ug/kg	0%	0%	310000	0%	0%	310000	0%	0%	310000	0%	0%	--	--	--	--	--
SVOCs	Benzyl dichloride	98-87-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	beta,beta-2,3,4,5,6-Heptachlorostyrene	29082-75-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Bis(2-Chloroethoxy) methane	111-91-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Bis(2-Chloroethyl) ether	111-44-4	ug/kg	0%	0%	2200000	0%	0%	170	0%	100%	110000	0%	0%	44000	0%	0%	13000	0%
SVOCs	bis(2-Chloroisopropyl)ether	39638-32-9	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	bis(2-ethylhexyl) phthalate	117-81-7	ug/kg	0%	0%	10000000	0%	0%	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Bisphenol-A	80-05-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Caprolactam	105-60-2	ug/kg	0%	0%	--	--	--	340000	0%	0%	1E+09	0%	0%	--	--	--	--	--
SVOCs	Carbazole	86-74-8	ug/kg	0%	0%	--	--	--	39000	0%	0%	820000	0%	0%	--	--	--	--	--
SVOCs	Chlorobenzilate	510-15-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Chlorpyrifos	2921-88-2	ug/kg	0%	0%	--	--	--	48000	0%	0%	840000	0%	0%	240	0%	0%	5500	0%
SVOCs	Chrysene	218-01-9	ug/kg	0%	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	cis-Nonachlor	5103-73-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Cresol, Total	MEPH1314	ug/kg	0%	0%	--	--	--	20000	0%	0%	16000000	0%	0%	--	--	--	--	--
SVOCs	Diallate (total of cis and trans isomers)	2303-16-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Dibenz(a,h)anthracene	53-70-3	ug/kg	0%	2%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Dibenzofuran	132-64-9	ug/kg	--	--	--	--	--	--	--	--	--	--	--	3600000	0%	0%	160000	0%
SVOCs	Diethyl phthalate	84-66-2	ug/kg	0%	0%	740000	0%	0%	320000	0%	0%	740000	0%	0%	--	--	--	--	--
SVOCs	Dimethoate	60-51-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Dimethyl phthalate	131-11-3	ug/kg	0%	0%	790000	0%	0%	790000	0%	0%	790000	0%	0%	--	--	--	--	--
SVOCs	Di-n-butyl phthalate	84-74-2	ug/kg	0%	0%	760000	0%	0%	760000	0%	0%	760000	0%	0%	--	--	--	--	--
SVOCs	Di-n-octylphthalate	117-84-0	ug/kg	0%	0%	1.4E+08	0%	0%	1.4E+08	0%	0%	1.4E+08	0%	0%	--	--	--	--	--
SVOCs	Dinoseb	88-85-7	ug/kg	0%	0%	140000	0%	0%	300	0%	100%	140000	0%	0%	--	--	--	--	--
SVOCs	Diphenylamine	122-39-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Disulfoton	298-04-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Ethyl methanesulfonate	62-50-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Famphur	52-85-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Fluoranthene	206-44-0	ug/kg	0%	0%	--	--	--	730000	0%	0%	730000	0%	0%	1E+09	0%	0%	8.9E+08	0%
SVOCs	Fluorene	86-73-7	ug/kg	0%	0%	--	--	--	890000	0%	0%	890000	0%	0%	1E+09	0%	0%	1.5E+08	0%
SVOCs	Hexabromobenzene	87-82-1	ug/kg	0%	0%	--	--	--	5400	0%	0%	5400	0%	0%	--	--	--	--	--
SVOCs	Hexabromobiphenyl	HEX - varies	ug/kg	0%	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Hexachlorobenzene	118-74-1	ug/kg	0.4%	0%	--	--	--	1800	0.9%	0.4%	8200	0.4%	0%	220000	0%	0%	56000	0%
SVOCs	Hexachlorobutadiene	87-68-3	ug/kg	0%	0%	350000	0%	0%	72000	0%	0%	350000	0%	0%	350000	0%	0%	460000	0%
SVOCs	Hexachlorocyclopentadiene	77-47-4	ug/kg	0%	0%	720000	0%	0%	320000	0%	0%	720000	0%	0%	56000	0%	0%	60000	0%
SVOCs	Hexachloroethane	67-72-1	ug/kg	0%	0%	--	--	--	1200	0%	2%	110000	0%	0%	79000	0%	0%	660000	0%
SVOCs	Hexachlorophene	70-30-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Hexachloropropene	1888-71-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Indeno(1,2,3-c,d)Pyrene	193-39-5	ug/kg	0%	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Isodrin	465-73-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air1	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air2	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Particulate Soil Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential Soil Direct Contact	Percent Exceed (Detect)	Percent Exceed (Non-detect)	EPA Residential Soil	Percent Exceed (Detect)	Percent Exceed (Non-detect)
SVOCs	Benzoic acid	65-85-0	ug/kg	--	--	--	--	--	--	--	--	--	--	1E+09	0%	0%	--	--	--
SVOCs	Benzyl alcohol	100-51-6	ug/kg	--	--	--	--	--	--	--	1.5E+11	0%	0%	5800000	0%	0%	--	--	--
SVOCs	Benzyl Butyl Phthalate	85-68-7	ug/kg	--	--	--	--	--	--	--	2.1E+10	0%	0%	310000	0%	0%	--	--	--
SVOCs	Benzyl dichloride	98-87-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	beta,beta-2,3,4,5,6-Heptachlorostyrene	29082-75-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Bis(2-Chloroethoxy) methane	111-91-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	180000	0%	0%
SVOCs	Bis(2-Chloroethyl) ether	111-44-4	ug/kg	0%	13000	0%	0%	13000	0%	0%	12000000	0%	0%	58000	0%	0%	--	--	--
SVOCs	bis(2-Chloroisopropyl)ether	39638-32-9	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	bis(2-ethylhexyl) phthalate	117-81-7	ug/kg	--	--	--	--	--	--	--	8.9E+08	0%	0%	10000000	0%	0%	--	--	--
SVOCs	Bisphenol-A	80-05-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	3100000	0%	0%
SVOCs	Caprolactam	105-60-2	ug/kg	--	--	--	--	--	--	--	2.9E+08	0%	0%	3.1E+08	0%	0%	--	--	--
SVOCs	Carbazole	86-74-8	ug/kg	--	--	--	--	--	--	--	78000000	0%	0%	2400000	0%	0%	--	--	--
SVOCs	Chlorobenzilate	510-15-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	4400	0%	0%
SVOCs	Chlorpyrifos	2921-88-2	ug/kg	0%	23000	0%	0%	56000	0%	0%	59000000	0%	0%	34000000	0%	0%	--	--	--
SVOCs	Chrysene	218-01-9	ug/kg	--	--	--	--	--	--	--	--	--	--	8000000	0%	0%	--	--	--
SVOCs	cis-Nonachlor	5103-73-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Cresol, Total	MEPH1314	ug/kg	--	--	--	--	--	--	--	2.9E+09	0%	0%	36000000	0%	0%	--	--	--
SVOCs	Diallate (total of cis and trans isomers)	2303-16-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	8000	0%	0%
SVOCs	Dibenz(a,h)anthracene	53-70-3	ug/kg	--	--	--	--	--	--	--	--	--	--	8000	0%	0%	--	--	--
SVOCs	Dibenzofuran	132-64-9	ug/kg	0%	160000	0%	0%	160000	0%	0%	2900000	0%	0%	--	--	--	--	--	--
SVOCs	Diethyl phthalate	84-66-2	ug/kg	--	--	--	--	--	--	--	1.5E+09	0%	0%	740000	0%	0%	--	--	--
SVOCs	Dimethoate	60-51-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	12000	0%	0%
SVOCs	Dimethyl phthalate	131-11-3	ug/kg	--	--	--	--	--	--	--	1.5E+09	0%	0%	790000	0%	0%	--	--	--
SVOCs	Di-n-butyl phthalate	84-74-2	ug/kg	--	--	--	--	--	--	--	1.5E+09	0%	0%	760000	0%	0%	--	--	--
SVOCs	Di-n-octylphthalate	117-84-0	ug/kg	--	--	--	--	--	--	--	1.4E+10	0%	0%	20000000	0%	0%	--	--	--
SVOCs	Dinoseb	88-85-7	ug/kg	--	--	--	--	--	--	--	1.2E+08	0%	0%	140000	0%	0%	--	--	--
SVOCs	Diphenylamine	122-39-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	1500000	0%	0%
SVOCs	Disulfoton	298-04-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	2400	0%	0%
SVOCs	Ethyl methanesulfonate	62-50-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Famphur	52-85-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Fluoranthene	206-44-0	ug/kg	0%	8.8E+08	0%	0%	8.8E+08	0%	0%	4.1E+09	0%	0%	1.3E+08	0%	0%	--	--	--
SVOCs	Fluorene	86-73-7	ug/kg	0%	1.5E+08	0%	0%	1.5E+08	0%	0%	4.1E+09	0%	0%	87000000	0%	0%	--	--	--
SVOCs	Hexabromobenzene	87-82-1	ug/kg	--	--	--	--	--	--	--	--	--	--	3100000	0%	0%	--	--	--
SVOCs	Hexabromobiphenyl	HEX - varies	ug/kg	--	--	--	--	--	--	--	--	--	--	4800	0%	0%	--	--	--
SVOCs	Hexachlorobenzene	118-74-1	ug/kg	0%	56000	0%	0%	56000	0%	0%	8500000	0%	0%	37000	0%	0%	--	--	--
SVOCs	Hexachlorobutadiene	87-68-3	ug/kg	0%	460000	0%	0%	460000	0%	0%	1.8E+08	0%	0%	350000	0%	0%	--	--	--
SVOCs	Hexachlorocyclopentadiene	77-47-4	ug/kg	0%	60000	0%	0%	60000	0%	0%	5900000	0%	0%	720000	0%	0%	--	--	--
SVOCs	Hexachloroethane	67-72-1	ug/kg	0%	1400000	0%	0%	1400000	0%	0%	1E+08	0%	0%	730000	0%	0%	--	--	--
SVOCs	Hexachlorophene	70-30-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	18000	0%	0%
SVOCs	Hexachloropropene	1888-71-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Indeno(1,2,3-c,d)Pyrene	193-39-5	ug/kg	--	--	--	--	--	--	--	--	--	--	80000	0%	0%	--	--	--
SVOCs	Isodrin	465-73-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	EPA Industrial Soil	Percent Exceed (Detect)	Percent Exceed (Non-detect)	EPA Risk-Based SSL	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Group D2 and D3?	Group D4?	Group D5 and D6?
SVOCs	Benzoic acid	65-85-0	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	Benzyl alcohol	100-51-6	ug/kg	--	--	--	--	--	--	D2	--	--
SVOCs	Benzyl Butyl Phthalate	85-68-7	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	Benzyl dichloride	98-87-3	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	beta,beta-2,3,4,5,6-Heptachlorostyrene	29082-75-5	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	Bis(2-Chloroethoxy) methane	111-91-1	ug/kg	1800000	0%	0%	25	0%	100%	--	D4	--
SVOCs	Bis(2-Chloroethyl) ether	111-44-4	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	bis(2-Chloroisopropyl)ether	39638-32-9	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	bis(2-ethylhexyl) phthalate	117-81-7	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	Bisphenol-A	80-05-7	ug/kg	31000000	0%	0%	140000	0%	0%	--	--	--
SVOCs	Caprolactam	105-60-2	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	Carbazole	86-74-8	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	Chlorobenzilate	510-15-6	ug/kg	16000	0%	0%	2	0%	100%	--	D4	--
SVOCs	Chlorpyrifos	2921-88-2	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	Chrysene	218-01-9	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	cis-Nonachlor	5103-73-1	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	Cresol, Total	MEPH1314	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	Diallate (total of cis and trans isomers)	2303-16-4	ug/kg	28000	0%	0%	1.6	0%	100%	--	D4	--
SVOCs	Dibenz(a,h)anthracene	53-70-3	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	Dibenzofuran	132-64-9	ug/kg	--	--	--	--	--	--	--	--	D6
SVOCs	Diethyl phthalate	84-66-2	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	Dimethoate	60-51-5	ug/kg	120000	0%	0%	1.6	0%	100%	--	D4	--
SVOCs	Dimethyl phthalate	131-11-3	ug/kg	--	--	--	--	--	--	D2	--	--
SVOCs	Di-n-butyl phthalate	84-74-2	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	Di-n-octylphthalate	117-84-0	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	Dinoseb	88-85-7	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	Diphenylamine	122-39-4	ug/kg	15000000	0%	0%	1700	0%	2%	--	D4	--
SVOCs	Disulfoton	298-04-4	ug/kg	25000	0%	0%	2.7	0%	100%	--	D4	--
SVOCs	Ethyl methanesulfonate	62-50-0	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	Famphur	52-85-7	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	Fluoranthene	206-44-0	ug/kg	--	--	--	--	--	--	--	--	D6
SVOCs	Fluorene	86-73-7	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	Hexabromobenzene	87-82-1	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	Hexabromobiphenyl	HEX - varies	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	Hexachlorobenzene	118-74-1	ug/kg	--	--	--	--	--	--	--	--	D6
SVOCs	Hexachlorobutadiene	87-68-3	ug/kg	--	--	--	--	--	--	--	--	D5
SVOCs	Hexachlorocyclopentadiene	77-47-4	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	Hexachloroethane	67-72-1	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	Hexachlorophene	70-30-4	ug/kg	180000	0%	0%	15000	0%	0%	--	--	--
SVOCs	Hexachloropropene	1888-71-7	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	Indeno(1,2,3-c,d)Pyrene	193-39-5	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	Isodrin	465-73-6	ug/kg	--	--	--	--	--	--	--	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				Number of Samples					Summary Statistics								(A) Background Screen	
Analyte Group	Analyte	CAS Number	Unit	No. of Samples from 2005/6 Dow On-Site	No. of Samples from 2006 COM Blind	No. of Samples from 2010 Dow	No. of Samples from 2010 MDEQ	Total No. of Samples	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	Min RL of NDs	Max RL of NDs	Max RL of NDs (Off-site)	Group A?	MDEQ Target Detection Levels
SVOCs	Isophorone	78-59-1	ug/kg	23	72	0	33	**128**	0.8%	218	187	120	120	330	4,100	919	--	330
SVOCs	Isosafrole	120-58-1	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	Kepone	143-50-0	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	1,780	4,650	4,650	--	--
SVOCs	Methapyrilene	91-80-5	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	Methyl chlorpyrifos	5598-13-0	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	33	66	66	--	--
SVOCs	Methyl methanesulfonate	66-27-3	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	Nitrobenzene	98-95-3	ug/kg	23	72	99	33	**227**	0.9%	134	170	34	69	44	4,100	919	--	330
SVOCs	n-Nitrosodiethylamine	55-18-5	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	n-Nitrosodimethylamine	62-75-9	ug/kg	23	72	0	33	**128**	0%	--	--	--	--	330	4,100	919	--	330
SVOCs	N-Nitroso-di-n-butylamine	924-16-3	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	n-Nitrosodi-n-propylamine	621-64-7	ug/kg	23	72	0	33	**128**	0%	--	--	--	--	330	4,100	919	--	330
SVOCs	n-Nitrosodiphenylamine	86-30-6	ug/kg	23	72	0	33	**128**	2%	218	187	130	160	330	4,100	919	--	330
SVOCs	n-Nitrosomethylethylamine	10595-95-6	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	n-Nitrosomorpholine	59-89-2	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	n-Nitrosopiperidine	100-75-4	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	n-Nitrosopyrrolidine	930-55-2	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	O,O,O-Triethyl Phosphorothioate	126-68-1	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	O,O-Diethyl O-2-Pyrazinyl Phosphorothioate (Thionazin)	297-97-2	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	o,p'-DDD	53-19-0	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	17.6	35.2	35.2	--	--
SVOCs	Octachlorostyrene	29082-74-4	ug/kg	0	0	99	0	**99**	3%	9.32	2.61	12	14	16.665	33.33	33.33	--	--
SVOCs	o-Phenylphenol	90-43-7	ug/kg	0	0	99	0	**99**	6%	48.1	21.6	31	215	83.325	167	167	--	--
SVOCs	o-Toluidine	95-53-4	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	Parathion, Ethyl (Parathion)	56-38-2	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	Parathion, Methyl	298-00-0	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	704	1,840	1,840	--	40
SVOCs	p-Dimethylaminoazobenzene	60-11-7	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	Pentachlorobenzene	608-93-5	ug/kg	0	72	0	33	**105**	0%	--	--	--	--	330	919	919	--	330
SVOCs	Pentachloronitrobenzene	82-68-8	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	330
SVOCs	Pentachlorophenol	87-86-5	ug/kg	23	72	99	33	**227**	15%	425	848	3	755	17	21,000	2,300	--	20
SVOCs	Pentochlorethane	76-01-7	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	Phenacetin	62-44-2	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	Phenanthrene	85-01-8	ug/kg	23	72	99	33	**227**	52%	304	970	8.86	8,938	210	432	432	--	330
SVOCs	Phenol	108-95-2	ug/kg	23	72	0	33	**128**	22%	183	133	21	1,200	330	919	919	--	330
SVOCs	Phorate	298-02-2	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	704	1,840	1,840	--	--
SVOCs	p-Phenylenediamine	106-50-3	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	Pronamide	23950-58-5	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	Propachlor	1918-16-7	ug/kg	0	0	99	0	**99**	1%	14.7	4.0	16.166	16.166	26.664	53.328	53.328	--	200
SVOCs	Pyrene	129-00-0	ug/kg	15	72	0	33	**120**	86%	312	885	15	7,985	350	432	432	--	330
SVOCs	Pyridine	110-86-1	ug/kg	0	72	0	33	**105**	0%	--	--	--	--	352	930	930	--	330
SVOCs	Ronnel	299-84-3	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	37.4	74.8	74.8	--	--
SVOCs	Safrole	94-59-7	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--
SVOCs	Sym-Trinitrobenzene	99-35-4	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	352	919	919	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				(B) Target Detection Level Screen				(C) Identify Criteria											
Analyte Group	Analyte	CAS Number	Unit	Max RL of NDs < TDL	Max RL of NDs (Off-site) < TDL	Max RL of NDs < All Criteria	Group B?	Have Criteria?	Minimum Criteria	Group C?	Residential Drinking Water Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Groundwater Surface Water Interface Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Groundwater Contact Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)
SVOCs	Isophorone	78-59-1	ug/kg	No	No	Yes	--	Yes	15000	--	15000	0%	0%	26000	0%	0%	2400000	0%	0%
SVOCs	Isosafrole	120-58-1	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Kepone	143-50-0	ug/kg	No	No	No	--	Yes	0.24	--	--	--	--	--	--	--	--	--	--
SVOCs	Methapyrilene	91-80-5	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Methyl chlorpyrifos	5598-13-0	ug/kg	No	No	Yes	B3	Yes	1700	--	--	--	--	--	--	--	--	--	--
SVOCs	Methyl methanesulfonate	66-27-3	ug/kg	No	No	No	--	Yes	0.14	--	--	--	--	--	--	--	--	--	--
SVOCs	Nitrobenzene	98-95-3	ug/kg	No	No	No	--	Yes	330	--	330	0%	52%	3600	0%	0.4%	220000	0%	0%
SVOCs	n-Nitrosodiethylamine	55-18-5	ug/kg	No	No	No	--	Yes	0.000053	--	--	--	--	--	--	--	--	--	--
SVOCs	n-Nitrosodimethylamine	62-75-9	ug/kg	No	No	No	--	Yes	0.0001	--	--	--	--	--	--	--	--	--	--
SVOCs	N-Nitroso-di-n-butylamine	924-16-3	ug/kg	No	No	No	--	Yes	0.005	--	--	--	--	--	--	--	--	--	--
SVOCs	n-Nitrosodi-n-propylamine	621-64-7	ug/kg	No	No	No	--	Yes	330	--	330	0%	92%	--	--	--	7200	0%	0%
SVOCs	n-Nitrosodiphenylamine	86-30-6	ug/kg	No	No	Yes	--	Yes	5400	--	5400	0%	0%	--	--	--	700000	0%	0%
SVOCs	n-Nitrosomethylethylamine	10595-95-6	ug/kg	No	No	No	--	Yes	0.00088	--	--	--	--	--	--	--	--	--	--
SVOCs	n-Nitrosomorpholine	59-89-2	ug/kg	No	No	No	--	Yes	0.0025	--	--	--	--	--	--	--	--	--	--
SVOCs	n-Nitrosopiperidine	100-75-4	ug/kg	No	No	No	--	Yes	0.0038	--	--	--	--	--	--	--	--	--	--
SVOCs	n-Nitrosopyrrolidine	930-55-2	ug/kg	No	No	No	--	Yes	0.012	--	--	--	--	--	--	--	--	--	--
SVOCs	O,O,O-Triethyl Phosphorothioate	126-68-1	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	O,O-Diethyl O-2-Pyrazinyl Phosphorothioate (Thionazin)	297-97-2	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	o,p'-DDD	53-19-0	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Octachlorostyrene	29082-74-4	ug/kg	No	No	Yes	--	No	--	C1	--	--	--	--	--	--	--	--	--
SVOCs	o-Phenylphenol	90-43-7	ug/kg	No	No	Yes	--	Yes	470	--	--	--	--	--	--	--	--	--	--
SVOCs	o-Toluidine	95-53-4	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Parathion, Ethyl (Parathion)	56-38-2	ug/kg	No	No	Yes	B3	Yes	1100	--	--	--	--	--	--	--	--	--	--
SVOCs	Parathion, Methyl	298-00-0	ug/kg	No	No	No	--	Yes	46	--	46	0%	100%	--	--	--	76000	0%	0%
SVOCs	p-Dimethylaminoazobenzene	60-11-7	ug/kg	No	No	No	--	Yes	0.062	--	--	--	--	--	--	--	--	--	--
SVOCs	Pentachlorobenzene	608-93-5	ug/kg	No	No	Yes	B3	Yes	9500	--	29000	0%	0%	9500	0%	0%	190000	0%	0%
SVOCs	Pentachloronitrobenzene	82-68-8	ug/kg	No	No	Yes	B3	Yes	37000	--	37000	0%	0%	--	--	--	37000	0%	0%
SVOCs	Pentachlorophenol	87-86-5	ug/kg	No	No	No	--	Yes	22	--	22	8%	58%	17000	0%	0.4%	4300	0%	0.9%
SVOCs	Pentochlorethane	76-01-7	ug/kg	No	No	No	--	Yes	0.36	--	--	--	--	--	--	--	--	--	--
SVOCs	Phenacetin	62-44-2	ug/kg	No	No	No	--	Yes	8.6	--	--	--	--	--	--	--	--	--	--
SVOCs	Phenanthrene	85-01-8	ug/kg	No	No	Yes	--	Yes	2100	--	56000	0%	0%	2100	3%	0%	1100000	0%	0%
SVOCs	Phenol	108-95-2	ug/kg	No	No	Yes	--	Yes	9000	--	88000	0%	0%	9000	0%	0%	12000000	0%	0%
SVOCs	Phorate	298-02-2	ug/kg	No	No	No	--	Yes	8.2	--	--	--	--	--	--	--	--	--	--
SVOCs	p-Phenylenediamine	106-50-3	ug/kg	No	No	Yes	B3	Yes	1900	--	--	--	--	--	--	--	--	--	--
SVOCs	Pronamide	23950-58-5	ug/kg	No	No	Yes	B3	Yes	2800	--	--	--	--	--	--	--	--	--	--
SVOCs	Propachlor	1918-16-7	ug/kg	Yes	Yes	Yes	--	Yes	1900	--	1900	0%	0%	--	--	--	8800000	0%	0%
SVOCs	Pyrene	129-00-0	ug/kg	No	No	Yes	--	Yes	480000	--	480000	0%	0%	--	--	--	480000	0%	0%
SVOCs	Pyridine	110-86-1	ug/kg	No	No	No	--	Yes	400	--	400	0%	57%	--	--	--	37000	0%	0%
SVOCs	Ronnel	299-84-3	ug/kg	No	No	Yes	B3	Yes	17000	--	--	--	--	--	--	--	--	--	--
SVOCs	Safrole	94-59-7	ug/kg	No	No	No	--	Yes	0.19	--	--	--	--	--	--	--	--	--	--
SVOCs	Sym-Trinitrobenzene	99-35-4	ug/kg	No	No	Yes	B3	Yes	3900	--	--	--	--	--	--	--	--	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	Residential Soil Volatilization to Indoor Air Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air1	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air2	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Particulate Soil Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Direct Contact
SVOCs	Isophorone	78-59-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	1.2E+10	0%	0%	2400000
SVOCs	Isosafrole	120-58-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Kepone	143-50-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Methapyrilene	91-80-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Methyl chlorpyrifos	5598-13-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Methyl methanesulfonate	66-27-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Nitrobenzene	98-95-3	ug/kg	91000	0%	0%	54000	0%	0%	54000	0%	0%	54000	0%	0%	47000000	0%	0%	100000
SVOCs	n-Nitrosodiethylamine	55-18-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	n-Nitrosodimethylamine	62-75-9	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	N-Nitroso-di-n-butylamine	924-16-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	n-Nitrosodi-n-propylamine	621-64-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	1600000	0%	0%	1200
SVOCs	n-Nitrosodiphenylamine	86-30-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	2.2E+09	0%	0%	1700000
SVOCs	n-Nitrosomethylethylamine	10595-95-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	n-Nitrosomorpholine	59-89-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	n-Nitrosopiperidine	100-75-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	n-Nitrosopyrrolidine	930-55-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	O,O,O-Triethyl Phosphorothioate	126-68-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	O,O-Diethyl O-2-Pyrazinyl Phosphorothioate (Thionazin)	297-97-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	o,p'-DDD	53-19-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Octachlorostyrene	29082-74-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	o-Phenylphenol	90-43-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	o-Toluidine	95-53-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Parathion, Ethyl (Parathion)	56-38-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Parathion, Methyl	298-00-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	56000
SVOCs	p-Dimethylaminoazobenzene	60-11-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Pentachlorobenzene	608-93-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	190000
SVOCs	Pentachloronitrobenzene	82-68-8	ug/kg	120000	0%	0%	230000	0%	0%	230000	0%	0%	230000	0%	0%	3.3E+08	0%	0%	1700000
SVOCs	Pentachlorophenol	87-86-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	1E+08	0%	0%	90000
SVOCs	Pentochlorethane	76-01-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Phenacetin	62-44-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Phenanthrene	85-01-8	ug/kg	2800000	0%	0%	160000	0%	0%	160000	0%	0%	160000	0%	0%	6700000	0%	0%	1600000
SVOCs	Phenol	108-95-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	4E+10	0%	0%	12000000
SVOCs	Phorate	298-02-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	p-Phenylenediamine	106-50-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Pronamide	23950-58-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Propachlor	1918-16-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2900000
SVOCs	Pyrene	129-00-0	ug/kg	1E+09	0%	0%	6.5E+08	0%	0%	6.5E+08	0%	0%	6.5E+08	0%	0%	6.7E+09	0%	0%	29000000
SVOCs	Pyridine	110-86-1	ug/kg	1100	0%	0%	8200	0%	0%	40000	0%	0%	97000	0%	0%	2.3E+08	0%	0%	37000
SVOCs	Ronnel	299-84-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Safrole	94-59-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Sym-Trinitrobenzene	99-35-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				(D) Pathway-Specific Toxicity Screening Criteria															
Analyte Group	Analyte	CAS Number	Unit	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Soil Saturation Screening Levels	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential Drinking Water Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential GW Contact Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Soil Volatilization to Indoor Air Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air	Percent Exceed (Detect)
SVOCs	Isophorone	78-59-1	ug/kg	0%	0%	2400000	0%	0%	62000	0%	0%	2400000	0%	0%	--	--	--	--	--
SVOCs	Isosafrole	120-58-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Kepone	143-50-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Methapyrilene	91-80-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Methyl chlorpyrifos	5598-13-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Methyl methanesulfonate	66-27-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Nitrobenzene	98-95-3	ug/kg	0%	0%	490000	0%	0%	330	0%	52%	220000	0%	0%	170000	0%	0%	64000	0%
SVOCs	n-Nitrosodiethylamine	55-18-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	n-Nitrosodimethylamine	62-75-9	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	N-Nitroso-di-n-butylamine	924-16-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	n-Nitrosodi-n-propylamine	621-64-7	ug/kg	0%	2%	1500000	0%	0%	330	0%	92%	7200	0%	0%	--	--	--	--	--
SVOCs	n-Nitrosodiphenylamine	86-30-6	ug/kg	0%	0%	--	--	--	22000	0%	0%	700000	0%	0%	--	--	--	--	--
SVOCs	n-Nitrosomethylethylamine	10595-95-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	n-Nitrosomorpholine	59-89-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	n-Nitrosopiperidine	100-75-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	n-Nitrosopyrrolidine	930-55-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	O,O,O-Triethyl Phosphorothioate	126-68-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	O,O-Diethyl O-2-Pyrazinyl Phosphorothioate (Thionazin)	297-97-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	o,p'-DDD	53-19-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Octachlorostyrene	29082-74-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	o-Phenylphenol	90-43-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	o-Toluidine	95-53-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Parathion, Ethyl (Parathion)	56-38-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Parathion, Methyl	298-00-0	ug/kg	0%	0%	--	--	--	130	0%	100%	76000	0%	0%	--	--	--	--	--
SVOCs	p-Dimethylaminoazobenzene	60-11-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Pentachlorobenzene	608-93-5	ug/kg	0%	0%	190000	0%	0%	81000	0%	0%	190000	0%	0%	--	--	--	--	--
SVOCs	Pentachloronitrobenzene	82-68-8	ug/kg	0%	0%	--	--	--	37000	0%	0%	37000	0%	0%	220000	0%	0%	280000	0%
SVOCs	Pentachlorophenol	87-86-5	ug/kg	0%	0%	--	--	--	22	8%	58%	4300	0%	0.9%	--	--	--	--	--
SVOCs	Pentochlorethane	76-01-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Phenacetin	62-44-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Phenanthrene	85-01-8	ug/kg	0%	0%	--	--	--	160000	0%	0%	1100000	0%	0%	5100000	0%	0%	190000	0%
SVOCs	Phenol	108-95-2	ug/kg	0%	0%	12000000	0%	0%	260000	0%	0%	12000000	0%	0%	--	--	--	--	--
SVOCs	Phorate	298-02-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	p-Phenylenediamine	106-50-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Pronamide	23950-58-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Propachlor	1918-16-7	ug/kg	0%	0%	--	--	--	5400	0%	0%	8800000	0%	0%	--	--	--	--	--
SVOCs	Pyrene	129-00-0	ug/kg	0%	0%	--	--	--	480000	0%	0%	480000	0%	0%	1E+09	0%	0%	7.8E+08	0%
SVOCs	Pyridine	110-86-1	ug/kg	0%	0%	37000	0%	0%	420	0%	45%	37000	0%	0%	2000	0%	0%	9800	0%
SVOCs	Ronnel	299-84-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Safrole	94-59-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Sym-Trinitrobenzene	99-35-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air1	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air2	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Particulate Soil Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential Soil Direct Contact	Percent Exceed (Detect)	Percent Exceed (Non-detect)	EPA Residential Soil	Percent Exceed (Detect)	Percent Exceed (Non-detect)
SVOCs	Isophorone	78-59-1	ug/kg	--	--	--	--	--	--	--	8.2E+09	0%	0%	2400000	0%	0%	--	--	--
SVOCs	Isosafrole	120-58-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Kepone	143-50-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	49	0%	100%
SVOCs	Methapyrilene	91-80-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Methyl chlorpyrifos	5598-13-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	610000	0%	0%
SVOCs	Methyl methanesulfonate	66-27-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	4900	0%	0%
SVOCs	Nitrobenzene	98-95-3	ug/kg	0%	64000	0%	0%	64000	0%	0%	21000000	0%	0%	340000	0%	0%	--	--	--
SVOCs	n-Nitrosodiethylamine	55-18-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	0.77	0%	100%
SVOCs	n-Nitrosodimethylamine	62-75-9	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	2.3	0%	100%
SVOCs	N-Nitroso-di-n-butylamine	924-16-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	87	0%	100%
SVOCs	n-Nitrosodi-n-propylamine	621-64-7	ug/kg	--	--	--	--	--	--	--	2000000	0%	0%	5400	0%	0%	--	--	--
SVOCs	n-Nitrosodiphenylamine	86-30-6	ug/kg	--	--	--	--	--	--	--	2.8E+09	0%	0%	7800000	0%	0%	--	--	--
SVOCs	n-Nitrosomethylethylamine	10595-95-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	22	0%	100%
SVOCs	n-Nitrosomorpholine	59-89-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	72	0%	100%
SVOCs	n-Nitrosopiperidine	100-75-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	52	0%	100%
SVOCs	n-Nitrosopyrrolidine	930-55-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	230	0%	100%
SVOCs	O,O,O-Triethyl Phosphorothioate	126-68-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	O,O-Diethyl O-2-Pyrazinyl Phosphorothioate (Thionazin)	297-97-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	o,p'-DDD	53-19-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Octachlorostyrene	29082-74-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	o-Phenylphenol	90-43-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	250000	0%	0%
SVOCs	o-Toluidine	95-53-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	Parathion, Ethyl (Parathion)	56-38-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	370000	0%	0%
SVOCs	Parathion, Methyl	298-00-0	ug/kg	--	--	--	--	--	--	--	--	--	--	180000	0%	0%	--	--	--
SVOCs	p-Dimethylaminoazobenzene	60-11-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	110	0%	100%
SVOCs	Pentachlorobenzene	608-93-5	ug/kg	--	--	--	--	--	--	--	--	--	--	190000	0%	0%	--	--	--
SVOCs	Pentachloronitrobenzene	82-68-8	ug/kg	0%	280000	0%	0%	280000	0%	0%	1.5E+08	0%	0%	5500000	0%	0%	--	--	--
SVOCs	Pentachlorophenol	87-86-5	ug/kg	--	--	--	--	--	--	--	1.3E+08	0%	0%	320000	0%	0%	--	--	--
SVOCs	Pentochlorethane	76-01-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	5400	0%	0%
SVOCs	Phenacetin	62-44-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	220000	0%	0%
SVOCs	Phenanthrene	85-01-8	ug/kg	0%	190000	0%	0%	190000	0%	0%	2900000	0%	0%	5200000	0%	0%	--	--	--
SVOCs	Phenol	108-95-2	ug/kg	--	--	--	--	--	--	--	1.8E+10	0%	0%	12000000	0%	0%	--	--	--
SVOCs	Phorate	298-02-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	12000	0%	0%
SVOCs	p-Phenylenediamine	106-50-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	12000000	0%	0%
SVOCs	Pronamide	23950-58-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	4600000	0%	0%
SVOCs	Propachlor	1918-16-7	ug/kg	--	--	--	--	--	--	--	--	--	--	9500000	0%	0%	--	--	--
SVOCs	Pyrene	129-00-0	ug/kg	0%	7.8E+08	0%	0%	7.8E+08	0%	0%	2.9E+09	0%	0%	84000000	0%	0%	--	--	--
SVOCs	Pyridine	110-86-1	ug/kg	0%	40000	0%	0%	97000	0%	0%	1E+08	0%	0%	37000	0%	0%	--	--	--
SVOCs	Ronnel	299-84-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	3100000	0%	0%
SVOCs	Safrole	94-59-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	2200	0%	0%
SVOCs	Sym-Trinitrobenzene	99-35-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	2200000	0%	0%

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	EPA Industrial Soil	Percent Exceed (Detect)	Percent Exceed (Non-detect)	EPA Risk-Based SSL	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Group D2 and D3?	Group D4?	Group D5 and D6?
SVOCs	Isophorone	78-59-1	ug/kg	--	--	--	--	--	--	D2	--	--
SVOCs	Isosafrole	120-58-1	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	Kepone	143-50-0	ug/kg	170	0%	100%	0.24	0%	100%	--	D4	--
SVOCs	Methapyrilene	91-80-5	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	Methyl chlorpyrifos	5598-13-0	ug/kg	6200000	0%	0%	1700	0%	0%	--	--	--
SVOCs	Methyl methanesulfonate	66-27-3	ug/kg	17000	0%	0%	0.14	0%	100%	--	D4	--
SVOCs	Nitrobenzene	98-95-3	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	n-Nitrosodiethylamine	55-18-5	ug/kg	11	0%	100%	0.000053	0%	100%	--	D4	--
SVOCs	n-Nitrosodimethylamine	62-75-9	ug/kg	34	0%	100%	0.0001	0%	100%	--	D4	--
SVOCs	N-Nitroso-di-n-butylamine	924-16-3	ug/kg	400	0%	38%	0.005	0%	100%	--	D4	--
SVOCs	n-Nitrosodi-n-propylamine	621-64-7	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	n-Nitrosodiphenylamine	86-30-6	ug/kg	--	--	--	--	--	--	D2	--	--
SVOCs	n-Nitrosomethylethylamine	10595-95-6	ug/kg	78	0%	100%	0.00088	0%	100%	--	D4	--
SVOCs	n-Nitrosomorpholine	59-89-2	ug/kg	260	0%	100%	0.0025	0%	100%	--	D4	--
SVOCs	n-Nitrosopiperidine	100-75-4	ug/kg	180	0%	100%	0.0038	0%	100%	--	D4	--
SVOCs	n-Nitrosopyrrolidine	930-55-2	ug/kg	820	0%	1%	0.012	0%	100%	--	D4	--
SVOCs	O,O,O-Triethyl Phosphorothioate	126-68-1	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	O,O-Diethyl O-2-Pyrazinyl Phosphorothioate (Thionazin)	297-97-2	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	o,p'-DDD	53-19-0	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	Octachlorostyrene	29082-74-4	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	o-Phenylphenol	90-43-7	ug/kg	890000	0%	0%	470	0%	0%	D3	--	--
SVOCs	o-Toluidine	95-53-4	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	Parathion, Ethyl (Parathion)	56-38-2	ug/kg	3700000	0%	0%	1100	0%	0%	--	--	--
SVOCs	Parathion, Methyl	298-00-0	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	p-Dimethylaminoazobenzene	60-11-7	ug/kg	370	0%	85%	0.062	0%	100%	--	D4	--
SVOCs	Pentachlorobenzene	608-93-5	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	Pentachloronitrobenzene	82-68-8	ug/kg	--	--	--	--	--	--	--	--	--
SVOCs	Pentachlorophenol	87-86-5	ug/kg	--	--	--	--	--	--	--	--	D6
SVOCs	Pentochlorethane	76-01-7	ug/kg	19000	0%	0%	0.36	0%	100%	--	D4	--
SVOCs	Phenacetin	62-44-2	ug/kg	780000	0%	0%	8.6	0%	100%	--	D4	--
SVOCs	Phenanthrene	85-01-8	ug/kg	--	--	--	--	--	--	--	--	D6
SVOCs	Phenol	108-95-2	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	Phorate	298-02-2	ug/kg	120000	0%	0%	8.2	0%	100%	--	D4	--
SVOCs	p-Phenylenediamine	106-50-3	ug/kg	1.2E+08	0%	0%	1900	0%	0%	--	--	--
SVOCs	Pronamide	23950-58-5	ug/kg	46000000	0%	0%	2800	0%	0%	--	--	--
SVOCs	Propachlor	1918-16-7	ug/kg	--	--	--	--	--	--	D2	--	--
SVOCs	Pyrene	129-00-0	ug/kg	--	--	--	--	--	--	D3	--	--
SVOCs	Pyridine	110-86-1	ug/kg	--	--	--	--	--	--	--	D4	--
SVOCs	Ronnel	299-84-3	ug/kg	31000000	0%	0%	17000	0%	0%	--	--	--
SVOCs	Safrole	94-59-7	ug/kg	7800	0%	0%	0.19	0%	100%	--	D4	--
SVOCs	Sym-Trinitrobenzene	99-35-4	ug/kg	27000000	0%	0%	3900	0%	0%	--	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				Number of Samples					Summary Statistics								(A) Background Screen	
Analyte Group	Analyte	CAS Number	Unit	No. of Samples from 2005/6 Dow On-Site	No. of Samples from 2006 COM Blind	No. of Samples from 2010 Dow	No. of Samples from 2010 MDEQ	Total No. of Samples	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	Min RL of NDs	Max RL of NDs	Max RL of NDs (Off-site)	Group A?	MDEQ Target Detection Levels
SVOCs	Tetraethyl Dithiopyrophosphate (Sulfotepp)	3689-24-5	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	704	1,840	1,840	--	--
SVOCs	trans-Nonachlor	39765-80-5	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	23.331	46.662	46.662	--	--
VOCs	1,1,1,2-Tetrachloroethane	630-20-6	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	480	480	--	100
VOCs	1,1,1-Trichloroethane	71-55-6	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	480	480	--	50
VOCs	1,1,2,2-Tetrachloroethane	79-34-5	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	480	480	--	50
VOCs	1,1,2-Trichloroethane	79-00-5	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	480	480	--	50
VOCs	1,1,2-Trichlorotrifluoroethane	76-13-1	ug/kg	0	0	0	28	**28**	0%	--	--	--	--	720	1,900	1,900	--	250
VOCs	1,1-Dichloroethane	75-34-3	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	480	480	--	50
VOCs	1,1-Dichloroethene	75-35-4	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	480	480	--	50
VOCs	1,1-Dichloropropene	563-58-6	ug/kg	0	0	99	28	**127**	0.8%	39.1	57.5	9	9	20	480	480	--	50
VOCs	1,2,3-Trichloropropane	96-18-4	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	480	480	--	100
VOCs	1,2,3-Trimethylbenzene	526-73-8	ug/kg	0	0	99	0	**99**	13%	7.96	5.38	5	45	14	14	14	--	--
VOCs	1,2,4-Trimethylbenzene	95-63-6	ug/kg	23	0	0	28	**51**	18%	89.5	76.3	34	300	0.5	480	480	--	100
VOCs	1,2-Dibromo-3-chloropropane	96-12-8	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	970	970	--	10
VOCs	1,2-Dibromoethane (EDB)	106-93-4	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	480	480	--	20
VOCs	1,2-Dichlorobenzene	95-50-1	ug/kg	23	72	99	28	**222**	3%	91.8	95.1	5	370	0.5	919	919	--	100
VOCs	1,2-Dichloroethane	107-06-2	ug/kg	23	72	0	28	**123**	0.8%	53.1	53.8	40	40	0.5	480	480	--	50
VOCs	1,2-Dichloropropane	78-87-5	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	480	480	--	50
VOCs	1,3,5-Trimethylbenzene	108-67-8	ug/kg	23	0	0	28	**51**	4%	82.2	69.0	74	81	0.5	480	480	--	100
VOCs	1,3-Dichlorobenzene	541-73-1	ug/kg	23	72	99	28	**222**	11%	90.0	96.9	4	380	0.5	919	919	--	100
VOCs	1,3-Dichloropropane	142-28-9	ug/kg	0	0	0	28	**28**	0%	--	--	--	--	180	480	480	--	50
VOCs	1,3-Dichloropropene, Total	542-75-6	ug/kg	0	0	0	28	**28**	0%	--	--	--	--	180	480	480	--	100
VOCs	1,4-Dichlorobenzene	106-46-7	ug/kg	23	72	99	28	**222**	9%	96.1	123.6	5	1,300	0.5	919	919	--	100
VOCs	1,4-Dioxane	123-91-1	ug/kg	0	72	0	28	**100**	0%	--	--	--	--	352	48,000	48,000	--	500
VOCs	2,2-Dichloropropane	594-20-7	ug/kg	0	0	99	28	**127**	0%	--	--	--	--	10	480	480	--	50
VOCs	2-Chloroethyl vinyl ether	110-75-8	ug/kg	0	0	0	28	**28**	0%	--	--	--	--	1,800	4,800	4,800	--	5000
VOCs	2-Chlorotoluene	95-49-8	ug/kg	0	0	99	28	**127**	0.8%	36.3	60.2	144	144	10	480	480	--	50
VOCs	2-Hexanone	591-78-6	ug/kg	23	72	0	28	**123**	0.8%	155	238	470	470	1	1,900	1,900	--	2500
VOCs	2-Propanol	67-63-0	ug/kg	0	0	0	28	**28**	0%	--	--	--	--	7,200	19,000	19,000	--	4400
VOCs	4-Chlorotoluene	106-43-4	ug/kg	0	0	99	28	**127**	0%	--	--	--	--	20	480	480	--	50
VOCs	Acetone	67-64-1	ug/kg	23	72	0	28	**123**	27%	468	316	49.1	1,880	5	2,700	2,700	--	1000
VOCs	Acetonitrile	75-05-8	ug/kg	0	72	0	28	**100**	0%	--	--	--	--	873	9,700	9,700	--	2500
VOCs	Acrolein	107-02-8	ug/kg	0	72	0	28	**100**	0%	--	--	--	--	436	9,700	9,700	--	250
VOCs	Acrylonitrile	107-13-1	ug/kg	23	72	99	28	**222**	2%	467	956	212	563	0.5	9,700	9,700	--	100
VOCs	Allyl Chloride (3-Chloropropene)	107-05-1	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	87.3	618	618	--	--
VOCs	Benzene	71-43-2	ug/kg	23	72	99	28	**222**	19%	35.2	46.5	10.5	200	0.5	480	480	--	50
VOCs	Bromobenzene	108-86-1	ug/kg	23	0	0	28	**51**	0%	--	--	--	--	0.5	480	480	--	100
VOCs	Bromodichloromethane	75-27-4	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	480	480	--	100
VOCs	Bromoform	75-25-2	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	480	480	--	100
VOCs	Bromomethane	74-83-9	ug/kg	23	72	0	28	**123**	6%	109	112	100	372	1	970	970	--	200
VOCs	Carbon disulfide	75-15-0	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	480	480	--	250

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				(B) Target Detection Level Screen				(C) Identify Criteria											
Analyte Group	Analyte	CAS Number	Unit	Max RL of NDs < TDL	Max RL of NDs (Off-site) < TDL	Max RL of NDs < All Criteria	Group B?	Have Criteria?	Minimum Criteria	Group C?	Residential Drinking Water Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Groundwater Surface Water Interface Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Groundwater Contact Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)
SVOCs	Tetraethyl Dithiopyrophosphate (Sulfotepp)	3689-24-5	ug/kg	No	No	No	--	Yes	13	--	--	--	--	--	--	--	--	--	--
SVOCs	trans-Nonachlor	39765-80-5	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
VOCs	1,1,1,2-Tetrachloroethane	630-20-6	ug/kg	No	No	Yes	B3	Yes	1500	--	1500	0%	0%	--	--	--	440000	0%	0%
VOCs	1,1,1-Trichloroethane	71-55-6	ug/kg	No	No	Yes	B3	Yes	1800	--	4000	0%	0%	1800	0%	0%	460000	0%	0%
VOCs	1,1,2,2-Tetrachloroethane	79-34-5	ug/kg	No	No	No	--	Yes	170	--	170	0%	24%	1600	0%	0%	94000	0%	0%
VOCs	1,1,2-Trichloroethane	79-00-5	ug/kg	No	No	No	--	Yes	100	--	100	0%	26%	6600	0%	0%	420000	0%	0%
VOCs	1,1,2-Trichlorotrifluoroethane	76-13-1	ug/kg	No	No	No	--	Yes	1700	--	550000	0%	0%	1700	0%	4%	550000	0%	0%
VOCs	1,1-Dichloroethane	75-34-3	ug/kg	No	No	Yes	B3	Yes	15000	--	18000	0%	0%	15000	0%	0%	890000	0%	0%
VOCs	1,1-Dichloroethene	75-35-4	ug/kg	No	No	No	--	Yes	62	--	140	0%	24%	2600	0%	0%	220000	0%	0%
VOCs	1,1-Dichloropropene	563-58-6	ug/kg	No	No	Yes	--	No	--	C1	--	--	--	--	--	--	--	--	--
VOCs	1,2,3-Trichloropropane	96-18-4	ug/kg	No	No	Yes	B3	Yes	840	--	840	0%	0%	--	--	--	830000	0%	0%
VOCs	1,2,3-Trimethylbenzene	526-73-8	ug/kg	No	No	Yes	--	No	--	C2	--	--	--	--	--	--	--	--	--
VOCs	1,2,4-Trimethylbenzene	95-63-6	ug/kg	No	No	Yes	--	Yes	570	--	2100	0%	0%	570	0%	0%	110000	0%	0%
VOCs	1,2-Dibromo-3-chloropropane	96-12-8	ug/kg	No	No	No	--	Yes	10	--	10	0%	93%	--	--	--	1200	0%	0%
VOCs	1,2-Dibromoethane (EDB)	106-93-4	ug/kg	No	No	No	--	Yes	20	--	20	0%	93%	110	0%	26%	500	0%	0%
VOCs	1,2-Dichlorobenzene	95-50-1	ug/kg	No	No	No	--	Yes	280	--	14000	0%	0%	280	0.5%	37%	210000	0%	0%
VOCs	1,2-Dichloroethane	107-06-2	ug/kg	No	No	No	--	Yes	100	--	100	0%	26%	7200	0%	0%	380000	0%	0%
VOCs	1,2-Dichloropropane	78-87-5	ug/kg	No	No	No	--	Yes	100	--	100	0%	26%	4600	0%	0%	320000	0%	0%
VOCs	1,3,5-Trimethylbenzene	108-67-8	ug/kg	No	No	Yes	--	Yes	1100	--	1800	0%	0%	1100	0%	0%	94000	0%	0%
VOCs	1,3-Dichlorobenzene	541-73-1	ug/kg	No	No	No	--	Yes	170	--	170	0.5%	45%	680	0%	0.9%	51000	0%	0%
VOCs	1,3-Dichloropropane	142-28-9	ug/kg	No	No	No	--	Yes	250	--	--	--	--	--	--	--	--	--	--
VOCs	1,3-Dichloropropene, Total	542-75-6	ug/kg	No	No	No	--	Yes	170	--	170	0%	100%	180	0%	96%	110000	0%	0%
VOCs	1,4-Dichlorobenzene	106-46-7	ug/kg	No	No	No	--	Yes	360	--	1700	0%	0%	360	0.5%	33%	140000	0%	0%
VOCs	1,4-Dioxane	123-91-1	ug/kg	No	No	No	--	Yes	1700	--	1700	0%	28%	56000	0%	0%	34000000	0%	0%
VOCs	2,2-Dichloropropane	594-20-7	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
VOCs	2-Chloroethyl vinyl ether	110-75-8	ug/kg	Yes	Yes	Yes	B1	Yes	1900000	--	--	--	--	--	--	--	--	--	--
VOCs	2-Chlorotoluene	95-49-8	ug/kg	No	No	Yes	--	Yes	3300	--	3300	0%	0%	--	--	--	500000	0%	0%
VOCs	2-Hexanone	591-78-6	ug/kg	Yes	Yes	Yes	--	Yes	20000	--	20000	0%	0%	--	--	--	2500000	0%	0%
VOCs	2-Propanol	67-63-0	ug/kg	No	No	No	--	Yes	9400	--	9400	0%	82%	1100000	0%	0%	1.1E+08	0%	0%
VOCs	4-Chlorotoluene	106-43-4	ug/kg	No	No	Yes	B3	Yes	2500	--	--	--	--	--	--	--	--	--	--
VOCs	Acetone	67-64-1	ug/kg	No	No	Yes	--	Yes	15000	--	15000	0%	0%	34000	0%	0%	1.1E+08	0%	0%
VOCs	Acetonitrile	75-05-8	ug/kg	No	No	No	--	Yes	2800	--	2800	0%	30%	--	--	--	22000000	0%	0%
VOCs	Acrolein	107-02-8	ug/kg	No	No	No	--	Yes	310	--	2400	0%	29%	--	--	--	23000000	0%	0%
VOCs	Acrylonitrile	107-13-1	ug/kg	No	No	No	--	Yes	100	--	100	2%	43%	100	2%	43%	280000	0%	0%
VOCs	Allyl Chloride (3-Chloropropene)	107-05-1	ug/kg	No	No	No	--	Yes	0.21	--	--	--	--	--	--	--	--	--	--
VOCs	Benzene	71-43-2	ug/kg	No	No	No	--	Yes	100	--	100	0.9%	14%	4000	0%	0%	220000	0%	0%
VOCs	Bromobenzene	108-86-1	ug/kg	No	No	Yes	B3	Yes	550	--	550	0%	0%	--	--	--	360000	0%	0%
VOCs	Bromodichloromethane	75-27-4	ug/kg	No	No	Yes	B3	Yes	1200	--	1600	0%	0%	--	--	--	280000	0%	0%
VOCs	Bromoform	75-25-2	ug/kg	No	No	Yes	B3	Yes	1600	--	1600	0%	0%	--	--	--	870000	0%	0%
VOCs	Bromomethane	74-83-9	ug/kg	No	No	No	--	Yes	200	--	200	0.8%	25%	700	0%	4%	1400000	0%	0%
VOCs	Carbon disulfide	75-15-0	ug/kg	No	No	Yes	B3	Yes	16000	--	16000	0%	0%	--	--	--	280000	0%	0%

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	Residential Soil Volatilization to Indoor Air Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air1	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air2	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Particulate Soil Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Direct Contact
SVOCs	Tetraethyl Dithiopyrophosphate (Sulfotepp)	3689-24-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	trans-Nonachlor	39765-80-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	1,1,1,2-Tetrachloroethane	630-20-6	ug/kg	6200	0%	0%	36000	0%	0%	54000	0%	0%	100000	0%	0%	4.2E+08	0%	0%	440000
VOCs	1,1,1-Trichloroethane	71-55-6	ug/kg	250000	0%	0%	3800000	0%	0%	12000000	0%	0%	28000000	0%	0%	6.7E+10	0%	0%	460000
VOCs	1,1,2,2-Tetrachloroethane	79-34-5	ug/kg	4300	0%	0%	10000	0%	0%	10000	0%	0%	14000	0%	0%	54000000	0%	0%	53000
VOCs	1,1,2-Trichloroethane	79-00-5	ug/kg	4600	0%	0%	17000	0%	0%	21000	0%	0%	44000	0%	0%	1.9E+08	0%	0%	180000
VOCs	1,1,2-Trichlorotrifluoroethane	76-13-1	ug/kg	550000	0%	0%	1.8E+08	0%	0%	8.8E+08	0%	0%	2.1E+09	0%	0%	5.10E+12	0%	0%	550000
VOCs	1,1-Dichloroethane	75-34-3	ug/kg	230000	0%	0%	2100000	0%	0%	5900000	0%	0%	14000000	0%	0%	3.3E+10	0%	0%	890000
VOCs	1,1-Dichloroethene	75-35-4	ug/kg	62	0%	38%	1100	0%	0%	5300	0%	0%	13000	0%	0%	62000000	0%	0%	200000
VOCs	1,1-Dichloropropene	563-58-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	1,2,3-Trichloropropane	96-18-4	ug/kg	4000	0%	0%	9200	0%	0%	9200	0%	0%	11000	0%	0%	20000000	0%	0%	830000
VOCs	1,2,3-Trimethylbenzene	526-73-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	1,2,4-Trimethylbenzene	95-63-6	ug/kg	110000	0%	0%	21000000	0%	0%	5E+08	0%	0%	5E+08	0%	0%	8.2E+10	0%	0%	110000
VOCs	1,2-Dibromo-3-chloropropane	96-12-8	ug/kg	1200	0%	0%	13000	0%	0%	13000	0%	0%	13000	0%	0%	13000000	0%	0%	1200
VOCs	1,2-Dibromoethane (EDB)	106-93-4	ug/kg	670	0%	0%	1700	0%	0%	1700	0%	0%	3300	0%	0%	14000000	0%	0%	92
VOCs	1,2-Dichlorobenzene	95-50-1	ug/kg	210000	0%	0%	39000000	0%	0%	39000000	0%	0%	52000000	0%	0%	1E+11	0%	0%	210000
VOCs	1,2-Dichloroethane	107-06-2	ug/kg	2100	0%	0%	6200	0%	0%	11000	0%	0%	26000	0%	0%	1.2E+08	0%	0%	91000
VOCs	1,2-Dichloropropane	78-87-5	ug/kg	4000	0%	0%	25000	0%	0%	50000	0%	0%	110000	0%	0%	2.7E+08	0%	0%	140000
VOCs	1,3,5-Trimethylbenzene	108-67-8	ug/kg	94000	0%	0%	16000000	0%	0%	3.8E+08	0%	0%	3.8E+08	0%	0%	8.2E+10	0%	0%	94000
VOCs	1,3-Dichlorobenzene	541-73-1	ug/kg	26000	0%	0%	79000	0%	0%	79000	0%	0%	110000	0%	0%	2E+08	0%	0%	170000
VOCs	1,3-Dichloropropane	142-28-9	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	1,3-Dichloropropene, Total	542-75-6	ug/kg	1000	0%	0%	18000	0%	0%	68000	0%	0%	160000	0%	0%	7.8E+08	0%	0%	10000
VOCs	1,4-Dichlorobenzene	106-46-7	ug/kg	19000	0%	0%	77000	0%	0%	77000	0%	0%	110000	0%	0%	4.5E+08	0%	0%	400000
VOCs	1,4-Dioxane	123-91-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	5.7E+08	0%	0%	530000
VOCs	2,2-Dichloropropane	594-20-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	2-Chloroethyl vinyl ether	110-75-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	2-Chlorotoluene	95-49-8	ug/kg	270000	0%	0%	1200000	0%	0%	2900000	0%	0%	6300000	0%	0%	4.7E+09	0%	0%	500000
VOCs	2-Hexanone	591-78-6	ug/kg	990000	0%	0%	1100000	0%	0%	1100000	0%	0%	1400000	0%	0%	2.7E+09	0%	0%	2500000
VOCs	2-Propanol	67-63-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	1.5E+10	0%	0%	14000000
VOCs	4-Chlorotoluene	106-43-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Acetone	67-64-1	ug/kg	1.1E+08	0%	0%	1.3E+08	0%	0%	1.3E+08	0%	0%	1.9E+08	0%	0%	3.9E+11	0%	0%	23000000
VOCs	Acetonitrile	75-05-8	ug/kg	4800000	0%	0%	1600000	0%	0%	1600000	0%	0%	2100000	0%	0%	4E+09	0%	0%	4300000
VOCs	Acrolein	107-02-8	ug/kg	410	0%	100%	310	0%	100%	310	0%	100%	610	0%	48%	1300000	0%	0%	3600000
VOCs	Acrylonitrile	107-13-1	ug/kg	6600	0%	3%	5000	0%	6%	5100	0%	6%	10000	0%	0%	46000000	0%	0%	16000
VOCs	Allyl Chloride (3-Chloropropene)	107-05-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Benzene	71-43-2	ug/kg	1600	0%	0%	13000	0%	0%	34000	0%	0%	79000	0%	0%	3.8E+08	0%	0%	180000
VOCs	Bromobenzene	108-86-1	ug/kg	310000	0%	0%	450000	0%	0%	450000	0%	0%	450000	0%	0%	5.3E+08	0%	0%	540000
VOCs	Bromodichloromethane	75-27-4	ug/kg	1200	0%	0%	9100	0%	0%	9700	0%	0%	19000	0%	0%	84000000	0%	0%	110000
VOCs	Bromoform	75-25-2	ug/kg	150000	0%	0%	900000	0%	0%	900000	0%	0%	900000	0%	0%	2.8E+09	0%	0%	820000
VOCs	Bromomethane	74-83-9	ug/kg	860	0%	0.8%	11000	0%	0%	57000	0%	0%	140000	0%	0%	3.3E+08	0%	0%	320000
VOCs	Carbon disulfide	75-15-0	ug/kg	76000	0%	0%	1300000	0%	0%	7900000	0%	0%	19000000	0%	0%	4.7E+10	0%	0%	280000

Table 5-2
Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				(D) Pathway-Specific Toxicity Screening Criteria															
Analyte Group	Analyte	CAS Number	Unit	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Soil Saturation Screening Levels	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential Drinking Water Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential GW Contact Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Soil Volatilization to Indoor Air Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air	Percent Exceed (Detect)
SVOCs	Tetraethyl Dithiopyrophosphate (Sulfotepp)	3689-24-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SVOCs	trans-Nonachlor	39765-80-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	1,1,1,2-Tetrachloroethane	630-20-6	ug/kg	0%	0%	440000	0%	0%	6400	0%	0%	440000	0%	0%	33000	0%	0%	120000	0%
VOCs	1,1,1-Trichloroethane	71-55-6	ug/kg	0%	0%	460000	0%	0%	4000	0%	0%	460000	0%	0%	460000	0%	0%	4500000	0%
VOCs	1,1,2,2-Tetrachloroethane	79-34-5	ug/kg	0%	0%	870000	0%	0%	700	0%	0%	94000	0%	0%	23000	0%	0%	34000	0%
VOCs	1,1,2-Trichloroethane	79-00-5	ug/kg	0%	0%	920000	0%	0%	100	0%	26%	420000	0%	0%	24000	0%	0%	57000	0%
VOCs	1,1,2-Trichlorotrifluoroethane	76-13-1	ug/kg	0%	0%	550000	0%	0%	550000	0%	0%	550000	0%	0%	550000	0%	0%	2.1E+08	0%
VOCs	1,1-Dichloroethane	75-34-3	ug/kg	0%	0%	890000	0%	0%	50000	0%	0%	890000	0%	0%	430000	0%	0%	2500000	0%
VOCs	1,1-Dichloroethene	75-35-4	ug/kg	0%	0%	570000	0%	0%	140	0%	24%	220000	0%	0%	330	0%	5%	3700	0%
VOCs	1,1-Dichloropropene	563-58-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	1,2,3-Trichloropropane	96-18-4	ug/kg	0%	0%	830000	0%	0%	2400	0%	0%	830000	0%	0%	7500	0%	0%	11000	0%
VOCs	1,2,3-Trimethylbenzene	526-73-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	1,2,4-Trimethylbenzene	95-63-6	ug/kg	0%	0%	110000	0%	0%	2100	0%	0%	110000	0%	0%	110000	0%	0%	25000000	0%
VOCs	1,2-Dibromo-3-chloropropane	96-12-8	ug/kg	0%	0%	1200	0%	0%	10	0%	93%	1200	0%	0%	1200	0%	0%	15000	0%
VOCs	1,2-Dibromoethane (EDB)	106-93-4	ug/kg	0%	26%	890000	0%	0%	20	0%	93%	500	0%	0%	3600	0%	0%	5800	0%
VOCs	1,2-Dichlorobenzene	95-50-1	ug/kg	0%	0%	210000	0%	0%	14000	0%	0%	210000	0%	0%	210000	0%	0%	46000000	0%
VOCs	1,2-Dichloroethane	107-06-2	ug/kg	0%	0%	1200000	0%	0%	100	0%	26%	380000	0%	0%	11000	0%	0%	21000	0%
VOCs	1,2-Dichloropropane	78-87-5	ug/kg	0%	0%	550000	0%	0%	100	0%	26%	320000	0%	0%	7400	0%	0%	30000	0%
VOCs	1,3,5-Trimethylbenzene	108-67-8	ug/kg	0%	0%	94000	0%	0%	1800	0%	0%	94000	0%	0%	94000	0%	0%	19000000	0%
VOCs	1,3-Dichlorobenzene	541-73-1	ug/kg	0%	0%	170000	0%	0%	480	0%	1%	51000	0%	0%	48000	0%	0%	94000	0%
VOCs	1,3-Dichloropropane	142-28-9	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	1,3-Dichloropropene, Total	542-75-6	ug/kg	0%	0%	620000	0%	0%	700	0%	0%	110000	0%	0%	5400	0%	0%	60000	0%
VOCs	1,4-Dichlorobenzene	106-46-7	ug/kg	0%	0%	--	--	--	1700	0%	0%	140000	0%	0%	100000	0%	0%	260000	0%
VOCs	1,4-Dioxane	123-91-1	ug/kg	0%	0%	97000000	0%	0%	7000	0%	28%	34000000	0%	0%	--	--	--	--	--
VOCs	2,2-Dichloropropane	594-20-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	2-Chloroethyl vinyl ether	110-75-8	ug/kg	--	--	1900000	0%	0%	--	--	--	--	--	--	--	--	--	--	--
VOCs	2-Chlorotoluene	95-49-8	ug/kg	0%	0%	500000	0%	0%	9300	0%	0%	500000	0%	0%	500000	0%	0%	1500000	0%
VOCs	2-Hexanone	591-78-6	ug/kg	0%	0%	2500000	0%	0%	58000	0%	0%	2500000	0%	0%	1800000	0%	0%	1300000	0%
VOCs	2-Propanol	67-63-0	ug/kg	0%	0%	1.1E+08	0%	0%	26000	0%	0%	1.1E+08	0%	0%	--	--	--	--	--
VOCs	4-Chlorotoluene	106-43-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Acetone	67-64-1	ug/kg	0%	0%	1.1E+08	0%	0%	42000	0%	0%	1.1E+08	0%	0%	11000000	0%	0%	1.6E+08	0%
VOCs	Acetonitrile	75-05-8	ug/kg	0%	0%	22000000	0%	0%	8000	0%	3%	2200000	0%	0%	8800000	0%	0%	1900000	0%
VOCs	Acrolein	107-02-8	ug/kg	0%	0%	23000000	0%	0%	6600	0%	6%	2300000	0%	0%	760	0%	35%	370	0%
VOCs	Acrylonitrile	107-13-1	ug/kg	0%	0%	8300000	0%	0%	220	1%	43%	280000	0%	0%	35000	0%	0%	17000	0%
VOCs	Allyl Chloride (3-Chloropropene)	107-05-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Benzene	71-43-2	ug/kg	0%	0%	400000	0%	0%	100	0.9%	14%	220000	0%	0%	8400	0%	0%	45000	0%
VOCs	Bromobenzene	108-86-1	ug/kg	0%	0%	760000	0%	0%	1500	0%	0%	360000	0%	0%	580000	0%	0%	540000	0%
VOCs	Bromodichloromethane	75-27-4	ug/kg	0%	0%	1500000	0%	0%	1600	0%	0%	280000	0%	0%	6400	0%	0%	31000	0%
VOCs	Bromoform	75-25-2	ug/kg	0%	0%	870000	0%	0%	1600	0%	0%	870000	0%	0%	770000	0%	0%	3100000	0%
VOCs	Bromomethane	74-83-9	ug/kg	0%	0%	2200000	0%	0%	580	0%	10%	1400000	0%	0%	1600	0%	0%	13000	0%
VOCs	Carbon disulfide	75-15-0	ug/kg	0%	0%	280000	0%	0%	46000	0%	0%	280000	0%	0%	140000	0%	0%	1600000	0%

Table 5-2
Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air1	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air2	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Particulate Soil Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential Soil Direct Contact	Percent Exceed (Detect)	Percent Exceed (Non-detect)	EPA Residential Soil	Percent Exceed (Detect)	Percent Exceed (Non-detect)
SVOCs	Tetraethyl Dithiopyrophosphate (Sulfotepp)	3689-24-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	31000	0%	0%
SVOCs	trans-Nonachlor	39765-80-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	1,1,1,2-Tetrachloroethane	630-20-6	ug/kg	0%	210000	0%	0%	330000	0%	0%	5.3E+08	0%	0%	440000	0%	0%	--	--	--
VOCs	1,1,1-Trichloroethane	71-55-6	ug/kg	0%	15000000	0%	0%	31000000	0%	0%	2.9E+10	0%	0%	460000	0%	0%	--	--	--
VOCs	1,1,2,2-Tetrachloroethane	79-34-5	ug/kg	0%	34000	0%	0%	34000	0%	0%	68000000	0%	0%	240000	0%	0%	--	--	--
VOCs	1,1,2-Trichloroethane	79-00-5	ug/kg	0%	57000	0%	0%	120000	0%	0%	2.5E+08	0%	0%	840000	0%	0%	--	--	--
VOCs	1,1,2-Trichlorotrifluoroethane	76-13-1	ug/kg	0%	8.9E+08	0%	0%	2.1E+09	0%	0%	2.30E+12	0%	0%	550000	0%	0%	--	--	--
VOCs	1,1-Dichloroethane	75-34-3	ug/kg	0%	6000000	0%	0%	14000000	0%	0%	1.5E+10	0%	0%	890000	0%	0%	--	--	--
VOCs	1,1-Dichloroethene	75-35-4	ug/kg	0%	15000	0%	0%	37000	0%	0%	78000000	0%	0%	570000	0%	0%	--	--	--
VOCs	1,1-Dichloropropene	563-58-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	1,2,3-Trichloropropane	96-18-4	ug/kg	0%	11000	0%	0%	12000	0%	0%	8800000	0%	0%	830000	0%	0%	--	--	--
VOCs	1,2,3-Trimethylbenzene	526-73-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	1,2,4-Trimethylbenzene	95-63-6	ug/kg	0%	6E+08	0%	0%	6E+08	0%	0%	3.6E+10	0%	0%	110000	0%	0%	--	--	--
VOCs	1,2-Dibromo-3-chloropropane	96-12-8	ug/kg	0%	15000	0%	0%	15000	0%	0%	5900000	0%	0%	1200	0%	0%	--	--	--
VOCs	1,2-Dibromoethane (EDB)	106-93-4	ug/kg	0%	5800	0%	0%	9800	0%	0%	18000000	0%	0%	430	0%	0.8%	--	--	--
VOCs	1,2-Dichlorobenzene	95-50-1	ug/kg	0%	46000000	0%	0%	55000000	0%	0%	4.4E+10	0%	0%	210000	0%	0%	--	--	--
VOCs	1,2-Dichloroethane	107-06-2	ug/kg	0%	33000	0%	0%	74000	0%	0%	1.5E+08	0%	0%	420000	0%	0%	--	--	--
VOCs	1,2-Dichloropropane	78-87-5	ug/kg	0%	51000	0%	0%	120000	0%	0%	1.2E+08	0%	0%	550000	0%	0%	--	--	--
VOCs	1,3,5-Trimethylbenzene	108-67-8	ug/kg	0%	4.6E+08	0%	0%	4.6E+08	0%	0%	3.6E+10	0%	0%	94000	0%	0%	--	--	--
VOCs	1,3-Dichlorobenzene	541-73-1	ug/kg	0%	94000	0%	0%	110000	0%	0%	88000000	0%	0%	170000	0%	0%	--	--	--
VOCs	1,3-Dichloropropane	142-28-9	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	1600000	0%	0%
VOCs	1,3-Dichloropropene, Total	542-75-6	ug/kg	0%	200000	0%	0%	470000	0%	0%	5.9E+08	0%	0%	240000	0%	0%	--	--	--
VOCs	1,4-Dichlorobenzene	106-46-7	ug/kg	0%	260000	0%	0%	340000	0%	0%	5.7E+08	0%	0%	1900000	0%	0%	--	--	--
VOCs	1,4-Dioxane	123-91-1	ug/kg	--	--	--	--	--	--	--	7.1E+08	0%	0%	2400000	0%	0%	--	--	--
VOCs	2,2-Dichloropropane	594-20-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	2-Chloroethyl vinyl ether	110-75-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	2-Chlorotoluene	95-49-8	ug/kg	0%	3100000	0%	0%	6400000	0%	0%	2.1E+09	0%	0%	500000	0%	0%	--	--	--
VOCs	2-Hexanone	591-78-6	ug/kg	0%	1300000	0%	0%	1500000	0%	0%	1.2E+09	0%	0%	2500000	0%	0%	--	--	--
VOCs	2-Propanol	67-63-0	ug/kg	--	--	--	--	--	--	--	6.5E+09	0%	0%	47000000	0%	0%	--	--	--
VOCs	4-Chlorotoluene	106-43-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	5500000	0%	0%
VOCs	Acetone	67-64-1	ug/kg	0%	1.6E+08	0%	0%	2E+08	0%	0%	1.7E+11	0%	0%	73000000	0%	0%	--	--	--
VOCs	Acetonitrile	75-05-8	ug/kg	0%	1900000	0%	0%	2200000	0%	0%	1.8E+09	0%	0%	14000000	0%	0%	--	--	--
VOCs	Acrolein	107-02-8	ug/kg	100%	370	0%	100%	630	0%	45%	590000	0%	0%	12000000	0%	0%	--	--	--
VOCs	Acrylonitrile	107-13-1	ug/kg	0%	17000	0%	0%	31000	0%	0%	58000000	0%	0%	74000	0%	0%	--	--	--
VOCs	Allyl Chloride (3-Chloropropene)	107-05-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	680	0%	0%
VOCs	Benzene	71-43-2	ug/kg	0%	99000	0%	0%	230000	0%	0%	4.7E+08	0%	0%	400000	0%	0%	--	--	--
VOCs	Bromobenzene	108-86-1	ug/kg	0%	540000	0%	0%	540000	0%	0%	2.4E+08	0%	0%	760000	0%	0%	--	--	--
VOCs	Bromodichloromethane	75-27-4	ug/kg	0%	31000	0%	0%	57000	0%	0%	1.1E+08	0%	0%	490000	0%	0%	--	--	--
VOCs	Bromoform	75-25-2	ug/kg	0%	3100000	0%	0%	3100000	0%	0%	3.6E+09	0%	0%	870000	0%	0%	--	--	--
VOCs	Bromomethane	74-83-9	ug/kg	0%	57000	0%	0%	140000	0%	0%	1.5E+08	0%	0%	1000000	0%	0%	--	--	--
VOCs	Carbon disulfide	75-15-0	ug/kg	0%	8000000	0%	0%	19000000	0%	0%	2.1E+10	0%	0%	280000	0%	0%	--	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	EPA Industrial Soil	Percent Exceed (Detect)	Percent Exceed (Non-detect)	EPA Risk-Based SSL	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Group D2 and D3?	Group D4?	Group D5 and D6?
SVOCs	Tetraethyl Dithiopyrophosphate (Sulfotepp)	3689-24-5	ug/kg	310000	0%	0%	13	0%	100%	--	D4	--
SVOCs	trans-Nonachlor	39765-80-5	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	1,1,1,2-Tetrachloroethane	630-20-6	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	1,1,1-Trichloroethane	71-55-6	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	1,1,2,2-Tetrachloroethane	79-34-5	ug/kg	--	--	--	--	--	--	--	D4	--
VOCs	1,1,2-Trichloroethane	79-00-5	ug/kg	--	--	--	--	--	--	--	D4	--
VOCs	1,1,2-Trichlorotrifluoroethane	76-13-1	ug/kg	--	--	--	--	--	--	--	D4	--
VOCs	1,1-Dichloroethane	75-34-3	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	1,1-Dichloroethene	75-35-4	ug/kg	--	--	--	--	--	--	--	D4	--
VOCs	1,1-Dichloropropene	563-58-6	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	1,2,3-Trichloropropane	96-18-4	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	1,2,3-Trimethylbenzene	526-73-8	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	1,2,4-Trimethylbenzene	95-63-6	ug/kg	--	--	--	--	--	--	D3	--	--
VOCs	1,2-Dibromo-3-chloropropane	96-12-8	ug/kg	--	--	--	--	--	--	--	D4	--
VOCs	1,2-Dibromoethane (EDB)	106-93-4	ug/kg	--	--	--	--	--	--	--	D4	--
VOCs	1,2-Dichlorobenzene	95-50-1	ug/kg	--	--	--	--	--	--	--	--	D5
VOCs	1,2-Dichloroethane	107-06-2	ug/kg	--	--	--	--	--	--	--	D4	--
VOCs	1,2-Dichloropropane	78-87-5	ug/kg	--	--	--	--	--	--	--	D4	--
VOCs	1,3,5-Trimethylbenzene	108-67-8	ug/kg	--	--	--	--	--	--	D2	--	--
VOCs	1,3-Dichlorobenzene	541-73-1	ug/kg	--	--	--	--	--	--	--	--	D6
VOCs	1,3-Dichloropropane	142-28-9	ug/kg	20000000	0%	0%	250	0%	50%	--	D4	--
VOCs	1,3-Dichloropropene, Total	542-75-6	ug/kg	--	--	--	--	--	--	--	D4	--
VOCs	1,4-Dichlorobenzene	106-46-7	ug/kg	--	--	--	--	--	--	--	--	D6
VOCs	1,4-Dioxane	123-91-1	ug/kg	--	--	--	--	--	--	--	D4	--
VOCs	2,2-Dichloropropane	594-20-7	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	2-Chloroethyl vinyl ether	110-75-8	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	2-Chlorotoluene	95-49-8	ug/kg	--	--	--	--	--	--	D2	--	--
VOCs	2-Hexanone	591-78-6	ug/kg	--	--	--	--	--	--	D2	--	--
VOCs	2-Propanol	67-63-0	ug/kg	--	--	--	--	--	--	--	D4	--
VOCs	4-Chlorotoluene	106-43-4	ug/kg	72000000	0%	0%	2500	0%	0%	--	--	--
VOCs	Acetone	67-64-1	ug/kg	--	--	--	--	--	--	D3	--	--
VOCs	Acetonitrile	75-05-8	ug/kg	--	--	--	--	--	--	--	D4	--
VOCs	Acrolein	107-02-8	ug/kg	--	--	--	--	--	--	--	D4	--
VOCs	Acrylonitrile	107-13-1	ug/kg	--	--	--	--	--	--	--	--	D5
VOCs	Allyl Chloride (3-Chloropropene)	107-05-1	ug/kg	3400	0%	0%	0.21	0%	100%	--	D4	--
VOCs	Benzene	71-43-2	ug/kg	--	--	--	--	--	--	--	--	D6
VOCs	Bromobenzene	108-86-1	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	Bromodichloromethane	75-27-4	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	Bromoform	75-25-2	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	Bromomethane	74-83-9	ug/kg	--	--	--	--	--	--	--	--	D6
VOCs	Carbon disulfide	75-15-0	ug/kg	--	--	--	--	--	--	--	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				Number of Samples					Summary Statistics								(A) Background Screen	
Analyte Group	Analyte	CAS Number	Unit	No. of Samples from 2005/6 Dow On-Site	No. of Samples from 2006 COM Blind	No. of Samples from 2010 Dow	No. of Samples from 2010 MDEQ	Total No. of Samples	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	Min RL of NDs	Max RL of NDs	Max RL of NDs (Off-site)	Group A?	MDEQ Target Detection Levels
VOCs	Carbon tetrachloride	56-23-5	ug/kg	23	72	0	28	**123**	2%	53.3	53.8	17	71	0.5	480	480	--	50
VOCs	Chlorobenzene	108-90-7	ug/kg	23	72	99	28	**222**	0.5%	40.9	146.4	2,100	2,100	0.5	480	480	--	50
VOCs	Chlorobromomethane	74-97-5	ug/kg	23	0	0	28	**51**	0%	--	--	--	--	0.5	480	480	--	100
VOCs	Chloroethane	75-00-3	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	970	970	--	250
VOCs	Chloroform	67-66-3	ug/kg	23	72	0	28	**123**	4%	53.7	53.7	27.5	88	0.5	480	480	--	50
VOCs	Chloromethane	74-87-3	ug/kg	23	72	0	28	**123**	2%	86.3	114.8	87	113	1	970	970	--	250
VOCs	Chloroprene (2-Chloro-1,3-Butadiene)	126-99-8	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	436	3,090	3,090	--	--
VOCs	cis-1,2-Dichloroethene	156-59-2	ug/kg	23	0	0	28	**51**	0%	--	--	--	--	0.5	240	240	--	50
VOCs	cis-1,3-Dichloropropene	10061-01-5	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	480	480	--	50
VOCs	Cyclohexane	110-82-7	ug/kg	0	0	99	0	**99**	3%	7.16	15.24	11	137	10	10	10	--	--
VOCs	Cyclohexanone	108-94-1	ug/kg	0	0	0	28	**28**	0%	--	--	--	--	2,900	7,800	7,800	--	2500
VOCs	Dibromochloromethane	124-48-1	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	480	480	--	100
VOCs	Dibromomethane	74-95-3	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	480	480	--	250
VOCs	Dichlorodifluoromethane	75-71-8	ug/kg	23	72	0	28	**123**	0.8%	87.3	113.9	44.8	44.8	0.5	970	970	--	250
VOCs	Ethyl Benzene	100-41-4	ug/kg	23	72	0	28	**123**	10%	59.8	57.1	25.6	229	0.5	480	480	--	50
VOCs	Ethyl ether	60-29-7	ug/kg	23	0	0	28	**51**	0%	--	--	--	--	0.5	970	970	--	200
VOCs	Ethyl methacrylate	97-63-2	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	62.7	618	618	--	--
VOCs	Ethyl tert-Butyl Ether	637-92-3	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	10	10	10	--	250
VOCs	Ethylene oxide	75-21-8	ug/kg	0	0	0	28	**28**	0%	--	--	--	--	110,000	290,000	290,000	--	10000
VOCs	Isobutanol	78-83-1	ug/kg	0	72	0	28	**100**	0%	--	--	--	--	4,360	30,900	30,900	--	4400
VOCs	Isopropyl Ether	108-20-3	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	30	30	30	--	250
VOCs	Isopropylbenzene	98-82-8	ug/kg	23	0	0	28	**51**	8%	85.9	69.7	8.6	110	0.5	480	480	--	250
VOCs	Methyl Ethyl Ketone (2-Butanone)	78-93-3	ug/kg	23	72	0	28	**123**	0.8%	226	215	39	39	5	1,900	1,900	--	750
VOCs	Methyl Iodide (Iodomethane)	74-88-4	ug/kg	23	72	0	28	**123**	18%	62.7	74.8	52	542	0.5	480	480	--	100
VOCs	Methyl Isobutyl Ketone (4-Methyl 2-Pentanone)	108-10-1	ug/kg	23	72	0	28	**123**	3%	177	234	56	750	0.5	1,900	1,900	--	2500
VOCs	Methyl methacrylate	80-62-6	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	87.3	618	618	--	--
VOCs	Methylacrylonitrile	126-98-7	ug/kg	0	72	0	0	**72**	0%	--	--	--	--	218	1,540	1,540	--	--
VOCs	Methylene Chloride	75-09-2	ug/kg	23	72	99	28	**222**	69%	284	326	6	2,175	0.5	762	762	--	100
VOCs	Methyl-t-butyl ether	1634-04-4	ug/kg	23	0	0	0	**23**	0%	--	--	--	--	0.5	42	--	--	250
VOCs	Naphthalene	91-20-3	ug/kg	23	72	99	28	**222**	27%	201	493	31	7,200	127	2,300	970	--	330
VOCs	n-Butanol	71-36-3	ug/kg	0	0	0	28	**28**	0%	--	--	--	--	7,200	19,000	19,000	--	4400
VOCs	n-Butylbenzene	104-51-8	ug/kg	23	0	0	28	**51**	4%	86.0	69.8	84	99	0.5	480	480	--	50
VOCs	N-Propylbenzene	103-65-1	ug/kg	23	0	0	28	**51**	10%	87.2	70.3	6.3	170	0.5	480	480	--	100
VOCs	p-Isopropyltoluene	99-87-6	ug/kg	23	0	0	0	**23**	17%	16.2	14.3	8.6	53	0.5	42	--	--	100
VOCs	Propionitrile, Ethyl Cyanide	107-12-0	ug/kg	0	72	0	0	**72**	1%	630	346	506	506	873	6,180	6,180	--	--
VOCs	sec-Butylbenzene	135-98-8	ug/kg	23	0	0	28	**51**	6%	84.8	69.7	6.3	58	0.5	480	480	--	50
VOCs	Styrene	100-42-5	ug/kg	23	72	0	28	**123**	5%	56.9	54.9	17	157	0.5	480	480	--	50
VOCs	t-Butanol	75-65-0	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	110	110	110	--	2500
VOCs	tert-Amyl Methyl Ether	994-05-8	ug/kg	0	0	99	0	**99**	0%	--	--	--	--	30	30	30	--	250
VOCs	tert-Butylbenzene	98-06-6	ug/kg	23	0	0	28	**51**	2%	83.5	70.8	37	37	0.5	480	480	--	50
VOCs	Tetrachloroethene	127-18-4	ug/kg	23	72	99	28	**222**	5%	45.9	146.7	5	2,100	0.5	480	480	--	50

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				(B) Target Detection Level Screen				(C) Identify Criteria											
Analyte Group	Analyte	CAS Number	Unit	Max RL of NDs < TDL	Max RL of NDs (Off-site) < TDL	Max RL of NDs < All Criteria	Group B?	Have Criteria?	Minimum Criteria	Group C?	Residential Drinking Water Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Groundwater Surface Water Interface Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Groundwater Contact Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)
VOCs	Carbon tetrachloride	56-23-5	ug/kg	No	No	No	--	Yes	100	--	100	0%	26%	900	0%	0%	92000	0%	0%
VOCs	Chlorobenzene	108-90-7	ug/kg	No	No	Yes	--	Yes	500	--	2000	0.5%	0%	500	0.5%	0%	260000	0%	0%
VOCs	Chlorobromomethane	74-97-5	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
VOCs	Chloroethane	75-00-3	ug/kg	No	No	Yes	B3	Yes	8600	--	8600	0%	0%	22000	0%	0%	950000	0%	0%
VOCs	Chloroform	67-66-3	ug/kg	No	No	Yes	--	Yes	1600	--	1600	0%	0%	7000	0%	0%	1500000	0%	0%
VOCs	Chloromethane	74-87-3	ug/kg	No	No	Yes	--	Yes	2300	--	5200	0%	0%	--	--	--	1100000	0%	0%
VOCs	Chloroprene (2-Chloro-1,3-Butadiene)	126-99-8	ug/kg	No	No	No	--	Yes	0.0085	--	--	--	--	--	--	--	--	--	--
VOCs	cis-1,2-Dichloroethene	156-59-2	ug/kg	No	No	Yes	B3	Yes	1400	--	1400	0%	0%	12000	0%	0%	640000	0%	0%
VOCs	cis-1,3-Dichloropropene	10061-01-5	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
VOCs	Cyclohexane	110-82-7	ug/kg	No	No	Yes	--	Yes	13000	--	--	--	--	--	--	--	--	--	--
VOCs	Cyclohexanone	108-94-1	ug/kg	No	No	Yes	B3	Yes	17000	--	5200000	0%	0%	--	--	--	2.2E+08	0%	0%
VOCs	Dibromochloromethane	124-48-1	ug/kg	No	No	Yes	B3	Yes	1600	--	1600	0%	0%	--	--	--	360000	0%	0%
VOCs	Dibromomethane	74-95-3	ug/kg	No	No	Yes	B3	Yes	1600	--	1600	0%	0%	--	--	--	2000000	0%	0%
VOCs	Dichlorodifluoromethane	75-71-8	ug/kg	No	No	Yes	--	Yes	95000	--	95000	0%	0%	--	--	--	1000000	0%	0%
VOCs	Ethyl Benzene	100-41-4	ug/kg	No	No	No	--	Yes	360	--	1500	0%	0%	360	0%	3%	140000	0%	0%
VOCs	Ethyl ether	60-29-7	ug/kg	No	No	No	--	Yes	200	--	200	0%	55%	--	--	--	7400000	0%	0%
VOCs	Ethyl methacrylate	97-63-2	ug/kg	No	No	Yes	B3	Yes	770	--	--	--	--	--	--	--	--	--	--
VOCs	Ethyl tert-Butyl Ether	637-92-3	ug/kg	Yes	Yes	Yes	B1	Yes	980	--	980	0%	0%	--	--	--	--	--	--
VOCs	Ethylene oxide	75-21-8	ug/kg	No	No	No	--	Yes	0.0091	--	--	--	--	--	--	--	--	--	--
VOCs	Isobutanol	78-83-1	ug/kg	No	No	Yes	B3	Yes	46000	--	46000	0%	0%	--	--	--	8900000	0%	0%
VOCs	Isopropyl Ether	108-20-3	ug/kg	Yes	Yes	Yes	B1	Yes	600	--	600	0%	0%	--	--	--	1300	0%	0%
VOCs	Isopropylbenzene	98-82-8	ug/kg	No	No	Yes	--	Yes	3200	--	91000	0%	0%	3200	0%	0%	390000	0%	0%
VOCs	Methyl Ethyl Ketone (2-Butanone)	78-93-3	ug/kg	No	No	Yes	--	Yes	44000	--	260000	0%	0%	44000	0%	0%	27000000	0%	0%
VOCs	Methyl Iodide (Iodomethane)	74-88-4	ug/kg	No	No	Yes	--	No	--	C2	--	--	--	--	--	--	--	--	--
VOCs	Methyl Isobutyl Ketone (4-Methyl 2-Pentanone)	108-10-1	ug/kg	Yes	Yes	Yes	--	Yes	36000	--	36000	0%	0%	--	--	--	2700000	0%	0%
VOCs	Methyl methacrylate	80-62-6	ug/kg	No	No	No	--	Yes	310	--	--	--	--	--	--	--	--	--	--
VOCs	Methylacrylonitrile	126-98-7	ug/kg	No	No	No	--	Yes	0.24	--	--	--	--	--	--	--	--	--	--
VOCs	Methylene Chloride	75-09-2	ug/kg	No	No	No	--	Yes	100	--	100	58%	21%	30000	0%	0%	2300000	0%	0%
VOCs	Methyl-t-butyl ether	1634-04-4	ug/kg	Yes	Yes	Yes	B1	Yes	800	--	800	0%	0%	140000	0%	0%	5900000	0%	0%
VOCs	Naphthalene	91-20-3	ug/kg	No	No	No	--	Yes	730	--	35000	0%	0%	730	0.9%	3%	2100000	0%	0%
VOCs	n-Butanol	71-36-3	ug/kg	No	No	Yes	B3	Yes	19000	--	19000	0%	0%	--	--	--	8700000	0%	0%
VOCs	n-Butylbenzene	104-51-8	ug/kg	No	No	Yes	--	Yes	1600	--	1600	0%	0%	--	--	--	120000	0%	0%
VOCs	N-Propylbenzene	103-65-1	ug/kg	No	No	Yes	--	Yes	1600	--	1600	0%	0%	--	--	--	300000	0%	0%
VOCs	p-Isopropyltoluene	99-87-6	ug/kg	Yes	Yes	Yes	--	No	--	C2	--	--	--	--	--	--	--	--	--
VOCs	Propionitrile, Ethyl Cyanide	107-12-0	ug/kg	No	No	Yes	--	No	--	C1	--	--	--	--	--	--	--	--	--
VOCs	sec-Butylbenzene	135-98-8	ug/kg	No	No	Yes	--	Yes	1600	--	1600	0%	0%	--	--	--	88000	0%	0%
VOCs	Styrene	100-42-5	ug/kg	No	No	Yes	--	Yes	2100	--	2700	0%	0%	2100	0%	0%	270000	0%	0%
VOCs	t-Butanol	75-65-0	ug/kg	Yes	Yes	Yes	B1	Yes	78000	--	78000	0%	0%	--	--	--	1.1E+08	0%	0%
VOCs	tert-Amyl Methyl Ether	994-05-8	ug/kg	Yes	Yes	Yes	B1	Yes	3900	--	3900	0%	0%	--	--	--	440000	0%	0%
VOCs	tert-Butylbenzene	98-06-6	ug/kg	No	No	Yes	--	Yes	1600	--	1600	0%	0%	--	--	--	180000	0%	0%
VOCs	Tetrachloroethene	127-18-4	ug/kg	No	No	No	--	Yes	100	--	100	2%	14%	1200	0.5%	0%	88000	0%	0%

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	Residential Soil Volatilization to Indoor Air Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air1	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air2	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Particulate Soil Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Direct Contact
VOCs	Carbon tetrachloride	56-23-5	ug/kg	190	0%	23%	3500	0%	0%	12000	0%	0%	28000	0%	0%	1.3E+08	0%	0%	96000
VOCs	Chlorobenzene	108-90-7	ug/kg	120000	0%	0%	770000	0%	0%	990000	0%	0%	2100000	0%	0%	4.7E+09	0%	0%	260000
VOCs	Chlorobromomethane	74-97-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Chloroethane	75-00-3	ug/kg	950000	0%	0%	30000000	0%	0%	1.2E+08	0%	0%	2.8E+08	0%	0%	6.7E+11	0%	0%	950000
VOCs	Chloroform	67-66-3	ug/kg	7200	0%	0%	45000	0%	0%	120000	0%	0%	270000	0%	0%	1.3E+09	0%	0%	1200000
VOCs	Chloromethane	74-87-3	ug/kg	2300	0%	0%	40000	0%	0%	410000	0%	0%	1000000	0%	0%	4.9E+09	0%	0%	1100000
VOCs	Chloroprene (2-Chloro-1,3-Butadiene)	126-99-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	cis-1,2-Dichloroethene	156-59-2	ug/kg	22000	0%	0%	180000	0%	0%	420000	0%	0%	990000	0%	0%	2.3E+09	0%	0%	640000
VOCs	cis-1,3-Dichloropropene	10061-01-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Cyclohexane	110-82-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Cyclohexanone	108-94-1	ug/kg	17000	0%	0%	1000000	0%	0%	11000000	0%	0%	27000000	0%	0%	6.7E+10	0%	0%	2.2E+08
VOCs	Dibromochloromethane	124-48-1	ug/kg	3900	0%	0%	24000	0%	0%	24000	0%	0%	33000	0%	0%	1.3E+08	0%	0%	110000
VOCs	Dibromomethane	74-95-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2000000
VOCs	Dichlorodifluoromethane	75-71-8	ug/kg	900000	0%	0%	53000000	0%	0%	5.5E+08	0%	0%	1.4E+09	0%	0%	3.30E+12	0%	0%	1000000
VOCs	Ethyl Benzene	100-41-4	ug/kg	87000	0%	0%	720000	0%	0%	1000000	0%	0%	2200000	0%	0%	1E+10	0%	0%	140000
VOCs	Ethyl ether	60-29-7	ug/kg	7400000	0%	0%	85000000	0%	0%	1.5E+08	0%	0%	3.4E+08	0%	0%	8E+11	0%	0%	7400000
VOCs	Ethyl methacrylate	97-63-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Ethyl tert-Butyl Ether	637-92-3	ug/kg	540000	0%	0%	1900000	0%	0%	4500000	0%	0%	11000000	0%	0%	2.5E+10	0%	0%	--
VOCs	Ethylene oxide	75-21-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Isobutanol	78-83-1	ug/kg	8900000	0%	0%	79000000	0%	0%	79000000	0%	0%	79000000	0%	0%	1E+11	0%	0%	8900000
VOCs	Isopropyl Ether	108-20-3	ug/kg	1300	0%	0%	340000	0%	0%	760000	0%	0%	1800000	0%	0%	4.1E+09	0%	0%	1300
VOCs	Isopropylbenzene	98-82-8	ug/kg	390000	0%	0%	1700000	0%	0%	1700000	0%	0%	2800000	0%	0%	5.8E+09	0%	0%	390000
VOCs	Methyl Ethyl Ketone (2-Butanone)	78-93-3	ug/kg	27000000	0%	0%	29000000	0%	0%	29000000	0%	0%	35000000	0%	0%	6.7E+10	0%	0%	27000000
VOCs	Methyl Iodide (Iodomethane)	74-88-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Methyl Isobutyl Ketone (4-Methyl 2-Pentanone)	108-10-1	ug/kg	2700000	0%	0%	45000000	0%	0%	45000000	0%	0%	67000000	0%	0%	1.4E+11	0%	0%	2700000
VOCs	Methyl methacrylate	80-62-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Methylacrylonitrile	126-98-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Methylene Chloride	75-09-2	ug/kg	45000	0%	0%	210000	0%	0%	590000	0%	0%	1400000	0%	0%	6.6E+09	0%	0%	1300000
VOCs	Methyl-t-butyl ether	1634-04-4	ug/kg	5900000	0%	0%	25000000	0%	0%	39000000	0%	0%	87000000	0%	0%	2E+11	0%	0%	1500000
VOCs	Naphthalene	91-20-3	ug/kg	250000	0%	0%	300000	0%	0%	300000	0%	0%	300000	0%	0%	2E+08	0%	0%	16000000
VOCs	n-Butanol	71-36-3	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	2.3E+10	0%	0%	8700000
VOCs	n-Butylbenzene	104-51-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	2E+09	0%	0%	2500000
VOCs	N-Propylbenzene	103-65-1	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	1.3E+09	0%	0%	2500000
VOCs	p-Isopropyltoluene	99-87-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Propionitrile, Ethyl Cyanide	107-12-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	sec-Butylbenzene	135-98-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	4E+08	0%	0%	2500000
VOCs	Styrene	100-42-5	ug/kg	250000	0%	0%	970000	0%	0%	970000	0%	0%	1400000	0%	0%	5.5E+09	0%	0%	400000
VOCs	t-Butanol	75-65-0	ug/kg	1.1E+08	0%	0%	97000000	0%	0%	2E+08	0%	0%	2E+08	0%	0%	1.3E+11	0%	0%	1.1E+08
VOCs	tert-Amyl Methyl Ether	994-05-8	ug/kg	58000	0%	0%	340000	0%	0%	760000	0%	0%	1800000	0%	0%	4.1E+09	0%	0%	440000
VOCs	tert-Butylbenzene	98-06-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	6.7E+08	0%	0%	2500000
VOCs	Tetrachloroethene	127-18-4	ug/kg	11000	0%	0%	180000	0%	0%	480000	0%	0%	1100000	0%	0%	5.4E+09	0%	0%	88000

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				(D) Pathway-Specific Toxicity Screening Criteria															
Analyte Group	Analyte	CAS Number	Unit	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Soil Saturation Screening Levels	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential Drinking Water Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential GW Contact Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Soil Volatilization to Indoor Air Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air	Percent Exceed (Detect)
VOCs	Carbon tetrachloride	56-23-5	ug/kg	0%	0%	390000	0%	0%	100	0%	26%	92000	0%	0%	990	0%	0%	12000	0%
VOCs	Chlorobenzene	108-90-7	ug/kg	0%	0%	260000	0%	0%	2000	0.5%	0%	260000	0%	0%	220000	0%	0%	920000	0%
VOCs	Chlorobromomethane	74-97-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Chloroethane	75-00-3	ug/kg	0%	0%	950000	0%	0%	34000	0%	0%	950000	0%	0%	950000	0%	0%	36000000	0%
VOCs	Chloroform	67-66-3	ug/kg	0%	0%	1500000	0%	0%	1600	0%	0%	1500000	0%	0%	38000	0%	0%	150000	0%
VOCs	Chloromethane	74-87-3	ug/kg	0%	0%	1100000	0%	0%	22000	0%	0%	1100000	0%	0%	10000	0%	0%	120000	0%
VOCs	Chloroprene (2-Chloro-1,3-Butadiene)	126-99-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	cis-1,2-Dichloroethene	156-59-2	ug/kg	0%	0%	640000	0%	0%	1400	0%	0%	640000	0%	0%	41000	0%	0%	210000	0%
VOCs	cis-1,3-Dichloropropene	10061-01-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Cyclohexane	110-82-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Cyclohexanone	108-94-1	ug/kg	0%	0%	2.2E+08	0%	0%	15000000	0%	0%	2.2E+08	0%	0%	32000	0%	0%	1300000	0%
VOCs	Dibromochloromethane	124-48-1	ug/kg	0%	0%	610000	0%	0%	1600	0%	0%	360000	0%	0%	21000	0%	0%	80000	0%
VOCs	Dibromomethane	74-95-3	ug/kg	0%	0%	2000000	0%	0%	4600	0%	0%	2000000	0%	0%	--	--	--	--	--
VOCs	Dichlorodifluoromethane	75-71-8	ug/kg	0%	0%	1000000	0%	0%	270000	0%	0%	1000000	0%	0%	1700000	0%	0%	63000000	0%
VOCs	Ethyl Benzene	100-41-4	ug/kg	0%	0%	140000	0%	0%	1500	0%	0%	140000	0%	0%	140000	0%	0%	2400000	0%
VOCs	Ethyl ether	60-29-7	ug/kg	0%	0%	7400000	0%	0%	200	0%	55%	7400000	0%	0%	7400000	0%	0%	1E+08	0%
VOCs	Ethyl methacrylate	97-63-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Ethyl tert-Butyl Ether	637-92-3	ug/kg	--	--	650000	0%	0%	980	0%	0%	--	--	--	650000	0%	0%	2300000	0%
VOCs	Ethylene oxide	75-21-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Isobutanol	78-83-1	ug/kg	0%	0%	8900000	0%	0%	130000	0%	0%	8900000	0%	0%	8900000	0%	0%	95000000	0%
VOCs	Isopropyl Ether	108-20-3	ug/kg	0%	0%	1300	0%	0%	1300	0%	0%	1300	0%	0%	1300	0%	0%	3200000	0%
VOCs	Isopropylbenzene	98-82-8	ug/kg	0%	0%	390000	0%	0%	260000	0%	0%	390000	0%	0%	390000	0%	0%	2000000	0%
VOCs	Methyl Ethyl Ketone (2-Butanone)	78-93-3	ug/kg	0%	0%	27000000	0%	0%	760000	0%	0%	27000000	0%	0%	27000000	0%	0%	35000000	0%
VOCs	Methyl Iodide (Iodomethane)	74-88-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Methyl Isobutyl Ketone (4-Methyl 2-Pentanone)	108-10-1	ug/kg	0%	0%	2700000	0%	0%	100000	0%	0%	2700000	0%	0%	2700000	0%	0%	53000000	0%
VOCs	Methyl methacrylate	80-62-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Methylacrylonitrile	126-98-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Methylene Chloride	75-09-2	ug/kg	0%	0%	2300000	0%	0%	100	58%	21%	2300000	0%	0%	240000	0%	0%	700000	0%
VOCs	Methyl-t-butyl ether	1634-04-4	ug/kg	0%	0%	5900000	0%	0%	800	0%	0%	5900000	0%	0%	5900000	0%	0%	30000000	0%
VOCs	Naphthalene	91-20-3	ug/kg	0%	0%	--	--	--	100000	0%	0%	2100000	0%	0%	470000	0%	0%	350000	0%
VOCs	n-Butanol	71-36-3	ug/kg	0%	0%	8700000	0%	0%	54000	0%	0%	8700000	0%	0%	--	--	--	--	--
VOCs	n-Butylbenzene	104-51-8	ug/kg	0%	0%	10000000	0%	0%	4600	0%	0%	120000	0%	0%	--	--	--	--	--
VOCs	N-Propylbenzene	103-65-1	ug/kg	0%	0%	10000000	0%	0%	4600	0%	0%	300000	0%	0%	--	--	--	--	--
VOCs	p-Isopropyltoluene	99-87-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Propionitrile, Ethyl Cyanide	107-12-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	sec-Butylbenzene	135-98-8	ug/kg	0%	0%	10000000	0%	0%	4600	0%	0%	88000	0%	0%	--	--	--	--	--
VOCs	Styrene	100-42-5	ug/kg	0%	0%	520000	0%	0%	2700	0%	0%	270000	0%	0%	520000	0%	0%	3300000	0%
VOCs	t-Butanol	75-65-0	ug/kg	0%	0%	1.1E+08	0%	0%	220000	0%	0%	1.1E+08	0%	0%	1.1E+08	0%	0%	1.2E+08	0%
VOCs	tert-Amyl Methyl Ether	994-05-8	ug/kg	0%	0%	440000	0%	0%	3900	0%	0%	440000	0%	0%	110000	0%	0%	400000	0%
VOCs	tert-Butylbenzene	98-06-6	ug/kg	0%	0%	10000000	0%	0%	4600	0%	0%	180000	0%	0%	--	--	--	--	--
VOCs	Tetrachloroethene	127-18-4	ug/kg	0%	0%	88000	0%	0%	100	2%	14%	88000	0%	0%	60000	0%	0%	600000	0%

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air1	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air2	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Particulate Soil Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential Soil Direct Contact	Percent Exceed (Detect)	Percent Exceed (Non-detect)	EPA Residential Soil	Percent Exceed (Detect)	Percent Exceed (Non-detect)
VOCs	Carbon tetrachloride	56-23-5	ug/kg	0%	34000	0%	0%	79000	0%	0%	1.7E+08	0%	0%	390000	0%	0%	--	--	--
VOCs	Chlorobenzene	108-90-7	ug/kg	0%	1100000	0%	0%	2100000	0%	0%	2.1E+09	0%	0%	260000	0%	0%	--	--	--
VOCs	Chlorobromomethane	74-97-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Chloroethane	75-00-3	ug/kg	0%	1.2E+08	0%	0%	2.8E+08	0%	0%	2.9E+11	0%	0%	950000	0%	0%	--	--	--
VOCs	Chloroform	67-66-3	ug/kg	0%	340000	0%	0%	790000	0%	0%	1.6E+09	0%	0%	1500000	0%	0%	--	--	--
VOCs	Chloromethane	74-87-3	ug/kg	0%	1000000	0%	0%	2500000	0%	0%	2.6E+09	0%	0%	1100000	0%	0%	--	--	--
VOCs	Chloroprene (2-Chloro-1,3-Butadiene)	126-99-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	9.4	0%	100%
VOCs	cis-1,2-Dichloroethene	156-59-2	ug/kg	0%	430000	0%	0%	1000000	0%	0%	1E+09	0%	0%	640000	0%	0%	--	--	--
VOCs	cis-1,3-Dichloropropene	10061-01-5	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Cyclohexane	110-82-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	7000000	0%	0%
VOCs	Cyclohexanone	108-94-1	ug/kg	0%	11000000	0%	0%	27000000	0%	0%	2.9E+10	0%	0%	2.2E+08	0%	0%	--	--	--
VOCs	Dibromochloromethane	124-48-1	ug/kg	0%	80000	0%	0%	98000	0%	0%	1.6E+08	0%	0%	500000	0%	0%	--	--	--
VOCs	Dibromomethane	74-95-3	ug/kg	--	--	--	--	--	--	--	--	--	--	2000000	0%	0%	--	--	--
VOCs	Dichlorodifluoromethane	75-71-8	ug/kg	0%	5.5E+08	0%	0%	1.4E+09	0%	0%	1.50E+12	0%	0%	1000000	0%	0%	--	--	--
VOCs	Ethyl Benzene	100-41-4	ug/kg	0%	3100000	0%	0%	6500000	0%	0%	1.3E+10	0%	0%	140000	0%	0%	--	--	--
VOCs	Ethyl ether	60-29-7	ug/kg	0%	1.6E+08	0%	0%	3.5E+08	0%	0%	3.5E+11	0%	0%	7400000	0%	0%	--	--	--
VOCs	Ethyl methacrylate	97-63-2	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	7000000	0%	0%
VOCs	Ethyl tert-Butyl Ether	637-92-3	ug/kg	0%	4600000	0%	0%	11000000	0%	0%	1.1E+10	0%	0%	--	--	--	--	--	--
VOCs	Ethylene oxide	75-21-8	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	170	0%	100%
VOCs	Isobutanol	78-83-1	ug/kg	0%	95000000	0%	0%	95000000	0%	0%	4.4E+10	0%	0%	8900000	0%	0%	--	--	--
VOCs	Isopropyl Ether	108-20-3	ug/kg	0%	4800000	0%	0%	10000000	0%	0%	1.1E+10	0%	0%	1300	0%	0%	--	--	--
VOCs	Isopropylbenzene	98-82-8	ug/kg	0%	2000000	0%	0%	3000000	0%	0%	2.6E+09	0%	0%	390000	0%	0%	--	--	--
VOCs	Methyl Ethyl Ketone (2-Butanone)	78-93-3	ug/kg	0%	35000000	0%	0%	36000000	0%	0%	2.9E+10	0%	0%	27000000	0%	0%	--	--	--
VOCs	Methyl Iodide (Iodomethane)	74-88-4	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Methyl Isobutyl Ketone (4-Methyl 2-Pentanone)	108-10-1	ug/kg	0%	53000000	0%	0%	70000000	0%	0%	6E+10	0%	0%	2700000	0%	0%	--	--	--
VOCs	Methyl methacrylate	80-62-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	4800000	0%	0%
VOCs	Methylacrylonitrile	126-98-7	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	3200	0%	0%
VOCs	Methylene Chloride	75-09-2	ug/kg	0%	1700000	0%	0%	4000000	0%	0%	8.3E+09	0%	0%	2300000	0%	0%	--	--	--
VOCs	Methyl-t-butyl ether	1634-04-4	ug/kg	0%	41000000	0%	0%	89000000	0%	0%	8.8E+10	0%	0%	5900000	0%	0%	--	--	--
VOCs	Naphthalene	91-20-3	ug/kg	0%	350000	0%	0%	350000	0%	0%	88000000	0%	0%	52000000	0%	0%	--	--	--
VOCs	n-Butanol	71-36-3	ug/kg	--	--	--	--	--	--	--	1E+10	0%	0%	8700000	0%	0%	--	--	--
VOCs	n-Butylbenzene	104-51-8	ug/kg	--	--	--	--	--	--	--	8.8E+08	0%	0%	8000000	0%	0%	--	--	--
VOCs	N-Propylbenzene	103-65-1	ug/kg	--	--	--	--	--	--	--	5.9E+08	0%	0%	8000000	0%	0%	--	--	--
VOCs	p-Isopropyltoluene	99-87-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Propionitrile, Ethyl Cyanide	107-12-0	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	sec-Butylbenzene	135-98-8	ug/kg	--	--	--	--	--	--	--	1.8E+08	0%	0%	8000000	0%	0%	--	--	--
VOCs	Styrene	100-42-5	ug/kg	0%	3300000	0%	0%	4200000	0%	0%	6.9E+09	0%	0%	520000	0%	0%	--	--	--
VOCs	t-Butanol	75-65-0	ug/kg	0%	2.4E+08	0%	0%	2.4E+08	0%	0%	5.6E+10	0%	0%	1.1E+08	0%	0%	--	--	--
VOCs	tert-Amyl Methyl Ether	994-05-8	ug/kg	0%	780000	0%	0%	1800000	0%	0%	1.8E+09	0%	0%	440000	0%	0%	--	--	--
VOCs	tert-Butylbenzene	98-06-6	ug/kg	--	--	--	--	--	--	--	2.9E+08	0%	0%	8000000	0%	0%	--	--	--
VOCs	Tetrachloroethene	127-18-4	ug/kg	0%	1400000	0%	0%	3300000	0%	0%	6.8E+09	0%	0%	88000	0%	0%	--	--	--

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	EPA Industrial Soil	Percent Exceed (Detect)	Percent Exceed (Non-detect)	EPA Risk-Based SSL	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Group D2 and D3?	Group D4?	Group D5 and D6?
VOCs	Carbon tetrachloride	56-23-5	ug/kg	--	--	--	--	--	--	--	D4	--
VOCs	Chlorobenzene	108-90-7	ug/kg	--	--	--	--	--	--	--	--	D5
VOCs	Chlorobromomethane	74-97-5	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	Chloroethane	75-00-3	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	Chloroform	67-66-3	ug/kg	--	--	--	--	--	--	D2	--	--
VOCs	Chloromethane	74-87-3	ug/kg	--	--	--	--	--	--	D2	--	--
VOCs	Chloroprene (2-Chloro-1,3-Butadiene)	126-99-8	ug/kg	47	0%	100%	0.0085	0%	100%	--	D4	--
VOCs	cis-1,2-Dichloroethene	156-59-2	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	cis-1,3-Dichloropropene	10061-01-5	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	Cyclohexane	110-82-7	ug/kg	29000000	0%	0%	13000	0%	0%	D2	--	--
VOCs	Cyclohexanone	108-94-1	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	Dibromochloromethane	124-48-1	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	Dibromomethane	74-95-3	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	Dichlorodifluoromethane	75-71-8	ug/kg	--	--	--	--	--	--	D2	--	--
VOCs	Ethyl Benzene	100-41-4	ug/kg	--	--	--	--	--	--	--	D4	--
VOCs	Ethyl ether	60-29-7	ug/kg	--	--	--	--	--	--	--	D4	--
VOCs	Ethyl methacrylate	97-63-2	ug/kg	92000000	0%	0%	770	0%	0%	--	--	--
VOCs	Ethyl tert-Butyl Ether	637-92-3	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	Ethylene oxide	75-21-8	ug/kg	830	0%	100%	0.0091	0%	100%	--	D4	--
VOCs	Isobutanol	78-83-1	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	Isopropyl Ether	108-20-3	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	Isopropylbenzene	98-82-8	ug/kg	--	--	--	--	--	--	D3	--	--
VOCs	Methyl Ethyl Ketone (2-Butanone)	78-93-3	ug/kg	--	--	--	--	--	--	D2	--	--
VOCs	Methyl Iodide (Iodomethane)	74-88-4	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	Methyl Isobutyl Ketone (4-Methyl 2-Pentanone)	108-10-1	ug/kg	--	--	--	--	--	--	D2	--	--
VOCs	Methyl methacrylate	80-62-6	ug/kg	21000000	0%	0%	310	0%	1%	--	D4	--
VOCs	Methylacrylonitrile	126-98-7	ug/kg	18000	0%	0%	0.24	0%	100%	--	D4	--
VOCs	Methylene Chloride	75-09-2	ug/kg	--	--	--	--	--	--	--	--	D6
VOCs	Methyl-t-butyl ether	1634-04-4	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	Naphthalene	91-20-3	ug/kg	--	--	--	--	--	--	--	--	D6
VOCs	n-Butanol	71-36-3	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	n-Butylbenzene	104-51-8	ug/kg	--	--	--	--	--	--	D2	--	--
VOCs	N-Propylbenzene	103-65-1	ug/kg	--	--	--	--	--	--	D3	--	--
VOCs	p-Isopropyltoluene	99-87-6	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	Propionitrile, Ethyl Cyanide	107-12-0	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	sec-Butylbenzene	135-98-8	ug/kg	--	--	--	--	--	--	D3	--	--
VOCs	Styrene	100-42-5	ug/kg	--	--	--	--	--	--	D2	--	--
VOCs	t-Butanol	75-65-0	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	tert-Amyl Methyl Ether	994-05-8	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	tert-Butylbenzene	98-06-6	ug/kg	--	--	--	--	--	--	D2	--	--
VOCs	Tetrachloroethene	127-18-4	ug/kg	--	--	--	--	--	--	--	--	D5

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				Number of Samples					Summary Statistics									(A) Background Screen	
Analyte Group	Analyte	CAS Number	Unit	No. of Samples from 2005/6 Dow On-Site	No. of Samples from 2006 COM Blind	No. of Samples from 2010 Dow	No. of Samples from 2010 MDEQ	Total No. of Samples	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	Min RL of NDs	Max RL of NDs	Max RL of NDs (Off-site)	Group A?	MDEQ Target Detection Levels
VOCs	Tetrahydrofuran	109-99-9	ug/kg	23	0	0	28	**51**	16%	332	284	78	180	25.5	1,900	1,900	--	1000
VOCs	Toluene	108-88-3	ug/kg	23	72	99	28	**222**	75%	434	1,181	4	7,010	25.5	480	480	--	100
VOCs	trans-1,2-Dichloroethene	156-60-5	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	309	309	--	50
VOCs	trans-1,3-Dichloropropene	10061-02-6	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	480	480	--	50
VOCs	trans-1,4-Dichloro-2-butene	110-57-6	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	480	480	--	--
VOCs	Trichloroethene (TCE)	79-01-6	ug/kg	23	72	0	28	**123**	2%	53.4	53.5	11	51	0.5	480	480	--	50
VOCs	Trichlorofluoromethane	75-69-4	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	970	970	--	100
VOCs	Trihalomethanes, Total	STL00209	ug/kg	0	0	0	28	**28**	0%	--	--	--	--	180	480	480	--	--
VOCs	Vinyl acetate	108-05-4	ug/kg	0	72	0	28	**100**	0%	--	--	--	--	43.6	970	970	--	5000
VOCs	Vinyl chloride	75-01-4	ug/kg	23	72	0	28	**123**	0%	--	--	--	--	0.5	970	970	--	40
VOCs	Xylenes, Total	1330-20-7	ug/kg	23	72	99	28	**222**	24%	92.8	160.2	10.05	1,470	1.5	926	926	--	150

Notes:

If duplicates exist, the average of the duplicate results was used as a single data point.

Nondetects were substituted by half of reporting limit (RL) for the computation of summary statistics.

Laboratory QAQC results are not included.

Isomer:

When the lab reports a total for one of these "isomer" groups, use that value. If the lab reports only the individual constituents, add them together for the total to compare to criteria. (Use half of RL for NDs in the summation; unless otherwise noted.)

Xylenes	Total Xylenes is the total of o-Xylene, p-Xylene, and m-Xylene. m and p-Xylenes are usually grouped together.
Endosulfan	Total Endosulfan is composed of Endosulfan I and Endosulfan II.
Cresol	Total Cresol or Methylphenol is composed of 2-Methylphenol (2-Cresol), 3-Methylphenol (3-Cresol, and 4-Methylphenol (4-Cresol). 3 and 4-Methylphenol are sometimes grouped together.
Chlordane	Total Chlordane is the sum of alpha-Chlordane and gamma-Chlordane (also called trans-Chlordane), as well as oxychlordane if such data are present.
PCBs	Total PCBs is the sum of all individual PCBs. (ND aroclors are substituted by zero in the summation.)

Table 5-2
Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				(B) Target Detection Level Screen				(C) Identify Criteria											
Analyte Group	Analyte	CAS Number	Unit	Max RL of NDs < TDL	Max RL of NDs (Off-site) < TDL	Max RL of NDs < All Criteria	Group B?	Have Criteria?	Minimum Criteria	Group C?	Residential Drinking Water Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Groundwater Surface Water Interface Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Groundwater Contact Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)
VOCs	Tetrahydrofuran	109-99-9	ug/kg	No	No	No	--	Yes	1900	--	1900	0%	0%	220000	0%	0%	32000000	0%	0%
VOCs	Toluene	108-88-3	ug/kg	No	No	Yes	--	Yes	5400	--	16000	0%	0%	5400	2%	0%	250000	0%	0%
VOCs	trans-1,2-Dichloroethene	156-60-5	ug/kg	No	No	Yes	B3	Yes	2000	--	2000	0%	0%	30000	0%	0%	1400000	0%	0%
VOCs	trans-1,3-Dichloropropene	10061-02-6	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
VOCs	trans-1,4-Dichloro-2-butene	110-57-6	ug/kg	No	No	No	--	Yes	0.00054	--	--	--	--	--	--	--	--	--	--
VOCs	Trichloroethene (TCE)	79-01-6	ug/kg	No	No	No	--	Yes	100	--	100	0%	26%	4000	0%	0%	440000	0%	0%
VOCs	Trichlorofluoromethane	75-69-4	ug/kg	No	No	Yes	B3	Yes	52000	--	52000	0%	0%	--	--	--	560000	0%	0%
VOCs	Trihalomethanes, Total	STL00209	ug/kg	No	No	Yes	B3	No	--	--	--	--	--	--	--	--	--	--	--
VOCs	Vinyl acetate	108-05-4	ug/kg	Yes	Yes	Yes	B1	Yes	13000	--	13000	0%	0%	--	--	--	2400000	0%	0%
VOCs	Vinyl chloride	75-01-4	ug/kg	No	No	No	--	Yes	40	--	40	0%	83%	260	0%	24%	20000	0%	0%
VOCs	Xylenes, Total	1330-20-7	ug/kg	No	No	No	--	Yes	820	--	5600	0%	0%	820	1%	0.5%	150000	0%	0%

Notes:
If duplicates exist, the average of the duplicate results was used as
Nondetects were substituted by half of reporting limit (RL) for the c
Laboratory QAQC results are not included.

Isomer:
When the lab reports a total for one of these "isomer" groups, use t

Xylenes	Total Xylenes is the total of o-Xylene, p-Xylene, and m
Endosulfan	Total Endosulfan is composed of Endosulfan I and En
Cresol	Total Cresol or Methylphenol is composed of 2-Methyl
Chlordane	Total Chlordane is the sum of alpha-Chlordane and ga
PCBs	Total PCBs is the sum of all individual PCBs. (ND aro

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	Residential Soil Volatilization to Indoor Air Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air1	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Volatilization to Ambient Air2	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Particulate Soil Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Residential Direct Contact
VOCs	Tetrahydrofuran	109-99-9	ug/kg	1300000	0%	0%	13000000	0%	0%	67000000	0%	0%	1.6E+08	0%	0%	3.9E+11	0%	0%	2900000
VOCs	Toluene	108-88-3	ug/kg	250000	0%	0%	2800000	0%	0%	5100000	0%	0%	12000000	0%	0%	2.7E+10	0%	0%	250000
VOCs	trans-1,2-Dichloroethene	156-60-5	ug/kg	23000	0%	0%	280000	0%	0%	830000	0%	0%	2000000	0%	0%	4.7E+09	0%	0%	1400000
VOCs	trans-1,3-Dichloropropene	10061-02-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	trans-1,4-Dichloro-2-butene	110-57-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Trichloroethene (TCE)	79-01-6	ug/kg	7100	0%	0%	78000	0%	0%	170000	0%	0%	390000	0%	0%	1.8E+09	0%	0%	500000
VOCs	Trichlorofluoromethane	75-69-4	ug/kg	560000	0%	0%	92000000	0%	0%	6.3E+08	0%	0%	1.5E+09	0%	0%	3.80E+12	0%	0%	560000
VOCs	Trihalomethanes, Total	STL00209	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Vinyl acetate	108-05-4	ug/kg	790000	0%	0%	1700000	0%	0%	2600000	0%	0%	5800000	0%	0%	1.3E+10	0%	0%	2400000
VOCs	Vinyl chloride	75-01-4	ug/kg	270	0%	24%	4200	0%	0%	30000	0%	0%	73000	0%	0%	3.5E+08	0%	0%	3800
VOCs	Xylenes, Total	1330-20-7	ug/kg	150000	0%	0%	46000000	0%	0%	61000000	0%	0%	1.3E+08	0%	0%	2.9E+11	0%	0%	150000

Notes:

If duplicates exist, the average of the duplicate results was used as

Nondetects were substituted by half of reporting limit (RL) for the c

Laboratory QAQC results are not included.

Isomer:

When the lab reports a total for one of these "isomer" groups, use t

Xylenes	Total Xylenes is the total of o-Xylene, p-Xylene, and m
Endosulfan	Total Endosulfan is composed of Endosulfan I and En
Cresol	Total Cresol or Methylphenol is composed of 2-Methyl
Chlordane	Total Chlordane is the sum of alpha-Chlordane and ga
PCBs	Total PCBs is the sum of all individual PCBs. (ND aro

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

				(D) Pathway-Specific Toxicity Screening Criteria															
Analyte Group	Analyte	CAS Number	Unit	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Soil Saturation Screening Levels	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential Drinking Water Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential GW Contact Protection	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Soil Volatilization to Indoor Air Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air	Percent Exceed (Detect)
VOCs	Tetrahydrofuran	109-99-9	ug/kg	0%	0%	1.2E+08	0%	0%	5400	0%	0%	32000000	0%	0%	2400000	0%	0%	15000000	0%
VOCs	Toluene	108-88-3	ug/kg	0%	0%	250000	0%	0%	16000	0%	0%	250000	0%	0%	250000	0%	0%	3300000	0%
VOCs	trans-1,2-Dichloroethene	156-60-5	ug/kg	0%	0%	1400000	0%	0%	2000	0%	0%	1400000	0%	0%	43000	0%	0%	330000	0%
VOCs	trans-1,3-Dichloropropene	10061-02-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	trans-1,4-Dichloro-2-butene	110-57-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Trichloroethene (TCE)	79-01-6	ug/kg	0%	0%	500000	0%	0%	100	0%	26%	440000	0%	0%	37000	0%	0%	260000	0%
VOCs	Trichlorofluoromethane	75-69-4	ug/kg	0%	0%	560000	0%	0%	150000	0%	0%	560000	0%	0%	560000	0%	0%	1.1E+08	0%
VOCs	Trihalomethanes, Total	STL00209	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Vinyl acetate	108-05-4	ug/kg	0%	0%	2400000	0%	0%	36000	0%	0%	2400000	0%	0%	1500000	0%	0%	2000000	0%
VOCs	Vinyl chloride	75-01-4	ug/kg	0%	0%	490000	0%	0%	40	0%	83%	20000	0%	0%	2800	0%	0%	29000	0%
VOCs	Xylenes, Total	1330-20-7	ug/kg	0%	0%	150000	0%	0%	5600	0%	0%	150000	0%	0%	150000	0%	0%	54000000	0%

Notes:

If duplicates exist, the average of the duplicate results was used as

Nondetects were substituted by half of reporting limit (RL) for the c

Laboratory QAQC results are not included.

Isomer:

When the lab reports a total for one of these "isomer" groups, use t

Xylenes	Total Xylenes is the total of o-Xylene, p-Xylene, and m
Endosulfan	Total Endosulfan is composed of Endosulfan I and En
Cresol	Total Cresol or Methylphenol is composed of 2-Methyl
Chlordane	Total Chlordane is the sum of alpha-Chlordane and ga
PCBs	Total PCBs is the sum of all individual PCBs. (ND aro

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air1	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Volatilization to Ambient Air2	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Res Particulate Soil Inhalation	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Non-Residential Soil Direct Contact	Percent Exceed (Detect)	Percent Exceed (Non-detect)	EPA Residential Soil	Percent Exceed (Detect)	Percent Exceed (Non-detect)
VOCs	Tetrahydrofuran	109-99-9	ug/kg	0%	67000000	0%	0%	1.6E+08	0%	0%	1.7E+11	0%	0%	9500000	0%	0%	--	--	--
VOCs	Toluene	108-88-3	ug/kg	0%	36000000	0%	0%	36000000	0%	0%	1.2E+10	0%	0%	250000	0%	0%	--	--	--
VOCs	trans-1,2-Dichloroethene	156-60-5	ug/kg	0%	840000	0%	0%	2000000	0%	0%	2.1E+09	0%	0%	1400000	0%	0%	--	--	--
VOCs	trans-1,3-Dichloropropene	10061-02-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	trans-1,4-Dichloro-2-butene	110-57-6	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	6.9	0%	93%
VOCs	Trichloroethene (TCE)	79-01-6	ug/kg	0%	440000	0%	0%	1100000	0%	0%	2.3E+09	0%	0%	500000	0%	0%	--	--	--
VOCs	Trichlorofluoromethane	75-69-4	ug/kg	0%	1.4E+11	0%	0%	1.4E+11	0%	0%	1.70E+12	0%	0%	560000	0%	0%	--	--	--
VOCs	Trihalomethanes, Total	STL00209	ug/kg	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs	Vinyl acetate	108-05-4	ug/kg	0%	2700000	0%	0%	5900000	0%	0%	5.9E+09	0%	0%	2400000	0%	0%	--	--	--
VOCs	Vinyl chloride	75-01-4	ug/kg	0%	170000	0%	0%	420000	0%	0%	8.9E+08	0%	0%	34000	0%	0%	--	--	--
VOCs	Xylenes, Total	1330-20-7	ug/kg	0%	65000000	0%	0%	1.3E+08	0%	0%	1.3E+11	0%	0%	150000	0%	0%	--	--	--

Notes:

If duplicates exist, the average of the duplicate results was used as

Nondetects were substituted by half of reporting limit (RL) for the c

Laboratory QAQC results are not included.

Isomer:

When the lab reports a total for one of these "isomer" groups, use t

Xylenes	Total Xylenes is the total of o-Xylene, p-Xylene, and m
Endosulfan	Total Endosulfan is composed of Endosulfan I and En
Cresol	Total Cresol or Methylphenol is composed of 2-Methyl
Chlordane	Total Chlordane is the sum of alpha-Chlordane and ga
PCBs	Total PCBs is the sum of all individual PCBs. (ND aro

Table 5-2

Summary Statistics and Comparison with Screening Criteria of Combined Results -- 2005/6 Dow On-site, 2006 COM Blind, 2010 Dow, and 2010 MDEQ Data, The Dow Chemical Company, Michigan Operations

Analyte Group	Analyte	CAS Number	Unit	EPA Industrial Soil	Percent Exceed (Detect)	Percent Exceed (Non-detect)	EPA Risk-Based SSL	Percent Exceed (Detect)	Percent Exceed (Non-detect)	Group D2 and D3?	Group D4?	Group D5 and D6?
VOCs	Tetrahydrofuran	109-99-9	ug/kg	--	--	--	--	--	--	D3	--	--
VOCs	Toluene	108-88-3	ug/kg	--	--	--	--	--	--	--	--	D6
VOCs	trans-1,2-Dichloroethene	156-60-5	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	trans-1,3-Dichloropropene	10061-02-6	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	trans-1,4-Dichloro-2-butene	110-57-6	ug/kg	35	0%	83%	0.00054	0%	100%	--	D4	--
VOCs	Trichloroethene (TCE)	79-01-6	ug/kg	--	--	--	--	--	--	--	D4	--
VOCs	Trichlorofluoromethane	75-69-4	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	Trihalomethanes, Total	STL00209	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	Vinyl acetate	108-05-4	ug/kg	--	--	--	--	--	--	--	--	--
VOCs	Vinyl chloride	75-01-4	ug/kg	--	--	--	--	--	--	--	D4	--
VOCs	Xylenes, Total	1330-20-7	ug/kg	--	--	--	--	--	--	--	--	D6

Notes:

If duplicates exist, the average of the duplicate results was used as

Nondetects were substituted by half of reporting limit (RL) for the c

Laboratory QAQC results are not included.

Isomer:

When the lab reports a total for one of these "isomer" groups, use t

Xylenes	Total Xylenes is the total of o-Xylene, p-Xylene, and m
Endosulfan	Total Endosulfan is composed of Endosulfan I and En
Cresol	Total Cresol or Methylphenol is composed of 2-Methyl
Chlordane	Total Chlordane is the sum of alpha-Chlordane and ga
PCBs	Total PCBs is the sum of all individual PCBs. (ND aro

Table 5-3
Summary Statistics of Dioxin Results

		Number of Samples					Summary Statistics						
Analyte	Unit	No. of Samples from 2005/6 Dow On-Site	No. of Samples from 2006 COM Blind	No. of Samples from 2010 Dow	No. of Samples from 2010 MDEQ	Total No. of Samples	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	Min RL of NDs	Max RL of NDs
WHO-TEQ_2005	**ppt**	**28**	**258**	**537**	**31**	**854**	**100.0%**	**981**	**11,538**	**0.231**	**299,017**	**-**	**-**
1,2,3,4,6,7,8-HpCDD	ppt	28	196	536	33	**793**	100.0%	2,763	14,480	0.962	287,057	-	-
1,2,3,4,6,7,8-HpCDF	ppt	27	196	536	33	**792**	99.9%	2,097	8,994	0.922	116,877	0.743	0.743
1,2,3,4,7,8,9-HpCDF	ppt	27	196	521	33	**777**	98.3%	103	673	0.276	16,507	0.536	0.749
1,2,3,4,7,8-HxCDD	ppt	28	196	527	33	**784**	99.0%	49.4	189.1	0.130	3,596	0.142	0.571
1,2,3,4,7,8-HxCDF	ppt	28	196	535	33	**792**	99.6%	201	1,252	0.214	30,935	0.143	0.149
1,2,3,6,7,8-HxCDD	ppt	28	196	534	33	**791**	99.5%	150	529	0.166	10,319	0.149	0.59
1,2,3,6,7,8-HxCDF	ppt	23	196	533	33	**785**	99.5%	83.5	534.5	0.189	12,514	0.143	0.157
1,2,3,7,8,9-HxCDD	ppt	28	196	532	33	**789**	99.2%	92.5	333.8	0.164	5,640	0.143	0.623
1,2,3,7,8,9-HxCDF	ppt	20	196	505	33	**754**	97.9%	18.7	190.8	0.160	4,967	0.142	6.3
1,2,3,7,8-PCDD	ppt	28	196	529	33	**786**	99.0%	84.3	422.5	0.145	6,960	0.096	0.335
1,2,3,7,8-PCDF	ppt	28	196	535	33	**792**	99.7%	59.9	227.3	0.0950	4,000	0.096	0.099
2,3,4,6,7,8-HxCDF	ppt	27	196	526	33	**782**	92.5%	95.9	753.8	0.145	15,602	0.149	28.8
2,3,4,7,8-PCDF	ppt	28	196	517	33	**774**	99.9%	83.4	411.8	0.167	8,529	0.295	0.295
2,3,7,8-TCDD	ppt	28	196	531	33	**788**	99.5%	812	11,472	0.111	289,000	0.157	0.679
2,3,7,8-TCDF	ppt	28	196	528	33	**785**	99.7%	84.9	329.4	0.151	6,572	0.137	0.804
OCDD	ppt	28	196	537	33	**794**	100.0%	28,202	147,339	4.21	2,911,985	-	-
OCDF	ppt	28	196	533	33	**790**	99.9%	3,811	20,879	1.04	393,873	2.23	2.23

Notes:

If duplicates exist, the average of the duplicate results was used as a single data point.

Nondetects were substituted by half of reporting limit (RL) for the computation of summary statistics.

Laboratory QAQC results are not included.

Missing data are pending to be included.

Table 5-4
Summary of Non-dioxin Data Screening Results, The Dow Chemical Company, Michigan Operations

A1 [1] Metals Screen-out by Statewide Default Background	A2 [1] Metals Screen-out by Regional Background Screening Levels	B1 [1] Screen-out by all NDs; RLs met MDEQ target detection levels	B2 [1] Screen-out by off-site NDs; RLs met MDEQ target detection levels	B3 [1] Screen-out by all NDs; all RLs ≤ all Part 201/EPA criteria	C1 [2] No criteria; detected ≤ 5%	C2 [2] No criteria; detected > 5%	D1 [1] Screen-out by other reasons	D2 [1] Detected ≤ 5%; screen-out by Part 201/EPA criteria	D3 [1] Detected > 5%; screen-out by Part 201/EPA criteria	D4 [2] Not detected above Part 201/EPA criteria; but have elevated RLs for NDs	D5 [2] Detected ≤ 5%; one or more detected concentrations > Part 201/EPA criteria	D6 [2] Detected > 5%; one or more detected concentrations > Part 201/EPA criteria	E1 [3] Eliminate through a review of spacial distribution	E2 Eliminate based on leach testing results	E3 Eliminate - analyte not sourced by Dow
(none)	Barium	Silvex (2,4,5-TP)	bis(2-Chloroisopropyl)ether	Endrin ketone	Delta BHC	Calcium	*(none)*	2,4,5-T (Trichlorophenoxyacetic Acid)	2,4-D (Dichlorophenoxyacetic Acid)	Thallium	alpha-BHC	Cyanide, Total	Delta BHC	***Pending***	***Pending***
	Cadmium	3,3'-Dichlorobenzidine	Hexabromobenzene	Heptachlor	Endrin aldehyde	Potassium		Endrin	Beryllium	PCBs, Total	Gamma BHC (Lindane)	Mercury	Endrin aldehyde		
	Magnesium	4,4'-Methylene bis(2-chloroaniline)	Hexabromobiphenyl	(E)-alpha,beta-2,3,4,5,6-Heptachlorostyrene	4-Bromophenyl phenyl ether	Thorium		Mirex	Sodium	Aldrin	Hexachlorobutadiene	Aluminum	4-Bromophenyl phenyl ether		
	Manganese	2-Chloroethyl vinyl ether		(E)-beta-2,3,4,5,6-Hexachlorostyrene	4-Chlorophenyl phenyl ether	Titanium		1,2,4-Trichlorobenzene	Tin	Beta BHC	1,2-Dichlorobenzene	Antimony	4-Chlorophenyl phenyl ether		
		Ethyl tert-Butyl Ether		(Z)-alpha,beta-2,3,4,5,6-Heptachlorostyrene	Octachlorostyrene	Endosulfan sulfate		2,4,5-Trichlorophenol	4,4'-DDD	Dieldrin	Acrylonitrile	Arsenic	Octachlorostyrene		
		Isopropyl Ether		(Z)-beta-2,3,4,5,6-Hexachlorostyrene	1,1-Dichloropropene	Sulfide		Azobenzene	4,4'-DDE	Toxaphene	Chlorobenzene	Boron	1,1-Dichloropropene		
		Methyl-t-butyl ether		1,2,3-Trichlorobenzene	Propionitrile, Ethyl Cyanide	1,2,3,4-Tetrachlorobenzene		Benzyl alcohol	4,4'-DDT	Tris(2,3-dibromopropyl)phosphate	Tetrachloroethene	Chromium	Propionitrile, Ethyl Cyanide		
		t-Butanol		1,2,4,5-Tetrachlorobenzene		1,2,3-Trimethylbenzene		Dimethyl phthalate	Chlordane, Total	1,2-Diphenyl-hydrazine		Chromium VI	Calcium		
		tert-Amyl Methyl Ether		1,4-Naphthoquinone		Methyl Iodide (Iodomethane)		Isophorone	Endosulfan, Total	1,3-Dinitrobenzene		Cobalt	Potassium		
		Vinyl acetate		1-Naphthylamine		p-Isopropyltoluene		n-Nitrosodiphenylamine	Heptachlor epoxide	2,2'-Oxybis(1-Chloropropane)		Copper	Thorium		
				2,3,4,5,6-Pentachlorostyrene				Propachlor	Methoxychlor	2,4,6-Trichlorophenol		Iron	Titanium		
				2,4-Dimethylphenol				1,3,5-Trimethylbenzene	2,3,4,6-Tetrachlorophenol	2,4-Dichlorophenol		Lead	Endosulfan sulfate		
				2,6-Dichlorophenol				2-Chlorotoluene	2-Methylnaphthalene	2,4-Dinitrophenol		Lithium	Sulfide		
				2-Acetylaminofluorene				2-Hexanone	Acenaphthene	2,4-Dinitrotoluene		Molybdenum	1,2,3,4-Tetrachlorobenzene		
				2-Chloronaphthalene				Chloroform	Acenaphthylene	2,6-Dimethylphenol		Nickel	1,2,3-Trimethylbenzene		
				3-Nitroaniline				Chloromethane	Acetophenone	2,6-Dinitrotoluene		Selenium	Methyl Iodide (Iodomethane)		
				4-Nitrophenol				Cyclohexane	Anthracene	2-Chlorophenol		Silver	p-Isopropyltoluene		
				4-Nitroquinoline-1-oxide				Dichlorodifluoromethane	Benzo(a)anthracene	2-Naphthylamine		Strontium	Thallium		
				4-tert-Butylphenol				Methyl Ethyl Ketone (2-Butanone)	Benzo(b)fluoranthene	2-Nitroaniline		Vanadium	PCBs, Total		
				Alpha, Alpha Dimethylphenethylamine				Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	Benzo(g,h,i)perylene	2-Nitrophenol		Zinc	Aldrin		
				alpha-2,3,4,5,6-Hexachlorostyrene				n-Butylbenzene	Benzo(k)fluoranthene	3,3'-Dimethylbenzidine		Benzo[a]pyrene	Beta BHC		
				Benzyl dichloride				Styrene	Benzoic acid	3-Methylcholanthrene		Dibenzofuran	Dieldrin		
				beta,beta-2,3,4,5,6-Heptachlorostyrene				tert-Butylbenzene	Benzyl Butyl Phthalate	4,6-Dinitro-2-methylphenol		Fluoranthene	Toxaphene		
				Bisphenol-A					bis(2-ethylhexyl) phthalate	4-Aminobiphenyl		Hexachlorobenzene	Tris(2,3-dibromopropyl)phosphate		
				Caprolactam					Carbazole	4-Chloro-3-methylphenol		Pentachlorophenol	1,2-Diphenyl-hydrazine		
				cis-Nonachlor					Chrysene	4-Chloroaniline		Phenanthrene	1,3-Dinitrobenzene		
				Di-n-octylphthalate					Di-n-butyl phthalate	4-Nitroaniline		1,3-Dichlorobenzene	2,2'-Oxybis(1-Chloropropane)		
				Ethyl methanesulfonate					Fluorene	5-Nitro-o-toluidine		1,4-Dichlorobenzene	2,4,6-Trichlorophenol		
				Famphur					Indeno(1,2,3-c,d)Pyrene	7,12-Dimethylbenz(a)anthracene		Benzene	2,4-Dichlorophenol		
				Hexachlorocyclopentadiene					o-Phenylphenol	Aniline		Bromomethane	2,4-Dinitrophenol		
				Hexachlorophene					Phenol	Aramite (Total)		Methylene Chloride	2,4-Dinitrotoluene		
				Hexachloropropene					Pyrene	Benzidine		Naphthalene	2,6-Dimethylphenol		
				Isodrin					1,2,4-Trimethylbenzene	Bis(2-Chloroethoxy) methane		Toluene	2,6-Dinitrotoluene		
				Isosafrole					Acetone	Bis(2-Chloroethyl) ether		Xylenes, Total	2-Chlorophenol		
				Methapyrilene					Isopropylbenzene	Chlorobenzilate			2-Naphthylamine		
				Methyl chlorpyrifos					N-Propylbenzene	Chlorpyrifos			2-Nitroaniline		
				O,O,O-Triethyl Phosphorothioate					sec-Butylbenzene	Cresol, Total			2-Nitrophenol		
				O,O-Diethyl O-2-Pyrazinyl Phosphorothioate (Thionazin)					Tetrahydrofuran	Diallate (total of cis and trans isomers)			3,3'-Dimethylbenzidine		
				o,p'-DDD						Dibenz(a,h)anthracene			3-Methylcholanthrene		
				o-Toluidine						Diethyl phthalate			4,6-Dinitro-2-methylphenol		
				Parathion, Ethyl (Parathion)						Dimethoate			4-Aminobiphenyl		
				Pentachlorobenzene						Dinoseb			4-Chloro-3-methylphenol		

Table 5-4
Summary of Non-dioxin Data Screening Results, The Dow Chemical Company, Michigan Operations

A1[1] Metals Screen-out by Statewide Default Background	A2[1] Metals Screen-out by Regional Background Screening Levels	B1[1] Screen-out by all NDs; RLs met MDEQ target detection levels	B2[1] Screen-out by off-site NDs; RLs met MDEQ target detection levels	B3[1] Screen-out by all NDs; all RLs ≤ all Part 201/EPA criteria	C1[2] No criteria; detected ≤ 5%	C2[2] No criteria; detected > 5%	D1[1] Screen-out by other reasons	D2[1] Detected ≤ 5%; screen-out by Part 201/EPA criteria	D3[1] Detected > 5%; screen-out by Part 201/EPA criteria	D4[2] Not detected above Part 201/EPA criteria; but have elevated RLs for NDs	D5[2] Detected ≤ 5%; one or more detected concentrations > Part 201/EPA criteria	D6[2] Detected > 5%; one or more detected concentrations > Part 201/EPA criteria	E1[3] Eliminate through a review of spacial distribution	E2 Eliminate based on leach testing results	E3 Eliminate - analyte not sourced by Dow
				Pentachloronitrobenzene						Diphenylamine			4-Chloroaniline		
				p-Phenylenediamine						Disulfoton			4-Nitroaniline		
				Pronamide						Hexachloroethane			5-Nitro-o-toluidine		
				Ronnel						Kepone			7,12-Dimethylbenz(a)anthracene		
				Sym-Trinitrobenzene						Methyl methanesulfonate			Aniline		
				trans-Nonachlor						Nitrobenzene			Aramite (Total)		
				1,1,1,2-Tetrachloroethane						n-Nitrosodiethylamine			Benzidine		
				1,1,1-Trichloroethane						n-Nitrosodimethylamine			Bis(2-Chloroethoxy) methane		
				1,1-Dichloroethane						N-Nitroso-di-n-butylamine			Bis(2-Chloroethyl) ether		
				1,2,3-Trichloropropane						n-Nitrosodi-n-propylamine			Chlorobenzilate		
				2,2-Dichloropropane						n-Nitrosomethylethylamine			Chlorpyrifos		
				4-Chlorotoluene						n-Nitrosomorpholine			Cresol, Total		
				Bromobenzene						n-Nitrosopiperidine			Diallate (total of cis and trans isomers)		
				Bromodichloromethane						n-Nitrosopyrrolidine			Dibenz(a,h)anthracene		
				Bromoform						Parathion, Methyl			Diethyl phthalate		
				Carbon disulfide						p-Dimethylaminoazobenzene			Dimethoate		
				Chlorobromomethane						Pentochlorethane			Dinoseb		
				Chloroethane						Phenacetin			Diphenylamine		
				cis-1,2-Dichloroethene						Phorate			Disulfoton		
				cis-1,3-Dichloropropene						Pyridine			Hexachloroethane		
				Cyclohexanone						Safrole			Kepone		
				Dibromochloromethane						Tetraethyl Dithiopyrophosphate (Sulfotepp)			Methyl methanesulfonate		
				Dibromomethane						1,1,2,2-Tetrachloroethane			Nitrobenzene		
				Ethyl methacrylate						1,1,2-Trichloroethane			n-Nitrosodiethylamine		
				Isobutanol						1,1,2-Trichlorotrifluoroethane			n-Nitrosodimethylamine		
				n-Butanol						1,1-Dichloroethene			N-Nitroso-di-n-butylamine		
				trans-1,2-Dichloroethene						1,2-Dibromo-3-chloropropane			n-Nitrosodi-n-propylamine		
				trans-1,3-Dichloropropene						1,2-Dibromoethane (EDB)			n-Nitrosomethylethylamine		
				Trichlorofluoromethane						1,2-Dichloroethane			n-Nitrosomorpholine		
				Trihalomethanes, Total						1,2-Dichloropropane			n-Nitrosopiperidine		
										1,3-Dichloropropane			n-Nitrosopyrrolidine		
										1,3-Dichloropropene, Total			Parathion, Methyl		
										1,4-Dioxane			p-Dimethylaminoazobenzene		
										2-Propanol			Pentochlorethane		
										Acetonitrile			Phenacetin		
										Acrolein			Phorate		
										Allyl Chloride (3-Chloropropene)			Pyridine		
										Carbon tetrachloride			Safrole		
										Chloroprene (2-Chloro-1,3-Butadiene)			Tetraethyl Dithiopyrophosphate (Sulfotepp)		
										Ethyl Benzene			1,1,2,2-Tetrachloroethane		
										Ethyl ether			1,1,2-Trichloroethane		
										Ethylene oxide			1,1,2-Trichlorotrifluoroethane		
										Methyl methacrylate			1,1-Dichloroethene		
										Methylacrylonitrile			1,2-Dibromo-3-chloropropane		
										trans-1,4-Dichloro-2-butene			1,2-Dibromoethane (EDB)		
										Trichloroethene (TCE)			1,2-Dichloroethane		
										Vinyl chloride			1,2-Dichloropropane		

Table 5-4
Summary of Non-dioxin Data Screening Results, The Dow Chemical Company, Michigan Operations

A1[1] Metals Screen-out by Statewide Default Background	A2[1] Metals Screen-out by Regional Background Screening Levels	B1[1] Screen-out by all NDs; RLs met MDEQ target detection levels	B2[1] Screen-out by off-site NDs; RLs met MDEQ target detection levels	B3[1] Screen-out by all NDs; all RLs ≤ all Part 201/EPA criteria	C1[2] No criteria; detected ≤ 5%	C2[2] No criteria; detected > 5%	D1[1] Screen-out by other reasons	D2[1] Detected ≤ 5%; screen-out by Part 201/EPA criteria	D3[1] Detected > 5%; screen-out by Part 201/EPA criteria	D4[2] Not detected above Part 201/EPA criteria; but have elevated RLs for NDs	D5[2] Detected ≤ 5%; one or more detected concentrations > Part 201/EPA criteria	D6[2] Detected > 5%; one or more detected concentrations > Part 201/EPA criteria	E1[3] Eliminate through a review of spacial distribution	E2 Eliminate based on leach testing results	E3 Eliminate - analyte not sourced by Dow
													1,3-Dichloropropane		
													1,3-Dichloropropene, Total		
													1,4-Dioxane		
													2-Propanol		
													Acetonitrile		
													Acrolein		
													Allyl Chloride (3-Chloropropene)		
													Carbon tetrachloride		
													Chloroprene (2-Chloro-1,3-Butadiene)		
													Ethyl Benzene		
													Ethyl ether		
													Ethylene oxide		
													Methyl methacrylate		
													Methylacrylonitrile		
													trans-1,4-Dichloro-2-butene		
													Trichloroethene (TCE)		
													Vinyl chloride		
													alpha-BHC		
													Gamma BHC (Lindane)		
													1,2-Dichlorobenzene		
													Acrylonitrile		
													Chlorobenzene		
													Tetrachloroethene		
													Cyanide, Total		
													Mercury		
													Aluminum		
													Antimony		
													Chromium		
													Cobalt		
													Copper		
													Iron		
													Lead		
													Molybdenum		
													Nickel		
													Selenium		
													Silver		
													Vanadium		
													Benzo[a]pyrene		
													Dibenzofuran		
													Fluoranthene		
													Phenanthrene		
													1,3-Dichlorobenzene		
													1,4-Dichlorobenzene		
													Benzene		
													Bromomethane		
													Methylene Chloride		
													Naphthalene		
													Toluene		
													Xylenes, Total		

Notes:
Figure 5-4 serves as a companion figure to this table.
Screen-out
Eliminate
May require additional evaluation
Requires additional evaluation
[1] Anayltes in categories A1, A2, B1. B2, B3, D1, D2, and D3 screened-out from further evaluation based on the screening category they were placed.
[2] Analytes in categories C1, C2, D4, D5, and D6 were initially retained and were each evaluated in a series of meetings and conference calls (held in May through July 2011) attended by MDEQ, EPA, and Dow sta
[3] Analytes from categories C1, C2, D4, D5, and D6 (shaded in gray) were placed in category E1 when the analyte was determined to be eliminated from further evaluation based on the results of the meetings and conference calls

Table 5-5
Dioxin/Furan TEQ and Arsenic Direct Contact Exceedance Correlations

		Summary Statistics					
Analyte	**Unit**	**# of Sampling Periods**	**Detection Rate**	**Mean**	**Std Dev**	**Min**	**Max**
Arsenic	ug/kg	192	98%	4444	4440	195	38029
WHO-TEQ 2005	ng/kg	192	100%	216	291	0.49	2310

Correlation Analysis -- Parametric Method

Linear Regression R-Square	***p*-value**	**Conclusion**
0.233	<.0001	Positive Correlation

Correlation Analysis -- Non-parametric Method

Kendall's *Tau* Correlation Coefficient	***p*-value**	**Conclusion**
0.488	<.0001	Positive Correlation

Notes:

Nondetects were substituted by half of reporting limit (RL) for the statistical evaluation.

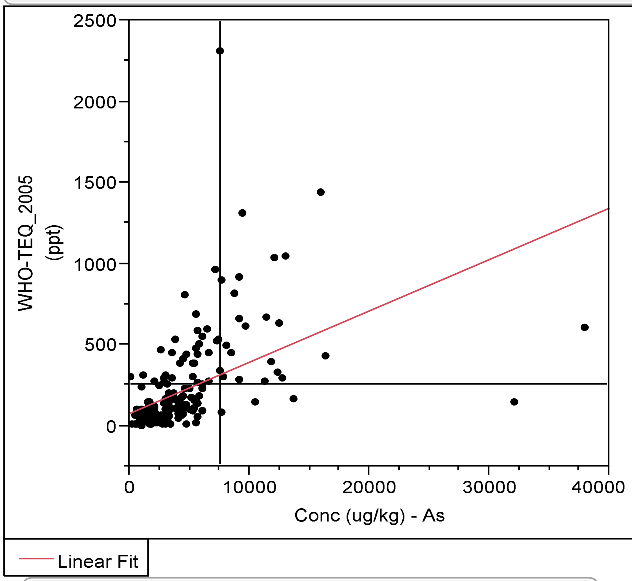
DOS-series data were excluded.

Only samples which were analyzed for both arsenic and TEQ were included.

Correlation was tested at a 5% significance level.

Table 5-5
Dioxin/Furan TEQ and Arsenic Direct Contact Exceedance Correlations

Bivariate Fit of WHO-TEQ_2005 (ppt) By Conc (ug/kg) - As



Linear Fit

WHO-TEQ_2005 (ppt) = 75.125479 + 0.0316933*Conc (ug/kg) - As

Summary of Fit

RSquare	0.233277
RSquare Adj	0.229241
Root Mean Square Error	255.772
Mean of Response	215.9758
Observations (or Sum Wgts)	192

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	3781748	3781748	57.8078
Error	190	12429673	65419	**Prob > F**
C. Total	191	16211421		<.0001*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	75.125479	26.1517	2.87	0.0045*
Conc (ug/kg) - As	0.0316933	0.004168	7.60	<.0001*

Samples which are <250 ng/Kg TEQ, but >7600 ug/Kg As:

Sample ID	Arsenic (ug/kg)	WHO-TEQ 2005 (ng/kg)
A2-01_6"-1'_12/17/2010_TDF	10580	148
A2-02_6"-1'_12/17/2010_TDF	32128	141
A2-03_6"-1'_12/17/2010_TDF	13754	162
F1-02_6"-1'_12/17/2010_TDF	7703	84.1

Table 5-5
Dioxin/Furan TEQ and Arsenic Direct Contact Exceedance Correlations

Multivariate

Nonparametric: Kendall's τ

Variable	by Variable	Kendall τ	Prob>|τ|	-.8 -.6 -.4 -.2 0 .2 .4 .6 .8
WHO-TEQ_2005 (ppt)	Conc (ug/kg) - As	0.4879	<.0001*	

Univariate Simple Statistics

Column	N	DF	Mean	Std Dev	Sum	Minimum	Maximum
Conc (ug/kg) - As	192	191.00	4444.17	4439.79	853281	195.000	38028.8
WHO-TEQ_2005 (ppt)	192	191.00	215.976	291.336	41467.4	0.4900	2310.00

Note: Statistics were calculated for each column independently without regard for missing values in other columns.

Scatterplot Matrix

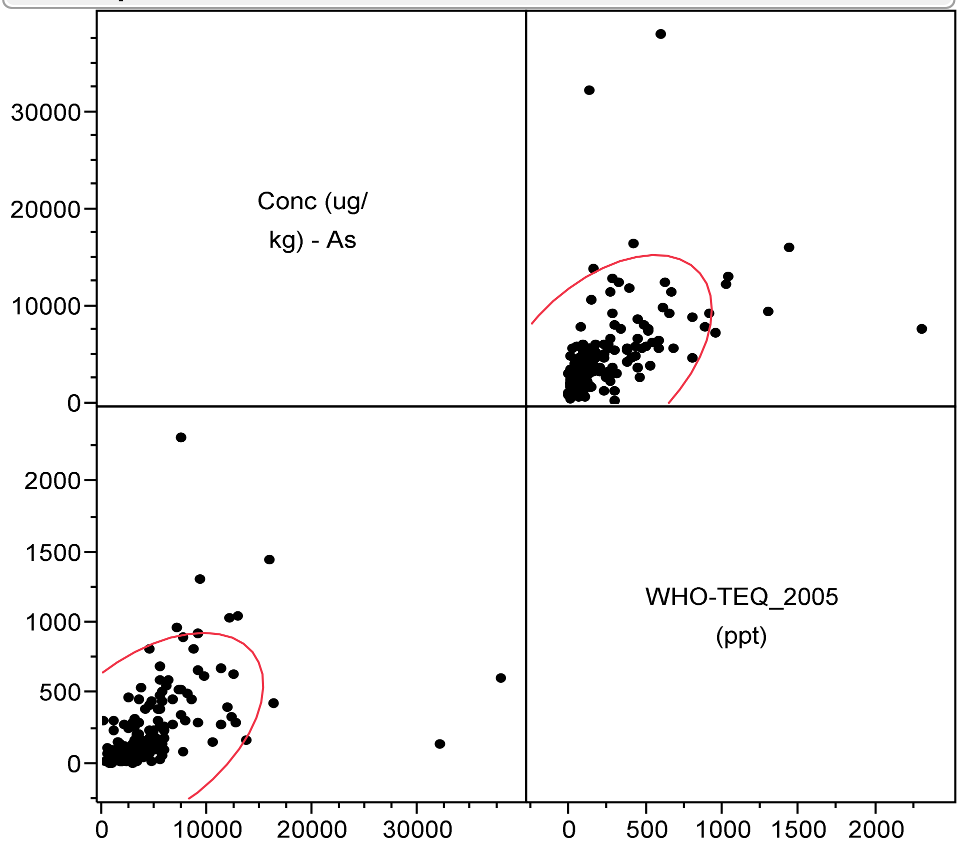


Table 5-6
Summary Statistics of Dioxin Results by Data Set and Depth

			2005/6 Dow On-Site								2006 COM Blind								2010 Dow/MDEQ							
Analyte	Unit	Depth Interval	No. of Samples	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	Min RL of NDs	Max RL of NDs	No. of Samples	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	Min RL of NDs	Max RL of NDs	No. of Samples	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	Min RL of NDs	Max RL of NDs
WHO-TEQ_2005	**ppt**	**(1) 0 in - 1 in**	**28**	**100%**	**23,796**	**60,346**	**7.90**	**299,017**	**-**	**-**	**223**	**100%**	**152**	**145**	**2.5**	**915**	**-**	**-**	**138**	**100%**	**332**	**417**	**9.63**	**2,750**	**-**	**-**
WHO-TEQ_2005	**ppt**	**(2) 1 in - 6 in**	**0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**35**	**100%**	**159**	**150**	**2.9**	**633**	**-**	**-**	**138**	**100%**	**340**	**909**	**7.19**	**10,500**	**-**	**-**
WHO-TEQ_2005	**ppt**	**(3) 6 in - 1 ft**	**0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**138**	**100%**	**196**	**282**	**0.49**	**1,310**	**-**	**-**
WHO-TEQ_2005	**ppt**	**(4) > 1 ft**	**0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**154**	**100%**	**76.8**	**109**	**0.231**	**807**	**-**	**-**
1,2,3,4,6,7,8-HpCDD	ppt	(1) 0 in - 1 in	28	100%	36,582	69,283	88	287,057	-	-	161	100%	1,228	1,434	18.1	10,900	-	-	139	100%	2,646	2,633	67	13,514	-	-
1,2,3,4,6,7,8-HpCDD	ppt	(2) 1 in - 6 in	0	-	-	-	-	-	-	-	35	100%	1,524	1,560	16.9	7,400	-	-	139	100%	2,118	2,175	39	12,382	-	-
1,2,3,4,6,7,8-HpCDD	ppt	(3) 6 in - 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	138	100%	1,306	2,304	8.02	12,833	-	-
1,2,3,4,6,7,8-HpCDD	ppt	(4) > 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	153	100%	478	782	0.962	5,051	-	-
1,2,3,4,6,7,8-HpCDF	ppt	(1) 0 in - 1 in	27	100%	28,812	39,979	43	116,877	-	-	161	100%	712	870	5.44	4,980	-	-	139	100%	1,734	2,071	26	13,884	-	-
1,2,3,4,6,7,8-HpCDF	ppt	(2) 1 in - 6 in	0	-	-	-	-	-	-	-	35	100%	927	1,057	5.62	4,770	-	-	139	100%	1,678	2,595	17.5	24,753	-	-
1,2,3,4,6,7,8-HpCDF	ppt	(3) 6 in - 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	138	100%	1,203	1,816	6.14	7,892	-	-
1,2,3,4,6,7,8-HpCDF	ppt	(4) > 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	153	99%	625	1,097	0.922	7,575	0.743	0.743
1,2,3,4,7,8,9-HpCDF	ppt	(1) 0 in - 1 in	27	100%	1,513	3,257	3.1	16,507	-	-	161	100%	29.7	43.2	0.82	347	-	-	138	100%	70.0	85.4	1.67	578	-	-
1,2,3,4,7,8,9-HpCDF	ppt	(2) 1 in - 6 in	0	-	-	-	-	-	-	-	35	100%	44.8	65.4	0.429	307	-	-	139	100%	84.1	317	0.76	3,717	-	-
1,2,3,4,7,8,9-HpCDF	ppt	(3) 6 in - 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	133	98%	63.6	184	0.796	1,870	0.738	0.749
1,2,3,4,7,8,9-HpCDF	ppt	(4) > 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	144	93%	21.3	31.4	0.276	213	0.536	0.743
1,2,3,4,7,8-HxCDD	ppt	(1) 0 in - 1 in	28	100%	482	824	2	3,596	-	-	161	100%	24.7	27.6	0.833	203	-	-	139	100%	51.4	53.1	1.9	258	-	-
1,2,3,4,7,8-HxCDD	ppt	(2) 1 in - 6 in	0	-	-	-	-	-	-	-	35	100%	25.5	24.6	0.776	104	-	-	139	100%	53.1	152	1.19	1,774	-	-
1,2,3,4,7,8-HxCDD	ppt	(3) 6 in - 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	135	100%	31.0	49.3	0.235	247	-	-
1,2,3,4,7,8-HxCDD	ppt	(4) > 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	147	95%	11.5	18.0	0.13	103	0.142	0.571
1,2,3,4,7,8-HxCDF	ppt	(1) 0 in - 1 in	28	100%	2,670	5,877	11	30,935	-	-	161	100%	56.4	76.1	0.716	548	-	-	139	100%	141	188	2.82	1,294	-	-
1,2,3,4,7,8-HxCDF	ppt	(2) 1 in - 6 in	0	-	-	-	-	-	-	-	35	100%	80.8	118	0.721	563	-	-	139	100%	200	891	1.46	10,476	-	-
1,2,3,4,7,8-HxCDF	ppt	(3) 6 in - 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	137	100%	127	296	0.785	2,824	-	-
1,2,3,4,7,8-HxCDF	ppt	(4) > 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	153	98%	49.0	73.7	0.214	591	0.143	0.149
1,2,3,6,7,8-HxCDD	ppt	(1) 0 in - 1 in	28	100%	1,465	2,193	4.5	10,319	-	-	161	100%	69.8	77.6	1.51	484	-	-	139	100%	154	163	5.7	830	-	-
1,2,3,6,7,8-HxCDD	ppt	(2) 1 in - 6 in	0	-	-	-	-	-	-	-	35	100%	83.2	87.7	1.46	408	-	-	139	100%	165	469	3.64	5,474	-	-
1,2,3,6,7,8-HxCDD	ppt	(3) 6 in - 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	138	100%	98.9	163	0.569	1,040	-	-
1,2,3,6,7,8-HxCDD	ppt	(4) > 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	151	97%	38.7	58.3	0.166	384	0.149	0.59
1,2,3,6,7,8-HxCDF	ppt	(1) 0 in - 1 in	23	100%	652	1,389	2.8	6,467	-	-	161	100%	28.0	42.8	0.422	267	-	-	139	100%	101	306	1.67	2,227	-	-
1,2,3,6,7,8-HxCDF	ppt	(2) 1 in - 6 in	0	-	-	-	-	-	-	-	35	100%	35.2	44.0	0.419	204	-	-	139	100%	154	1,067	0.87	12,514	-	-
1,2,3,6,7,8-HxCDF	ppt	(3) 6 in - 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	137	100%	48.2	106	0.347	981	-	-
1,2,3,6,7,8-HxCDF	ppt	(4) > 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	151	97%	18.1	25.2	0.189	171	0.143	0.157
1,2,3,7,8,9-HxCDD	ppt	(1) 0 in - 1 in	28	100%	928	1,443	3.6	5,640	-	-	161	100%	45.4	49.1	1.24	346	-	-	139	100%	97.0	99.4	3.9	546	-	-
1,2,3,7,8,9-HxCDD	ppt	(2) 1 in - 6 in	0	-	-	-	-	-	-	-	35	100%	49.2	51.1	1.2	255	-	-	139	100%	96.0	234	2.65	2,700	-	-
1,2,3,7,8,9-HxCDD	ppt	(3) 6 in - 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	137	100%	56.3	88.3	0.345	433	-	-
1,2,3,7,8,9-HxCDD	ppt	(4) > 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	150	96%	22.7	35.3	0.164	224	0.143	0.623
1,2,3,7,8,9-HxCDF	ppt	(1) 0 in - 1 in	20	100%	393	1,125	1.7	4,967	-	-	161	100%	3.95	11.69	0.263	146	-	-	135	96%	8.60	17.05	0.23	144	5.8	6.3
1,2,3,7,8,9-HxCDF	ppt	(2) 1 in - 6 in	0	-	-	-	-	-	-	-	35	100%	3.87	4.82	0.363	22.25	-	-	136	99%	9.75	32.33	0.16	355	6	6
1,2,3,7,8,9-HxCDF	ppt	(3) 6 in - 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	123	98%	12.8	43.9	0.16	452	0.148	5.5
1,2,3,7,8,9-HxCDF	ppt	(4) > 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	144	94%	9.69	21.14	0.212	174	0.142	1.03
1,2,3,7,8-PCDD	ppt	(1) 0 in - 1 in	28	100%	988	1,648	1.3	6,960	-	-	161	100%	32.2	34.5	0.761	224	-	-	139	100%	64.8	72.2	2.4	386	-	-
1,2,3,7,8-PCDD	ppt	(2) 1 in - 6 in	0	-	-	-	-	-	-	-	35	100%	29.2	26.1	1.01	122	-	-	139	100%	68.8	198	1.81	2,304	-	-
1,2,3,7,8-PCDD	ppt	(3) 6 in - 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	135	100%	40.4	64.2	0.300	376	-	-
1,2,3,7,8-PCDD	ppt	(4) > 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	149	95%	56.0	493	0.145	6,025	0.096	0.335
1,2,3,7,8-PCDF	ppt	(1) 0 in - 1 in	28	100%	545	1,035	3.7	4,000	-	-	161	100%	23.8	37.0	0.3	238	-	-	139	100%	51.0	67.8	1.1	409	-	-
1,2,3,7,8-PCDF	ppt	(2) 1 in - 6 in	0	-	-	-	-	-	-	-	35	100%	29.9	51.0	0.235	271	-	-	139	100%	63.1	125	0.48	1,022	-	-
1,2,3,7,8-PCDF	ppt	(3) 6 in - 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	136	100%	50.4	89.6	0.289	707	-	-
1,2,3,7,8-PCDF	ppt	(4) > 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	154	99%	29.9	69.8	0.095	626	0.096	0.099
2,3,4,6,7,8-HxCDF	ppt	(1) 0 in - 1 in	27	100%	968	2,375	1.4	12,359	-	-	161	100%	21.0	34.1	0.506	251	-	-	139	94%	108	428	1.04	3,327	0.758	20.7
2,3,4,6,7,8-HxCDF	ppt	(2) 1 in - 6 in	0	-	-	-	-	-	-	-	35	100%	23.0	26.1	0.609	130	-	-	139	96%	174	1,338	0.87	15,602	1.89	22.5
2,3,4,6,7,8-HxCDF	ppt	(3) 6 in - 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	131	95%	30.7	62.8	0.48	631	0.932	24.9
2,3,4,6,7,8-HxCDF	ppt	(4) > 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	150	73%	9.71	18.13	0.145	155	0.149	28.8
2,3,4,7,8-PCDF	ppt	(1) 0 in - 1 in	28	100%	668	1,217	2.8	5,952	-	-	161	100%	27.1	40.3	0.422	248	-	-	134	100%	84.3	200	1.77	1,357	-	-
2,3,4,7,8-PCDF	ppt	(2) 1 in - 6 in	0	-	-	-	-	-	-	-	35	100%	31.1	40.7	0.541	197	-	-	138	100%	125	730	0.72	8,529	-	-
2,3,4,7,8-PCDF	ppt	(3) 6 in - 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	130	100%	58.3	98.2	0.583	841	-	-
2,3,4,7,8-PCDF	ppt	(4) > 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	148	99%	28.4	50.2	0.167	393	0.295	0.295
2,3,7,8-TCDD	ppt	(1) 0 in - 1 in	28	100%	21,000	58,287	0.8	289,000	-	-	161	100%	62.5	66.8	0.739	398	-	-	139	100%	113	156	3.2	934	-	-
2,3,7,8-TCDD	ppt	(2) 1 in - 6 in	0	-	-	-	-	-	-	-	35	100%	56.0	64.0	0.876	269	-	-	139	100%	91.7	97.4	2.81	532	-	-
2,3,7,8-TCDD	ppt	(3) 6 in - 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	136	100%	61.6	113	0.218	598	-	-
2,3,7,8-TCDD	ppt	(4) > 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	150	97%	20.0	43.4	0.111	311	0.157	0.679

Table 5-6
Summary Statistics of Dioxin Results by Data Set and Depth

			2005/6 Dow On-Site								2006 COM Blind								2010 Dow/MDEQ							
Analyte	Unit	Depth Interval	No. of Samples	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	Min RL of NDs	Max RL of NDs	No. of Samples	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	Min RL of NDs	Max RL of NDs	No. of Samples	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	Min RL of NDs	Max RL of NDs
2,3,7,8-TCDF	ppt	(1) 0 in - 1 in	28	100%	759	1,519	5	6,572	-	-	161	100%	33.1	58.6	0.416	412	-	-	137	100%	76.1	104	1.4	622	-	-
2,3,7,8-TCDF	ppt	(2) 1 in - 6 in	0	-	-	-	-	-	-	-	35	100%	43.3	82.4	0.261	462	-	-	137	100%	81.2	134	0.74	935	-	-
2,3,7,8-TCDF	ppt	(3) 6 in - 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	134	100%	76.8	147	0.296	1,139	-	-
2,3,7,8-TCDF	ppt	(4) > 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	153	99%	43.9	107	0.151	863	0.137	0.804
OCDD	ppt	(1) 0 in - 1 in	28	100%	368,918	707,133	890	2,911,985	-	-	161	100%	12,514	15,684	104	121,000	-	-	139	100%	27,899	26,595	560	151,009	-	-
OCDD	ppt	(2) 1 in - 6 in	0	-	-	-	-	-	-	-	35	100%	16,125	18,087	101	91,700	-	-	139	100%	21,755	22,254	348	146,440	-	-
OCDD	ppt	(3) 6 in - 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	138	100%	12,924	22,695	85.9	145,854	-	-
OCDD	ppt	(4) > 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	154	100%	5,181	8,951	4.21	59,361	-	-
OCDF	ppt	(1) 0 in - 1 in	28	100%	56,375	97,470	75	393,873	-	-	161	100%	1,202	1,445	7.48	9,900	-	-	139	100%	3,065	3,818	45.9	26,700	-	-
OCDF	ppt	(2) 1 in - 6 in	0	-	-	-	-	-	-	-	35	100%	1,616	1,783	7.07	7,440	-	-	138	100%	2,614	3,738	27.7	34,995	-	-
OCDF	ppt	(3) 6 in - 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	138	100%	1,935	3,797	8.95	26,000	-	-
OCDF	ppt	(4) > 1 ft	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	151	99%	851	1,587	1.04	10,600	2.23	2.23

Notes:
If duplicates exist, the average of the duplicate results was used as a single data point.
Nondetects were substituted by half of reporting limit (RL) for the computation of summary statistics.
Laboratory QAQC results are not included.
Missing data are pending to be included.

Table 5-7
Summary Statistics of Dioxin Results for the Combined 2006 CH2M Hill and 2010 Dow and MDEQ Data Sets by Depth

			Summmary Statistics of Combined 2006 CH2M Hill and 2010 Dow/MDEQ						Compare to Dioxin Criteria			
Chemical	Unit	Depth Interval	No. of Samples	Detection Rate	Mean	Std Dev	Min Detected Value	Max Detected Value	No. of Samples > 250 ppt	% of Samples > 250 ppt	No. of Samples > 300 ppt	% of Samples > 300 ppt
WHO-TEQ_2005	ppt	(1) 0 in - 1 in	361	100%	221	295	2.5	2750	102	28%	82	23%
WHO-TEQ_2005	ppt	(2) 1 in - 6 in	173	100%	303	817	2.9	10500	69	40%	56	32%
WHO-TEQ_2005	ppt	(3) 6 in - 1 ft	138	100%	196	282	0.49	1310	32	23%	28	20%
WHO-TEQ_2005	ppt	(4) > 1 ft	154	100%	76.8	109.4	0.231	807	11	7%	8	5%

Notes:

If duplicates exist, the average of the duplicate results was used as a single data point.

Nondetects were substituted by half of reporting limit (RL) for the computation of summary statistics.

Laboratory QAQC results are not included.

Missing data are pending to be included.

Table 8-1
Year 1 Property Information
Implementation Plan for 2012

Property Address[1]	Property Zip	Owner Address	Owner Zip	Owner State	Owner Zip	ZONING	Property ID Number	Property Acreage
North of Facility								
501 STATE ST	48640	717 E INDIAN / P O Box 183	MIDLAND	MI	48640-0183	MULT	14-21-10-622	0.98901508
704 E GROVE ST	48640	704 E GROVE ST	MIDLAND	MI	48640-5279	RB	14-21-10-630	0.16537673
615 E INDIAN ST	48640	5414 GARDENBROOK DR	MIDLAND	MI	48642-3237	OS	14-16-50-064	0.34579973
611 E INDIAN ST	48640	804 VANCE RD	MIDLAND	MI	48640-4170	OS	14-16-50-063	0.14101992
502 GEORGE ST	48640	804 VANCE RD	MIDLAND	MI	48640	OS	14-16-50-062	0.13441228
508 GEORGE ST	48640	608 SYLVAN LN	MIDLAND	MI	48640-2903	OS	14-16-50-060	0.12929165
612 E GROVE ST	48640	612 E GROVE	MIDLAND	MI	48640	RB	14-16-40-410	0.16528703
512 GEORGE ST	48640	608 SYLVAN LN	MIDLAND	MI	48640	RB	14-16-50-058	0.15422875
516 GEORGE ST	48640	5800 SWEDE AVE	MIDLAND	MI	48642	RB	14-16-50-056	0.15447731
616 E GROVE ST	48640	616 E GROVE ST	MIDLAND	MI	48640-5225	RB	14-16-40-406	0.27343940
515 E BUTTLES ST	48640	PO BOX 1010	MIDLAND	MI	48641-1010	OS	14-16-50-096	0.16497238
509 E BUTTLES ST	48640	1111 MICHIGAN AVE STE 201	EAST LANSING	MI	48823	OS	14-16-50-095	0.16705044
411 GEORGE ST	48640	1111 MICHIGAN AVE STE 201	EAST LANSING	MI	48823	OS	14-16-50-065	0.16697036
505 E BUTTLES ST	48640	1111 MICHIGAN AVE STE 201	EAST LANSING	MI	48823	OS	14-16-50-094	0.16747404
415 GEORGE ST	48640	110 N MICHIGAN AVE	SAGINAW	MI	48602-4234	OS	14-16-50-066	0.16566392
501 E BUTTLES ST	48640	1111 MICHIGAN AVE STE 200	EAST LANSING	MI	48823	OS	14-16-50-092	0.16647342
412 CRONKRIGHT ST	48640	1111 MICHIGAN AVE STE 201	EAST LANSING	MI	48823	OS	14-16-50-090	0.16554370
416 CRONKRIGHT ST	48640	416 CRONKRIGHT	MIDLAND	MI	48640	OS	14-16-50-088	0.16567915
1010 E GROVE ST	48640	P O BOX 1647	MIDLAND	MI	48641-1647	RB	14-21-10-410	1.31230565
1015 E GROVE ST	48640	1015 E GROVE ST	MIDLAND	MI	48640-5203	RB	14-21-10-408	0.16629517
915 E INDIAN ST	48640	P O BOX 2455	MIDLAND	MI	48641-2455	OS	14-21-10-536	0.16629517
1011 E GROVE ST	48640	1011 E GROVE ST	MIDLAND	MI	48640-5203	RB	14-21-10-406	0.16600602
909 E INDIAN ST	48640	P O BOX 2455	MIDLAND	MI	48641-2455	OS	14-21-10-534	0.16600602
609 FOURNIE ST	48640	609 FOURNIE ST	MIDLAND	MI	48640	RB	14-21-10-346	0.16643427
602 HALEY ST	48640	602 HALEY ST	MIDLAND	MI	48640	RB	14-21-10-404	0.16528465
916 E GROVE ST	48640	829 PAWTUCKET DR	HOPE	MI	48628-9716	RB	14-21-10-520	0.16628969
613 FOURNIE ST	48640	613 FOURNIE ST	MIDLAND	MI	48640	RB	14-21-10-350	0.16585503
606 HALEY ST	48640	606 HALEY ST	MIDLAND	MI	48640-5310	RB	14-21-10-402	0.16585962
914 E GROVE ST	48640	914 E GROVE ST	MIDLAND	MI	48640	RB	14-21-10-522	0.16600094
901 E INDIAN ST	48640	901 E INDIAN ST	MIDLAND	MI	48640-5233	OS	14-21-10-530	0.33114397
510 MILL ST	48640	3310 JEFFERSON AVE	MIDLAND	MI	48640-3502	RB	14-21-10-528	0.12729187
612 HALEY ST	48640	612 HALEY ST	MIDLAND	MI	48640	RB	14-21-10-400	0.20659728
614 HALEY ST	48640	4878 BAILEY BRIDGE	FREELAND	MI	48623-9801	RB	14-21-10-398	0.12453433
516 MILL ST	48640	516 MILL	MIDLAND	MI	48642	RB	14-21-10-524	0.20383985
915 E GROVE ST	48640	406 IRELAND	AUBURN	MI	48611	RB	14-21-10-554	0.16629517
913 E GROVE ST	48640	913 E GROVE ST	MIDLAND	MI	48640	RB	14-21-10-552	0.16600602
811 E INDIAN ST	48640	3310 JEFFERSON AVE	MIDLAND	MI	48640-3502	OS	14-21-10-604	0.33230088
613 HALEY ST	48640	613 HALEY ST	MIDLAND	MI	48640	RB	14-21-10-538	0.16643427
602 MILL ST	48640	602 MILL ST	MIDLAND	MI	48640-5333	RB	14-21-10-550	0.16528434
816 E GROVE ST	48640	4878 BAILEY BRIDGE	FREELAND	MI	48623-9801	RB	14-21-10-590	0.16628969
615 HALEY ST	48640	2855 N MID-BAY CO LINE	MIDLAND	MI	48642	RB	14-21-10-540	0.16585503
606 MILL ST	48640	606 MILL ST	MIDLAND	MI	48640-5333	RB	14-21-10-548	0.16585993
812 E GROVE ST	48640	812 E GROVE ST	MIDLAND	MI	48640-5227	RB	14-21-10-592	0.16600019
610 MILL ST	48640	3065 ALETHA CT	MIDLAND	MI	48640	RB	14-21-10-546	0.16527855
502 STATE ST	48640	3310 JEFFERSON AVE	MIDLAND	MI	48640-3502	OS	14-21-10-600	0.49642131
906 E PINE ST	48640	72 E YOUNGS CT	MIDLAND	MI	48640	RB	14-21-10-542	0.16585352
808 E GROVE ST	48640	3310 JEFFERSON	MIDLAND	MI	48640	RB	14-21-10-594	0.16585412
1110 E GROVE ST	48640	P O BOX 1647	MIDLAND	MI	48641-1647	RB	14-21-10-344	0.30664443
1110 E PINE ST	48640	P O BOX 1647	MIDLAND	MI	48641-1647	RB	14-21-10-308	1.20047272

Table 8-1
Year 1 Property Information
Implementation Plan for 2012

Property Address[1]	Property Zip	Owner Address	Owner Zip	Owner State	Owner Zip	ZONING	Property ID Number	Property Acreage
North of Facility								
613 E BUTTLES ST	48640	613 E BUTTLES ST	MIDLAND	MI	48640-5215	OS	14-21-80-470	0.16768470
609 E BUTTLES ST	48640	609 E BUTTLES ST	MIDLAND	MI	48640	OS	14-21-80-468	0.16769386
616 E INDIAN ST	48640	1111 MICHIGAN AVE STE 200	EAST LANSING	MI	48823	OS	14-21-80-492	0.20861647
612 E INDIAN ST	48640	1111 MICHIGAN AVE STE 201	EAST LANSING	MI	48823	OS	14-21-80-494	0.16607560
402 GEORGE ST	48640	718 E BUTTLES ST	MIDLAND	MI	48640	OS	14-21-80-499	0.33541056
412 GEORGE ST	48640	117 W REARDON STREET	MIDLAND	MI	48640	OS	14-21-80-498	0.16649730
416 GEORGE ST	48640	1111 MICHIGAN AVE STE 201	EAST LANSING	MI	48823	OS	14-21-80-496	0.16567915
715 E BUTTLES ST	48640	825 E MAIN ST	MIDLAND	MI	48640	OS	14-21-80-480	0.16629638
711 E BUTTLES ST	48640	P O BOX 1010	MIDLAND	MI	48641	OS	14-21-80-478	0.12453265
409 STATE ST	48640	P O BOX 1010	MIDLAND	MI	48641-1010	OS	14-21-80-482	0.08321736
707 E BUTTLES ST	48640	1111 E MICHIGAN AVE STE 201	EAST LANSING	MI	48823	OS	14-21-80-476	0.12436890
411 STATE ST	48640	P O BOX 1647	MIDLAND	MI	48641-1647	OS	14-21-80-484	0.08307177
701 E BUTTLES ST	48640	1111 MICHIGAN AVE STE 201	EAST LANSING	MI	48823	OS	14-21-80-472	0.24732236
712 E INDIAN ST	48640	P O BOX 1010	MIDLAND	MI	48641-1010	OS	14-21-80-486	0.18262313
706 E INDIAN ST	48640	706 E INDIAN ST	MIDLAND	MI	48640	OS	14-21-80-488	0.14908812
702 E INDIAN ST	48640	1111 MICHIGAN AVE STE 200	EAST LANSING	MI	48823	OS	14-21-80-490	0.12409203
East of Facility								
306 KENT CT	48642	306 KENT ST	MIDLAND	MI	48642	RB	14-23-60-154	0.21775498
301 WALTER CT	48642	301 WALTER CT	MIDLAND	MI	48640	RB	14-23-60-088	0.24200219
310 KENT CT	48642	310 KENT CT	MIDLAND	MI	48642	RB	14-23-60-152	0.20934214
307 WALTER CT	48642	307 WALTER CT	MIDLAND	MI	48642	RB	14-23-60-090	0.25817845
309 WALTER CT	48642	309 WALTER CT	MIDLAND	MI	48642	RB	14-23-60-092	0.21984235
306 WALTER CT	48642	4285 TWO MILE ROAD	BAY CITY	MI	48706-2332	RB	14-23-60-080	1.46912935
314 KENT CT	48642	314 KENT CT	MIDLAND	MI	48642-5909	RB	14-23-60-148	0.15080430
311 WALTER CT	48642	1104 W PARK DR	MIDLAND	MI	48640-4251	RB	14-23-60-094	0.21493851
316 WALTER CT	48642	4285 TWO MILE RD	BAY CITY	MI	48706	RB	14-23-60-078	0.47353458
320 WALTER CT	48642	4285 TWO MILE RD	BAY CITY	MI	48706	RB	14-23-60-076	0.34032174
324 WALTER CT	48642	4285 TWO MILE	BAY CITY	MI	48706	RB	14-23-60-074	0.34036939
322 KENT CT	48642	322 KENT CT	MIDLAND	MI	48642	RB	14-23-60-144	0.22899550
328 WALTER CT	48642	328 WALTER ST	MIDLAND	MI	48642-5917	RB	14-23-60-072	0.32339420
328 KENT CT	48642	2810 SWEDE AVE	MIDLAND	MI	48642-4716	RB	14-23-60-142	0.24580309
329 WALTER CT	48642	329 WALTER CT	MIDLAND	MI	48640	RB	14-23-60-102	0.22128358
332 WALTER CT	48642	332 WALTER ST	MIDLAND	MI	48642-5917	RB	14-23-60-070	0.39721059
332 KENT CT	48642	332 KENT CT	MIDLAND	MI	48642	RB	14-23-60-140	0.22007870
401 WALTER CT	48642	401 WALTER ST	MIDLAND	MI	48642-5916	RB	14-23-60-106	0.22008762
400 WALTER CT	48642	400 WALTER	MIDLAND	MI	48640	RB	14-23-60-068	0.63567175
400 KENT CT	48642	P O BOX 1647	MIDLAND	MI	48641-1647	RB	14-23-60-132	0.67557556
408 WALTER CT	48642	408 WALTER CT	MIDLAND	MI	48642	RB	14-23-60-064	0.48253987
410 KENT CT	48642	410 KENT CT	MIDLAND	MI	48642	RB	14-23-60-131	0.18237201
409 WALTER CT	48642	409 WALTER ST	MIDLAND	MI	48642-5916	RB	14-23-60-110	0.19853196
410 WALTER CT	48642	410 WALTER CT	MIDLAND	MI	48642	RB	14-23-60-062	0.49399140
412 KENT CT	48642	1525 S NINE MILE RD	MIDLAND	MI	48640-9148	RB	14-23-60-130	0.27060826
413 WALTER CT	48642	3310 JEFFERSON AVE	MIDLAND	MI	48640-3502	RB	14-23-60-112	0.29507442
416 KENT CT	48642	416 KENT	MIDLAND	MI	48640	RB	14-23-60-128	0.42686996
424 KENT CT	48642	424 KENT CT	MIDLAND	MI	48642	RB	14-23-60-124	0.22662708
2201 MARK PUTNAM RD	48642	P O BOX 1647	MIDLAND	MI	48641-1647	IA	14-23-50-060	2.07206636
425 WALTER CT	48642	3310 JEFFERSON AVE	MIDLAND	MI	48640-3502	RB	14-23-60-120	0.48391618
420 KENT CT	48642	420 KENT CT	MIDLAND	MI	48642	RB	14-23-60-126	0.27800628
2208 BAY CITY RD	48642	2727 W. N. UNION	MIDLAND	MI	48642	RB	14-23-60-122	0.23895908

Table 8-1
Year 1 Property Information
Implementation Plan for 2012

Property Address[1]	Property Zip	Owner Address	Owner Zip	Owner State	Owner Zip	ZONING	Property ID Number	Property Acreage
North of Facility								
319 WALTER CT	48642	319 WALTER	MIDLAND	MI	48640	RB	14-23-60-098	0.17675209
318 KENT CT	48642	318 KENT CT	MIDLAND	MI	48642	RB	14-23-60-146	0.21563785
325 WALTER CT	48642	325 WALTER ST	MIDLAND	MI	48642-5916	RB	14-23-60-100	0.22112573
312 KENT CT	48642	312 KENT CT	MIDLAND	MI	48640	RB	14-23-60-150	0.22631085
301 KENT CT	48642	301 KENT CT	MIDLAND	MI	48640	RB	14-23-60-156	0.37979005
309 KENT CT	48642	202 SEMINOLE CT	MIDLAND	MI	48642-3560	MULT	14-23-60-160	1.58009593
315 KENT CT	48642	315 KENT CT	MIDLAND	MI	48642	MULT	14-23-60-164	0.15546996
315 KENT CT	48642	315 KENT CT	MIDLAND	MI	48642	MULT	14-23-60-164	0.97523373
319 KENT CT	48642	3439 HIGHLAND DR	BAY CITY	MI	48706-2414	MULT	14-23-60-168	0.48764888
323 KENT CT	48642	5101 OAKRIDGE DR	MIDLAND	MI	48640	MULT	14-23-60-170	0.48765170
327 KENT CT	48642	327 KENT CT	MIDLAND	MI	48640	MULT	14-23-60-172	0.97033524
331 KENT CT	48642	331 KENT CT	MIDLAND	MI	48640	MULT	14-23-60-176	0.96961809
409 KENT CT	48642	409 KENT CT	MIDLAND	MI	48640	RB	14-23-60-184	0.42574975
415 KENT CT	48642	415 KENT CT	MIDLAND	MI	48640	RB	14-23-60-190	0.26772867
419 KENT CT	48642	419 KENT CT	MIDLAND	MI	48640	RB	14-23-60-196	0.26461667
2127 MARK PUTNAM RD	48642	P O BOX 1647	MIDLAND	MI	48641-1647	IA	14-23-50-070	0.95232106

[1] All Properties are within the City of Midland, MI

Table 8-2
Year 1 Property Information
Implementation Plan for 2012

Property Address[1]	Property Zip	Property ID Number	Total Property Acreage	Available Acreage for Sampling (Total acreage - Permanent Structures)	# of Increments	Does Property Contain Woodland Areas of >7,200 sq ft in size (Y/N)	Land Use (Residential / Non-residential)
North of Facility							
501 STATE ST	48640	14-21-10-622	0.98901508	0.566556	20	N	Residential
704 E GROVE ST	48640	14-21-10-630	0.16537673	0.130034	10	N	Residential
615 E INDIAN ST	48640	14-16-50-064	0.17946900	0.140559	10	N	Residential
611 E INDIAN ST	48640	14-16-50-063	0.24226700	0.214774	10	N	Residential
502 GEORGE ST	48640	14-16-50-062	0.16690400	0.106663	10	N	Residential
508 GEORGE ST	48640	14-16-50-060	0.16234300	0.128113	10	N	Residential
612 E GROVE ST	48640	14-16-40-410	0.16528703	0.118291	10	N	Residential
512 GEORGE ST	48640	14-16-50-058	0.15422875	0.107175	10	N	Residential
516 GEORGE ST	48640	14-16-50-056	0.15447731	0.114754	10	N	Residential
616 E GROVE ST	48640	14-16-40-406	0.27343940	0.213142	10	N	Residential
515 E BUTTLES ST	48640	14-16-50-096	0.16497238	0.1243	10	N	Residential
509 E BUTTLES ST	48640	14-16-50-095	0.16705044	0.16705044	10	N	Residential
411 GEORGE ST	48640	14-16-50-065	0.16697036	0.16697036	10	N	Residential
505 E BUTTLES ST	48640	14-16-50-094	0.16747404	0.16747404	10	N	Residential
415 GEORGE ST	48640	14-16-50-066	0.16566392	0.098344	10	N	Residential
501 E BUTTLES ST	48640	14-16-50-092	0.16647342	0.16647342	10	N	Residential
412 CRONKRIGHT ST	48640	14-16-50-090	0.16554370	0.16554370	10	N	Residential
416 CRONKRIGHT ST	48640	14-16-50-088	0.16567915	0.132966	10	N	Residential
1010 E GROVE ST	48640	14-21-10-410	1.31230565	1.31230565	30+ or Divide	N	Residential
1015 E GROVE ST	48640	14-21-10-408	0.16629517	0.109175	10	N	Residential
915 E INDIAN ST	48640	14-21-10-536	0.16629517	0.134492	10	N	Residential
1011 E GROVE ST	48640	14-21-10-406	0.16600602	0.131489	10	N	Residential
909 E INDIAN ST	48640	14-21-10-534	0.16600602	0.139956	10	N	Residential
609 FOURNIE ST	48640	14-21-10-346	0.16643427	0.137542	10	N	Residential
602 HALEY ST	48640	14-21-10-404	0.16528465	0.131391	10	N	Residential
916 E GROVE ST	48640	14-21-10-520	0.16628969	0.126479	10	N	Residential
613 FOURNIE ST	48640	14-21-10-350	0.16585503	0.134705	10	N	Residential
606 HALEY ST	48640	14-21-10-402	0.16585962	0.142187	10	N	Residential
914 E GROVE ST	48640	14-21-10-522	0.16600094	0.132333	10	N	Residential
901 E INDIAN ST	48640	14-21-10-530	0.33114397	0.091629	0	N	Non-Residential
510 MILL ST	48640	14-21-10-528	0.12729187	0.090434	10	N	Residential

Table 8-2
Year 1 Property Information
Implementation Plan for 2012

Property Address[1]	Property Zip	Property ID Number	Total Property Acreage	Available Acreage for Sampling (Total acreage - Permanent Structures)	# of Increments	Does Property Contain Woodland Areas of >7,200 sq ft in size (Y/N)	Land Use (Residential / Non-residential)
612 HALEY ST	48640	14-21-10-400	0.20659728	0.163746	10	N	Residential
614 HALEY ST	48640	14-21-10-398	0.12453433	0.078837	0	N	Non-Residential
516 MILL ST	48640	14-21-10-524	0.20383985	0.17637	10	N	Residential
915 E GROVE ST	48640	14-21-10-554	0.16629517	0.13073	10	N	Residential
913 E GROVE ST	48640	14-21-10-552	0.16600602	0.108048	10	N	Residential
811 E INDIAN ST	48640	14-21-10-604	0.33230088	0.272936	20	N	Residential
613 HALEY ST	48640	14-21-10-538	0.16643427	0.122409	10	N	Residential
602 MILL ST	48640	14-21-10-550	0.16528434	0.103426	10	N	Residential
816 E GROVE ST	48640	14-21-10-590	0.16628969	0.148412	10	N	Residential
615 HALEY ST	48640	14-21-10-540	0.16585503	0.140417	10	N	Residential
606 MILL ST	48640	14-21-10-548	0.16585993	0.118682	10	N	Residential
812 E GROVE ST	48640	14-21-10-592	0.16600019	0.131359	10	N	Residential
610 MILL ST	48640	14-21-10-546	0.16527855	0.147001	10	N	Residential
502 STATE ST	48640	14-21-10-600	0.49642131	0.382029	20	N	Residential
906 E PINE ST	48640	14-21-10-542	0.16585352	0.107773	10	N	Residential
808 E GROVE ST	48640	14-21-10-594	0.16585412	0.131669	10	N	Residential
1110 E GROVE ST	48640	14-21-10-344	0.30664443	0.30664443	20	N	Residential
1110 E PINE ST	48640	14-21-10-308	1.20047272	1.20047272	30+ or Divide	N	Residential
613 E BUTTLES ST	48640	14-21-80-470	0.16768470	0.136036	10	N	Residential
609 E BUTTLES ST	48640	14-21-80-468	0.16769386	0.134515	10	N	Residential
616 E INDIAN ST	48640	14-21-80-492	0.20861647	0.20861647	10	N	Residential
612 E INDIAN ST	48640	14-21-80-494	0.16607560	0.16607560	10	N	Residential
402 GEORGE ST	48640	14-21-80-499	0.33541056	0	0	N	Non-Residential
412 GEORGE ST	48640	14-21-80-498	0.16649730	0.143428	10	N	Residential
416 GEORGE ST	48640	14-21-80-496	0.16567915	0.16567915	10	N	Residential
715 E BUTTLES ST	48640	14-21-80-480	0.16629638	0.16629638	10	N	Residential
711 E BUTTLES ST	48640	14-21-80-478	0.12453265	0.100969	10	N	Residential
409 STATE ST	48640	14-21-80-482	0.08321736	0.059792	10	N	Residential
707 E BUTTLES ST	48640	14-21-80-476	0.12436890	0.12436890	10	N	Residential
411 STATE ST	48640	14-21-80-484	0.08307177	0.08307177	10	N	Residential
701 E BUTTLES ST	48640	14-21-80-472	0.24732236	0.24732236	10	N	Residential
712 E INDIAN ST	48640	14-21-80-486	0.18262313	0.154943	10	N	Residential

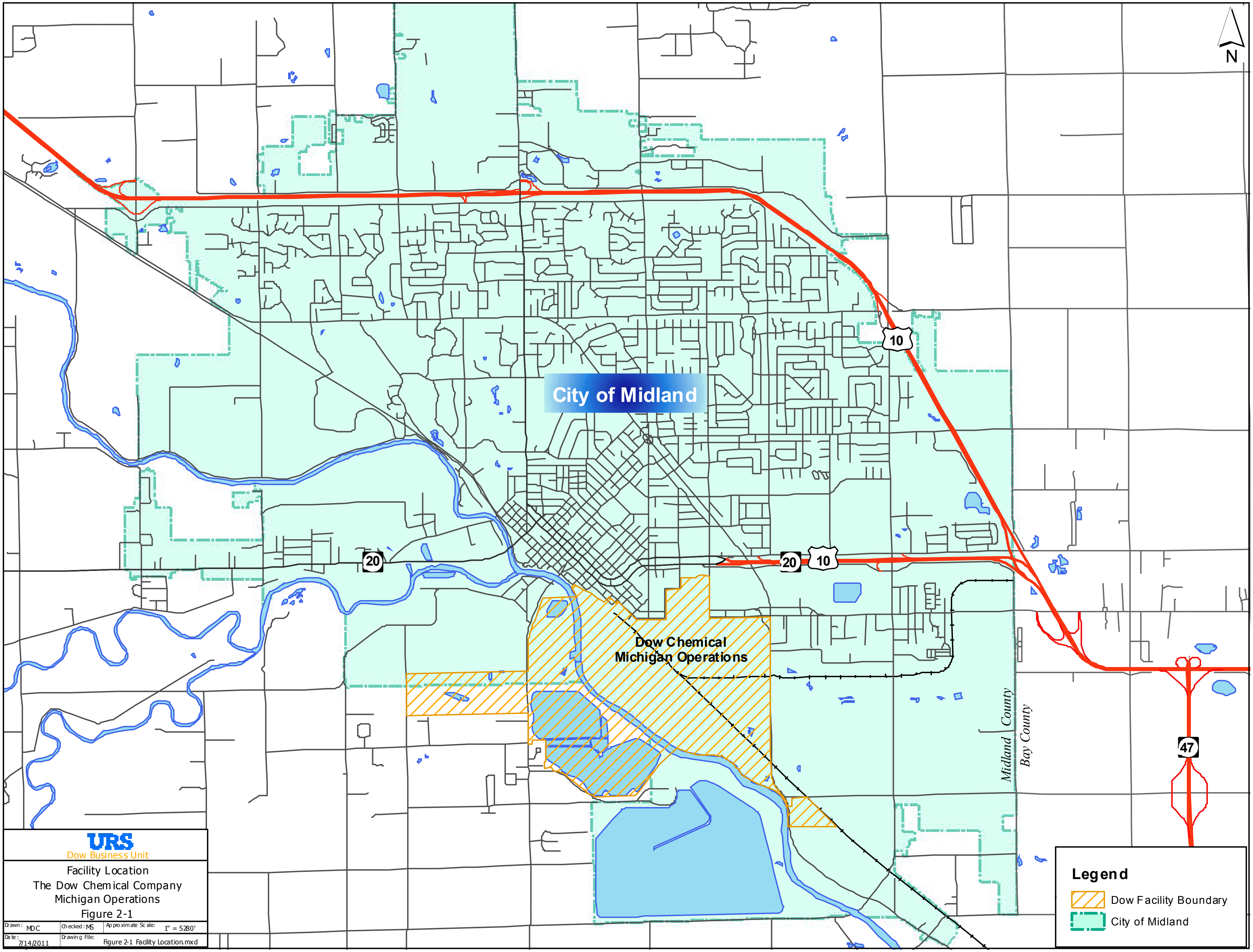
Table 8-2
Year 1 Property Information
Implementation Plan for 2012

Property Address[1]	Property Zip	Property ID Number	Total Property Acreage	Available Acreage for Sampling (Total acreage - Permanent Structures)	# of Increments	Does Property Contain Woodland Areas of >7,200 sq ft in size (Y/N)	Land Use (Residential / Non-residential)
706 E INDIAN ST	48640	14-21-80-488	0.14908812	0.112363	10	N	Residential
702 E INDIAN ST	48640	14-21-80-490	0.12409203	0.12409203	10	N	Residential
East of Facility							
306 KENT CT	48642	14-23-60-154	0.21775498	0.187263	10	N	Residential
301 WALTER CT	48642	14-23-60-088	0.24200219	0.195877	10	N	Residential
310 KENT CT	48642	14-23-60-152	0.20934214	0.166711	10	N	Residential
307 WALTER CT	48642	14-23-60-090	0.25817845	0.209166	10	N	Residential
309 WALTER CT	48642	14-23-60-092	0.21984235	0.179094	10	N	Residential
306 WALTER CT	48642	14-23-60-080	1.46912935	0.996877	20	N	Residential
314 KENT CT	48642	14-23-60-148	0.15080430	0.107066	10	N	Residential
311 WALTER CT	48642	14-23-60-094	0.21493851	0.178137	10	N	Residential
316 WALTER CT	48642	14-23-60-078	0.47353458	0.439364	20	N	Residential
320 WALTER CT	48642	14-23-60-076	0.34032174	0.311071	20	N	Residential
324 WALTER CT	48642	14-23-60-074	0.34036939	0.307745	20	N	Residential
322 KENT CT	48642	14-23-60-144	0.22899550	0.190652	10	N	Residential
328 WALTER CT	48642	14-23-60-072	0.32339420	0.263022	20	N	Residential
328 KENT CT	48642	14-23-60-142	0.24580309	0.24580309	10	N	Residential
329 WALTER CT	48642	14-23-60-102	0.22128358	0.197536	10	N	Residential
332 WALTER CT	48642	14-23-60-070	0.39721059	0.356687	20	N	Residential
332 KENT CT	48642	14-23-60-140	0.22007870	0.177137	10	N	Residential
401 WALTER CT	48642	14-23-60-106	0.22008762	0.166554	10	N	Residential
400 WALTER CT	48642	14-23-60-068	0.63567175	0.596985	20	N	Residential
400 KENT CT	48642	14-23-60-132	0.67557556	0.63986456	20	N	Residential
408 WALTER CT	48642	14-23-60-064	0.48253987	0.432122	20	N	Residential
410 KENT CT	48642	14-23-60-131	0.18237201	0.101571	10	N	Residential
409 WALTER CT	48642	14-23-60-110	0.19853196	0.15915	10	N	Residential
410 WALTER CT	48642	14-23-60-062	0.49399140	0.447218	20	N	Residential
412 KENT CT	48642	14-23-60-130	0.27060826	0.233946	10	N	Residential
413 WALTER CT	48642	14-23-60-112	0.29507442	0.261346	20	N	Residential
416 KENT CT	48642	14-23-60-128	0.42686996	0.37274	20	N	Residential
424 KENT CT	48642	14-23-60-124	0.22662708	0.204476	10	N	Residential
2201 MARK PUTNAM RD	48642	14-23-50-060	2.07206636	1.85033536	0	N	Non-Residential

Table 8-2
Year 1 Property Information
Implementation Plan for 2012

Property Address[1]	Property Zip	Property ID Number	Total Property Acreage	Available Acreage for Sampling (Total acreage - Permanent Structures)	# of Increments	Does Property Contain Woodland Areas of >7,200 sq ft in size (Y/N)	Land Use (Residential / Non-residential)
425 WALTER CT	48642	14-23-60-120	0.48391618	0.48391618	20	N	Residential
420 KENT CT	48642	14-23-60-126	0.27800628	0.245668	10	N	Residential
2208 BAY CITY RD	48642	14-23-60-122	0.23895908	0.199316	10	N	Residential
319 WALTER CT	48642	14-23-60-098	0.17675209	0.149673	10	N	Residential
318 KENT CT	48642	14-23-60-146	0.21563785	0.21473085	10	N	Residential
325 WALTER CT	48642	14-23-60-100	0.22112573	0.170721	10	N	Residential
312 KENT CT	48642	14-23-60-150	0.22631085	0.190768	10	N	Residential
301 KENT CT	48642	14-23-60-156	0.37979005	0.32929705	20	N	Residential
309 KENT CT	48642	14-23-60-160	1.46912935	1.46912935	0	N	Non-Residential
315 KENT CT	48642	14-23-60-164 (ne	0.15546996	0.15546996	10	Y	Residential
315 KENT CT	48642	14-23-60-164	0.97523373	0.91544973	20	Y	Residential
319 KENT CT	48642	14-23-60-168	0.48764888	0.41908588	20	Y	Residential
323 KENT CT	48642	14-23-60-170	0.48765170	0.4561707	20	Y	Residential
327 KENT CT	48642	14-23-60-172	0.97033525	0.95121325	20	Y	Residential
331 KENT CT	48642	14-23-60-176	0.96961810	0.9433811	20	Y	Residential
409 KENT CT	48642	14-23-60-184	0.42574975	0.37153475	20	N	Residential
415 KENT CT	48642	14-23-60-190	0.26772867	0.17317567	10	N	Residential
419 KENT CT	48642	14-23-60-196	0.26461667	0.21962467	10	N	Residential
2127 MARK PUTNAM RD	48642	14-23-50-070	0.95232106	0.95232106	0	N	Non-Residential

Notes:
> 0.25 acres = 10 increments
<0.25 but >1 acre = 20 increments
> 1 acre = 30 + increments or divide
[1] All Properties are within the City of Midland, MI


N
City of Midland
10
20
20
10
47
Dow Chemical
Michigan Operations
Midland County
Bay County
Legend
Dow Facility Boundary
City of Midland
URS
Dow Business Unit
Facility Location
The Dow Chemical Company
Michigan Operations
Figure 2-1
Drawn: MDC
Checked: MS
Approximate Scale: 1" = 5280'
Date: 7/14/2011
Drawing File: Figure 2-1 Facility Location.mxd

Wind Rose for Meteorological Station No. 72639 (Dow Midland Plant)
Composite for 1987-1991

Source: Incinerator Upgrade Human Health Risk Assessment,
The Dow Chemical Company,
July 2001
Wind Rose originates from monitoring
station on Midland Plant.

Note: Wind rose indicates direction from which wind originates.

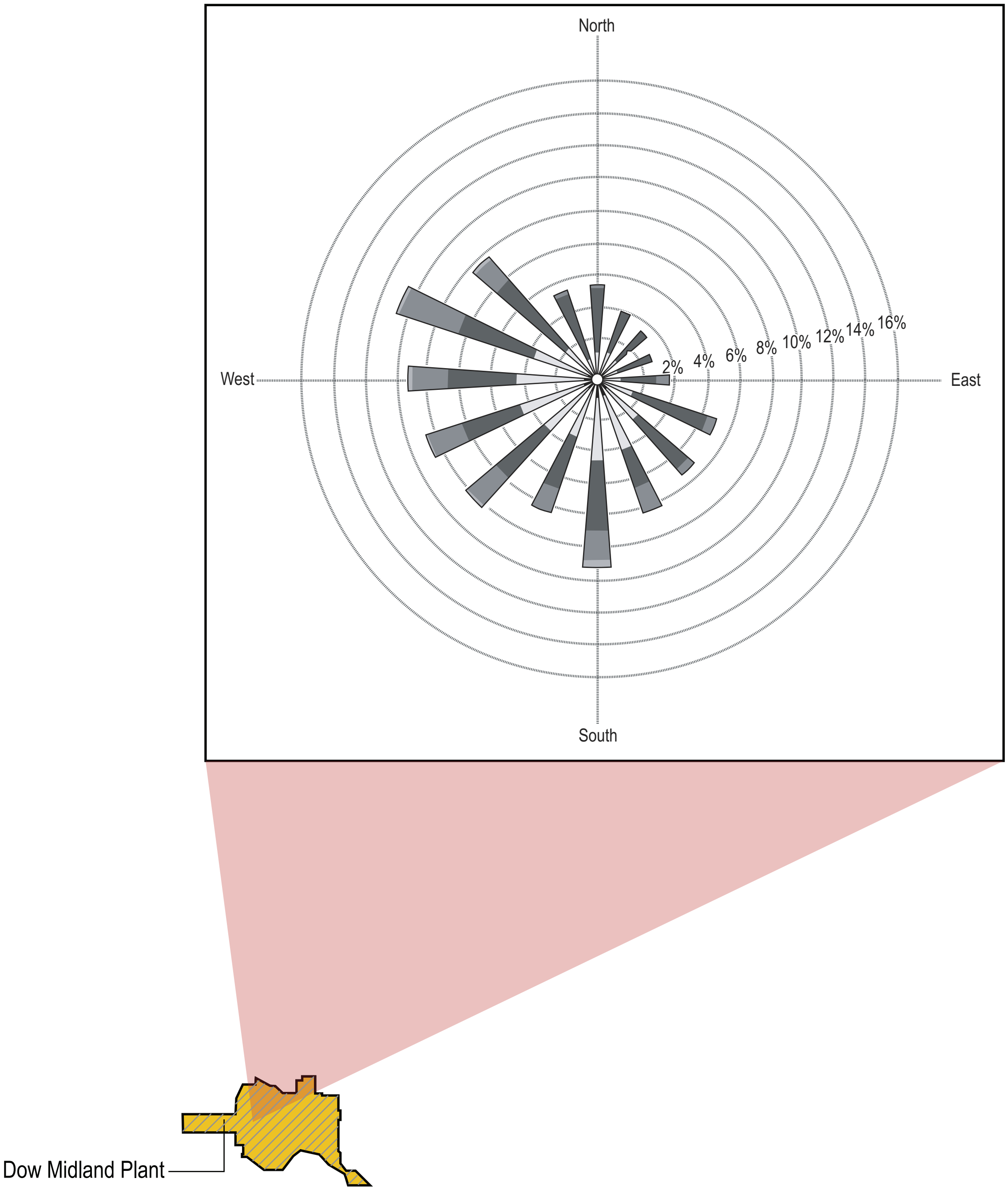


Figure 4-1
Wind Rose Diagram
Midland Area Soils Remedial Investigation Work Plan

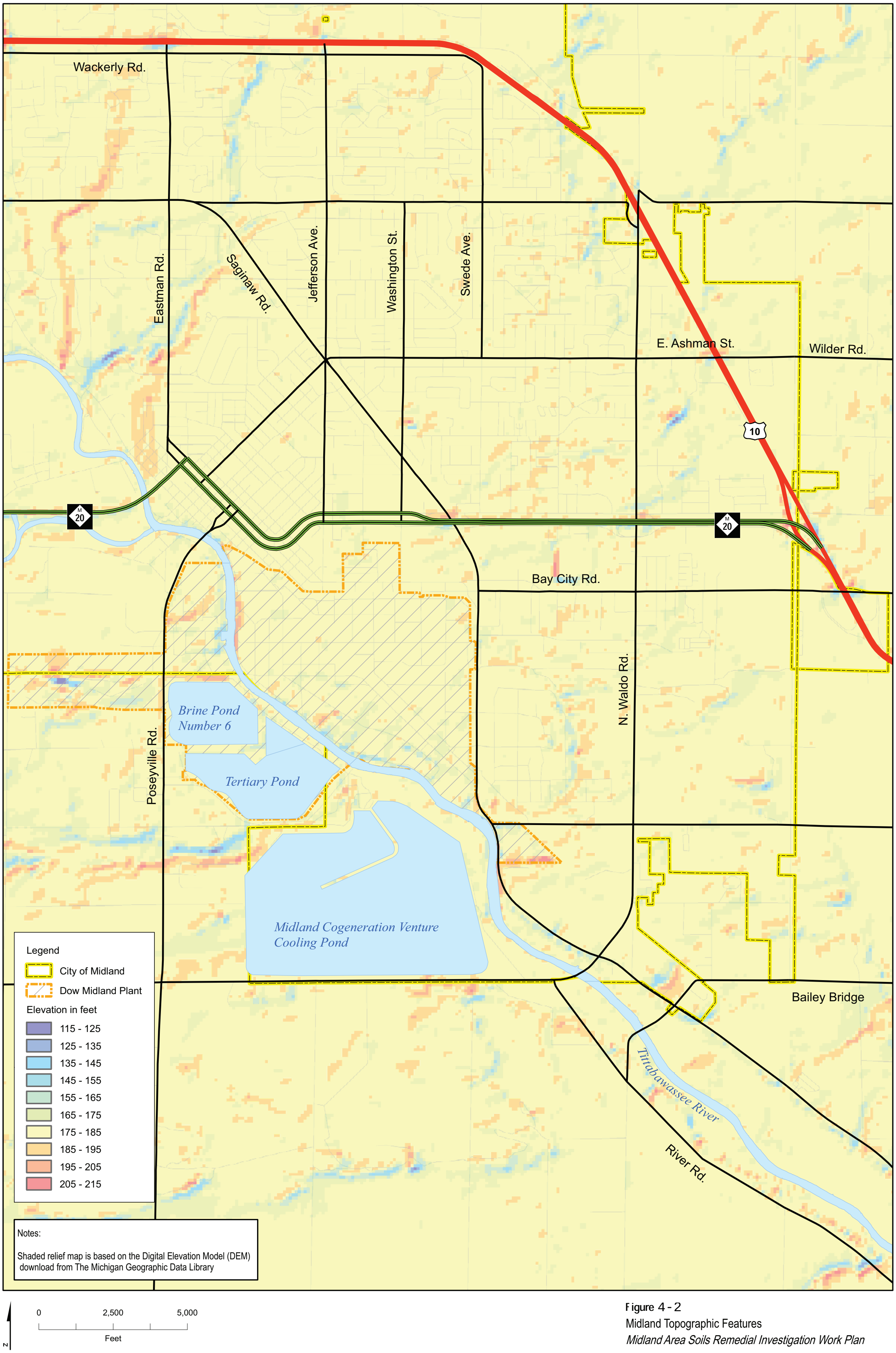
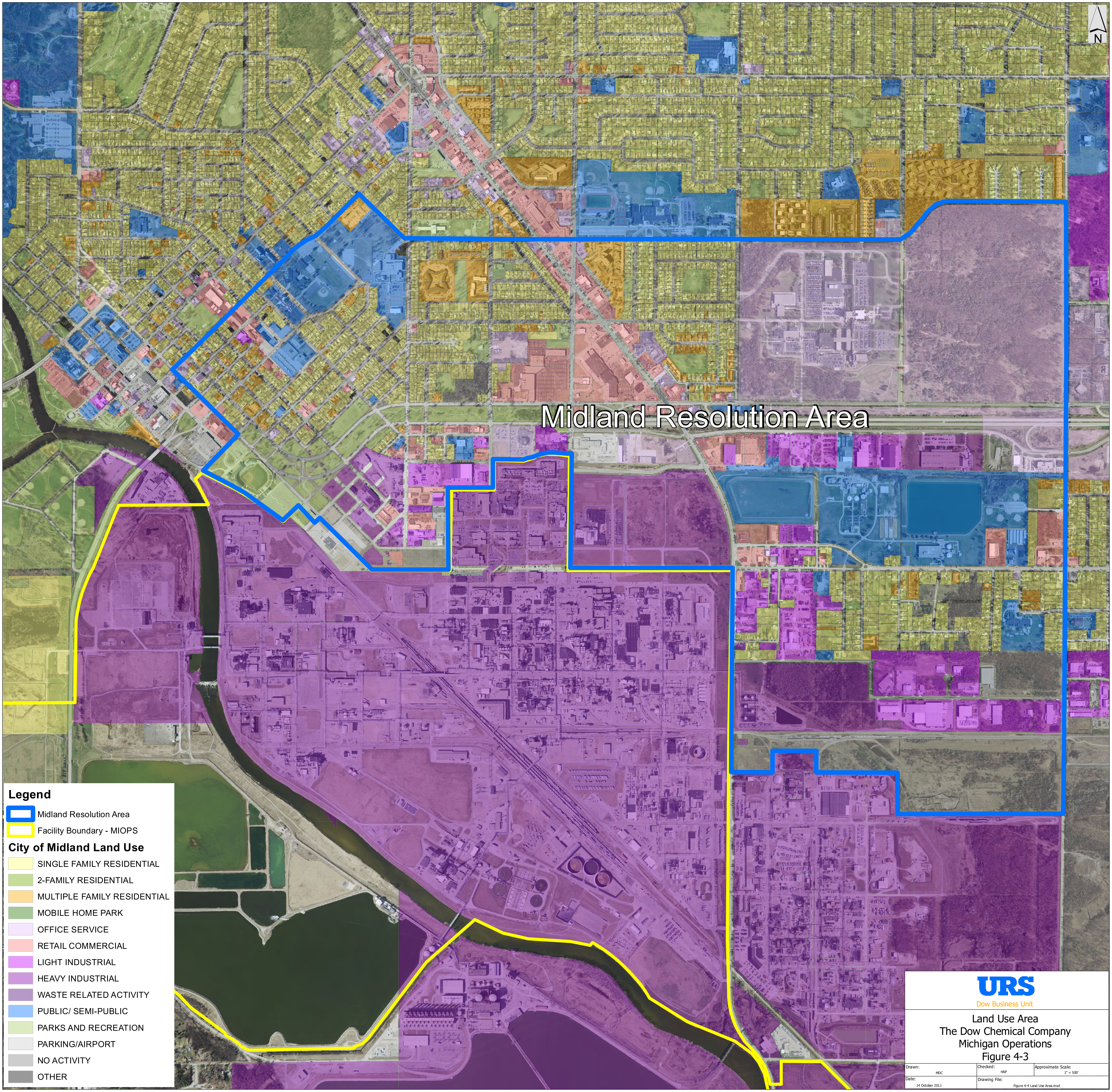
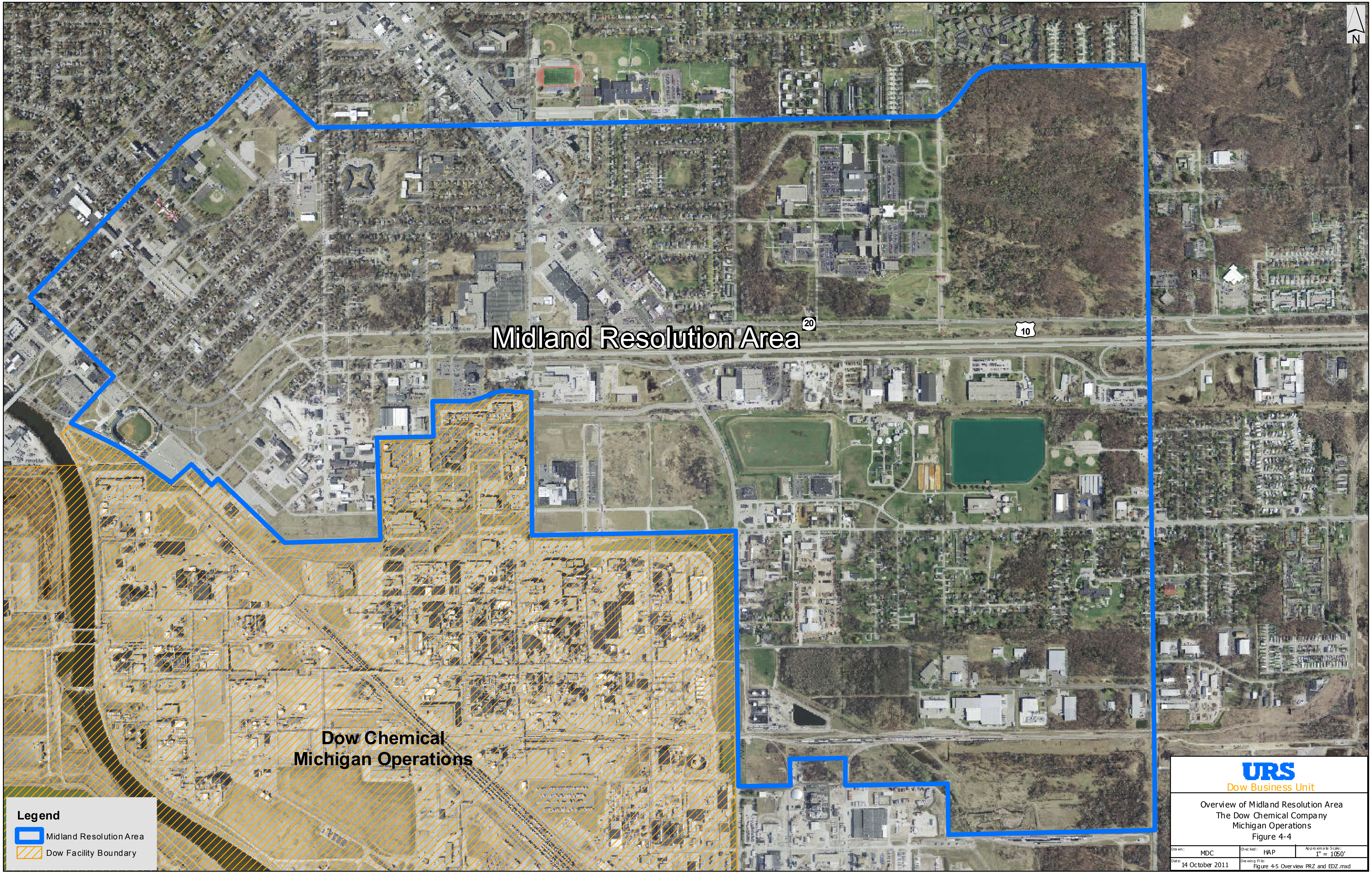
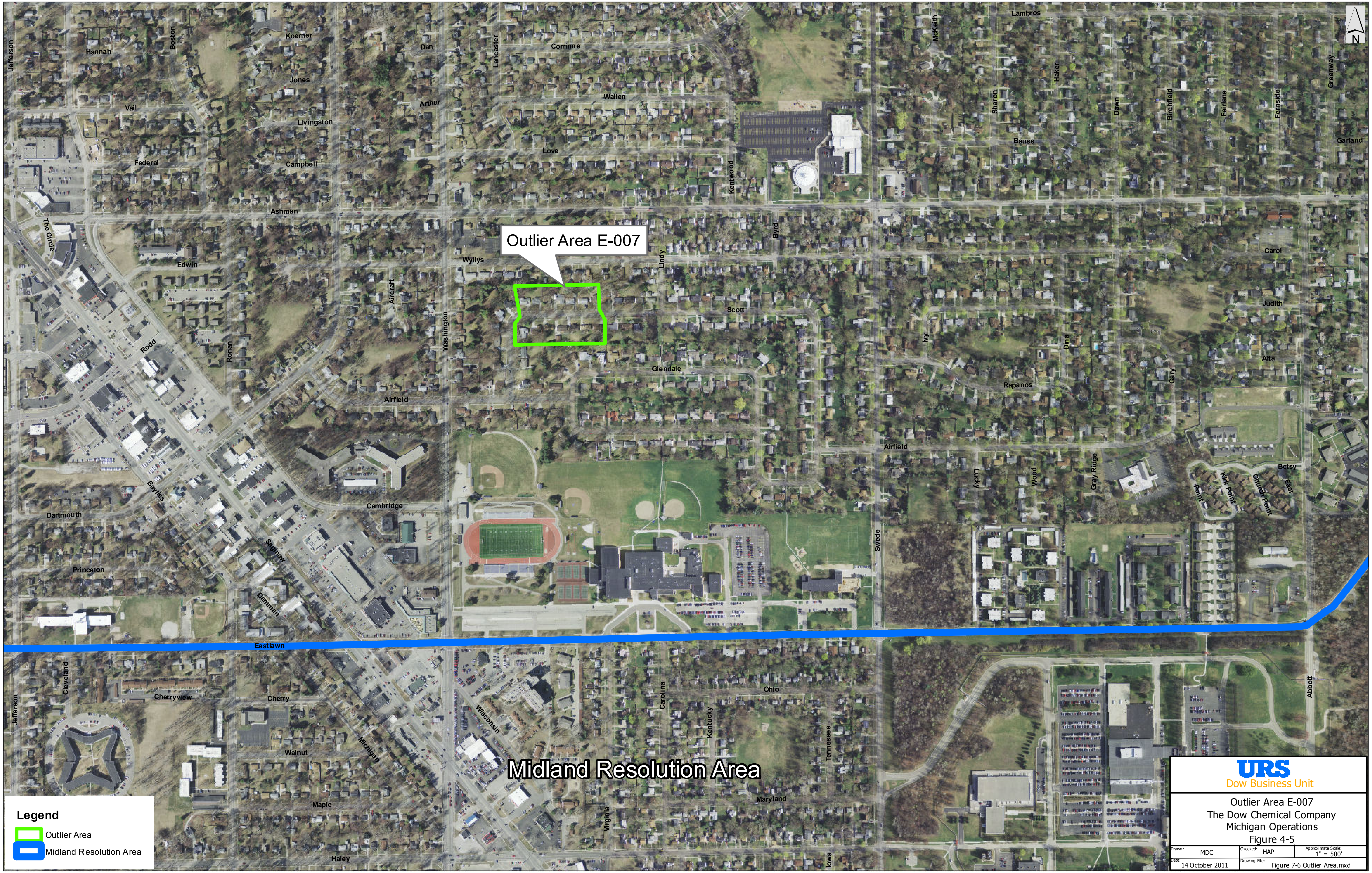
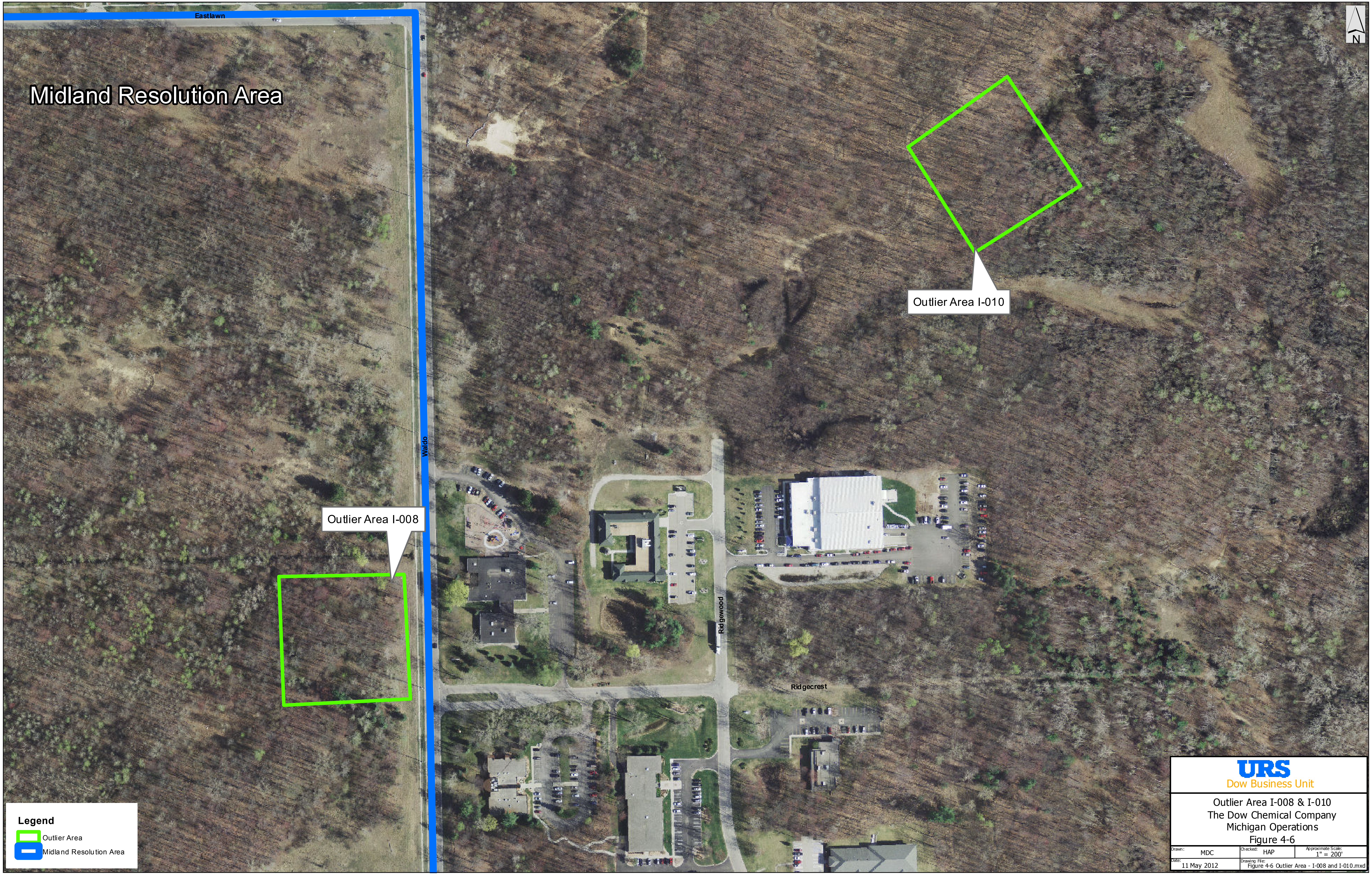


Figure 4 - 2
Midland Topographic Features
Midland Area Soils Remedial Investigation Work Plan


N
Midland Resolution Area
Legend
Midland Resolution Area
Facility Boundary - MIOPS
City of Midland Land Use
SINGLE FAMILY RESIDENTIAL
2-FAMILY RESIDENTIAL
MULTIPLE FAMILY RESIDENTIAL
MOBILE HOME PARK
OFFICE SERVICE
RETAIL COMMERCIAL
LIGHT INDUSTRIAL
HEAVY INDUSTRIAL
WASTE RELATED ACTIVITY
PUBLIC/ SEMI-PUBLIC
PARKS AND RECREATION
PARKING/AIRPORT
NO ACTIVITY
OTHER
URS
Dow Business Unit
Land Use Area
The Dow Chemical Company
Michigan Operations
Figure 4-3
Drawn: MDC
Checked: HAP
Approximate Scale: 1" = 500'
Date: 14 October 2011
Drawing File: Figure 4-4 Land Use Area.mxd

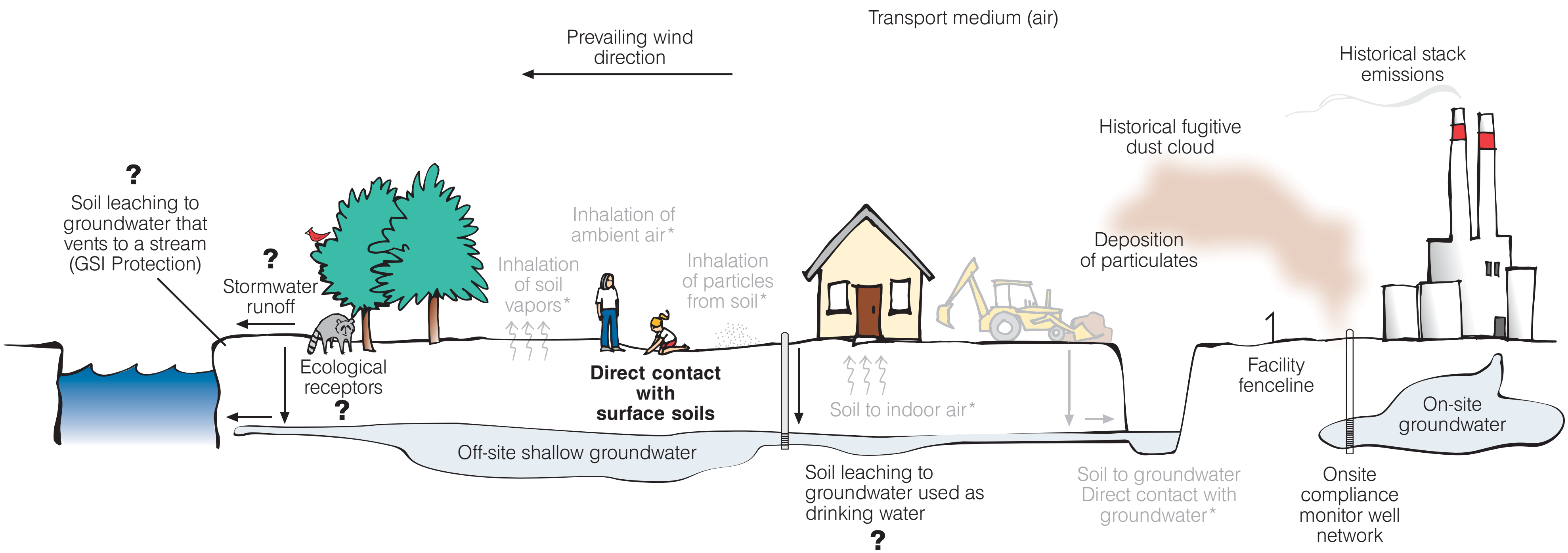

N
Midland Resolution Area
20
10
Dow Chemical
Michigan Operations
Legend
Midland Resolution Area
Dow Facility Boundary
URS
Dow Business Unit
Overview of Midland Resolution Area
The Dow Chemical Company
Michigan Operations
Figure 4-4
Drawn: MDC
Checked: HAP
Approximate Scale: 1" = 1050'
Date: 14 October 2011
Drawing File: Figure 4-5 Overview PRZ and EDZ.mxd


Outlier Area E-007
Midland Resolution Area
N
Legend
Outlier Area
Midland Resolution Area
URS
Dow Business Unit
Outlier Area E-007
The Dow Chemical Company
Michigan Operations
Figure 4-5
Drawn: MDC
Checked: HAP
Approximate Scale: 1" = 500'
Date: 14 October 2011
Drawing File: Figure 7-6 Outlier Area.mxd
Eastlawn
Ashman
Airfield
Washington
Swede
Scott
Glendale
Wyllys
Cambridge
Saginaw
Lambros
Abbott
Rapanos
Jefferson

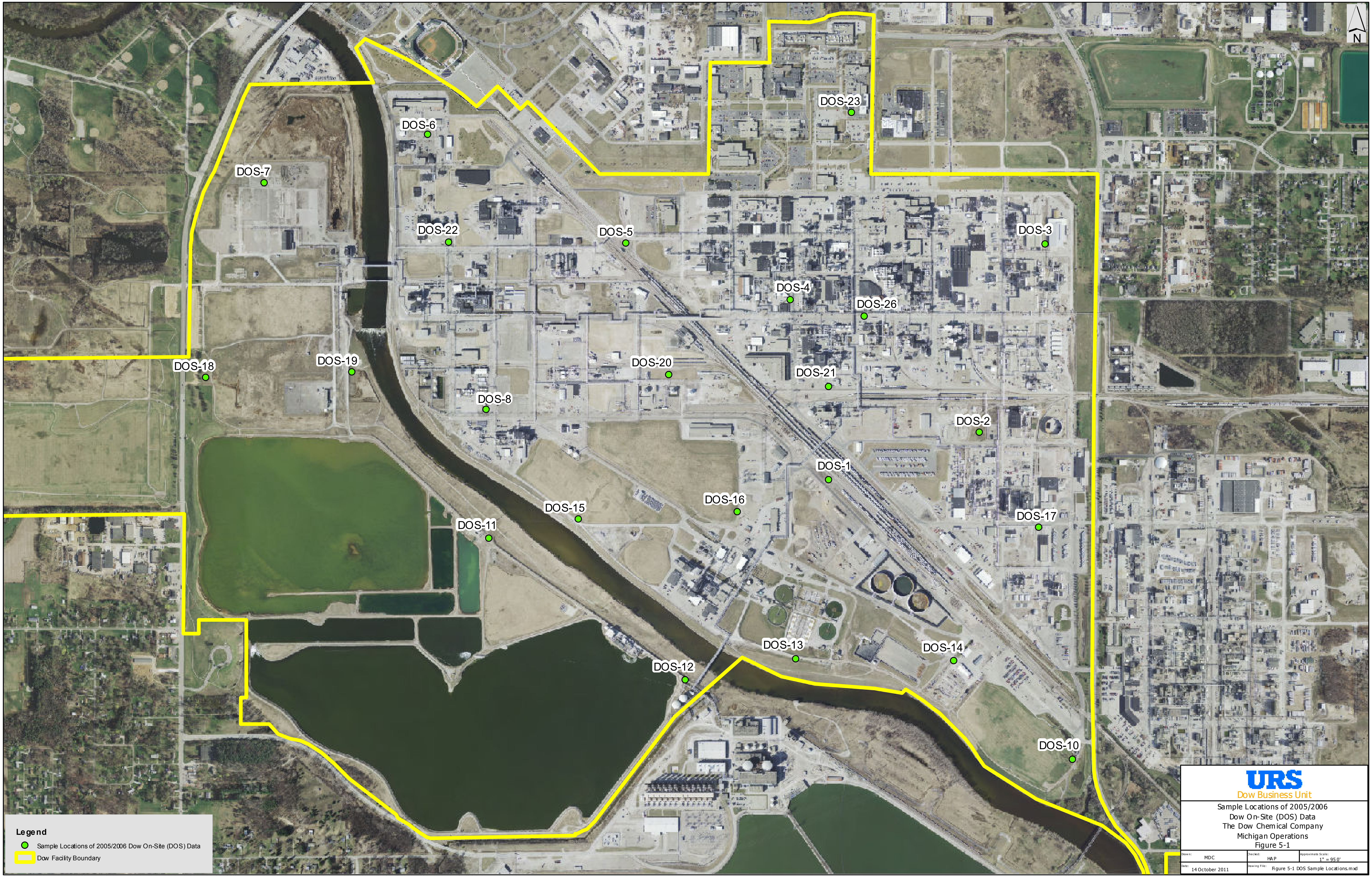


Midland Resolution Area
Eastlawn
Waldo
Ridgewood
Ridgecrest
Outlier Area I-010
Outlier Area I-008
N
Legend
Outlier Area
Midland Resolution Area
URS
Dow Business Unit
Outlier Area I-008 & I-010
The Dow Chemical Company
Michigan Operations
Figure 4-6
Drawn: MDC
Checked: HAP
Approximate Scale: 1" = 200'
Date: 11 May 2012
Drawing File: Figure 4-6 Outlier Area - I-008 and I-010.mxd

Figure 4-7



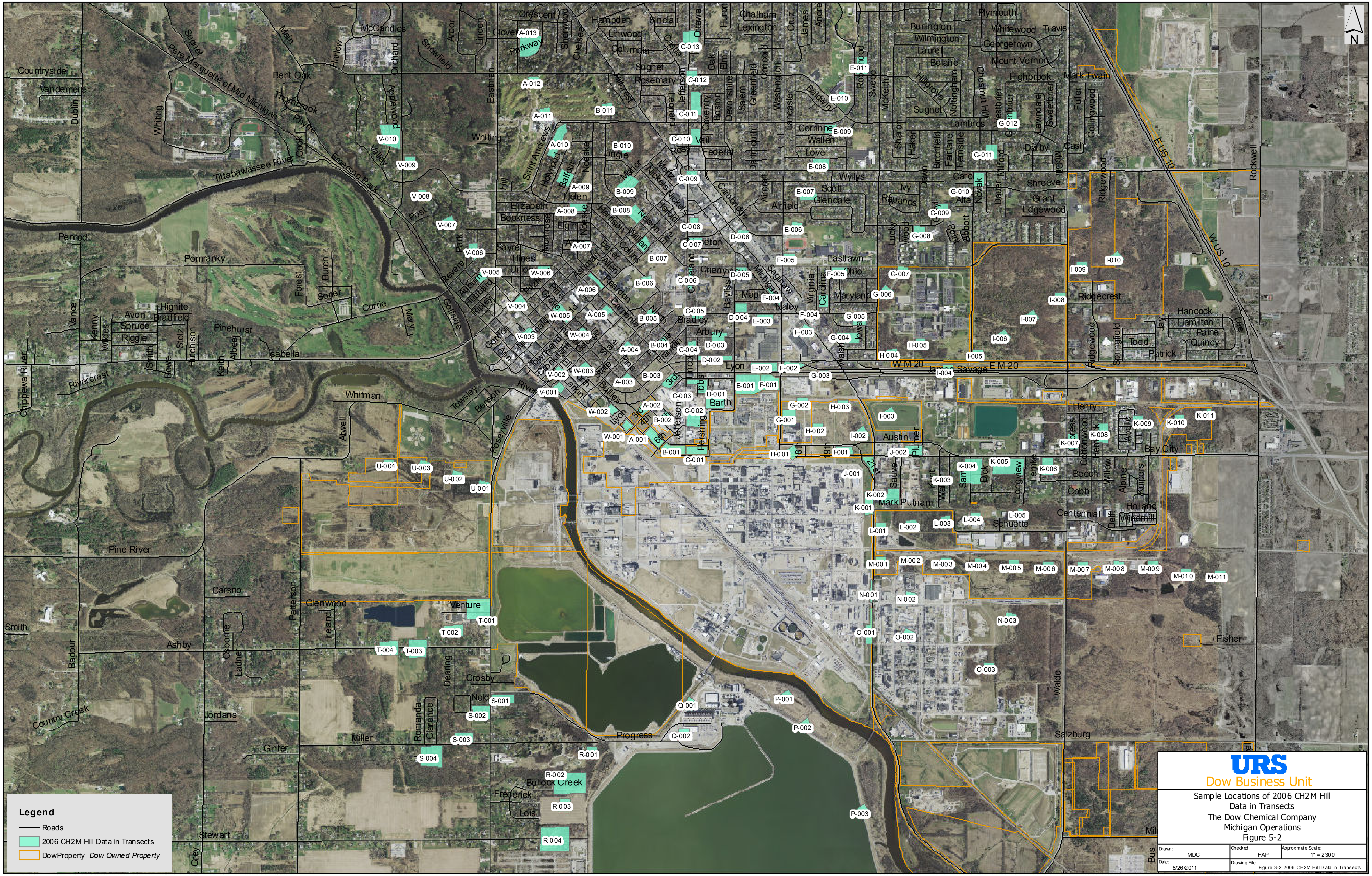
* The analytical results were compared to the screening criterion for this pathway. There were no analytes detected above the criterion and therefore, exposure via this pathway is not a risk to human health or the environment.



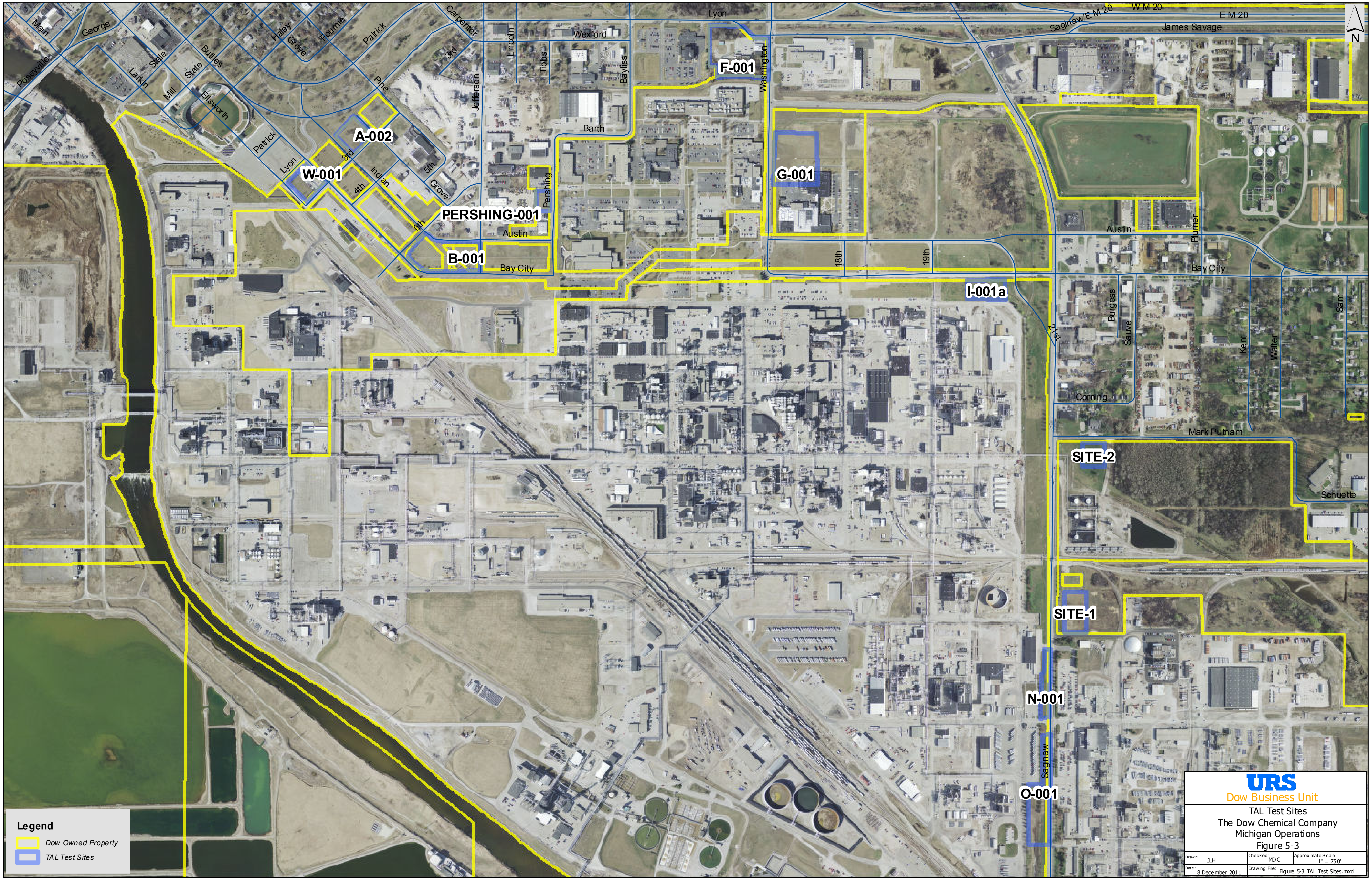
URS
Dow Business Unit

Sample Locations of 2005/2006
Dow On-Site (DOS) Data
The Dow Chemical Company
Michigan Operations
Figure 5-1

Drawn: MDC	Checked: HAP	Approximate Scale: 1" = 950'
Date: 14 October 2011	Drawing File: Figure 5-1 DOS Sample Locations.mxd	



N
Legend
Roads
2006 CH2M Hill Data in Transects
DowProperty Dow Owned Property
URS
Dow Business Unit
Sample Locations of 2006 CH2M Hill
Data in Transects
The Dow Chemical Company
Michigan Operations
Figure 5-2
Drawn: MDC
Checked: HAP
Approximate Scale: 1" = 2300'
Date: 8/26/2011
Drawing File: Figure 5-2 2006 CH2M Hill Data in Transects

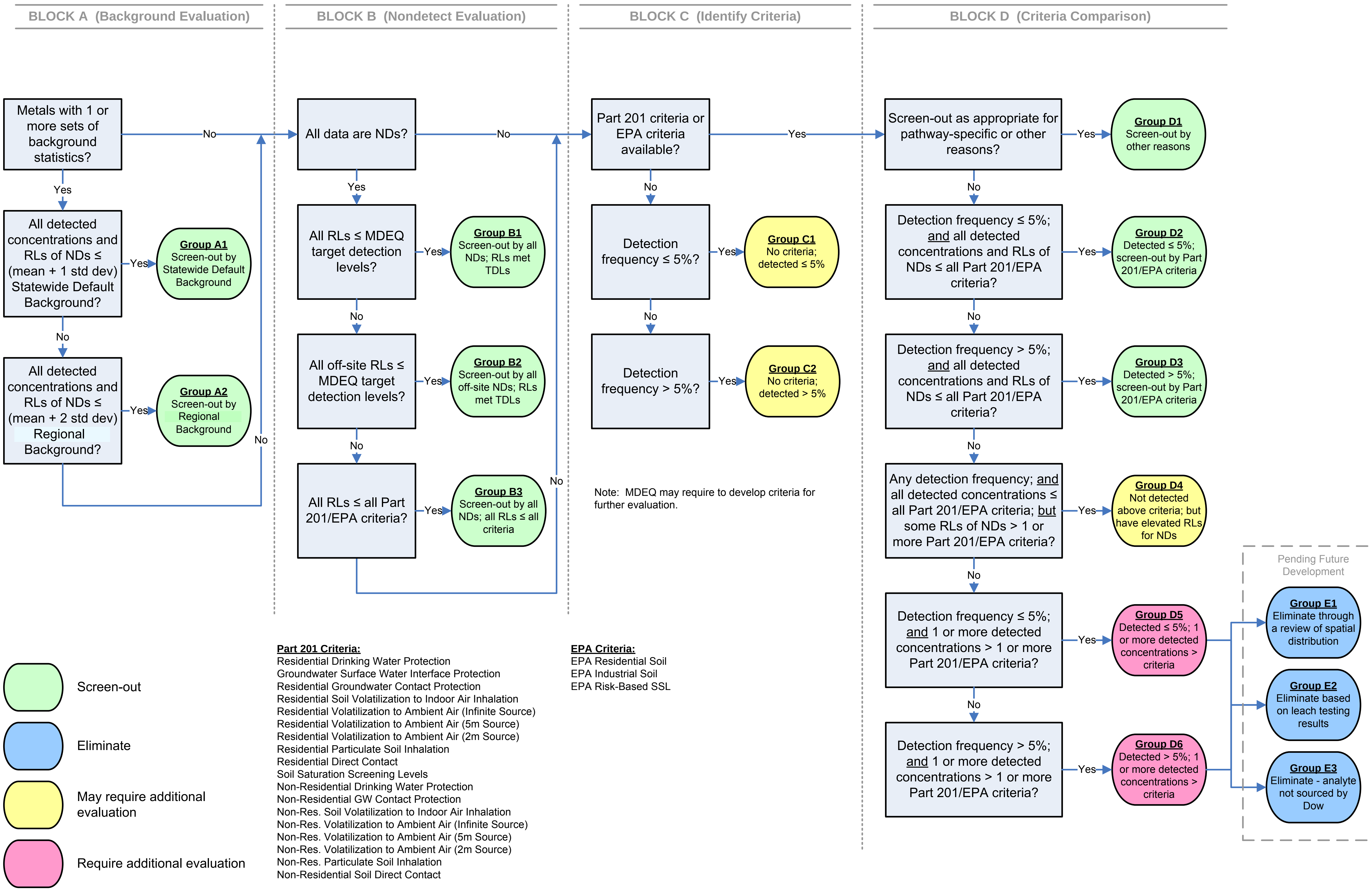


URS
Dow Business Unit

TAL Test Sites
The Dow Chemical Company
Michigan Operations
Figure 5-3

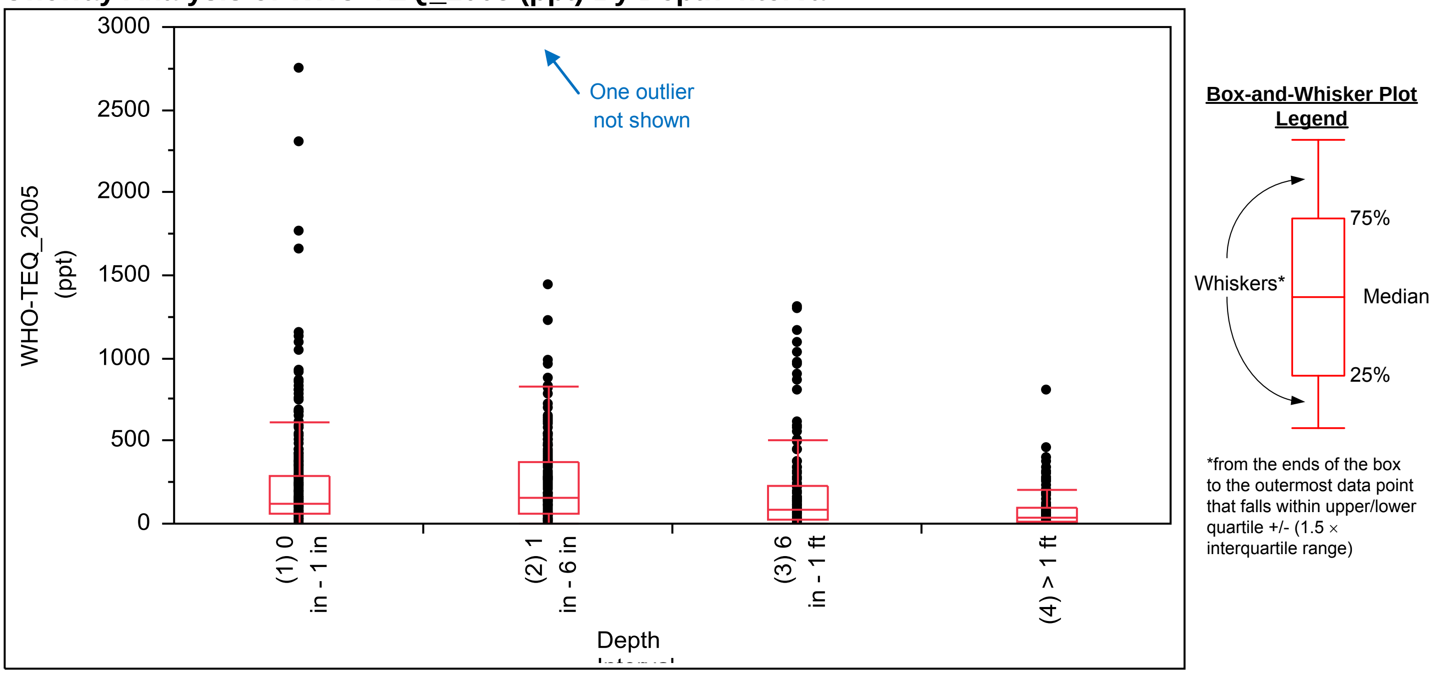
Drawn: JLH	Checked: MDC	Approximate Scale: 1" = 750'
Date: 8 December 2011	Drawing File: Figure 5-3 TAL Test Sites.mxd	

Figure 5-4



BLOCK A (Background Evaluation)
BLOCK B (Nondetect Evaluation)
BLOCK C (Identify Criteria)
BLOCK D (Criteria Comparison)
Metals with 1 or more sets of background statistics?
No
Yes
All detected concentrations and RLs of NDs ≤ (mean + 1 std dev) Statewide Default Background?
Yes
Group A1 Screen-out by Statewide Default Background
No
All detected concentrations and RLs of NDs ≤ (mean + 2 std dev) Regional Background?
Yes
Group A2 Screen-out by Regional Background
No
All data are NDs?
No
Yes
All RLs ≤ MDEQ target detection levels?
Yes
Group B1 Screen-out by all NDs; RLs met TDLs
No
All off-site RLs ≤ MDEQ target detection levels?
Yes
Group B2 Screen-out by all off-site NDs; RLs met TDLs
No
All RLs ≤ all Part 201/EPA criteria?
Yes
Group B3 Screen-out by all NDs; all RLs ≤ all criteria
No
Part 201 criteria or EPA criteria available?
Yes
No
Detection frequency ≤ 5%?
Yes
Group C1 No criteria; detected ≤ 5%
No
Detection frequency > 5%?
Yes
Group C2 No criteria; detected > 5%
Note: MDEQ may require to develop criteria for further evaluation.
Screen-out as appropriate for pathway-specific or other reasons?
Yes
Group D1 Screen-out by other reasons
No
Detection frequency ≤ 5%; and all detected concentrations and RLs of NDs ≤ all Part 201/EPA criteria?
Yes
Group D2 Detected ≤ 5%; screen-out by Part 201/EPA criteria
No
Detection frequency > 5%; and all detected concentrations and RLs of NDs ≤ all Part 201/EPA criteria?
Yes
Group D3 Detected > 5%; screen-out by Part 201/EPA criteria
No
Any detection frequency; and all detected concentrations ≤ all Part 201/EPA criteria; but some RLs of NDs > 1 or more Part 201/EPA criteria?
Yes
Group D4 Not detected above criteria; but have elevated RLs for NDs
No
Detection frequency ≤ 5%; and 1 or more detected concentrations > 1 or more Part 201/EPA criteria?
Yes
Group D5 Detected ≤ 5%; 1 or more detected concentrations > criteria
No
Detection frequency > 5%; and 1 or more detected concentrations > 1 or more Part 201/EPA criteria?
Yes
Group D6 Detected > 5%; 1 or more detected concentrations > criteria
Pending Future Development
Group E1 Eliminate through a review of spatial distribution
Group E2 Eliminate based on leach testing results
Group E3 Eliminate - analyte not sourced by Dow
Screen-out
Eliminate
May require additional evaluation
Require additional evaluation
Part 201 Criteria:
Residential Drinking Water Protection
Groundwater Surface Water Interface Protection
Residential Groundwater Contact Protection
Residential Soil Volatilization to Indoor Air Inhalation
Residential Volatilization to Ambient Air (Infinite Source)
Residential Volatilization to Ambient Air (5m Source)
Residential Volatilization to Ambient Air (2m Source)
Residential Particulate Soil Inhalation
Residential Direct Contact
Soil Saturation Screening Levels
Non-Residential Drinking Water Protection
Non-Residential GW Contact Protection
Non-Res. Soil Volatilization to Indoor Air Inhalation
Non-Res. Volatilization to Ambient Air (Infinite Source)
Non-Res. Volatilization to Ambient Air (5m Source)
Non-Res. Volatilization to Ambient Air (2m Source)
Non-Res. Particulate Soil Inhalation
Non-Residential Soil Direct Contact
EPA Criteria:
EPA Residential Soil
EPA Industrial Soil
EPA Risk-Based SSL

Figure 5-5
Oneway Analysis of WHO-TEQ_2005 (ppt) By Depth Interval



Quantiles

Level	Minimum	10%	25%	Median	75%	90%	Maximum
(1) 0 in - 1 in	2.5	29.26	61.85	123	285.5	495.6	2750
(2) 1 in - 6 in	2.9	20.64	62.3	155	377	564	10500
(3) 6 in - 1 ft	0.49	5.814	22.025	85.3	231	569.2	1310
(4) > 1 ft	0.231	2.111688	8.295368	35.59355	92.96923	212.2579	806.5071

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
(1) 0 in - 1 in	361	221.142	294.852	15.519	190.62	251.66
(2) 1 in - 6 in	173	303.207	817.180	62.129	180.57	425.84
(3) 6 in - 1 ft	138	195.723	282.452	24.044	148.18	243.27
(4) > 1 ft	154	76.793	109.450	8.820	59.37	94.22

Nonparametric Comparisons For All Pairs Using Steel-Dwass Method

q*	Alpha
2.56903	0.05

Level	- Level	Score Mean Difference	Std Err Dif	Z	p-Value
(2) 1 in - 6 in	(1) 0 in - 1 in	23.270	14.26754	1.63097	0.3611
(3) 6 in - 1 ft	(2) 1 in - 6 in	-38.455	10.26321	-3.74687	0.0010*
(4) > 1 ft	(3) 6 in - 1 ft	-41.934	9.89749	-4.23685	0.0001*
(3) 6 in - 1 ft	(1) 0 in - 1 in	-48.259	14.43111	-3.34412	0.0046*
(4) > 1 ft	(2) 1 in - 6 in	-91.600	10.47394	-8.74550	<.0001*
(4) > 1 ft	(1) 0 in - 1 in	-137.013	14.32274	-9.56613	<.0001*

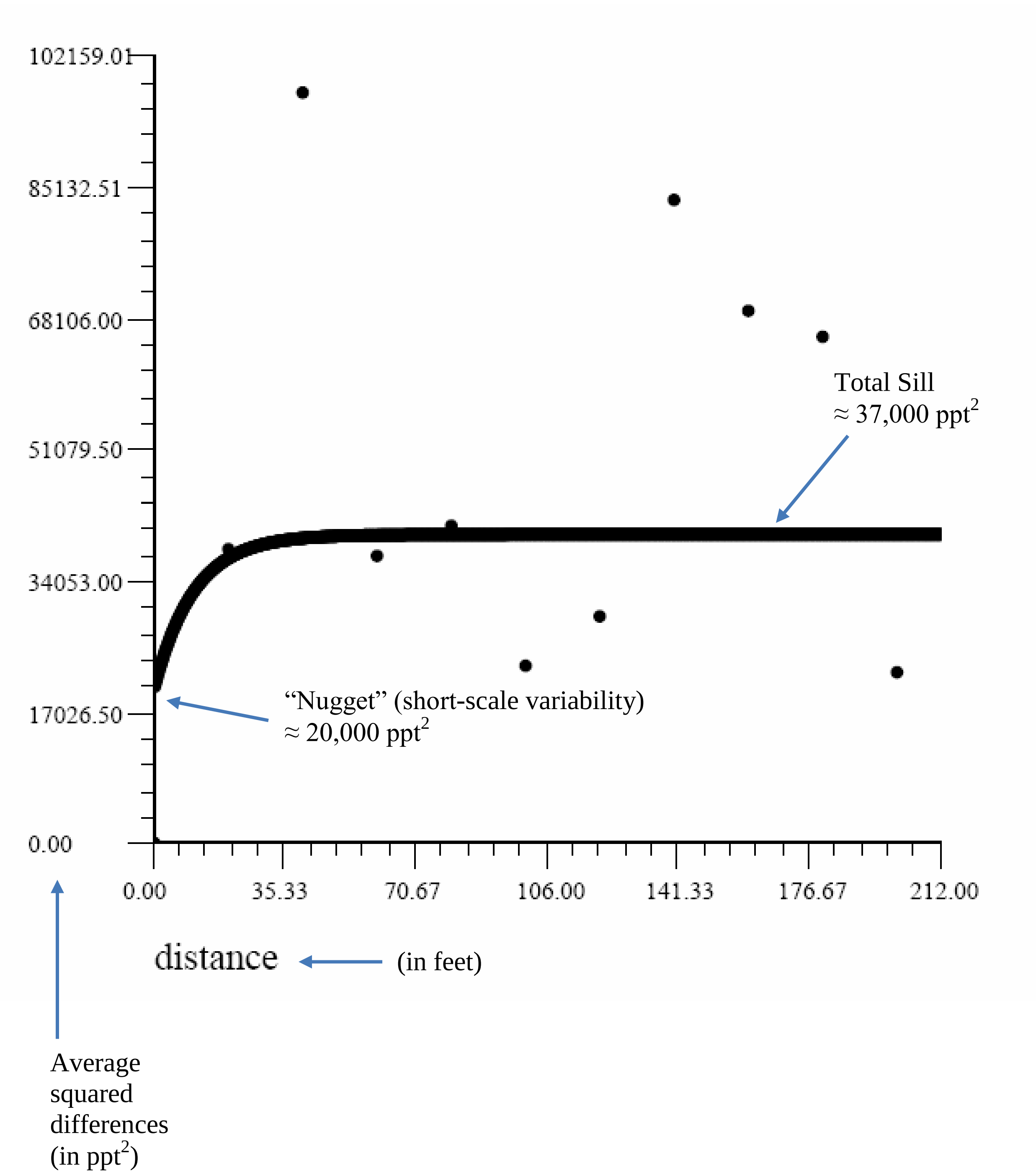


Figure 5-6. Omni-directional Short-Range Variogram

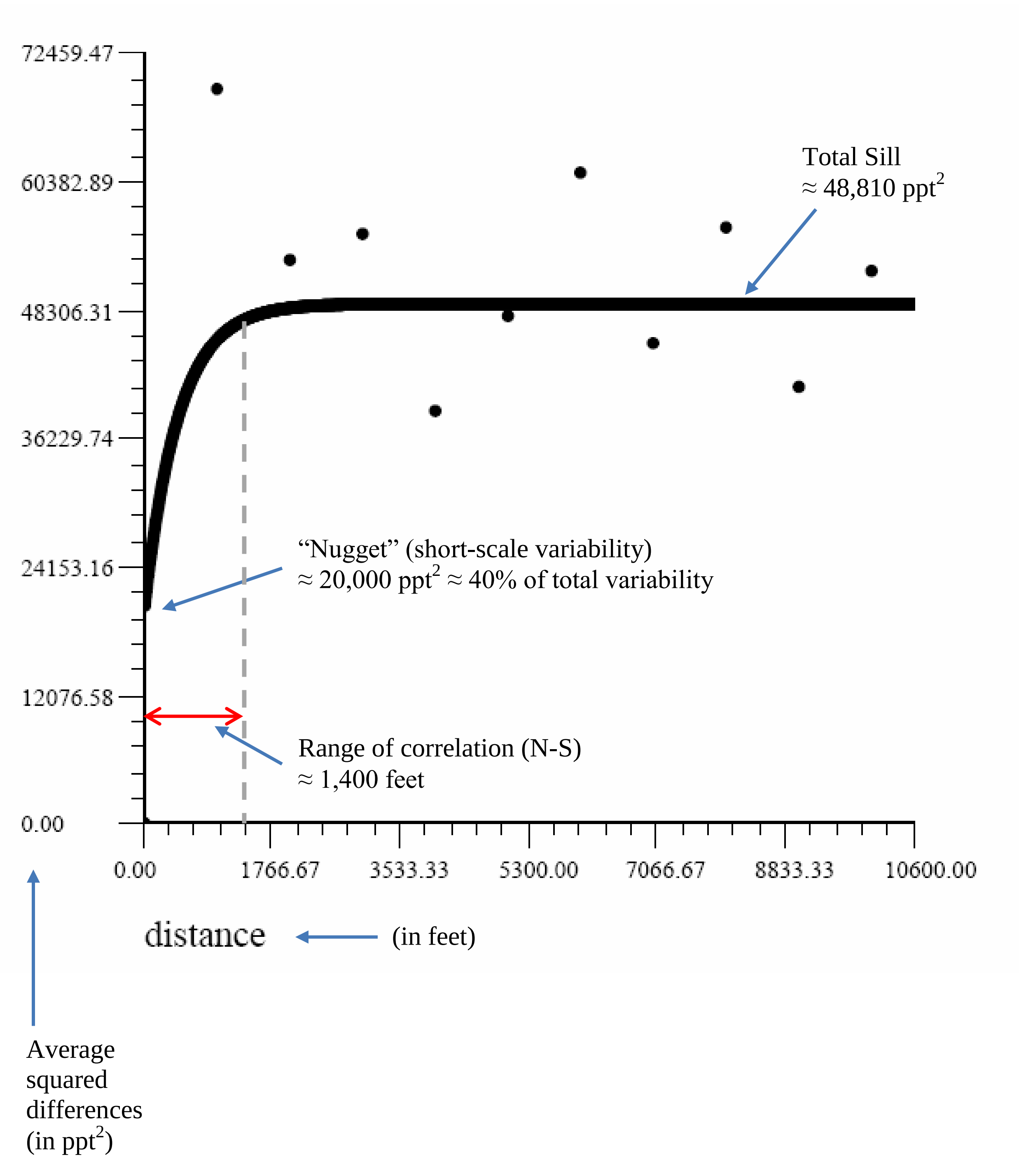


Figure 5-7. North-South Directional Long-Range Variogram

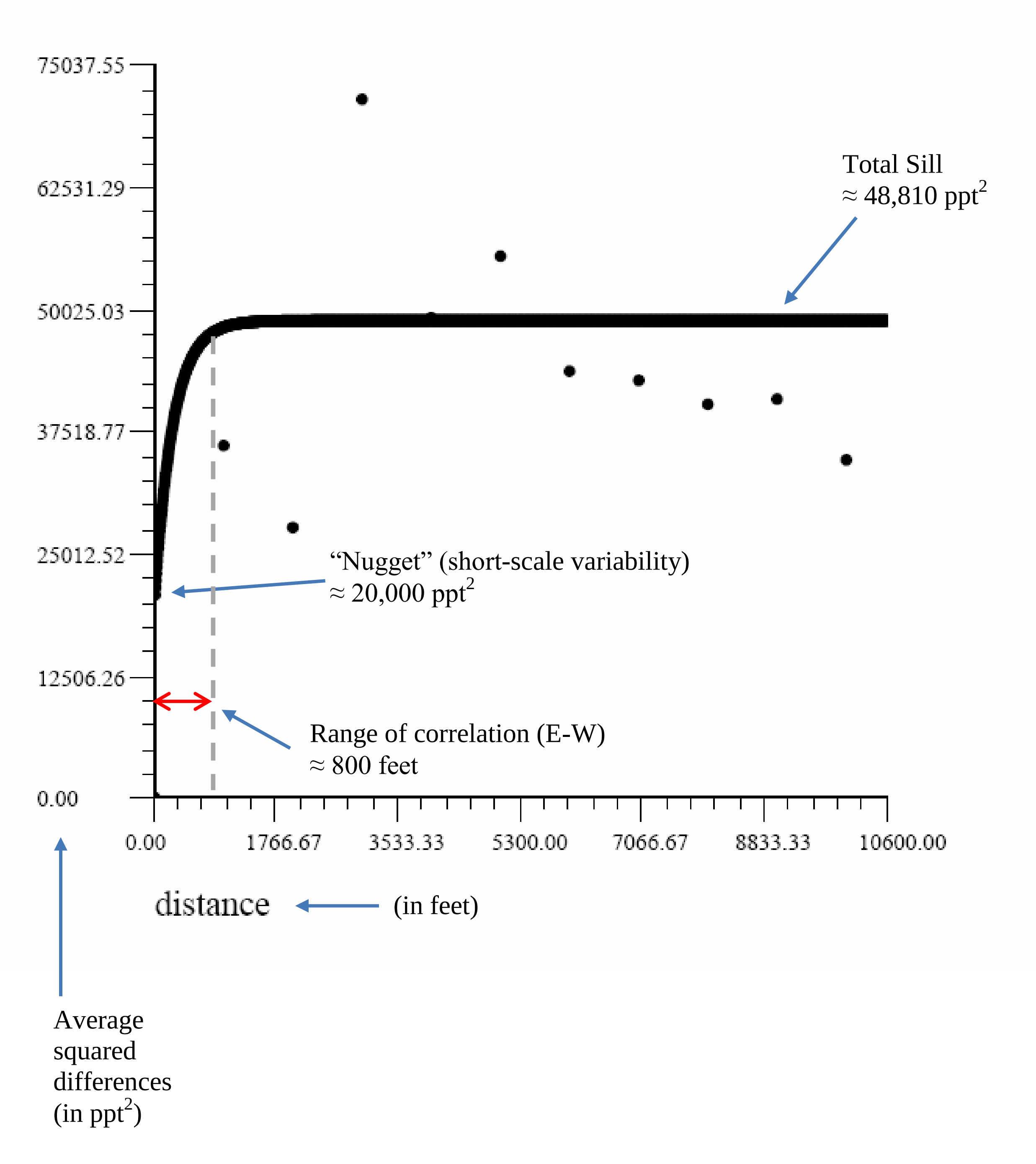
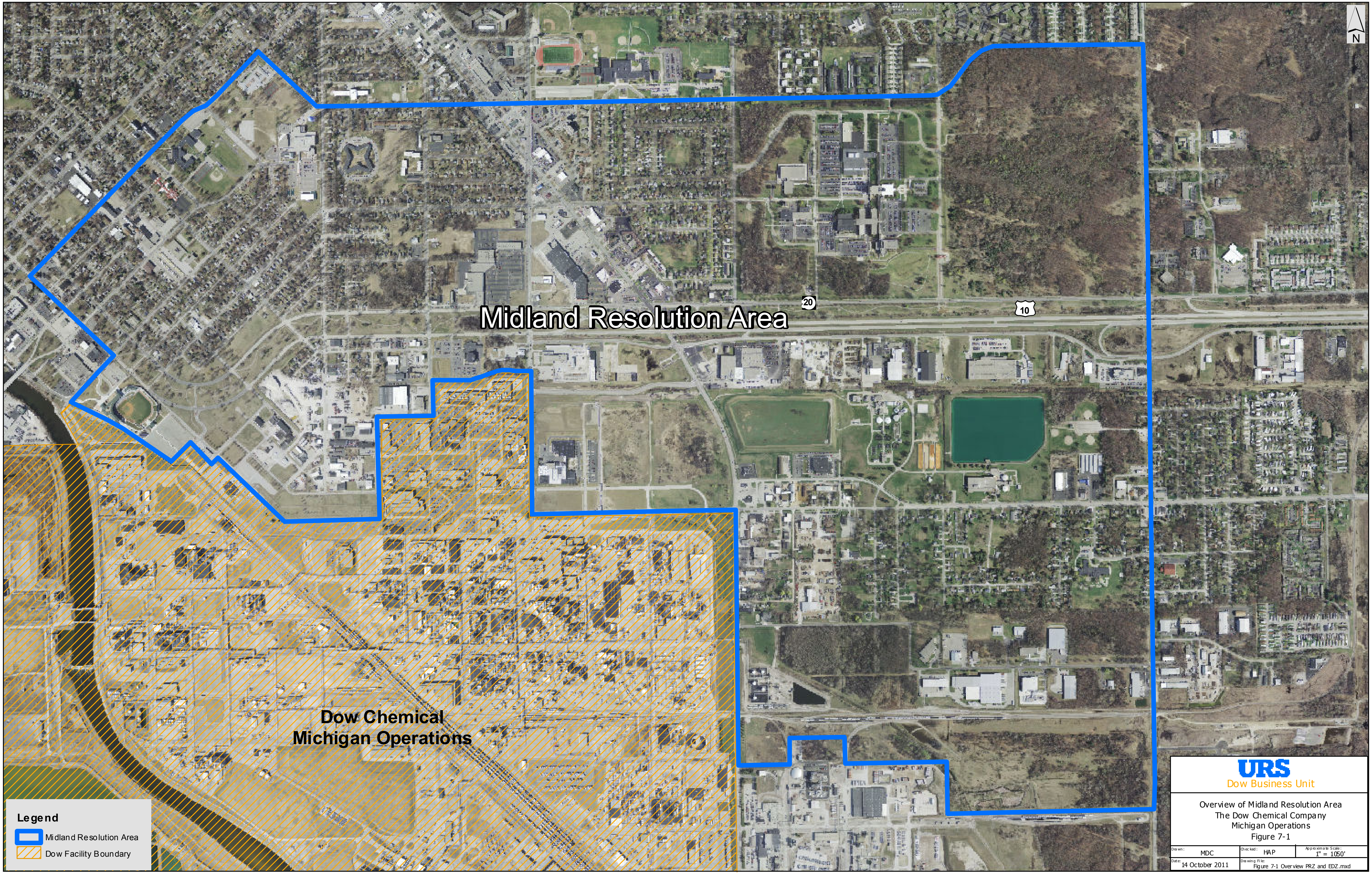
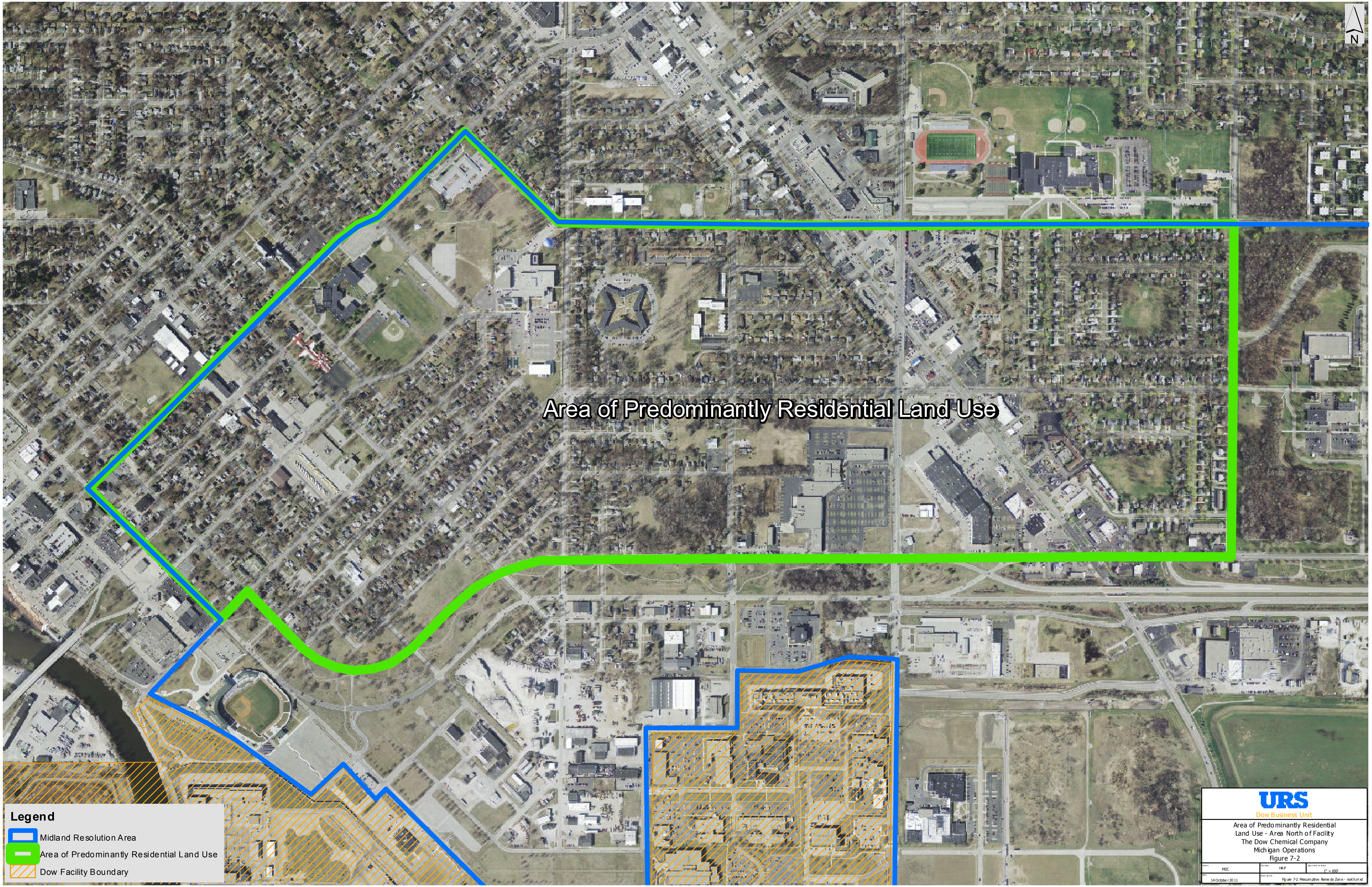
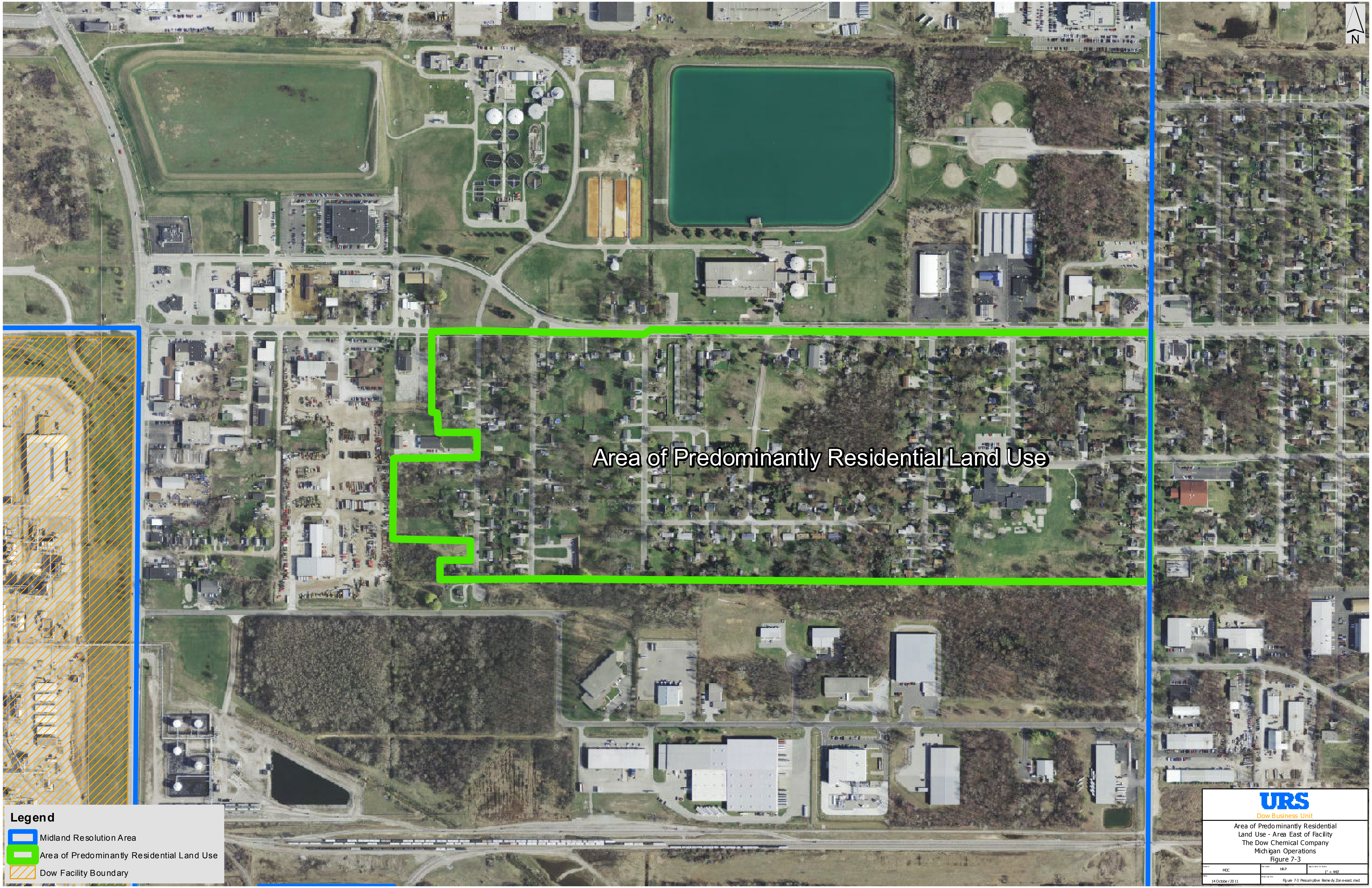
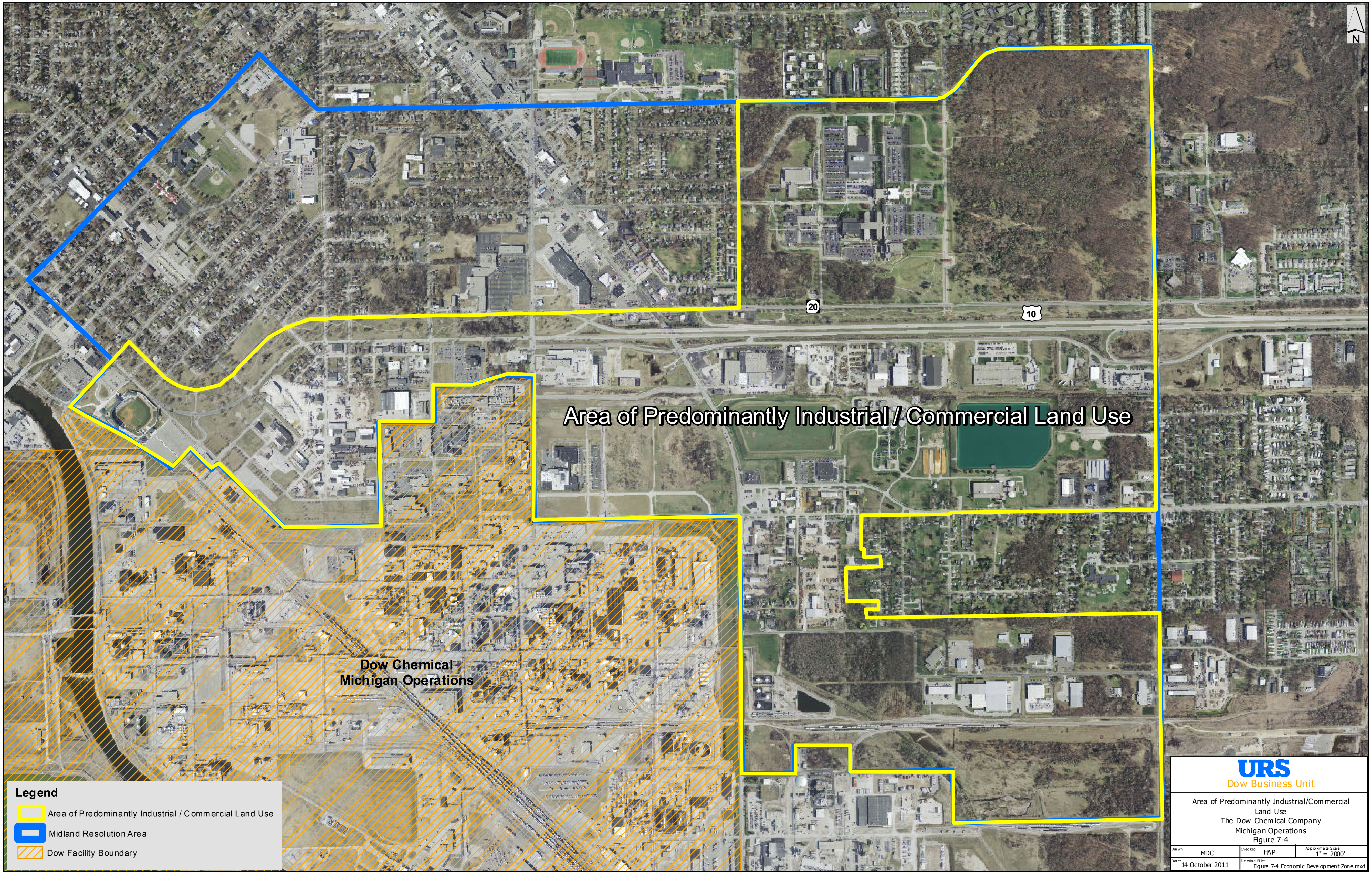


Figure 5-8. East-West Directional Long-Range Variogram


N
Midland Resolution Area
20
10
Dow Chemical
Michigan Operations
Legend
Midland Resolution Area
Dow Facility Boundary
URS
Dow Business Unit
Overview of Midland Resolution Area
The Dow Chemical Company
Michigan Operations
Figure 7-1
Drawn: MDC
Checked: HAP
Approximate Scale: 1" = 1050'
Date: 14 October 2011
Drawing File: Figure 7-1 Overview PRZ and EDZ.mxd


N
Area of Predominantly Residential Land Use
Legend
Midland Resolution Area
Area of Predominantly Residential Land Use
Dow Facility Boundary
URS
Dow Business Unit
Area of Predominantly Residential
Land Use - Area North of Facility
The Dow Chemical Company
Michigan Operations
Figure 7-2
Drawn:
MDC
Checked:
HAP
Approximate Scale:
1" = 650'
Date:
14 October 2011
Drawing File:
Figure 7-2 Presumptive Remedy Zone - north.mxd


N
Area of Predominantly Residential Land Use
Legend
Midland Resolution Area
Area of Predominantly Residential Land Use
Dow Facility Boundary
URS
Dow Business Unit
Area of Predominantly Residential
Land Use - Area East of Facility
The Dow Chemical Company
Michigan Operations
Figure 7-3
Drawn: MDC
Checked: HAP
Approximate Scale: 1" = 440'
Date: 14 October 2011
Drawing File: Figure 7-3 Presumptive Remedy Zone-east.mxd



N
20
10
Area of Predominantly Industrial / Commercial Land Use
Dow Chemical
Michigan Operations
Legend
Area of Predominantly Industrial / Commercial Land Use
Midland Resolution Area
Dow Facility Boundary
URS
Dow Business Unit
Area of Predominantly Industrial/Commercial
Land Use
The Dow Chemical Company
Michigan Operations
Figure 7-4
Drawn: MDC
Checked: HAP
Approximate Scale: 1" = 2000'
Date: 14 October 2011
Drawing File: Figure 7-4 Economic Development Zone.mxd


2014
2017
(as required)
2016
(as required)
2014
2015
(as required)
2013
2012
2017
(as required)
2017
(as required)
2016
(as required)
2015
(as required)
2014
2013
(as required)
2016
(as required)
2013
2015
(as required)
2016
(as required)
2012
2014
2013
(as required)
Legend
Property Group A
Property Group B
Property Group C
Property Group D (As Required)
Property Group E (As Required)
Property Group F (As Required)
Economic Development Zone Residences, as necessary
URS
Dow Business Unit
Six-Year
Resolution Area Implementation Plan
The Dow Chemical Company
Michigan Operations
Figure 7-5
Drawn: MDC
Checked: HAP
Approximate Scale: 1" = 500'
Date: 14 October 2011
Drawing File: Figure 7-5 Six-Year Presumptive Remedy Implementation Plan.mxd

Decision Rules

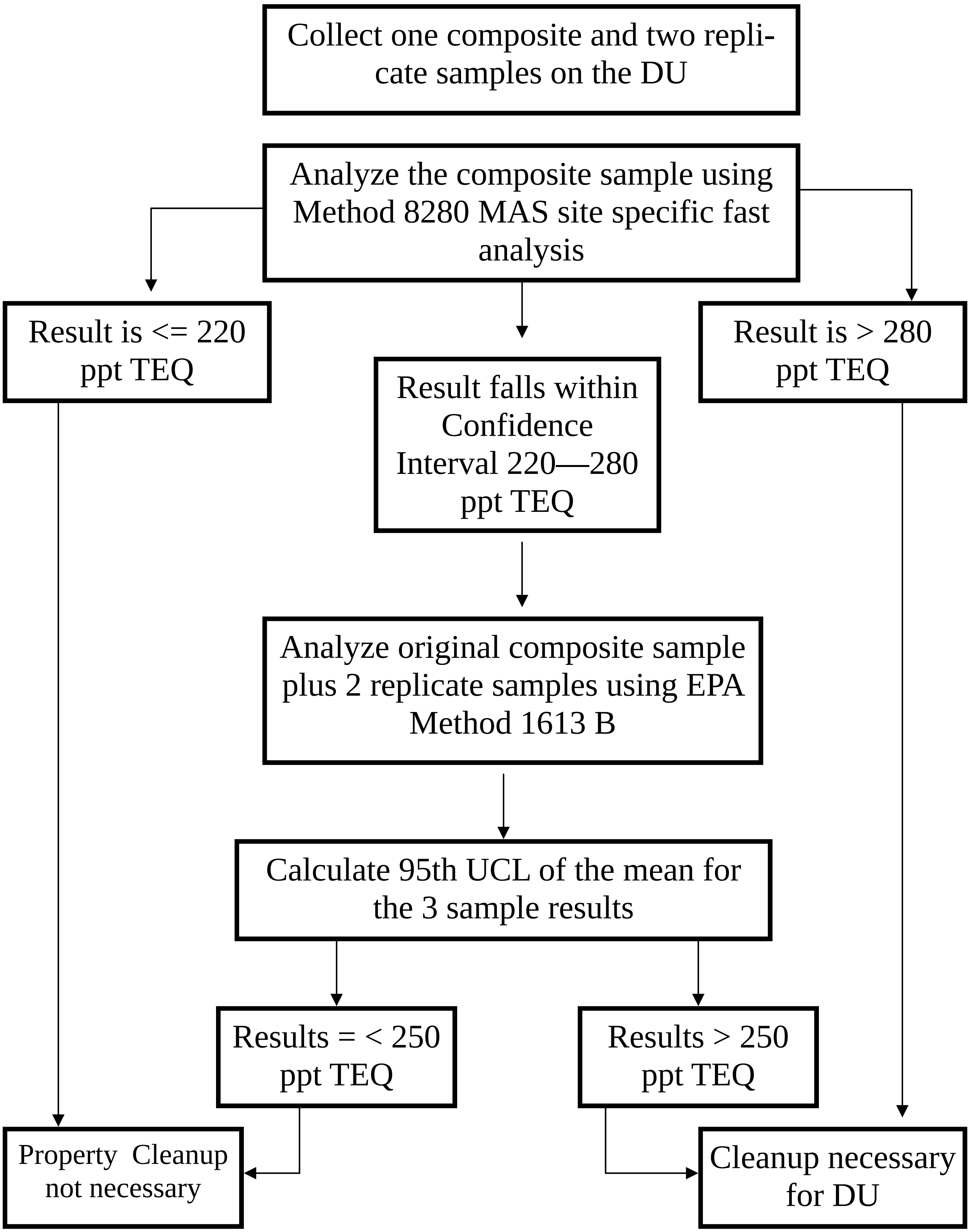
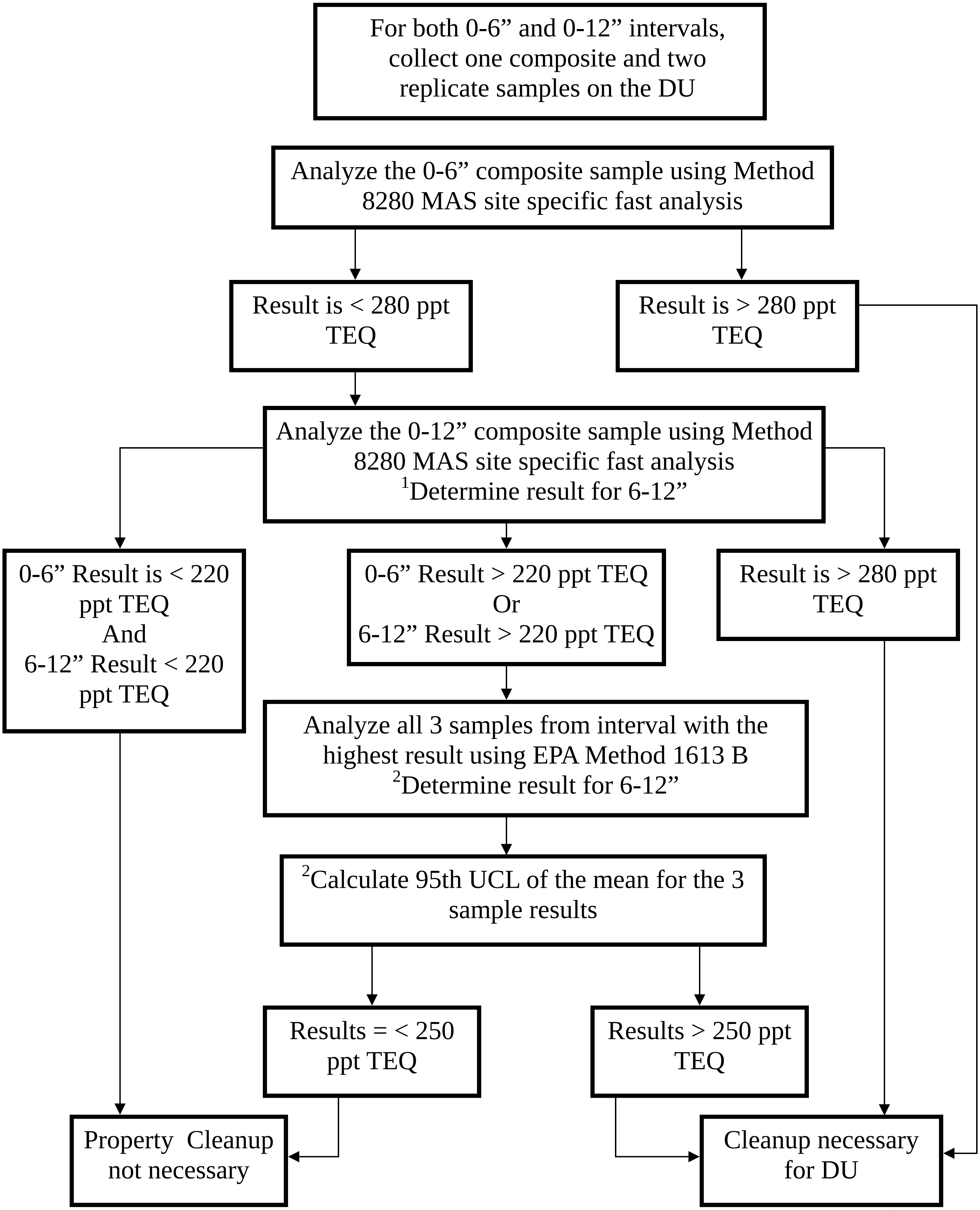


Figure 7-6. Decision Rules for Residential or Residential –Like DUs

Decision Rules



Notes 1 & 2 See Page 2

Figure 7-7. Decision Rules for Residential or Residential –Like DUs with Extensive Landscaping.

Decision Rules (notes)

Note 1:

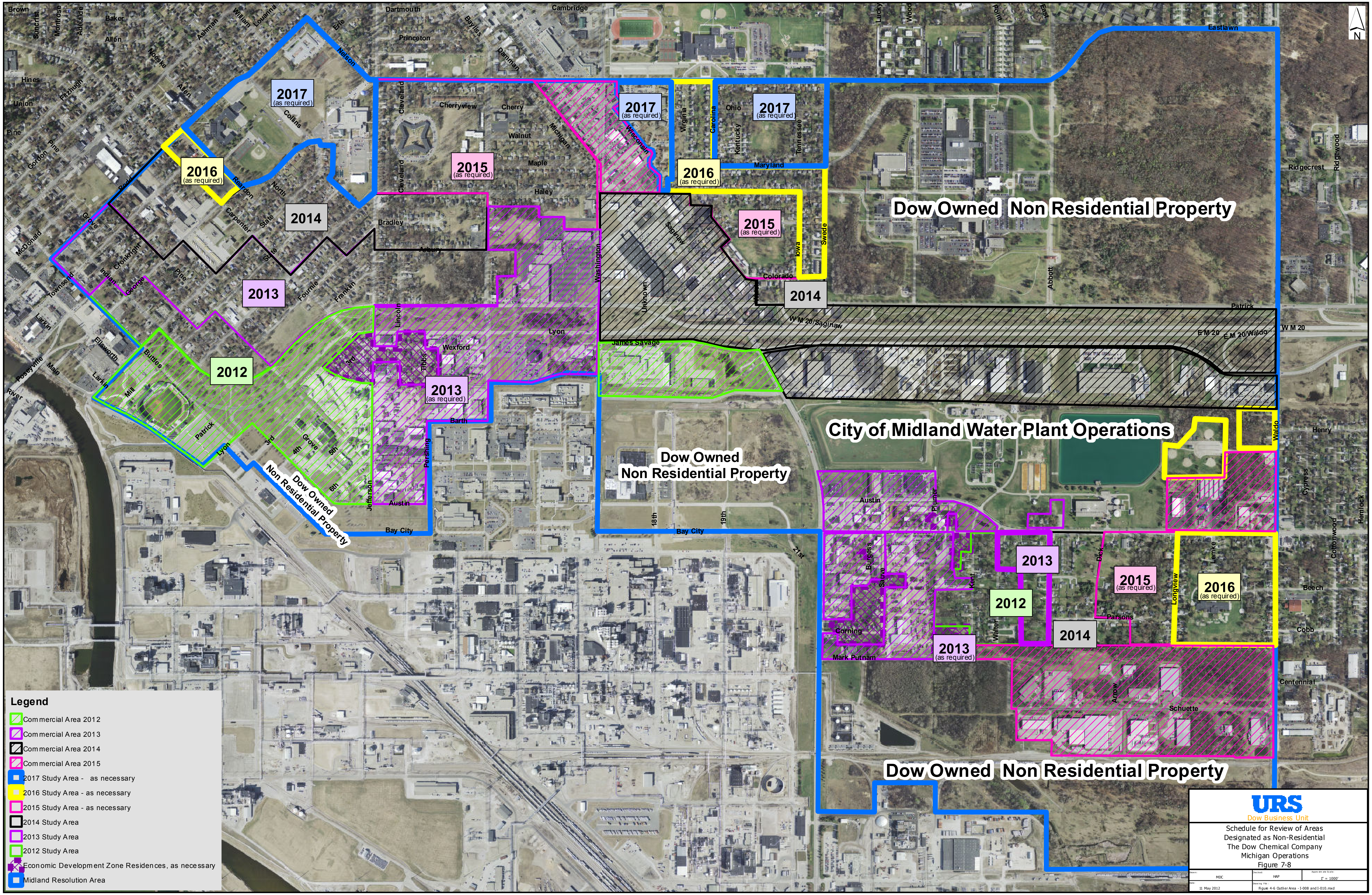
$$[6-12''] = \left(\frac{[0-12'']}{0.5'}^{8280\text{MAS}}\right) - [0-6'']^{8280MAS}$$

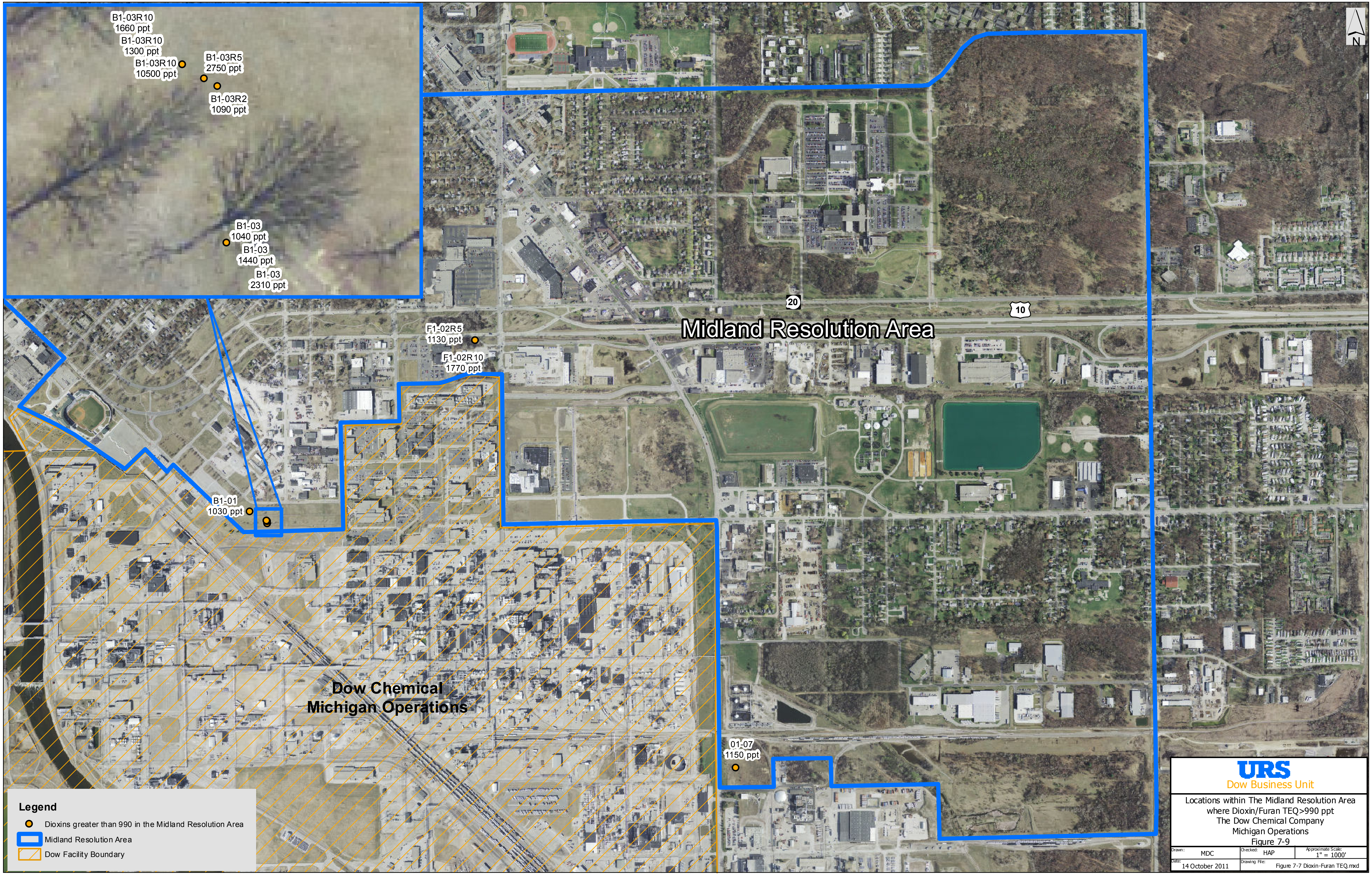
Note 2:

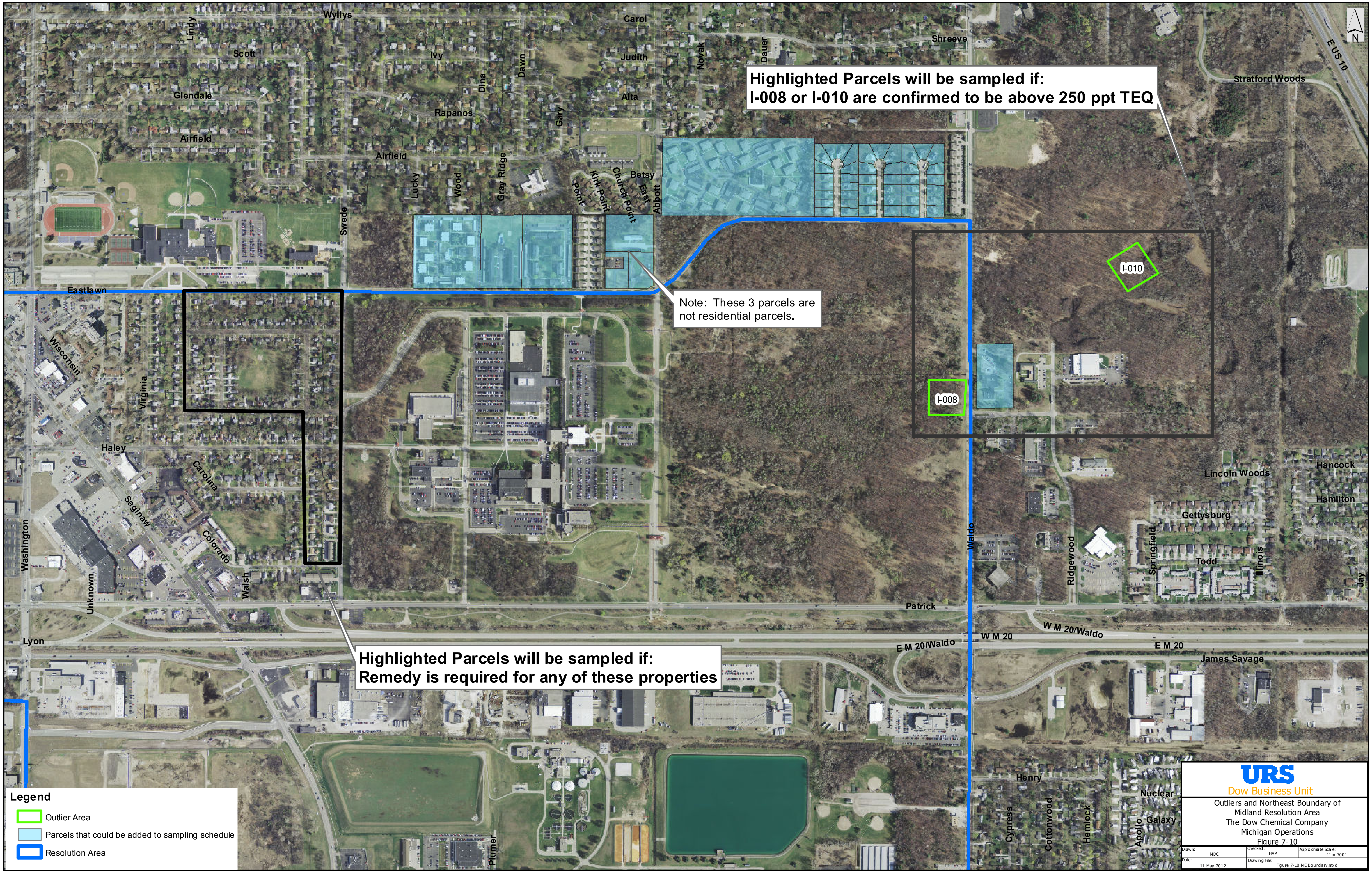
If [0-12”] < [0-6”] $$[6-12''] = \left(\frac{[0-12'']}{0.5'}^{8280\text{MAS}}\right) - [0-6'']_{95\%\text{UCL}}^{1613\text{b}}$$

If [0-12”] > [0-6”] $$[6-12''] = \left(\frac{[0-12'']_{95\%UCL}^{1613b}}{0.5'}\right) - [0-6'']^{8280\text{MAS}}$$

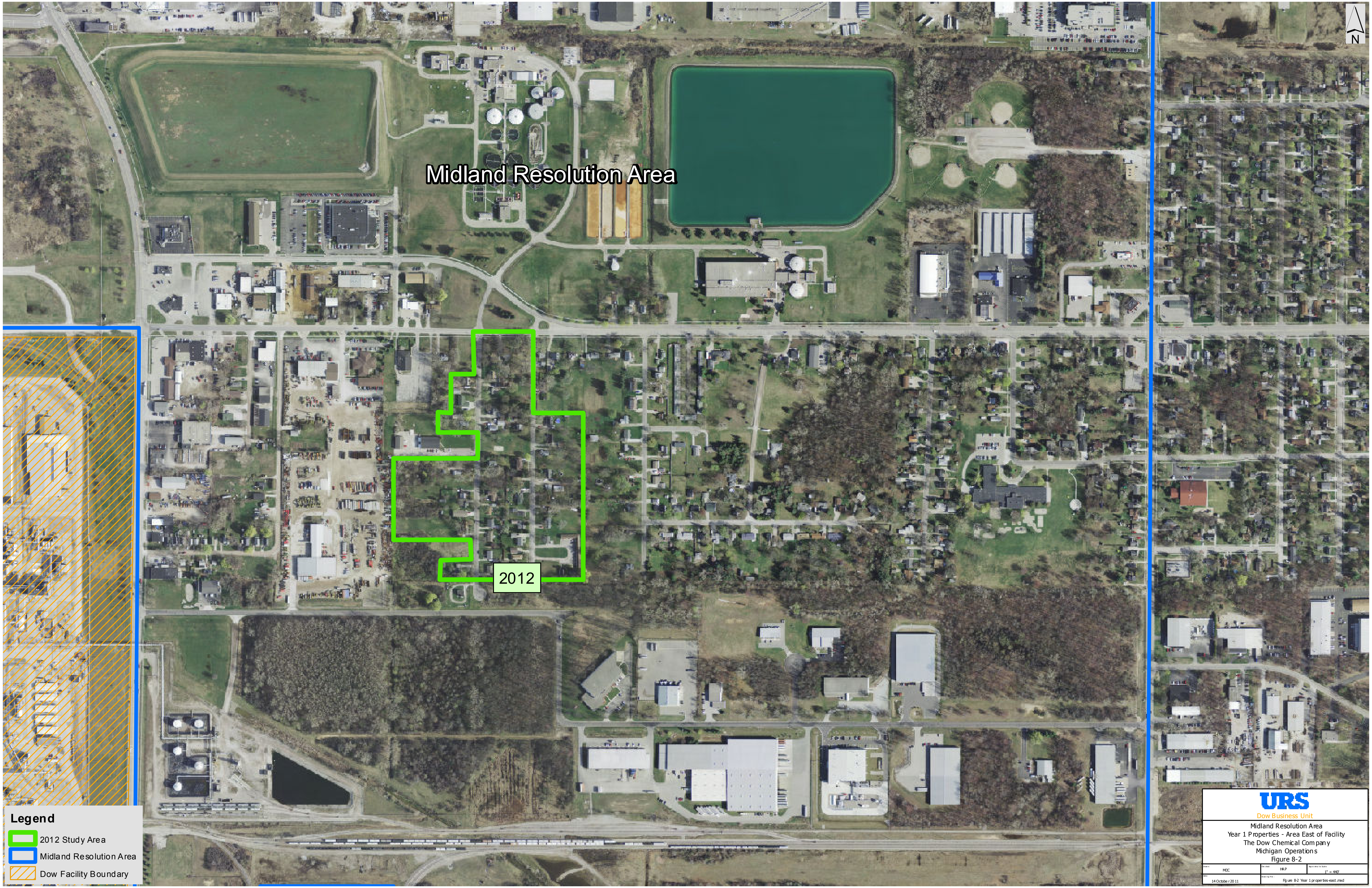
Figure 7-7. Decision Rules for Residential or Residential –Like DUs with Extensive Landscaping.


Dow Owned Non Residential Property
City of Midland Water Plant Operations
Dow Owned
Non Residential Property
Dow Owned Non Residential Property
Dow Owned Non Residential Property
2017 (as required)
2016 (as required)
2015 (as required)
2014
2013
2013 (as required)
2012
Legend
Commercial Area 2012
Commercial Area 2013
Commercial Area 2014
Commercial Area 2015
2017 Study Area - as necessary
2016 Study Area - as necessary
2015 Study Area - as necessary
2014 Study Area
2013 Study Area
2012 Study Area
Economic Development Zone Residences, as necessary
Midland Resolution Area
URS
Dow Business Unit
Schedule for Review of Areas
Designated as Non-Residential
The Dow Chemical Company
Michigan Operations
Figure 7-8
1" = 1000'
31 May 2012


N
B1-03R10
1660 ppt
B1-03R10
1300 ppt
B1-03R10
10500 ppt
B1-03R5
2750 ppt
B1-03R2
1090 ppt
B1-03
1040 ppt
B1-03
1440 ppt
B1-03
2310 ppt
20
10
Midland Resolution Area
F1-02R5
1130 ppt
F1-02R10
1770 ppt
B1-01
1030 ppt
Dow Chemical
Michigan Operations
01-07
1150 ppt
Legend
Dioxins greater than 990 in the Midland Resolution Area
Midland Resolution Area
Dow Facility Boundary
URS
Dow Business Unit
Locations within The Midland Resolution Area
where Dioxin/Furan TEQ>990 ppt
The Dow Chemical Company
Michigan Operations
Figure 7-9
Drawn: MDC
Checked: HAP
Approximate Scale: 1" = 1000'
Date: 14 October 2011
Drawing File: Figure 7-7 Dioxin-Furan TEQ.mxd


Highlighted Parcels will be sampled if:
I-008 or I-010 are confirmed to be above 250 ppt TEQ
Note: These 3 parcels are not residential parcels.
Highlighted Parcels will be sampled if:
Remedy is required for any of these properties
I-010
I-008
N
Wyllys
Lindy
Scott
Glendale
Airfield
Ivy
Rapanos
Dina
Dawn
Gary
Carol
Judith
Alta
Novak
Dauer
Shreeve
Stratford Woods
E US 10
Airfield
Lucky
Wood
Gray Ridge
Point
Kirk Point
Church Point
Betsy
East
Abbott
Swede
Eastlawn
Wisconsin
Virginia
Haley
Carolina
Saginaw
Colorado
Washington
Unknown
Walsh
Lyon
Patrick
Waldo
Ridgewood
Springfield
Illinois
Jay
Lincoln Woods
Hancock
Hamilton
Gettysburg
Todd
E M 20/Waldo
W M 20
W M 20/Waldo
E M 20
James Savage
Henry
Nuclear
Galaxy
Cypress
Cottonwood
Hemlock
Apollo
Plumer
Legend
Outlier Area
Parcels that could be added to sampling schedule
Resolution Area
URS
Dow Business Unit
Outliers and Northeast Boundary of
Midland Resolution Area
The Dow Chemical Company
Michigan Operations
Figure 7-10
Drawn: MDC
Checked: HAP
Approximate Scale: 1" = 700'
Date: 11 May 2012
Drawing File: Figure 7-10 NE Boundary.mxd


N
Midland Resolution Area
2012
Legend
2012 Study Area
Midland Resolution Area
Dow Facility Boundary
URS
Dow Business Unit
Midland Resolution Area
Year 1 Properties - Area North of Facility
The Dow Chemical Company
Michigan Operations
Figure 8-1
Drawn:
MDC
Checked:
HAP
Approximate Scale:
1" = 650'
Date:
14 October 2011
Drawing File:
Figure 8-1 Year 1 properties-north.mxd



N
Midland Resolution Area
2012
Legend
2012 Study Area
Midland Resolution Area
Dow Facility Boundary
URS
Dow Business Unit
Midland Resolution Area
Year 1 Properties - Area East of Facility
The Dow Chemical Company
Michigan Operations
Figure 8-2
Drawn: MDC
Checked: HAP
Approximate Scale: 1" = 440'
Date: 14 October 2011
Drawing File: Figure 8-2 Year 1 properties-east.mxd

Attachment A

The City of Midland investigation and corrective action activities are being conducted under the jurisdiction of Dow's License issued pursuant to Part 111 of Michigan's Natural Resources and Environmental Protection Act (NREPA), M.C.L.A. § 324.11101 *et seq.* Part 111 requires owners of licensed hazardous waste facilities to undertake "corrective action" for releases of contaminants from waste management units. M.C.L.A. § 324.11115a(1). "Corrective action" is defined broadly to mean

> an action determined by the department to be necessary to protect the public health, safety, welfare, or the environment, and includes, but is not limited to, investigation, evaluation, cleanup, removal, remediation, monitoring, containment, isolation, treatment, storage, management, temporary relocation of people, and provision of alternative water supplies, or any corrective action allowed under title II of the solid waste disposal act or regulations promulgated pursuant to the act. M.C.L.A. § 324.11102(3).

Michigan's corrective action rule, Administrative Code Rule 299.9629, authorizes the department to specify in a license "the environmental protection standards which are necessary for the cleanup and protection of soil, surface water, sediments, and ambient air that are established pursuant to part 201 [of NREPA]." Mich. Admin. Code Rule 299.9629(3)(a)(iii). According to Rule 629, contamination must either meet applicable "protection standards," be removed, or be treated in place. Mich. Admin. Code Rule 299.9629(4).

In order to clarify acceptable means to meet these corrective action requirements, in a Memorandum of Understanding (MOU) executed in November of 2000 between the MDEQ and the U.S. Environmental Protection Agency (EPA), the agencies agreed that the "process and clean-up criteria specified in Part 201," including "land-use based" cleanups, are an acceptable way of achieving corrective action objectives. The MDEQ also acknowledged its intent to use Part 201 to implement the Part 111 corrective action program at all State-lead sites. MOU, p. 3- 4. Accordingly, Dow's License requires corrective action, but also recognizes that "substantively equivalent" processes under Part 201 may be used to satisfy those obligations." License, XI.A.1.

Part 201 provides for the development of "site-specific criteria." As set forth in section 20120b "[t]he [MDEQ] shall approve site-specific criteria in a response activity under section 20120a if such criteria, in comparison to generic criteria, better reflect best available information concerning toxicity or exposure risk posed by the hazardous substance or other factors." M.C.L.A. § 324.20120b.[1] Such site-specific criteria may, as appropriate, alter any algorithm value, parameter, or assumption used to calculate the generic criteria, and may consider the depth of contamination and other site-specific information M.C.L.A. § 324.20120b(2). Section 6 of the Work Plan discusses the calculation of a residential direct contact site-specific criterion for the City of Midland, and proposes a site-specific action level that will be used to trigger work under the Work Plan.

Investigation and corrective action work will be conducted within the procedural framework set forth in Dow's License.[2] Dow's License expressly includes the option of conducting corrective action as an interim action, including an interim action "designed to meet cleanup criteria," so long as substantively equivalent to the interim action requirements of Part 201. License, XI.G. Interim action "designed to meet criteria" is action that is undertaken before final remedial action is taken or determined at the site, but, nevertheless, is stringent enough that no further action will be required. Under Part 201, an interim action is a type of "response activity" approved as part of a "response activity plan." M.C.L.A. § 324.20101(1)(pp) and (rr). Accordingly, Dow's Work Plan is being submitted as a "Response Activity Plan Designed to Meet Criteria," but will also serve the purpose of an "IRA Work Plan" under the License. License XI.G.1. The License also requires that Dow submit "IRA Reports" to document completion of the IRA work. License, XI.G.4. In this case, the summary reports that are required each year pursuant to the Work Plan will serve that purpose. Finally, IRAs under the License require the submittal of monthly written IRA progress reports. In satisfaction of this monthly reporting requirement, Dow will frequently update a progress tracking log, which will be continuously available to MDEQ.

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[1] Dow's License also authorizes the use of site-specific criteria. License, XI.B.3(b)(iv) ("The licensee has the option to propose steps to develop site-specific cleanup criteria . . . .").

[2] This discussion is based on Dow's License issued June 12, 2003, and the relevant provisions of Part 201 and the Part 201 administrative rules in effect on that date (License Condition XI.G).

Below is a table setting forth the primary corrective action requirements of Dow's License together with a brief explanation of how each requirement will be met for the City of Midland.

License Requirement	**How Met**
Conduct interim response activities to cleanup or remove a released contaminant or take other actions prior to remedial action. Dow shall submit an IRA Work Plan for MDEQ approval. License, XI.G.	This Response Activity Plan Designed to Meet Criteria / IRA Work Plan fulfills this requirement. The Response Activity Plan will be implemented after it is approved by MDEQ.
Submit a written IRA Report within 60 days after completion of the IRA. License XI.G.4.	As described in this Work Plan (see Sections 9 and 10), Dow will submit annual summary reports in December of each year, summarizing the work completed during that year. The last such report shall serve as a final summary report for the IRA, and will contain a general summary of all work completed.
Submit monthly IRA progress reports to MDEQ. License XI.G.6.	In lieu of submitting monthly written progress reports, Dow will create a progress tracking log that MDEQ can access at any time. The log will be updated with progress information as appropriate to the activities being conducted.
Dow may conduct interim response activities designed to meet criteria if those activities are conducted in a manner that conforms or is substantively equivalent to the provisions of R 299.5526(7) and (8) and R 299.5705[3] of the December 21, 2002 Part 201 administrative rules. License XI.G.	See rows below for discussion of subrule 299.5526(7) and (8) components.
R. 299.5526(7) A person who wishes to establish that an interim response activity intended to meet applicable cleanup criteria provided for under section 20120a(1)(f) to (j) or (2) [site specific criteria] of the act is complete for 1 or more environmental media in all or a portion of the facility shall maintain documentation that substantially complies with subrule (5) [see below] of this rule and also includes all of the following:	

[3] This rule basically adopts the cleanup criteria section of the rules and makes them applicable to interim actions designed to meet criteria. As discussed above, the Work Plan uses cleanup criteria in conformity with Part 201.

(a)	Clarification that the response activity is intended to satisfy particular land use-based cleanup criteria.	The selection of cleanup criteria is discussed in section 6 of the Work Plan. How those criteria will be satisfied is discussed in section 7 of the Work Plan.
(b)	Demonstration that the cleanup criteria selected are appropriate to the facility, including documentation of land use, zoning, activity patterns anticipated at the facility, and other factors that affect the appropriateness of the selected category.	Section 4 of the Work Plan discusses land use and zoning and how the selected cleanup criteria are appropriate to various land uses in the Presumptive Remedy Zone.
(c)	Documentation of the department's approval of all of the following: (i) The selected cleanup category. (ii) The applicable provisions in section 20120b(3)(a) to (e) of the act [land use restrictions, monitoring, operation and maintenance, permanent markers, financial assurance]. (iii) Any of the components of the response activity in subrule (8) of this rule, if applicable.	Documentation of the Department's approval will be through the Department's approval of the Work Plan, annual summary reports, and additional submissions as needed. Land use restrictions are discussed in section 7 of the Work Plan. Monitoring and operation and maintenance are provided for in the Work Plan. Permanent markers will not be needed. Financial assurance is being provided by the Trust Fund as set forth in section 7 of the Work Plan. For subrule (8), see discussion below.
(d)	The date on which the interim response activity is complete.	Will be documented in the final summary report.
(e)	A description of the condition of the facility at the conclusion of the interim response activity, including both of the following: (i) Identification of areas known to be contaminated but not addressed by the interim response. (ii) A discussion of how relevant pathways have been addressed and why other exposure pathways are not relevant or were not addressed in the area that was the subject of the interim response.	Will be documented in each annual summary report, as well as in the final summary report.

R. 299.5526(8) An interim response that

includes any of the following components will not be considered complete, consistent with, or in compliance with, this rule unless the department has approved that component of the interim response:	
(a) The interim response activity relies on an institutional control in any form that is not a preapproved institutional control in place of a restrictive covenant to achieve land or resource use restrictions.	Institutional controls are discussed in section 7 of the Work Plan. The details of any institutional control will be discussed with and approved by MDEQ after the final resolution boundary has been determined.
(b) The response to aquifer contamination that is part of the interim response is the final action intended to be taken to address aquifer contamination and that action requires a waiver of R 299.5705(5) or R 209.5705(6) under Section 20118 of the act.	The need for waivers under Rule 299.5705(5) or (6), if any, will be addressed in subsequent submittals.
(c) The interim response activity addresses venting groundwater and a mixing zone determination is required to establish that the conditions in question are protective of public health, safety, welfare and the environment.	Mixing zone determinations, if any are needed, will be addressed in subsequent submittals.
R. 299.5526(5) If a person who is planning to conduct or has conducted an interim response activity requests or is required to have the department's approval, then he or she shall submit an interim response work plan describing response activity to be performed or an implementation report that describes interim response activity that has been undertaken, whichever is appropriate. The department shall approve an interim response work plan or implementation report if it contains all of the following, and the documentation required by subrule (6) [same as (7), but for generic unrestricted criteria] or (7) [see above] of this rule, if applicable, and the	

	department determines that the action complies with part 201 and these rules with regard to interim response activity:	
(a)	A description of the objectives of the response activity and how they were or will be achieved.	Work Plan sections 1 and 7.
(b)	A legal description of the specific parcel of property addressed by the interim response activity.	Maps of the areas subject to the response action are included as Figures in the Work Plan. Further, lists, by address and parcel number, of properties that have been addressed in a given year will be provided in each annual summary report. For parcels where only a portion of the property is addressed, Dow will provide a map with parcel number and GPS coordinates delineating the unsampled / unremediated areas.
(c)	A detailed description of the response activity undertaken, including all data that is relevant to the conclusions drawn. Information supplied under this subdivision shall include sufficient documentation of the nature and extent of contamination to support any conclusions about the effectiveness of the response activity.	Nature and extent of contamination are discussed in section 3 of the Work Plan, and will be further assessed as set forth in section 7 of the Work Plan. All response activities that are undertaken will be described in annual summary reports submitted to the MDEQ.
(d)	If the interim response activity is a subset of a remedial action that is being planned, then a description of the relationship of the interim response to the remedial action.	This interim response is a subset of the remedial action. The interim response described in the Work Plan is intended to meet criteria for direct contact with Midland area soils; therefore, no additional action will be necessary to address this pathway (except as noted in the Work Plan). Additional evaluation of other pathways / COCs will be addressed in subsequent submittals, including the revised RIWP discussed below.
(e)	A schedule for implementation of the proposed activity, if department approval is sought for a work plan before implementation of the interim response activity	Section 10 of the Work Plan.

Submit a Scope of Work (SOW) for conducting remedial investigation for all areas where a release from the facility is known to have occurred or could potentially have occurred. License, XI.B.3.	MDEQ approved Dow's "Scope of Work for Midland Area Soils Remedial Investigation" on October 18, 2005, fulfilling this License requirement. Dow has conducted numerous activities pursuant to the SOW; however, the SOW is no longer up-to-date or reflective of activities to be conducted pursuant to the Work Plan. Therefore, in order to clarify the administrative record, Dow will submit an amended and revised SOW pursuant to the schedule set forth in the Work Plan.[4]
Submit a written RI Work Plan. License, XI.B.5.	Dow submitted its initial Midland RIWP in December of 2006. By letter dated July 24, 2007, MDEQ approved the RIWP's implementation schedule (with modifications); MDEQ did not, however, approve the rest of the RIWP. In October of 2007, Dow submitted a revised RIWP, which has not been approved by MDEQ, although the parties have agreed to modifications of the approved schedule from time to time. In order to clarify the record, Dow will withdraw the prior RIWP and submit a revised RIWP pursuant to the schedule set forth in the Work Plan.[5] The revised RIWP will further evaluate COCs / exposure pathways not addressed in this Work Plan.
Submit a RI Final Report. License, XI.B.5.	As required by the License, Dow will submit a RI Final Report pursuant to the schedule set forth in the Work Plan.
Develop and implement a Feasibility Study (FS) to evaluate response activity alternatives (may be waived by MDEQ). License, XI.I.	This Work Plan requests a waiver from MDEQ of the requirement to prepare an FS because other discussions between Dow and MDEQ and other documents (including this Work Plan) have or will fulfill this function.

4 Because the revised SOW will be an amendment to the currently-approved SOW, and will not withdraw the SOW, a formal License amendment is not necessary.

5 Because the RIWP has not been approved (except for the schedule), a formal License amendment is not necessary. It has not been the practice of the parties to amend the License merely for schedule changes and amendments.

Submit a Remedial Action Plan (RAP) if the response activities are based on Part 201 generic or site-specific criteria. License, XI.J.1. After completing the remedial action and meeting cleanup criteria, submit a RAP Completion Report. License, XI.J.4.	Dow will submit a RAP / RAP Completion Report detailing how the remedy was implemented.

7099497-3

1. SCOPE AND APPLICATION

1.1. This method is for the fast determination of polychlorinated dibenzo-p-dioxins (PCDDs) and dibenzofurans (PCDFs) in soil by high resolution gas chromatography/high or low resolution mass spectrometry (HRGC/HRMS or HRGC/LRMS). It is specific for the Midland area soils (MAS).

1.2. The fast analysis is designed to dramatically speed up the analytical process and to reduce the costs of the analysis (*1*).

1.3. Selected 2,3,7,8-substituted PCDDs/PCDFs may be determined by this method. Due to the pattern distribution of the Midland area soil samples, an analysis of specific congeners allows a reliable estimation of the total TEQ concentrations present in the samples. In this sense, the Fast Analysis is used to calculate the total TEQ with a sufficient precision as described in the QAPP.

1.4. Due to the nature of this technique, the QA/QC of the methods 1613b, 8280 and 8290 will be adapted accordingly (*2-5*). Co-elutions and interferences in addition to those accepted by the methods 1613b, 8280 and 8290 may occur but will only bias the values high (*6-10*).

1.5. The method is for use only by analysts extensively experienced with the determination of PCDD and PCDF according to the methods 1613b, 8280 and 8290 or under the close supervision of such qualified persons.

1.6. This method is "performance-based". The analyst is permitted to modify the method to overcome interferences or lower the cost of measurements, provided that all performance criteria in this method are met.

2. SUMMARY OF THE METHOD

2.1. Extraction: At a minimum, a mixture of all 2,3,7,8-substituted ^{13}C-labeled PCDD/PCDF standards is spiked into a sample containing up to 50g (dry weight) of sample (Table 1). The samples are homogenized prior to extraction. The samples are extracted with either a Soxhlet/Dean-Stark (SDS) extractor for a minimum of 16 hours (an application of shorter extraction time may be possible if the cycle rate is increased accordingly) or other extraction techniques proven to have a similar or better extraction efficiency and do not have measurable carry-over effects. The raw extract is split to create a retainer for potential re-analysis.

2.2. Cleanup: After extraction the sample extracts are concentrated and an aliquot is processed using simplified and especially adapted adsorption chromatographic cleanup method.

2.3. Concentration: After cleanup, the extract is concentrated to dryness, an internal standard is added to each extract, and the extract is injected into the gas chromatograph.

2.4. Determination: The target analytes are separated by the GC and detected by a mass spectrometer. Two exact m/z's are monitored for each analyte and standard.

2.5. Identification: the target PCDD/PCDF are identified by comparing the GC retention time and ion-abundance ratio of two exact m/z's with the retention time of the corresponding ^{13}C labeled standard and the theoretical or acquired ion-abundance ratio of the two exact m/z's.

2.6. Quantitation: Quantitative analysis is performed using selected ion current profile (SICP) areas: For the target PCDDs/PCDFs, the GC/MS system is calibrated, and the concentration of each compound is determined using the isotope dilution technique.

2.7. The quality of the analysis is assured through an initial calibration and initial testing of the extraction and cleanup performance (IPR).

2.8. In addition to section 2.7, a daily calibration check (calibration verification), a detection verification standard (DVS), a method blank, and an OPR (on-going precision and recovery) will be performed and SQC-charts may be developed.

3. CONTAMINATION AND INTERFERENCES

3.1. Solvents, reagents, glassware, and other sample processing hardware may yield artifacts and/or elevated baselines causing misinterpretation of chromatograms. Specific selection of reagents and purification of solvents may be required. Where possible, reagents are cleaned by extraction or solvent rinse.

3.2. Proper cleaning of glassware is extremely important, because glassware may not only contaminate the samples but may also remove the analytes of interest by adsorption on the glass surface.

3.3. Glassware should be rinsed with solvent as soon after use as is practical. Sonication of glassware containing a detergent solution for approximately 30 seconds may aid in cleaning.

3.4. If performing a detergent wash, glassware should be rinsed at a minimum with acetone.

3.5. Baking of the glassware can be used to effectively clean glassware and may be particularly warranted after dirty and/or highly contaminated samples are encountered to avoid carry-over.

3.6. All materials used in the analysis shall be free from interferences at significant levels. To monitor interferences, a method blank will be analyzed with each sample batch.

3.7. Interferences co-extracted from samples may be present at concentrations several orders of magnitude higher than the PCDDs/PCDFs. The cleanup step options given in Section 10 are used to reduce or eliminate these interferences for the target analytes and thereby permit reliable determination of the target PCDDs/PCDFs.

4. SAFETY

4.1 This method does not address all safety issues associated with its use. The laboratory is responsible for maintaining a safe work environment and a current awareness file of OSHA regulations regarding the safe handling of the chemicals listed in this method. A reference file of material safety data sheets (MSDSs) should be available to all personnel involved in the chemical analysis of samples suspected to contain PCDDs/PCDFs.

4.2 Because of the extreme toxicity of many of these compounds, the analyst must take the necessary precautions to prevent exposure to materials known or believed to contain PCDDs or PCDFs. It is the responsibility of the laboratory personnel to ensure that safe handling procedures are employed.

4.3 The following safety practices are excerpts from EPA Method 1613, Sec. 5 (October 1994 version), amended as necessary for use in conjunction with this method. The 2,3,7,8-TCDD isomer has been found to be acnegenic, carcinogenic, and teratogenic in laboratory animal studies. Other PCDDs and PCDFs containing chlorine atoms in positions 2,3,7,8 are known to have toxicities comparable to that of 2,3,7,8-TCDD. The analyst should note that finely divided dry soils contaminated with PCDDs and PCDFs are particularly hazardous because of the potential for inhalation and ingestion. It is recommended that such samples be processed in a confined environment, such as a hood or a glove box. Laboratory personnel handling these types of samples should wear masks fitted with charcoal filters to prevent inhalation of dust.

4.4 The toxicity or carcinogenicity of each reagent used in this method is not precisely defined; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be kept to a minimum.

4.5 Each laboratory must develop a strict safety program for the handling of PCDDs and PCDFs. The laboratory practices listed below are recommended.

> 4.5.1 Contamination of the laboratory will be minimized by conducting most of the manipulations in a hood, or in a separate containment facility away from the main laboratory.
>
> 4.5.2 The effluents of sample splitters for the gas chromatograph and roughing pumps on the HRGC/HRMS system should pass through either a column of activated charcoal or be bubbled through a trap containing oil or high boiling alcohols.
>
> 4.5.3 Liquid waste should be dissolved in methanol or ethanol and irradiated with ultraviolet light at a wavelength less than 290 nm for several days (use F 40 BL lamps, or equivalent). Using this analytical method, analyze the irradiated liquid wastes and dispose of the solutions when 2,3,7,8-TCDD and 2,3,7,8-TCDF congeners can no longer be detected.

4.6 The following precautions for safe handling of 2,3,7,8-TCDD in the laboratory were issued by Dow Chemical U.S.A. (revised 11/78) and were amended for use in conjunction with this method. The following statements on safe handling are as complete as possible on the basis of available toxicological information. The precautions for safe handling and use are necessarily general in nature since detailed, specific recommendations can be made only for the particular exposure and circumstances of each individual use. Assistance in evaluating the health hazards of particular plant conditions may be obtained from certain consulting laboratories and from State Departments of Health or of Labor, many of which have an industrial health service. The 2,3,7,8-TCDD isomer is extremely toxic to certain kinds of laboratory animals. However, it has been handled for years without injury in analytical and biological laboratories. Many techniques used in handling radioactive and infectious materials are applicable

> 4.6.1 Protective equipment -- Disposable plastic gloves, apron or lab coat, safety glasses and laboratory hood adequate for radioactive work. However, PVC gloves should not be used.

4.6.2 Training -- Workers must be trained in the proper method of removing contaminated gloves and clothing without contacting the exterior surfaces.

4.6.3 Personal hygiene -- Thorough washing of hands and forearms after each manipulation and before breaks (coffee, lunch, and shift).

4.6.4 Confinement -- Isolated work area, posted with signs, segregated glassware and tools, plastic-backed absorbent paper on bench tops.

4.6.5 Waste -- Good technique includes minimizing contaminated waste. Plastic bag liners should be used in waste cans.

4.6.6 Disposal of hazardous wastes -- Refer to the November 7, 1986 issue of the Federal Register on Land Ban Rulings for details concerning the handling of dioxin containing wastes.

4.6.7 Decontamination of personnel -- Apply a mild soap with plenty of scrubbing action.

4.6.8 Glassware, tools and surfaces -- Chlorothene NU Solvent™ (Dow Chemical Company) is the least toxic solvent shown to be effective. Satisfactory cleaning may be accomplished by rinsing with chlorothene, then washing with a detergent and water. Dish water may be disposed to the sewer after percolation through a charcoal bed filter. It is prudent to minimize solvent wastes because they require special disposal through commercial services that are expensive.

4.6.9 Laundry -- Clothing known to be contaminated should be disposed according to the precautions of the source described under Sec. 5.6.6. Laboratory coats or other clothing worn in 2,3,7,8-TCDD work area may be laundered. Clothing should be collected in plastic bags. Persons who convey the bags and launder the clothing should be advised of the hazard and trained in proper handling. The clothing may be put into a washer without contact if the launderer knows the problem. The washer should be run through one full cycle before being used again for other clothing.

4.6.10 Wipe tests -- A useful method for determining cleanliness of work surfaces and tools is to wipe the surface with a piece of filter paper, extract the filter paper and analyze the extract. NOTE: A procedure for the collection, handling, analysis, and reporting requirements of wipe tests performed within the laboratory is described in Appendix A of Method 8290. The results and decision-making processes are based on the presence of 2,3,7,8-substituted PCDDs/PCDFs.

4.6.11 Inhalation -- Any procedure that may generate airborne contamination must be carried out with good ventilation. Gross losses to a ventilation system must not be allowed. Handling of the dilute solutions normally used in analytical and animal work presents no significant inhalation hazards except in case of an accident.

4.6.12 Accidents -- Remove contaminated clothing immediately, taking precautions not to contaminate skin or other articles. Wash exposed skin vigorously and repeatedly until medical attention is obtained.

4.7 It is recommended that personnel working in laboratories where PCDDs/PCDFs are handled be given periodic physical examinations (at least annually). Such examinations should include specialized tests, such as those for urinary porphyrins and for certain blood parameters which, based upon published clinical observations, are appropriate for persons who may be exposed to PCDDs/PCDFs. Periodic facial photographs to document the onset of dermatologic problems are also advisable.

5. APPARATUS AND MATERIALS

Note: Brand names, suppliers, and part numbers are for illustration purposes only and no endorsement is implied. Equivalent performance may be achieved using apparatus and materials other than those specified here. Meeting the performance requirements of this method is the responsibility of the laboratory.

5.1. Equipment for Glassware Cleaning

5.1.1. Laboratory sink with overhead fume hood.

5.1.2. Kiln (optional)

5.2. Equipment for Sample Preparation

5.2.1. Laboratory fume hood of sufficient size to contain the sample preparation equipment.

5.2.2. Glove box (optional).

5.2.3. Top loading balance for samples: Capable of weighing to 0.01 g. Analytical balance capable of weighing 0.001 g (optional)

5.2.4. Aluminum weighing boats.

5.2.5. Spatulas: Stainless steel.

5.3. Extraction Apparatus

5.3.1. Soxhlet/Dean-Stark (SDS) extractor

5.3.1.1. Soxhlet: 50mm ID, 200mL capacity with 500mL flask (Cal-Glass LG–6900, or equivalent, except substitute 300mL round-bottom flask 500mL flat-bottom flask).

5.3.1.2. Thimble: 30 × 100 to fit Soxhlet (Whatman Glass Microfibre thimbles, or Cal-Glass LG–6901–122, or equivalent).

5.3.1.3. Moisture trap: Dean Stark or Barret with fluoropolymer stopcock, to fit Soxhlet.

5.3.1.4. Heating mantle: Hemispherical, to fit 300mL round-bottom flask (Cal-Glass LG–8801–112, or equivalent).

5.3.1.5. Variable transformer: Powerstat (or equivalent), 110 volt, 10 amp.

5.3.2. Beakers: Assorted volumes.

5.3.3. Spatulas: Stainless steel

5.3.4. Extract storage: assorted sample vials

5.4. Cleanup Apparatus.

5.4.1. Laboratory Oven: For baking and storage of adsorbents, capable of maintaining a constant temperature (±5°C) in the range of 100–250°C.

5.4.2. Tube furnace with heating range from 100 - 250°C

5.4.3. Disposable glass tubes: approximately 25 cm in length and 1 mm in diameter

5.5. Concentration Apparatus.

5.5.1. Nitrogen blowdown apparatus: Equipped with water bath controlled in the range of 30–60°C (N-Evap, Organomation Associates, Inc., South Berlin, MA, or equivalent), installed in a fume hood.

5.5.2. Sample Vials.

5.5.2.1. Glass: 2–5mL with fluoropolymer-lined screw-cap.

5.5.2.2. Glass: 0.3mL, conical, with fluoropolymer-lined screw or crimp cap.

5.6. Gas Chromatograph: Shall have splitless or on-column injection port for capillary column, temperature program with isothermal hold, and shall meet all of the performance specifications in Section 10.

5.6.1. GC column for PCDDs/PCDFs: for instance 30±5m long × 0.32±0.02mm ID; 0.25µm silicone bonded-phase fused-silica capillary column (e.g. DB–5MS, or equivalent). An attached guard column is recommended.

5.7. Mass Spectrometer: low or high resolution mass spectrometry capable of analyzing the target PCDD/PCDF

5.7.1. Data System: Capable of collecting, recording, and storing MS data.

6. REAGENTS AND STANDARDS

6.1. Extraction.

6.1.1. Solvent: Acetone, toluene, benzene, hexane, methanol, ethyl acetate, methylene chloride, and nonane; distilled in glass, HPLC grade or better recommended

6.1.2. White quartz sand, 60/70 mesh: For Soxhlet/Dean-Stark extraction (Aldrich Chemical, Cat. No. 27–437–9, or equivalent). Bake at 450°C for four hours minimum or extract for 16 hours with benzene or toluene.

6.2. Adsorbents for Sample Cleanup.

6.2.1 Silica gel

6.2.1.1 Activated silica gel—100-200 mesh, Supelco 1-3651 (or equivalent), rinsed with methanol and methylene chloride (optional), baked at approximately 180°C for a minimum of one hour, cooled in a dessicator, and stored in a precleaned glass bottle with screwcap that prevents moisture from entering.

6.2.1.2 Acid silica gel (44% w/w)—Thoroughly mix 44.0 g of concentrated sulfuric acid with 56g of activated silica gel in a clean container. Break up aggregates with a stirring rod until a uniform mixture is obtained. Store in a bottle with a fluoropolymer-lined screw-cap.
6.2.1.3 Basic silica gel—Thoroughly mix 30 g of 1N sodium hydroxide with 100 g of activated silica gel in a clean container. Break up aggregates with a stirring rod until a uniform mixture is obtained. Store in a bottle with a fluoropolymer-lined screw-cap.

6.2.2. Carbon.

6.2.2.1. Carbopak B: (Supelco 20274, or equivalent).

6.2.2.2. Celite 545: (Supelco 2–0199, or equivalent).

6.2.2.3. Thoroughly mix Carbopak B and Celite 545 to produce an 18% w/w mixture (Carbopack B/Celite 545). Extract the mixture in toluene for at least 16 hours. Dry the mixture above 130°C for a minimum of six hours. Store in a dessicator.

6.3. Reference Matrices: Playground sand or similar material. Prepared by extraction with benzene or toluene and/or baking at 450°C for a minimum of four hours and spiked with the PAR solution (see section 6.7.)

6.4. Standard Solutions: Purchased as solutions or mixtures with certification of their purity, concentration, and authenticity, or prepared from materials of known purity and composition. If the chemical purity is 98% or greater, the weight may be used without correction to compute the concentration of the standard. When not being used, standards should be stored in the dark at room temperature in screw-capped vials with fluoropolymerlined caps. A mark is placed on the vial at the level of the solution so that solvent loss by evaporation can be detected. If solvent loss has occurred, the solution should be replaced.

6.5. Selected isomer standard solutions: The 13 target congeners for the fast analysis of the MAS samples are 2,3,7,8-TCDD; 2,3,7,8-TCDF; 1,2,3,7,8-PeCDD; 2,3,4,7,8-PeCDF; 1,2,3,4,7,8 +1,2,3,6,7,8-HxCDD; 1,2,3,7,8,9-HxCDD; 1,2,3,4,7,8 +1,2,3,6,7,8-HxCDF; 1,2,3,4,6,7,8-HpCDD; 1,2,3,4,6,7,8-HpCDF; OCDD; OCDF. These are referred to as “target PCDDs/PCDFs” in this method.

6.6. Stock Solutions.

6.6.1. Preparation: Prepare in nonane per the steps below or purchase as dilute solutions (Cambridge Isotope Laboratories (CIL), Woburn, MA, or equivalent). Observe the safety precautions in Section 4, and the recommendation in Section 4.2. Alternatively purchased certified reference standards may be used.

6.6.2. Dissolve an appropriate amount of assayed reference material in solvent. For example, weigh 1–2mg of 2,3,7,8-TCDF to three significant figures in a 10mL ground-glass-stoppered volumetric flask and fill to the mark with nonane. After the TCDF is completely dissolved, transfer the solution to a clean 15mL vial with fluoropolymerlined cap.

6.6.3. Stock standard solutions should be checked for signs of degradation prior to the preparation of calibration or performance test standards. Reference standards that can be used to determine the accuracy of calibration standards are available from CIL and may be available from other vendors.

6.7. Precision and Recovery (PAR) Stock Solution

6.7.1. Used for determination of initial and ongoing precision and recovery

6.7.2. PCDDs/PCDFs: Using the solutions in Section 6.6 or purchased solutions, prepare the PAR stock solution to contain the PCDDs/PCDFs at the concentrations shown in Table 2.

6.8. Labeled Compound Spiking Solution.

6.8.1. PCDDs/PCDFs: From stock solutions, or from purchased mixtures, prepare this solution to contain the labeled compounds in nonane at the concentrations shown in Table 2.

6.9. Internal (injection) Standard

6.9.1. Prepare the internal standard solution to contain any $^{13}C_{12}$-labeled PCDD/PCDF-standard other than the PCDD/PCDF standards in nonane at the concentration shown in Table 2.

6.10. Calibration Standards (CS1 through CS5): Combine the solutions in Sections 6.6 through 6.9 to produce a minimum of five calibration solutions in nonane (Table 3). These solutions permit the relative responses (labeled to native) and response factors to be measured as a function of concentration. A standard close to the middle of the calibration range should be used for calibration verification (VER).

6.11. Detection Verification Standard (DVS): A standard at the low end of the calibration curve that will be run daily (24-hour) to determine the daily quantification level. Sample concentrations determined from peak areas below the DVS peak areas will be flagged.

6.12. Stability of Solutions: Standard solutions used for quantitative purposes should be analyzed periodically, and should be assayed against reference standards.

6.13. Quality Check standard (QC): a standard, containing at a minimum, the analytes of interest obtained from a source independent of solution used for the calibration curve.

7. SAMPLE COLLECTION, PRESERVATION, STORAGE, AND HOLDING TIMES

7.1. Collect samples in amber glass containers following guidelines put forth in the project QAPP.

7.2. Maintain solid samples in the dark at <-10 °C.

7.3. Sample extracts, will be kept long term, at room temperature in the dark with the volume marked.

8. QUALITY ASSURANCE/QUALITY CONTROL

8.1. The analyst shall make an initial demonstration of the ability to generate acceptable accuracy and precision with this method.

8.2. Analyses of method blanks are required to indicate freedom from significant contamination.

8.3. The laboratory shall spike all samples with labeled compounds to monitor method performance.

8.4. The laboratory shall, on an ongoing basis, demonstrate through calibration verification and the analysis of the ongoing precision and recovery aliquot that the analytical system is in control.

8.5. The laboratory shall maintain records to define the quality of data that is generated.

8.6. Initial Precision and Recovery (IPR): To establish the ability to generate acceptable precision and recovery, the analyst shall perform the following operations. Alternatively, an analyst can perform sections of the procedure and therefore be qualified to run those steps of this procedure.

8.6.1. Analyze four aliquots of reagent sand spiked with the diluted labeled compound spiking solution and the PAR standard (10 μL for both solutions based on Table 2 concentrations). All sample processing steps that are to be used for processing samples, including preparation, extraction, and cleanup, shall be included in this test.

8.6.2. Using results of the set of four analyses, compute the average concentration (X) of the extracts and the standard deviation of the concentration (s) for each target compound, by isotope dilution for the PCDDs/PCDFs with a labeled analog.

8.6.3. For each target PCDD/PCDF compound, compare s and X with the corresponding limits for initial precision and recovery in Table 4. If s and X for all compounds meet the acceptance criteria, system performance is acceptable and analysis of blanks and samples may begin. If, however, any individual s exceeds the precision limit or any individual X falls outside the range for accuracy, system performance is unacceptable for that compound. Correct the problem and repeat the test.

8.7. The laboratory shall spike all samples with labeled compound spiking solution to assess method performance on the sample matrix for the target compounds.

8.7.1. Analyze each sample according to the procedures outlined below.

8.7.2. Compute the percent recovery of the labeled target compounds using the internal standard method.

8.7.3. The recovery of each labeled target compound should be within the limits in Table 5. If the recovery of any compound falls outside of these limits, an assessment of the acceptability will be done. The assessment of acceptability will involve determining the peak height of the labeled compound. If the peak height is greater than 10:1 signal:noise (meaning quantifiable) the recovery will be deemed acceptable and reported with a flag. If the peak height is below 10:1, the value will not be reported and action to correct the problem will need to be taken.

8.8. Recovery of labeled target compounds from samples should be assessed and records should be maintained.

8.9. Method Blanks: Reference matrix method blanks are analyzed to indicate freedom from significant contamination.

8.9.1. Prepare, extract, clean up, and concentrate a method blank with each sample batch (samples started through the extraction process on the same 12-hour shift). The matrix for the method blank shall be sand. Analyze the blank immediately after analysis of the OPR to indicate freedom from significant contamination.

8.9.2. If any of the target PCDD/PCDFs is found in the blank at a significant level, the result will be flagged and an assessment of the acceptability will be done.

8.10. The specifications contained in this method can be met if the apparatus used is calibrated properly and then maintained in a calibrated state. The standards used for calibration, calibration verification, and for initial and ongoing precision and recovery should be identical, so that the most precise results will be obtained. A GC/MS instrument will provide the most reproducible results if dedicated to the settings and conditions required for the analyses of PCDDs/PCDFs by this method.

8.11. A QC standard will be analyzed after the initial calibration curve has been built.

9. CALIBRATION

9.1. Suggested GC operating conditions for a 30m DB-5MS column:

9.1.1. Injector: temperature 250°C, constant pressure 12 psi

9.1.2. Interface temperature: 280°C

9.1.3. Initial temperature: 120°C

9.1.4. Initial time: One minute

9.1.5. Temperature program:

9.1.5.1. 120 to 240°C, at 40°C/minute

9.1.5.2. 240 to 295°C, at 5°C/minute

9.1.5.3 295 to 325°C, at 30°C/minute

9.1.5.4. 325°C for 6.5 minutes

9.1.6. Optimize GC and MS conditions for compound sensitivity. Once optimized, the same GC conditions must be used for the analysis of all standards, blanks, IPR and OPR aliquots, and samples.

As long as all method QC and project requirements are met the GC conditions should be optimized for short analysis times.

9.2. Ion Abundance Ratios, Minimum Levels: Choose an injection volume of either 1µL or 2µL, consistent with the capability of the HRGC/MS instrument. Inject a 1µL or 2µL aliquot of the Detection Verification Standard (DVS) solution using the GC/MS conditions listed above.

9.2.1. Measure the SICP areas for each target analyte, and compute the ion abundance ratios at the m/z's specified in Table 6. Compare the computed ratio to the theoretical ratio given in Table 6.

9.2.2. All target PCDDs/PCDFs and labeled target compounds in the DVS standard shall be within the QC limits in Table 6 for their respective ion abundance ratios; otherwise, the mass spectrometer shall be adjusted and this test repeated until the m/z ratios fall within the limits specified .

9.3. Isomer Specificity. Target analyte co-elutions can be accepted as long as the TEQ values are biased high and the interferences are known and limited.

9.3.1. Check system performance ensuring adequate separation between the ^{13}C 2378-TCDF and the native 2378-TCDD.

9.3.2. Ensure that all target analytes are detected in VER standard in the proper windows.

9.4. Calibration by Isotope Dilution: Isotope dilution calibration is used for the target PCDDs/PCDFs for which the labeled compounds are added to samples prior to extraction.

9.4.1. A calibration curve encompassing the concentration range is prepared for each compound to be determined. The relative response (RR) (labeled to native) vs. concentration in standard solutions is plotted or computed using a linear regression. Relative response is determined according to the procedures described below. At a minimum a five point calibration is employed.

9.4.2. The response of each target PCDD/PCDF relative to a labeled analog is determined using the area responses of either the primary or secondary exact m/z's specified in Table 6, for each calibration standard, as follows:

RR1 = (A1n/A21)(Cl/Cn)
RR2 = (A2n/A21)(Cl/Cn)

where:

A1n and A2n = The areas of the primary and secondary m/z's for the PCDD/PCDF.
A21 = The area of the primary or secondary m/z's for the labeled compound.
Cl = The concentration of the labeled compound in the calibration standard (Table 4).
Cn = The concentration of the native compound in the calibration standard (Table 4).

9.4.3. To calibrate the analytical system by isotope dilution, inject a volume of calibration standards CS1 through CS5. Compute the relative responses (RR1 and RR2) at each concentration.

9.4.4. Linearity: If the relative response for any compound is constant (less than 20% coefficient of variation) over the five-point calibration range, an averaged relative response may be used for that compound; otherwise, the complete calibration curve for that compound shall be used over the five-point calibration range.

9.5. Data Storage: MS data shall be collected, recorded, and stored.

9.5.1. Data acquisition: The signal at each exact m/z shall be collected repetitively throughout the monitoring period and stored on a mass storage device.

9.5.2. Response factors and multipoint calibrations: The data system shall be used to record and maintain lists of response factors (response ratios for isotope dilution) and multipoint calibration curves. Computations of relative standard deviation (coefficient of variation) shall be used to test calibration linearity. Statistics on initial performance and ongoing performance should be computed and maintained, either on the instrument data system, or on a separate computer system.

10. PROCEDURE

10.1. Sample Preparation

10.1.1. Sample preparation involves modifying the physical form of the sample so that the PCDDs/PCDFs can be extracted efficiently.

10.1.2. For samples known or expected to contain high levels of the PCDDs/PCDFs, the smallest sample size representative of the entire sample should be used.

10.1.3. For all samples, the blank and IPR/OPR aliquots must be processed through the same steps as the sample to check for contamination and losses in the preparation processes. If the set contains a field duplicate, it must also be processed through the same steps as the other samples in the batch.

10.1.4. Sample Sub-Dividing

10.1.4.1. The homogenization, or blending procedures may be carried out in fume hood to prevent particles from contaminating the work environment.

10.1.4.2. Mixing: Place sample in a zip-lock plastic bag. Thoroughly homogenize the sample for several minutes until completely mixed. Take care to exclude plant material and obvious rocks or other non-representative components before mixing. Treat the blank and reference matrix aliquots using a clean spatula.

10.1.4.3. Homogenization or blending: Particles that are not ground effectively, or particles greater than 1mm in size after grinding, may often be reduced in size by high speed homogenization or blending.

10.1.4.4. Each size-reducing preparation procedure shall be verified before the procedure is employed routinely.

10.2. Sample spiking

10.2.1. Weigh 10-50g of the homogenized or blended sample into a soxhlet thimble.
10.2.2. Decant excess water. If necessary to remove water, filter the sample through a glass-fiber filter and discard the aqueous liquid.

10.2.3. Spike an appropriate amount of the diluted labeled compound spiking solution into the sample (See Table 2).

10.2.4. For each sample or sample batch to be extracted during the same 12 hour shift weigh out two 10-50g aliquots of the sand reference matrix in clean soxhlet thimbles.

10.2.5. Spike an appropriate amount of the diluted labeled compound spiking solution into each reference matrix aliquot (See Table 2). One aliquot will serve as the method blank. Spike an appropriate amount of the PAR solution into the other reference matrix aliquot (See Table 2). This will serve as the OPR.

10.3. Extraction

10.3.1. SDS Extraction

10.3.1.1. Charge a clean extraction thimble with the sample and spike according to section 10.2.

10.3.1.2. Place the thimble in a clean extractor. Place 30-40mL of toluene or benzene in the receiver and 200-300mL of toluene or benzene in the flask with boiling stones added.

10.3.1.3. Assemble the SDS apparatus, and apply power to the heating mantle to begin refluxing. Adjust the reflux rate to match the rate of percolation through the sample until water removal lessens the restriction to toluene or benzene flow. Frequently check the apparatus for foaming during the first two hours of extraction. If foaming occurs, reduce the reflux rate until foaming subsides.

10.3.1.4. Drain the water from the receiver at one to two hours and/or eight to nine hours, or sooner if the receiver fills with water. Reflux the sample for a minimum of 16 hours.

10.3.1.5. Drain the water from the Dean-Stark receiver

10.3.1.6. Concentrate the extract using one of the macro-concentration procedures.

10.4. Macro-Concentration

10.4.1. Extracts in benzene or toluene are concentrated using a heating mantle

10.4.2. Turn heating mantle off. Disassemble SDS apparatus once it has cooled for approx. 10 minutes. Leave round flat bottom flasks in heating mantle with sample and prepare them for boil down. Place a vigreaux in each flask and set mantle to desired temp. Boil sample to 20ml or under. Pour sample into pre-marked 40 ml vial and bring final volume to 40ml using hexane.

10.5. Extract Cleanup

10.5.1 Acid Silica column

10.5.1.1. Insert glass wool plug into a disposable pipette. In the following manner, add approximately 0.5 g of dried silica, 0.5 g of acid silica, and 0.2 g of dried silica into the pipette.

10.5.2. Carbon Column.

10.5.2.1. Insert a glass-wool plug at one end of the disposable glass tube, and pack the column with 0.55g +/- 0.05 grams of Carbopak/Celite to form an adsorbent bed approximately 2cm long. Insert a glass-wool plug on top of the bed to hold the adsorbent in place. With a marker, mark one end of the tube.

10.5.3. Two column clean-up using Acid Silica and Carbon Columns

10.5.3.1. Set up column system that the acid silica column drains into the carbon column (make sure mark on carbon column is on top). Pre-elute the columns by adding approximately 10mL of benzene or toluene to the acid column which drains into the carbon column. Add additional 10mL of 50/50 hexane/methylene chloride to the carbon column.

10.5.3.2. Apply not more than 20mL of the sample extract to the column (if less than 20mL of the sample extract is added to the column, after the column drains, apply additional hexane so that the sample extract and hexane amount totals 20mL). Apply 5 mL of hexane to complete the elution. Discard acid column

10.5.3.3. Invert the carbon column (mark on carbon column on bottom), and wash the column with 10mL of 50/50 hexane/methylene chloride. Discard the eluate. Elute the PCDDs/PCDFs with 10mL of toluene. If carbon particles are present in the eluate, filter through glass-fiber filter paper or glass wool.

10.5.3.4. Concentrate the eluate for further cleanup or injection into the GC/MS.

10.6. Micro-Concentration and Solvent Exchange.

10.6.1. Transfer the vial containing the sample extract to a nitrogen blowdown device. Adjust the flow of nitrogen so that the surface of the solvent is visibly disturbed.

10.6.2. Lower the vial into a 40-60°C water bath and continue concentrating to dryness.

10.6.3. Transfer sample by adding hexane into a 0.3mL conical vial for final concentration

10.6.4. Evaporate to dryness in the conical vial

10.6.5. Add a known amount (e.g. 20µL) of the appropriate injection standard to the vial. Seal the vial and label with the sample number. If an extract is to be reanalyzed and evaporation has occurred, do not add more instrument internal standard solution. Rather, bring the extract back to its previous volume with nonane.

10.7. HRGC/LRMS Analysis

10.7.1. Establish the operating conditions.

10.7.2. Inject 1.0µL or 2.0µL of the concentrated extract containing the internal standard solution, using on-column or splitless injection. The volume injected must be identical to the volume used for calibration. Start the GC column initial isothermal hold upon injection. Start MS data collection after the solvent peak elutes. Stop data collection after the last peaks of interest have eluted. Return the column to the initial temperature for analysis of the next extract or standard.

10.8. System and Laboratory Performance

10.8.1. For each 12-hour shift where analyses are performed, GC/MS system performance and calibration are verified for all target PCDDs/PCDFs and labeled target compounds. Adjustment and/or recalibration shall be performed until all performance criteria are met. Only after all performance criteria are met samples, blank, and OPR may be analyzed.

10.8.2. Calibration Verification.

10.8.2.1. Inject the DVS and VER standard.

10.8.2.2. The m/z abundance ratios for all target PCDDs/PCDFs shall be within the limits in Table 6; otherwise, the mass spectrometer shall be adjusted until the m/z abundance ratios fall within the limits specified, and the verification test shall be repeated.

10.8.2.3. For VER, compute the concentration of each target PCDD/PCDF compound by isotope dilution.

10.8.2.4. For each target compound, compare the concentration with the calibration verification limit in Table 4. If all target compounds meet the acceptance criteria, calibration has been verified and analysis of standards and sample extracts may proceed. If, however, any target compound fails its respective limit, the measurement system is not performing properly for that compound. In this event, prepare a fresh calibration standard or correct the problem causing the failure and repeat the verification test, or recalibrate.

10.8.3. Ongoing Precision and Recovery.

10.8.3.1. Analyze the extract of the ongoing precision and recovery (OPR) aliquot prior to analysis of samples from the same batch.

10.8.3.2. Compute the concentration of each target PCDD/PCDF by isotope dilution. Compute the concentration of each labeled target compound by the internal standard method.

10.8.3.3. For each target PCDD/PCDF, compare the concentration with the OPR limits given in Table 4. If all target compounds meet the acceptance criteria, system performance is acceptable and analysis of blanks and samples may proceed. If, however, any individual target compound concentration falls outside of the range given, the extraction/concentration process may have been performed improperly for that compound. In this event, the result will be flagged and an assessment of the acceptability will be done.

10.8.3.4. Blank: Analyze the method blank extracted with each sample batch immediately following analysis of the OPR aliquot to indicate freedom from significant contamination and freedom from significant carryover from the OPR analysis.

10.9. Qualitative Determination

10.9.1. A PCDD, PCDF, or labeled compound is identified in a standard, blank, or sample when all of the criteria below are met.

10.9.2. The signals for the two m/z's in Table 6 must be present and must maximize within the same two seconds.

10.9.3. The signals for the native m/z's must maximize within the two seconds of the corresponding 13C-standard.

10.9.4. The ratio of the integrated areas of the two m/z's specified in Table 6 must be within the limit in Table 6, or within ±15% of the ratio in the midpoint calibration.

10.10. Quantitative Determination.

10.10.1. Isotope Dilution Quantitation: By adding a known amount of a labeled compound to every sample prior to extraction, correction for recovery of the PCDD/PCDF can be made because the PCDD/PCDF and its labeled analog exhibit similar effects upon extraction, concentration, and gas chromatography. Relative response (RR) values are used in conjunction with the initial calibration data to determine concentrations directly, as long as labeled compound spiking levels are constant, using the following equation:

C1ex (pg/g) = [((A1n/A21)*Cl)/RR1]/sample weight dry (g)
C2ex (pg/g) = [((A2n/A21)*Cl)/RR2]/sample weight dry (g)

where:

A1n and A2n = The areas of the primary and secondary m/z's for the PCDD/PCDF.
A2l = The area of the primary or secondary m/z's for the labeled compound.
Cl = The amount in pg of the labeled compound in the calibration standard (Table 4).
Cnex = The concentration (pg/g) of the PCDD/PCDF in the sample.

10.10.2 Reporting Concentrations:

10.10.2.1 If C1ex and C2ex are within 15% RPD (relative percent difference), average the two values for reporting final concentration. If the values do not agree within 15% then report the lower value and the value will be flagged.

10.11. Internal Standard Quantitation and Labeled Compound Recovery.

10.11.1. Compute the concentrations of 13C-labeled analogs in the extract using the response factors determined from the initial calibration data and the following equation:

RRF = (A1is/A2ij)*(Aij/Ais)

% recovery = (A1iss/A2ijs)*(Aij/Amis)/RRF*Af

A1is - area of internal standard in calibration standard
A1iss - area of internal standard in sample
A2ij – area of injection standard in calibration standard
A2ijs – area of injection standard in sample
Aij – amount of injection standard in pg
Ais – amount of internal standard in pg
Amis – amount of internal standard in pg in the sample
Af – aliquot factor (taking into account the aliquot taken in step 10.5.3.2.). Value will always be 1 or greater

10.11.2. If the SICP area at either quantitation m/z for any compound exceeds the calibration range, determine if the value is within the linear range of the instrument. If the SICP area is within the linear range of the instrument, no further dilution is necessary and the value will be flagged as outside the calibration range but within the linear range of the instrument. If the SICP area is not within the linear range of the instrument, dilute the extract until the SICP area is within the linear range of the instrument.

10.11.3. Results are reported to three significant figures for the PCDDs/PCDFs and two significant figures for recovery rate found in the OPR, blank, and samples.

10.12. Reporting units

10.12.1. Report results in ng/kg based on the dry weight of the sample. Also calculate and report TEQ for the target analytes and an estimated total TEQ (ETEQ).

10.13. Reporting level

10.13.1. Data will be reported down to the sample specific estimated detection level. In general, the method should be able to achieve the estimated detection limits listed in Table 8.

10.14. Polychlorinated Diphenyl Ethers: For the purposes of this method polychlorinated diphenyl ethers will be quantified as polychlorinated dibenzofurans resulting in a high ETEQ bias.

11. POLLUTION PREVENTION

11.1. The solvents used in this method pose little threat to the environment when managed properly. The solvent evaporation techniques used in this method are amenable to solvent recovery, and it is recommended that the laboratory recover solvents wherever feasible.

11.2. Standards should be prepared in volumes consistent with laboratory use to minimize disposal of standards.

12. WASTE MANAGEMENT

12.1. It is the laboratory's responsibility to comply with all federal, state, and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions, and to protect the air, water, and land by minimizing and controlling all releases from fume hoods and bench operations. Compliance is also required with any sewage discharge permits and regulations.

12.2. The PCDDs/PCDFs decompose above 800°C. Low-level waste such as absorbent paper, tissues, animal remains, and plastic gloves may be burned in an appropriate incinerator. Gross quantities (milligrams) should be packaged securely and disposed of through commercial or governmental channels that are capable of handling extremely toxic wastes.

12.3. Liquid or soluble waste should be dissolved in methanol or ethanol and irradiated with ultraviolet light with a wavelength shorter than 290 nm for several days. Use F40 BL or equivalent lamps. Analyze liquid wastes, and dispose of the solutions when the PCDDs/PCDFs can no longer be detected.

12.4. Further information on waste management, consult "The Waste Management Manual for Laboratory Personnel" and "Less is Better—Laboratory Chemical Management for Waste Reduction," available from the American Chemical Society's Department of Government Relations and Science Policy, 1155 16th Street N.W., Washington, D.C. 20036.

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14. TABLES AND FIGURES

Table 1

Chlorinated Dibenzo-p-Dioxins and Furans Determined by Isotope Dilution and Internal Standard High Resolution Gas Chromatography (HRGC)/Low Resolution Mass Spectrometry (LRMS)

PCDD/PCDF	CAS Registry
2,3,7,8-TCDD	1746-01-6
2,3,7,8-TCDF	51207-31-9
1,2,3,7,8-PeCDD	40321-76-4
1,2,3,7,8-PeCDF	57117-41-6
2,3,4,7,8-PeCDF	57117-31-4
1,2,3,4,7,8-HxCDD	39227-28-6
1,2,3,6,7,8-HxCDD	57653-85-7
1,2,3,7,8,9-HxCDD	19408-74-3
1,2,3,4,7,8-HxCDF	70648-26-9
1,2,3,6,7,8-HxCDF	57117-44-9
2,3,4,6,7,8-HxCDF	60851-34-5
1,2,3,7,8,9-HxCDF	72918-21-9
1,2,3,4,6,7,8-HpCDD	35822-46-9
1,2,3,4,6,7,8-HpCDF	67562-39-4
1,2,3,4,7,8,9-HpCDF	55673-89-7
OCDD	3268-87-9
OCDF	39001-02-0
13C-2,3,7,8-TCDD	76523-40-5
13C-2,3,7,8-TCDF	89059-46-1
13C-1,2,3,7,8-PeCDD	109719-79-1
13C-1,2,3,7,8-PeCDF	109719-77-9
13C-2,3,4,7,8-PeCDF	116843-02-8
13C-1,2,3,4,7,8-HxCDD	109719-80-4
13C-1,2,3,6,7,8-HxCDD	109719-81-5
13C-1,2,3,7,8,9-HxCDD	109719-82-6
13C-1,2,3,4,7,8-HxCDF	114423-98-2
13C-1,2,3,6,7,8-HxCDF	116843-03-9
13C-2,3,4,6,7,8-HxCDF	116843-05-1
13C-1,2,3,7,8,9-HxCDF	116843-04-0
13C-1,2,3,4,6,7,8-HpCDD	109719-83-7
13C-1,2,3,4,6,7,8-HpCDF	109719-84-8
13C-1,2,3,4,7,8,9-HpCDF	109719-94-0
13C-OCDD	114423-97-1
13C-OCDF	109719-78-0

Table 2

Concentration of Stock and Spiking Solutions Containing PCDDs/PCDFs and Labeled Compounds

	Labeled Spiking solution (ng/mL)	PAR Stock Solution (ng/mL)	Injection Standard (ng/mL)	Labeled Spiked Amount (ng)	PAR Spiked Amount (ng)
PCDD/PCDF					
2,3,7,8-TCDD		1000			10
2,3,7,8-TCDF		1000			10
1,2,3,7,8-PeCDD		2500			25
1,2,3,7,8-PeCDF		2500			25
2,3,4,7,8-PeCDF		2500			25
1,2,3,4,7,8-HxCDD		2500			25
1,2,3,6,7,8-HxCDD		2500			25
1,2,3,7,8,9-HxCDD		2500			25
1,2,3,4,7,8-HxCDF		2500			25
1,2,3,6,7,8-HxCDF		2500			25
2,3,4,6,7,8-HxCDF		2500			25
1,2,3,7,8,9-HxCDF		2500			25
1,2,3,4,6,7,8-HpCDD		2500			25
1,2,3,4,6,7,8-HpCDF		2500			25
1,2,3,4,7,8,9-HpCDF		2500			25
OCDD		5000			50
OCDF		5000			50
13C-2,3,7,8-TCDD	1000, 10000			110	
13C-2,3,7,8-TCDF	1000			10	
13C-1,2,3,7,8-PeCDD	1000			10	
13C-1,2,3,7,8-PeCDF	1000			10	
13C-2,3,4,7,8-PeCDF	1000			10	
13C-1,2,3,4,7,8-HxCDD	1000			10	
13C-1,2,3,6,7,8-HxCDD	1000			10	
13C-1,2,3,7,7,9-HxCDD	1000			10	
13C-1,2,3,4,7,8-HxCDF	1000			10	
13C-1,2,3,6,7,8-HxCDF	1000			10	
13C-2,3,4,6,7,8-HxCDF	1000			10	
13C-1,2,3,7,8,9-HxCDF	1000			10	
13C-1,2,3,4,6,7,8-HpCDD	1000			10	
13C-1,2,3,4,6,7,8-HpCDF	1000			10	
13C-1,2,3,4,7,8,9-HpCDF	1000			10	
13C-OCDD	2000			20	
13C-OCDF	2000			20	
Injection Standard					
13C-1,2,7,8-TCDF			50		

Table 3

An Example Set of PCDDs/PCDFs in Calibration and Calibration Verification Solutions

PCDD/PCDF	CS1 (ng/mL)	CS2 (ng/mL)	CS3 (ng/mL)	CS4 (ng/mL)	CS5 (ng/mL)
2,3,7,8-TCDD	4	50	250	1000	5000
2,3,7,8-TCDF	4	50	250	1000	5000
1,2,3,7,8-PeCDD	10	125	625	2500	12500
1,2,3,7,8-PeCDF	10	125	625	2500	12500
2,3,4,7,8-PeCDF	10	125	625	2500	12500
1,2,3,4,7,8-HxCDD	10	125	625	2500	12500
1,2,3,6,7,8-HxCDD	10	125	625	2500	12500
1,2,3,7,8,9-HxCDD	10	125	625	2500	12500
1,2,3,4,7,8-HxCDF	10	125	625	2500	12500
1,2,3,6,7,8-HxCDF	10	125	625	2500	12500
2,3,4,6,7,8-HxCDF	10	125	625	2500	12500
1,2,3,7,8,9-HxCDF	10	125	625	2500	12500
1,2,3,4,6,7,8-HpCDD	10	125	625	2500	12500
1,2,3,4,6,7,8-HpCDF	10	125	625	2500	12500
1,2,3,4,7,8,9-HpCDF	10	125	625	2500	12500
OCDD	20	250	1250	5000	25000
OCDF	20	250	1250	5000	25000
13C-2,3,7,8-TCDD	10	10	10	10	10
13C-2,3,7,8-TCDF	10	10	10	10	10
13C-1,2,3,7,8-PeCDD	10	10	10	10	10
13C-1,2,3,7,8-PeCDF	10	10	10	10	10
13C-2,3,4,7,8-PeCDF	10	10	10	10	10
13C-1,2,3,4,7,8-HxCDD	10	10	10	10	10
13C-1,2,3,6,7,8-HxCDD	10	10	10	10	10
13C-1,2,3,7,8,9-HxCDD	10	10	10	10	10
13C-1,2,3,4,7,8-HxCDF	10	10	10	10	10
13C-1,2,3,6,7,8-HxCDF	10	10	10	10	10
13C-2,3,4,6,7,8-HxCDF	10	10	10	10	10
13C-1,2,3,7,8,9-HxCDF	10	10	10	10	10
13C-1,2,3,4,6,7,8-HpCDD	10	10	10	10	10
13C-1,2,3,4,6,7,8-HpCDF	10	10	10	10	10
13C-1,2,3,4,7,8,9-HpCDF	10	10	10	10	10
13C-OCDD	20	20	20	20	20
13C-OCDF	20	20	20	20	20

Table 4

Acceptance Criteria for Performance Tests

PCDD/PCDF	amount [ng]	S [ng]	x [ng]	OPR [ng]	OPR [%]	VER [ng/mL]	VER [%]
2,3,7,8-TCDD	10	2.8	8.3-12.9	6.7-15.8	67-158	80-120	80-120
2,3,7,8-TCDF	10	2.0	8.7-13.7	7.5-15.8	75-158	80-120	80-120
1,2,3,7,8-PeCDD	25	3.8	19-33	17-36	68-144	200-300	80-120
1,2,3,7,8-PeCDF	25	3.8	21-31	20-34	80-136	200-300	80-120
2,3,4,7,8-PeCDF	25	4.3	18-38	17-40	68-160	200-300	80-120
1,2,3,4(6),7,8-HxCDD	50	4.7	39-76	35-82	70-164	400-600	80-120
1,2,3,7,8,9-HxCDD	25	5.6	18-36	16-42	64-168	200-300	80-120
1,2,3,4(6),7,8-HxCDF	50	4.4	42-61	36-67	76-134	400-600	80-120
2,3,4,6,7,8-HxCDF	25	3.7	18-37	17-39	68-156	200-300	80-120
1,2,3,7,8,9-HxCDF	25	3.2	21-31	19-33	76-132	200-300	80-120
1,2,3,4,6,7,8-HpCDD	25	3.9	19-33	17-35	68-140	200-300	80-120
1,2,3,4,6,7,8-HpCDF	25	3.2	22-28	20-32	80-128	200-300	80-120
1,2,3,4,7,8,9-HpCDF	25	4.1	21-32	18-35	76-140	200-300	80-120
OCDD	50	10	44-64	39-72	78-144	400-600	80-120
OCDF	50	14	37-73	31-85	62-170	400-600	80-120

Table 5

Labeled Compound Recovery in Samples

PCDD/PCDF	lower limit [%]	upper limit [%]
13C-2,3,7,8-TCDD	5	100
13C-2,3,7,8-TCDF	5	100
13C-1,2,3,7,8-PeCDD	5	100
13C-1,2,3,7,8-PeCDF	5	100
13C-2,3,4,7,8-PeCDF	5	100
13C-1,2,3,4,7,8-HxCDD	5	100
13C-1,2,3,6,7,8-HxCDD	5	100
13C-1,2,3,7,8,9-HxCDD	5	100
13C-1,2,3,4,7,8-HxCDF	5	100
13C-1,2,3,6,7,8-HxCDF	5	100
13C-2,3,4,6,7,8-HxCDF	5	100
13C-1,2,3,7,8,9-HxCDF	5	100
13C-1,2,3,4,6,7,8-HpCDD	5	100
13C-1,2,3,4,6,7,8-HpCDF	5	100
13C-1,2,3,4,7,8,9-HpCDF	5	100
13C-OCDD	5	100
13C-OCDF	5	100

Table 6

Descriptors, M/Z's, M/Z Types, and Elemental Compositions, Theoretical Ion Abundance Ratios and QC Limits of the PCDDs and PCDFs

	selected ions	Theoretical Abundance	Control Limits
PCDD/PCDF			
2,3,7,8-TCDD	320/322	0.77	0.65 - 0.89
2,3,7,8-TCDF	304/306	0.77	0.65 - 0.89
1,2,3,7,8-PeCDD	356/358	1.53	1.30 - 1.76
1,2,3,7,8-PeCDF	340/342	1.53	1.30 - 1.76
2,3,4,7,8-PeCDF	340/342	1.53	1.30 - 1.76
1,2,3,4,7,8-HxCDD	390/392	1.22	1.04 - 1.40
1,2,3,6,7,8-HxCDD	390/392	1.22	1.04 - 1.40
1,2,3,7,8,9-HxCDD	390/392	1.22	1.04 - 1.40
1,2,3,4,7,8-HxCDF	374/376	1.23	1.05 - 1.42
1,2,3,6,7,8-HxCDF	374/376	1.23	1.05 - 1.42
2,3,4,6,7,8-HxCDF	374/376	1.23	1.05 - 1.42
1,2,3,7,8,9-HxCDF	374/376	1.23	1.05 - 1.42
1,2,3,4,6,7,8-HpCDD	424/426	1.02	0.87 - 1.17
1,2,3,4,6,7,8-HpCDF	408/410	1.02	0.87 - 1.17
1,2,3,4,7,8,9-HpCDF	408/410	1.02	0.87 - 1.17
OCDD	462/464	2.45	2.08 - 2.82
OCDF	442/444	0.88	0.75 - 1.01
13C-2,3,7,8-TCDD	332/334	0.77	0.65 - 0.89
13C-2,3,7,8-TCDF	316/318	0.77	0.65 - 0.89
13C-1,2,3,7,8-PeCDD	366/368	0.62	0.53 - 0.71
13C-1,2,3,7,8-PeCDF	350/352	0.62	0.53 - 0.71
13C-2,3,4,7,8-PeCDF	350/352	0.62	0.53 - 0.71
13C-1,2,3,4,7,8-HxCDD	400/402	0.51	0.43 - 0.59
13C-1,2,3,6,7,8-HxCDD	400/402	0.51	0.43 - 0.59
13C-1,2,3,7,8,9-HxCDD	400/402	0.51	0.43 - 0.59
13C-1,2,3,4,7,8-HxCDF	384/386	0.51	0.43 - 0.59
13C-1,2,3,6,7,8-HxCDF	384/386	0.51	0.43 - 0.59
13C-2,3,4,6,7,8-HxCDF	384/386	0.51	0.43 - 0.59
13C-1,2,3,7,8,9-HxCDF	384/386	0.51	0.43 - 0.59
13C-1,2,3,4,6,7,8-HpCDD	438/436	0.97	0.82 - 1.12
13C-1,2,3,4,6,7,8-HpCDF	422/420	0.97	0.82 - 1.12
13C-1,2,3,4,7,8,9-HpCDF	422/420	0.97	0.82 - 1.12
13C-OCDD	474/472	0.65	0.55 - 0.75
13C-OCDF	456/454	1.14	0.97 - 1.31

Table 7

Example for elution order on a DB-5MS column

PCDD/PCDF
2,3,7,8-TCDF
2,3,7,8-TCDD
1,2,3,7,8-PeCDF
2,3,4,7,8-PeCDF
1,2,3,7,8-PeCDD
1,2,3,4,7,8-HxCDF
1,2,3,6,7,8-HxCDF
2,3,4,6,7,8-HxCDF
1,2,3,4,7,8-HxCDD
1,2,3,6,7,8-HxCDD
1,2,3,7,8,9-HxCDD
1,2,3,7,8,9-HxCDF
1,2,3,4,6,7,8-HpCDF
1,2,3,4,6,7,8-HpCDD
1,2,3,4,7,8,9-HpCDF
OCDD
OCDF

Note: elution orders may change on other column types

Table 8

Target Estimated Detection Levels (TEDL)

PCDD/PCDF	TEDL (ng/kg dry weight)
2,3,7,8-TCDD	10
2,3,7,8-TCDF	10
1,2,3,7,8-PeCDD	10
1,2,3,7,8-PeCDF	10
2,3,4,7,8-PeCDF	10
1,2,3,4 (6),7,8-HxCDD	20
1,2,3,7,8,9-HxCDD	10
1,2,3,4 (6),7,8-HxCDF	20
2,3,4,6,7,8-HxCDF	10
1,2,3,7,8,9-HxCDF	10
1,2,3,4,6,7,8-HpCDD	25
1,2,3,4,6,7,8-HpCDF	25
1,2,3,4,7,8,9-HpCDF	25
OCDD	50
OCDF	50

QUALITY ASSURANCE PROJECT PLAN

MIDLAND AREA SOIL SAMPLING
MIDLAND, MICHIGAN

May 2012

URS

URS Corporation
9400 Amberglen Boulevard
Austin, Texas 78729
(512) 454-4797

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ATTACHMENTS

This appendix is a Quality Assurance Project Plan (QAPP) for use in the Midland Area Soils Interim Response Activity Plan Designed to Meet Criteria (Work Plan). The context for the project, the site background, and conceptual model, objectives, sampling plan and implementation strategy are provided in the Work Plan.

This QAPP describes the sampling and analysis requirements and the quality assurance (QA) and quality control (QC) measures that will be taken for samples collected and analyzed under the Work Plan which describes the sample locations, the frequency of sampling, the sampling methods, and the analytes that are to be assayed.

1.1 OBJECTIVES FOR MEASUREMENT

The purpose of a quality assurance/quality control (QA/QC) program is to produce analytical measurement data of known quality that satisfy the project objectives. In regards to measurement data quality, the QA/QC program shall:

- Provide a mechanism for the ongoing control and evaluation of measurement data quality; and
- Provide measures of data quality in terms of accuracy, precision, completeness, representativeness, and comparability to assess whether the data meet the project objectives and can be used for their intended purpose.

The objective of the chemical measurement data is to generate sufficient information to quantify the presence or absence of chemical contamination within the site's media for the purpose of making remedial decisions. To meet this objective, data acquired during the sample collection phase must be defensible to meet this objective. The quality objectives for the chemical measurement data specify the "quality" of the data needed to enable project personnel to make decisions (e.g., a decision to pick one remediation technique over another, etc.). As such, the objectives determine the type and quantity of data needed to make a decision, as well as the measurement objectives (precision, accuracy) for each type of measurement data collected. The objectives for the analytical data will be:

- To collect samples required for remedial decisions;
- To collect and analyze samples under controlled situations using validated methods; and
- To obtain usable and defensible analytical results.

The following sections discuss the steps that will be taken to ensure the validity of the data acquired during the program. The representativeness of the measurement data is a function of the sampling strategy and will be achieved by following the procedures discussed in this section. The quality of the analytical results is a function of the analytical system and will be achieved by using validated methods and the QC system discussed in this section. The basis for assessing precision, accuracy, completeness, representativeness, and comparability is discussed in the following subsections. Typical calculations used in data quality measurements and data assessments are provided for reference in Attachment 1.

1.2 DEFINITION OF CRITERIA

This section defines how the project analytical measurement data objectives will be assessed for the project.

1.2.1 Precision

Precision measures the reproducibility of repetitive measurements and is usually expressed in terms of imprecision. It is strictly defined as the degree of mutual agreement among independent measurements as the result of the repeated application of the same process under similar conditions. Analytical precision is a measurement of the variability associated with duplicate (two) or replicate (more than two) analyses of the same sample extract in the laboratory and is determined by analysis of analytical duplicates. Total precision is a measurement of the variability associated with the entire sampling and analysis process. It is estimated by analysis of duplicate or replicate field samples and includes all possible sources of variability. Imprecision will be estimated using the relative percent difference (RPD) between the replicate samples. The frequency of collection for field duplicates is 10%.

Analytical precision goals are presented in documentation for each individual method. The field duplicate precision goal is ≤ 30% RPD. Uncontrollable matrix effects may confound the field duplicate evaluation and will be noted where identifiable. Results of these duplicate determinations will be used to evaluate the total imprecision possible in natural matrix sample results.

1.2.2 Accuracy

Accuracy is a statistical measurement of correctness, and includes components of random error (variability due to imprecision) and systematic error (bias). It, therefore, reflects the total error associated with a measurement. A measurement is accurate when the value reported does not differ from the true value. Analytical method accuracy is typically measured by determining the percent recovery of known target analytes that are spiked into a reagent water or soil (ongoing precision and recovery [OPR] sample) before extraction, at known concentrations. Additionally, $^{13}C_{12}$ labeled compounds are added to every sample and QC sample before extraction at known concentrations.

Both accuracy and precision are calculated for specific sampling or analytical batches, and the associated sample results must be interpreted considering these specific measures. An additional consideration in applying accuracy and precision is the concentration level of the samples; a procedure capable of producing the same value within 50% would be considered precise for low level (near the detection limit) analyses of minor constituents, but would be unacceptable, and possibly useless, for major constituents at high concentrations.

Accuracy goals for OPRs and $^{13}C_{12}$ labeled compounds are presented in each method. Accuracy goals will be met if individual OPR and $^{13}C_{12}$ labeled compounds recoveries are within laboratory-derived acceptance criteria. OPR and $^{13}C_{12}$ labeled compound recoveries outside criteria indicate the analytical system is out of control and may require samples to be reanalyzed.

1.2.3 Completeness

Completeness is calculated from the aggregation of data for each method for any particular sampling event. For each method and each site, the number of valid results, divided by the number of individual analyte results initially planned for, expressed as a percentage, determines the completeness for the data set. The objective for completeness is 90 percent. If there are any instances of samples that could not be analyzed for any reason (holding time violations in which resampling and reanalysis were not possible, samples spilled or broken, etc.), the numerator of this calculation becomes the number of valid results minus the number of possible results not reported.

Valid results used to meet completeness objectives are those results that provide defensible estimates of the true concentration of an analyte in a sample. These valid results include data that is not qualified and data that QC results indicate qualification is necessary but which may still be used to meet project objectives. Invalid results are those data for which there is an indication that the prescribed sampling or analytical protocol was not followed.

The formula for calculation of completeness is presented below:

$$\%\ \text{completeness} = \frac{\text{number of valid (i.e., non-R flagged) results}}{\text{number of possible results}}$$

1.2.4 Representativeness

Objectives for representativeness will be defined for each sampling and analysis task and will be a function of the investigative objectives. Representativeness will be achieved in part through use of the standard sampling and analytical procedures described in this QAPP, Work Plan, and the laboratory's Standard Operating Procedures (SOPs). The use of equipment/rinseate blanks ensures that sample contamination is not present. Equipment/rinseate blanks will initially be collected at a frequency of 2% when unique sampling devices are not used for sample collection. The equipment/rinseate blanks will be retained until the analytical report is issued and the project team may elect to test on a case-by-case basis. The frequency of equipment/rinseate blank collection will be adjusted during the project, based on need.

1.2.5 Comparability

Comparability is the confidence with which one data set can be compared to other data sets. The objectives for this QA/QC program are to produce data with the greatest degree of comparability possible. Comparability will be achieved by using validated methods for sampling and analysis, reporting data in standard units, and using standard and comprehensive reporting formats.

1.3 GOALS

The overall project goal is to collect data sufficient for qualitative evaluation and future decisions. The QA objective (i.e., goal) is to have all analyses performed on an analytical system that is in statistical control and meets method specifications. Numerically, the goal is to have all individual results traceable to an OPR whose recovery is within laboratory-specified limits. Inaccurate or imprecise recovery of OPRs will potentially invalidate results.

This section describes the components of the sampling procedures that will be performed to meet the quality assurance objectives for the project.

2.1 SAMPLING PROTOCOLS

Detailed sampling protocols are provided and discussed in the Work Plan. Prior to beginning each sampling event, the field manager will ensure that the field personnel understand the purpose and objectives of the event. Topics of review and discussion with the team may include sampling locations, types of samples to be collected, number of samples collected, sample numbering, preservation requirements, parameter(s) to be analyzed, sampling procedures, equipment decontamination procedures, and chain-of-custody requirements.

2.2 SAMPLE HANDLING

The project manager is responsible for ensuring that samples are collected with properly decontaminated equipment and containerized in properly cleaned sample bottles. A summary of the recommended sample containers, volume, and preservation for each analytical method is provided in Table 2-1.

Soil and liquid extract samples will be retained until remedial decisions have been made, or the end of the calendar year in which the samples were collected, whichever is longer.

2.3 SAMPLING EQUIPMENT DECONTAMINATION

Equipment decontamination is an integral part of the data collection and QA process. The implementation of proper decontamination practices and procedures will begin in the field prior to use of sample collection equipment. All field sampling equipment will be decontaminated before use and after each sample location. Wash water and other fluids generated during decontamination will be managed at Dow’s Wastewater Treatment Plant.

Table 2-1
Requirements for Containers, Preservation Techniques, and Sample Volumes

Name	Analytical Method [a]	Container [b]	Preservation	Minimum Sample Volume or Weight
% Moisture	EAC SOP	P,G	≤ 6°C	4oz. (s)
Dioxins and Furans	Method 8280 MAS/EPA 1613B[c]	P bag (s only), transferred in lab to G w/ Teflon-lined cap for long-term storage	≤ 6°C Freeze soil to ≤ -10°C for long-term storage	1 liter (w); 8 oz. (s)

[a] Comparable methods may be used with the approval of the project chemist.
[b] All containers are pretreated and cleaned before being purchased. Polyethylene (P); glass (G).
[c] EPA 1613B analyses will include a 2nd column confirmation for all Tetra-HexaCDD/F (only confirmation listed in the method documents are for 2378-TCDF).

C = Centigrade
s = Solid
w = Water

Sample possession during all sampling efforts must be traceable from the time of collection until the results are verified and reported. The sample custody procedures provide a mechanism for documentation of all information related to sample collection and handling to achieve this objective.

The field manager will be responsible for ensuring that the field team adheres to proper custody and documentation procedures for all sampling operations. Preformatted electronic chain-of-custody (eC-O-C) forms will be used as the primary documentation mechanism to track sample custody and analyses.

3.1 FIELD OPERATIONS

This section describes field procedures for maintaining sample custody. Other information describing field operations may be found in the Work Plan and its appendices. A summary of the recommended sample containers, volume, preservation, and hold times for each analytical method is provided in Table 2-1.

3.1.1 Field Records

Field personnel will be required to keep accurate written records of their daily activities in a bound logbook or with field forms. All entries will be legible, written in waterproof ink, and contain accurate and inclusive documentation of the team's activities, including instrument calibration, samples collected, field data and observations, any problems encountered, and actions taken to solve problems. Entry errors or changes will be crossed out with a single line and initialed by the person making the correction. Field logbooks or field forms will be available for review by the QA coordinator during systems audits or at any other time for QC checks by the field manager. This documentation provides verification of sampling procedures.

3.1.2 Sample Custody

The custody of the sample is maintained by:

- The sample is in the sampler's possession;
- The sample is in the sampler's view after being in possession;

- The sample was in the sampler's possession and then was locked up to prevent tampering; and
- The sample is in a designated secure area.

3.1.3 Sample Labels and Identification

Each sample container will receive a sample label. All samples shall be uniquely identified, labeled, and documented in the field at the time of collection. Sample labels will identify the sample by documenting the unique sample identification number, the sample type, the analytical method, the sampler's initials, date and time collected, the receiving laboratory, and the preservation method used. Sample labels will be computer-generated or hand written with a permanent marker and affixed to the sample container.

3.1.4 Chain-of-Custody Record

All sample ice chests will be accompanied by the C-O-C record, which identifies their contents. The original record plus one copy will accompany the ice chest; the other copy will be retained in the project file. One copy will be returned to the project team with the analytical results and the original is retained in the laboratory files with the analytical data.

The person relinquishing the samples to the facility will request the signature of a representative to acknowledge receipt of the samples. If a representative is unavailable or refuses to sign, this is noted in the "Received By" space. When appropriate, as in the case of overnight shipment, the custody record should contain a statement that the samples were delivered to the designated location and the date and time noted.

All ice chests will be secured with custody seals for transportation to the off-site laboratory. Custody seals are not required for onsite analysis with the provision that the samples are delivered shortly after collection and that they will not be left unattended. Custody seals must be applied to all ice chests left unattended that contain samples.

The method of shipment, courier name(s), and other pertinent information is entered in the "Remarks" section when the samples are to be shipped (i.e., Federal Express, Express Mail, etc.) instead of hand delivered.

3.1.5 Shipping Procedures

The objective of sample handling procedures is to ensure that samples arrive at the laboratory intact, at the proper temperature, and free of external contamination. For all samples which will be shipped to the analytical service laboratory via overnight carriers, according to Department of Transportation standards, C-O-C procedures will be followed during transport.

Sample packaging requirements for hazardous materials requiring interstate transport is defined in the Code of Federal Regulations (CFR) 49, Chapter 1, and Part 171. These requirements outline in detail the proper classification and procedures for transportation of hazardous materials that will be used for transport of the samples. When samples are required to be stored at ≤ 6°C, generous amounts of ice will be packed with the samples. The ice will be of sufficient volume and will be distributed in the coolers so that the proper storage temperature will be maintained until the samples reach the laboratory. When the samples are delivered to the laboratory the temperature of each cooler of samples will be measured and recorded on the C-O-C form or addendum. The samples will be immediately placed in the sample control refrigerator after sample log in.

The following procedures will be used to prevent bottle breakage and cross contamination:

- All samples will be transported inside hard plastic coolers;
- All glass bottles will be protected to prevent glass to glass contact;
- The coolers will be taped shut and sealed with custody seals to indicate unauthorized opening of the cooler; and
- Samples that are known or suspected to contain high levels of chemical constituents (based on past monitoring data or observation) will be packaged and transported separately from other samples.

3.2 LABORATORY OPERATIONS

The analytical service laboratory will follow SOPs for handling, identification, control, and C-O-C procedures and to maintain the validity of the samples. These SOPs are based on the use of a laboratory information management system (LIMS), which is for tracking samples from receipt through reporting of the analytical results.

3.2.1 Sample Handling

The following section describes the activities related to sample receipt, storage, and tracking.

- Upon receipt, the sample custodian will inspect all sample containers for integrity. The presence of leaking or broken containers or custody seals will be noted on the C-O-C form. The sample custodian will sign the C-O-C form (with date and time of receipt), thus assuming custody of the samples.
- The information on the C-O-C form will be compared with that on the sample tags and labels to verify sample identity. Any inconsistencies will be resolved with the project chemist (or field team member) before sample analysis proceeds.
- The temperature of incoming coolers of samples will be checked and the temperature recorded on the internal C-O-C record.
- Preserved samples (i.e., those requiring pH adjustments) will be checked and any improperly preserved samples noted on the C-O-C.
- Samples will be moved to a controlled sample storage refrigerator for storage prior to analysis.
- Document control will retain a legible copy of the original C-O-C form.

Samples will be maintained in storage refrigerators at ≤ 6°C prior to sample preparation and analysis. Analytical laboratory personnel will request or check out samples for analysis from the sample custodian (if a different person).

If samples are known or suspected to be highly contaminated, laboratory sample control will be notified, so those samples can be stored separately from less contaminated samples, minimizing the potential for cross contamination.

3.2.2 Sample Identification

As samples are logged into the laboratory sample tracking system each sample is assigned a unique sample control number and is correlated with the field sample numbers obtained from the field C-O-C forms, as both numbers are entered into the system for a given job. Analytical requirements for each sample are entered into the computer. A hard copy of the work order and other information is printed and filed with the received documentation. Labels are printed with sample information and secured to each sample. Data sheets and work sheets are printed for each batch of samples and are distributed to the appropriate laboratory managers.

3.2.3 Sample Custody Records

Sample custody and documentation in analytical laboratories are organized around sample and analysis management systems. For example, these systems are computer software systems specifically designed for tracking and handling the large amount of information required for the efficient management of an analytical chemistry laboratory.

Following sample log in, the samples are placed in a designated secured storage area. Samples are maintained at ≤ 6º C from the time of receipt until the analyses are complete. Samples in freezers are maintained at less than 0°C from the time of receipt until the analyses are complete. Subsequent sample custody and all transactions are documented. Sample custody is documented according to the laboratory SOP.

The analyst receives the samples from sample control and completes the sample work sheets or custody sheet. After analysis, the sample is returned to the designated storage location in sample control. The sample is stored until the assigned time or written permission is given to either properly dispose of or return the sample to the client. All sample documentation is maintained in secure storage in a controlled access area.

This section contains brief descriptions of calibration procedures and analytical methodologies used for the analysis of soil samples that will be collected for this investigation.

4.1 IDENTIFICATION OF METHODS

Methods to be used for sample analysis are presented in Table 4-1. Method 8280 MAS will be the primary method used for the analysis of the target dioxins and furans. It is based upon modifications to EPA Method SW8280B. EPA Method 1613B with 2nd column confirmation for all Tetra-HexaCDD/Fs will be used to make remedial decisions for samples in the range of >220 and ≤280 (as determined by Method 8280 MAS); and will also serve as the confirmation method for the analysis of dioxins and furans. The laboratory will follow the QC procedures as specified in Methods 8280 MAS and EPA Method 1613B. All soil sample results must be reported as dry weight.

4.1.1 Analytical Batch Size

The analytical batch size for the project will be limited to no more than forty (40) samples. Modification of the analytical batch size may be completed during the project based on performance metrics described in Sections 4.3.2 (calibration verification), 4.4.1 (OPR), 4.4.3 ($^{13}C_{12}$ labeled compounds), 4.4.4 (method blank) and Table 5-2 of this Plan. Justification for changes to the batch size will be maintained in the project QA file.

4.2 DETECTION AND QUANTITATION LIMITS

This section presents and defines limits to be used in describing detectable concentrations. All soil sample results must be reported as dry weight. All sample-specific estimated detection limits (EDLs) and method quantitation limits (MQLs) must be corrected for dry weight (if applicable), dilution factors, sample size, and any other factors applied to the field sample result.

4.2.1 Estimated Detection Limits

The EDL will be calculated on a per analyte and sample basis. The EDL will be extrapolated from the detection verification standard (DVS; see Method 8280 MAS).

4.2.2 Method Quantitation Limits

The MQL is defined by the DVS. All results shall be reported at or above the EDL values. For results falling between the EDL and the MQL, a "J" flag (as estimated) shall be applied by the laboratory to the results indicating the variability associated with the result. No results shall be reported below the EDLs. Target MQLs are presented in Table 4-2.

Table 4-2
Target Method Reporting Limits

Analyte	CAS Number	Soil (ng/kg)
EAC-SOP, % Moisture	NS	NS
Method 8280 MAS, Dioxins and Furans[a]		
1,2,3,4,6,7,8-HpCDD	35822-46-9	25
1,2,3,4,6,7,8-HpCDF	67562-39-4	25
1,2,3,4,7,8-HxCDD/1,2,3,6,7,8-HxCDD	39227-28-6/57653-85-7	20
1,2,3,4,7,8-HxCDF/1,2,3,6,7,8-HxCDF	70648-26-9/57117-44-6	20
1,2,3,7,8,9-HxCDD	19408-74-3	10
1,2,3,7,8-PeCDD	40321-76-4	10
2,3,4,7,8-PeCDF	57117-31-4	10
2,3,7,8-TCDD	1746-01-6	10
2,3,7,8-TCDF	51207-31-9	10
OCDD	3268-87-9	50
OCDF	39001-02-0	50
EPA 1613B, Dioxins and Furans[b]		
2,3,7,8-TCDD	1746-01-6	1
1,2,3,7,8-PeCDD	40321-76-4	5
1,2,3,6,7,8-HxCDD	57653-85-7	5
1,2,3,4,7,8-HxCDD	39227-28-6	5
1,2,3,7,8,9-HxCDD	19408-74-3	5
1,2,3,4,6,7,8-HpCDD	35822-39-4	5
OCDD	3268-87-9	10
2,3,7,8-TCDF	51207-31-9	1
1,2,3,7,8-PeCDF	57117-41-6	5
2,3,4,7,8-PeCDF	57117-31-4	5
1,2,3,6,7,8-HxCDF	57117-44-9	5
1,2,3,7,8,9-HxCDF	72918-21-9	5
1,2,3,4,7,8-HxCDF	70648-26-9	5
2,3,4,6,7,8-HxCDF	60851-34-5	5
1,2,3,4,6,7,8-HpCDF	67562-39-4	5
1,2,3,4,7,8,9-HpCDF	55673-89-7	5
OCDF	39001-02-0	10

[a] Reporting Limits for Method 8280 MAS
[b] Target Quantitation Limits for Method 1613b

CAS = Chemical Abstract Service
EPA = United States Environmental Protection Agency
ng/kg = Nanogram per kilogram
NS = Not specified
SOP = Standard Operating Procedure

4.3 INSTRUMENT CALIBRATION REQUIREMENTS

The compliance requirements for satisfactory instrument calibration ensure that the instrument is capable of producing acceptable quantitative data. Records of standard preparation and instrument calibration shall be maintained. Records shall unambiguously trace the preparation of standards and their use in calibration and quantitation of sample results. Calibration standards shall be traceable to standard materials. Instrument calibration for the method shall be checked using all of the target analytes. They consist of an initial calibration to demonstrate that the instrument is performing acceptably throughout the analytical working range before project samples are analyzed, and continuing calibration verification checks that document that the initial calibration is still valid, and that satisfactory maintenance and day-to-day adjustment of the instrument have been achieved. Specific control criteria and corrective action requirements for initial and continuing calibration verification checks are presented Methods 8280 MAS and EPA 1613B.

4.3.1 Initial Calibration

The initial calibration will be performed for all target analytes. Changes in the instrumental set-up or responses outside of acceptance criteria will require a recalibration. A QC check sample containing all target analytes (from a different supplier than the standards used in the calibration curve) and at a concentration in the midpoint of the calibration curve must be analyzed to verify initial calibration. Instrumentation will be recalibrated with each new lot of $^{13}C_{12}$ labeled standards.

Additional calibration QC parameters and their respective acceptance criteria are listed in Tables 5-2 and 5-3.

4.3.2 Calibration Verification

With each batch of samples a Calibration Verification Standard (CVS) will be analyzed by using a mid-range calibration standard. A quantification of the samples in the associated set will only be performed if this CVS is within the acceptance criteria.

Additional calibration QC parameters and their respective acceptance criteria are listed in Tables 5-2 and 5-3.

4.4 ELEMENTS OF QUALITY CONTROL

This section presents QC requirements relevant to analysis of environmental samples that shall be followed during all analytical activities producing definitive data. The purpose of this QC program is to produce data of known quality that satisfy the project objectives and that meet or exceed the requirements of the standard methods of analysis. This program provides a mechanism for ongoing control and evaluation of data quality measurements through the use of QC materials.

Laboratory QC samples (e.g., blanks and OPRs) shall be included in the preparation batch with the field samples. A preparation batch is a number of samples (not to exceed 40 environmental samples plus the associated laboratory QC samples) that are similar in composition (matrix) and that are extracted at the same time and with the same lot of reagents. The identity of each preparation and analytical batch shall be unambiguously reported with the analyses so that a reviewer can identify the QC samples and the associated environmental samples.

The type of QC samples and the frequency of use of these samples are discussed below and in the specific methods.

4.4.1 Ongoing Precision and Recovery (OPR) Sample

The OPR sample is an analyte-free sand or soil spiked with all project-specified analytes for the method. Each analyte in the OPR sample shall be spiked at a level approximately equal to the midpoint of the calibration curve for each analyte. The OPR sample shall be carried through the complete sample preparation and analysis procedure. The OPR is used to evaluate each batch and to determine if the method is in control. The OPR sample cannot be used as the CVS.

One OPR sample shall be included in every preparation batch. If more than one OPR sample is analyzed in a batch, results from all OPR samples analyzed shall be reported. Laboratory-derived acceptance criteria will be used and checked annually. Data will be rejected if these values are not met. A QC failure of an analyte in any of the OPR samples shall require appropriate corrective action, including qualification of the failed analyte in all of the associated samples.

If an OPR fails, an attempt must be made to determine the source of error and find a solution. All of the analytes that were subject to corrective action in the OPR and all of the samples in the batch be reprepared and reanalyzed. The corrective action applied shall be based on professional judgment in the review of other QC measures (i.e., internal standards). If an analyte falls outside the OPR acceptance criteria a second time or if there is not sufficient sample material available to be reanalyzed, then all the results in the associated batch for that analyte must be flagged. The recoveries of those analytes subject to corrective action must be documented in the case narrative, whether flagging is needed or not. When an analyte in an OPR exceeds the acceptance criteria and no corrective action is performed or the corrective action was ineffective, the appropriate validation flag, as described in Section 6.0, shall be applied to all affected results.

4.4.2 Field Replicates (FRs)

A field replicate (FR) sample is a second or multiple sample(s) collected at the same location as the original sample. Replicate samples are collected simultaneously or in immediate succession, using identical recovery techniques, and treated in an identical manner during storage, transportation, and analysis. All DUs will have two (2) replicates collected (three total samples), but not all will be tested. If the first sample result by MAS 8280 is greater than 220 ppt TEQ and less than or equal to 280 ppt TEQ, both the first sample and the replicates will be tested according to EPA Method 1613b with second column confirmation.

If no MAS 8280 results are within the range specified above, replicate sample results are used to assess precision of the sample collection process. The frequency of collection for field replicates is 10%, biased to samples closest to 250 ppt. Two areas are planned for investigation (North Area and East Area). Replicates should be equally representative of those two areas. Field replicate results that are greater than the MQLs in at least one sample of the field replicate pair are used to assess precision. The RPD acceptance criterion for soil samples is $\leq$30%. If this acceptance criterion is not met, then the analyte in the parent sample and the field duplicate sample are qualified according to the data flagging criteria in Section 6.0.

4.4.3 $^{13}C_{12}$ Labeled Compounds

A mixture of stable isotopically labeled analogs of 17 of the dioxins/furans is added into each sample and QC sample before extraction. They are used to assess method performance on the sample matrix.

When the $^{13}C_{12}$ labeled compound results are outside of the acceptance limits, corrective actions shall be performed. Check for system problems and correct. If there are obvious matrix problems, flag data. If there are no obvious matrix problems, reanalyze affected samples. If corrective actions are not performed or are ineffective, the appropriate validation flag, as described in Section 6.0, shall be applied to the sample results.

4.4.4 Method Blank (MB)

A method blank (MB) is an analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. It shall be carried through the complete sample preparation and analytical procedure and is used to document contamination resulting from the analytical process. A MB shall be included in every preparation batch.

The presence of analytes in a MB at concentrations equal to or greater than the MQL indicates a need for corrective action. Corrective action shall be performed to eliminate the source of contamination. No analytical data shall be corrected for the presence of analytes in blanks. When an analyte is detected in the MB and in the associated samples and corrective actions are not performed or are ineffective, the appropriate validation flag, as described in Section 6.0, shall be applied to the sample results.

4.4.5 Equipment Blank (EB)/Rinsate Blank (RB)

An equipment blank (EB) or rinsate blank (RB) is a sample of ASTM Type II reagent grade water poured into or over or pumped through the sampling device, collected in a sample container, and transported to the laboratory for analysis. EBs are used to assess the effectiveness of equipment decontamination procedures.

Equipment/rinseate blanks will initially be collected at a frequency of 2% when unique sampling devices are not used for sample collection. The equipment/rinseate blanks will be retained until the analytical report is issued and the project team may elect to test on a case-by-case basis. When an analyte is quantified in the EB the appropriate validation flag, as described in Section 6.0, shall be applied to all sample results from samples associated with the sampling device. The frequency of equipment/rinseate blank collection will be adjusted during the project, based on need.

4.4.6 Additional QC Parameters

Other additional QC parameters are specified in Method 8280 MAS and EPA 1613B. Clarification of specific practices (where different from those listed or suggested in the methods) are noted in this Plan. Appropriate data validation flags will be assigned to results that do not meet the acceptance criteria specified in this Plan.

4.4.7 Split Sampling Procedures

Michigan Department of Environmental Quality (DEQ) staff will periodically split some samples as part of their oversight of this project. Data generated from DEQ split samples will be used to monitor the overall quality of project analytical work. The laboratories used during this project will use different analytical methods, and some differences are anticipated. A comparability study between Dow analyzed samples and agency analyzed samples is being conducted prior to the start of this project.

Laboratory QC is necessary to control the analytical process, to assess the accuracy and precision of analytical results, and to identify assignable causes for atypical analytical results. QC is achieved by collecting and/or analyzing a series of duplicate, replicate, blank, spike, and spike duplicate samples to ensure that the analytical results are within QC limits specified by the program. Laboratory QC samples are documented at the bench and reported with the analytical results. The QC sample results are used to quantify precision and accuracy and identify any problems or limitations associated sample results.

5.1 CONTROL LIMITS

QC control limits and procedures are presented by method in the following tables. The laboratory may use laboratory-derived acceptance criteria. Laboratory-derived acceptance criteria must be checked annually. The required corrective action guidelines to be followed are also presented in the following tables when results fall outside the prescribed QC limits. The corrective action activities listed are to be used as guidelines and are not necessarily followed in the order listed. The primary intent of these guidelines is to identify any problems and correct the problem before proceeding.

Table 5-1
Summary of Calibration and Internal QC for Moisture

Quality Control Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Calibration – Every six months	Test with ASTM ULTRA Class weights at 1500 g and 3000 g.	+0.05 g	1. Recalibrate. 2. If still out, repair balance and recalibrate.
Calibration Verification – Daily	Using Global-SOP-00602.05 Scales are tested with ASTM ULTRA Class weights at 200 g and 2000 g.	200g – +0.004 2000g – +4.00	1. Repeat calibration 2. If still out, identify and correct problem, then recalibrate. 3. If still out, repair balance.
Oven Temperature Check – Every sample set	Test oven temperature when before samples are put into oven and before sample are removed from oven. Record date, time, and temperature.	100°C – 110°C	Adjust temperature to within limits

Table 5-2
Summary of Calibration and Internal QC for Method 8280 MAS

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Initial Precision and Recovery	Significant change in instrumentation	Laboratory-derived acceptance criteria.	Correct problem, re-extract and reanalyze.
Initial calibration (ICAL)	Minimum 5-point calibration curve using isotope dilution	Use average response factor if <20% relative standard deviation (RSD). If >20% RSD, then use linear regression curve.	No analyses until acceptance criteria are met.
Quality Check Standard (QC)	After each ICAL	Laboratory-derived acceptance criteria.	Correct problem and reanalyze ICAL.
Calibration verification standard (VER)	Every 12 hours	Ion ratios must be within limits listed in Table 6. Verification must be within limits listed in Table 4 of Method 8280 MAS.	Adjust instrument and reanalyze. No analyses until acceptance criteria are met.
Ion abundance	Each sample	Ion ratios must be within limits listed in Table 6 of Method 8280 MAS.	Adjust instrument and reanalyze. No analyses until acceptance criteria are met.
Isomer specificity	Daily using calibration verification standard (VER)	Adequate separation between ^{13}C 2,3,7,8-TCDF and native 2,3,7,8-TCDD.	Adjust instrument and reanalyze. No analyses until acceptance criteria are met.
Analyte identification	For each component and sample	As per Method 8280 MAS Section 10.9 (qualitative) or Section 10.10 (quantitative).	N/A
Isotopic ratio measurements for dioxins/furans	For each component and sample	As per Method 8280, Section 9.4.	Adjust instrument and reanalyze. No analyses until acceptance criteria are met.
Retention time windows	N/A for isotope dilution	N/A for isotope dilution.	N/A
Detection verification standard (DVS)	Every 12 hours	As per 8280 MAS, Section 10.8.2.	Adjust instrument and reanalyze. No analyses until acceptance criteria are met.
Method blank (MB)	One MB per preparation batch	Must not exceed MQL.	Correct problem and rerun.
Ongoing Precision and recovery (OPR) standard for all compounds.	One OPR per preparation batch	Laboratory-derived acceptance criteria.	Correct problem, re-extract, and reanalyze .
Labeled Compound Recovery Standards	Each sample and QC sample	Recoveries: 5%-100%.	Correct problem, re-extract, and reanalyze .

Table 5-3
Summary of Calibration and Internal QC for Method EPA 1613B

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Initial Precision and Recovery	Once per analyst or significant change in instrumentation	Laboratory-derived acceptance criteria.	Correct problem, re-extract and reanalyze.
Initial calibration (ICAL)	Minimum 5-point calibration curve using isotope dilution	Use average response factor if <20% relative standard deviation (RSD). If >20% RSD, then use linear regression curve.	No analyses until acceptance criteria are met.
Quality Check Standard (QC)	After each ICAL.	Laboratory-derived acceptance criteria.	Correct problem and reanalyze ICAL.
Calibration verification standard (VER)	Every 12 hours.	As per Method 1613b, Section 15.3.	Adjust instrument and reanalyze. No analyses until acceptance criteria are met.
Ion abundance	Daily using detection verification standard (DVS)	As per Method 1613b, Section 10.2.	Adjust instrument and reanalyze. No analyses until acceptance criteria are met.
Isomer specificity	Daily using calibration verification standard (VER)	As per Method 1613b, Section 10.4.	Adjust instrument and reanalyze. No analyses until acceptance criteria are met.
Analyte identification	For each component and sample	As per Method 1613b, Section 16 (qualitative) or Section 17 (quantitative).	N/A
Isotopic ratio measurements for dioxins/furans	For each component and sample	As per Method 1613b, Section 17.	Adjust instrument and reanalyze. No analyses until acceptance criteria are met.
Method blank (MB)	One MB per preparation batch	Must not exceed MQL.	Correct problem and rerun.
Ongoing Precision and recovery (OPR) standard for all compounds.	One OPR per preparation batch	Laboratory-derived acceptance criteria.	Correct problem, re-extract, and reanalyze.
Labeled Compound Recovery Standards	Each sample and QC sample	As per Method 1613b, Table 7.	Correct problem, re-extract, and reanalyze.
Cleanup standard	Optional, for each sample and QC sample	As per Method 1613b, Table 7.	Correct problem, re-extract, and reanalyze.

The data reduction, validation, and reporting procedures described in this section will ensure that complete documentation is maintained, that transcription and data reduction errors are minimized, the quality of the data is reviewed and documented, and the reported results are properly qualified.

6.1 DATA MANAGEMENT

The primary data management activities will include:

- Data transfer from field and laboratory activities to a project filing system;
- Data management to ensure that data are stored and output in a manner that continues the C-O-C;
- Requirements of review to ensure that plans for data collection were fulfilled;
- Analytical data validation which will report data to be used for interpretation activities; and
- Reporting functions may include outputting data for report tables, statistical analysis, interpretation, and electronic transfer.

A computerized project database will be used for data management on the project. The proposed database will be implemented in relational data management software. The database is used to store, transfer, and report analytical data. A series of programs allows electronic reporting of data. The laboratory is responsible for generating hard copies and electronic files for the analytical results. Both the hardcopy analytical reports and electronic data files are transferred to the project QA coordinator and/or data management staff. The laboratory provides additional documentation regarding C-O-C procedures, etc. that are not transmitted via electronic files.

6.2 DATA REDUCTION

The laboratory analyst is responsible for the reduction of raw data generated at the laboratory bench. The data interpretation that is required to calculate sample concentrations follows the methodology described in the specific analytical SOP. After all analyses have been completed and reported, the laboratory manager or designee reviews the raw data and verifies that the analyses were properly performed and reported. All non-detected results must be reported as < EDL. A value that is reported between the EDL and the MQL must be flagged ("J") by the laboratory to indicate that the number is an estimate. Blank results below the

MQLs cannot be controlled by the laboratory. The laboratory manager may then transfer the raw data to the document control area, where the raw data are filed if needed for a subsequent QC review. Raw data, together with all supporting documentation, are stored in confidential files by document control.

After all analyses for a report are complete, the data are entered into the laboratory reporting system and a preliminary report is generated for review by the laboratory managers. This review is followed by a quality check carried out by the document control group to verify that the QC meets the specifications of the method. Data qualifiers shall be added or, if applied by a software package, reviewed by the laboratory manager. A case narrative shall be included with each data report package to explain any nonconformance or other issues.

Identification of outliers is also a part of the data review. An outlier is an unusually large (or small) value in a set of observations. There are many possible reasons for outliers including:

- Faulty instruments or component parts;
- Inaccurate reading of a record, dialing error, etc;
- Errors in transcribing data; and
- Calculation errors.

Sometimes analysts or operators can identify outliers by noting the above types of occurrences when they record the observations. In these instances, the errors are corrected, or if correction is not possible, the suspect observations may be removed from the data before calculations are performed. If no such information exists, the statistical evaluation techniques are used to test suspected outliers at the five percent significance level if there are three or more points in the data set containing the outlier. Outliers identified by this method may be removed from the data before further processing.

Laboratory concentration data will be reported using three significant figures for statistical calculations. Remedial decisions and external reports will be made using two significant figures.

6.3 DATA QUALITY ASSESSMENT

Validation of the laboratory reports and sample custody documentation will be performed to ensure all samples were analyzed as requested. The laboratory reports are reviewed for the following:

- Sample hold times;
- Target analyte list;
- Reporting limits;
- Reporting units;
- Laboratory blanks;
- Field duplicates;
- OPR results; and
- Other applicable QC results.

The data validation task that will be performed in support of the project work will consist of reviewing three areas of data quality. The QC checks used to assess measurement precision are field duplicate samples. The QC checks used for the assessment of measurement accuracy are OPRs and surrogate spikes. The results for field and laboratory (i.e., method) blanks are the third group of QC data reviewed.

6.4 DATA VALIDATION AND REPORTING

The Project QA Coordinator, or other QA staff, will review and summarize all QC sample results to evaluate the sampling and analytical performance. Blank results will be evaluated to identify any systematic contamination; spike and duplicate results will be compared to the QA objectives presented in Section 1, and the results used to calculate precision and accuracy for the data set. This process will identify analytical methods and analytes for which the QA objectives are not satisfied and corresponding sample data will be qualified with a "flag" indicating the problem. Samples collected on the same day, or analyzed in the same run or batch, or individual samples may be flagged, depending on the type of problem that has been identified. Reanalysis or resampling may be recommended as a corrective action at this time if data are determined to be unacceptable for the intended application.

A data validation report will be submitted by the data validator summarizing the result of the data quality assessment. The measurement data will be discussed and qualified as appropriate based on the QC results. For example, a laboratory blank contamination will influence all samples extracted or analyzed on a specific day or during a specific analytical run. Data validation flags will be assigned to the data. Data validation flags, codes, and descriptions are presented in Table 6-1.

Table 6-1
Data Qualifier Definitions

Qualifier	Definition	When Assigned:
B	Reported result is similar to associated blank concentration and is not considered representative of actual site conditions.	This qualifier is assigned when a sample result is equal to or less than five times the associated blank result.
J	Reported result is an estimate.	This qualifier is assigned when unacceptable precision is demonstrated, if there are chromatographic interferences, if conflicting data exists about whether or not the sample result is biased high or low, or if an internal standard does not meet acceptance criteria. It also can indicate that the value is between the laboratory's EDL and MQL. A code indicating a low or high bias may be used in conjunction with this flag.
H	Reported result is potentially biased high.	This qualifier is assigned when unacceptable accuracy is demonstrated for high OPR recoveries, high internal standards, high surrogate recoveries, or high calibration verification checks.
L	Reported result is potentially biased low.	This qualifier is assigned when unacceptable accuracy is demonstrated for low OPR recoveries, low surrogate recoveries, missed hold times, or low calibration checks.
UJ	The analyte was not detected above the EDL, but may still be present.	This qualifier is assigned when unacceptable precision is demonstrated, when a sample receipt condition is compromised, a sample is analyzed past hold time, or if an internal standard does not meet acceptance criteria. A code indicating a low bias may be used in conjunction with this flag.
R	Reported result is unusable for its intended purpose.	This qualifier is assigned when an OPR or surrogate compound is recovered below 5% and the sample results were not detected. It also is used when hold times are grossly missed.

EDL = Estimated detection limit
MQL = Method quantitation limit
OPR = Ongoing performance and recovery

A QA audit is an independent appraisal of a measurement system. It typically includes a performance evaluation using apparatus and/or standards that are different from those used in the measurement system. It also may include an evaluation of the potential of the system to produce data of adequate quality to satisfy the objectives of the measurement efforts. The independent, objective nature of the audit requires that the auditor be functionally independent of the sampling/analytical team.

Quality assurance audits play an important role in an overall QA/QC program. This section describes the role of the QA auditor and the nature of both systems and performance audits.

While this is not required at this time by the client, these audits can be requested by the client in order to ensure that the data quality is acceptable.

Attachment 1
Statistical Calculations

Statistic	Symbol	Formula	Definition	Uses
Mean	$\overline{X}$	$\dfrac{\left(\sum_{i=1}^{n} x_i\right)}{n}$	Measure of central tendency	Used to determine average value of measurements
Standard Deviation	S	$\left(\dfrac{\Sigma(x_i-\overline{X})^2}{(n-1)}\right)^{½}$	Measure of relative scatter of the data	Used in calculating variation of measurements
Relative Standard Deviation	RSD	$(S/\overline{X}) \times 100$	Relative standard deviation, adjusts for magnitude of observations	Used to assess precision for replicate results
Percent Difference	%D	$\dfrac{x_1 - x_2}{x_1} \times 100$	Measure of the difference of 2 observations	Used to assess accuracy
Relative Percent Difference	RPD	$\left(\dfrac{(X_1 - X_2)}{(X_1 + X_2)/2}\right) \times 100$	Measure of variability that adjusts for the magnitude of observations	Used to assess total and analytical precision of duplicate measurements
Percent Recovery	%R	$\left(\dfrac{X_{meas}}{X_{true}}\right) \times 100$	Recovery of spiked compound in pure matrix	Used to assess accuracy
Percent Recovery	%R	$\dfrac{\left(\text{value of spiked sample} - \text{value of unspiked sample}\right)}{\text{Value of added spike}} \times 100$	Recovery of spiked compound in sample matrix	Used to assess matrix effects and total precision
Correlation Coefficient	R	see SW8000B Section 7.5.3		Evaluation of "goodness of fit" of a regression line
Coefficient of Determination	COD	see SW8000B Section 7.5.3		Evaluation of "goodness of fit" of a polynomial equation

n = Number of observations
x = Observation (concentration)

Example Access Form - Minor Changes May be Made to Accommodate Special Circumstances

Midland Soils Cleanup Activities Agreement Form

1008 Jefferson Avenue
Midland, MI 48640

Contact Information

Property Owner ______________________ *& Phone Number* ______________________

Property Address ____

Contact Person ______________________

& Phone Number ______________________

Description of Service Agreements:
(Activities that will be performed on property by Dow and its contractors:)

Remove 12-inches of soil from property	
Soil removal will be cut 1 foot (12-inches) from permanent structures including sidewalks, driveways and decks	
Backfill with six-inches of clean screen borrow and six-inches of topsoil	

Special Conditions

____

____

____

I (we) ______________________ ***on*** ______________, _______ ***and***
Property Owner *Date*

______________________ ***on*** ______________, _______ ***agree to allow***
Additional Property Owner *Date*

The Dow Chemical Company and it's Contractor(s)to implement the activities described above and perform follow up as necessary. I (we) understand the MDEQ may be present during these activities.

I (we) ______________________ ***on*** ______________, _______ ***and***
Property Owner *Date*

______________________ ***on*** ______________, _______ ***decline to allow***
Additional Property Owner *Date*

The Dow Chemical Company and it's Contractor(s)to implement cleanup activities .

Dow Representative ______________________ ***Date*** ____________

Property Owner(s) warrants that they own the Property; and the Property Owner(s) has read and understands the Agreement.

Midland Soils Sampling Agreement Form

1008 Jefferson Avenue
Midland, MI 48640

Contact Information

Property Owner ______________________ *& Phone Number* ______________________

Property Address ____

Contact Person ______________________

& Phone Number ______________________

Description of Service Agreements:
(Activities that will be performed on property by Dow and its contractors:)

Collect approximately ____ soil cores for laboratory analyses.	
The soil cores will be 1-inch wide and 6-inches in depth.	
Laboratory results will be submitted in writing to the property owner.	
The sampling activities will require 2 hours and be a single occurrence.	

Special Conditions

____

____

____

I (we) ______________________ (*Property Owner*) ***on*** ______________ (*Date*), __________ ***and***

______________________ (*Additional Property Owner*) ***on*** ______________ (*Date*), __________ ***agree to allow***

The Dow Chemical Company and it's Contractor(s)to implement the activities described above and perform follow up as necessary. I (we) understand the MDEQ may be present during these activities.

I (we) ______________________ (*Property Owner*) ***on*** ______________ (*Date*), __________ ***and***

______________________ (*Additional Property Owner*) ***on*** ______________ (*Date*), __________ ***decline to allow***

The Dow Chemical Company and it's Contractor(s)to implement sampling activities .

Dow Representative ______________________ ***Date*** __________

Property Owner(s) warrants that they own the Property; and the Property Owner(s) has read and understands the Agreement.

EXAMPLE. Letter substantially equivalent to example will be used to communicate purpose of program and initial inquiry regarding property access. It is possible that specific conditions unique to the property or owner could require modifications to this example letter.

<Date>

<Owner Name>
<Owner Address>
<City>, <State> (Zip Code>

Re: Midland Area Soils Corrective Actions
<Parcel ID>
<Parcel Address>

To <Owner Name>,

Earlier this year, The Dow Chemical Company (Dow) and the Michigan Department of Environmental Quality (DEQ) entered into an agreement to conduct cleanup within the City of Midland. These actions include soil sampling and soil removal and restoration activities. Dow is required to conduct soil sampling to determine if cleanup is necessary for your property. **We are asking your permission to access your property for the purpose of sampling the soils.**

Sampling will consist of the collection of soil cores from your property(ies). These cores will be 1-inch wide and approximately 6-inches deep and will be collected using hand held equipment. The soil will be submitted for laboratory analysis of dioxin. You will receive a letter providing the results of the sample for your property. In cases where analysis confirms dioxin concentrations exceed 250 parts per trillion (ppt), the landowner will be contacted to schedule an appointment with a representative of Dow to discuss the potential cleanup for your property(ies). Please find attached to this letter additional information on the sampling plan for your property.

If you have any questions or concerns on the sampling plan for you property please contact <Dow Representative> at 989-631-2270. We would be glad to meet with you by phone, in person at the Midland Resolution Center or at your home at your convenience to explain the sampling, answer any questions and address any specific concerns you may have. You may also contact DEQ staff at 1-517-335-4799.

We encourage you to participate in this program. If you are ready to participate, please complete and return the attached agreement to the Midland Resolution Center in the enclosed postage paid envelope by Month, Date, 2012. Your participation is completely voluntary.

If you decide not to participate, please also indicate that decision on the enclosed form and return to **Midland Resolution Center in the enclosed postage paid envelope**. Dow is obligated to try several times through various means (phone, home visits, etc.) to contact you to explain your options and attempt to obtain access. If you do not want to participate, please let us know.

Thank you for your attention to this matter. We look forward to working with you.

Sincerely,

<Dow Leader>
<Title>
The Dow Chemical Company

Enclosures
cc: MDEQ

EXAMPLE. Letter substantially equivalent to example will be used to communicate the need for a response from the property owner regarding property access (accept or decline). It is possible that specific conditions unique to the property or owner could require modifications to this example letter.

<Date>

<Subject Property Owner's name>
<Owner Address>
<City, State, Zip Code>

SUBJECT: Letter regarding Property Access
<Property Address>
<Parcel ID>

Dear <Subject Property Owner's name>:

In XXXXX 2012, you should have received a letter from The Dow Chemical Company (Dow) regarding permission to access your property(ies) for the purposes of soil sampling. Copies of these letters are attached. Under an agreement between Dow and the Michigan Department of Environmental Quality (DEQ), Dow is obligated to contact property owners and request permission to conduct soil sampling activities on their property(ies). Dow has made several attempts to contact you via phone regarding the letter and access for soil sampling but was unsuccessful or we do not have a current telephone number for you and have attempted visiting you at your home.

Dow is required to document your choice to accept or decline participation in the soil sampling program. Whatever your choice, we will respect it; however, it is important that we document your choice. Please indicate on the attached form whether or not you grant or decline access and return it in enclosed postage paid envelope. If you have any questions regarding the letter or the attached document, please contact < Dow Representative> at the Midland Resolution Center at 989-631-2270. You may also contact DEQ staff at 1-517-335-4799.

Sincerely,

<Dow Leader>
<Title>
The Dow Chemical Company

Enclosures
cc: MDEQ

EXAMPLE. Letter substantially equivalent to example will be used to communicate that sample result indicates that no further action is necessary for the property. It is possible that specific conditions unique to the property or owner could require modifications to this example letter.

<Date>

<Subject Property Owner's name>
<Owner Address>
<City, State, Zip Code>

SUBJECT: Notice of Sampling Results
<Property Address>
<Parcel ID>

To <Subject Property Owner's name>:

The Dow Chemical Company (Dow) is conducting cleanup within the City of Midland and has been testing soil surrounding the Michigan Operations Facility. As part of an agreement between Dow and the Michigan Department of Environmental Quality (DEQ), and with your permission soil was collected from your property located at _____________. The test result of the sample has been used to determine if your property requires cleanup.

The result for your property is ____ parts per trillion (ppt) dioxin. The action level for cleanup is 250 ppt dioxin and is based on direct contact exposure to soils. **The result for your property was less than 250 ppt dioxin and therefore, no cleanup is required.**

This concludes Dow's activities at your property. You will receive a letter from the MDEQ confirming that no cleanup is required for your property and this matter is closed. If you would like detailed information about your test results, please contact the Midland Resolution Center at 989-631-2270. You may also contact DEQ staff at 1-517-335-4799.

Sincerely,

<Dow Leader>

<Title>

The Dow Chemical Company

Enclosures
cc: MDEQ

EXAMPLE. Letter substantially equivalent to example will be used to communicate that sample results indicate that remedy is necessary. It is possible that specific conditions unique to the property or owner could require modifications to this example letter.

<Date>

<Subject Property Owner's name>
<Owner Address>
<City, State, Zip Code>

SUBJECT: Notice of Sampling Results
<Property Address>
<Parcel ID>

To <Subject Property Owner's name>:

The Dow Chemical Company (Dow) is conducting cleanup activities within the City of Midland and has been testing soil surrounding the Michigan Operations Facility. As part of the agreement between Dow and the Michigan Department of Environmental Quality (DEQ), and with your permission, a soil sample was collected from your property located at ____________. The test result of the sample has been used to determine if your property requires cleanup.

The test result for your property is ____ parts per trillion (ppt) dioxin. The action level for cleanup is 250 ppt dioxin and is based on direct contact exposure to soils. **The result for your property is greater than 250 ppt dioxin and therefore, Dow is obligated to offer cleanup.** Cleanup includes:

- Soil removal and replacement to a depth of 12 inches;
- Preservation of non-replaceable plants and mature trees;
- Restoration of lawns and landscaping; and
- Monitoring and maintenance until the lawn is established

Please find attached additional information describing the cleanup and your options.

Within 10 days of the mailing of this letter, <INSERT REP NAME> will be contacting you on behalf of Dow requesting a meeting to discuss the cleanup, your options, answer any questions and review your unique property features. If you have any questions or concerns or would like detailed information on your test results, please contact the Midland Resolution Center at 989-631-2270. You may also contact DEQ staff at 1-517-335-4799.

Sincerely,

<Dow Leader>
<Title>
The Dow Chemical Company
Enclosures
cc: MDEQ

EXAMPLE. Letter is substantially equivalent to example will be used to communicate that while sample result indicates that remedy is necessary, the owner has declined cleanup at this time. It is possible that specific conditions unique to the property or owner could require modifications to this example letter.

<Date>

<Subject Property Owner's name>
<Owner Address>
<City, State, Zip Code>

SUBJECT: Notice of Sampling Results
<Property Address>
<Parcel ID>

To <Subject Property Owner's name>:

The Dow Chemical Company (Dow) is conducting cleanup activities within the City of Midland and has been testing soil surrounding the Michigan Operations Facility. As part of the agreement between Dow and the Michigan Department of Environmental Quality (DEQ), soil was collected from your property located at ____________. The result has been used to determine if your property requires cleanup.

In a letter dated ______, you were notified that the result for your property is ____ parts per trillion (ppt) dioxin. The action level for cleanup is 250 ppt TEQ and is based on direct contact exposure to soils. The result for your property was greater than 250 ppt TEQ and therefore, Dow is obligated to perform a cleanup of your property.

Upon notification of these test results and a review of your cleanup options and potential obligations you declined to allow the cleanup for your property or chose to defer the cleanup for a period of time. You or future property owners will continue to have the option to have the cleanup performed at a later date. You may decide to participate at any time. You may be contacted by mail periodically to remind you that your property is eligible for a cleanup.

As the property owner, until cleanup has been completed; you may have certain obligations under Michigan Law, which are summarized in the attachment to this letter.

If you have any questions, concerns or wish to discuss future implementation of corrective action on your property please contact the Midland Resolution Center at 989-631-2270 or DEQ staff at 1-517-335-4799.

Sincerely,

<Dow Leader>
<Title>
The Dow Chemical Company

Enclosures
cc: MDEQ

EXAMPLE. Letter substantially equivalent to example will be used to communicate that corrective actions are completed for a property. It is possible that specific conditions unique to the property or owner could require modifications to this example letter.

<Date>

<Owner Name>
<Owner Address>
<Owner City>, < Owner State> <Owner Zip Code>

RE: Corrective Actions Completion

Location: <Property Address>
<Parcel ID>

Dear <Name of Property Owner>,

The Dow Chemical Company has completed the agreed upon cleanup as outlined in the attached cleanup agreement. The actions completed on your property included:

- Soil removal and replacement to a depth of 12 inches
- Restoration of landscaping and lawns, including:
    - <Insert property specific information>

Dow will work with you to maintain the new lawn and plants until they are established. For your property, this included <Insert property specific information>. A meeting will be set with you to review the status of the lawn and determine whether the lawn is established in < > months of the mailing of this letter.

This concludes the activities conducted at your property, aside from maintaining the lawn until established. By early next year, you will receive a letter from the MDEQ confirming that remedy is complete for your property and this matter is closed.

If you have any questions or concerns associated with these activities or ongoing yard maintenance please contact the Midland Resolution Center at 989-631-2270. You may also contact DEQ staff at 1-517-335-4799.

Sincerely,

<Dow Leader>
<Title>
The Dow Chemical Company

Construction Quality Assurance Form

Midland Resolution

Property Information

Property Owner ____________________ *Contractor Personnel* ____________________

Property Address ____

Date ____________________

Field Person ____________________ *Contractor Equipment* ____________________

Description of Field Activities

Truck Loads Out ____________________ *Truck Loads In* ____________________

Remediation Area (sq ft) ____________________ *Cut Depth Verified* __________ *(date / initial)*

Describe soils remaining ____

Remarks

Field Representative ____________________ *Date* __________

Weather ____

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.21 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-40-406
616 E Grove St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

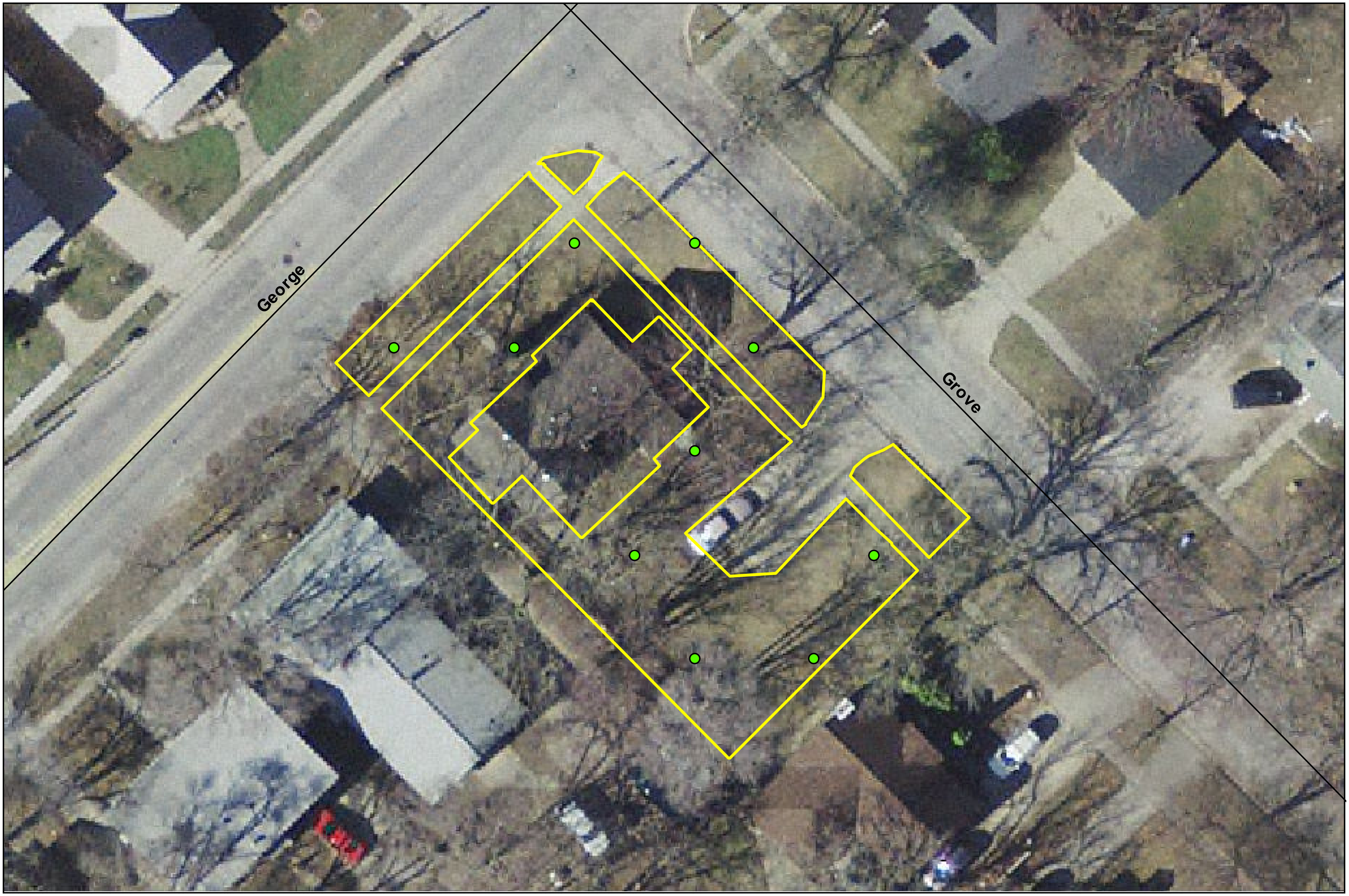
LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.12 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-40-410
612 E Grove St.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.11 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-16-50-056
516 George St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.11 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-16-50-058
512 George St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.13 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-16-50-060
508 George St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.11 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-50-062
502 George St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

Increment Locations

Property

Roadways

Notes:
0.21 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-50-063
611 E Indian St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

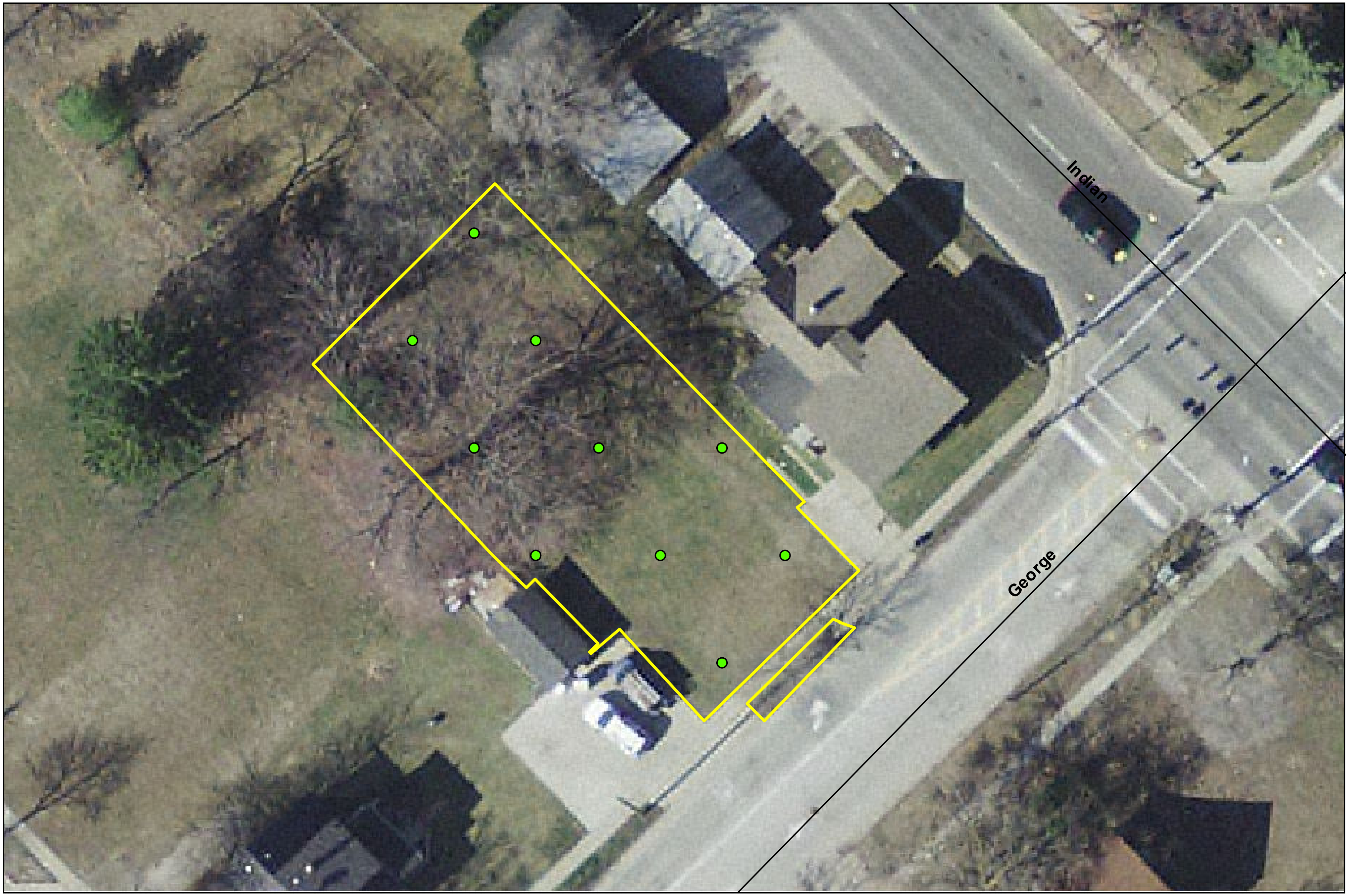
LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.14 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-16-50-064
615 E Indian St.
Midland Resolution Sampling Plan



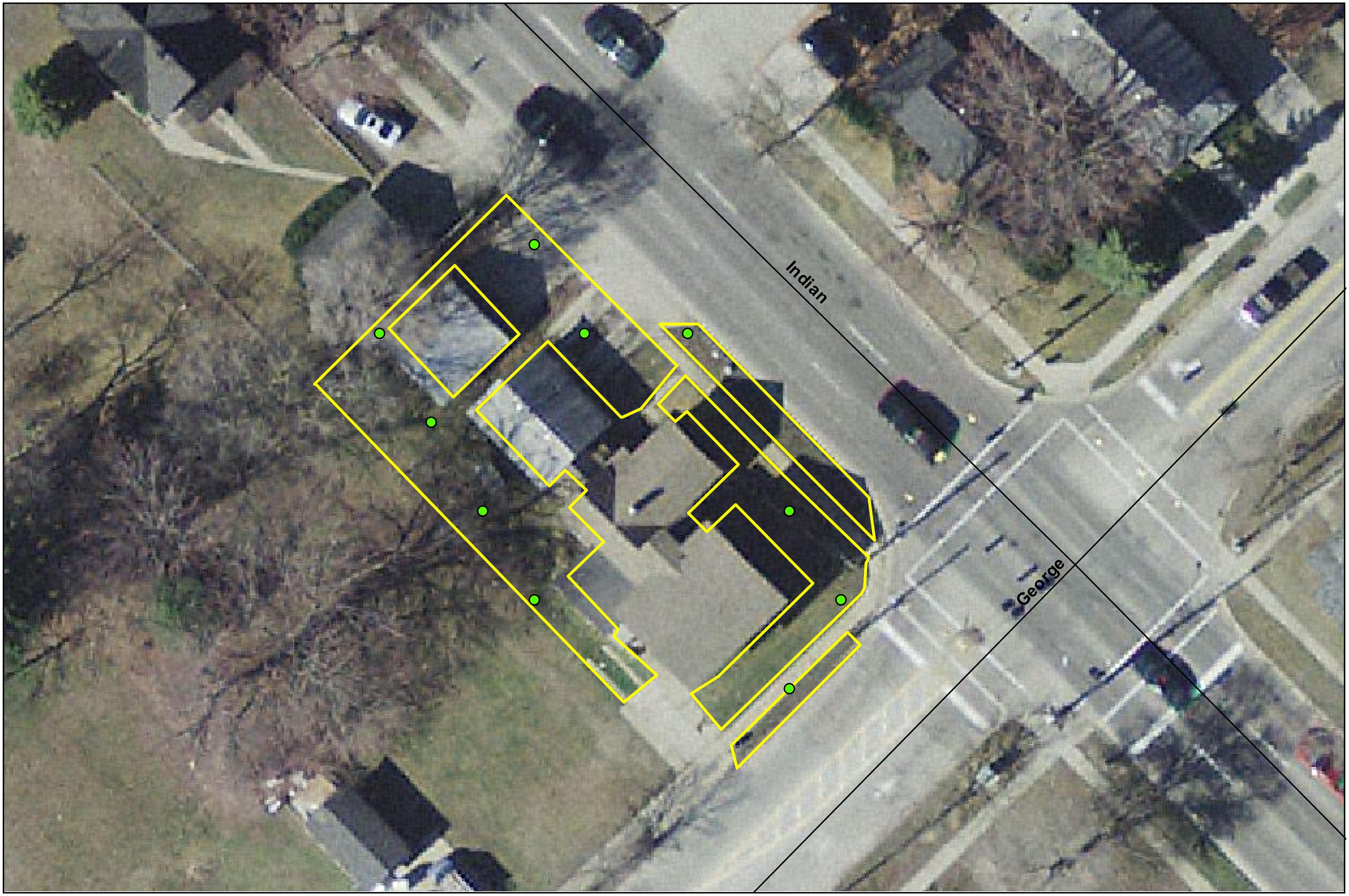
LEGEND
Increment Locations
Property
Roadways

Notes:
0.17 Acres
10 Increments

0 15 30 60 Feet

MIDLAND RESOLUTION

Parcel 14-16-50-065
411 George St.
Midland Resolution Sampling Plan



LEGEND
Increment Locations
Property
Roadways

Notes:
0.10 Acres
10 Increments

MIDLAND RESOLUTION

Feet
0 15 30 60

Parcel 14-16-50-066
415 George St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
Sample Locations
Parcel
Roadways

Notes:
0.13 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-16-50-088
416 Cronkright St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.17 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-16-50-090
412 Cronkright St.
Midland Resolution Sampling Plan

LEGEND
Increment Locations
Property
Roadways

Notes:
0.17 Acres
10 Increments

Feet
0 15 30 60

MIDLAND RESOLUTION

Parcel 14-16-50-092
501 E Buttles St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.17 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-16-50-094
505 E Buttles St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.17 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-50-095
509 E Buttles St.
Midland Resolution Sampling Plan

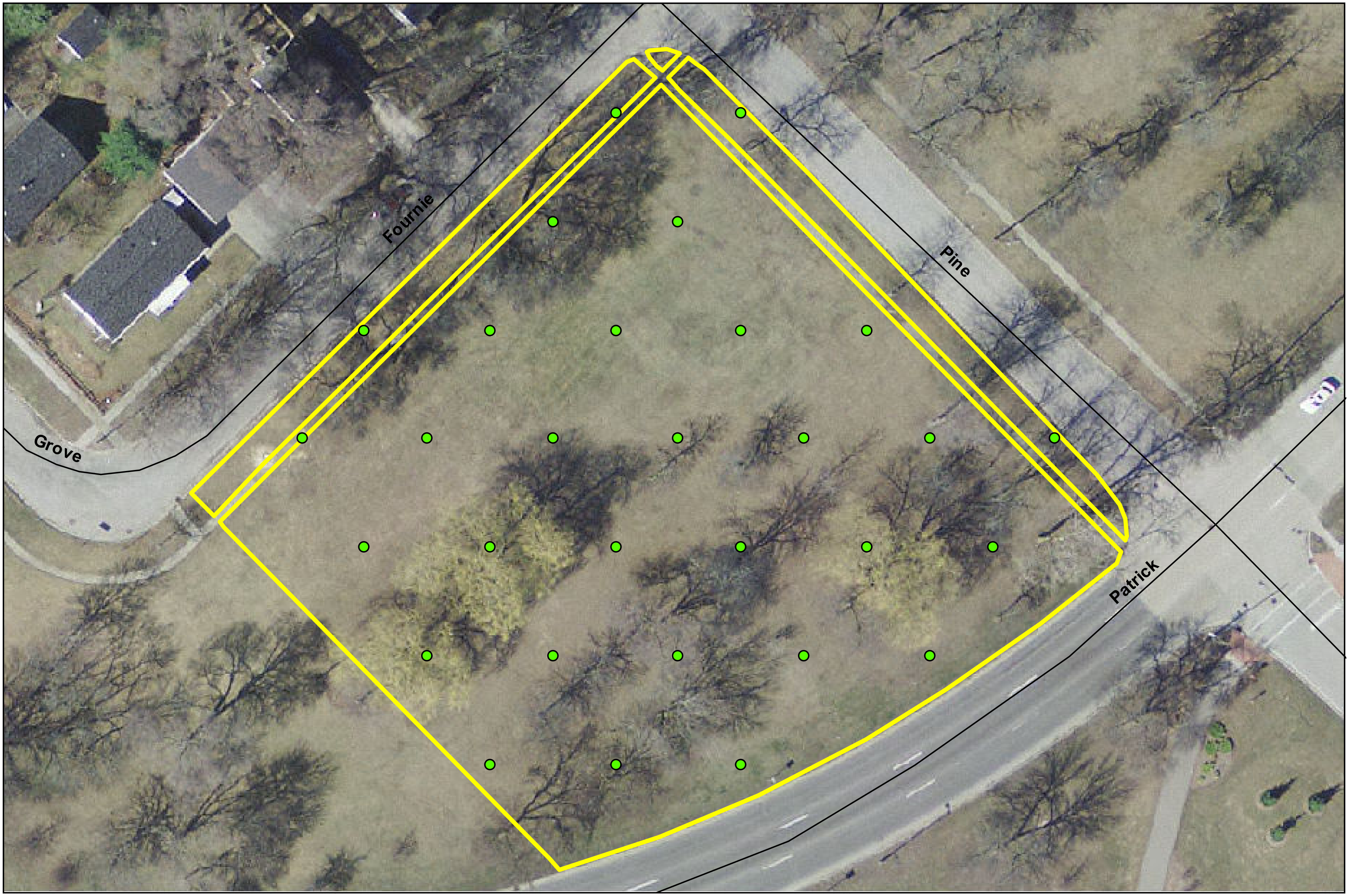
MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.12 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-16-50-096
515 E Buttles St.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
1.2 Acres
30 Increments

0 25 50 100 Feet

Parcel 14-21-10-308
1110 E Pine St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.31 Acres
20 Increments

0 25 50 100 Feet

Parcel 14-21-10-344
1110 E Grove St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.14 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-346
609 Fournie St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.13 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-21-10-350
613 Fournie St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.16 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-400
612 Haley St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.14 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-402
606 Haley St.
Midland Resolution Sampling Plan

LEGEND
Increment Locations
Property
Roadways

MIDLAND RESOLUTION

Notes:
0.13 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-404
602 Haley St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.13 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-21-10-406
1011 E Grove St
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

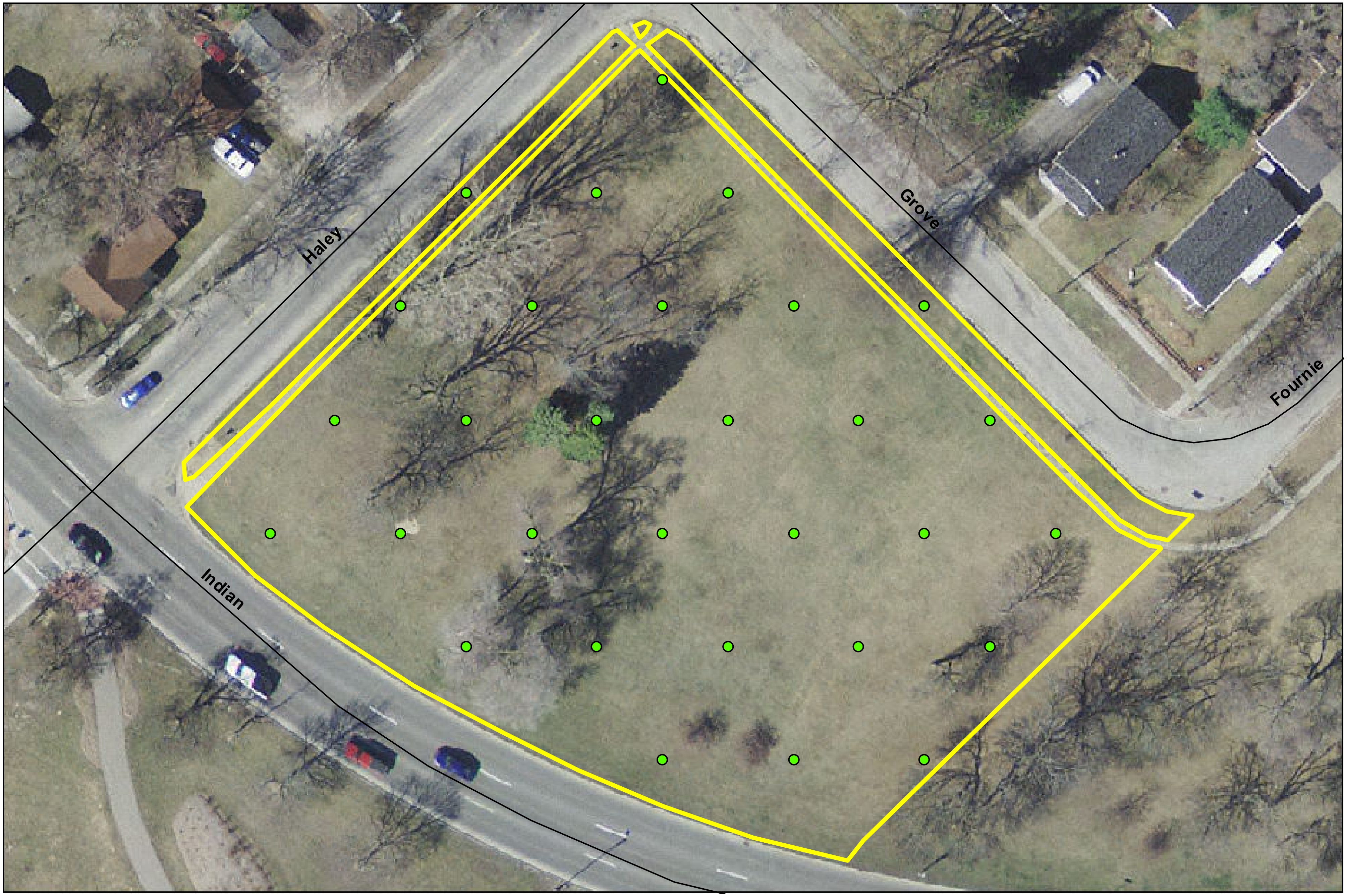
LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.11 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-408

1015 E. Grove St.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Property
- Roadways

Notes:
1.31 Acres
30 Increments

0 25 50 100 Feet

Parcel 14-21-10-410
1010 E. Grove St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

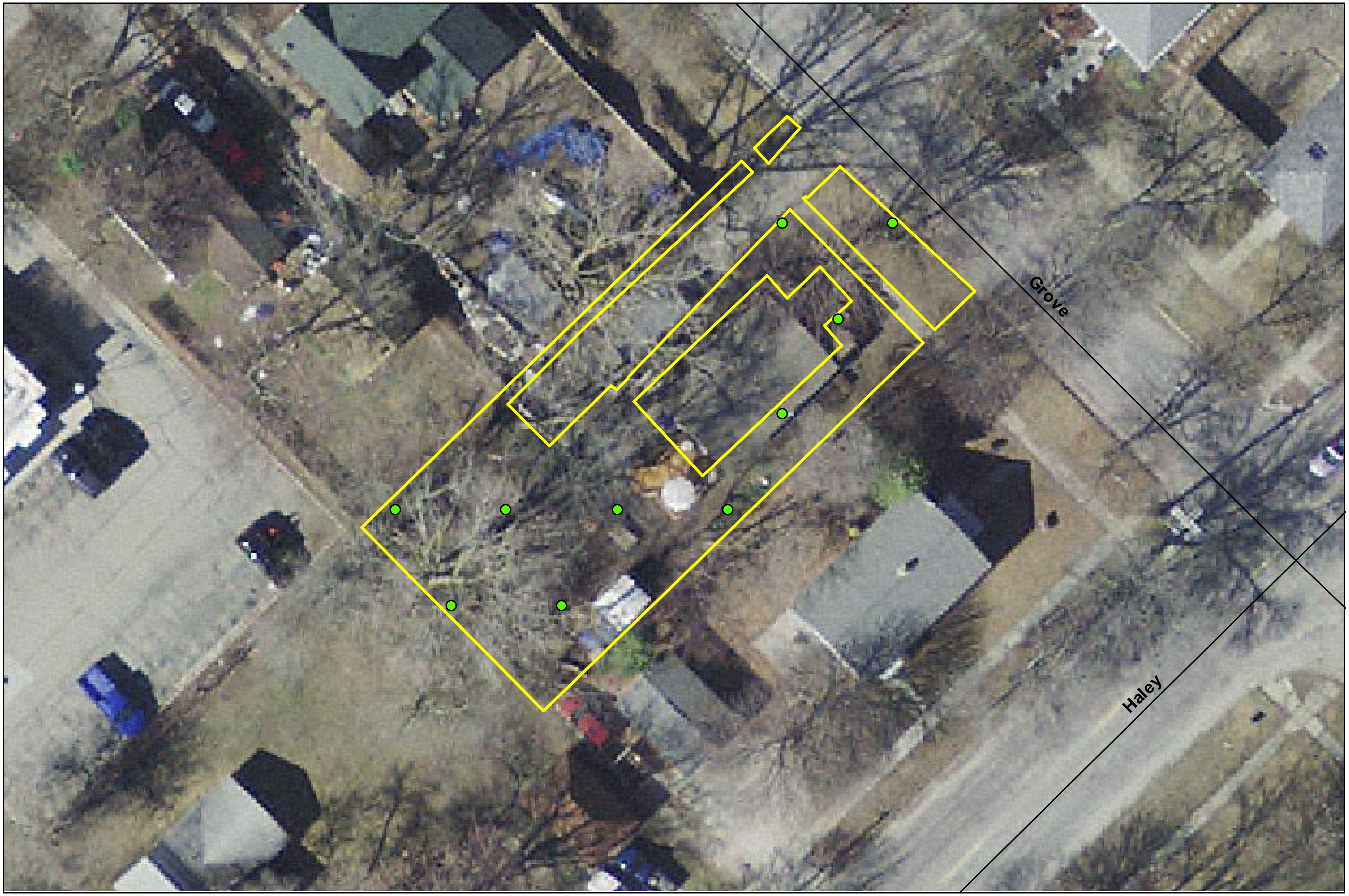
LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.13 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-21-10-520
916 E Grove St.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

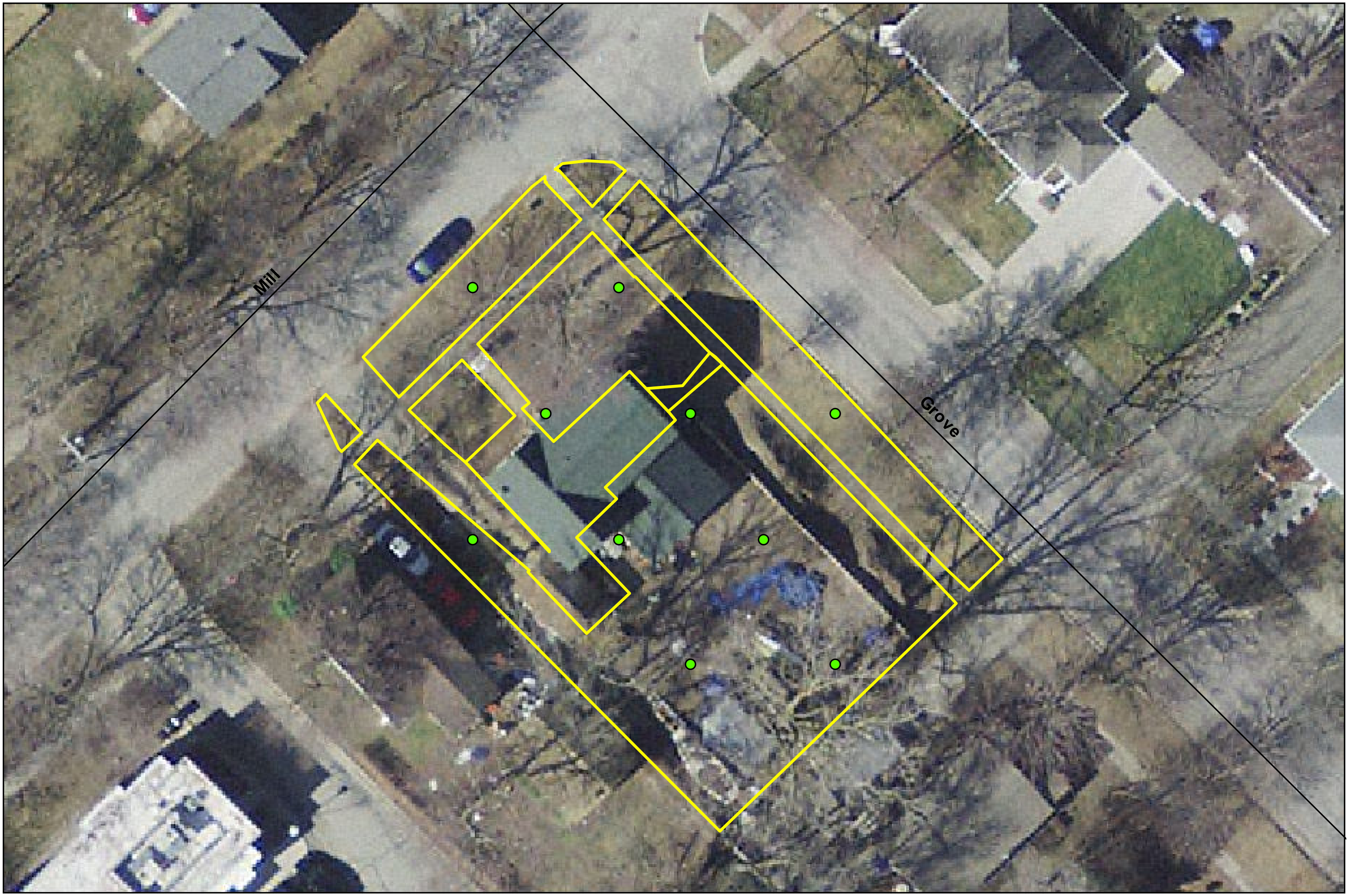
LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.13 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-522
914 E Grove St.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.18 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-524
516 Mill St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.09 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-528
510 Mill St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.14 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-534
909 E Indian St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

Increment Locations

Property

Roadways

Notes:

0.13 Acres

10 Increments

0 15 30 60 Feet

Parcel 14-21-10-536

915 E. Indian St.

Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.12 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-538
613 Haley St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.14 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-540
615 Haley St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.11 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-542
906 E Pine St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.15 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-546
610 Mill St.
Midland Resolution Sampling Plan

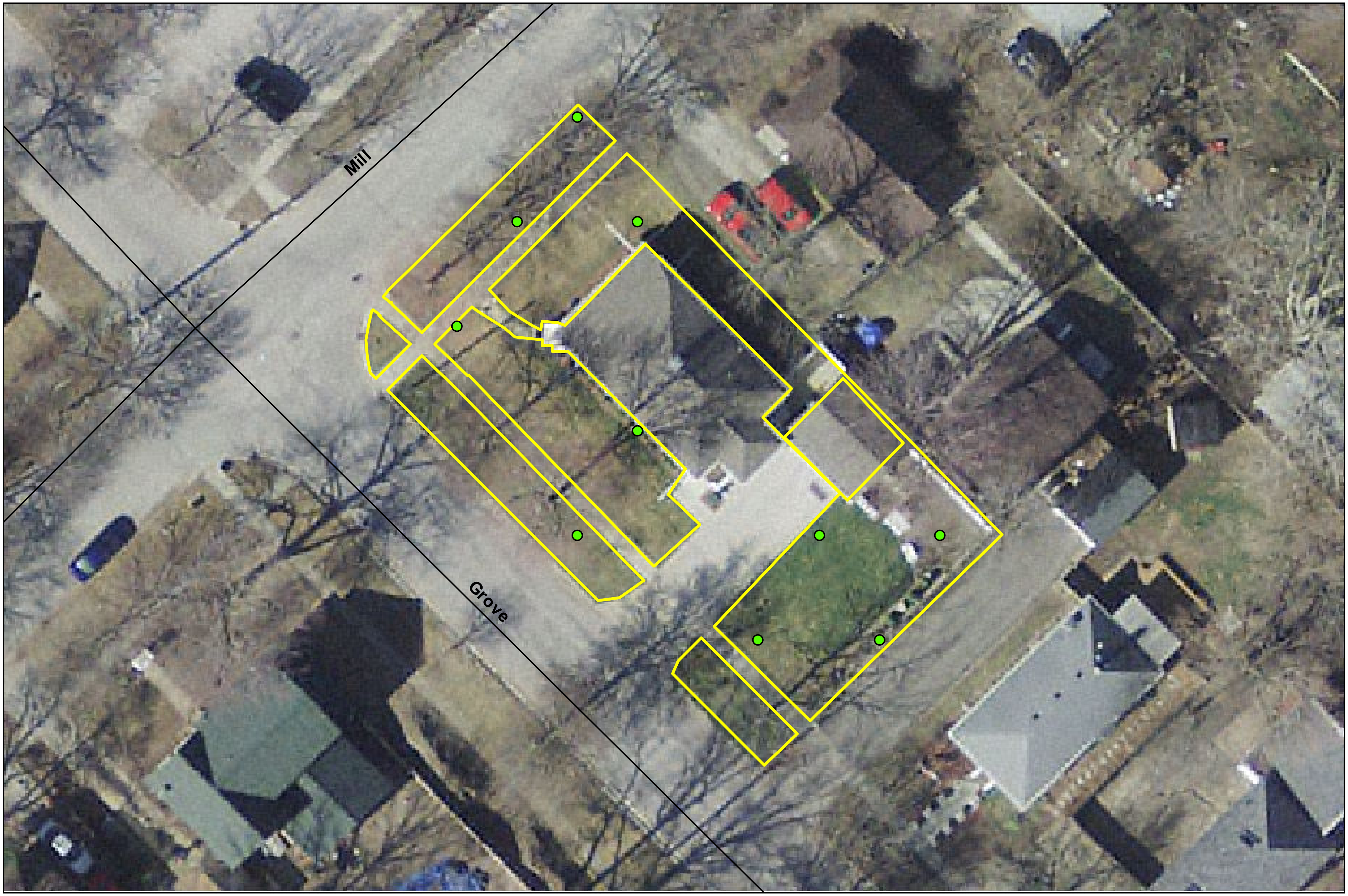
LEGEND
Increment Locations
Property
Roadways

Notes:
0.12 Acres
10 Increments

0 15 30 60 Feet

MIDLAND RESOLUTION

Parcel 14-21-10-548
606 Mill St.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.10 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-550
602 Mill St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

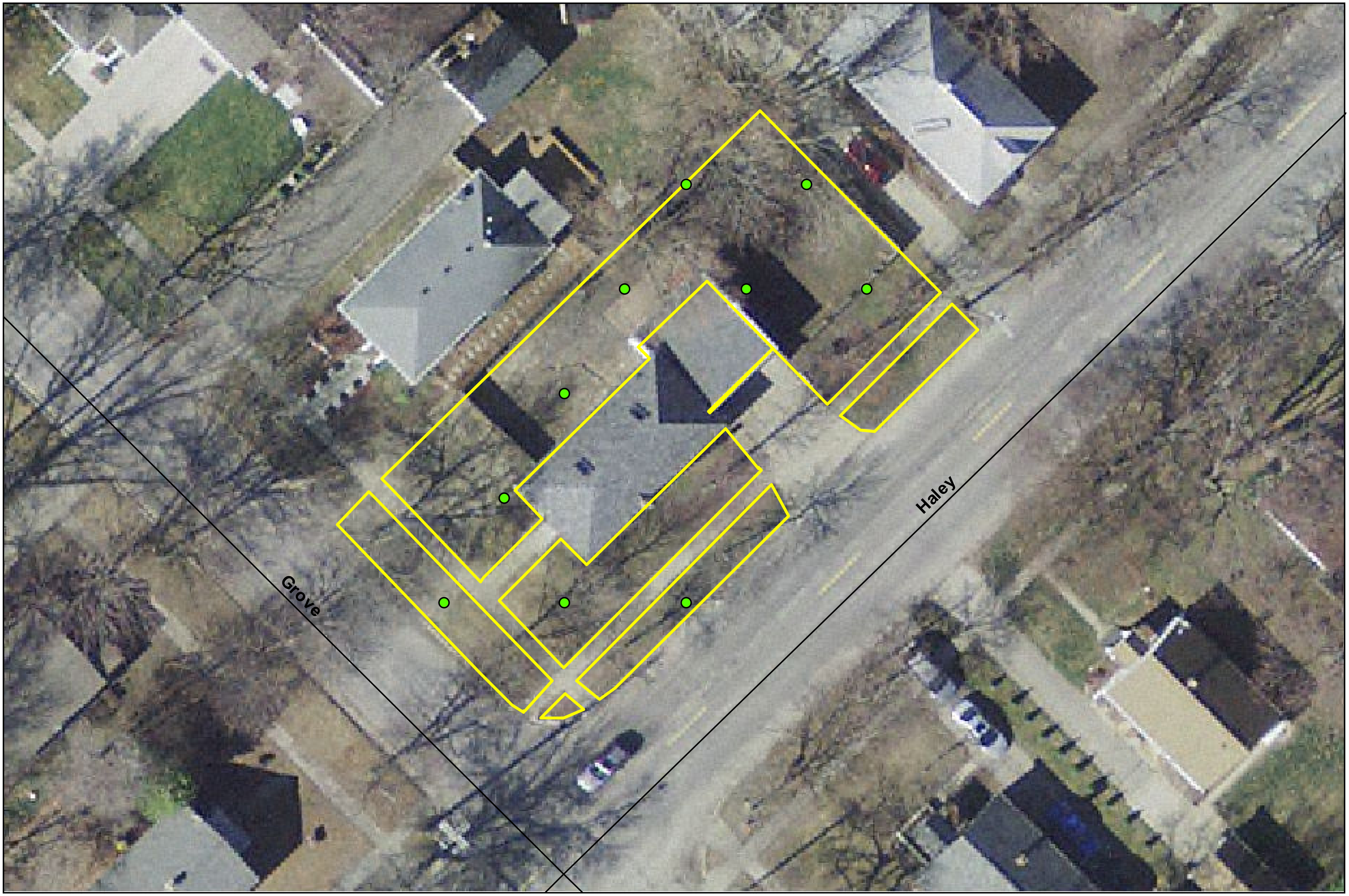
LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.11 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-21-10-552
913 E Grove St.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.13 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-554
915 E. Grove St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.15 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-21-10-590
816 E Grove St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

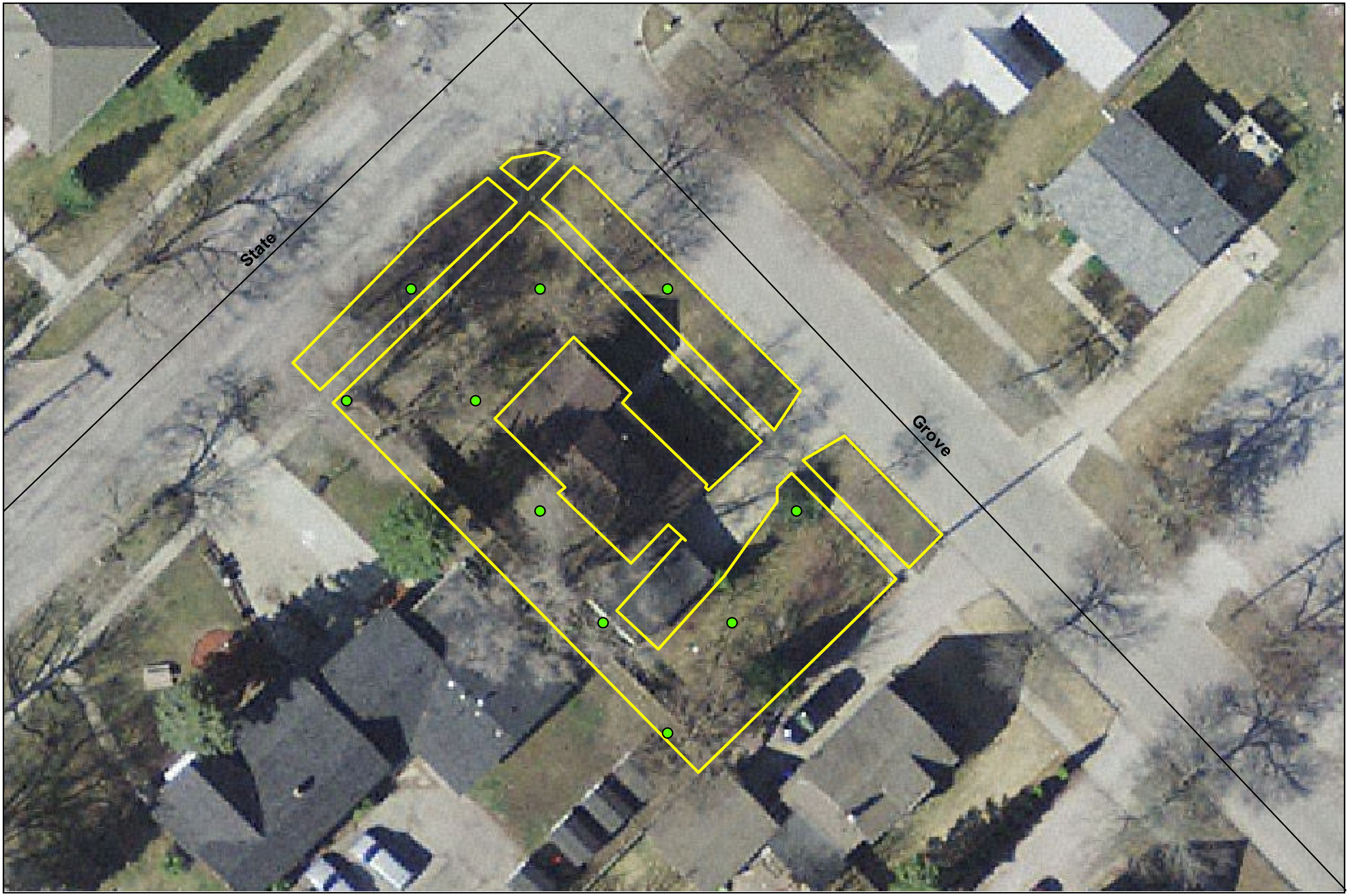
LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.13 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-592
812 E Grove St.
Midland Resolution Sampling Plan



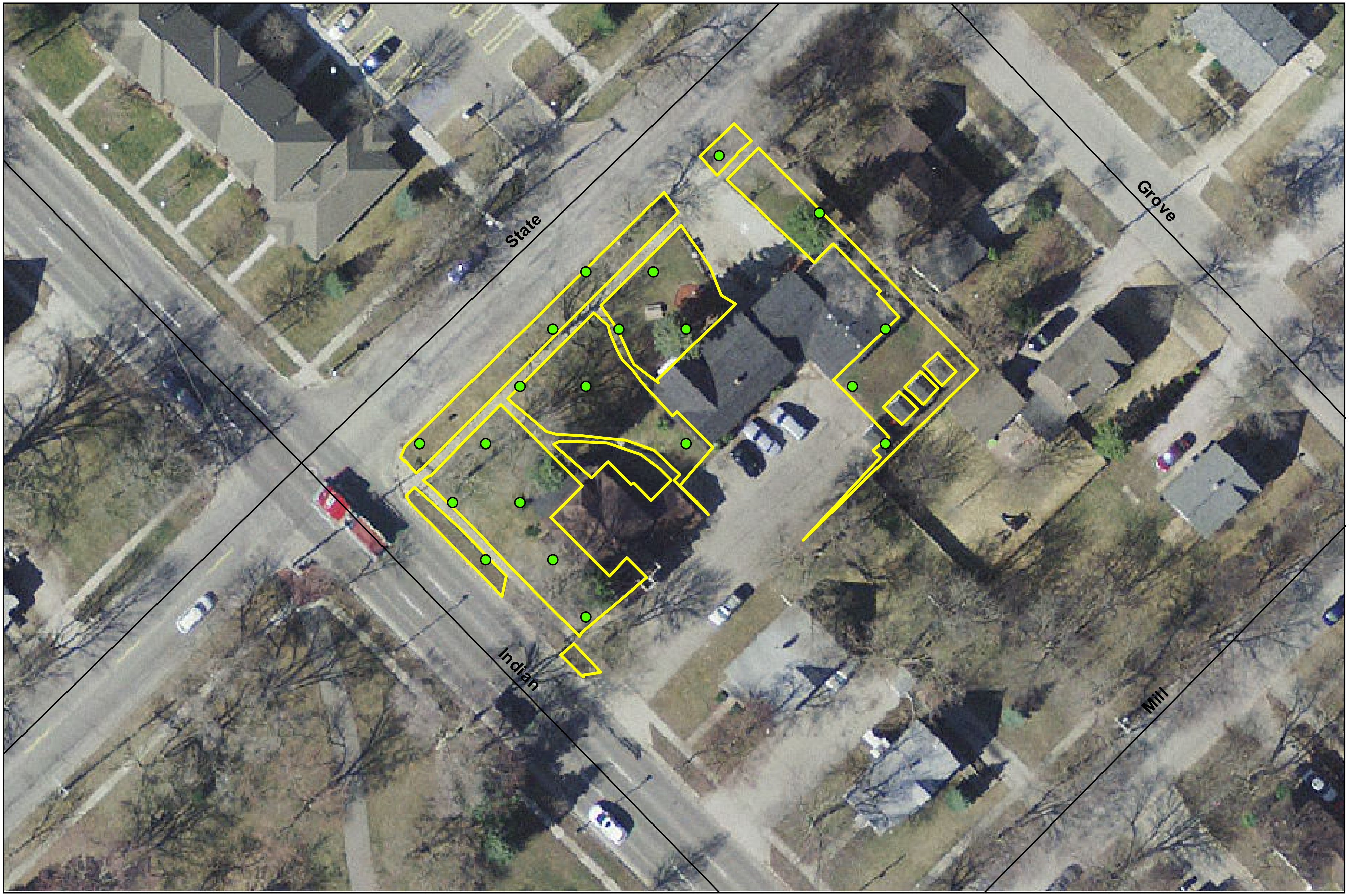
MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.13 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-21-10-594
808 E Grove St.
Midland Resolution Sampling Plan



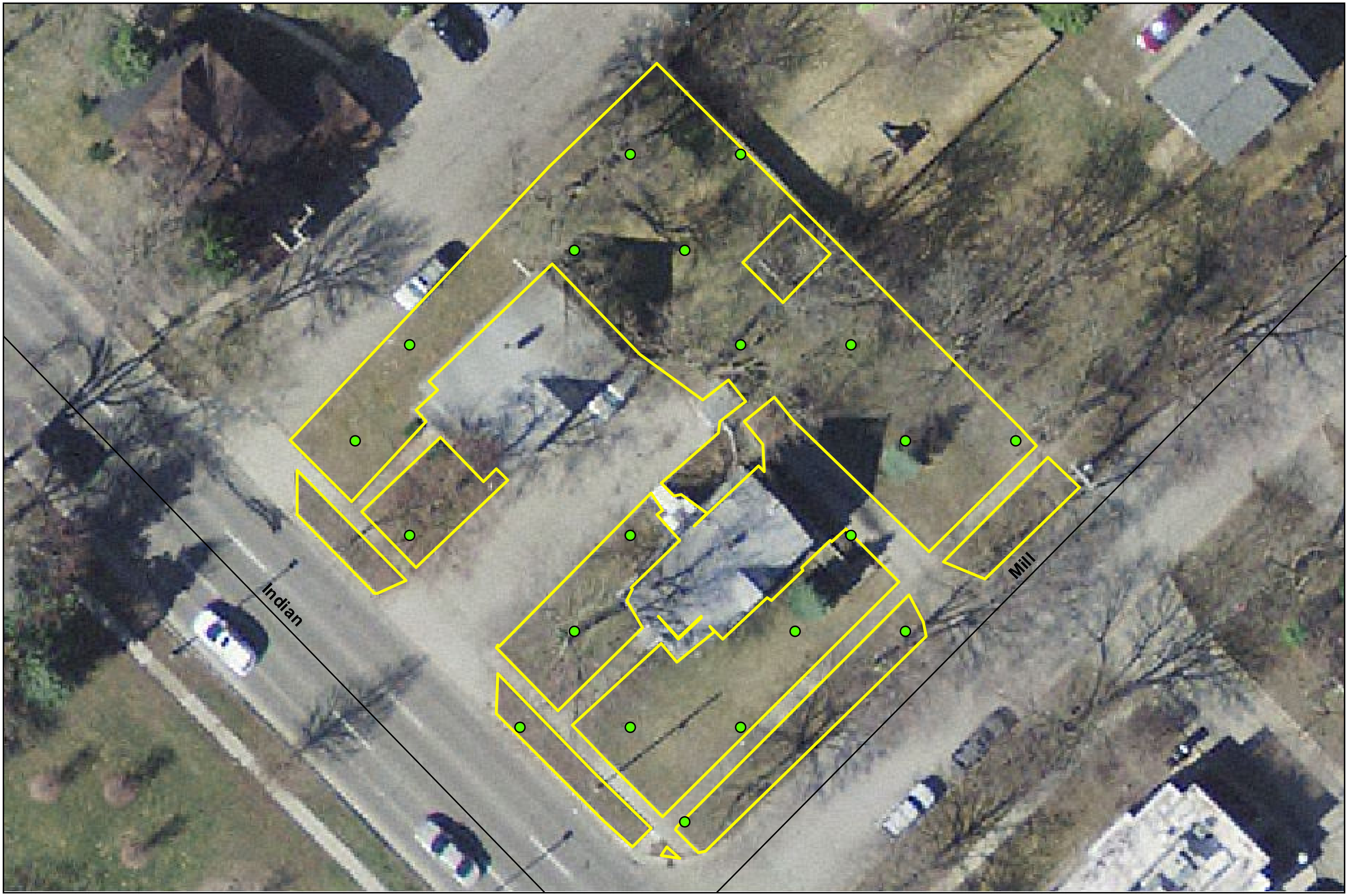
MIDLAND RESOLUTION

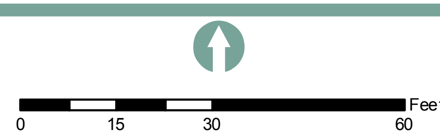
LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.38 Acres
20 Increments

0 25 50 100 Feet

Parcel 14-21-10-600
502 State St.
Midland Resolution Sampling Plan





MIDLAND RESOLUTION

LEGEND

Increment Locations

Property

Roadways

Notes:
0.27 Acres
20 Increments

Feet
0 15 30 60

Parcel 14-21-10-604
811 E Indian St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.57 Acres
20 Increments

Feet 0 25 50 100

Parcel 14-21-10-622
501 State St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.13 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-630
704 E Grove St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.13 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-80-468
609 E Buttles St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.14 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-21-80-470
613 E Buttles St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.25 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-21-80-472
701 E Buttles St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.12 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-21-80-476
707 E Buttles St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.10 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-21-80-478
711 E Buttles St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.17 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-21-80-480
715 E Buttles St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.06 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-21-80-482
409 State St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.08 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-80-484
411 State St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.15 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-21-80-486
712 E Indian St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.11 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-80-488
706 E Indian St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.12 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-80-490
702 E Indian St.
Midland Resolution Sampling Plan

LEGEND
Increment Locations
Property
Roadways

Notes:
0.21 Acres
10 Increments

0 15 30 60 Feet

MIDLAND RESOLUTION

Parcel 14-21-80-492
616 E Indian St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.17 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-80-494
612 E Indian St.
Midland Resolution Sampling Plan

LEGEND
Increment Locations
Property
Roadways

Notes:
0.17 Acres
10 Increments

0 15 30 60 Feet

MIDLAND RESOLUTION

Parcel 14-21-80-496
416 George St.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.14 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-21-80-498
412 George St.
Midland Resolution Sampling Plan

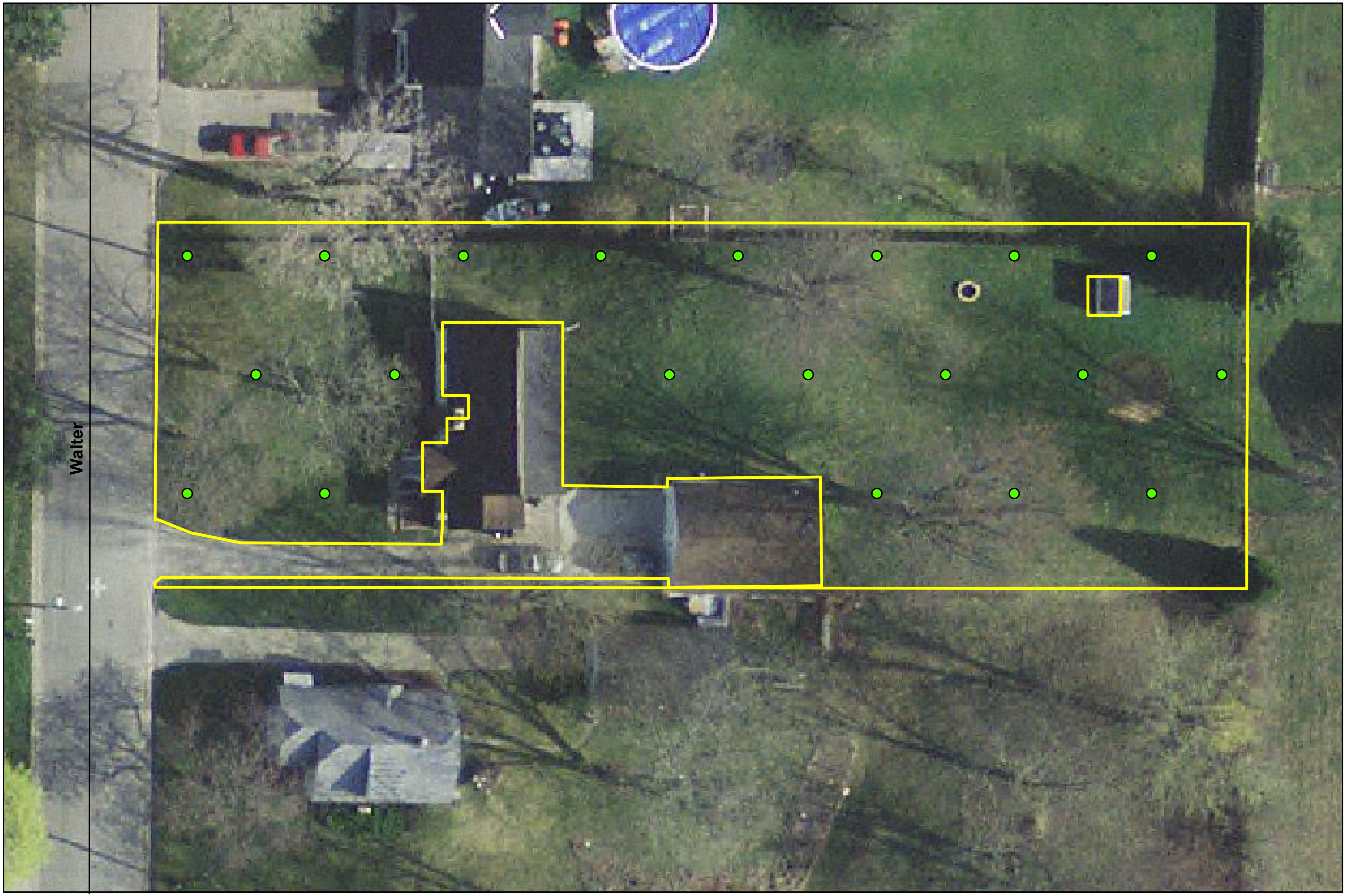
MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.45 Acres
20 Increments

Feet
0 15 30 60

Parcel 14-23-60-062
410 Walter Ct.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

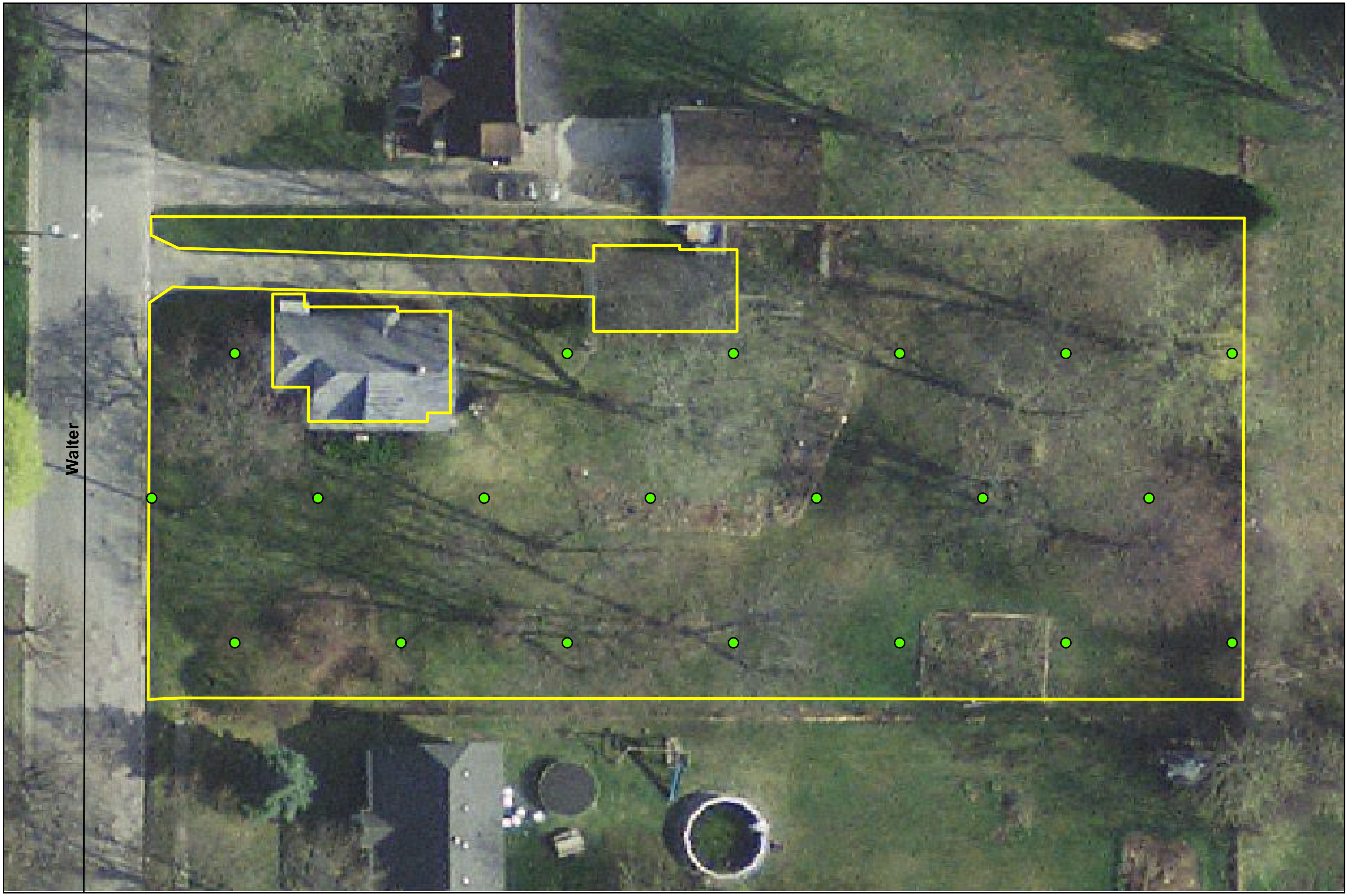
LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.43 Acres
20 Increments

Feet
0 15 30 60

Parcel 14-23-60-064
408 Walter Ct.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.60 Acres
20 Increments

0 15 30 60 Feet

Parcel 14-23-60-068
400 Walter Ct.
Midland Resolution Sampling Plan

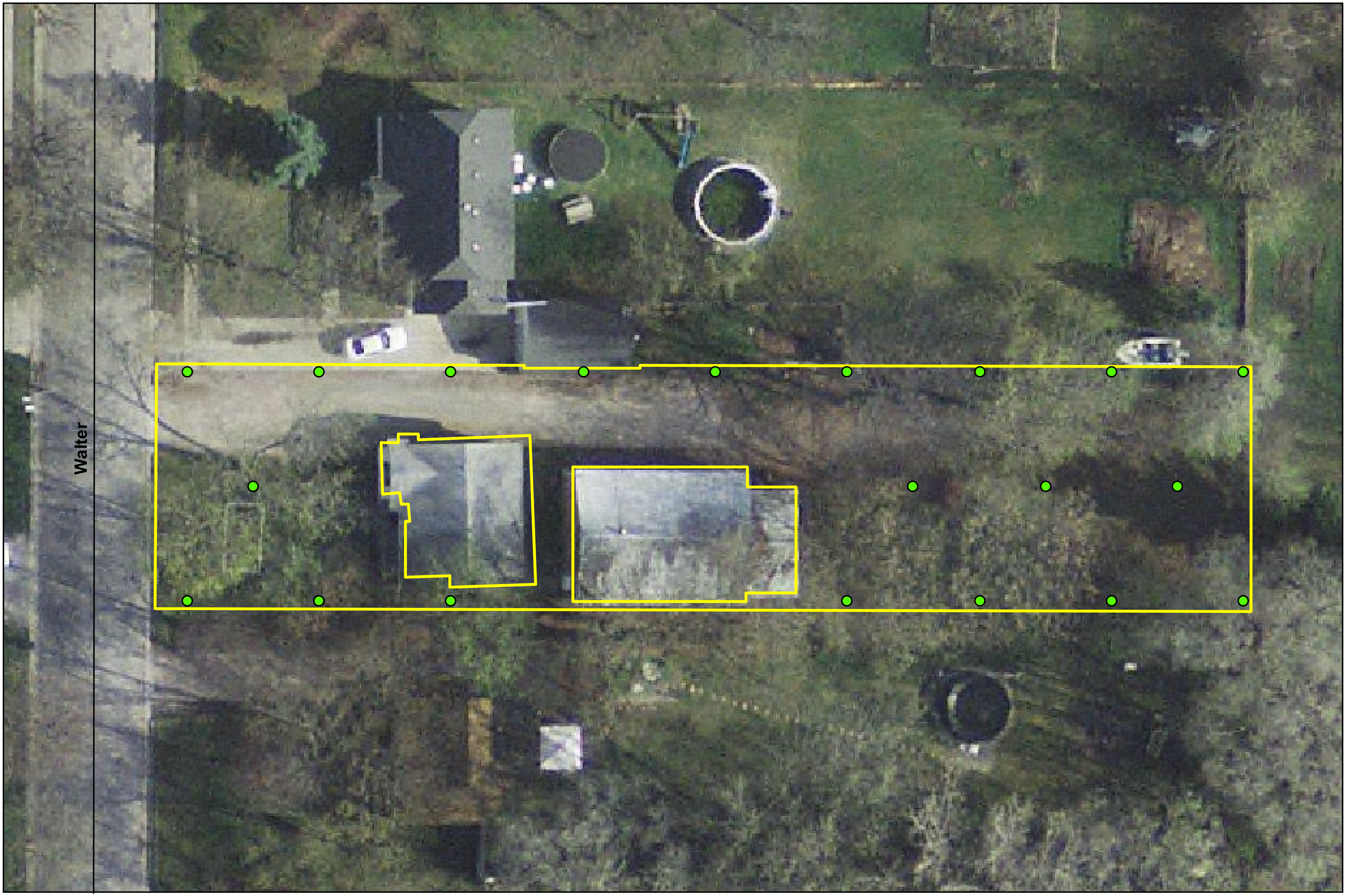
LEGEND
Increment Locations
Property
Roadways

Notes:
0.36 Acres
20 Increments

0 15 30 60
Feet

MIDLAND RESOLUTION

Parcel 14-23-60-070
332 Walter Ct.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

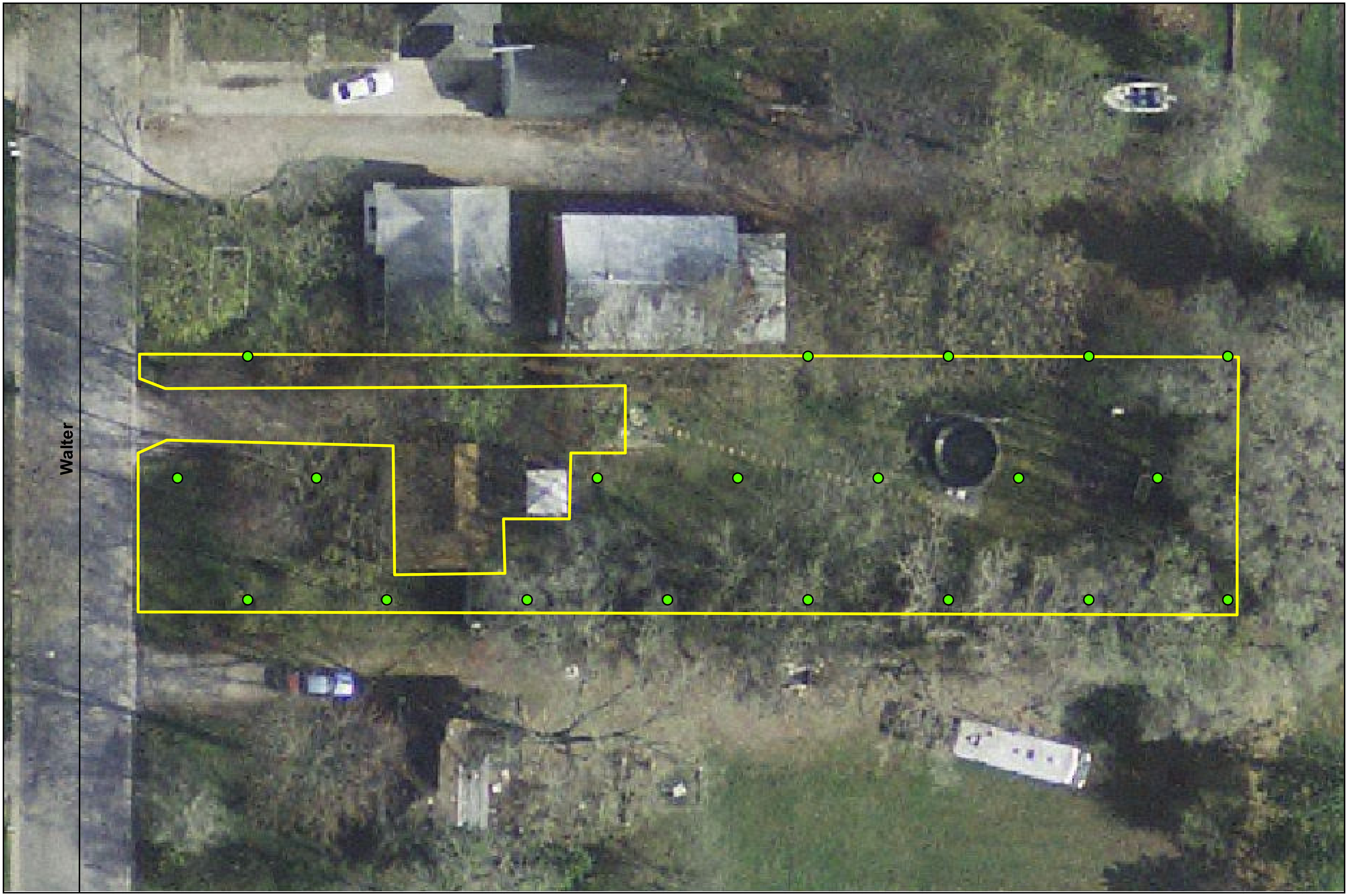
LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.26 Acres
20 Increments

0 15 30 60 Feet

Parcel 14-23-60-072
328 Walter Ct.
Midland Resolution Sampling Plan



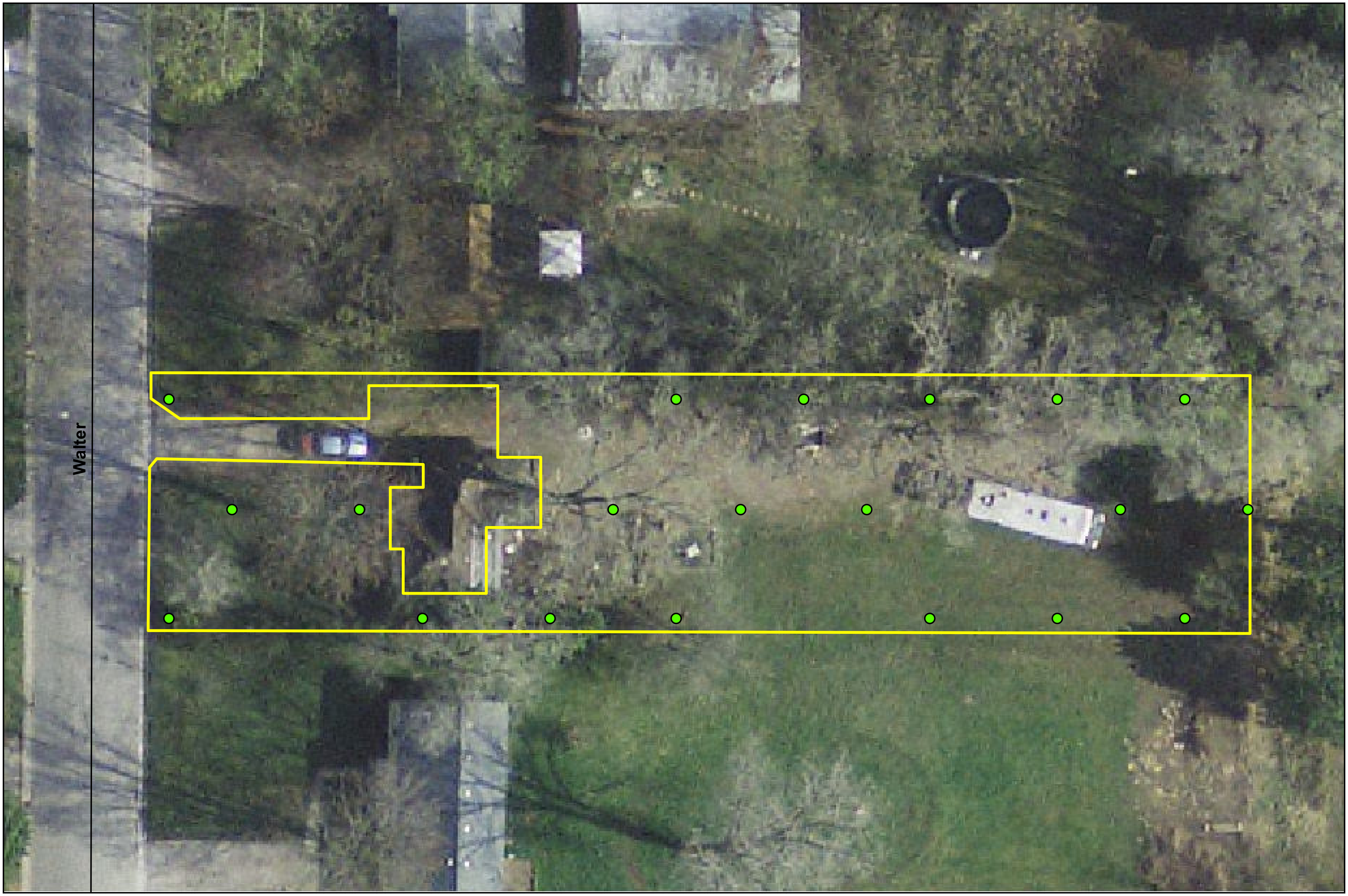
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.31 Acres
20 Increments

0 15 30 60 Feet

Parcel 14-23-60-074
324 Walter Ct.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.31 Acres
20 Increments

Feet
0 15 30 60

Parcel 14-23-60-076
320 Walter Ct.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

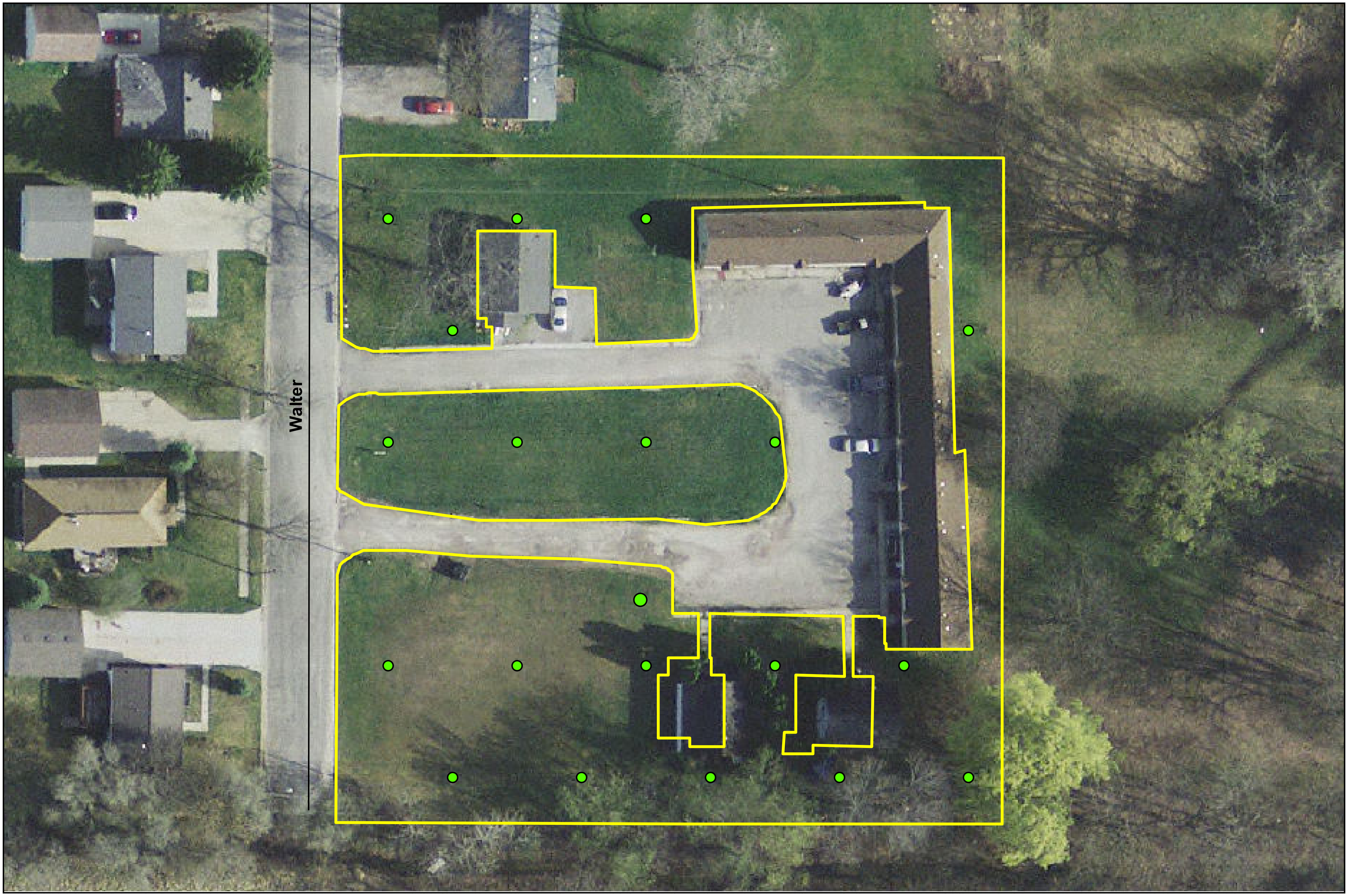
LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.44 Acres
20 Increments

Feet
0 15 30 60

Parcel 14-23-60-078
316 Walter Ct.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND

Increment Locations

Property

Roadways

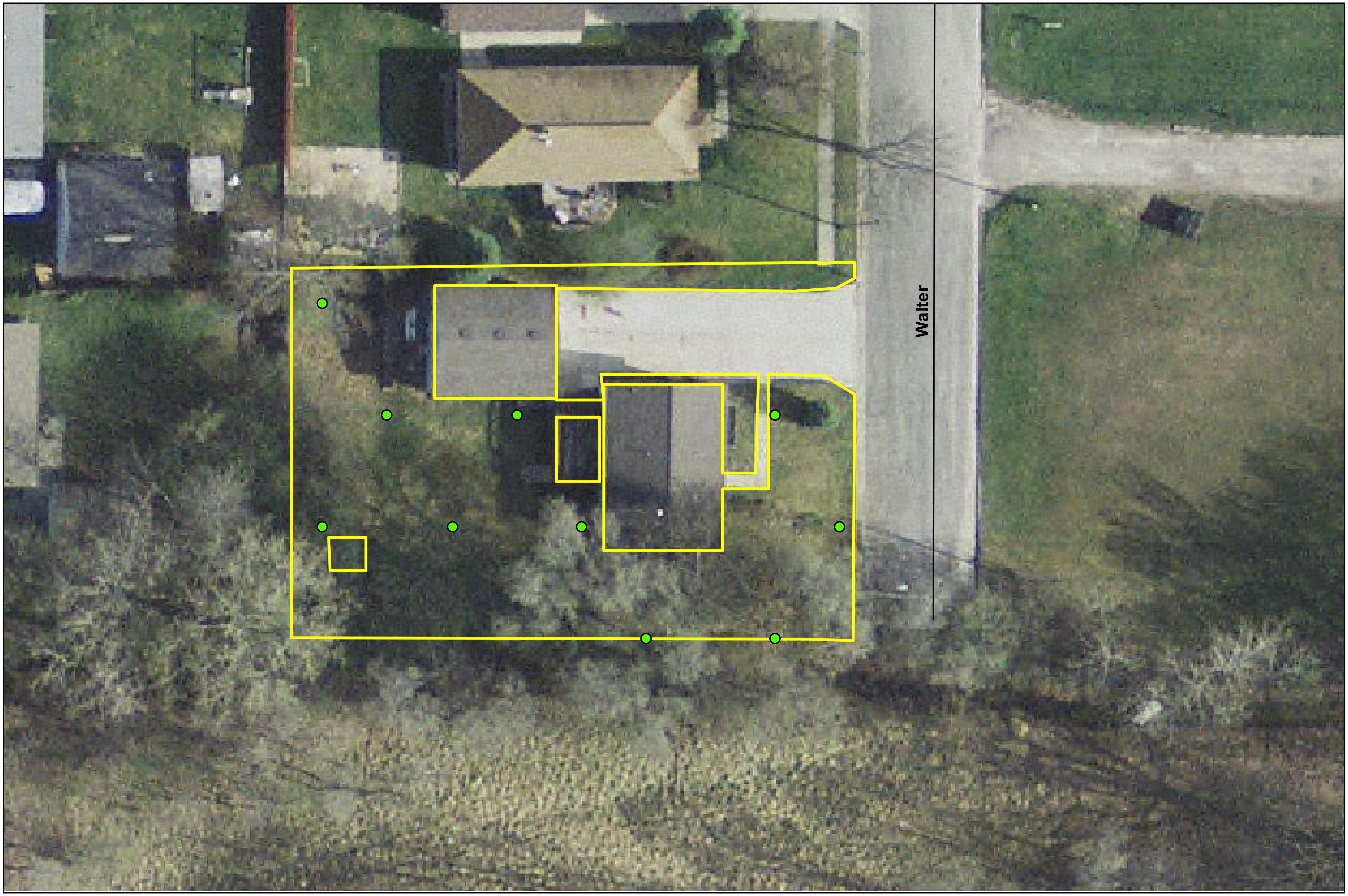
Notes:
1.00 Acres
20 Increments

0 25 50 100 Feet

Parcel 14-23-60-080

306 Walter Ct.

Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND

Increment Locations

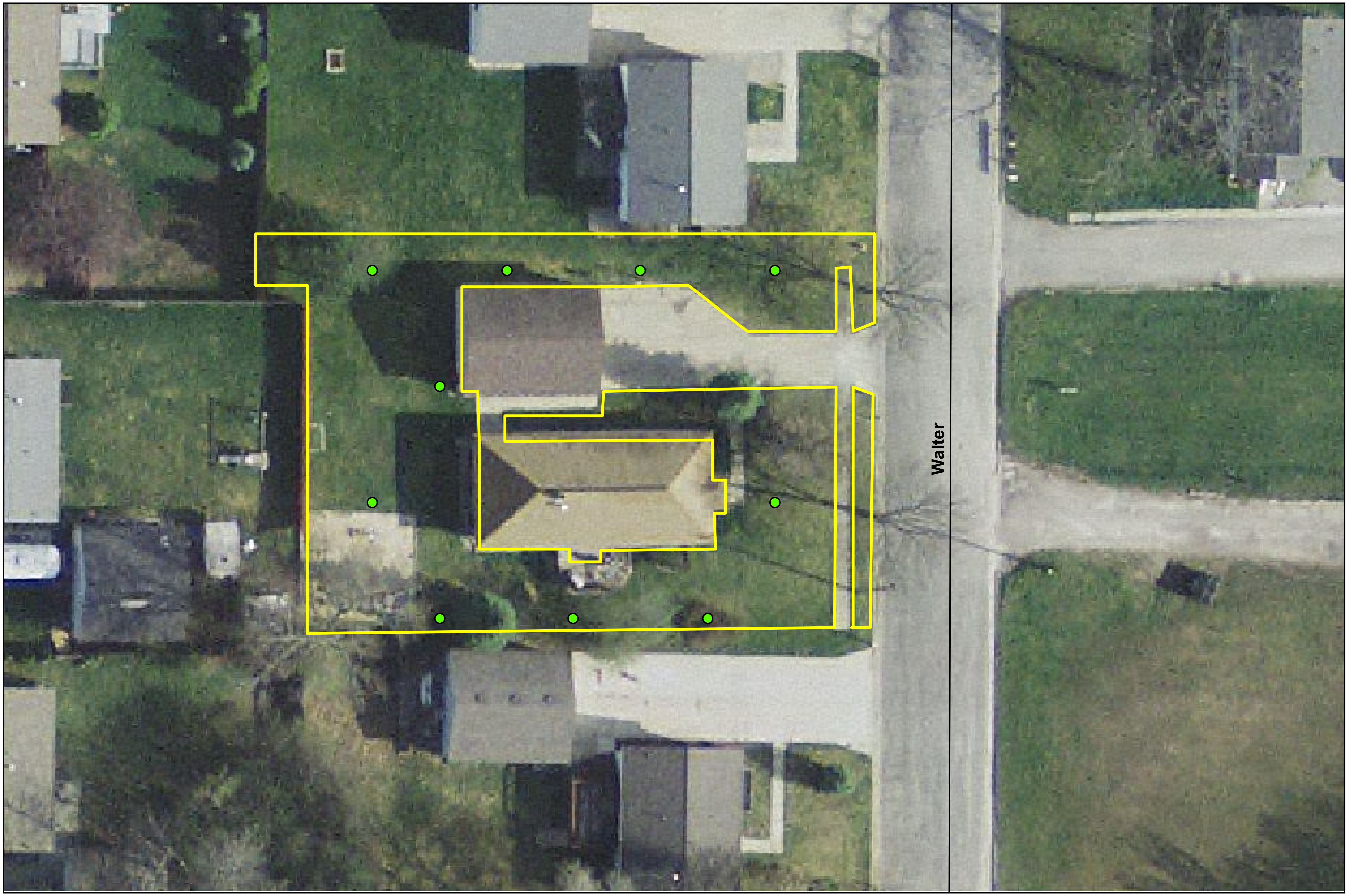
Property

Roadways

Notes:
0.20 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-23-60-088
301 Walter Ct.
Midland Resolution Sampling Plan



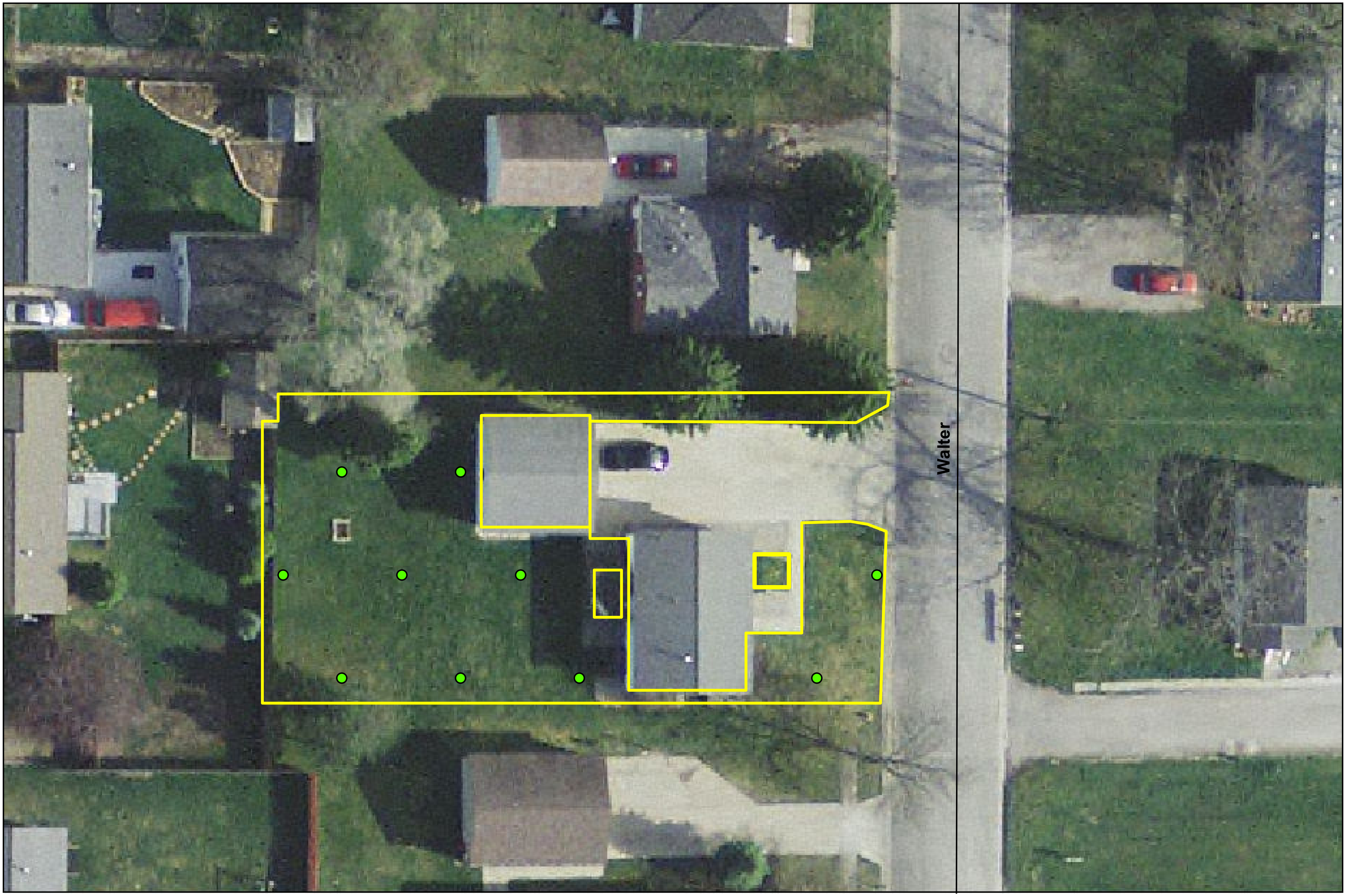
MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.21 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-23-60-090
307 Walter Ct.
Midland Resolution Sampling Plan



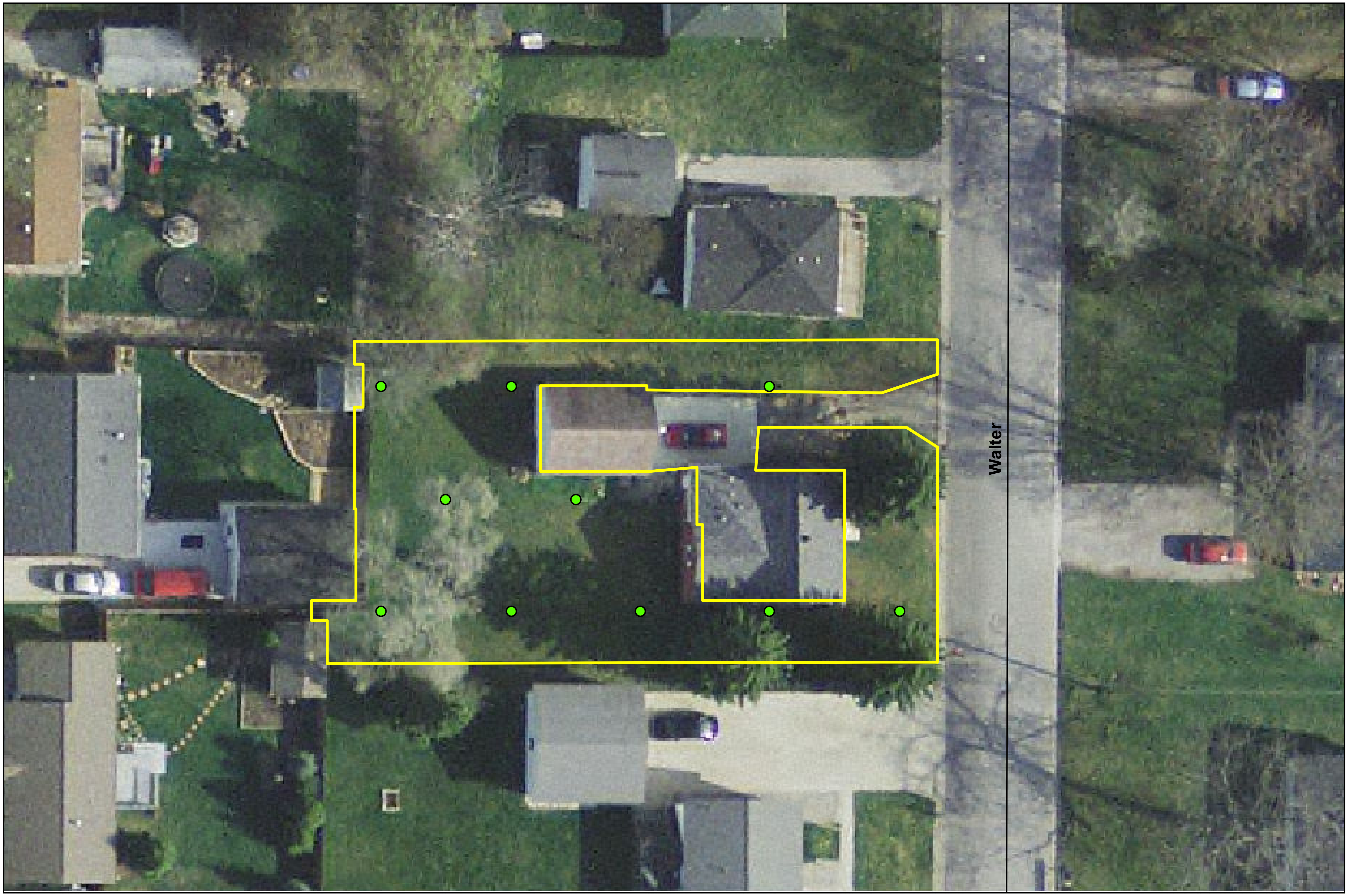
MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.18 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-23-60-092
309 Walter Ct.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

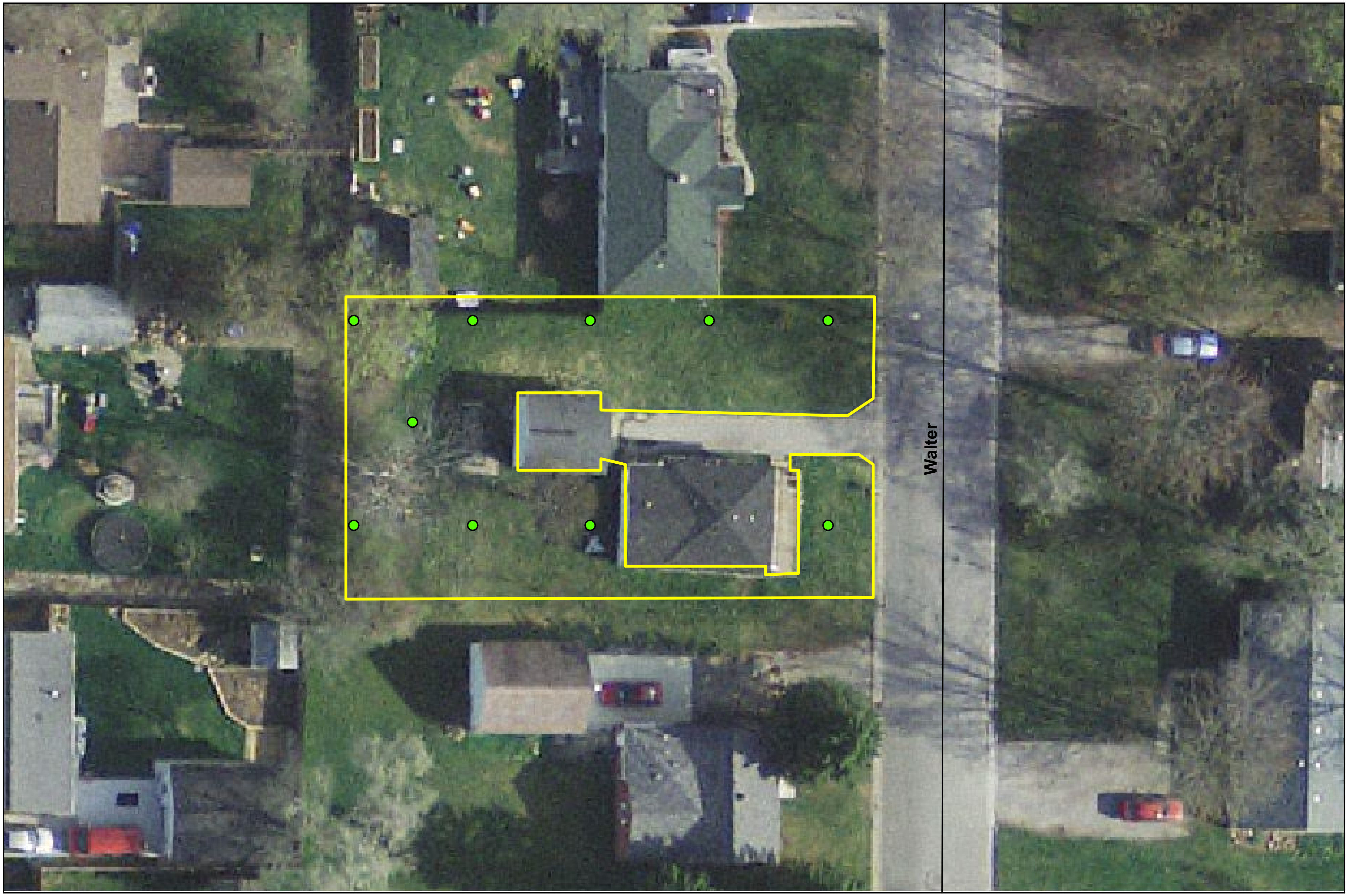
LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.18 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-23-60-094
311 Walter Ct.
Midland Resolution Sampling Plan



LEGEND

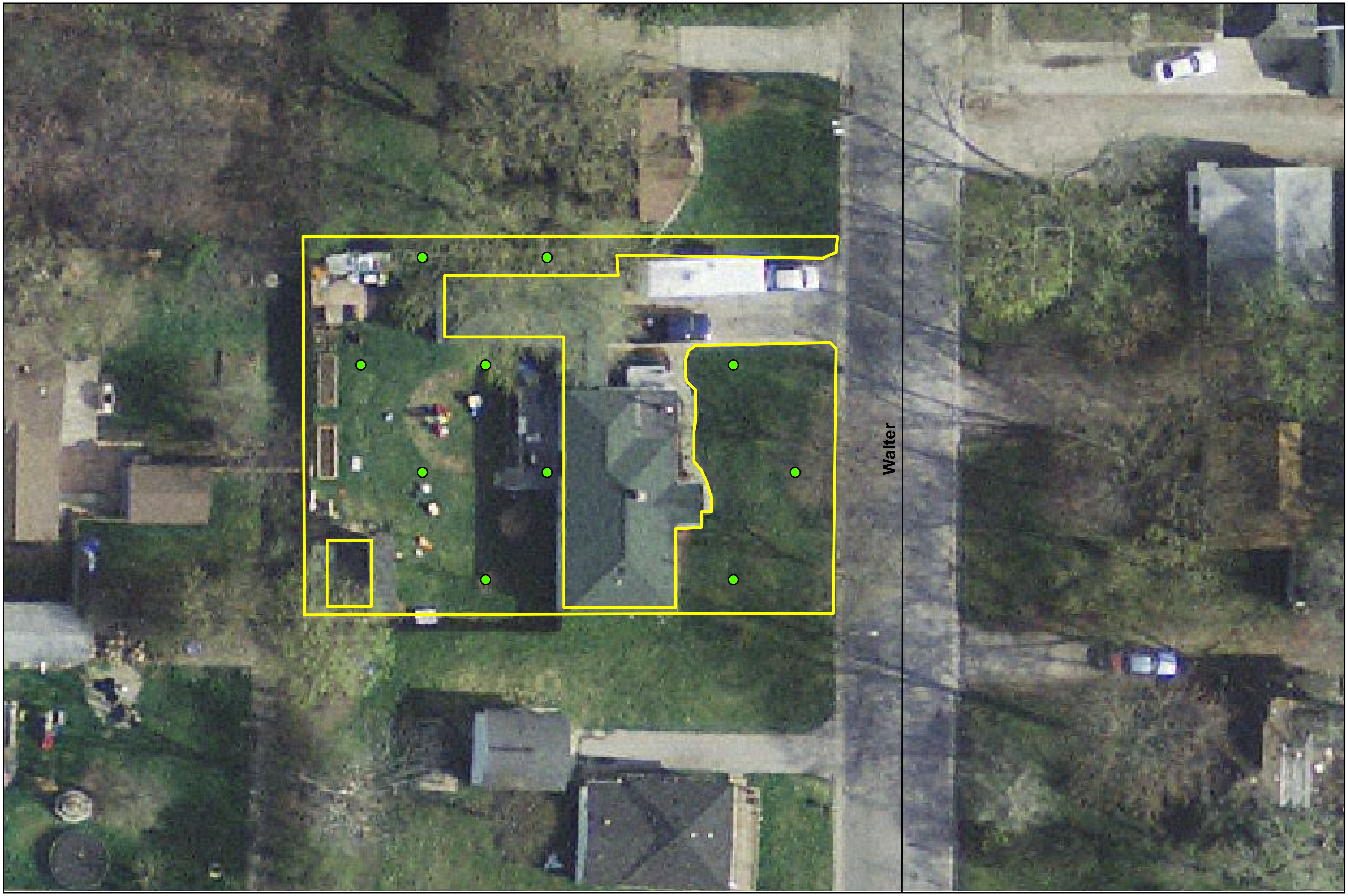
- Increment Locations
- Property
- Roadways

Notes:
0.15 Acres
10 Increments

0 15 30 60 Feet

MIDLAND RESOLUTION

Parcel 14-23-60-098
319 Walter Ct.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND

Increment Locations
Property
Roadways

Notes:
0.17 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-23-60-100
325 Walter Ct.
Midland Resolution Sampling Plan

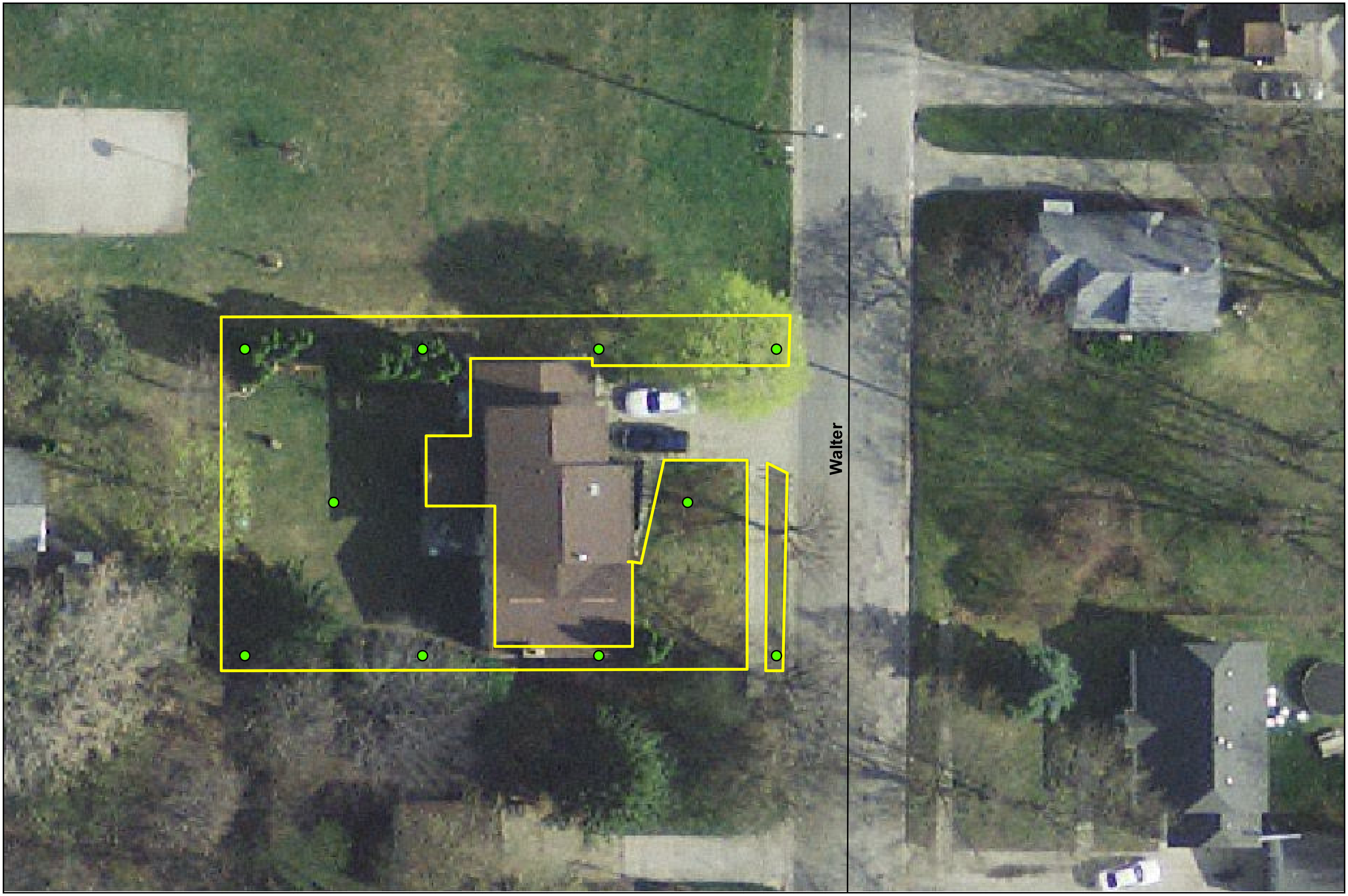
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.20 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-23-60-102
329 Walter Ct.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

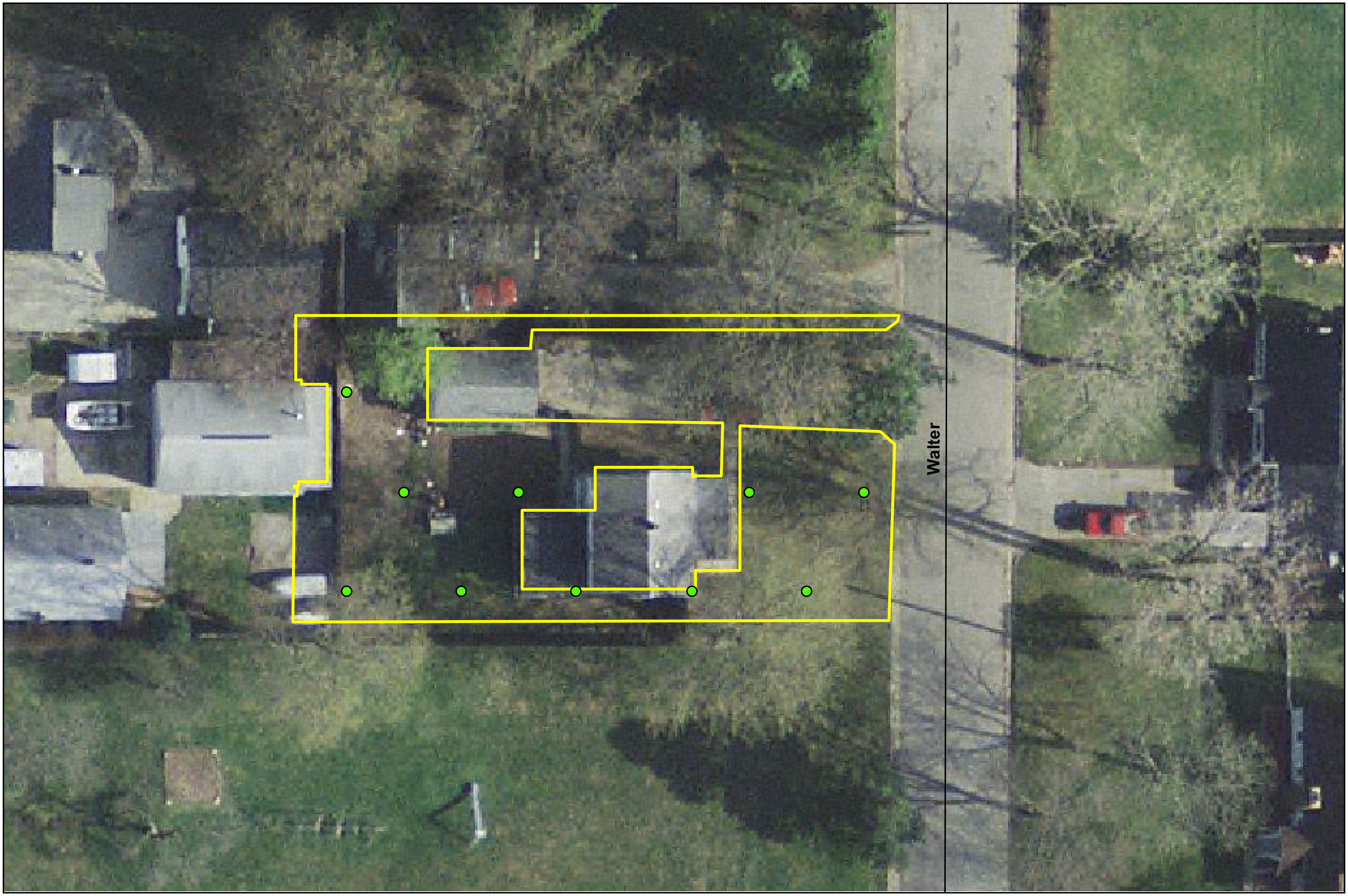
LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.17 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-23-60-106
401 Walter Ct.
Midland Resolution Sampling Plan



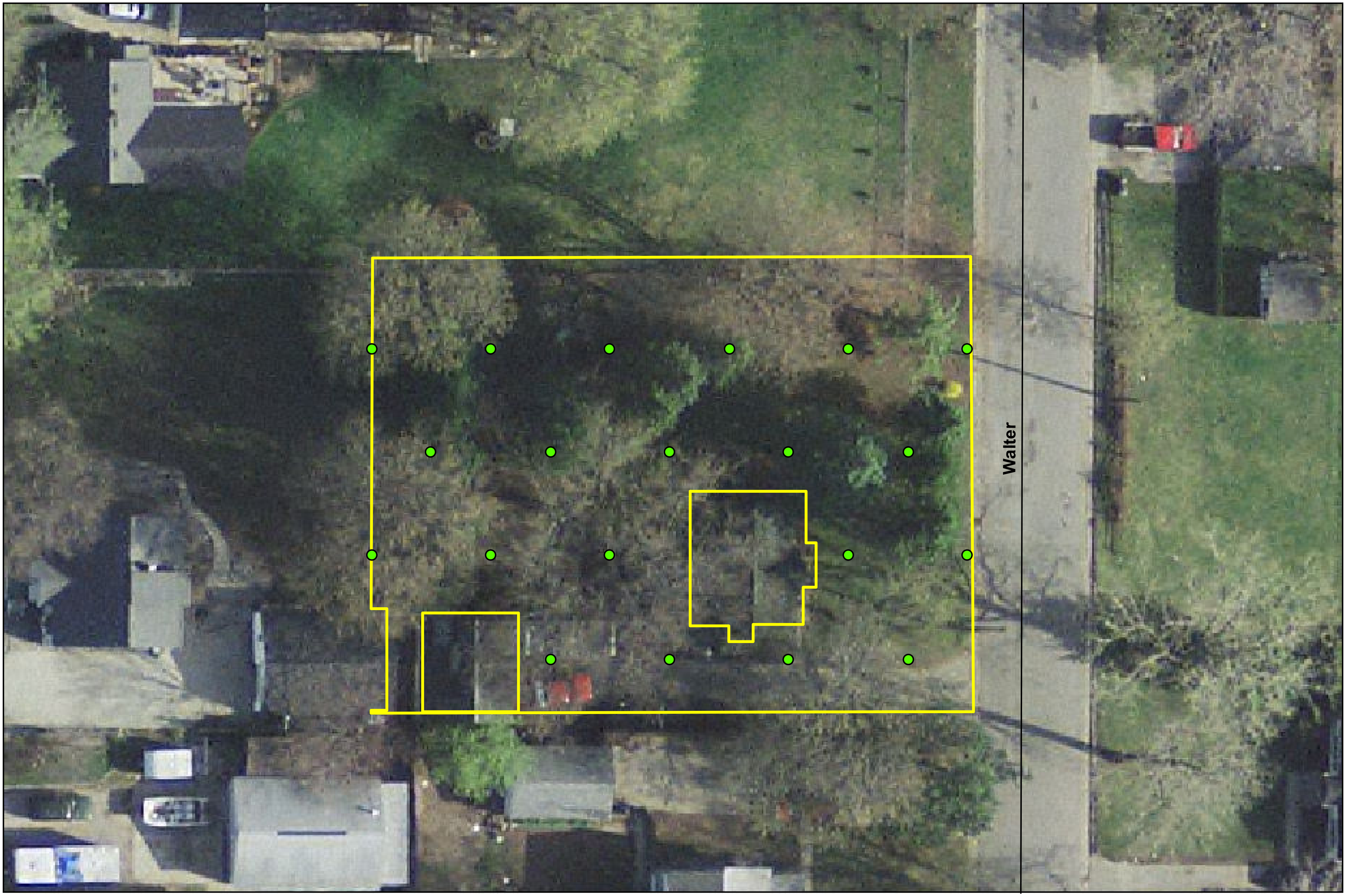
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.16 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-23-60-110
409 Walter Ct.
Midland Resolution Sampling Plan



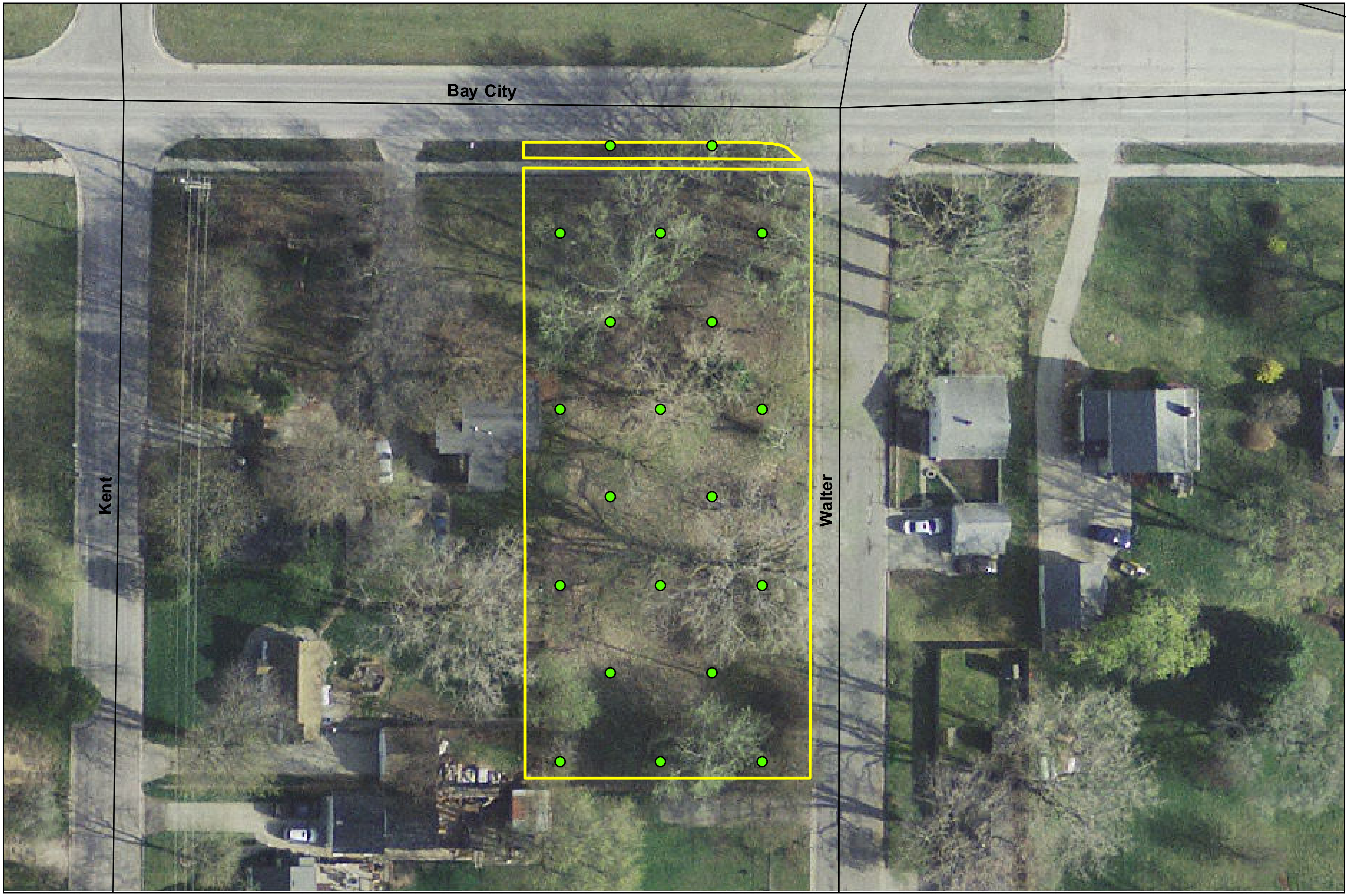
MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.26 Acres
20 Increments

0 15 30 60 Feet

Parcel 14-23-60-112
413 Walter Ct.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.48 Acres
20 Increments

Feet
0 25 50 100

Parcel 14-23-60-120
425 Walter Ct.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

Increment Locations
Property
Roadways

Notes:
0.20 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-23-60-122
2208 Bay City Rd.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.20 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-23-60-124
424 Kent Ct.
Midland Resolution Sampling Plan

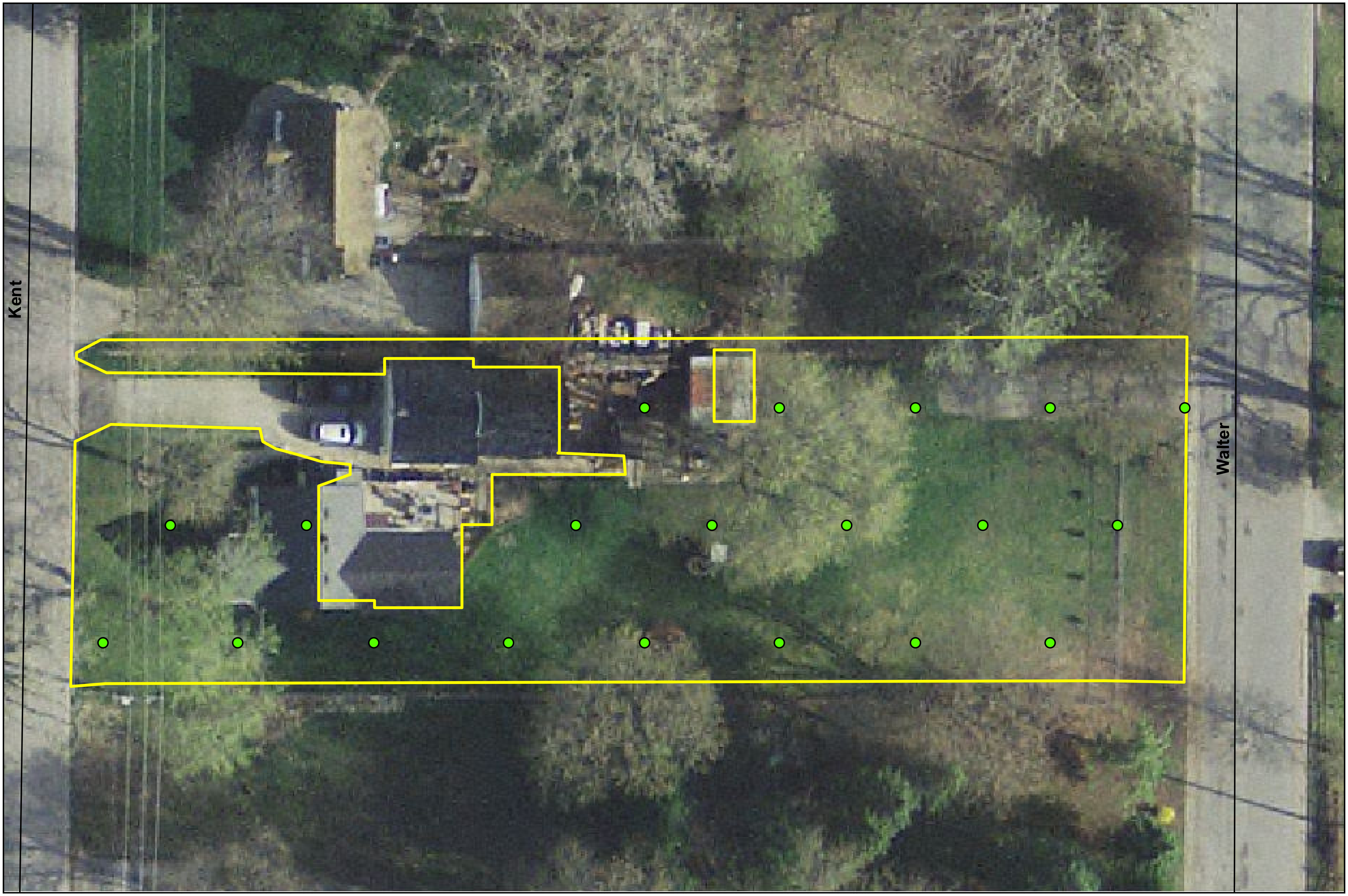
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.25 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-23-60-126
420 Kent Ct.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.37 Acres
20 Increments

Feet
0 15 30 60

Parcel 14-23-60-128
416 Kent Ct.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

Increment Locations

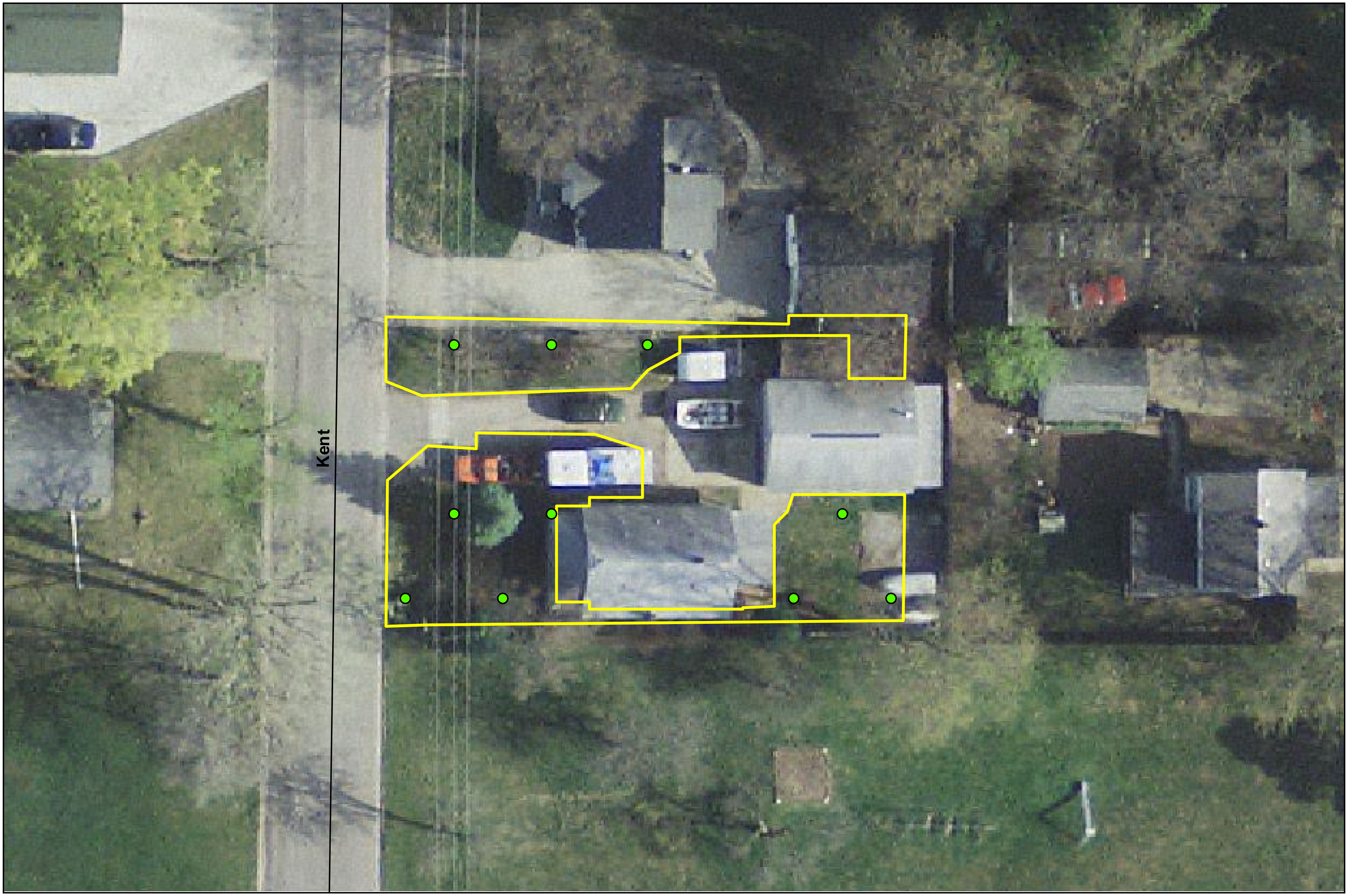
Property

Roadways

Notes:
0.23 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-23-60-130
412 Kent Ct.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.10 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-23-60-131
410 Kent Ct.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

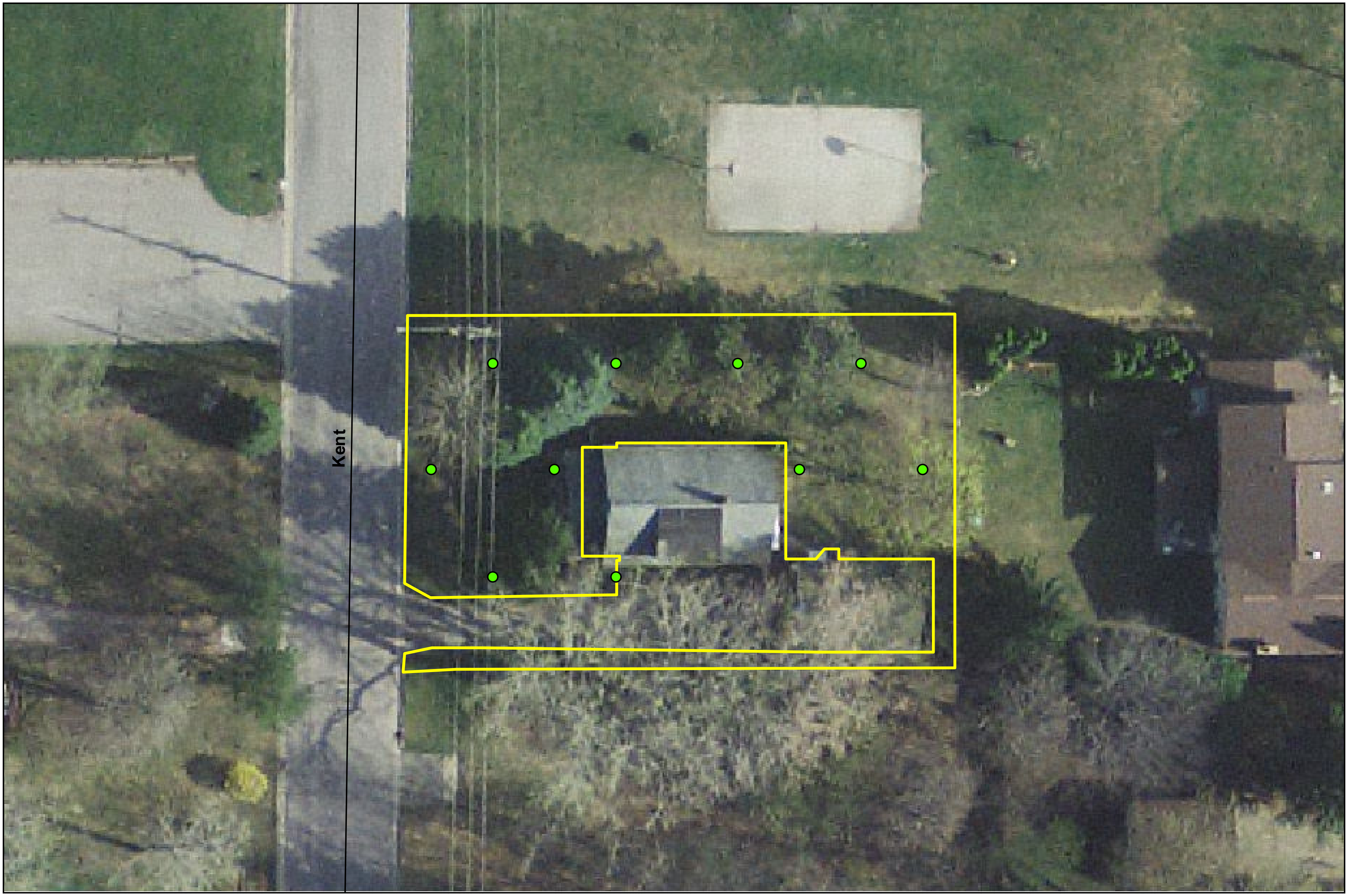
LEGEND

Increment Locations
Property
Roadways

Notes:
0.64 Acres
20 Increments

0 15 30 60 Feet

Parcel 14-23-60-132
400 Kent Ct.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.18 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-23-60-140
332 Kent Ct.
Midland Resolution Sampling Plan

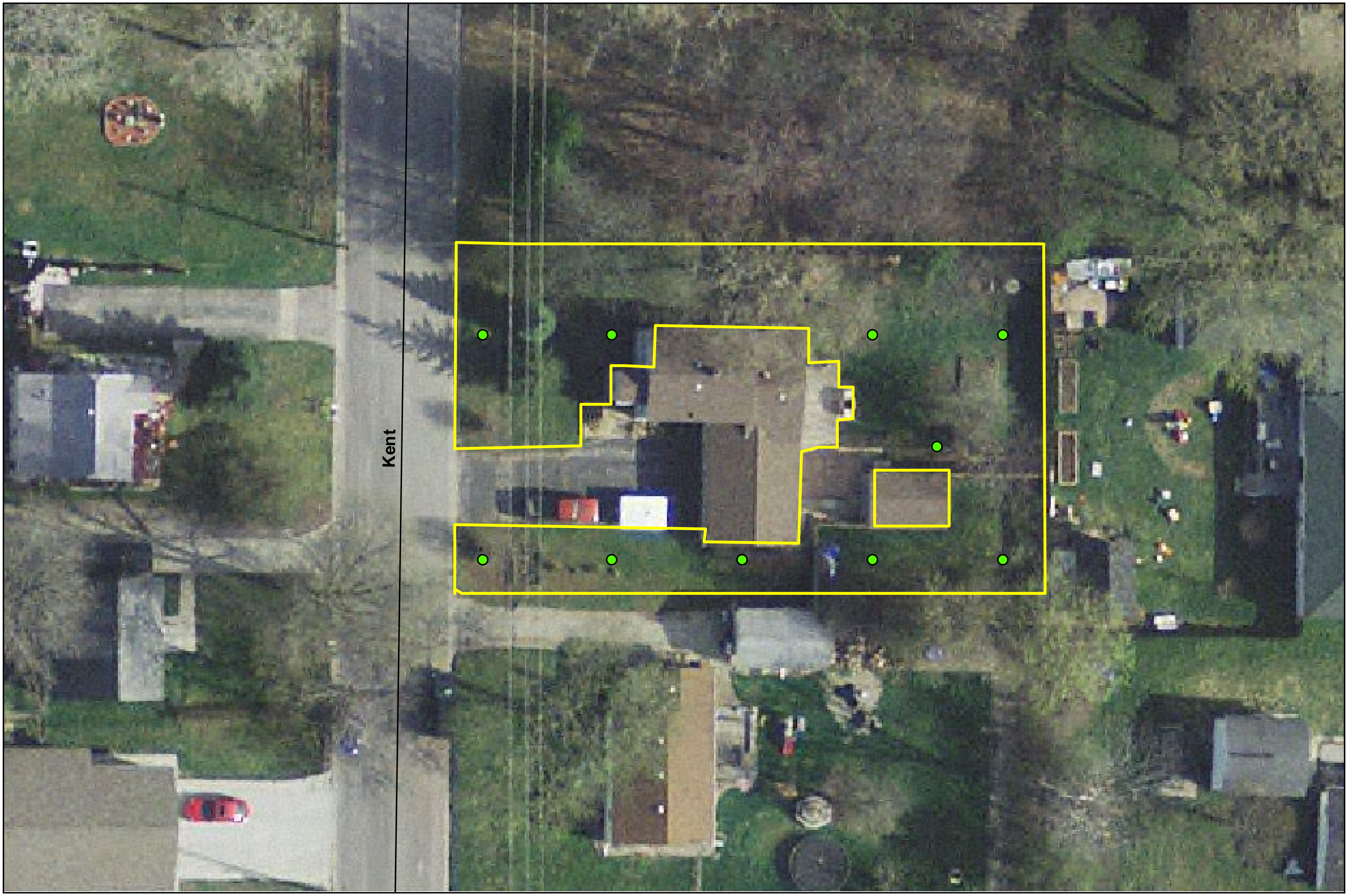
MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
0.25 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-23-60-142
328 Kent Ct.
Midland Resolution Sampling Plan



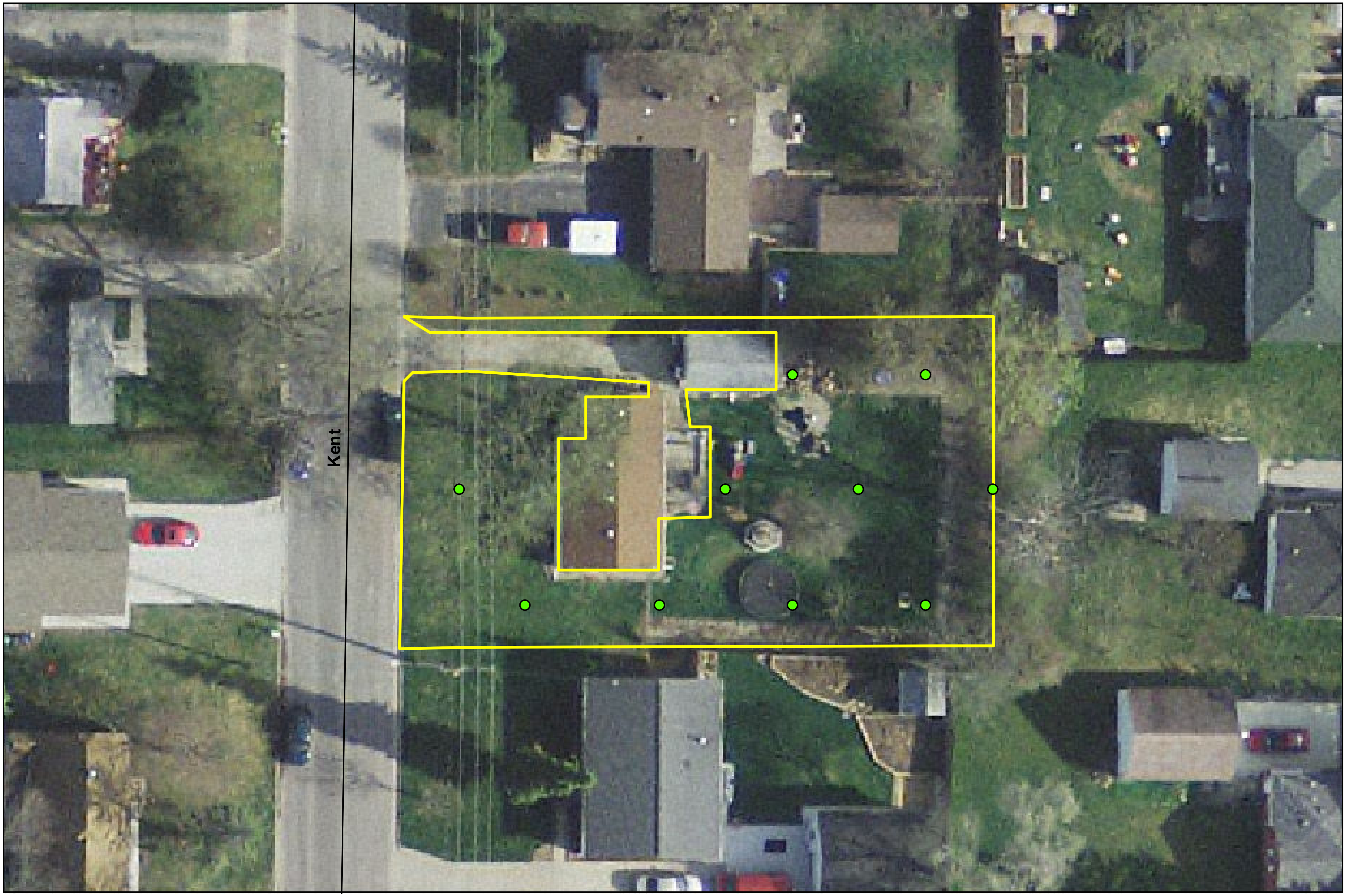
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.19 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-23-60-144
322 Kent Ct.
Midland Resolution Sampling Plan



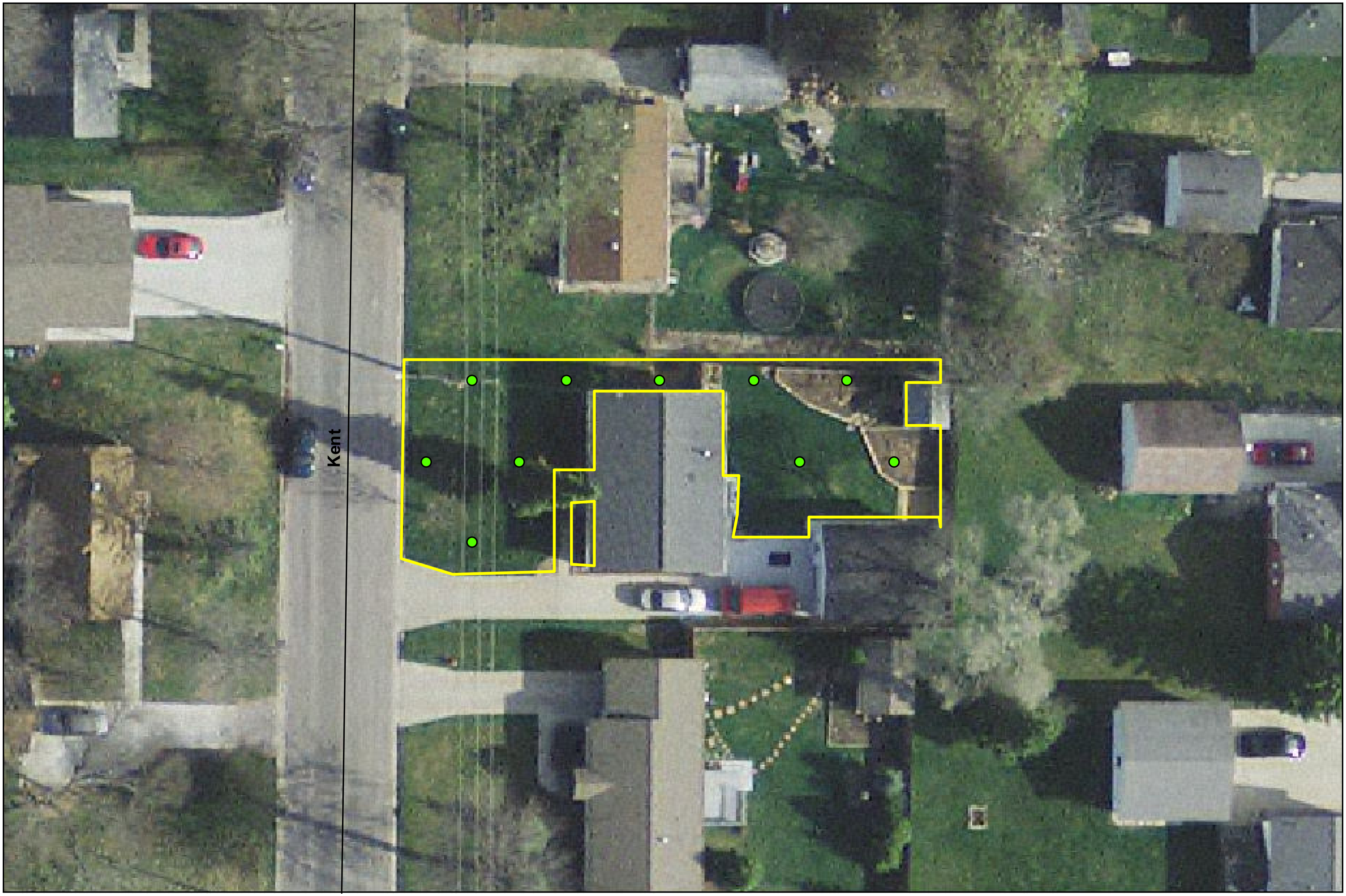
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.21 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-23-60-146
318 Kent Ct.
Midland Resolution Sampling Plan



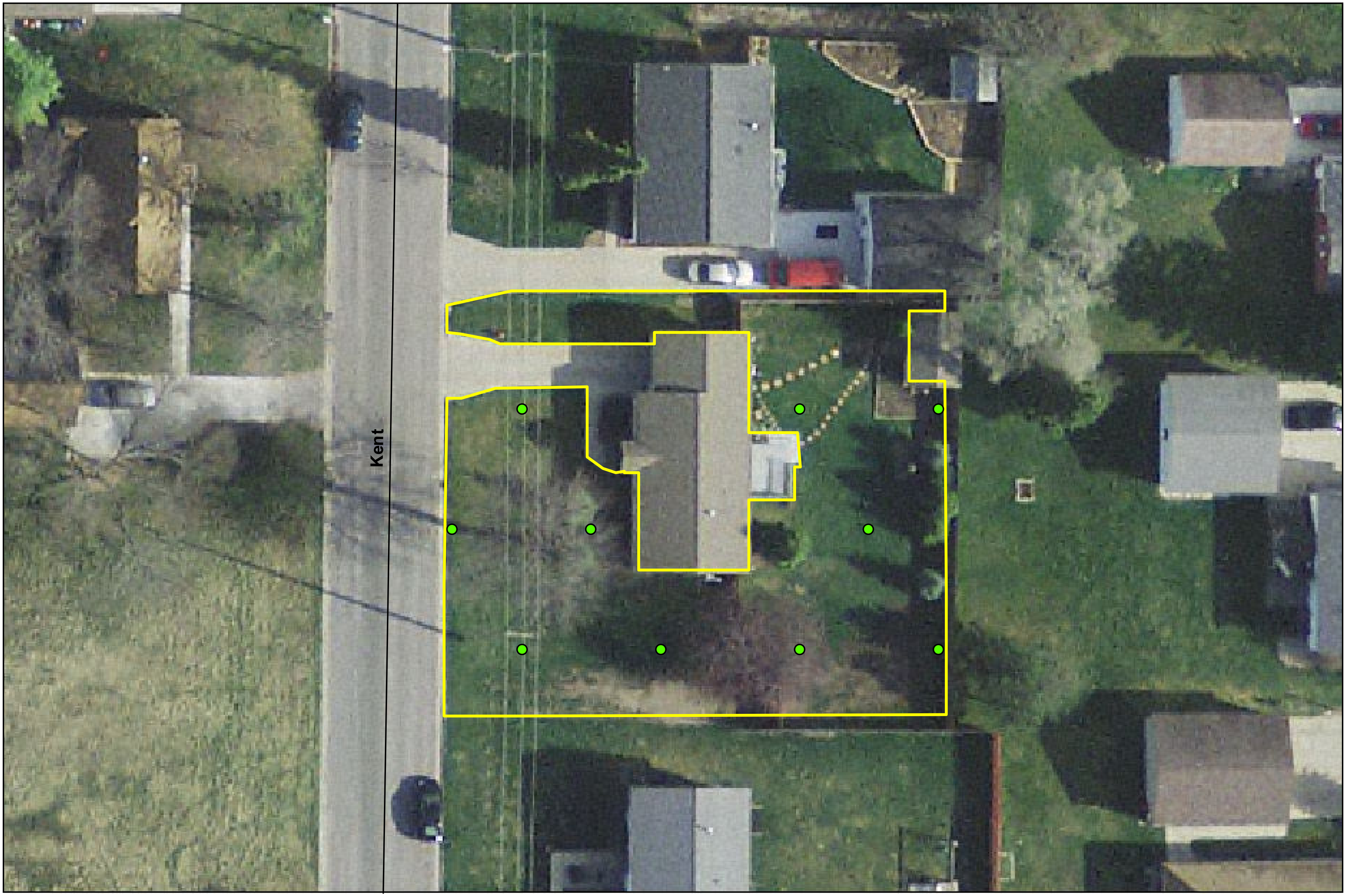
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.11 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-23-60-148
314 Kent Ct.
Midland Resolution Sampling Plan



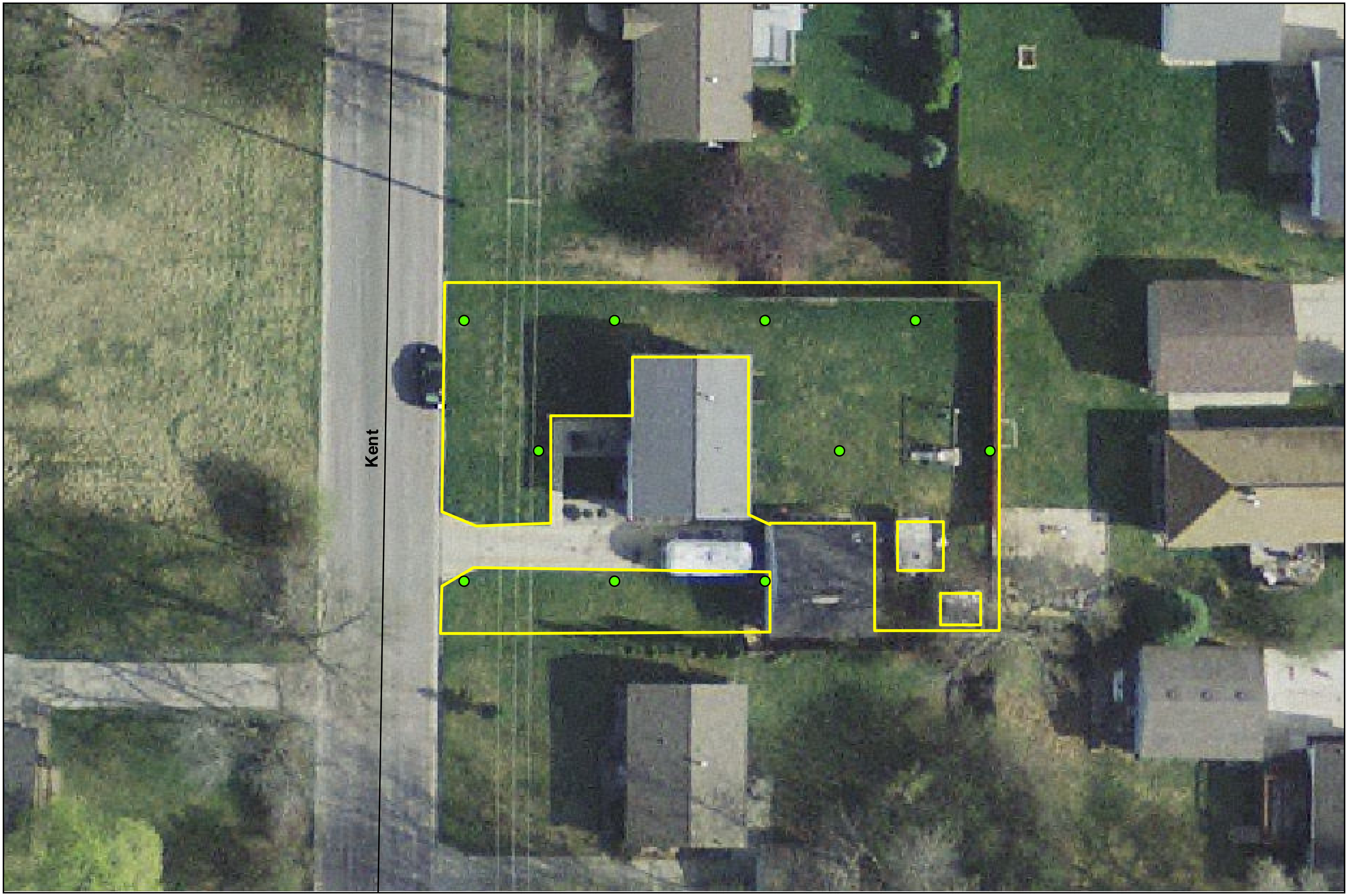
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.19 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-23-60-150
312 Kent Ct.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

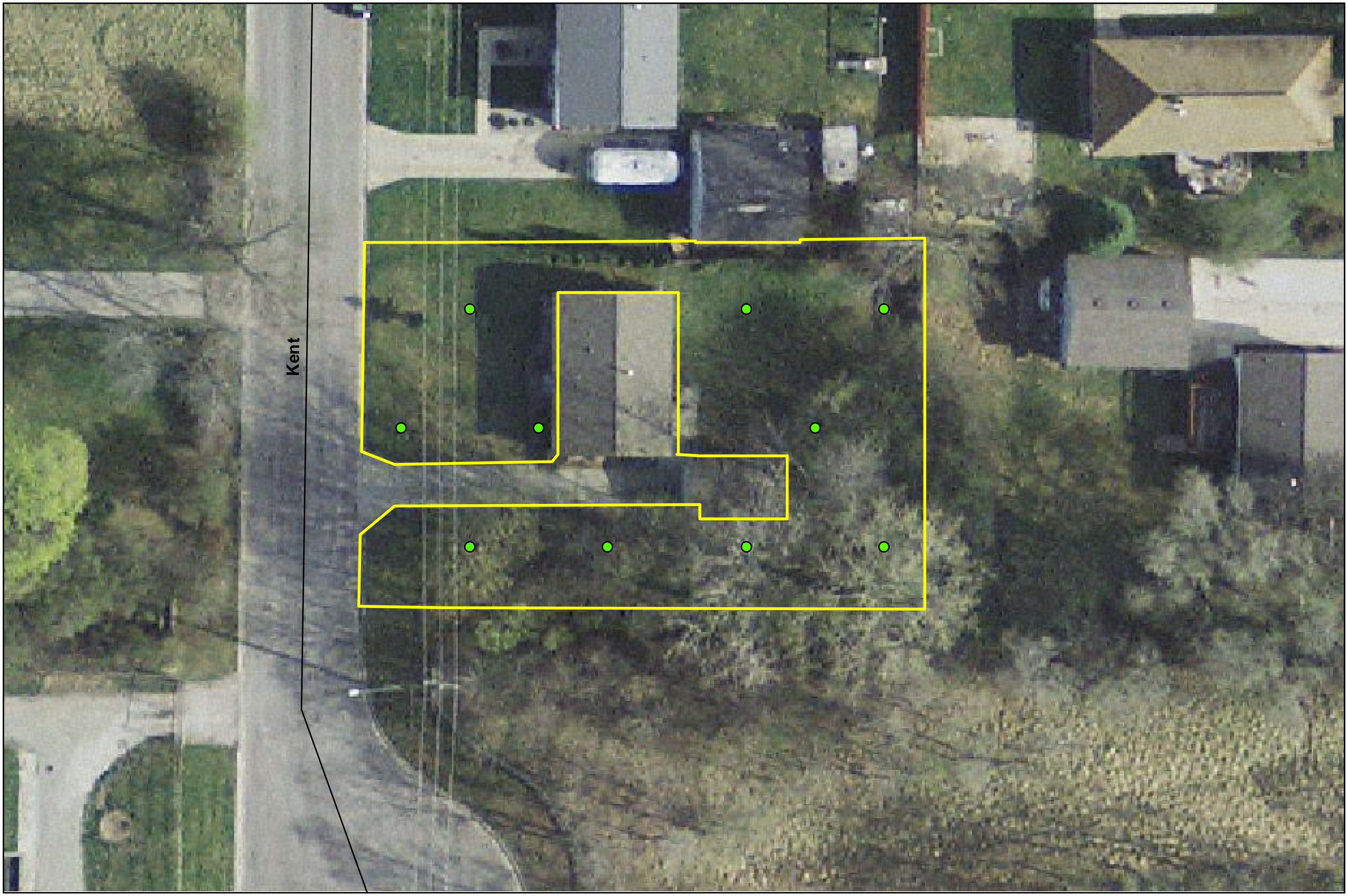
LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.17 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-23-60-152
310 Kent Ct.
Midland Resolution Sampling Plan



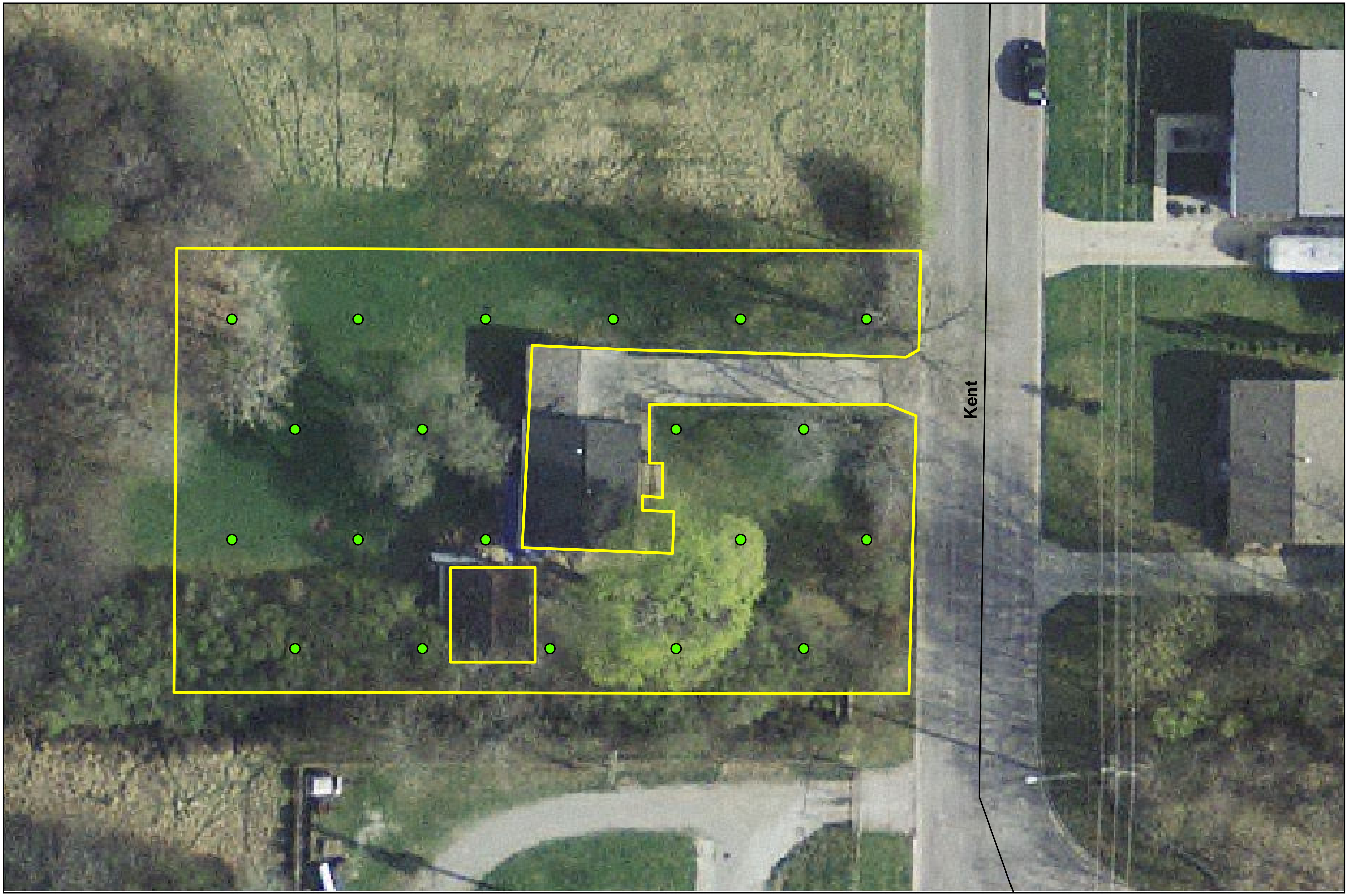
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.19 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-23-60-154
306 Kent Ct.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

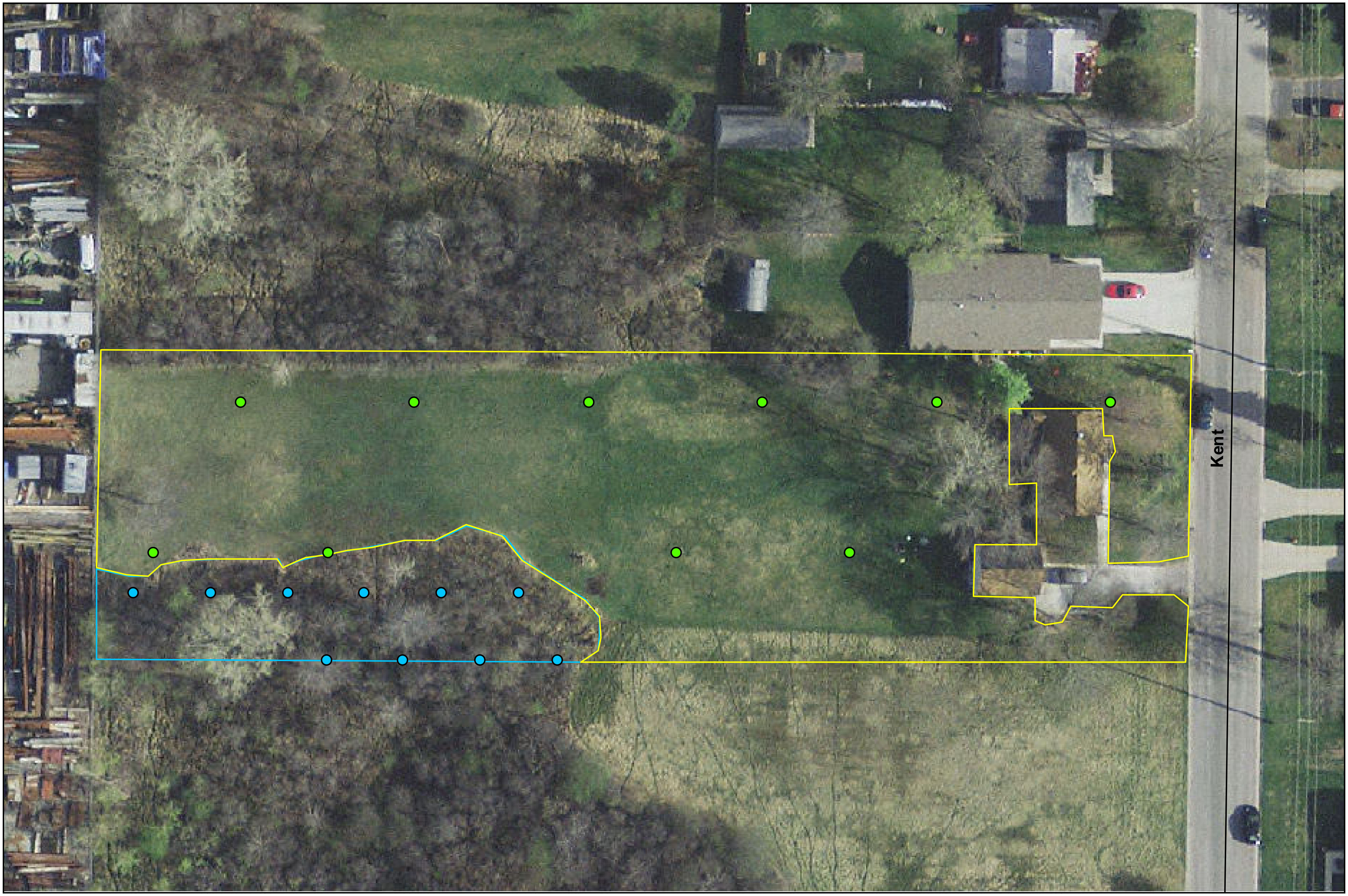
LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.33 Acres
20 Increments

Feet
0 15 30 60

Parcel 14-23-60-156
301 Kent Ct.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND

Increment Locations

Property

Increment Locations - Wooded Area

Property - Wooded Area

Roadways

Notes:
.92 Total Acres
20 Increments

0 25 50 100 Feet

Parcel 14-23-60-164
315 Kent Ct.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Property
- Increment Locations - Wooded Area
- Property - Wooded Area
- Roadways

Notes:
.42 Total Acres
20 Increments

0 25 50 100 Feet

Parcel 14-23-60-168
319 Kent Ct.
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Increment Locations - Wooded Area
- Property - Wooded Area
- Roadways

Notes:
.46 Total Acres
20 Increments

0 25 50 100 Feet

Parcel 14-23-60-170
323 Kent Ct.
Midland Resolution Sampling Plan

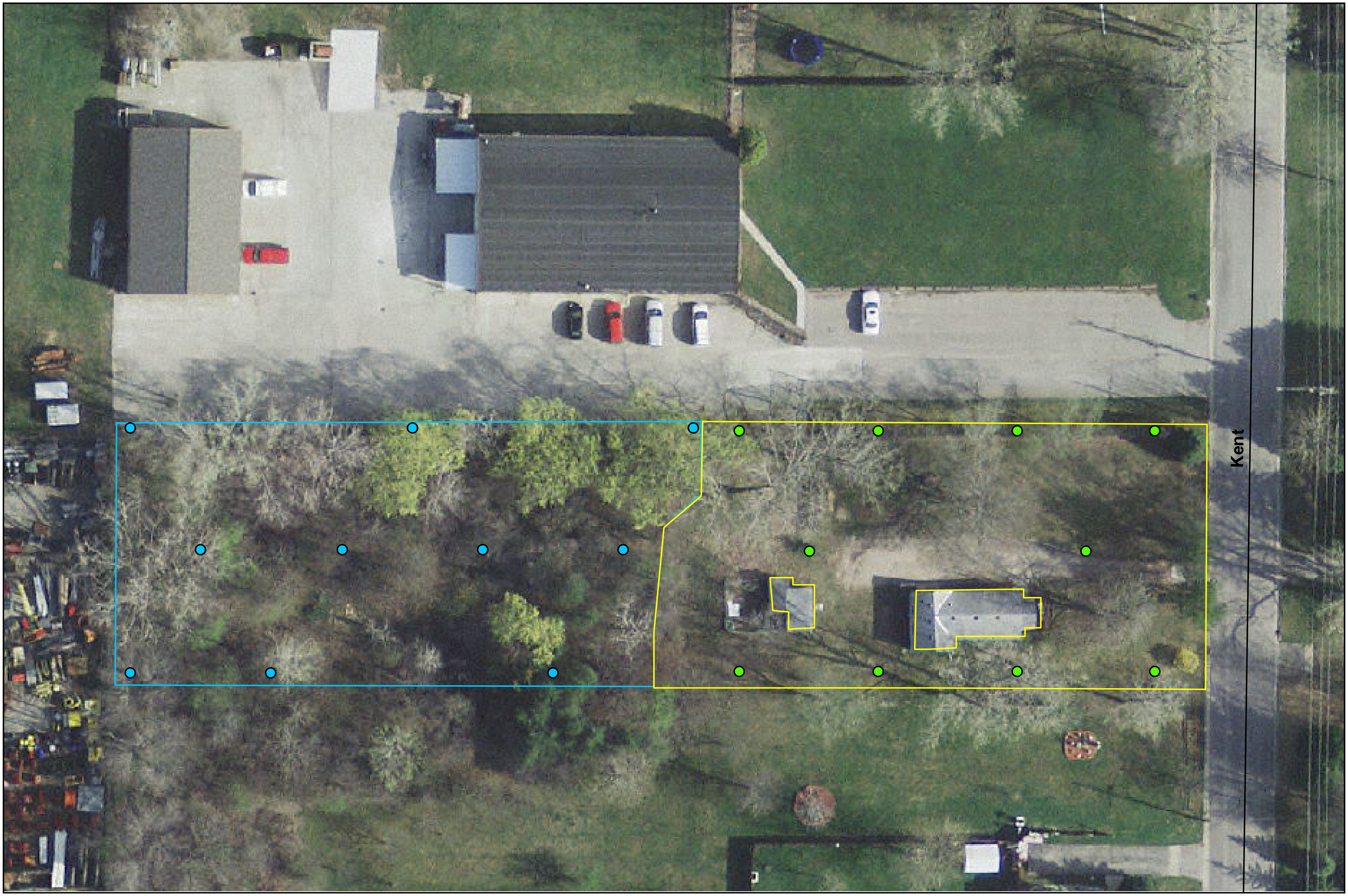
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Increment Locations - Wooded Area
- Property - Wooded Area
- Roadways

Notes:
.95 Total Acres
20 Increments

Feet
0 25 50 100

Parcel 14-23-60-172
327 Kent Ct.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

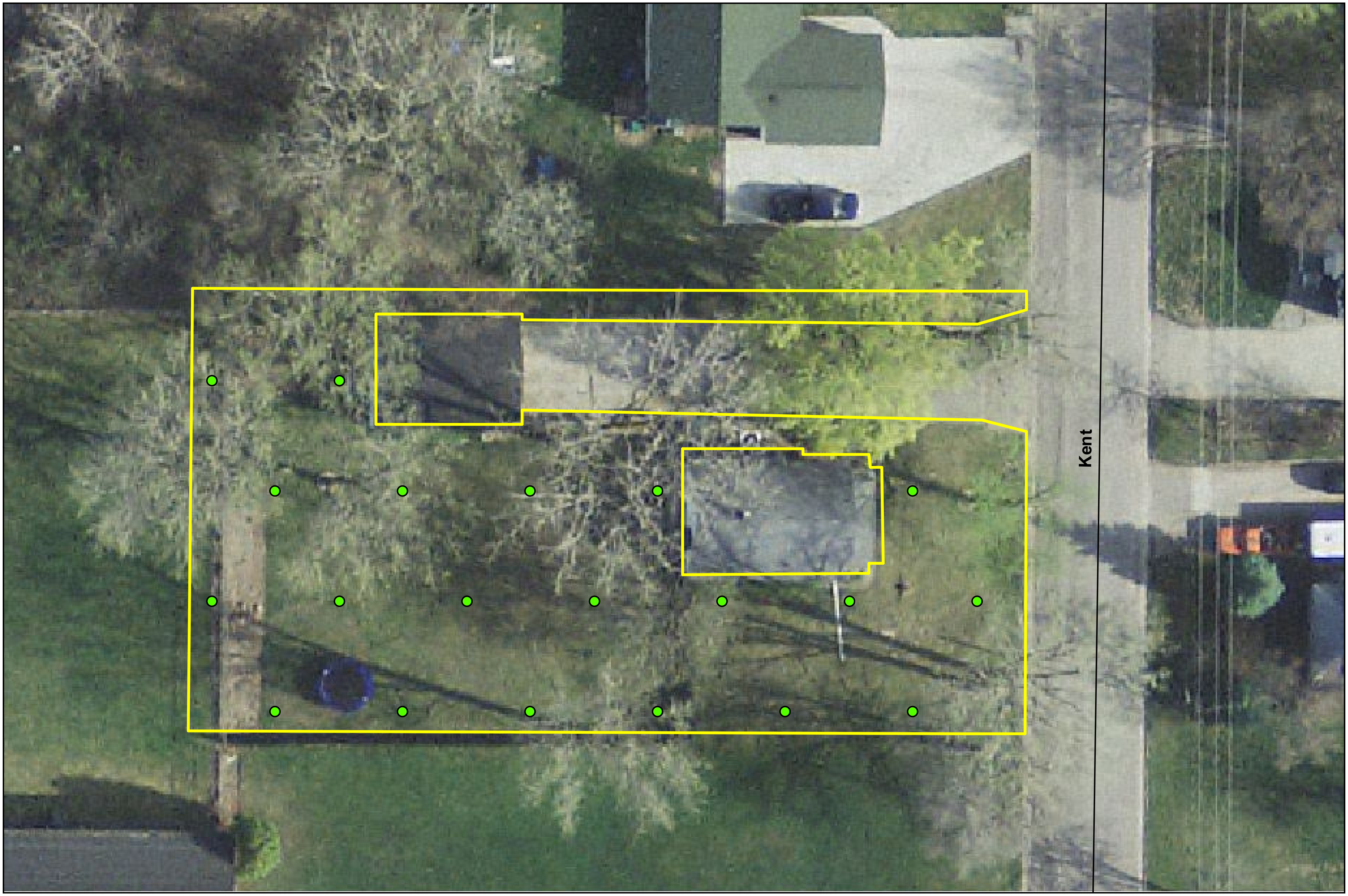
LEGEND

- Increment Locations
- Property
- Increment Locations - Wooded Area
- Property - Wooded Area
- Roadways

Notes:
.94 Total Acres
20 Increments

Feet 0 25 50 100

Parcel 14-23-60-176
331 Kent Ct.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
.37 Acres
20 Increments

Feet
0 15 30 60

Parcel 14-23-60-184
409 Kent Ct.
Midland Resolution Sampling Plan

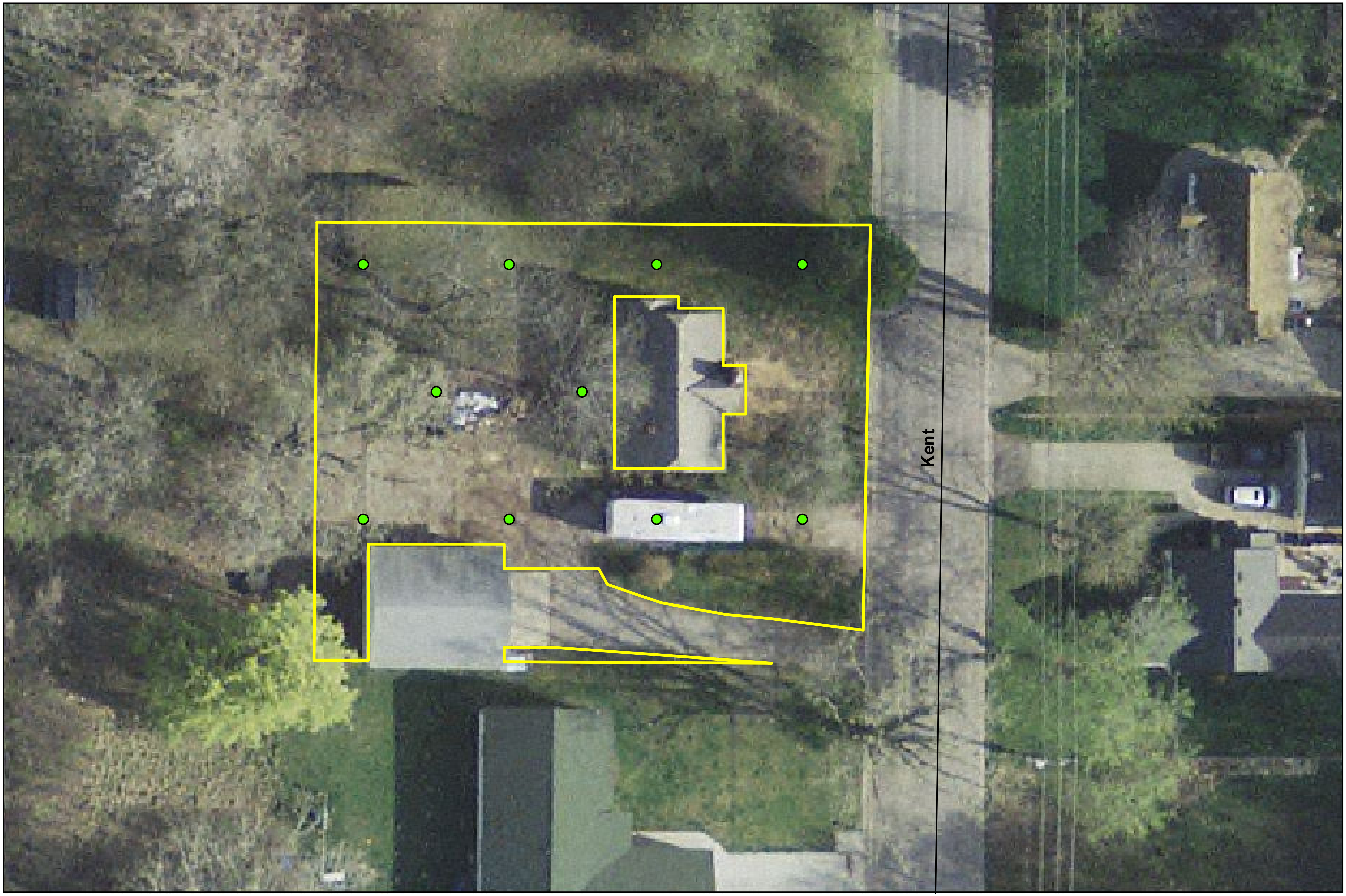
MIDLAND RESOLUTION

LEGEND
Increment Locations
Property
Roadways

Notes:
.17 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-23-60-190
415 Kent Ct.
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
.22 Acres
10 Increments

Feet
0 15 30 60

Parcel 14-23-60-196
419 Kent Ct.
Midland Resolution Sampling Plan

Attachment H

Work Plan Addendum
for
Site B-001
Remediation Project

November 9, 2011

Revised
May 25, 2012

Table of Contents

Attachments

Introduction:

During 2010, soil samples were obtained from nine locations in the area near B-001 (referred to as Site B-001). Results have identified concentrations which exceed MDEQ generic non-residential Direct Contact Criteria (DCC) in the upper six inches of soil from within the current perimeter security fence the north, bounded by Austin Street; and to the south, bounded by Bay City Road. This area is located coincident with a historical railroad line apparent in historical aerial photographs. The historic rail lines can be observed on the property to the north across Austin Street. Due to the identified concentrations of dioxins and furans which exceed the Generic Non-Residential DCC in the upper six inches of soil in an uncontrolled location, this area was selected for remediation. A work plan was submitted to MDEQ to conduct the remediation on September 27, 2011 and subsequently approved with modification on October 7, 2011.

MDEQ stipulated that Dow must propose a plan and schedule to investigate concentrations of dioxins and furans along the former rail spur to the north of Austin Street to determine if additional remediation is necessary. This work plan addendum provides the required plan and schedule.

Summary of Existing Data:

The soils data available from the site (roughly 1 acre in extent) include samples from multiple soil intervals as well as different analytical test methods. Laboratory testing of the soil samples obtained from site B-001 was done utilizing both EPA Method 1613b and the Midland Area Soils "Fast Analysis" Method (approved October 21, 2011). Attachment 1 provides a summary of all laboratory testing data results from site B-001. Trace organic laboratory analysis detected individual concentrations of dioxins and furans in the upper six inches of soil ranging from 28 to 10,518 ng/g (ppt TEQ).

For comparison purposes, data from the intervals 0-1" and 1-6" were normalized by a layer-weighted average technique by the following method:

0-6"LWA = [(0-1"TEQ x 0.1667) + (1-6"TEQ x 0.833)]

Where

0-6"LWA = six inch layer-weighted average concentration

0-1"TEQ = TEQ concentration from 0-1" sample interval

1-6"TEQ = TEQ concentration from 1-6" sample interval

Normalized data are provided in Attachment 1. A 95% upper confidence limit of the mean can be established for lognormally distributed data (i.e., data from site B-001), using Land's Method:

$$UCL_{1-\propto} = \exp\left[mean + \frac{s_y^2}{2} + \frac{s_y^2 H_{1-\propto}}{\sqrt{n-1}} \right] (MDEQ, 2002)$$

Where

$H_{1-\alpha}$ = Land's Method H-statistic, in this case α=0.05

s_y = standard deviation

n = number of measurements, in this case n=35

Using this method, the 95% UCL of the mean is compared to the generic Michigan dioxin & furan non-residential DCC. The 95% UCL is 1,384 µg/Kg, prior to remediation. A drawing indicating the results of the 2011 sampling is included in Attachment 2.

Remediation Summary:

The Site B-001 Remediation Project included three specific phases of work both within and directly adjacent to the Michigan Operations Facility, as described in the Work Plan.

Outside Michigan Operations Facility

Excavation at the site was started on October 5, 2011, and completed the next day. Thirty-four (34) 15-cy loads (510 cy total) were removed from the site and transported to Salzburg Landfill for disposal. Restoration was conducted by importing 200 cy of fill on October 6, 2011 and backfilling the excavation. Topsoil was imported on October 6 and 7 to complete the backfill operation. The area was prepared and hydro-seeded on October 10, 2011. Straw blanket was installed on October 11, 2011 to complete restoration activities.

<u>Within Michigan Operations Facility</u>

Topsoil was imported on October 6 and 7 to provide cover over the portion of the site within the Michigan Operations Facility shown on Attachment 2. The area was prepared and hydro-seeded on October 10, 2011. Straw blanket was installed on November 11, 2011 to complete restoration activities.

A total of 960 cy of topsoil was imported on 10/6/11 and 10/7/11 to complete both areas.

Scope of Work:

North of Austin Street across from Site B-001 Remediation Project, a single parcel spans the historic rail line (14-21-20-032), being 514 Sixth St. The property is zoned 1A Industrial, and is in non-residential use. The historic rail line is visible at the surface along this property (in contrast to site B-001 where the rail and most of the rail ties had been removed). Results from previous sampling at site B-001 suggest that the source of the identified dioxins and furans at this site is potentially primarily related to the former rail bed or backfill rather than from historical aerial releases.

There are four objectives for this work plan:

1. Evaluate the soils along the former rail line as a potential alternative source other than historical aerial deposition;
2. Evaluate potential exposure for adjacent properties;
3. Determine if remedy is required along the former rail line or at adjoining properties at this location; and
4. Determine if further delineation is necessary beyond this area.

Consistent with the objectives listed above, to determine if additional actions are required, Dow proposes to attempt to obtain property access and collect one incremental composite sample and two replicate samples from parcels 14-21-20-014, located at 613 Jefferson and 14-21-20-010, located at 91 Austin Street. These two parcels are currently zoned 1A Industrial, and will be treated as individual DUs. Parcel 14-21-20-032, located at 514 Sixth St, will consist of two DUs. One DU will be an approximately 60-ft wide by 200-ft long buffer roughly centered along the former rail line. The second DU will consist of the remaining property for that parcel. Parcels and DUs are shown on the Proposed Parcel Sampling Plan, in Attachment 2.

The incremental composite sample and replicates will each consist of ten (10) increments for DUs 2 and 3 (they are each less than 0.25-acres). The incremental composite sample and replicates from DUs 1 and 4 will each consist of twenty (20) increments (they are each larger than 0.25- acres, but less than one acre). Increment locations will be selected using a systematic random start equilateral triangular grid (EPA, 2002 and Matske, et al., 2007). The incremental composite sample will be tested for concentrations of dioxins and furans by Method 8280 MAS. If results of testing indicate that a concentration greater than 990 ppt TEQ for the DU, either the DU will be demonstrated to be below an appropriate action level for non-residential use incorporating appropriate site-specific exposure assumptions or a presumptive remedy will be implemented as specified in the Interim Response Activity Plan Designed to Meet Criteria (Section 7.4.7), submitted March 6, 2012.

If results of sampling on any of the four (4) DUs listed above indicate the soils exceed 990 ppt TEQ, Dow will submit a plan for further evaluation of the offsite area to MDEQ for review and approval within 30 days of determination.

Schedule:

Consistent with proposed schedule for the Midland Area Soils Project, it is anticipated that obtaining property access, sampling and construction (if necessary) will be implemented on the same schedule as the Year 1 Study area described in the Midland Area Soils Interim Response Designed to Meet Criteria Work Plan.

<u>**Citations:**</u>

Matzke, B., et al. 2007. *Visual Sample Plan 5.0 User's Guide*. PNHL-16939. Pacific Northwest National Laboratory, Richland, Washington.

USEPA. 2002. *Guidance on Choosing a Sampling Design for Environmental Data Collection*. EPA QA/G-5S. EPA/240/R-02/005. Office of Environmental Information, U.S. Environmental Protection Agency, Washington, D.C.

MDEQ. 2002. *Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria*.

Attachment 1
<u>Soils Laboratory Data</u>

Summary of Dioxin Furan TEQ Soil Data
Site B-001

Sample ID	WHO-TEQ 2005	Method	units (d.w.)
B1-01_0-1"_11/10/2010_DF	58.4	EPA Method 1613b	ng/Kg
B1-01_1"-6"_11/10/2010_DF	54.7	EPA Method 1613b	ng/Kg
B1-01_6"-1'_11/10/2010_DF	1031	EPA Method 1613b	ng/Kg
B1-01_1'-1'6"_11/10/2010_DF	928	EPA Method 1613b	ng/Kg
B1-01_1'6"-2'0"_11/10/2010_DF	24.4	EPA Method 1613b	ng/Kg
B1-02_0-1"_11/10/2010_DF	186	EPA Method 1613b	ng/Kg
B1-02_1"-6"_11/10/2010_DF	177	EPA Method 1613b	ng/Kg
B1-02_6"-1'_11/10/2010_DF	152	EPA Method 1613b	ng/Kg
B1-02_1'-1'6"_11/10/2010_DF	95.7	EPA Method 1613b	ng/Kg
B1-02_1'6"-2'_11/10/2010_DF	115	EPA Method 1613b	ng/Kg
B1-02R2_0-1"_11/11/2010_DF	228	EPA Method 1613b	ng/Kg
B1-02R2_1"-6"_11/11/2010_DF	267	EPA Method 1613b	ng/Kg
B1-02R2_6"-1'_11/11/2010_DF	86.4	EPA Method 1613b	ng/Kg
B1-02R2_1'0"-1'6"_11/11/10_DF	67.7	EPA Method 1613b	ng/Kg
B1-02R2_1'6"-2'0"_11/11/2010_DF	58.8	EPA Method 1613b	ng/Kg
B1-02R5_0-1"_11/10/2010_DF	276	EPA Method 1613b	ng/Kg
B1-02R5_1"-6"_11/10/2010_DF	223	EPA Method 1613b	ng/Kg
B1-02R5_6"-1'_11/10/2010_DF	143	EPA Method 1613b	ng/Kg
B1-02R5_1'-1'6"_11/10/2010_DF	64.0	EPA Method 1613b	ng/Kg
B1-02R5_1'6"-2'_11/10/2010_DF	1.3	EPA Method 1613b	ng/Kg
B1-02R10_0-1"_11/11/2010_DF	287	EPA Method 1613b	ng/Kg
B1-02R10_1"-6"_11/11/2010_DF	300	EPA Method 1613b	ng/Kg
B1-02R10_6"-1'_11/11/2010_DF	177	EPA Method 1613b	ng/Kg
B1-02R10_1'-1'6"_11/11/2010_DF	14.2	EPA Method 1613b	ng/Kg
B1-03_0-1"_11/11/2010_DF	2311	EPA Method 1613b	ng/Kg
B1-03_1"-6"_11/11/2010_DF	654	EPA Method 1613b	ng/Kg
B1-03_6"-1'_11/11/2010_DF	116	EPA Method 1613b	ng/Kg
B1-03_1'-1'6"_11/11/2010_DF	21.6	EPA Method 1613b	ng/Kg
B1-03R2_0-1"_11/11/2010_DF	1087	EPA Method 1613b	ng/Kg
B1-03R2_1"-6"_11/11/2010_DF	155	EPA Method 1613b	ng/Kg
B1-03R2_6"-1'_11/11/2010_DF	96.1	EPA Method 1613b	ng/Kg
B1-03R2_1'-1'6"_11/11/2010_DF	2.1	EPA Method 1613b	ng/Kg
B1-03R5_0-1"_11/12/2010_DF	2749	EPA Method 1613b	ng/Kg
B1-03R5_1"-6"_11/12/2010_DF	988	EPA Method 1613b	ng/Kg
B1-03R5_6"-1'_11/12/2010_DF	241	EPA Method 1613b	ng/Kg
B1-03R5_1'-1'6"_11/12/2010_DF	26.4	EPA Method 1613b	ng/Kg
B1-03R10_0-1"_11/12/2010_DF	1660	EPA Method 1613b	ng/Kg
B1-03R10_1"-6"_11/12/2010_DF	10518	EPA Method 1613b	ng/Kg
B1-03R10_6"-1'_11/12/2010_DF	1301	EPA Method 1613b	ng/Kg
B1-03R10_1'-1'6"_11/12/2010_DF	76	EPA Method 1613b	ng/Kg
B1-03R10_1'6"-2'_11/12/2010_DF	50.8	EPA Method 1613b	ng/Kg

Summary of Dioxin Furan TEQ Soil Data

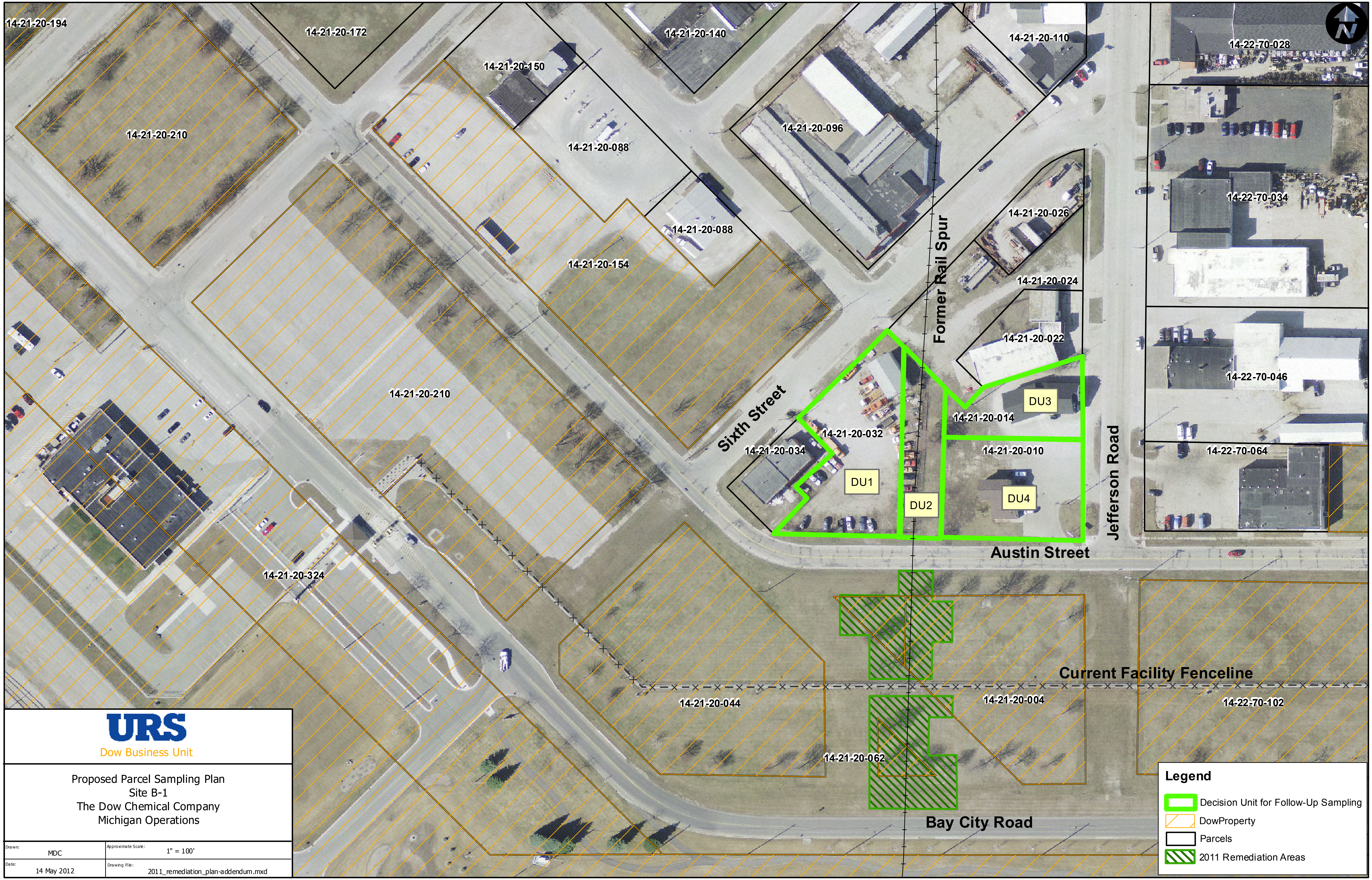
Site B-001

Sample ID	WHO-TEQ 2005	Method	units (d.w.)
B1-32_0-6"_7/7/11_DF	1030	Method 8280 MAS	ng/Kg
B1-33_0-6"_7/7/11_DF	866	Method 8280 MAS	ng/Kg
B1-34_0-6"_7/7/11_DF	801	Method 8280 MAS	ng/Kg
B1-35_0-6"_7/7/11_DF	1160	Method 8280 MAS	ng/Kg
B1-07_0-6"_7/7/11_DF	473	Method 8280 MAS	ng/Kg
B1-06_0-6"_7/7/11_DF	363	Method 8280 MAS	ng/Kg
B1-05_0-6"_7/7/11_DF	389	Method 8280 MAS	ng/Kg
B1-04_0-6"_7/7/11_DF	252	Method 8280 MAS	ng/Kg
B1-09_0-6"_7/7/11_DF	2080	Method 8280 MAS	ng/Kg
B1-10_0-6"_7/7/11_DF	963	Method 8280 MAS	ng/Kg
B1-11_0-6"_7/7/11_DF	314	Method 8280 MAS	ng/Kg
B1-14_0-6"_7/7/11_DF	407	Method 8280 MAS	ng/Kg
B1-13_0-6"_7/7/11_DF	1710	Method 8280 MAS	ng/Kg
B1-08_0-6"_7/7/11_DF	668	Method 8280 MAS	ng/Kg
B1-17_0-6"_7/7/11_DF	380	Method 8280 MAS	ng/Kg
B1-18_0-6"_7/7/11_DF	699	Method 8280 MAS	ng/Kg
B1-22_0-6"_7/7/11_DF	349	Method 8280 MAS	ng/Kg
B1-21_0-6"_7/7/11_DF	1100	Method 8280 MAS	ng/Kg
B1-24_0-6"_7/7/11_DF	28	Method 8280 MAS	ng/Kg
B1-25_0-6"_7/7/11_DF	1660	Method 8280 MAS	ng/Kg
B1-26_0-6"_7/7/11_DF	865	Method 8280 MAS	ng/Kg
B1-27_0-6"_7/7/11_DF	348	Method 8280 MAS	ng/Kg
B1-28_0-6"_7/7/11_DF	146	Method 8280 MAS	ng/Kg
B1-29_0-6"_7/7/11_DF	143	Method 8280 MAS	ng/Kg
B1-30_0-6"_7/7/11_DF	94.0	Method 8280 MAS	ng/Kg
B1-31_0-6"_7/7/11_DF	141	Method 8280 MAS	ng/Kg

Layer Weighted Averages
for
0-1" and 1-6" Intervals
Site B-001

Client's sample identity	WHO-TEQ 2005	Method	units (d.w.)
B1-01_0-1"_11/10/2010_DF	58.4	EPA Method 1613b	ng/Kg
B1-01_1"-6"_11/10/2010_DF	54.7	EPA Method 1613b	ng/Kg
B1-01_0-6" Normalized	55	Normalized	ng/Kg
B1-02_0-1"_11/10/2010_DF	186	EPA Method 1613b	ng/Kg
B1-02_1"-6"_11/10/2010_DF	177	EPA Method 1613b	ng/Kg
B1-02_0-6" Normalized	178	Normalized	ng/Kg
B1-02R2_0-1"_11/11/2010_DF	228	EPA Method 1613b	ng/Kg
B1-02R2_1"-6"_11/11/2010_DF	267	EPA Method 1613b	ng/Kg
B1-02R2_0-6" Normalized	260	Normalized	ng/Kg
B1-02R5_0-1"_11/10/2010_DF	276	EPA Method 1613b	ng/Kg
B1-02R5_1"-6"_11/10/2010_DF	223	EPA Method 1613b	ng/Kg
B1-02R5_0-6" Normalized	232	Normalized	ng/Kg
B1-02R10_0-1"_11/11/2010_DF	287	EPA Method 1613b	ng/Kg
B1-02R10_1"-6"_11/11/2010_DF	300	EPA Method 1613b	ng/Kg
B1-02R10_0-6" Normalized	298	Normalized	ng/Kg
B1-03_0-1"_11/11/2010_DF	2311	EPA Method 1613b	ng/Kg
B1-03_1"-6"_11/11/2010_DF	654	EPA Method 1613b	ng/Kg
B1-03_0-6" Normalized	931	Normalized	ng/Kg
B1-03R2_0-1"_11/11/2010_DF	1087	EPA Method 1613b	ng/Kg
B1-03R2_1"-6"_11/11/2010_DF	155	EPA Method 1613b	ng/Kg
B1-03R2_0-6" Normalized	311	Normalized	ng/Kg
B1-03R5_0-1"_11/12/2010_DF	2749	EPA Method 1613b	ng/Kg
B1-03R5_1"-6"_11/12/2010_DF	988	EPA Method 1613b	ng/Kg
B1-03R5_0-6" Normalized	1283	Normalized	ng/Kg
B1-03R10_0-1"_11/12/2010_DF	1660	EPA Method 1613b	ng/Kg
B1-03R10_1"-6"_11/12/2010_DF	10518	EPA Method 1613b	ng/Kg
B1-03R10_0-6" Normalized	9042	Normalized	ng/Kg

Attachment 2
<u>Site Maps</u>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14-21-20-026
14-21-20-154
14-21-20-024
Former Rail Spur
14-21-20-022
14-22-70-046
Sixth Street
14-21-20-210
DU3
14-21-20-014
14-21-20-032
14-21-20-034
14-21-20-010
14-22-70-064
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DU2
DU4
Austin Street
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Current Facility Fenceline
14-21-20-044
14-21-20-004
14-22-70-102
14-21-20-062
Bay City Road
URS
Dow Business Unit
Proposed Parcel Sampling Plan
Site B-1
The Dow Chemical Company
Michigan Operations
Drawn: MDC
Approximate Scale: 1" = 100'
Date: 14 May 2012
Drawing File: 2011_remediation_plan-addendum.mxd
Legend
Decision Unit for Follow-Up Sampling
DowProperty
Parcels
2011 Remediation Areas

The Dow Chemical Company

Michigan Operations

Midland Resolution Area

Soil Erosion and Sediment Control Plan

May 2012

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1.0 GENERAL SITE INFORMATION

1.1 Site Description

The project area is called the Midland Resolution Area. The Midland Resolution Area covers a total of approximately 1,700 acres within the City of Midland, Michigan. Approximately 425 acres of the Midland Resolution Area is residential land use. Properties with industrial or commercial land use within the Midland Resolution Area cover approximately 1,275 acres. The aerial extent of the Midland Resolution Area is shown on **Figures 1-1 and 1-2**. **Figures 1-3 and 1-4** provide an overview of the two predominantly residential areas within the Midland Resolution Area, and **Figure 1-5** provides an overview of the area with predominantly industrial/commercial land use. An outlier area was identified in a residential area southwest of the intersection of Washington St. and Ashman St. This location was identified during the 2006 blinded sample transect sampling activities. This location falls to the north of the main part of the Midland Resolution Area and is depicted on **Figure 1-6**. The final boundary for the Midland Resolution Area will be adjusted, as necessary, based on soils data generated during implementation of the work.

The remedial objective and presumptive remedy for the Midland Resolution Area will differ by land use type. Residential and residential-like properties will be tested per the approved Work Plan. The remedy as described below will be implemented for properties that are above 250 parts per trillion (ppt) toxicity equivalency quotient (TEQ). The majority of non-residential properties will not require additional evaluation under this work plan because they are below the non-residential dioxins and furans TEQ (990 ppt). A non-residential property will be addressed as a residential property if it determined to be used as a residence or in a residential-like manner.

Remedy implementation will include utility identification, erosion control, soil removal and management, backfill and site restoration and vegetation replacement. Where feasible, soils will be removed by hand digging and/or mechanical excavation to a minimum depth of 12 inches. The excavated soils will be placed into trucks for transport to the Dow Michigan Operation plant site for re-use or to an appropriate disposal facility. After loading, the trucks will be tarped for transport. Restoration of disturbed areas will include backfilling and replacing vegetation. New topsoil and backfill will be imported by the contracting firm from a borrow location that is outside the area possibly impacted by releases from the Dow Michigan Operations Facility, transported to the site and placed by mechanical equipment and hand tools. The final four to six inches of surface backfill materials will be topsoil. Excavated areas will be re-vegetated with sod or seed, as appropriate for the area. Previously landscaped areas will be replanted with similar plants (flower gardens, etc.) and all structures (swing sets, etc.) displaced during the removal process will be replaced, consistent with the property-specific plan developed with the property owner. Maintenance activities, including post construction watering, will be completed by Dow to allow the new vegetation to become established.

Implementation of the presumptive remedy will begin in areas that are the closest to Dow Michigan Operations and then progress outwards in bands across the Midland Resolution Area in subsequent years. The Midland Resolution Area will be subdivided into large property groupings, based on the number of properties that may be reasonably addressed based on current knowledge of the area within one construction season (April-October). The intent is for the full corrective action – from sampling and analysis to implementation of the remedy – for the property grouping to be addressed within one construction season. Changes to the schedule through the Adaptive Management Process may be made during the project; if improvements or efficiencies can be made; or if other factors make it appropriate to do so. **Figure 1-7** depicts the proposed property groupings designated by current block designation for implementation (A, B, C, etc.).

Table 1 (below) presents details for each property grouping, including the total number of properties, number of residential properties, and acreage.

Table 1: Annual Property Groupings

Property Group	Year Addressed	Total Number of Parcels	Residential Parcels	Total Area (acres)	Residential Acres
A	2012	113	106	38.6	Housing = 28.3 Parks & Rec = 3.75
B	2013	336	299	78.5	Housing = 59.6 Parks & Rec = 6.9 Public/semi-public = 0.8
C	2014	302	268	80.5	Housing = 57 Parks & Rec = 3.2 Public/semi-public = 8.6
D	2015	347	330	100.5	Housing = 80.7 Parks & Rec = 10.8
E	2016	184	178	58.2	Housing = 42.3 Parks & Rec = 0.9 Public/semi-public = 14.8
F	2017	121	115	89.4	Housing = 34.9 Parks & Rec = 3.7 Public/semi-public = 50.1

A Work Plan for this project has been prepared to meet the requirements of the Michigan Department of Environmental Quality (DEQ) Hazardous Waste Management Facility Operating License MID 000 724 724, in compliance with Part 111, Hazardous Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, for the implementation of corrective action in Midland Area Soils. This SE/SC Plan has been prepared to prevent discharge of contaminated sediments into the City of Midland municipal storm sewer system. The storm sewer system discharges into the Tittabawassee River.

1.2 Project Contact

Name:	Steve Lucas
Title:	Michigan Operations Remediation Leader
Telephone:	989-638-6012
Mailing Address:	1790 Building Midland, MI 48667

1.3 Certified Storm Water Operators

Personnel identified at the facility that will have supervision over the inspection and management of soil erosion and storm water controls and who are certified by the Michigan Department of Environmental Quality (MDEQ), as required by Section 3110 of the Michigan Act are:

Name	Certification Number	Work Phone
Gary Waugh (primary)	TBD	989-737-3374
Jim Sprague (alternate)	C-12020	989-636-8469

1.4 Permit Information

A NPDES storm water discharge permit has not been issued by the MDEQ for this project at this time.

1.5 Construction Activity Description

The Midland Resolution Area is located north and east of Dow Michigan Operations property. Surficial soils in the project area are known or suspected to be impacted with dioxins and furans. Dioxins and furans are by-products of incineration, uncontrolled burning and certain industrial processes, such as the manufacture of chlorinated organics. These by-products have been generated at Dow Michigan Operations since the late 1800s, and have been distributed beyond the manufacturing facility boundaries by airborne deposition and fugitive dust emissions.

Dioxins and furans adhere to particles that can then be deposited on soil. After deposition on soils, particle-bound hazardous substances have the potential to be redistributed through surface water runoff and construction and grading activities (secondary transfer mechanisms). In the case of surface water runoff, the particle-bound substances may be mixed with solids that accumulate in ditches and drainage basins. In the case of construction and grading, particle-bound substances in surface soil may be transferred to and mixed with subsurface soil.

2.0 SOIL EROSION and CONTROL TEAM

The soil erosion and control team is responsible for developing, implementing, maintaining, and revising this SE/SC Plan. The members of the team and their primary responsibilities (i.e. implementing, maintaining, record keeping, submitting reports, conducting inspections, employee training, conducting the annual compliance evaluation, testing for non-storm water discharges, signing the required certifications) are as follows:

Name & Title	Responsibility
Gary Waugh, Project Superintendent	Annual review SE/SC Plan signing certifications, recordkeeping, submitting reports, implementation, conducting weekly inspections and annual compliance evaluation, implementing corrective actions
Servinski Sod Service Personnel	Day-to-day operations, installation and maintenance of structural controls, implementing non-structural controls, inspection of structural and SE/SC control measures

3.0 SITE MAPS

The aerial extent of the Midland Resolution Area is shown on **Figures 1-1, 1-2 and 1-6**. Site-specific site maps will be created for individual work areas, as appropriate.

4.0 SIGNIFICANT MATERIALS

Significant materials are any material which could degrade or impair water quality, including but not limited to:

- Disturbed Soils
- Fuels
- Detergents
- Hydraulic oil, brake fluids and antifreeze required to operate heavy equipment.
- Fertilizers
- Pesticides
- Debris

4.1 Inventory of Exposed Significant Materials

The primary potential pollutant sources associated with construction activities will be disturbed soils, and sediment-laden surface water runoff. After deposition on soils, particle-bound hazardous substances such as dioxins and furans have the potential to be redistributed through surface water runoff and construction and grading activities (secondary transfer mechanisms). In the case of surface water runoff, the particle-bound substances may be mixed with solids that accumulate in ditches and drainage basins. In the case of construction and grading, particle-bound substances in surface soil may be transferred to and mixed with subsurface soil.

Other potential pollutant sources may include fugitive dust, solid waste, sanitary waste and materials/chemicals required to maintain construction equipment such as fuels, lubricants, oils, coolants and other vehicle-related materials.

Other significant materials potentially used onsite by Servinski Sod Services may include fertilizers and pesticides. These materials will not be stored on-site.

4.2 Description of Construction Activities & Significant Material Storage Areas

Construction activities and storage of significant materials are not currently conducted by Dow or Dow's contractors at properties located within the Midland Resolution Area. Site-specific activities and material storage will be assessed on an individual basis.

The following table outlines possible pollutants and their corresponding construction activity as it relates to the general construction locations.

Table 2: Construction Activity and Significant Materials

Construction Activity	Storm Water Pollutants		Location
	Primary	Secondary	
Clearing, Grading, Excavating and Unstabilized Areas	Soil[1]	Dust, Trash, Debris and Solids	Remediated Properties
Solid Waste (Trash and Debris)		Trash, Debris, Solids and Other Toxic Chemicals	Staging Area (To Be Determined, TBD)
Sanitary Waste		Nutrients, pH (Acids & Bases), Bacteria & Viruses and Other Toxic Chemicals	Staging Area (TBD)
Vehicle/Equipment Fueling and Maintenance		Oil, Grease and Other Toxic Chemicals	Staging Area (TBD if needed)
Vehicle/Equipment Use and Storage		Oil, Grease and Other Toxic Chemicals	Staging Area (TBD if needed)
Landscaping Operations	Soil[1]	Dust, Trash, Debris and Solids, Fertilizer, Pesticide	Remediated Properties

[1]*Soil may be impacted with dioxins and furans.*

4.3 List of Significant Spills

No reportable spills and leaks of polluting materials in quantities reportable under the Part 5 Rules (Rules 324.2001 through 324.2009) are known to have occurred at areas that are exposed to precipitation or that otherwise discharged to a point source for this project area.

4.4 Summary of Sampling Data

There is currently no monitoring program in place or storm water sampling data available. Extensive soil sampling has been performed within the Midland Resolution Area to determine the extent of dioxin and furan contamination in soils. Sampling has been performed during multiple phases from 1984 through 2010 and is included in various reports. These sampling events are summarized in the Interim Response Activity Plan Designed to Meet Criteria dated March 2012.

5.0 NON-STRUCTURAL CONTROLS

Non-structural controls are practices that are relatively simple, fairly inexpensive, and applicable to a wide variety of industries or activities. Non-structural controls are intended to reduce the amount of pollution getting into the surface waters of the state and are generally implemented to address the problem at the source. They do not require any structural changes to the project area. These are typically everyday types of activities undertaken by employees/contractors on the project.

The following sections describe the non-structural controls included to prevent significant materials from coming into contact with or entering storm water runoff.

5.1 Preventative Maintenance Program

Preventive maintenance (PM) involves the regular inspection, testing and cleaning of equipment, storm water management structures and control devices. PM inspections must be recorded and corrective actions taken shall be maintained on file for three years. A Preventative Maintenance Inspection Form is presented in **Appendix A**.

Routine vehicle safety checks are conducted once per month (see *Vehicle Inspection Form* in **Appendix A**). All defective equipment found during the inspections will promptly be repaired or replaced. All major repairs and maintenance of vehicles are conducted in non-storm water areas. Any equipment or vehicle washing will be done off of the construction site at an appropriate facility.

Table 4: Preventative Maintenance Program

Description of Area or Equipment	Task	Frequency
Large Construction Equipment	Inspection for leaking fluids, debris, mechanical operation	Weekly
Vehicle Inspections	Proper functioning of vehicle	Monthly
Street Sweeper	Inspection for leaking fluids, debris, mechanical operation	Weekly

5.2 Site Inspections

Regular inspections are used to document compliance with this SE/SC Plan and Storm Water Regulations. Inspections must be performed and completed by a certified construction storm water operator who are familiar and knowledgeable with NPDES storm water discharge general permits, familiar with the construction site, and have a working knowledge of this site-specific SE/SC Plan.

Qualified personnel shall inspect the following areas at least once every seven (7) days or within 24 hours of a storm event that results in discharge from the site: project staging areas, construction areas that receive hydroseeding until grass is established, catch basin Flexstorm filter inserts, and any site-specific structural control measures. Qualified personnel shall inspect construction sites at least once daily from beginning of excavation until the site has had sod placed or hydroseeding completed.

Standard construction practices regarding monitoring predicted weather and rain fall events will be implemented during the project. Planned tasks including activities involving soil disturbance will be modified as necessary, if heavy rain fall is predicted for a specific day. Excavation work will be suspended during rain events if track out cannot be appropriately managed in the field. Inspections may be conducted once per month if the following conditions are met:

- The final sod has been placed;
- The site has unlikely runoff because of winter conditions (e.g. site is covered with snow, ice or ground is frozen);

Adequate inspections of the erosion control, materials management, and spill prevention BMPs will be completed as specified. These Inspection Records shall be maintained for a minimum of three (3) years from the permit expiration date or the termination of the permit. Documentation of these inspections must be kept with the final SE/SC Plan and at a minimum; inspections shall provide the following information:

- Inspection date;
- Inspector's name, title and qualifications;
- Weather information since last inspection (including beginning time, duration, time since and the amount of rainfall (in inches) of the last storm event;
- Location(s) of discharges of site sediment and/or other pollutants;

- Location(s) and identification of BMPs requiring maintenance, failed to operate as designed, or proved to be inadequate;
- Location(s) where additional BMPs are needed;
- Corrective actions required (including SE/SC Plan changes and the implementation date);
- Identification of all non-storm water pollution sources and associated pollution prevention devices; and
- Identification of areas where material are stored and evidence or potential for pollutant discharge from these areas.

Inspectors shall document the evidence of potential pollutants entering the drainage system as well as observations of any sediment and erosion control measures identified in this SE/SC Plan. Discharge points where accessible should be observed and a nearby downstream location should be observed if discharge points are not accessible.

Based upon the results of the inspections, the SE/SC Plan must be modified to better control pollutants in the runoff. Following the inspection, revisions to the SE/SC Plan must be completed within seven (7) calendar days. If BMPs are modified and/or added, an implementation schedule must be described in the SE/SC Plan and wherever possible, those changes shall be implemented prior to the next storm event if at all possible.

In addition to inspections, follow-up maintenance activities must occur and be adequately documented. Follow-up maintenance includes repairing BMPS that have been damaged because of everyday construction activities, runoff and/or wind erosion. Maintenance may require the replacement and/or addition of BMPs in areas where high erosion and/or sedimentation has occurred.

A *Site Inspection Form* is included in **Appendix A**. Completed and signed inspections forms should be maintained with the SE/SC Plan in Appendix A.

5.3 Housekeeping Procedures

Good housekeeping practices are designed to maintain a clean and orderly work environment. Often the most effective first step in preventing critical materials from mixing with storm water is by improving facility housekeeping practices. Good housekeeping practices are core job expectations.

Good housekeeping measures shall be employed during material hauling in order to keep the streets clear of debris and soil. Paved public roads near construction sites will be routinely evaluated for soil and/or mud tracked out by vehicles and equipment. At a minimum, track out will be evaluated on a daily basis and cleaned up by the end of the work day. Where tracking has occurred, soil tracked onto streets will be removed by either shoveling and/or street sweeping; these soils will not be allowed to wash into adjacent ditches, catch basins, and/or water bodies. If soil escapes, accumulations must be removed in a timely manner and prior to the next storm event if at all possible. This will include cleaning any escaped soil that has been trapped in catch basins.

5.4 Material Handling & Spill Prevention / Clean-Up Procedures

Solid Waste Management. In order to minimize exposure of materials that may be entrained in storm water and to reduce the occurrence of spills, site construction waste materials must be managed. Materials management is accomplished via good storage practices, prevention and response practices and other controls. More specifically, the construction site must prevent litter, construction debris and construction chemicals from becoming pollutant sources. The discharge of water from solid waste to Waters of the United States will be prevented through the implementation of BMPs. Solid waste management shall be implemented to minimize storm water contact with construction and waste materials and the resulting discharge. Solid waste will be managed via project specific roll-off containers within a specified staging area for offsite disposal.

Material Delivery, Storage, and Use. A general material storage area shall be designated on or near the project area and construction related items that are stored in the open will be elevated on pallets as a means to minimize contact with run-on/runoff and soils. Plastic covers (geotextiles, erosion control blankets/mats, plastic, etc.) may be used if necessary for dust control and prior to rainfall.

Stockpile Management. Stockpile Management practices and procedures are designed in order to reduce or eliminate air and storm water pollution from stockpiles of soil and concrete rubble. Stockpiles (if necessary) will be managed as follows:

- Stockpiles shall be located a minimum of 50 feet away from concentrated or anticipated flows;
- Dust control suppression shall be achieved utilizing portable water applied as necessary, tackifier or covers during periods of high winds.
- Excavated soil from a specific construction site will typically be removed by the next day. Should temporary staging beyond the next day of excavated soils at a specific remedy site be required the stockpile will be covered by spraying the stockpile with tackifier or with an impermeable liner or other appropriate control method. If an unforeseen circumstance that would require a stockpile to be staged longer than 1 week, the appropriate MDEQ and COM personnel will be notified.

S**anitary and Septic Wastes.** The contractor(s) shall implement Sanitary and Septic Waste Management BMPs that will include portable toilets, which will be located and maintained at a designated area for the duration of the project, if necessary. Maintenance will be provided on a regular basis and wastes will be disposed of off-site. Portable toilets shall be located away from concentrated flow paths and away from traffic.

Concrete Truck Washout. The contractor(s) supplying the concrete truck will complete washout away from the site in an appropriate area within their concrete supply facility. Washout of trucks on City of Midland public streets or vegetated/exposed soil areas at a specific property will not be permitted during the project.

Vehicle Fueling and Maintenance. Various types of vehicles and equipment will be used on-site throughout the life of the project. To the extent practicable, all self-propelled vehicles will be fueled off-site or by a mobile fueling vehicle. On-site vehicle fueling, if necessary, will not occur within 100 feet of any water bodies and 10 feet within a catch basin. Drip pans may be used for all mobile fueling and spill kits shall be maintained in the fueling area. Fueling will not occur during heavy rain events. It is not anticipated that maintenance and cleaning of vehicles and equipment will occur on-site.

Spill Prevention and Control. Spill Prevention and Control BMPs shall be implemented to contain and clean up spills and prevent material discharges to the storm water system. When spills occur, the cleanup should occur immediately by a trained staff member.

Minor Spills. Minor spills are those that are likely to be controlled by on-site personnel. Upon discovery of a minor spill, the following actions should occur:

- Contain the spill;
- If the spill occurs on paved or impermeable surfaces, clean up using dry methods;
- If the spill occurs in dirt areas, immediately contain the spill by constructing and earthen dike. Dig up and properly dispose of contaminated soil;
- If the spill occurs during a rainfall event, cover the affected area to avoid runoff; and
- Record all steps taken to report and contain the spill.

Major Spills. On-site personnel shall not make any attempts to control major spills until the appropriate and qualified emergency response staff has arrived on-site. If the spilled material is hazardous, immediately contact the Fire Department for a Hazardous Material Response Team. For spills of a hazardous substance or oil in an amount equal to or in excess of reportable quantities established under either 40 CFR Part 110, 40 CFR Part 117 or 40 CFR Part 302, the owner or owner's representative will address the reporting requirements.

Spill cleanup materials must be maintained at each active construction site. The spill kits should include: absorbents (pads, booms, kitty litter, etc.), tools to cleanup (shovel, broom, etc.), PPE (gloves, booths, masks, etc.), and other materials such as warning tape and labels. Each spill kit should be labeled with the words "SPILL KIT" and the necessary emergency telephone number(s) of persons to be contacted in case of a spill or leak that is beyond the training and equipment available on or near the spill kit.

Release reporting documentation is provided in **Appendix B**. Should any spills occur, copies of the documentation pertaining to the spill should be maintained with this SE/SC Plan in Appendix B.

5.5 Soil Erosion & Sedimentation Control Measures

Due to proposed activities in the project area, soil will be exposed to storm water. Therefore, soil erosion and sedimentation control measures must be implemented to prevent discharge of soil into storm water runoff.

Soil erosion and sedimentation controls (SE/SC) are non-structural and structural control measures that are intended to enhance the selected soil stabilization and erosion control measures. Sedimentation controls are designed to capture and settle out soil particles that have been detached and transported by the force of water. The project will be structured to minimize exposed soils by scheduling of activities, use of sod, and Flexstorm inlet filters in catch basins located within 100 feet of remedy sites and any staging areas in the street. Silt fence will be utilized on sites larger than 1 acre where hydroseeding is conducted to reestablish vegetation, rather than sod.

Erosion controls or soil stabilization consists of source control measures that are designed to prevent soil particles from detaching and becoming suspended in runoff waters. The goal of the stabilization BMPs is to protect the soil surface by covering and/or binding the soil particles. On a case-by-case basis, sufficient quantities of sediment and erosion control materials, such as Flexstorm filters and silt fence, will be maintained on-site throughout the duration of the project. This action allows for the implementation of temporary sediment controls in the event of predicted rain and for the rapid response to failures or emergencies.

Dewatering of storm water will typically be avoided and will not be discharged into the City of Midland storm water system or others water of the state.

Table 5 provides a list and description of non-structural soil erosion and sedimentation control measures that may be implemented during this project. Structural SE/SC measures are described in Table 7 of Section 6.0.

Table 5: Non-Structural Soil Erosion and Sedimentation Control Measures

Control Measure	Description
Minimize Disturbed Area	Limited areas will be disturbed at any one time.
Phase Construction Activity	This project will be conducted in a manner to limit the amount and duration of areas with exposed soil.
Fugitive Dust Control	Water of acceptable quality will be applied to disturbed soil areas in an effort to control dust or during dry conditions. The water will be applied using mobile water trucks or hoses as necessary and shall be applied at rates that will minimize the production of runoff. During windy conditions (forecast/actual winds of 25 miles per hour or greater), dust control measures will be implemented and applied to any disturbed soil areas. Additionally, stockpile management using water will be applied as needed to prevent wind dispersal of soil particulates.
Street Sweeping/Cleaning	Street sweeping involves the use of specialized equipment to remove litter, loosed gravel, soil, vehicle debris and pollutants, dust and construction debris from road surfaces. Street sweeping will be conducted at the end of the day if track out is observed on public streets unless circumstances prevent it. Paved public roads near construction will be routinely evaluated for sediments and/or mud tracked on by vehicles and equipment. Soil tracked onto streets will be removed by either shoveling and/or street sweeping; this soil will not be allowed to wash into adjacent ditches and/or water bodies. If sediment escapes, accumulations must be removed in a timely manner and prior to the next storm event if at all possible including catch

Control Measure	Description
	basins.
Track-Out Control	Track-out of soil will be managed by removing all visible soil from vehicles and equipment prior to exiting the work site. Soil removal will be performed with brooms, brushes, shovels, etc., but no water will be used. All soil removed during this process will be placed in trucks and sent to Michigan Operations for reuse or properly disposed of.
Soil Management	Soil management is managing soil to provide the best growing conditions for turf and other vegetation. Soil management may include adding various soil amendments (lime, fertilizer, topsoil, etc.) to the existing soil.
Sodding	Sodding is transplanting vegetative sections of plant materials to promptly stabilize areas that are subject to erosion. A sodded area provides a filtering method for preventing soil particles and associated attached chemicals from leaving the site. Sod provides immediate protection against soil erosion caused by wind and water, helps minimize runoff, and allows for groundwater recharge. Sodding is the preferred method to be utilized at the majority of the project on properties less than one acre is size. Sod will be placed within 5 days of the final topsoil grading unless circumstances such as weather prevent this activity from being scheduled. In this event, MDEQ and the COM will be notified of a revised schedule.
Seeding and Hydroseeding	Seeding is the establishment of a temporary or permanent vegetative cover by planting seeds. Hydroseeding is a mechanical method of applying seed, fertilizer and mulch to land. Hydroseeding typically consists of applying a mixture of wood fiber, seed, fertilizer, and stabilizing emulsion with hydro-mulch equipment and will be placed within 5 days of final topsoil grading unless circumstances such as weather prevent this activity from being scheduled. In this event, MDEQ and the COM will be notified of a revised schedule. Hydroseeding temporarily protects exposed soils from erosion by wind and water. Hydroseeding will be typically used on project areas over one acre is size.
Grading Practices	Grading is reshaping the ground surface to planned grades. Proper grading practices help improve surface drainage and reduce the amount of soil that erodes from a site. Consistent with City of Midland ordinances grade elevation changes will not be implemented without appropriate approval of the City of Midland.
Mulching	Mulching is applying coarse plant residue or chips to cover the soil surface. The primary purpose is to provide initial erosion control while a seeding or shrub planting is established. Mulch will conserve moisture and modify the surface soil temperature and reduce fluctuation of both. Mulch will prevent soil surface crusting and aid in weed control. Mulch is also used alone for temporary stabilization in non-growing months.

Control Measure	Description
Spoil Piles Management	Spoil piles are excavated materials consisting of topsoil or subsoils that have been removed and are temporarily being stored during construction activities. Spoil piles must be properly placed and managed to reduce soil erosion or runoff of sediment. Excavated soils will typically not be staged on site beyond the next day.
Transportation	The excavated soils will be placed into trucks for transport to the Michigan Operation plant site for re-use or to an appropriate disposal facility. After loading, the trucks will be tarped for transport. After unloading the truck bed will be checked to ensure it contains only limited amount of contaminated soil.
Backfill and Topsoil Selection	New topsoil and backfill will be imported by the contracting firm from a borrow location transported to the site and placed by mechanical equipment and hand tools The final four to six inches of surface backfill materials will be topsoil. Deeper replacement soils may be clean fill soil.

5.5.1 Soil Erosion Site-Specific Work Plan

Areas undergoing the remedy will have the upper 12-inches of soil removed. Due to structures at the property that will remain in place and act as barriers to run-off, it is anticipated that no storm water will discharge off site. The final exposed subgrade will be backfilled with clean screened fill and topsoil after verification that the property specific soil removal plan has been achieved. Typically backfill and topsoil will occur within 3 days after the soil removal grades have been verified unless circumstances in the field such as weather prevent this soil moving activity. In the event of this occurrence, MDEQ and the COM will be notified of this schedule revision. Backfill and topsoil placement will be placed on the property in a manner to control potential discharge. Sod placement or revegetation will be completed within 5 days after final topsoil grades are established unless circumstances such as weather prevent this from occurring. The MDEQ and COM will be notified of this scheduling revision after final topsoil grade and typically should be accomplished within a week.

The appropriate MDEQ and City of Midland personnel will be notified with a weekly communication regarding the planned construction schedule, construction status and completed or stabilized remedy sites.

5.6 Employee Training Program

Spill response and material management training will be provided during employee orientation and annually to all project personnel. General storm water awareness for the project will be addressed in this training. These programs are supplemented with training and continuous emphasis on good housekeeping practices as it pertains to storm water pollution prevention.

Training of project personnel must be documented; documentation must be maintained with this SE/SC Plan in **Appendix C**.

5.7 List of Significant Materials Still Present

Sediment is not anticipated to be present in discharge from the site following implementation of all structural and non-structural SE/SC measures.

Table 6: Significant Materials Still Present

Significant Material	Planned Control Measure	Impacted Outfall
Soils (may be impacted with dioxin, furan)	BMPs as described above,	Municipal Storm Sewer, discharging to the Tittabawassee River.

6.0 STRUCTURAL CONTROLS

Structural control measures will be necessary to control any pollutants that are present in storm water discharges after implementation of non-structural controls. Structural controls are physical features that control and prevent storm water pollution. They can range from preventive measures to collection structures to treatment systems. Structural controls will typically require construction of a physical feature or barrier. The controls will typically be installed prior to the commencement of soil disturbance and removed after the earthmoving activities are complete and vegetation is established. All temporary measures will be removed within 5 days of approval of from MDEQ or City of Midland personnel.

Table 7 provides a list and description of structural control measures that may be implemented during this project.

Table 7: Structural Control Measures

Structural Control Measure (BMP)	Description
Drip Pans	Drip pans will be placed underneath all containers or transfer of hazardous materials or petroleum products. The drip pan will contain any leaks, drips or small spills that could occur and prevent discharge into the environment.
Catch Basin Flexstorm Filter Inserts *SE/SC Measure*	These are temporary barriers designed to retain sediment before discharge into the City of Midland storm water system. The BMP retains sediment by filtering storm water. These BMPs will be strategically placed within 100 feet down gradient of construction activities and placed prior to commencement of earthmoving activities. These locations are primarily near the construction activity. These structures should be maintained following each inspection or more frequently if necessary. The filters will be removed from the catch basin after sod has been established and after inspection or approval from the appropriate regulatory personnel.

Structural Control Measure (BMP)	Description
Geosynthetic Liner *SE/SC Measure*	The geosynthetic will be placed on the soil within internal areas of the property where truck traffic is anticipated. The geosynthetic liners will be used to avoid contact between the truck tires and exposed soils, further managing fugitive dust and track-out of sediment. The geosynthetic will be removed after the soil removal is completed.
Construction Barriers, Site Security Fencing	Construction barriers are fences, signs and other means used on a construction site to: confine equipment and personnel to the immediate construction area, protect trees and their root zones from abrasion and soil compaction, prevent unnecessary access to structural BMPs, protect sensitive areas, and restrict access of unauthorized persons and vehicles.
Rolled Erosion Control Products (RECPs) *SE/SC Measure*	RECPs consist of prefabricated blankets or netting which are formed from both natural and synthetic materials. RECPs fall into one of two categories: erosion control blankets (ECBs) and turf reinforcement mats (TRMs). ECBs are temporary degradable RECPs composed of processed natural or polymer fibers mechanically, structurally or chemically bound together to form a continuous matrix to provide erosion control and facilitate vegetation establishment. TRMs are RECPs composed of non-degradable synthetic fibers, filaments, nets, wire mesh and/or other elements, processed into a permanent, three-dimensional matrix. TRMs are typically used in hydraulic applications, such as high flow ditches and channels, steep slopes, stream banks, and shorelines.
Silt Fencing *SE/SC Measure*	Silt fencing is a linear fence installed at the edge of the area of earth disturbance and placed prior to commencement of earthmoving activities. It is generally constructed of porous geotextile fabric attached to wooded stakes. The purpose of silt fence is to protect downstream surface waters and properties by removed suspended solids from runoff prior to leaving the site. Silt fencing will typically be used on sites that will not be sodded and revegetation will be accomplished by hydroseeding. The silt fencing will be removed after the site vegetation has been established and approval has been received from the appropriate regulatory personnel.

7.0 NON-STORM WATER DISCHARGES

Storm water shall be defined to include all of the following non-storm water discharges provided pollution prevention controls for the non-storm water component are identified in the SE/SC Plan:

1) Irrigation drainage
2) Lawn watering

Table 8 below specifies non-storm water discharges that occur at the facility and may discharge into the municipal storm sewer system. The municipal storm sewer discharges into the Tittabawassee River.

Table 8: Non-Storm Water Discharges

Potential Non-Storm Water Discharge:	Pollution Prevention Controls:
Lawn Watering	Structural and non-structural BMPs as described above.
Irrigation Drainage	Structural and non-structural BMPs as described above.

8.0 ANNUAL REVIEW

This SE/SC Plan shall be reviewed annually, and a written summary of the review must be completed and maintained with this plan. The SE/SC Plan shall be amended as needed to ensure continued compliance with the terms and conditions of the permit (if one is issued for this project). The annual review does not need to be submitted to the MDEQ. The Annual Review Form is provided in **Appendix C**.

Revision Author/Reviewer	Summary of Review/Revision	Date of Review/Revision
Scott Madill	Preparation of new SE/SC Plan. Prepared to meet general permit requirements, but no permit issued at this time.	May 2012

9.0 CERTIFIED STORM WATER OPERATOR UPDATE

If a discharge permit is issued for this project, the permit requires that if the Certified Storm Water Operator is changed or an additional Certified Storm Water Operator is added, the permittee shall provide the name and certification number of the new Certified Storm Water Operator to the MDEQ.

10.0 RECORD KEEPING

Records of all SE/SC-related inspection and maintenance activities must be maintained with the SE/SC Plan. Records shall also be kept describing incidents such as spills or other discharges that can affect the quality of storm water runoff. All such records shall be retained for three years. Completed and signed inspection forms should be maintained with this SE/SC Plan in **Appendix A**.

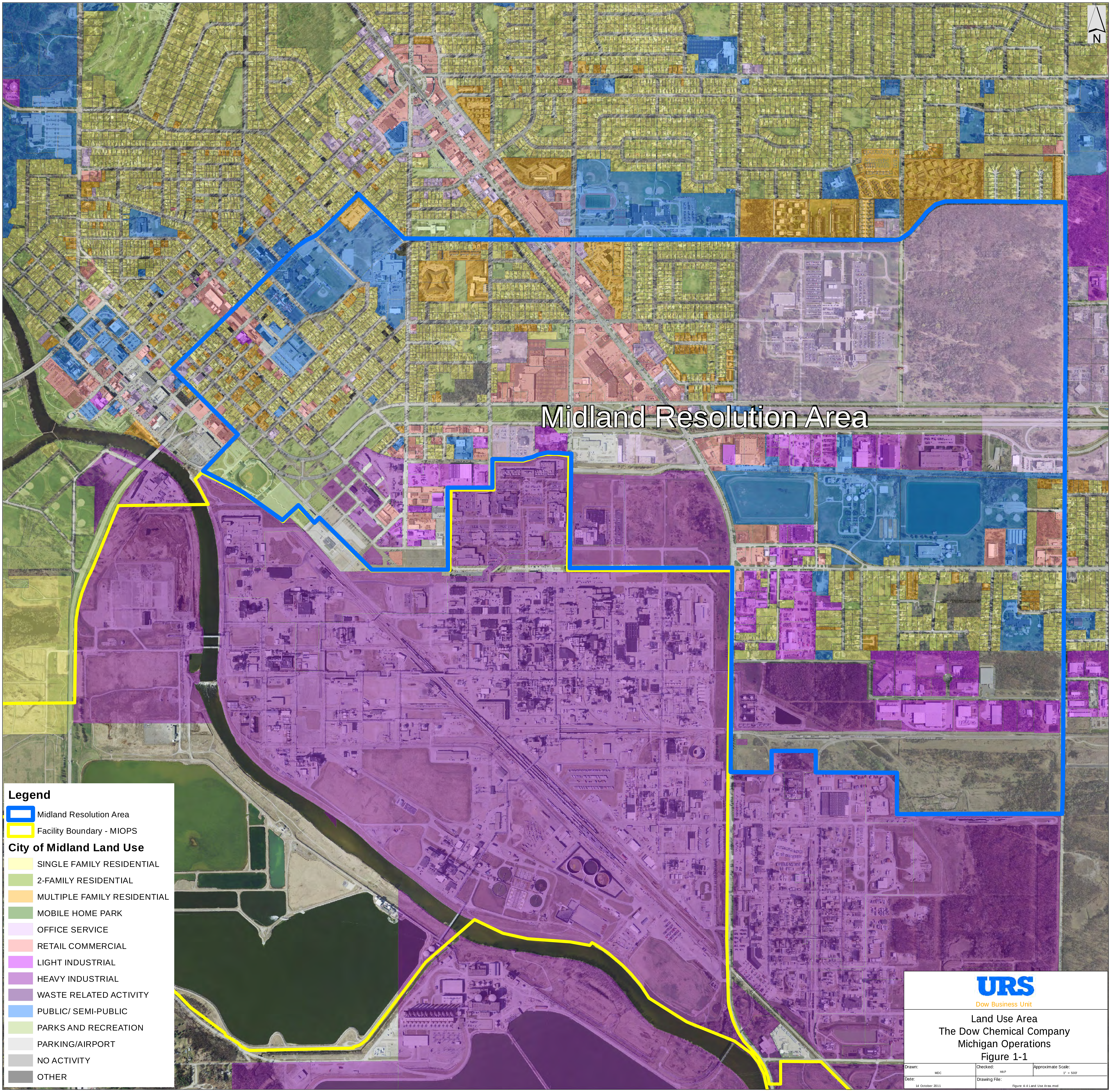
11.0 SE/SC CERTIFICATION

I certify under penalty of law that the storm water drainage system in this SE/SC Plan has been tested or evaluated for the presence of non-storm water discharges either by me, or under my direction and supervision. I certify under penalty of law that this SE/SC Plan has been developed in accordance with a General Permit and with good engineering practices. To the best of my knowledge and belief, the information submitted is true, accurate, and complete. At the time this plan was completed no unauthorized discharges were present. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment for knowing violations.

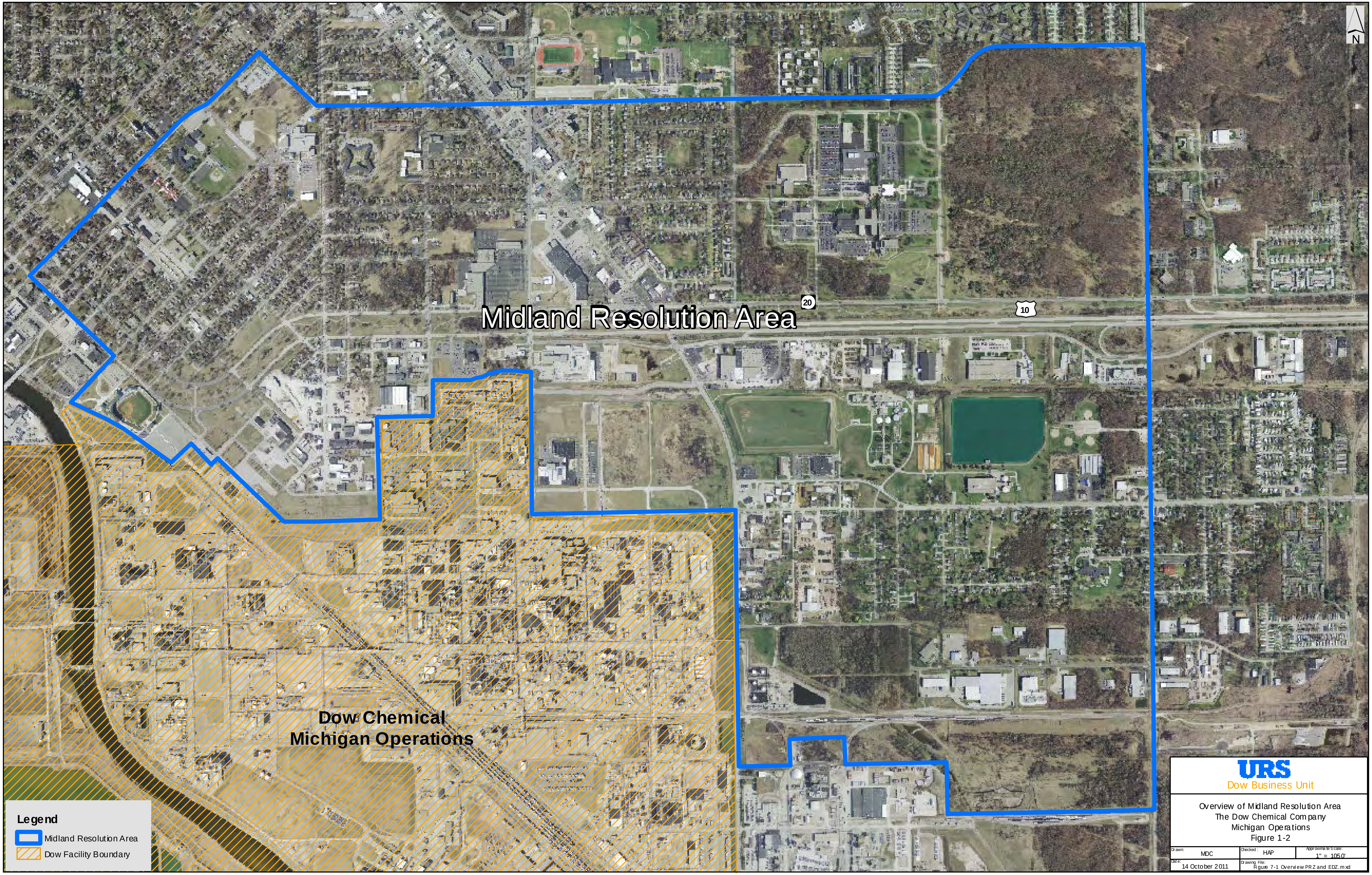
Permittee or Authorized Representative
Printed Name & Title:
Signature & Date:

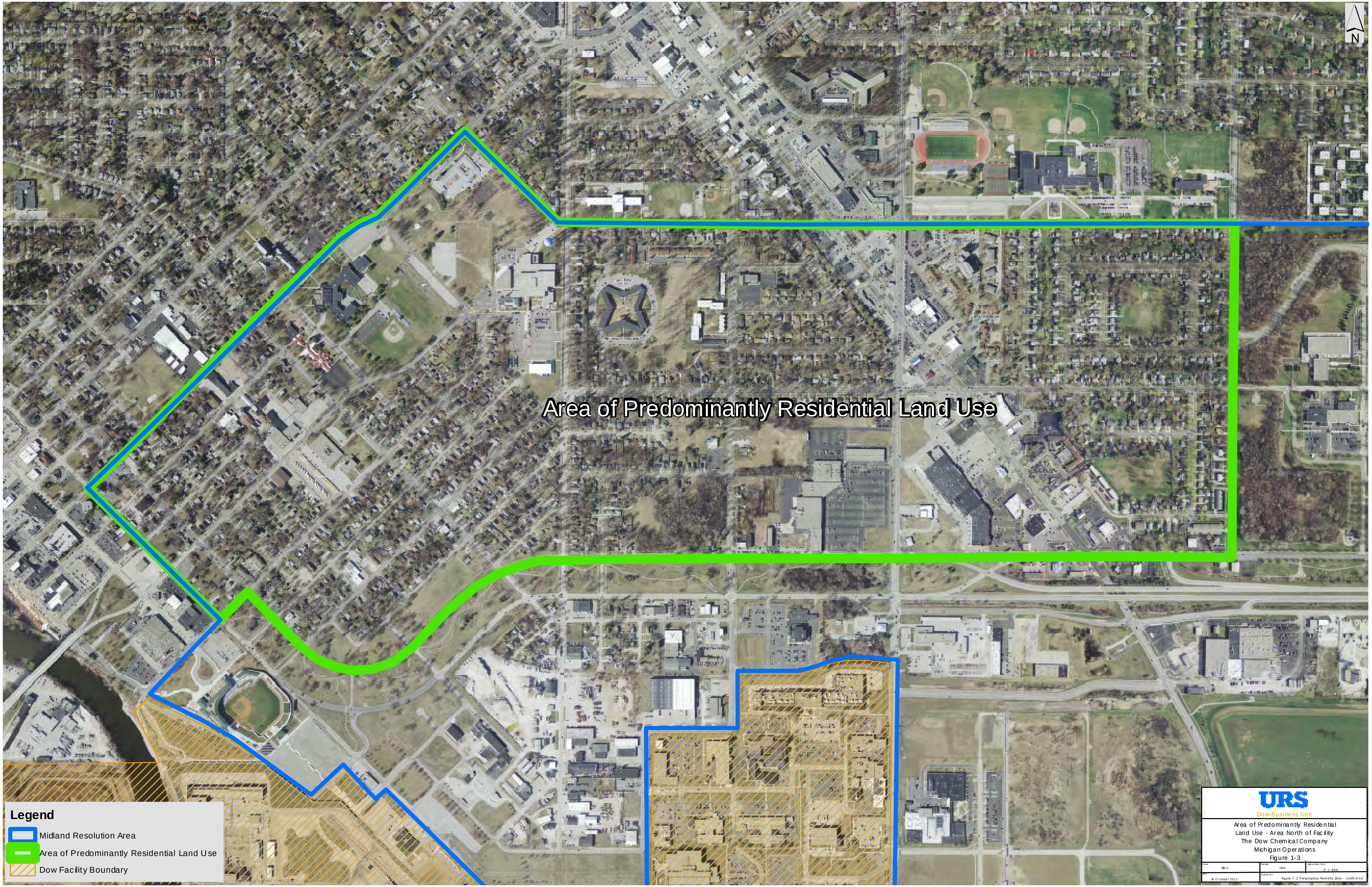
Certified Storm Water Operator
Printed Name & Certification Number:
Signature & Date:

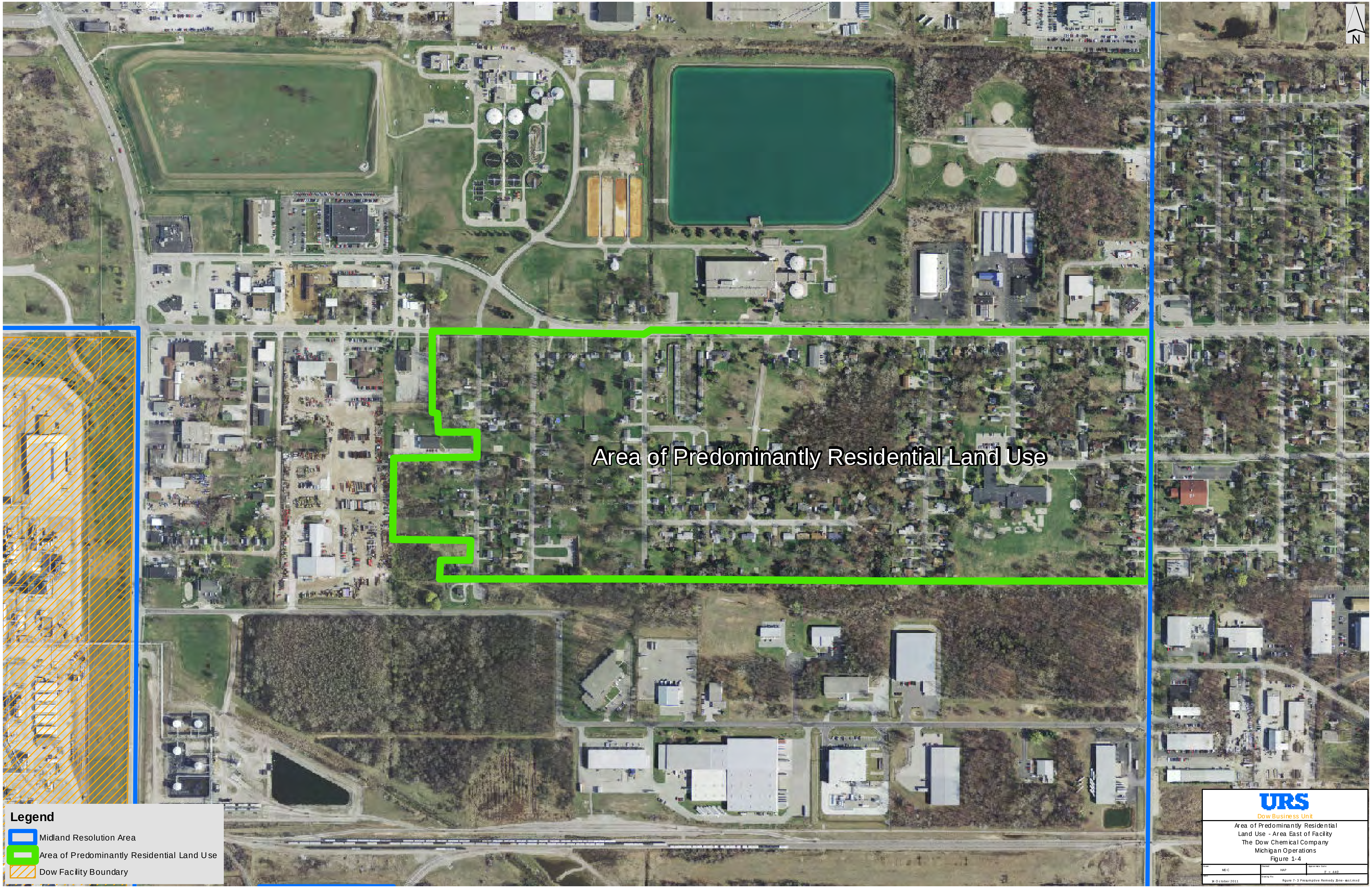
FIGURES



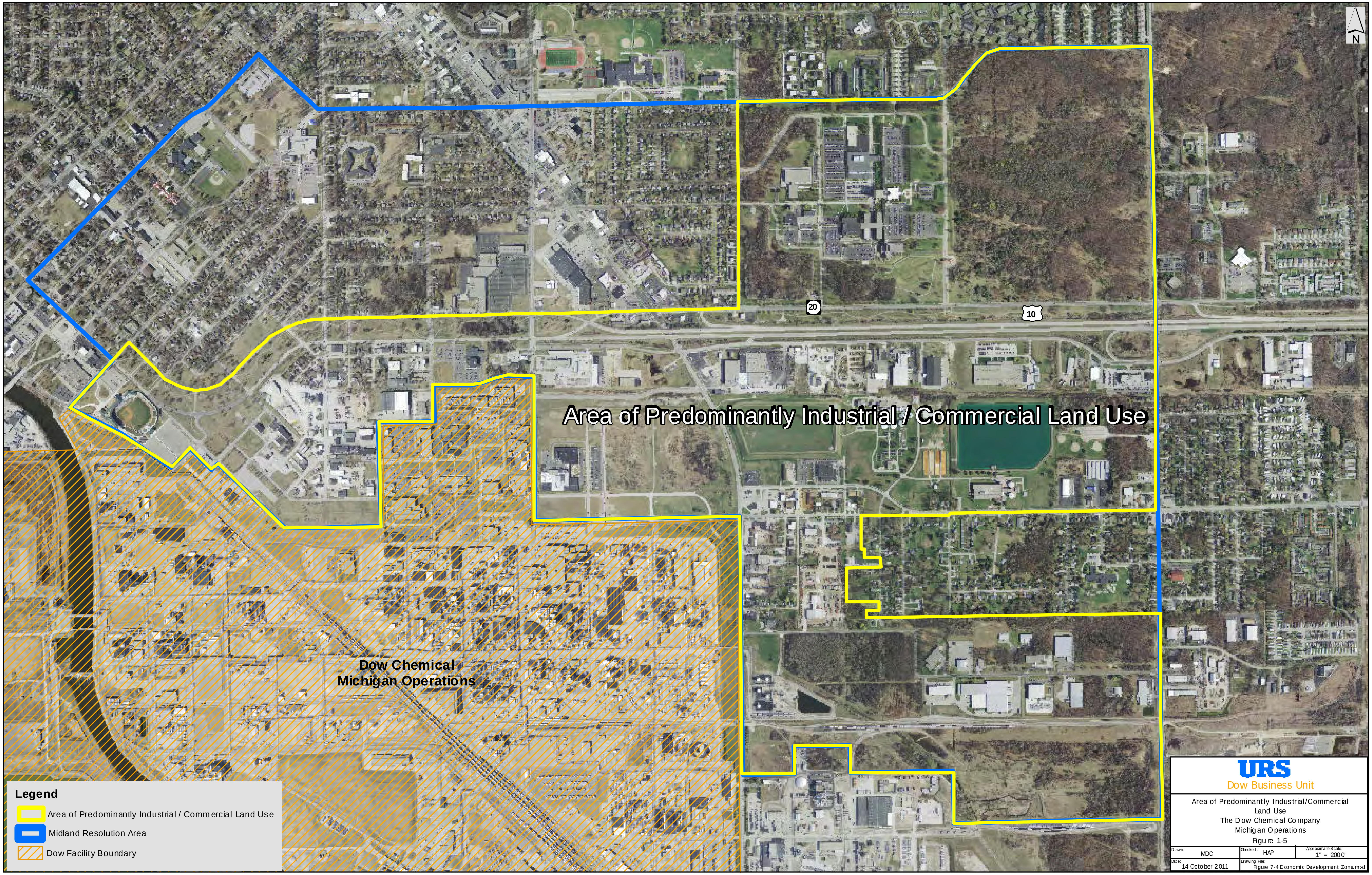
N
Midland Resolution Area
Legend
Midland Resolution Area
Facility Boundary - MIOPS
City of Midland Land Use
SINGLE FAMILY RESIDENTIAL
2-FAMILY RESIDENTIAL
MULTIPLE FAMILY RESIDENTIAL
MOBILE HOME PARK
OFFICE SERVICE
RETAIL COMMERCIAL
LIGHT INDUSTRIAL
HEAVY INDUSTRIAL
WASTE RELATED ACTIVITY
PUBLIC/ SEMI-PUBLIC
PARKS AND RECREATION
PARKING/AIRPORT
NO ACTIVITY
OTHER
URS
Dow Business Unit
Land Use Area
The Dow Chemical Company
Michigan Operations
Figure 1-1
Drawn:
MDC
Checked:
HAP
Approximate Scale:
1" = 500'
Date:
14 October 2011
Drawing File:
Figure 4-4 Land Use Area.mxd


N
Midland Resolution Area
20
10
Dow Chemical
Michigan Operations
Legend
Midland Resolution Area
Dow Facility Boundary
URS
Dow Business Unit
Overview of Midland Resolution Area
The Dow Chemical Company
Michigan Operations
Figure 1-2
Drawn: MDC
Checked: HAP
Approximate Scale: 1" = 1050'
Date: 14 October 2011
Drawing File: Figure 7-1 Overview PRZ and EDZ.mxd

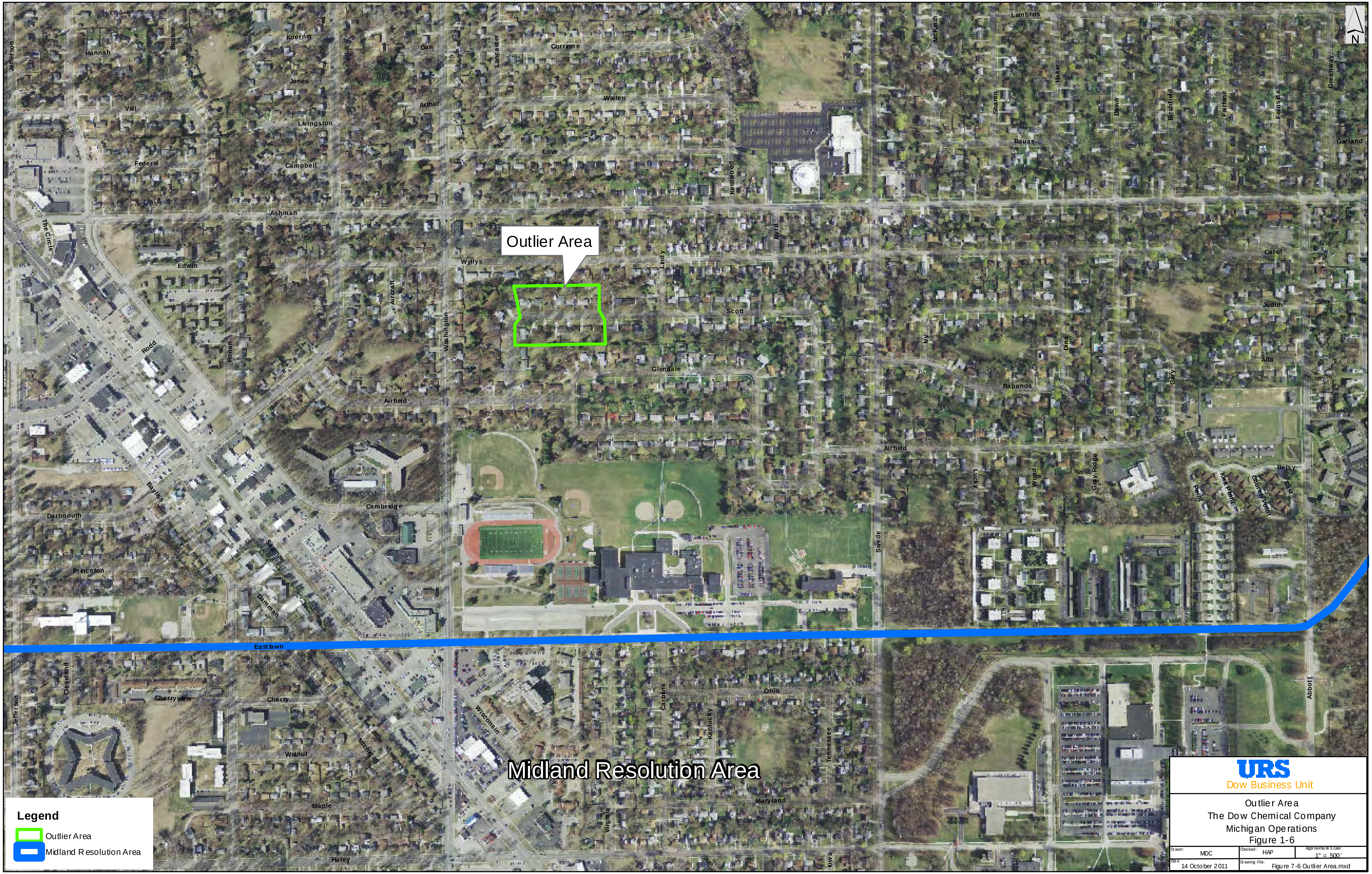

N
Area of Predominantly Residential Land Use
Legend
Midland Resolution Area
Area of Predominantly Residential Land Use
Dow Facility Boundary
URS
Dow Business Unit
Area of Predominantly Residential
Land Use - Area North of Facility
The Dow Chemical Company
Michigan Operations
Figure 1-3
Drawn :
MDC
Checked:
HAP
Approximate Scale:
1" = 650
Date:
14 October 2011
Drawing File:
Figure 7-2 Presumptive Remedy Zone - north.mxd



N
Area of Predominantly Residential Land Use
Legend
Midland Resolution Area
Area of Predominantly Residential Land Use
Dow Facility Boundary
URS
Dow Business Unit
Area of Predominantly Residential
Land Use - Area East of Facility
The Dow Chemical Company
Michigan Operations
Figure 1-4
Drawn:
MDC
Checked:
HAP
Approximate Scale:
1" = 440
Date:
14 October 2011
Drawing File:
Figure 7-3 Presumptive Remedy Zone-east.mxd



N
20
10
Area of Predominantly Industrial / Commercial Land Use
Dow Chemical
Michigan Operations
Legend
Area of Predominantly Industrial / Commercial Land Use
Midland Resolution Area
Dow Facility Boundary
URS
Dow Business Unit
Area of Predominantly Industrial/Commercial
Land Use
The Dow Chemical Company
Michigan Operations
Figure 1-5
Drawn: MDC
Checked: HAP
Approximate Scale: 1" = 2000'
Date: 14 October 2011
Drawing File: Figure 7-4 Economic Development Zone.mxd



Outlier Area
Midland Resolution Area
Legend
Outlier Area
Midland Resolution Area
URS
Dow Business Unit
Outlier Area
The Dow Chemical Company
Michigan Operations
Figure 1-6
Drawn: MDC
Checked: HAP
Approximate Scale: 1" = 500'
14 October 2011
Drawing File: Figure 7-6 Outlier Area.mxd
N
Ashman
Eastlawn
Washington
Swede
Airfield
Glendale
Scott
Wyllys
Cambridge
Dartmouth
Princeton
Cherry
Walnut
Maple
Maryland
Ohio
Abbott
Lambros
Bauss
Love
Wallen
Corrinne


2014
2017
(as required)
2016
(as required)
2015
(as required)
2014
2013
2012
2013
(as required)
2017
(as required)
2017
(as required)
2016
(as required)
2015
(as required)
2014
2016
(as required)
2013
2015
(as required)
2016
(as required)
2012
2014
2013
(as required)
Legend
Property Group A
Property Group B
Property Group C
Property Group D (As Required)
Property Group E (As Required)
Property Group F (As Required)
Economic Development Zone Residences, as necessary
URS
Dow Business Unit
Six-Year
Resolution Area Implementation Plan
The Dow Chemical Company
Michigan Operations
Figure 1-7
Drawn: MDC
Checked: HAP
Approximate Scale: 1" = 500'
Date: 14 October 2011
Drawing File: Figure 7-5 Six-Year Presumptive Remedy Implementation Plan.mxd

WEEKLY PREVENTATIVE MAINTENANCE INSPECTION FORM

Date:	Time:
Location:	
Inspector – Print Name:	Signature:

Areas to be Inspected includes all of the applicable: Construction Equipment, Street Sweeper, Soil Erosion/Sedimentation Control Measures, General Site Good Housekeeping

Corrective Actions need to be addressed within 7 days, if not the same day.

Areas To Be Inspected	Observation	Corrective Action Taken

SITE INSPECTION FORM

Date:	Time:
Weather:	Last Storm Event:
Location:	
Inspector – Print Name, Title:	Signature:

Corrective Actions need to be addressed within 7 days. Update the SE/SC as necessary.

Areas Inspected	Observation	Corrective Action Taken
Structural Control Measures : Silt Fencing Catch Basin Filter Inserts Geotextile Mats/Cover Site Security Measures		
Site-Specific Erosion Control Measures		
Sod Placement Status		
Staging Areas		
Any Track Out Observed		
Areas of Exposed Soil		
Spoil Stockpiles Covered		
Fugitive Dust Control		
Other:		
Any Non-Storm Water Discharges?		

Comments

MONTHLY VEHICLE INSPECTIONS

Performed by ____________________________ Date: ___________________ Time: ________________

Vehicle Unit #________________________

Description	**Check Complete**	**Comments (Include EMTS Work #)**
Previously entered work orders complete		
Tires in Good Condition (including spare)		
Windows Clean		
Windows Broken or Cracked		
Windshield Wipers in good condition		
Windshield Washer Fluid sufficient level		
All Mirrors clean and in place		
Headlight (High & Low Beam) working		
Taillights working properly		
Turn Signals working properly		
Emergency Flashers working properly		
License Plate Light working properly		
Horn working properly		
Heater/Defroster working properly		
Backup Light working properly		
Parking Light working properly		
License Plate Current working properly		
Registration & Insurance in vehicle		
Vehicle Number displayed and legible		
Seat Belts in good working order		
Loose Equipment secured		
Brakes in good condition		
Parking Brakes working properly		
Overall vehicle appearance		
Exhaust System		
Ice scraper, jack, spare tire in vehicle		
Inspect vehicle for any leaks of oil, transmission fluid, gasoline, and etc.		

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

SPILL OR RELEASE REPORT

NOTE: Some regulations require a specific form to use and procedures to follow when reporting a release. Those forms and procedures **MUST** be used and followed if reporting under those regulations. This report form is to aid persons reporting releases under regulations that do not require a specific form. This report form is not required to be used. **To report a release, some regulations require a facility to call the PEAS Hotline at 800-292-4706, or DEQ District Office that oversees the county where it occurred, and other regulating agencies and provide the following information. A follow-up written report may be required. Keep a copy of this report as documentation that the release was reported. If you prefer to submit this report electronically by FAX or e-mail, contact the regulating agency for the correct telephone number or e-mail address.** See the DEQ website on Spill/Release Reporting for more reporting information.

Please print or type all information.

NAME AND TITLE OF PERSON SUBMITTING WRITTEN REPORT	TELEPHONE NUMBER (provide area code)

NAME OF BUSINESS			RELEASE LOCATION (provide address if different than business, if known, and give directions to the spill location. Include nearest highway, town, road intersection, etc.)		
STREET ADDRESS					
CITY	STATE	ZIP CODE			
BUSINESS TELEPHONE NUMBER (provide area code)					
SITE IDENTIFICATION NUMBER AND OTHER IDENTIFYING NUMBERS (if applicable)			COUNTY	TOWNSHIP	TIER/RANGE/SECTION (if known)

RELEASE DATA. Complete all applicable categories. Check all the boxes that apply to the release. Provide the best available information regarding the release and its impacts. Attach additional pages if necessary.

DATE & TIME OF RELEASE (if known)	DATE & TIME OF DISCOVERY	DURATION OF RELEASE (if known)	TYPE OF INCIDENT
____/____/____ _________am/pm	____/____/____ _________am/pm	__________________ days __________________ hours __________________ minutes	☐ Explosion ☐ Fire ☐ Leaking container ☐ Loading/unloading release ☐ Pipe/valve leak or rupture ☐ Vehicle accident ☐ Other ________________

MATERIAL RELEASED (Chemical or trade name) ☐ CHECK HERE IF ADDITIONAL MATERIALS LISTED ON ATTACHED PAGE.	CAS NUMBER or HAZARDOUS WASTE CODE	ESTIMATED QUANTITY RELEASED (indicate unit e.g. lbs, gals, cu ft or yds)	PHYSICAL STATE RELEASED (indicate if solid, liquid, or gas)

FACTORS CONTRIBUTING TO RELEASE
- ☐ Equipment failure
- ☐ Operator error
- ☐ Faulty process design
- ☐ Training deficiencies
- ☐ Unusual weather conditions
- ☐ Other ______________________________________

SOURCE OF LOSS
- ☐ Container
- ☐ Railroad car
- ☐ Pipeline
- ☐ Ship
- ☐ Tank
- ☐ Tanker
- ☐ Truck
- ☐ Other _______ ___________

TYPE OF MATERIAL RELEASED
- ☐ Agricultural: manure, pesticide, fertilizer
- ☐ Chemicals
- ☐ Flammable or combustible liquid
- ☐ Hazardous waste
- ☐ Liquid industrial waste
- ☐ Oil/petroleum products or waste
- ☐ Salt
- ☐ Sewage
- ☐ Other______________________
- ☐ Unknown

MATERIAL LISTED ON or DEFINED BY
- ☐ CAA Section 112(r) list (40 CFR Part 68)
- ☐ CERCLA Table 302.4 (40 CFR Part 302)
- ☐ EPCRA Extremely Hazardous Substance (40 CFR Part 355)
- ☐ Michigan Critical Materials Register or permit
- ☐ NREPA Part 31, Part 5 Rules polluting material
- ☐ NREPA Part 111 or RCRA hazardous waste
- ☐ NREPA Part 121 liquid industrial waste
- ☐ Other list ___________________________
- ☐ Unknown

IMMEDIATE ACTIONS TAKEN
- ☐ Containment
- ☐ Dilution
- ☐ Evacuation
- ☐ Hazard removal
- ☐ Neutralization
- ☐ System shut down
- ☐ Diversion of release to treatment
- ☐ Decontamination of persons or equipment
- ☐ Monitoring
- ☐ Other ____________

RELEASE REACHED

- ☐ Surface waters (include name of river, lake, drain involved) ____ Distance from spill location to surface water, in feet_________
- ☐ Drain connected to sanitary sewer (include name of wastewater treatment plant and/or street drain, if known) ______________________________
- ☐ Drain connected to storm sewer (include name of drain or water body it discharges into, if known) ______________________________
- ☐ Groundwater (indicate if it is a known or suspected drinking water source and include name of aquifer, if known) ______________________ ____
- ☐ Soils (include type e.g. clay, sand, loam, etc.) ____
- ☐ Ambient Air
- ☐ Spill contained on impervious surface

THIS IS A MASTER COPY. PLEASE MAKE COPIES AS NEEDED.

EXTENT OF INJURIES, IF ANY	WAS ANYONE HOSPITALIZED?	TOTAL NUMBER OF INJURIES TREATED ON-SITE:
	☐ Yes NUMBER HOSPITALIZED:____ ☐ No	_______________

DESCRIBE THE INCIDENT, THE TYPE OF EQUIPMENT INVOLVED IN THE RELEASE, HOW THE VOLUME OF LOSS WAS DETERMINED, ALONG WITH ANY RESULTING ENVIRONMENTAL DAMAGE CAUSED BY THE RELEASE. IDENTIFY WHO IMMEDIATELY RESPONDED TO THE INCIDENT (own employees or contractor — include cleanup company name, contact person, and telephone number). ALSO IDENTIFY WHO DID FURTHER CLEANUP ACTIVITIES, IF PERFORMED OR KNOWN WHEN REPORT SUBMITTED

☐ CHECK HERE IF DESCRIPTION OR ADDITIONAL COMMENTS ARE INCLUDED ON ATTACHED PAGE

ESTIMATED QUANTITY OF ANY RECOVERED MATERIALS AND A DESCRIPTION OF HOW THOSE MATERIALS WERE MANAGED (include disposal method if applicable)

☐ CHECK HERE IF DESCRIPTION OR ADDITIONAL COMMENTS ARE INCLUDED ON ATTACHED PAGE

ASSESSMENT OF ACTUAL OR POTENTIAL HAZARDS TO HUMAN HEALTH (include known acute or immediate and chronic or delayed effects, and where appropriate, advice regarding medical attention necessary for exposed individuals.)

☐ CHECK HERE IF DESCRIPTION OR ADDITIONAL COMMENTS ARE INCLUDED ON ATTACHED PAGE

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY NOTIFIED:

INITIAL CONTACT BY: ☐ **Telephone** ☐ **Fax** ☐ **Email** ☐ **Other**

DATE/TIME INITIAL CONTACT:_____________________________

☐ PEAS: 800-292-4706 Log Number Assigned _______________

☐ DEQ District or Field Office

		Divisions or Offices Contacted:
☐ Baraga	☐ Gwinn	☐ Air Quality
☐ Bay City	☐ Jackson	☐ Land & Water Management
☐ Cadillac	☐ Kalamazoo	☐ Office Geological Survey
☐ Crystal Falls	☐ Lansing	☐ Remediation and Redevelopment
☐ Detroit	☐ Newberry	
☐ Gaylord	☐ Warren	☐ Waste and Hazardous Materials
☐ Grand Rapids	☐ Wyoming	
DEQ Office locations are subject to change		☐ Water Bureau

NAME AND TITLE OF PERSON MAKING INITIAL REPORT:

____

DEQ STAFF CONTACTED & PHONE NUMBER:

OTHER ENTITIES NOTIFIED:

	Date:	Time:
☐ National Response Center (NRC): 800-424-8802	________	_____
☐ US Coast Guard Office: ☐ Detroit ☐ Grand Haven ☐ Sault Ste. Marie	________	_____
☐ US Department of Transportation	________	_____
☐ US Environmental Protection Agency	________	_____
☐ 911 (or primary public safety answering point)	________	_____
☐ Local Fire Department	________	_____
☐ Local Police and/or State Police	________	_____
☐ Local Emergency Planning Committee	________	_____
☐ State Emergency Response Commission via MI SARA Title III Program	________	_____
☐ Wastewater Treatment Plant Authority	________	_____
☐ Hazmat Team	________	_____
☐ Local Health Department	________	_____
☐ Department of Labor & Economic Growth MIOSHA	________	_____
☐ Department of Labor & Economic Growth Fire Safety	________	_____
☐ Michigan Department of Agriculture: 800-405-0101		
☐ Other ____		

PERSON CONTACTED & PHONE NUMBER:

DATE WRITTEN REPORT SUBMITTED	SIGNATURE OF PERSON SUBMITTING WRITTEN REPORT

THIS IS A MASTER COPY. PLEASE MAKE COPIES AS NEEDED.

EMPLOYEE TRAINING FORM

Date of Session:	
Trainer	
Print:	Signature:
Topics Covered:	
Attendee Name	**Attendee Signature**

Training Materials for Project Personnel

- Project Specific Soil Erosion and Sediment Control Plan
- Relevant Project Specific BMPs from MDEQ Storm Water website.
- MDEQ Certified Storm Water Operator and SE/SC Inspector Training Manual.

ANNUAL SE/SC REVIEW FORM

(Maintain completed form with SE/SC documents.)

Date: ____________________

Reviewer: (print) ______________________________

(signature) ______________________________

1) Facility general information and SE/SC team information is current and accurate.	Yes	No	
2) Site map is current and accurate.	Yes	No	
3) Significant material inventory is current and accurate.	Yes	No	
4) New exposures, processes and related controls have been documented.	Yes	No	NA
5) Spills have been recorded and reported as appropriate.	Yes	No	NA
6) Records of routine preventative maintenance, housekeeping and employee training are available in the SE/SC file.	Yes	No	
7) Comprehensive site inspections have been completed, certified and filed with the SE/SC file.	Yes	No	
8) Corrective actions noted in the inspection reports have been completed.	Yes	No	
9) Certified Storm Water Operator is current.	Yes	No	
10) Annual fees have been paid to the MDEQ.	Yes	No	
11) Permit renewal request has been processed.	Yes	No	NA
12) SE/SC has been reviewed and signed by the Certified Storm Water Operator and the Permittee or designated representative.	Yes	No	
Additional Comments *(reason changes made to SE/SC, actions as result of spills, etc.)*			

Midland Area Soils Project

Health and Safety Plan

Midland, Michigan

The Dow Chemical Company
Michigan Division
Midland, Michigan

May 2012

TABLE OF CONTENTS

INTRODUCTION

This Health and Safety Plan (HASP) was developed specifically for The Dow Chemical Midland Area Soils (MAS) Project to assign responsibilities, establish personal protection standards and mandatory safety procedures, and provide for contingencies that may arise while operations are being conducted. It complies with, but does not replace, Federal Health and Safety Regulations, as set forth in OSHA 29 CFR 1910 and 1926, and applicable state regulations. Project personnel will use the HASP as a supplement to these rules, regulations, and guidance, and will augment it with individual contractor company specific Health and Safety Programs and Management Systems as well as with applicable portions of Dow's Health and Safety Program.

Changing and/or unanticipated site conditions may require modification of this HASP to maintain a safe and healthful work environment. Any proposed changes to this plan will be reviewed with a project health and safety professional prior to their implementation. If this is not feasible, the Site/Project Manager may modify the plan and record all changes on the revision history section. Under no circumstances will modifications to this plan conflict with federal, state, or other governmental health and safety regulations.

A copy of this project HASP will be provided to each project contractor to fulfill their obligation under OSHA 29 CFR 1910.120(b) to inform everyone working on the project of its site hazards. Also, each project contractor will provide documentation to Dow that describes their plan for addressing applicable health and safety requirements for activities that are unique to their scope of services.

Midland Area Soils Project

Scope of Work

Site History
Pursuant to its Part 111 Hazardous Waste Management Facility Operating License (License), Dow, with oversight from the Michigan Department of Environmental Quality (MDEQ), has investigated the City of Midland area soils.   An Interim Response Designed to Meet Criteria Work Plan (Work Plan) has been developed to address historic releases to Midland Area Soils.

Site Description
The study area is called the Presumptive Remedy Zone. The initial sampling area is generally defined as the area near the Michigan Operations site, north to Eastlawn Drive, west to Rodd Street, and east to Waldo Avenue. A smaller area to the southeast of the intersection of Washington and Ashman Streets will also be sampled. (See Figure 1)

Implementation of the presumptive remedy will begin in areas that are in closest proximity to Michigan Operations and then progress outwards in subsequent years. The year 1 implementation plan addresses approximately 30 acres with a total of 113 properties. Year 1 encompasses two areas, one northwest of the facility and one east of the facility (See Figure 1).

The project office, Midland Resolution Center, is located at 1008 Jefferson Ave. The office is in an industrial area just north of Michigan Operations.

Project Description
Access agreements will be obtained from the property owners within the remedy area for the current year's implementation plan. For properties where access is granted, soil samples will be collected, analyzed and evaluated according to the work plan. Properties in which the dioxin concentration exceeds the site specific criteria of 250 ppt will be eligible for remedy implementation. Remedy implementation will include development of parcel specific field activity plan, excavating 12 inches of soil where possible, replacing with clean backfill and topsoil, laying sod or planting grass seed, and replacing all landscaping. Other field activities may include repairing damaged sidewalks and driveways, cutting down trees, and repairing permanent structures that might be damaged during construction (i.e. fences, patios, decks, etc).

Project Safety Requirements
Project personnel are expected to meet the basic requirements for all Dow operations, including the tasks and expectations outlined in the Agreement for Services, the Rules & Procedures for Contractors as outlined in the Contractor "Blue" Book, and new and existing Dow initiatives. The "Blue" Book shall be available at all times as a reference and is also available at the Midland Resolution Center (1008 Jefferson Road).

The expectation for all work on the MAS project is zero injuries. Planning and preparation for all work will consider and address safety as a priority concern. Dow minimum safety requirements will be met by:

- Compliance to DOW policies and procedures
- An individual dedicated to safety for day-to-day involvement in and management of Dow work and, when identified, additional personnel may be allocated to mitigate or monitor specific project hazards
- Conduct independent audits, participate in Dow required self-audits and implement corrective actions when needed
- Conduct Pre-Job Safety Conferences with all involved parties and maintain documentation to verify that all contractor and subcontractor employees reviewed and understood job site safety information
- Conduct daily safety tailgates for all project work and periodic safety meetings incorporating Dow safety communications
- Track and keep current all site training requirements and other site- or job-specific training
- Near miss incidents or newly identified safety hazards or conditions will be evaluated, addressed, and communicated to the team
- Continuous Hazard Analysis Tool (CHAT) cards will be completed and tracked for compliance by the SSO
- Conduct Behavior Based Performance (BBP) observations and track by the SSO
- The authority to stop work is granted to all project personnel for the purposes of correcting an unsafe environment or work practice

A large portion of the MAS project is located in residential areas. Due to performing construction type activities in a residential area, a Construction Safety flyer for homeowners and/or occupants has been generated and is included as Appendix 1. The contents will be individually discussed with each resident prior to commencing any work activity. This flyer will include detail on where the occupant can park during construction, emphasize that flagging and barricades limiting access to heavy equipment and/or exposed soils must be strictly adhered to, and if there is a safety concern to contact the Midland Resolution Center.

SITE ORGANIZATION

Safety Roles and Responsibilities

Site Manager (SM)

The SM will direct site operations. The SM may delegate all or part of these duties to a properly qualified employee. The SM is responsible for:

- Establishing that project personnel are aware of the provisions of this HASP, are instructed in the work practices necessary to ensure safety; are familiar with planned procedures for dealing with emergencies; and have the resources, tools and equipment to conduct work in accordance with the Dow Zero Injury expectation

- Establishing that project personnel have completed all relevant health and safety training and that all field personnel have appropriate medical clearance, as required by OSHA 29 CFR 1910.120, including fit testing for the appropriate respirators
- Facilitating ongoing initiatives to ensure compliance with federal, state, and Dow training and performance expectations
- Correcting any project contractor work practices or conditions that may result in injury or exposure to hazardous substances
- Halting project operations, if necessary, in the event of an emergency or to correct unsafe work practices

Project Manager (PM)

The PM will direct project operations and will report to the Site Manager. The PM may delegate all or part of these duties to a properly qualified employee. The PM is responsible for:

- Seeing that appropriate personal protective equipment (PPE) and monitoring equipment are available and properly used by all project personnel
- Seeing that all personnel are aware of the potential hazards associated with project operations
- Monitoring the safety performance of all personnel to see that required work practices are employed, including implementation of any applicable safe work or health and safety plans
- Correcting any work practices or conditions that may result in injury or exposure to hazardous substances
- Preparing any accident/incident reports for project activities
- Halting project operations, if necessary, in the event of an emergency or to correct unsafe work practices
- Reviewing the project HASP, communicating safety expectations with project personnel, and conducting the Pre-Job Safety Conference

Site Safety Officer (SSO)

The SSO is responsible for managing the following:

- Implementing the project HASP and reporting any deviations from the anticipated conditions described in that plan to the Project Manager
- Determining that monitoring equipment is used properly by project personnel and calibrated in accordance with manufacturer's instructions or other standards and calibration and monitoring results are properly recorded and filed
- Ensuring project team members have current medical clearances and training and maintaining training documentation
- Conducting safety meetings for project personnel
- Conducting and documenting site safety inspections/assessments/observations
- Providing ongoing review of protection level needs as project work is performed and informing team members of the need to upgrade/downgrade protection levels, as appropriate
- Ensuring any required health and safety documentation is completed and maintained
- Halting site operations, if necessary, in the event of an emergency or to correct unsafe work practices

- Maintaining the visitor log as appropriate for project operations
- Delegating health and safety tasks as appropriate to qualified personnel
- Assuming any other safety related duties as directed by the Project Manager

Field Task Leader or Site Supervisor (FTL)

The FTL is responsible for field operations and reports to the Project Manager. The FTL ensures the implementation of the HASP requirements and procedures in the field. The specific responsibilities are:

- Executing the work plan and schedule as detailed by the PM
- Coordination with the SSO on health and safety requirements
- Ensuring site work compliance with the requirements of this HASP and/or any project-specific safe work or health and safety plans
- Halting site operations, if necessary, in the event of an emergency or to correct unsafe work practices

Field Team Member(s)

Project personnel involved in obtaining access, on-site sampling, development of parcel specific field activity plan, and operations at the direction of the Field Task Leader or Project Manager and are responsible for:

- Taking all reasonable precautions to prevent injury to themselves and to their fellow employees
- Performing only those tasks that they believe they can do safely, and immediately reporting any accidents and/or unsafe conditions
- Implementing the procedures set forth in the HASP and reporting any deviations from the procedures described in it
- Notifying the SSO and/or FTL of any special medical problems (i.e., allergies), and seeing that all on-site personnel are aware of such problems
- Reviewing the project HASP and acknowledging that in writing

Dow Senior Remediation Leader

- Signing the Project Management Scope of Work (PMSOW)
- Approving the Work Plan and Project Schedule, and ensuring proper review of documents
- Assisting in issue resolution

Site Organization Contacts

Role	Name	Company	Phone	email
Site Manager	Marty Crook	URS Corporation	989-942-0406	martin.crook@urs.com
Project Manager	Scott Madill	URS Corporation	989-859-0376	samadill@dow.com
Field Task Leader	Gary Waugh	URS Corporation	989-696-4075 989-737-3374	Gwaugh2@dow.com
Site Safety Officer	Don Burnell	Fisher	989-860-9577	
Dow Senior Remediation Leader	Steve Lucas	The Dow Chemical Company	989-638-6012 989-859-3352	sclucas@Dow.com

Hazard Analysis

Project Hazard Assessment

A Hazard Assessment has been conducted for the MAS project based on information provided by the project team, site visits, and detailed information regarding each stage of work, in accordance with OSHA 29 CFR 1910.132(d).

A risk assessment for project related tasks has been performed. Please note that the level of contamination on the site was considered in assignment of the severity rating beyond the task level.

Type of Activity Performed	Severity Rating (1-5)	Frequency Rating (1-5)	Risk Assigned (1-3)
Obtaining Access	1	5	1
Soil Sampling	2	5	1
Development of parcel specific field activity plan	1	1	1
Excavation	4	3	2
Soil management	2	1	1
Soil replacement and grading	4	3	2
Sod Installation	3	3	2
Hydroseeding	3	3	2
Landscape Installation	3	3	2
Operation & Maintenance Activities	3	3	2
Construction Oversight/Safety Support	3	3	2
Concrete replacement	3	1	2
Tree removal	5	1	3
Irrigation system installation	2	1	1
Administrative Functions & Support	1	5	1

Operations included on this list are further broken down for hazard awareness and mitigation in the Hazard Control Measures section contained in the HASP.

Hazard Control Measures

The purpose of this section is to list activities to be performed for this project, identify the associated hazards, and present actions to be taken to control or mitigate exposure to the hazard. All members of the site team should be aware of the potential hazards and control measures. Training to the specific hazards and control measures is the single most important mitigation activity for work conducted on the site.

Project pre-job safety conferences, safe work permits, daily CHAT cards, safety meetings, and checklists are designed to identify and mitigate project specific hazards. All team members are to participate fully in these initiatives. Some activities may have unique hazards in addition to or caused by hazards of other activities. Mitigation actions should be taken for all involved hazards. Inspections/observations can be conducted at any time by project personnel, and Dow and care should be taken to ensure all hazards are identified and mitigated to avoid unnecessary injuries, accidents, incidents, complaints, citations or fines.

Engineering and administrative hazard controls will be implemented preferentially to PPE.

A hazard analysis has been conducted for tasks that are associated with the MAS project. These tasks include driving, property visits, sampling, excavation/backfill, vegetation replacement/landscaping/irrigation system installation, post remedy care (O&M) mowing, fertilizing, landscape replacement, concrete replacement, and tree removal and/or trimming. Each individual hazard analysis is included in Appendix 2.

Individual contractor firms that will conduct this work will be required to provide their own Job Safety Analysis for their specific activities as a supplement to the MAS Job Safety Analysis. This HASP, along with the individual contractor Job Safety Analyses will provide a comprehensive hazard analysis for each task to be performed.

Chemicals of Concern

The primary chemicals of concern for the MAS Project are dioxins and furans in excavated soils and air particulates. Route of exposure may be via skin contact and/or inhalation. Soil analysis of dioxins and furans levels will be used to confirm soil concentrations; therefore it will not be necessary for workers to employ PPE beyond the general project requirements. In the unlikely event that soil monitoring shows dioxin and furan concentrations above 990 ppt, this HASP will be amended to address safety requirements. Dust control measures are discussed elsewhere in this HASP, under Hazard Control Measures.

Dioxins and furans

“Dioxins and furans” refer to a group of chemical compounds that share certain similar chemical structures and biological characteristics. Dioxins and furans are an unwanted byproduct of combustion, both from natural sources like forest fires and from man-made sources like power plants, backyard burn barrels, and industrial processes.

Dioxins and furans falling to land from air emissions tend to bind tightly to vegetation and soil. When dioxins and furans are released into water, they tend to settle into sediments where they can become trapped and stationary, or be ingested by fish and other aquatic organisms. Dioxins and furans trapped in sediment can be further transported during activities that dislodge sediment, such as flooding or dredging.

Human exposure to dioxins and furans

In the United States, the primary way people are exposed to dioxins and furans is through eating meat and dairy products. The animals we eat are exposed to background levels of dioxins and furans in the soil, on vegetation and in some commercial animal fees. Eating meat or dairy products exposes us to these low levels of dioxins and furans. Over time, we accumulate dioxins and furans in the fatty tissues of our own bodies.

For more information on human levels of dioxin, please see the U.S. Centers for Disease Control and Prevention (CDC)'s Fourth National Report on Human Exposure to Environmental Chemicals.

For further information on dioxins and furans, see Dow's dioxin information website.

Project Required PPE

During sampling activities, all personnel are required to wear steel-toed boots, safety glasses with attached side shields and appropriate gloves for the task. During remedy implementation or other O & M activities, all personnel are required to wear a hard hat, steel-toed boots, safety glasses with attached side shields, and gloves appropriate to the task. Dow requires that all personnel have gloves with them at all times and that gloves are to be worn for all work unless the wearing of the glove presents a greater hazard. The type of glove to be worn will be determined in accordance with the hazards of the task. In addition, safety reflective vests are required whenever work is done around heavy equipment and roadways. This defines Level D PPE for the project, a work uniform affording basic protection, used for nuisance contamination only.

Property specific work plan development, including property owner meetings and walk throughs will not require specific PPE.

Soil concentrations of dioxins and furans within the project area have been determined to be well below the trigger level required for PPE upgrade (990 ppt). Should a PPE upgrade be needed for any reason, this HASP must be amended to include at a minimum an additional hazard assessment, updated monitoring plan, and detailed hazard control measures.

Required Training

Project employees will be required to complete project specific communications training and initial Project Orientation training.

Safe Work Permits

Safe work permits (SWP) must be issued for all field operations unless a procedure is in place. Dow MiOps SWP forms will be used, in accordance with Dow's Safe Work Permit Standard with

Midland additions. SWP's may only be issued by trained and authorized personnel, and the SWP will only be good for the time listed on the permit, not to exceed one work shift.

Safe Work Permits must be *cancelled* in the following events:

- Complete change in work crew
- Change in work conditions or scope such that the hazards and safeguards have changed

Safe Work permits must be *suspended* in the following events and reauthorized before work can resume:

- Work stoppage due to an emergency or weather related occurrence
- Work stoppage due to a change in work conditions or scope with no change in hazards and safeguards
- Work has taken longer than originally permitted

Under all circumstances, a SWP will require a joint, initial on-site inspection by the permit issuer and the permit receiver. A copy of the SWP must remain at the job site for the duration of the work. The issuer's copy will be posted in dedicated project vehicles.

At the end of the permitted work, the status of the job and equipment must be reviewed by the issuer and the receiver, and the receiver's copy of the permit must be matched with the issuer's copy and signed by the receiver (the issuer may sign the next day if circumstances warrant). Other associated permits and checklists will be stapled to the SWP, placed in dedicated project file within the project vehicles, and retained for the specified time.

INSERT TAB TITLED: EMERGENCY RESPONSE

Provides an easy quick reference

EMERGENCY PLANNING AND PROCEDURES

The initial response to an emergency is to notify all site personnel, secure the safety of personnel and report the emergency through the appropriate channels. All emergencies will be reported to Dow, the Project Manager, Site Supervisor, Site Safety Officer, and any involved subcontractor representatives.

All incidents will be appropriately documented following Dow and individual contractor firm reporting policies..

Employees should call 9-1-1 for emergencies, but report all incidents through the SSO once the situation has been secured. Emergencies will be treated through MidMichigan Medical Center, 4000 Wellness Drive, Midland, MI 48670. General directions to the hospital from the MAS project area are:

Proceed west on Saginaw Road approximately 3-5 miles (past Eastman Road) to Wellness Drive. The hospital entrance is on the south.

An area map depicting the hospital is included on the proceeding page.

Non-emergency offsite injuries should be reported immediately to the SM and/or the SSO and appropriate treatment will be arranged. The SM will be responsible for ensuring all offsite injuries are reported through the appropriate URS and Dow channels per the DBU Incident Management protocol. Generally, a Covenant Occupational Medical facility will be selected as a primary treatment facility; however, an alternate may be selected depending upon work location and clinic hours. See table below.

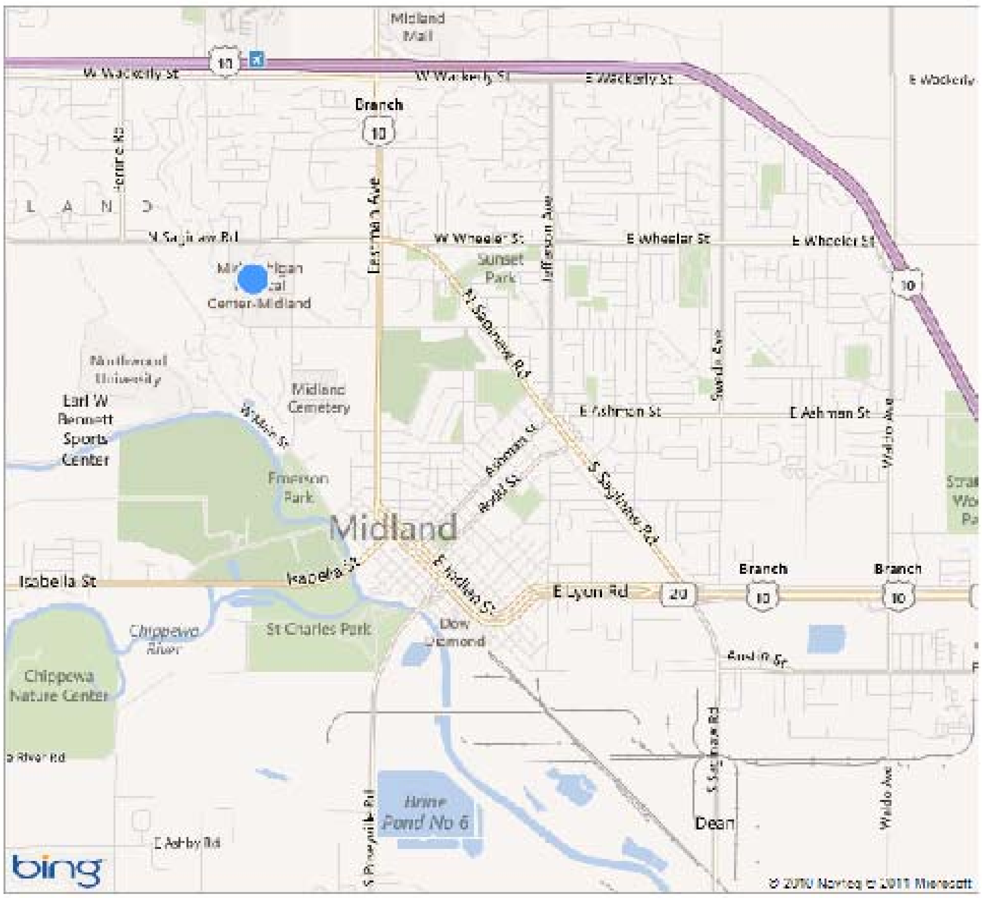
Clinic	Address	Phone	Hours
Covenant Occupational Health and Wellness Midland	1549 Washington Street, Midland, Michigan 48640	989-837-2647	Monday - Friday • 8:00 am - 5:00 PM
MidMichigan Urgent Care	3009 North Saginaw Road, Midland, Michigan 48640	989-633-1350	Monday - Friday 8 a.m. - 8 p.m. Saturday & Sunday 8 am - 4 pm
Midland Redi-Med	4615 Eastman, Midland, Michigan	989-631-7110	Weekdays: 8:00am to 8:00pm Sat: 8:00am to 6:00pm Sun: 10:00am to 6:00pm

bing Maps

Wellness Dr, Midland, MI 48640

Proceed west on Saginaw Road (past Eastman Road) to Wellness Drive. The hospital entrance is on the south.

On the go? Use **m.bing.com** to find maps, directions, businesses, and more



Reporting and Investigation
Dow may impose penalties for not reporting injuries or illnesses, up to and including, removal of involved employees or contractors from the site.

Dow requires a preliminary written report to be submitted to the Remediation Leader and the SSO within 24 hours of the incident. Upon completion of an investigation, a final report will be submitted to Dow. Written reports are required for any injury, illness, near miss, unplanned event, fire, hazardous condition or property damage incident, even if an injury did not occur.

A near miss is an incident which given a slight change in circumstance may have resulted in an injury, illness, or property damage. Dow uses near miss data to identify potential hazards and implement controls to prevent any future occurrence. Near miss events are to be recorded on the Near Miss/Safety Suggestion cards and turned in to the SSO for entry into the Dow near miss reporting tool.

In certain extremely hazardous situations, the SSO or Site Supervisor may request that site operations be temporarily suspended while the underlying hazard is corrected or controlled.

Project personnel will evacuate from areas of hazardous material emergencies and to summon outside assistance from agencies with personnel trained to respond to the specific emergency. These procedures are to be reviewed during the on-site safety briefings conducted by the SSO.

In the event of a fire or medical emergency, the emergency numbers identified in the included Emergency Contact List shown below should be called for assistance.

The emergency response will consist of employees who assume the following roles:

- Emergency care provider(s) will provide first aid/CPR as needed.
- Communication Coordinator - The role of the communication coordinator is to maintain contact with appropriate emergency services and to provide as much information as possible, such as the number injured, the type and extent of injuries, and the exact location of the accident scene. The communication coordinator will be located as close to the scene as possible to transmit to the emergency care providers any additional instructions that may be given by emergency services personnel in route.
- Field Task Leader - The FTL will survey and assess existing and potential hazards, evacuate personnel as needed, and contain the hazard. Follow up responsibilities include replacing or repairing damaged equipment, documenting the incident, and notifying appropriate personnel/agencies described under Incident Reporting. Responsibilities also include reviewing and revising site safety and contingency plans as necessary.

At least one project member on-site will hold a current certificate in American Red Cross Standard (or equivalent) First Aid. If a medical emergency exists, personnel should:

1. Consult the emergency contacts number list and request an ambulance immediately.
2. Perform First Aid/CPR as necessary.

3. Stabilize the injured; decontaminate if necessary, and extricate only if the environment the injured/ill person is in is dangerous or unsafe and ONLY if the rescuers are appropriately protected from potential hazards that might be encountered during the rescue.
4. When emergency services personnel arrive, communicate all first aid activities that have occurred.
5. Transfer responsibility for the care of the injured/ill to the emergency services personnel.
6. Once situation is stabilized, contact the SSO or SM so that incident management procedures can be enacted.

Emergency Contacts

Role (Location)	Name		Phone	Notes
OFFSITE: Emergency	Local Emergency Services in county of work		9-1-1	
OFFSITE: Non-emergency	Midland: Covenant Occupational		989-837-2647	Non-emergency treatment should be determined after reporting to the SSO.
Site Manager	Marty Crook	URS Corporation	989-638-9552 989-942-0406	martin.crook@urs.com
Project Manager	Scott Madill	URS Corporation	989-859-0376	samadill@dow.com
Field Task Leader	Gary Waugh	URS Corporation	989-737-3374	Gary.waugh@urs.com
Site Safety Officer	Don Burnell	Fisher	989-860-9577	
Dow Remediation Leader	Steve Lucas	Dow Chemical	989-638-6012 989-859-3352	sclucas@dow.com

First Aid Kits

The following items and emergency response equipment will be located within easy access at all times:

1. First aid kit and infection control kit.

   *Note: Dow procedures allow for the use of first aid supplies from the time of incident until the ambulance arrives to treat the injury/illness. Supplies are not to be used in lieu of treatment. First aid supplies will be maintained in URS trucks for remote sites.
2. Eyewash Station: a 15 minute eyewash (required if corrosives are present), or an appropriate amount of portable sterile eyewash bottles, will be available on-site for flushing foreign particles or contaminants out of eyes. The SSO will demonstrate the proper operation of the unit(s) prior to the start of work.
3. Emergency telephone numbers list.
4. Portable radios or cellular phones for emergency communications in remote areas.

Drugs, inhalants, medications, and expired items will not be included in the first aid kit. Supplies should be reordered as they are used. A quarterly inventory must be done on the first aid kit and infection control kit contents, and supplies that have been used must be reordered.

Safety Management Standards

Dow and individual contractor firms have developed Safety Standards to protect the health and safety of project personnel. Standards are also used to facilitate or exceed compliance to federal safety standards and industry best-practices. In the event that an individual contractor firm standard conflicts with a Dow requirement, the more stringent of the two standards will be applied. Dow procedures are generally to be adapted and applied, though questions regarding conflicts should be presented to the Site Manager.

The following standards generally apply to all field projects.

Emergency Preparedness Plans	Sanitation
Housekeeping	Inspections by Regulatory Agencies
Vehicle Safety Program	Health, Safety, and Environment Training
New Employee HSE Orientation	Injury/Illness/Incident Reporting and Notifications
Incident Investigation	Injury Management
Behavior Based Safety	Managing HSE Related Risks

The following standards only apply when specific activities are conducted by project personnel. If you answer "Yes" to any of the questions below, review the appropriate standard and determine the appropriate steps necessary to ensure project compliance with the requirements.

Will project activities involve any of the following?	Yes	No	Will project activities involve any of the following?	Yes	No
Abrasive blasting or exposure to abrasive blasting media or waste?	☐	☒	Excavations or exposure to excavation hazards?	☒	☐
Potential exposure to ticks, snakes, poisonous plants, and other biological hazards?	☒	☐	Flammable or combustible materials used or stored which could constitute a fire hazard?	☒	☐
Use of aerial lifts?	☐	☒	Use of portable, gas powered, electric, and/or powder actuated hand tools?	☒	☐
Potential exposure to air contaminants in hazardous concentrations?	☒	☐	Hazardous materials shipping?	☐	☒
Asbestos surveys or abatement oversight?	☐	☒	Hazardous substances – chemical or health hazards?	☒	☐
Potential exposure to Bloodborne Pathogens (i.e. blood or other bodily fluids)?	☒	☐	Hazardous waste activities (investigative or remedial)?	☐	☒

Will project activities involve any of the following?	Yes	No
Work over or near water?	☐	☒
California job activities?	☐	☒
Corrosive materials used or handled?	☐	☒
Confined space entries?	☐	☒
Cranes or hoists?	☒	☐
Demolition activities of any type of structures?	☐	☒
Drilling activities?	☐	☒
Use of small watercraft (e.g., boats, canoes)?	☐	☒
Exposure to chemical/physical/biological agents and/or activities that require Medical Surveillance? Examples would include exposures to; Noise, Asbestos, Lead, Hazardous Waste, High Altitudes, Carcinogens, Respirator Use.	☒	☐
Noise exposures?	☒	☐
Ladder use?	☒	☐
Exposure to eye, head, hand, foot, or other hazards that require the use of PPE?	☒	☐
Nuclear density gauge use?	☐	☒

Will project activities involve any of the following?	Yes	No
Heat Stress potential to employees working in: • Hot environments; or • Impermeable Chemical Protective Clothing?	☒	☐
Heavy equipment in use at this project site?	☒	☐
Hot Work (welding, cutting, grinding)?	☒	☐
Industrial site access of any kind?	☒	☐
Lead exposures (lead paint removal, lead in dust, etc)?	☐	☒
International travel?	☐	☒
Use of Manbasket (Crane Suspended Personnel Platforms) for working at heights?	☒	☐
Work on or near streets and/or roadways?	☒	☐
Exposure to uncontrolled energy sources including electrical, fluid, pneumatic, fuel, steam, gravity, and hazardous material?	☒	☐
Potential exposure to subsurface and/or overhead utilities?	☒	☐
Potential exposure to Unexploded Ordnance/Chemical Warfare agents?	☐	☒
Underground Storage Tank investigation, removal, etc.?	☐	☒
Work with live electrical systems?	☐	☒

Will project activities involve any of the following?	Yes	No	Will project activities involve any of the following?	Yes	No
Respiratory protection use – required and/or voluntary?	☐	☒	Work at altitudes greater than 7,000 feet (~ 2,100 meters)?	☐	☒
Scaffolding?	☐	☒	Working at heights of greater than 4 feet (1.22 meters) or 6 feet (1.83 meters) for construction/demolition?	☒	☐
Manual lifting and/or material handling?	☒	☐	Use of computer workstations for data entry, CADD, word processing, etc.?	☒	☐
Work on or near railroad transportation systems?	☒	☐	Exposure to recognized hand hazards?	☒	☐
Work at a client site requiring compliance with the OSHA Process Safety Management Standard?	☐	☒	Are employees or contractors required to operate Powered Industrial Vehicles (i.e. forklift trucks)?	☒	☐
Subcontractors to perform high risk activities (including drilling and excavation) with their own personnel and/or equipment?	☒	☐	Potential exposure to ionizing radiation?	☐	☒
Potential personnel exposure to temperatures below 32^{o}F?	☒	☐	Down-hole geologic logging operations associated with geotechnical explorations or caisson inspections?	☐	☒
URS personnel newly hired or transferred from another position?	☒	☐	Potential inhalation of chromium VI (hexavalent chromium)?	☐	☒
Diving activities?	☐	☒	Working alone in an area where they cannot be seen/heard by another person?	☒	☐
Work at a site regulated by the Mine Safety Health Administration (MSHA)?	☐	☒	Hoists, elevators or conveyors being used?	☐	☒
Coordinate building material storage on-site?	☒	☐	Tunnels, shafts and caissons?	☐	☒
Operating and testing compressed air systems?	☐	☒	Signs, signals or barricades will be used onsite?	☒	☐
Temporary floors being created?	☐	☒	Project security will be required?	☒	☐

Will project activities involve any of the following?	Yes	No	Will project activities involve any of the following?	Yes	No
Concrete will be poured or handled?	☒	☐	Installation of cofferdams being performed?	☐	☒
Steel erection activities being performed?	☐	☒	Use or handling of explosive or blasting agents?	☐	☒
Work on or transfer to/from marine transportation (e.g. barge, vessel)?	☐	☒	Mining operations are conducted or controlled by URS?	☐	☒

Chemical Hazards

Chemical exposure for each project must be considered by the project manager and, where necessary, specific safe work plans initiated to eliminate hazardous exposure. Work requiring respiratory protection will require an annual medical clearance and equipment fit test. Project Managers, in coordination with Dow Industrial Hygienists, will establish specific protective systems, including PPE, which will be strictly enforced.

Material Data Safety Sheets (MSDS) for materials to be utilized on the project will be available to project personnel. The majority of materials to be used by project staff are general consumer products (i.e., insect repellent, poison ivy wipes).

Decontamination

All sampling equipment should be decontaminated prior to sample collection or at the end of each workday. Wash water and other fluids generated during decontamination will be managed at the MiOps Wastewater Treatment Plant.

To manage track out at specific parcels, all heavy equipment will be broomed and inspected to ensure that all loose soil particles are removed prior to demobilization. Any material generated through decontamination will be handled similar to removal efforts. Designated floor mats for project staff vehicles will be utilized to manage foot traffic carry-over that may occur after leaving project parcels. Any substantial material accumulated on the floor mat will be handled as part of removal efforts.

Fire

To protect against fires, the following special precautions must be taken:

- A Safe Work Permit must be obtained for any Hot Work to be done and Dow Hot Work procedures must be followed.
- Type ABC fire extinguishers will be available on-site to contain and extinguish small fires.

Communication

A communication system or network must be set up to alert site personnel of emergencies and to summon outside emergency assistance. Where voice communication is not feasible, an alarm system (i.e., sirens, horns, etc.) will be set up to alert employees of emergencies.

Cell phone and radio communication may be used to communicate with personnel in a construction zone. Site personnel will be trained on the use of the site emergency communication system or network. Emergency phone numbers will be posted at the phone or radio used for outside communication. The SSO is responsible for establishing the communication network prior to the start of work and for explaining it to all site personnel during the site safety briefing.

In the event of an emergency, personnel will use the following hand signals where voice communications are not feasible. This will be communicated to the entire project team:

Signal	Definition
Arms Extended Straight Out	Emergency Stop
Hand Extended to the Front	Stop/Wait
Arms Waving Overhead	Need Assistance
Thumbs Up	OK/I'm Ok/Proceed
Thumbs Down	No/Negative

Approval Signatures

Steve Lucas
Dow Senior Remediation Leader

Marty Crook
URS Site Manager

Don Burnell
MAS Site Safety Officer

Health & Safety Plan Revisions

Date	Name	Description of Revision	Revision Approved by:
4/16/12	Scott Madill	Created MAS project specific HASP	

By signing below, I acknowledge that I have read the Health & Safety Plan (HASP), understand it and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project and may be subject to disciplinary actions for violating any of the safety requirements specified in the HASP.

Employee Signature	Employee Printed Name	Employee Number

By signing below, I acknowledge that I have read the Health & Safety Plan (HASP), understand it and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project and may be subject to disciplinary actions for violating any of the safety requirements specified in the HASP.

Employee Signature	Employee Printed Name	Employee Number

APPENDIX 1

CONSTRUCTION SAFETY FLYER FOR HOMEOWNERS AND/OR OCCUPANTS

YOUR SAFETY IS OUR PRIORITY

There are safety concerns on every construction site. To keep you and your family safe while work is being completed at your house, we ask that you...

DO:

- Park in designated areas to allow construction vehicles to access your property
- Remain outside of barricaded areas
- Pay close attention to hazards that could cause potential slips trips and falls
- Feel free to ask questions or express concerns with designated property liaison (identified in orange shirt)

DON'T:

- Allow children to touch the equipment
- Allow children to play unsupervised in areas near construction work
- Allow pets to roam unsupervised in construction area
- Approach a worker while they are operating equipment

The Dow Chemical Company is committed to making the remedy process as easy as possible for the you

Midland Resolution Center, 1008 Jefferson Avenue, Midland, MI 48640
(989) 631-2270 www.midlandresolution.com

APPENDIX 2

JOB SAFETY ANALYSIS

<table>
<tr><th colspan="3">MAS Job Safety Analysis</th></tr>
<tr><td colspan="3">Work Activity: Driving to and from Site</td></tr>
<tr><th>Key Hazard (s)</th><th>Training Requirements</th><th>Protective Equipment Use</th></tr>
<tr><td>Wet/slippery road conditions
Other drivers
Pedestrians
Construction site traffic and personnel
Line-of-Fire
Deer or other animals in or on the side of the road
Backing hazards
Distracted by the cell phone</td><td>URS personnel only
URS LMS - Vehicle Safety
NSC DD course (or equivalent)
Hazard Awareness Training</td><td>Seatbelt</td></tr>
<tr><th>Equipment Required</th><th colspan="2">Other Hazard Control Measures</th></tr>
<tr><td>NA</td><td colspan="2">Completion of STAC/CHAT cards
No cell phone use while driving
All occupants must wear seat belts
Use defensive driving techniques
Plan ahead to avoid feeling rushed – find destination on map prior to mobilizing
Have all paperwork available including maps and stop vehicle to review; if needed</td></tr>
</table>

MAS Job Safety Analysis		
Work Activity: Property Visits to Obtain Access and Develop Work Plan		
Key Hazard (s)	**Training Requirements**	**Protective Equipment Use**
• Property owner/tenant interface • Slips/trips/falls (i.e, wet grass, uneven sidewalks, etc.) • Biological hazards (i.e., bees, poison ivy, mosquitoes, snakes, pets, etc) • Unfamiliarity with area (i.e., planters, edging, holes, etc.) • Walking and writing at the same time • Weather exposure (sun, rain, wind) • Be aware of children and pets	• Communications training • Project Orientation training • Hazard Awareness training	• Proper attire and footwear (long pants and rain gear if appropriate) • Poison ivy wipes • Sunscreen wipes
Equipment Required	**Other Hazard Control Measures**	
• PPE • Paperwork	• Completion of STAC/CHAT cards • Buddy system • Watch step; don't multi-task while walking, stop to write things down • Ask and be aware of pets • Have available insect repellent, wasp spray and dog mace • Be aware of surroundings • Shuffle feet while walking through grass or tall brush • Use handrails on steps • Pass out Homeowners Safety Bulletin	

MAS Job Safety Analysis		
Work Activity: Soil Sampling		
Key Hazard (s)	**Training Requirements**	**Protective Equipment Use**
• Working near traffic • Lifting heavy loads • Ergonomic hazards (irregular positions) • Direct soil contact • Pinch points in truck beds, car doors, sampling tools • Property owner/tenant interface • Underground utilities • Weather exposure (i.e., sun, rain, wind) • Heat stress • Biological hazards (i.e. bees, poison ivy, snakes, pets, etc) • Hand Injuries • Slips/trips/falls • Beware of children and pets	• Communications training • Project Orientation training • PPE training (use) • Hazard Assessment training	• Proper attire (long pants and rain gear if appropriate) • Poison ivy wipes • Sunscreen wipes • Steel toed boots • Gloves-leather and nitrile; as appropriate to the task • Safety glasses with side shields Pg. 1 of 2

<table>
<tr><th colspan="2">MAS Job Safety Analysis</th></tr>
<tr><td colspan="2">Work Activity: Soil Sampling</td></tr>
<tr><th>Equipment Required</th><th>Other Hazard Control Measures</th></tr>
<tr><td>
• Use project approved sampling tools, including hand tools
• Bottles, coolers
• PPE
• Support truck
• Paperwork
</td><td>
• Completion of STAC/CHAT cards
• Buddy system
• Watch step; don’t multi-task while walking
• Ask and be aware of pets
• Be aware of potential areas for bees and wasps, and have nests larger than softball size sprayed
• Be aware of surroundings
• Use handrails on steps
• Take breaks and drink plenty of water
• Rotate tasks
• Use MISS DIG to identify underground utilities
• Be aware of hand placement (wear right glove for task)
• Use proper cutting tools
• Practice proper lifting techniques; use two-person lift for objects heavier than 50 lbs.
• Stage equipment away from potential traffic
• Have available insect repellent, wasp spray and dog mace
• Shuffle feet while walking through grass or tall brush
• Practice good housekeeping (eliminate or identify potential hazards)
• Designate a ‘working’ area (i.e. a section of the parcel) and ‘non-working’ area (i.e. table with paperwork, maps, etc.) and emphasize that property owners/tenants remain only near the non-working area
• Pass out Homeowners Safety Bulletin
</td></tr>
</table>

MAS Job Safety Analysis		
Work Activity: Excavation and Backfill		
Key Hazard (s)	**Training Requirements**	**Protective Equipment Use**
• Hazards associated with heavy equipment use • Shoveling (back strains) • Ergonomic hazards • Line-of-Fire • Hitting and breaking underground lines • Hand/finger injuries • Eye exposures • Excessive noise • Pinch points • Slips/trips/falls • Potential overhead obstructions • Direct soil contact • Property owner/tenant interface • Backing hazards • Dust track out • Weather exposure (i.e., sun, rain, wind) including heat stress • Biological hazards (i.e. bees, poison ivy, snakes, pets, etc) • Operator leaving focus due to having an audience • Automobile traffic in roadway and driveways • Beware of children and pets	• Project Orientation training • Communications training • Heavy equip. operations • Hazard Awareness training • Soil Erosion and Sediment Control/Fugitive Dust training • Property Owner/Occupant Safety awareness training	• Hardhat • Steel-toed boots • Safety glasses with side shields • Gloves – leather gloves • Proper hearing protection when working near heavy equipment • Proper attire (long pants and rain gear if appropriate) • High Vis vest or shirt • Poison ivy wipes • Sunscreen wipes

MAS Job Safety Analysis	
Work Activity:	Excavation and Backfill
Equipment Required	**Other Hazard Control Measures**
• Back hoe • Shovels • Cones, caution tape, barricades • Bobcat • Tri-axel dump truck • Mini-excavator • Water truck • Street sweeper • Traffic control truck • PPE • Paperwork • Support truck	• Pre-job site visit, safe work permitting process • Buddy system • Completion of STAC/CHAT cards • Practice good housekeeping (eliminate or identify all potential slip/trip, fall hazards) • No jewelry, loose clothing. or loose long hair; no worn steel-toed boots • Utilize proper lifting and shoveling techniques and discuss personal limitations (use two-person lift for objects heavier than 50 lbs) • Account for all potential LOF hazards on daily STAC/CHAT and discuss during safety tailgate meeting; • Eye focus on hands during all handling activities (wear right glove for task) • Use proper cutting tools • Be aware of surroundings (watch where you place hands and feet) • Maintain LINE-OF-SIGHT at all times • Assign spotter when backing up (Utilized Dow Vehicle/Equipment Backing/spotting PTA Card) • Dust/track out monitoring and control using water truck and street sweeper • Utilize MISS DIG system to identify underground utilities (also ask property owner) • Take breaks and drink plenty of water • Ask and be aware of pets • Be aware of potential areas for bees and wasps, and have nests larger than a softball sprayed • Stage equipment away from potential traffic • Have available insect repellent, wasp spray and dog mace • Shuffle feet while walking through grass or tall brush • Enforce onlookers to remain in only designated areas heed equipment backup alarm warnings • Pass out Homeowners Safety Bulletin

MAS Job Safety Analysis		
Work Activity: Vegetation Replacement/Landscaping/Irrigation System Installation		
Key Hazard (s)	**Training Requirements**	**Protective Equipment Use**
• Hazards associated with heavy equipment use • Shoveling (back strains) • Ergonomic hazards • Line-of-Fire • Hitting and breaking underground lines • Hand/finger injuries • Eye exposures • Excessive noise • Pinch points • Slips/trips/falls • Potential overhead obstructions • Direct soil contact • Property owner/tenant interface • Backing hazards • Dust track out • Lifting heavy loads • Weather exposure (i.e., sun, rain) including heat stress • Biological hazards (i.e. bees, poison ivy, snakes, pets, etc) • Operator leaving focus due to having an audience • Automobile traffic in roadway and driveways • Beware of children and pets	• Project Orientation training • Communications training • Heavy equip. operations • Hazard Awareness training • Soil Erosion and Sediment Control/Fugitive Dust training • Property Owner/Occupant Safety Awareness training	• Hardhat • Steel-toed boots • Safety glasses with side shields • Gloves – leather gloves • Proper hearing protection when working near heavy equipment • High Vis vest or shirt • Poison ivy wipes • Sunscreen wipes • Proper attire (long pants and rain gear if appropriate) Pg. 1 of 2

MAS Job Safety Analysis	
Work Activity:	Vegetation Replacement/Landscaping/Irrigation System Installation

Equipment Required	Other Hazard Control Measures
• Shovels • Cones, caution tape, barricades • Bobcat • Mini-excavator • Water truck • Street sweeper • Traffic control truck • PPE • Paperwork • Support truck	• Pre-job site visit, safe work permitting process • Buddy system • Completion of STAC/CHAT cards • Practice good housekeeping (eliminate or identify all potential slip/trip, fall hazards • No jewelry, loose clothing. or loose long hair; no worn steel-toed boots • Utilize proper lifting and shoveling techniques and discuss personal limitations (use two-person lift for objects heavier than 50 lbs) • Account for all potential LOF hazards on daily STAC/CHAT and discuss during safety tailgate meeting • Eye focus on hands during all handling activities (wear right glove for task) • Use proper cutting tools • Be aware of surroundings (watch where you place hands and feet) • Maintain LINE-OF-SIGHT at all times • Assign spotter when backing up (Utilized Dow Vehicle/Equipment Backing/Spotting PTA Card) • Dust/track out monitoring and control using water truck and street sweeper • Utilize MISS DIG system to identify underground utilities (also ask property owner) • Take breaks and drink plenty of water • Ask and be aware of pets • Be aware of potential areas for bees and wasps, and have nests larger than a softball sprayed • Stage equipment away from potential traffic • Have available insect repellent, wasp spray and dog mace • Shuffle feet while walking through grass or tall brush • Enforce onlookers to remain in only designated areas Heed equipment backup alarm warnings • Pass out Homeowners Safety Bulletin

MAS Job Safety Analysis		
Work Activity: Post Remedy Care (O&M Activities)		
Key Hazard (s)	**Training Requirements**	**Protective Equipment Use**
• Hazards associated with commercial mower • Line-of-Fire • Ergonomic hazards • Hand/finger injuries • Eye exposures • Excessive noise • Pinch points • Slips/trips/falls • Property owner/tenant interface • Lifting heavy loads • Heat stress • Biological hazards (i.e. bees, poison ivy, snakes, pets, etc) • Heat stress • Beware of children and pets	• Project Orientation training • Communications training • Hazard Awareness training	• Steel-toed boots – at all times • Safety glasses with side shields • Gloves - leather • Proper hearing protection when mowing • High Vis vest or shirt • Poison ivy wipes • Sunscreen wipes • Proper attire (long pants and rain gear if appropriate) Pg. 1 of 2

MAS Job Safety Analysis	
Work Activity: Post Remedy Care (O&M Activities)	
Equipment Required	**Other Hazard Control Measures**
• Commercial mower • Hand spreader • Nutrient applicator • PPE • Support Truck • Paperwork	• Buddy system • Completion of STAC/CHAT cards • Practice good housekeeping (eliminate or identify all potential slip/trip, fall hazards • No jewelry, loose clothing. or loose long hair; no worn steel-toed boots • Utilize proper lifting and shoveling techniques and discuss personal limitations (use two-person lift for objects heavier than 50 lbs) • Account for all potential LOF hazards on daily STAC/CHAT • Eye focus on hands during all handling activities (wear right glove for task) • Use proper cutting tools • Be aware of surroundings (watch where you place hands and feet) • Inspect mower prior to use to ensure that the safety features are working • Use proper mowing technique • Be aware of potential areas for bees and wasps, and have nests larger than a softball sprayed • Have available insect repellent, wasp spray and dog mace • Take breaks and drink plenty of water • Ask and be aware of pets • Designate a ‘working’ area (i.e. a section of the parcel) and ‘non-working’ area (i.e. table with paperwork, maps, etc.) and emphasize that property owners/tenants remain only near the non-working area • Pass out Homeowners Safety Bulletin Pg. 2 of 2

MAS Job Safety Analysis

Work Activity: Concrete Replacement

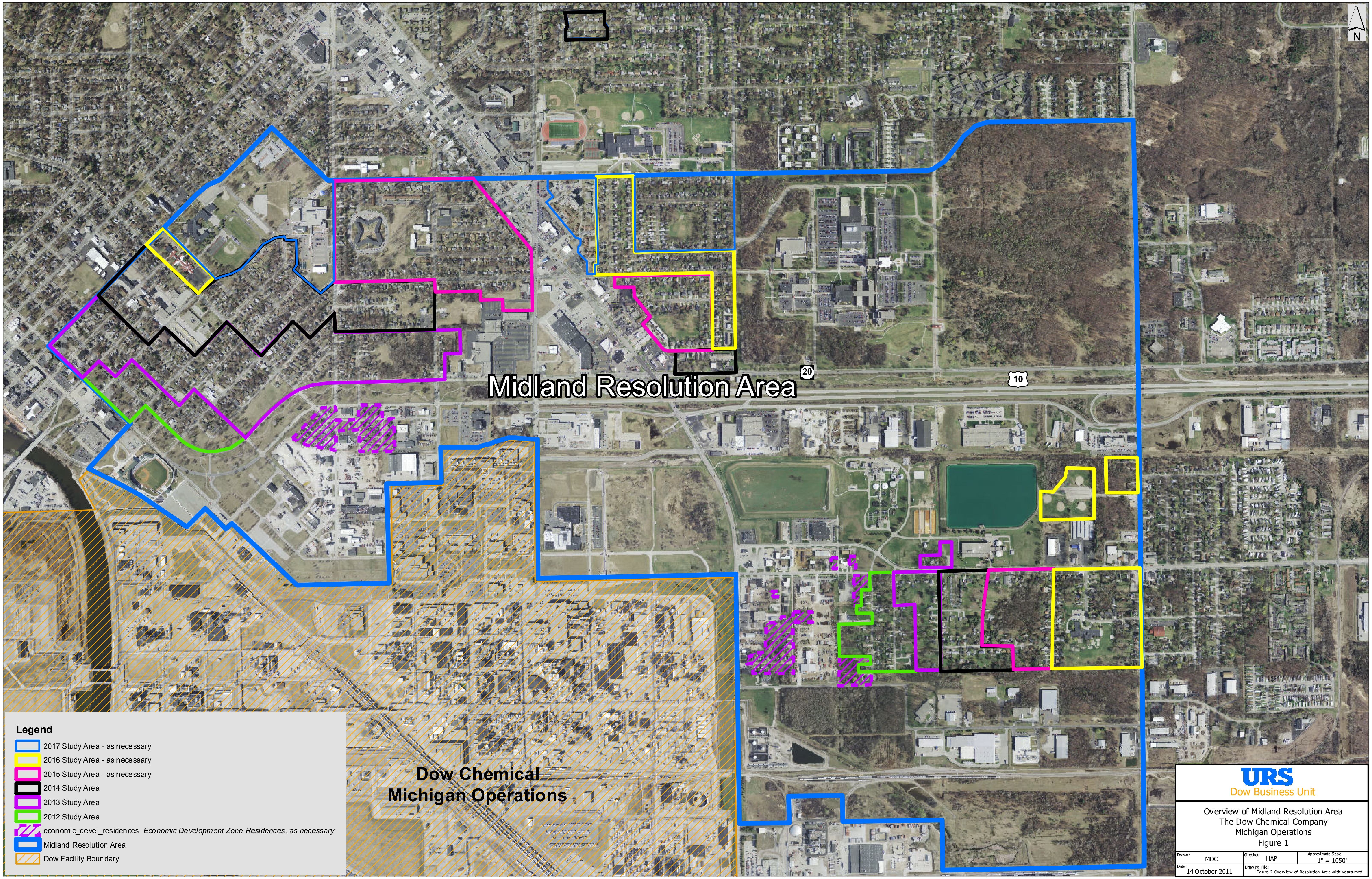
Key Hazard (s)	Training Requirements	Protective Equipment Use
• Hazards associated with heavy equipment use • Shoveling and leveling (back strains) • Line-of-Fire • Hitting and breaking underground lines • Hand/finger injuries • Eye exposures • Excessive noise • Pinch points • Slips/trips/falls • Potential overhead obstructions • Direct soil contact • Property owner/tenant interface • Backing hazards • Dust track out • Contact with cement • Ergonomic hazards • Biological hazards (i.e. bees, poison ivy, snakes, pets, etc) • Heat stress • Beware of children and pets	• Project Orientation training • Communications training • Hazard Awareness training • Property Owner/Occupant Safety Awareness training • Soil Erosion and Sediment Control/Fugitive Dust training	• Hardhat • Steel-toed boots • Rubber boots – during cement placement • Safety glasses with side shields • Gloves – leather gloves • Proper hearing protection when working near heavy equipment • High Vis vest or shirt • Poison ivy wipes • Sunscreen wipes • Proper attire (long pants and rain gear if appropriate)

MAS Job Safety Analysis	
Work Activity: Concrete Replacement	
Equipment Required	**Other Hazard Control Measures**
• Shovels • Cones, caution tape, barricade • Bobcat • Water truck • Street sweeper • Traffic control truck • Concrete truck • Leveling tools	• Pre-job site visit, safe work permitting process • Buddy system • Completion of STAC/CHAT cards • Practice good housekeeping (eliminate or identify all potential slip/trip, fall hazards • No jewelry, loose clothing. or loose long hair; no worn steel-toed boots • Utilize proper lifting and shoveling techniques and discuss personal limitations (use two-person lift for objects heavier than 50 lbs) • Account for all potential LOF hazards on daily STAC/CHAT and discuss during safety tailgate meeting • Eye focus on hands during all handling activities (wear right glove for task) • Be aware of surroundings (watch where you place hands and feet) • Maintain LINE-OF-SIGHT with equipment operators at all times • Assign spotter when backing up (Utilized Dow Vehicle/Equipment Backing/spotting PTA Card) • Dust/track out monitoring and control using water truck and street sweeper • Utilize MISS DIG system to identify underground utilities (also ask property owner) • Rotate tasks • Take breaks and drink plenty of water • Ask and be aware of pets • Be aware of potential areas for bees and wasps, and have nests larger than a softball sprayed • Enforce onlookers to remain in only designated areas • Pass out Homeowners Safety Bulletin

MAS Job Safety Analysis		
Work Activity: Tree Removal		
Key Hazard (s)	**Training Requirements**	**Protective Equipment Use**
• Hazards associated with heavy equipment use • Line-of-Fire • Hitting and breaking underground lines • Hand/finger injuries • Eye exposures • Excessive noise • Pinch points • Slips/trips/falls • Potential overhead obstructions • Property owner/tenant interface • Backing hazards • Dust track out • Heat stress • Falling branches/trees • Lacerations • Biological hazards (i.e. bees, poison ivy, snakes, pets, etc) • Beware of children and pets	• Communications training • Heavy equip. operations training • Project Orientation training • Hazard Awareness training • Property Owner/Occupant Safety Awareness training	• Hardhat – at all times • Steel-toed boots – at all times • Safety glasses with side shields • Gloves – leather gloves • Proper hearing protection when working near heavy equipment • High Vis vest or shirt • Chaps (when operating chain saw) • Proper attire (long pants and rain gear if appropriate)

MAS Job Safety Analysis	
Work Activity: Tree Removal	
Equipment Required	**Other Hazard Control Measures**
• Chain saws • Chipper • Bucket truck/cherry picker • Ladders • Cones, caution tape, barricades	• Pre-job site visit, safe work permitting process • Buddy system • Completion of STAC/CHAT cards • Practice good housekeeping (eliminate or identify all potential slip/trip, fall hazards • No jewelry, loose clothing or loose long hair; no worn steel-toed boots • Utilize proper lifting and shoveling techniques and discuss personal limitations (use two-person lift for objects heavier than 50 lbs) • Account for all potential LOF hazards on daily STAC/CHAT and discuss during safety tailgate meeting • Eye focus on hands during all handling activities (wear right glove for task) • Use proper cutting tools • Be aware of surroundings (watch where you place hands and feet) • Maintain LINE-OF-SIGHT at all times • Assign spotter when backing up (Utilized Dow Vehicle/Equipment Backing/Spotting PTA Card) • Dust/track out monitoring and control using water truck and street sweeper • Utilize MISS DIG system to identify underground utilities (also ask property owner) • Take breaks and drink plenty of water • Ask and be aware of pets • Be aware of potential areas for bees and wasps, and have nests larger than a softball sprayed • OSHA approved ladder use policies • Enforce that non-essential personal remain outside of the barricaded limits; including property owners and/or tenants. • Pass out Homeowners Safety Bulletin Pg. 2 of 2

FIGURE



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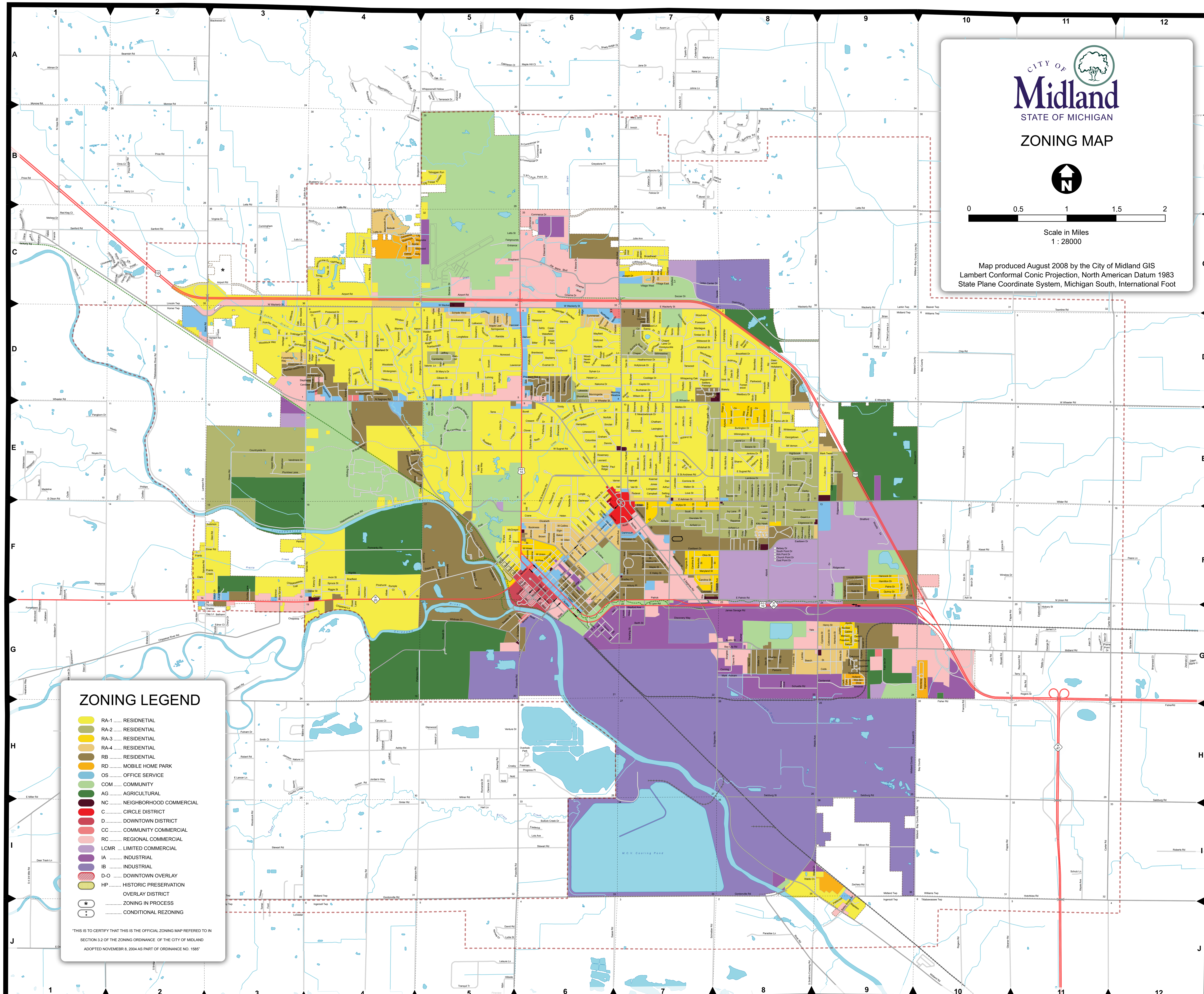
Midland Resolution Area
20
10
Dow Chemical
Michigan Operations
Legend
2017 Study Area - as necessary
2016 Study Area - as necessary
2015 Study Area - as necessary
2014 Study Area
2013 Study Area
2012 Study Area
economic_devel_residences Economic Development Zone Residences, as necessary
Midland Resolution Area
Dow Facility Boundary
URS
Dow Business Unit
Overview of Midland Resolution Area
The Dow Chemical Company
Michigan Operations
Figure 1
Drawn: MDC
Checked: HAP
Approximate Scale: 1" = 1050'
Date: 14 October 2011
Drawing File: Figure 2 Overview of Resolution Area with years.mxd



INDEX OF STREETS

Attachment L

Green Remediation Guidelines
for
Midland Area Soils Project

Midland Area Soils Project
Green Remediation Guidelines

Site Name: Midland Area Soils
Address: Midland, Michigan

Introduction: These potential green remediation best management practices were developed for the Midland Area Soils project to promote environmental stewardship, identify strategies in regard to sustainability, and reduce the impacts the field activities may have on the environment and home owners. The following are potential best management practices for the project.

Fuels:

- Use of low sulfur diesel in project equipment, off road diesel will not be used during the project.

Equipment:

- Commitment to use Tier 3 and Tier 4 – diesel motors for the project (manufactured after 2006).
- Use of administrative controls during construction – no idling of equipment during construction activities to include trucks and heavy equipment.
- Evaluation of scrubbing system for diesel exhaust portions of the planned heavy equipment for the project.
- Commitment of the use of suitable sized equipment for the project.
- Commitment and tracking of routine maintenance on project equipment is being completed.

Administrative:

- Procurement of vegetation and plants will be supplied by locally grown operation.
- Commitment to use local provider for sub contracted services including concrete, tree removal, trucking, and irrigation.
- Borrow pit source will be selected closer to the project but within or mandated radius criteria. Selected sources will be given preference over potential sources from greater trucking distances away.

Waste Management:

- Recycling: 99 per cent of the anticipated wastes generated during the remedy process will be recycled. The wood or tree's removed will be chipped and then staged for use.

- All new landscaping and perennial plants will be brought to the site in recyclable pots that will be collected and reused by the supplier.

Project Controls:

- Use of recycled newspaper as binder for hydroseeding portions.

- The remedy sites will be scheduled and implemented to avoid having multiple project sites with exposed soils.

- Use of best management practices to control track out and dust.

- Use of tarps on trucks during soil removal and borrow trucking to further manage dust and soil.

- Use of active dust management program during the project.

- Use of phosphate free fertilizers on any application that will be used on landscaping or lawns.

- Emphasis on removed soil as reused in the Dow Plant site to avoid managing these soils long term in a landfill.

- Use of sod as the preferred re-vegetation tool. Covers exposed soils and avoiding having soil and erosion management issues.

- Irrigation controls to include a rain sensor within the system to shutdown if it is raining to conserve water.

- Preprogramming irrigation system to only water at prescribed rates and times.